Brazed

BTA

Deep Hole Drilling

Member IMC Group Tungaloy

INDUSTRY 4.0

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FEED the SPEED!

How to use this catalog

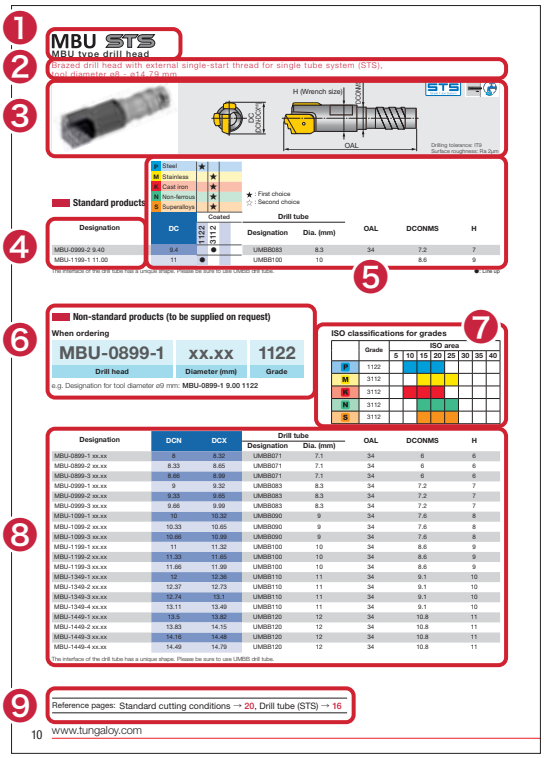
Option 1

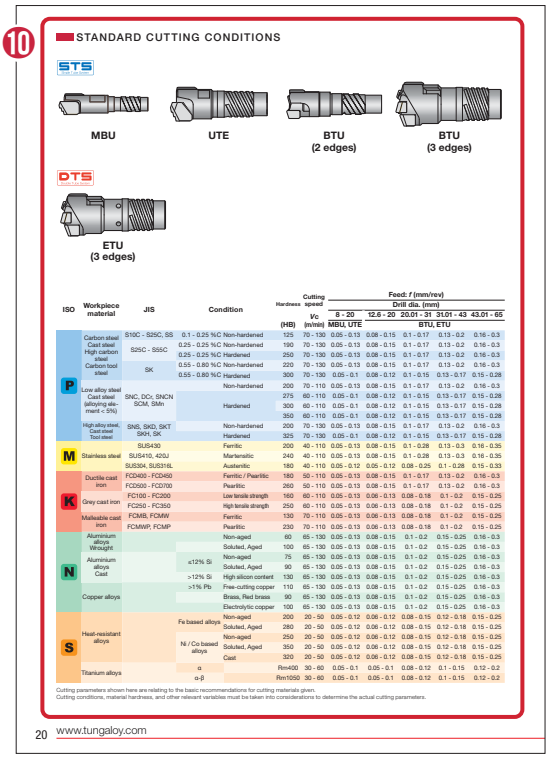
Standard brazed BTA drill features and size information are listed in Sections ❷, ❸, ❹, and ❺ on each page. Use the guide and information in Sections ❻ and ❽ for special tools tailored for specific components and applications.

Option 2

For brazed BTA drill head details go to Page 06.

Note: The products are arranged in increasing order of diameter.





❶ : Series name
❷ : Feature
❸ : Appearance and dimension drawing
❹ : Item designation
❺ : Dimension table
❻ : Ordering requirements of Non-standard products
❼ : ISO classifications for grades
❽ : Dimension table of Non-standard products
❾ : Reference pages
❿ : Standard cutting conditions

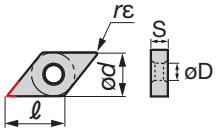
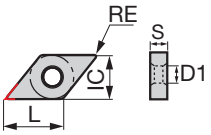
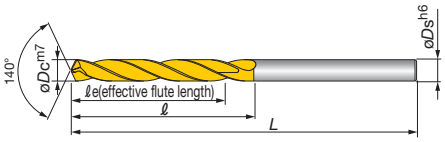
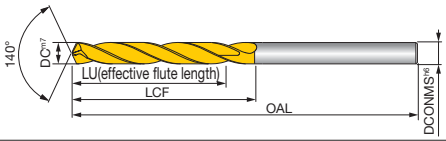
ISO13399 - Cutting tool data representation and exchange

What is ISO13399?

This *Brazed BTA Deep Hole Drilling* catalog is created in compliance with ISO 13399.

ISO13399 defines cutting tool data representation and exchange, allowing the accurate exchange of tooling data among computer aided applications that support and adhere to the standard, including CAD, CAM, CAE, PDM, PLM and tool management systems.

Shown below are examples of the ISO13399 symbols.

	Before	ISO13399
Insert		
Drill		

ISO13399 standardizes not only the format of 2D and 3D CAD data but also the tool dimension symbols (properties) and reference position information. This allows the tool information to be read and combined into NC programs and CAM software, regardless of any tool maker's data. In addition to the General Catalog (paper catalog), we are also updating the symbols in e-catalog (electronic catalog on our website) to the properties conforming to ISO13399. The e-catalog also provides 2D and 3D CAD data in accordance with ISO13399 standard.

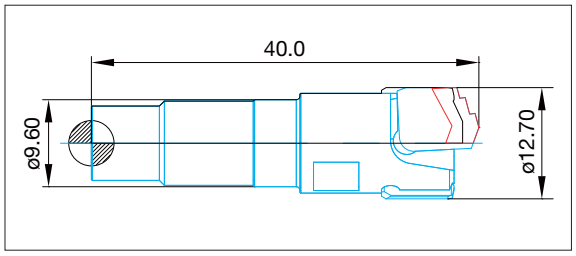
Drill

New symbol	Old symbol	Description
BD	***øD1, øD2, øD3***	Body external diameter
CICT	**z**	Number of inserts
CND	**-**	Oil hole diameter
CNT	**-**	Oil hole plug size
CRKS	***S***	Mounting screw size
DC	***øDc***	Machining diameter
DCONMS	***øDs***	Mounting part diameter on the machine
DCONWS	***øD, ød2***	Mounting part diameter on the workpiece
DCSFMS	***øD***	Connecting part diameter
KAPR	**κ**	Cutting edge angle
LCF	***ℓ***	Flute length
LF	***L*f**	Standard length (from the drill shoulder)
LPR	**-**	Parting length (from flange to tip)
LS	***ℓ*s**	Shank length
LU	***ℓ***	Machinable depth
NOF	**z**	Number of flutes
OAL	***L***	Overall length (from tip)
PL	**PL**	Distance from drill tip to shoulder
ZEFP	**Z eff**	Number of effective cutting edges on periphery

Note:
- Symbols unspecified in ISO13399 standard and Tungaloy's original symbols are not included.
- The symbols still under discussion are included. Please note any change or addition may occur.

CAD data provided in e-catalog

● **2D data (DXF format file)**



Includes actual cutting edge curve (CUT layer) and body cross section (NOCUT layer).

● **3D data Light type (STP format file): Can be used to check tool path and interference.**

A rotating body model of an actual cutting edge curve and a body cross section.

● **3D data Detail type (STP format file): Can be used to create a new tool layout chart. (Can be combined with any model on a CAD software.)**

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Brazed BTA tool

Deep Hole Drilling

Drill Head Categories

Brazed Drill Heads

Applications		STS (Single Tube System)			DTS (Double Tube System)
		MBU	UTE	BTU	ETU
Brazed drill heads					
Drill diameter (mm)		ø8 - ø14.79	ø12.6 - ø20	ø12.6 - ø65	ø18.4 - ø65
Thread type	External single-start thread	○	-	-	-
	External 2-start thread	-	○*1	○*1	-
	External 4-start thread	-	○*2	○*2	○
Hole tolerance		IT9	IT9	IT9	IT9
Surface finish Ra (µm)		2	2	2	2
Machine	Deep hole drilling machines	○	○	○	○
	NC machines	-	-	-	○
	Lathes	-	-	-	○
	Machining centers M/C	-	-	-	○
Workpiece material	P Steel	★★★	★★★	★★★	★★★
	M Stainless	★★★	★★★	★★★	★★★
	K Cast iron	★★★	★★★	★★★	★★★
	N Non-ferrous	★★★	★★★	★★★	★★★
	S Superalloys	★★	★★	★★	★★
	H Hard materials (≥40HRC)	★★	★★	★★	★★
Page		10	11	12 - 14	15

★★★ (Excellent) ◄► ★ (Standard)
*1: UTE & BTU Drill head : ø12.6 mm - ø15.59 mm, External 2-start thread
*2: UTE & BTU Drill head : ø15.6 mm - ø65 mm, External 4-start thread

Brazed drill head — Coated area

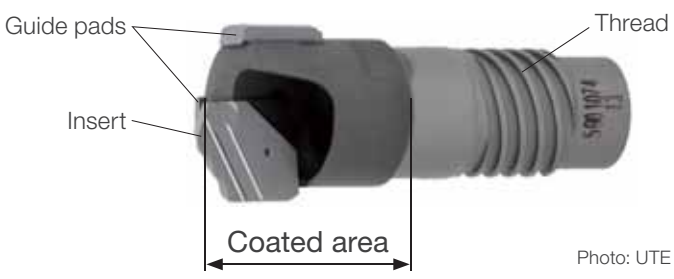


Photo: UTE

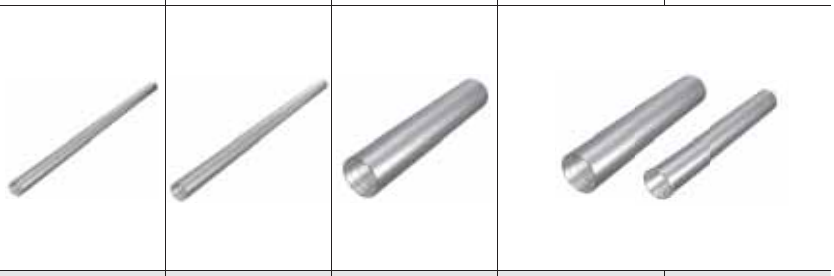
Tool Grades

Grade	Coating		Application	Features	Brazed drill heads			
	Main composition	Thickness / µm			MBU	UTE	BTU	ETU
								
1122 P10 - P30 K15 - K25 N15 - N25 S15 - S25 H15 - H25	TiAlCr	2.5	P K N S H	- High wear resistance - Suitable for steel, cast iron, and difficult-to-cut material	○	○	○	○
1132 P20 - P30 M25 - M35	TiAlCr	2.5	P M	- Good balance between wear and chipping resistance - Suitable for steel and stainless steel under general cutting conditions			○	○
2122 M30 - M40	TiAlCr	2.5	M	- High fracture resistance - Suitable for stainless steel			○	○
3112 M15 - M25 K10 - K20 N15 - N25 S15 - S25 H15 - H25	TiAlCr	2.5	M K N S H	- Good balance between wear and fracture resistance	○	○		
3132 K15 - K25 N10 - N20 S15 - S25 H15 - H25	TiAlCr	2.5	K N S H	- First choice for heat-resistant alloy under general cutting conditions		○	○	○

Note: Being brazed tools, the grade codes represent the grade combination of the brazed carbide tip and guide pad grades.
They do not represent the individual grade of carbide tips or guide pads.

Drill Tube Categories

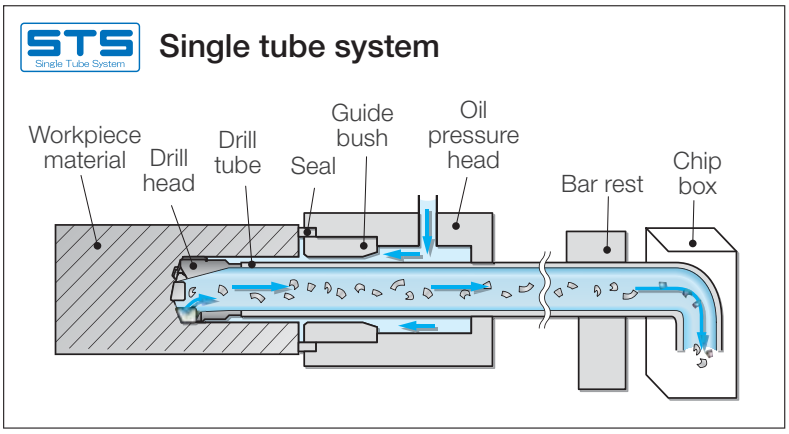
Drill Tubes

Applications			STS (Single Tube System)			DTS (Double Tube System)	
			UMBB	ST	ST	OT	IT
Drill tubes							
Tube diameter (mm)			ø7.1 - ø12	ø11 - ø13	ø14 - ø56	ø18 - ø55.5	ø12 - ø43
Thread type			Internal single-start thread	Internal 2-start thread	Internal 4-start thread	Internal 4-start thread	-
Drill heads	Brazed	For solid drilling	MBU	○	-	-	-	-
			UTE	-	○	○	-	-
			BTU	-	○	○	-	-
			ETU	-	-	-	○	○
Drill diameter (mm)			ø8 - ø14.79	ø12.6 - ø15.59	ø15.6 - ø65	ø18.4 - ø65	ø18.4 - ø65
Page			16	16	16	18	18

Single Tube System (STS) and Double Tube System (DTS)

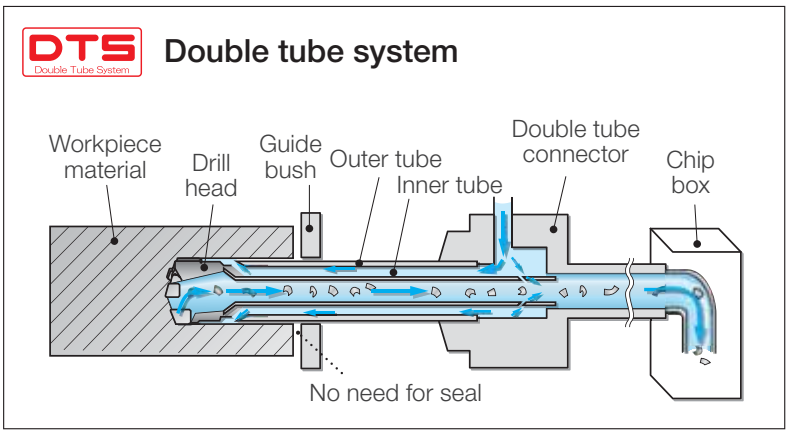
Single Tube System (STS)

The STS is also referred to as the BTA system in the deep hole drilling process.
A large volume of coolant is pumped under high pressure to the cutting area in the workpiece. Chips are then forced out through the drill tube at the back and do not touch the workpiece providing an outstanding surface finish. STS is a stable method to create holes with high accuracy by using a dedicated drilling machine and a sealing with the workpiece.



Double Tube System (DTS)

The DTS is characterized by its two tube construction and is therefore known as the double tube system. A sealing system and pressure head, which is required in the Single Tube System (STS), is not necessary for the DTS and it is therefore suitable for conventional general purpose machines such as lathes or machining centers.
In general, because of less efficient chip evacuation than the STS, the recommended max drilling depth is 1000mm. The unique DTC-R tube connector that is capable of supplying high pressure coolant can, however, successfully achieve drilling depths of up to 2000mm.



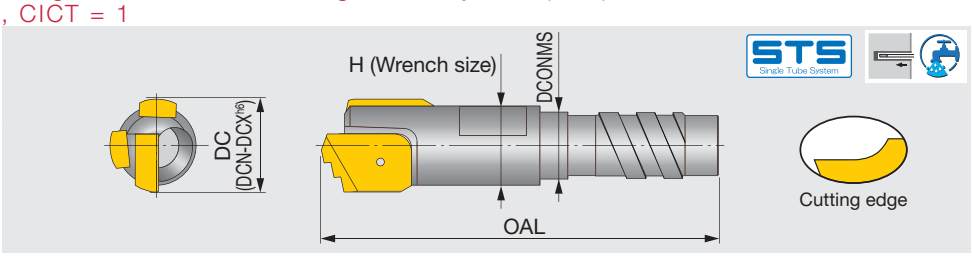
MBU, UTE, BTU, ETU

ø8 mm - ø65 mm

MBU STS

MBU type drill head

Brazed drill head with external single-start thread for single tube system (STS), tool diameter ø8 - ø14.79 mm, CICT = 1



P	Steel	★		
M	Stainless		★	
K	Cast iron		★	
N	Non-ferrous		★	
S	Superalloys		★	
H	Hard materials		★	

★ : First choice
☆ : Second choice

Standard products

Designation	DC	Coated 1122	Coated 3112	Drill tube Designation	Drill tube Dia. (mm)	OAL	DCONMS	H
MBU-0999-2 9.40	9.4		●	UMBB083	8.3	34	7.2	7
MBU-1199-1 11.00	11	●		UMBB100	10	34	8.6	9

●: Line up

Non-standard products (to be supplied on request)

When ordering

MBU-0899-1	xx.xx	1122
Drill head	Diameter (mm)	Grade

e.g. Designation for tool diameter ø9 mm: **MBU-0899-1 9.00 1122**

ISO classifications for grades

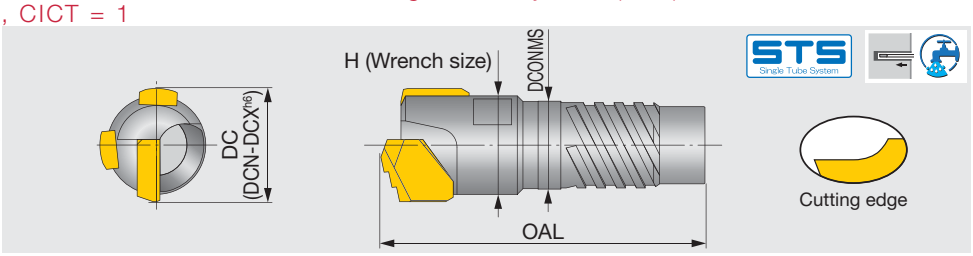
	Grade	ISO area 5	10	15	20	25	30	35	40
P	1122								
M	3112								
K	3112								
N	3112								
S	3112								
H	3112								

Designation	DCN	DCX	Drill tube Designation	Drill tube Dia. (mm)	OAL	DCONMS	H
MBU-0899-1 xx.xx	8	8.32	UMBB071	7.1	34	6	6
MBU-0899-2 xx.xx	8.33	8.65	UMBB071	7.1	34	6	6
MBU-0899-3 xx.xx	8.66	8.99	UMBB071	7.1	34	6	6
MBU-0999-1 xx.xx	9	9.32	UMBB083	8.3	34	7.2	7
MBU-0999-2 xx.xx	9.33	9.65	UMBB083	8.3	34	7.2	7
MBU-0999-3 xx.xx	9.66	9.99	UMBB083	8.3	34	7.2	7
MBU-1099-1 xx.xx	10	10.32	UMBB090	9	34	7.6	8
MBU-1099-2 xx.xx	10.33	10.65	UMBB090	9	34	7.6	8
MBU-1099-3 xx.xx	10.66	10.99	UMBB090	9	34	7.6	8
MBU-1199-1 xx.xx	11	11.32	UMBB100	10	34	8.6	9
MBU-1199-2 xx.xx	11.33	11.65	UMBB100	10	34	8.6	9
MBU-1199-3 xx.xx	11.66	11.99	UMBB100	10	34	8.6	9
MBU-1349-1 xx.xx	12	12.36	UMBB110	11	34	9.1	10
MBU-1349-2 xx.xx	12.37	12.73	UMBB110	11	34	9.1	10
MBU-1349-3 xx.xx	12.74	13.1	UMBB110	11	34	9.1	10
MBU-1349-4 xx.xx	13.11	13.49	UMBB110	11	34	9.1	10
MBU-1449-1 xx.xx	13.5	13.82	UMBB120	12	34	10.8	11
MBU-1449-2 xx.xx	13.83	14.15	UMBB120	12	34	10.8	11
MBU-1449-3 xx.xx	14.16	14.48	UMBB120	12	34	10.8	11
MBU-1449-4 xx.xx	14.49	14.79	UMBB120	12	34	10.8	11

Reference pages: Standard cutting conditions → 20, Drill tube (STS) → 16

UTE STS
UTE type drill head

Brazed drill head with external 2-start or 4-start thread for single tube system (STS), tool diameter ø12.6 - ø20 mm, CICT = 1



P	Steel	★	
M	Stainless		
K	Cast iron		
N	Non-ferrous		
S	Superalloys		
H	Hard materials		

★ : First choice
☆ : Second choice

Standard products

Designation	DC	Coated 1122	Drill tube Designation	Drill tube Dia. (mm)	OAL	DCONMS	H
UTE-0094-1 12.90	12.9	●	ST0094	11	40	9.6	10

●: Line up

Non-standard products (to be supplied on request)

When ordering

UTE-0094-1	xx.xx	1122
Drill head	Diameter (mm)	Grade

e.g. Designation for tool diameter ø12.92 mm: **UTE-0094-1 12.92 1122**

ISO classifications for grades

	Grade	ISO area 5	10	15	20	25	30	35	40
P	1122								
M	3112								
K	3112								
N	3112								
S	3132								
H	3132								

Designation	DCN	DCX	Drill tube Designation	Drill tube Dia. (mm)	OAL	DCONMS	H
UTE-0094-1 xx.xx	12.6	12.92	ST0094	11	40	9.6	10
UTE-0094-2 xx.xx	12.93	12.99	ST0094	11	40	9.6	10
UTE-0094-3 xx.xx	13	13.25	ST0094	11	40	9.6	10
UTE-0094-4 xx.xx	13.26	13.6	ST0094	11	40	9.6	10
UTE-0095-1 xx.xx	13.61	13.93	ST0095	12	40	10.6	11
UTE-0095-2 xx.xx	13.94	13.99	ST0095	12	40	10.6	11
UTE-0095-3 xx.xx	14	14.26	ST0095	12	40	10.6	11
UTE-0095-4 xx.xx	14.27	14.6	ST0095	12	40	10.6	11
UTE-0096-1 xx.xx	14.61	14.93	ST0096	13	40	11.6	12
UTE-0096-2 xx.xx	14.94	15.26	ST0096	13	40	11.6	12
UTE-0096-3 xx.xx	15.27	15.59	ST0096	13	40	11.6	12
UTE-0097-1 xx.xx	15.6	15.96	ST0097	14	40	12.6	13
UTE-0097-2 xx.xx	15.97	16.32	ST0097	14	40	12.6	13
UTE-0097-3 xx.xx	16.33	16.7	ST0097	14	40	12.6	13
UTE-0098-1 xx.xx	16.71	17.03	ST0098	15	40	13.6	14
UTE-0098-2 xx.xx	17.04	17.36	ST0098	15	40	13.6	14
UTE-0098-3 xx.xx	17.37	17.7	ST0098	15	40	13.6	14
UTE-0099-1 xx.xx	17.71	18.09	ST0099	16	40	14.5	15
UTE-0099-2 xx.xx	18.1	18.48	ST0099	16	40	14.5	15
UTE-0099-3 xx.xx	18.49	18.9	ST0099	16	40	14.5	15
UTE-0000-1 xx.xx	18.91	19.26	ST0000	17	40	15.5	16
UTE-0000-2 xx.xx	19.27	19.62	ST0099	17	40	15.5	16
UTE-0000-3 xx.xx	19.63	20	ST0099	17	40	15.5	16

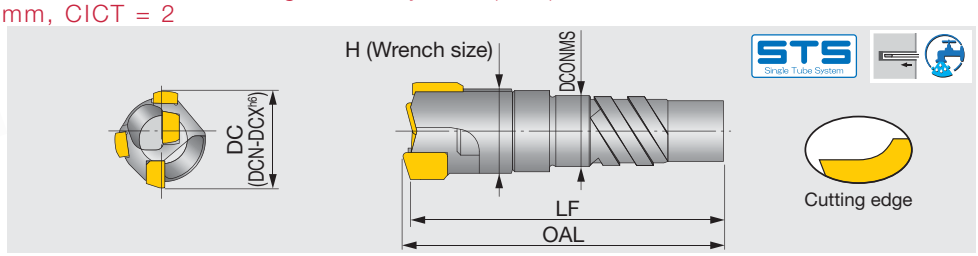
UTE Drill head : ø12.6 mm - ø15.59 mm, External 2-start thread
UTE Drill head : ø15.6 mm - ø20 mm, External 4-start thread

Reference pages: Standard cutting conditions → 20, Drill tube (STS) → 16

BTU STS

BTU type drill head (Small diameter, 2 edges)

Brazed drill head with external 2-start thread for single tube system (STS),
tool diameter ø12.6 - ø15.59 mm, CICT = 2



Non-standard products (to be supplied on request)

When ordering

BTU-00941	xx.xx	1122
Drill head	Diameter (mm)	Grade

e.g. Designation for tool diameter ø13.1 mm: **BTU-00941 13.10 1122**

ISO classifications for grades

	Grade	ISO area							
		5	10	15	20	25	30	35	40
P	1122								
M	2122								
K	1122								
N	1122								
S	1122								
H	1122								

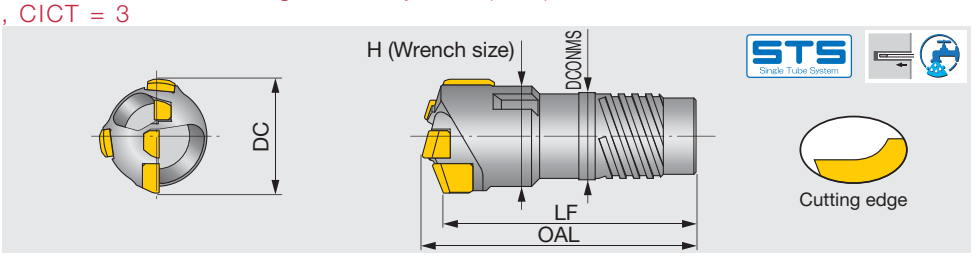
Designation	DCN	DCX	Drill tube		OAL	LF	DCONMS	H
			Designation	Dia. (mm)				
BTU-00941 xx.xx	12.6	13.1	ST0094	11	43	41.9	9.6	10
BTU-00942 xx.xx	13.11	13.6	ST0094	11	43	41.9	9.6	10
BTU-00951 xx.xx	13.61	14.1	ST0095	12	43	41.8	10.6	11
BTU-00952 xx.xx	14.11	14.6	ST0095	12	43	41.8	10.6	11
BTU-00961 xx.xx	14.61	15.1	ST0096	13	43	41.7	11.6	12
BTU-00962 xx.xx	15.11	15.59	ST0096	13	43	41.7	11.6	12

Reference pages: Standard cutting conditions → 20, Drill tube (STS) → 16

BTU STS

BTU type drill head (3 edges)

Brazed drill head with external 4-start thread for single tube system (STS),
tool diameter ø15.6 - ø65 mm, CICT = 3



P	Steel	★			
M	Stainless	★	★		
K	Cast iron			★	
N	Non-ferrous				
S	Superalloys				
H	Hard materials			★	

★ : First choice
☆ : Second choice

Standard products

Designation	DC	Coated			Drill tube		OAL	LF	DCONMS	H
		1132	2122	3132	Designation	Dia. (mm)				
BTU-00971 16.11	16.11	●			ST0097	14	43	40.3	12.6	-
BTU-00971 16.13	16.13	●			ST0097	14	43	40.3	12.6	-
BTU-002 19.26	19.26		●		ST0000	17	47	44	15.5	18
BTU-002 19.27	19.27	●			ST0000	17	47	44	15.5	18
BTU-002 19.28	19.28	●			ST0000	17	47	44	15.5	18
BTU-002 19.3	19.3	●			ST0000	17	47	44	15.5	18
BTU-011 20.21	20.21	●			ST00	18	52.5	49.4	16	18
BTU-011 20.28	20.28	●			ST00	18	52.5	49.4	16	18
BTU-021 22.1	22.1			●	ST01	20	56	52.8	18	20
BTU-022 23.6	23.6			●	ST01	20	56	52.6	18	21
BTU-032 25.26	25.26	●			ST02	22	57.5	54	19.5	24
BTU-032 25.28	25.28	●			ST02	22	57.5	54	19.5	24
BTU-032 25.66	25.66	●			ST02	22	57.5	54	19.5	24
BTU-032 25.67	25.67	●			ST02	22	57.5	54	19.5	24
BTU-032 25.68	25.68	●			ST02	22	57.5	54	19.5	24
BTU-032 26.4	26.4		●		ST02	22	57.5	54	19.5	24

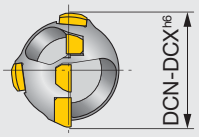
●: Line up

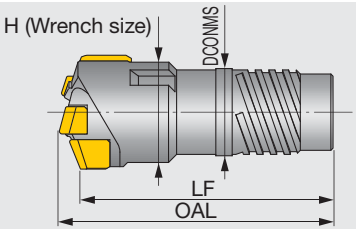
Reference pages: Standard cutting conditions → 20, Drill tube (STS) → 16

BTU STS

BTU type drill head (3 edges)

Brazed drill head with external 4-start thread for single tube system (STS), tool diameter ø15.6 - ø65 mm, CICT = 3





Non-standard products (to be supplied on request)

When ordering

BTU-00971	xx.xx	1122
Drill head	Diameter (mm)	Grade

e.g. Designation for tool diameter ø16.2 mm: **BTU-00971 16.20 1122**

ISO classifications for grades

	Grade	ISO area							
		5	10	15	20	25	30	35	40
P	1122								
	1132								
M	1132								
	2122								
K	3132								
N	3132								
S	3132								
H	3132								

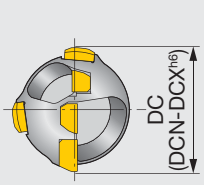
Designation	DCN	DCX	Drill tube		OAL	LF	DCONMS	H
			Designation	Dia. (mm)				
BTU-00971 xx.xx	15.6	16.2	ST0097	14	43	40.3	12.6	-
BTU-00972 xx.xx	16.21	16.7	ST0097	14	43	40.3	12.6	14
BTU-00981 xx.xx	16.71	17.2	ST0098	15	43	40.3	13.6	15
BTU-00982 xx.xx	17.21	17.7	ST0098	15	43	40.3	13.6	15
BTU-00991 xx.xx	17.71	18.4	ST0099	16	47	44.2	14.5	15
BTU-00992 xx.xx	18.41	18.9	ST0099	16	47	44.1	14.5	-
BTU-001 xx.xx	18.91	19.2	ST0000	17	47	44.1	15.5	17
BTU-002 xx.xx	19.21	20	ST0000	17	47	44	15.5	18
BTU-011 xx.xx	20.01	20.9	ST00	18	52.5	49.4	16	18
BTU-012 xx.xx	20.91	21.8	ST00	18	52.5	49.4	16	19
BTU-021 xx.xx	21.81	22.9	ST01	20	56	52.8	18	20
BTU-022 xx.xx	22.91	24.1	ST01	20	56	52.6	18	21
BTU-031 xx.xx	24.11	25.2	ST02	22	57.5	54	19.5	23
BTU-032 xx.xx	25.21	26.4	ST02	22	57.5	54	19.5	24
BTU-041 xx.xx	26.41	27.5	ST03	24	57.5	53.8	21	25
BTU-042 xx.xx	27.51	28.7	ST03	24	57.5	53.8	21	26
BTU-051 xx.xx	28.71	29.8	ST04	26	63.5	59.5	23.5	27
BTU-052 xx.xx	29.81	31	ST04	26	63.5	59.3	23.5	28
BTU-061 xx.xx	31.01	32.1	ST05	28	63.5	59.4	25.5	29
BTU-062 xx.xx	32.11	33.3	ST05	28	63.5	59.1	25.5	30
BTU-071 xx.xx	33.31	34.8	ST06	30	63.5	59	28	32
BTU-072 xx.xx	34.81	36.2	ST06	30	63.5	58.9	28	33
BTU-081 xx.xx	36.21	37.3	ST07	33	73.5	68.7	30	34
BTU-082 xx.xx	37.31	38.4	ST07	33	73.5	68.5	30	35
BTU-083 xx.xx	38.41	39.6	ST07	33	73.5	68.3	30	36
BTU-091 xx.xx	39.61	40.6	ST08	36	73.5	68.2	33	37
BTU-092 xx.xx	40.61	41.8	ST08	36	73.5	68	33	38
BTU-093 xx.xx	41.81	43	ST08	36	73.5	67.8	33	39
BTU-101 xx.xx	43.01	44.3	ST09	39	75	69.5	36	41
BTU-102 xx.xx	44.31	45.6	ST09	39	75	69.3	36	42
BTU-103 xx.xx	45.61	47	ST09	39	75	69.1	36	43
BTU-111 xx.xx	47.01	48.5	ST10	43	75	68.8	39	44
BTU-112 xx.xx	48.51	50.1	ST10	43	75	68.7	39	46
BTU-113 xx.xx	50.11	51.7	ST10	43	75	68.5	39	47
BTU-121 xx.xx	51.71	53.2	ST11	47	82	75.2	43	49
BTU-122 xx.xx	53.21	54.7	ST11	47	82	75.2	43	50
BTU-123 xx.xx	54.71	56.2	ST11	47	82	75.2	43	51
BTU-131 xx.xx	56.21	58.4	ST12	51	84	77.4	47	54
BTU-132 xx.xx	58.41	60.6	ST12	51	84	76.9	47	55
BTU-133 xx.xx	60.61	62.8	ST12	51	84	76.8	47	57
BTU-134 xx.xx	62.81	65	ST12	51	84	76.5	47	59
BTU-133L xx.xx	60.61	62.8	ST13	56	84	76.8	51	57
BTU-134L xx.xx	62.81	65	ST13	56	84	76.5	51	59

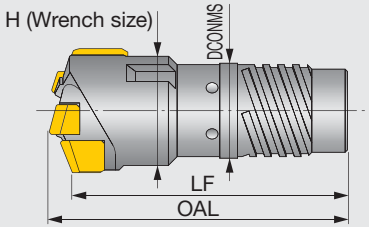
Reference pages: Standard cutting conditions → 20, Drill tube (STS) → 16

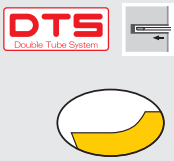
ETU DTS

ETU type drill head

Brazed drill head with external 4-start thread for double tube system (DTS), tool diameter ø18.4 - ø65 mm, CICT = 3







Non-standard products (to be supplied on request)

When ordering

ETU-001	xx.xx	1122
Drill head	Diameter (mm)	Grade

e.g. Designation for tool diameter ø19.2 mm: **ETU-001 19.20 1122**

ISO classifications for grades

	Grade	ISO area							
		5	10	15	20	25	30	35	40
P	1122								
	1132								
M	1132								
	2122								
K	3132								
N	3132								
S	3132								
H	3132								

Designation	DCN	DCX	Drill tube		OAL	LF	DCONMS	H
			Designation	Dia. (mm)				
ETU-001 xx.xx	18.4	19.2	OT00	18	50	47.1	16	17
ETU-002 xx.xx	19.21	20	OT00	18	50	47	16	18
ETU-011 xx.xx	20.01	20.9	OT01	20	56	52.8	18	18
ETU-012 xx.xx	20.91	21.8	OT01	20	56	52.7	18	19
ETU-021 xx.xx	21.81	22.9	OT02	22	56	52.8	19.5	20
ETU-022 xx.xx	22.91	24.1	OT02	22	56	52.6	19.5	21
ETU-031 xx.xx	24.11	25.2	OT03	24	57.5	54	21	23
ETU-032 xx.xx	25.21	26.4	OT03	24	57.5	54	21	24
ETU-041 xx.xx	26.41	27.5	OT04	26	60.5	56.8	23.5	25
ETU-042 xx.xx	27.51	28.7	OT04	26	60.5	56.8	23.5	26
ETU-051 xx.xx	28.71	29.8	OT05	28	63.5	59.5	25.5	27
ETU-052 xx.xx	29.81	31	OT05	28	63.5	59.3	25.5	28
ETU-061 xx.xx	31.01	32.1	OT06	31	63.5	59.4	28	29
ETU-062 xx.xx	32.11	33.3	OT06	31	63.5	59.2	28	30
ETU-071 xx.xx	33.31	34.8	OT07	33	70.5	66	30	32
ETU-072 xx.xx	34.81	36.2	OT07	33	70.5	65.8	30	33
ETU-081 xx.xx	36.21	37.3	OT08	36	73.5	68.7	33	34
ETU-082 xx.xx	37.31	38.4	OT08	36	73.5	68.5	33	35
ETU-083 xx.xx	38.41	39.6	OT08	36	73.5	68.3	33	36
ETU-091 xx.xx	39.61	40.6	OT09	39	73.5	68.2	36	37
ETU-092 xx.xx	40.61	41.8	OT09	39	73.5	68	36	38
ETU-093 xx.xx	41.81	43	OT09	39	73.5	67.9	36	39
ETU-101 xx.xx	43.01	44.3	OT10	43	75	69.5	39	41
ETU-102 xx.xx	44.31	45.6	OT10	43	75	69.3	39	42
ETU-103 xx.xx	45.61	47	OT10	43	75	69.1	39	43
ETU-111 xx.xx	47.01	48.5	OT11	47	79	72.9	43	44
ETU-112 xx.xx	48.51	50.1	OT11	47	79	72.8	43	46
ETU-113 xx.xx	50.11	51.7	OT11	47	79	72.5	43	47
ETU-121 xx.xx	51.71	53.2	OT12	51	82	75.3	47	49
ETU-122 xx.xx	53.21	54.7	OT12	51	82	75.5	47	50
ETU-123 xx.xx	54.71	56.2	OT12	51	82	75.3	47	51
ETU-131 xx.xx	56.21	58.4	OT13	56	84	77.4	51	54
ETU-132 xx.xx	58.41	60.6	OT13	56	84	76.9	51	55
ETU-133 xx.xx	60.61	62.8	OT13	56	84	77	51	57
ETU-134 xx.xx	62.81	65	OT13	56	84	76.6	51	59

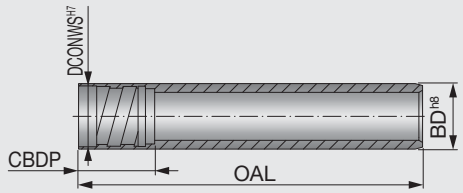
Reference pages: Standard cutting conditions → 20, Drill tube (DTS) → 18

TUBES

UMBB STS

UMBB - for single tube system with MBU

Drill tube with internal single-start thread for MBU drill head



Designation	DCN-DCX	OAL Special length	BD	DCONWS	CBDP
UMBB071	8 - 8.99	○	7.1	6	13.5
UMBB083	9 - 9.99	○	8.3	7.2	13.5
UMBB090	10 - 10.99	○	9	7.6	13.5
UMBB100	11 - 11.99	○	10	8.6	13.5
UMBB110	12 - 13.49	○	11	9.1	13.5
UMBB120	13.5 - 14.79	○	12	10.8	13.5

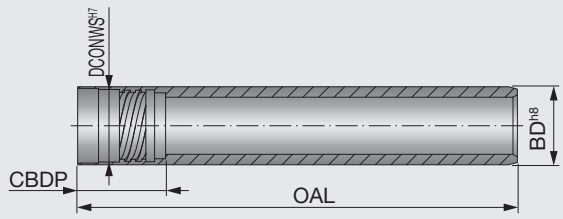
Please specify the length (L) when ordering.
e.g. For ø11 mm drill diameter / 1000 mm drill tube length: UMBB100X1000

○ : Item to be customized

ST STS

ST - for single tube system

Drill tube for single tube system (STS), internal thread type, 2-start thread (tool dia. ≤ ø15.59 mm) or 4-start thread (tool dia. ≥ ø15.6 mm)



Designation	DCN-DCX	OAL 1600	OAL 2600	Special length	BD	DCONWS	CBDP
ST0094	12.6 - 13.6	●		○	11	9.6	22
ST0095	13.61 - 14.6	●		○	12	10.6	22
ST0096	14.61 - 15.59	●		○	13	11.6	22
ST0097	15.6 - 16.7	●		○	14	12.6	21
ST0098	16.71 - 17.7	●	●	○	15	13.6	21
ST0099	17.71 - 18.9	●	●	○	16	14.5	22
ST0000	18.91 - 20	●	●	○	17	15.5	22
ST00	20.01 - 21.8	●	●	○	18	16	27.5
ST01	21.81 - 24.1		●	○	20	18	30
ST02	24.11 - 26.4		●	○	22	19.5	30

Designation	DCN-DCX	OAL 1600	OAL 2600	Special length	BD	DCONWS	CBDP
ST03	26.41 - 28.7		●	○	24	21	30
ST04	28.71 - 31		●	○	26	23.5	33
ST05	31.01 - 33.3		●	○	28	25.5	33
ST06	33.31 - 36.2		●	○	30	28	33
ST07	36.21 - 39.6		●	○	33	30	40
ST08	39.61 - 43		●	○	36	33	40
ST09	43.01 - 47		●	○	39	36	40
ST10	47.01 - 51.7		●	○	43	39	40
ST11	51.71 - 56.2		●	○	47	43	44
ST12	56.21 - 60.6		●	○	51	47	44
ST13	60.61 - 65			○	56	51	44

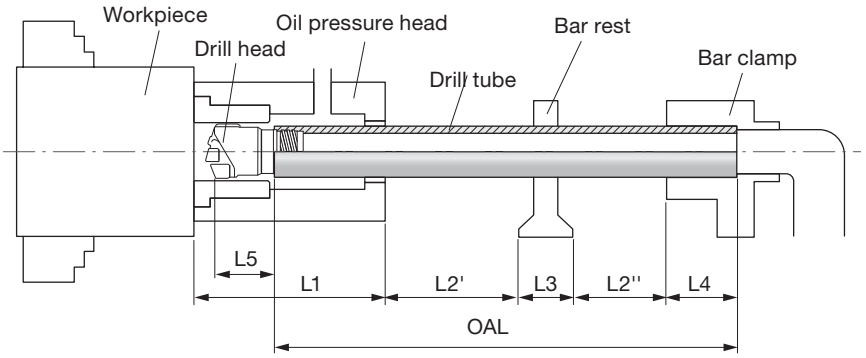
Please specify the length (L) when ordering.
e.g. For ø60 mm drill diameter / 2600 mm drill tube length: ST12X2600
The lengths that are not in the above will be available upon request.

● : Line up
○ : Item to be customized

Reference pages: ST : Drill head → 11 (UTE), 14 (BTU)
UMBB: Drill head → 10 (MBU)

Tube length for special drills

Drill tubes with non-standard lengths will be available upon request.
Please use the guide below to calculate the drill tube length.



OAL = Drill tube overall length
L1 = Oil pressure head length
L2 = Drilling depth (L2' + L2")
L3 = Bar rest length
L4 = Drill tube clamp length
L5 = Length from drill tube tip and peripheral edge tip

Drill tube length OAL = L1 + L2 + L3 + L4 - L5

MBU

DCN-DCX	L5
8 - 8.32	18
8.33 - 8.65	18
8.66 - 8.99	18
9 - 9.32	18
9.33 - 9.65	18
9.66 - 9.99	18
10 - 10.32	18
10.33 - 10.65	18
10.66 - 10.99	18
11 - 11.32	18
11.33 - 11.65	18
11.66 - 11.99	18
12 - 12.36	18
12.37 - 12.73	18
12.74 - 13.1	18
13.11 - 13.49	18
13.5 - 13.82	18
13.83 - 14.15	18
14.16 - 14.48	18
14.49 - 14.79	18

UTE

DCN-DCX	L5
12.6 - 12.92	19
12.93 - 12.99	19
13 - 13.25	19
13.26 - 13.6	19
13.61 - 13.93	19
13.94 - 13.99	19
14 - 14.26	19
14.27 - 14.6	19
14.61 - 14.93	19
14.94 - 15.26	19
15.27 - 15.59	19
15.6 - 15.96	20
15.97 - 16.32	20
16.33 - 16.7	20
16.71 - 17.03	20
17.04 - 17.36	20
17.37 - 17.7	20
17.71 - 18.09	19
18.1 - 18.48	19
18.49 - 18.9	19
18.91 - 19.26	19
19.27 - 19.62	19
19.63 - 20	19

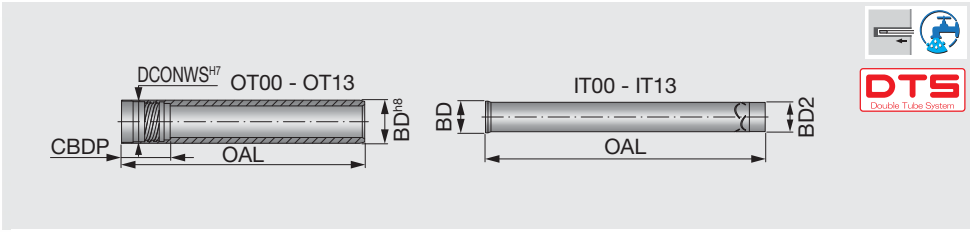
BTU

DCN-DCX	L5
12.6 - 17.7	20
17.71 - 19.2	23
19.21 - 21.8	22
21.81 - 24.1	23
24.11 - 28.7	24
28.71 - 33.3	27
33.31 - 36.2	26
36.21 - 40.6	29
40.61 - 43	28
43.01 - 47	30
47.01 - 51.7	29
51.71 - 56.2	32
56.21 - 58.4	34
58.41 - 65	33

OT & IT DTS

OT & IT - for double tube system

Outer tube and inner tube for double tube system (DTS)



Outer tube (OT)

Designation	DCN-DCX	OAL Special length	BD	DCONWS	CBDP
OT00	18.4 - 20	○	18	16	27.5
OT01	20.01 - 21.8	○	19.5	18	30
OT02	21.81 - 24.1	○	21.5	19.5	30
OT03	24.11 - 26.4	○	23.5	21	30
OT04	26.41 - 28.7	○	26	23.5	33
OT05	28.71 - 31	○	28	25.5	33
OT06	31.01 - 33.3	○	30.5	28	33
OT07	33.31 - 36.2	○	33	30	40
OT08	36.21 - 39.6	○	35.5	33	40
OT09	39.61 - 43	○	39	36	40
OT10	43.01 - 47	○	42.5	39	40
OT11	47.01 - 51.7	○	46.5	43	44
OT12	51.71 - 56.2	○	51	47	44
OT13	56.21 - 65	○	55.5	51	44

Inner tube (IT)

Designation	DCN-DCX	OAL Special length	BD	BD2
IT00	18.4 - 20	○	12	10
IT01	20.01 - 21.8	○	14	12
IT02	21.81 - 24.1	○	15	13
IT03	24.11 - 26.4	○	16	14
IT04	26.41 - 28.7	○	18	16
IT05	28.71 - 31	○	20	18
IT06	31.01 - 33.3	○	22	20
IT07	33.31 - 36.2	○	24	22
IT08	36.21 - 39.6	○	26	24
IT09	39.61 - 43	○	29	27
IT10	43.01 - 47	○	32	30
IT11	47.01 - 51.7	○	35	32
IT12	51.71 - 56.2	○	39	36
IT13	56.21 - 65	○	43	40

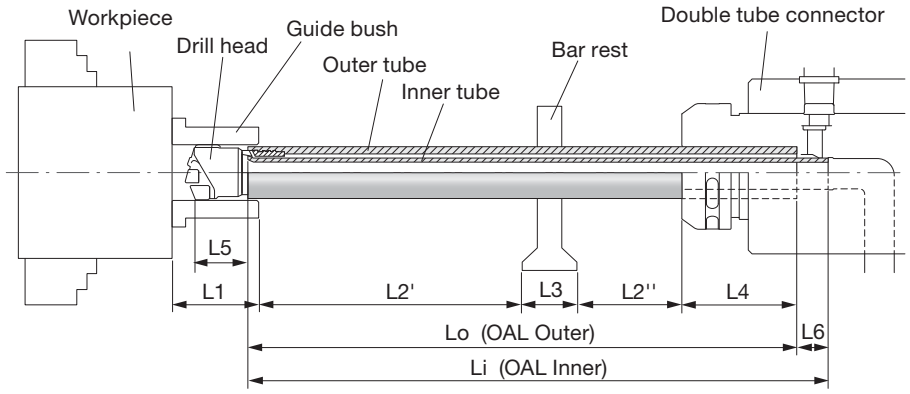
○ : Item to be customized

Please specify the length when ordering.
e.g. For ø60 mm drill diameter / 1070 mm drill outer tube length: OT13X1070
Please choose the inner tube length according to the guide below:

- tool diameter: ø18.40 - ø65.00 mm (OT00 - OT13) ..... Inner tube length = Outer tube length + 30 mm
- tool diameter: ø65.00 - ø123.99 mm (OT14 - OT20) ..... Inner tube length = Outer tube length + 190 mm
- tool diameter: ø124.00 - ø183.99 mm (OT21 - OT25) ..... Inner tube length = Outer tube length + 220 mm

Tube length for special drills

Please use the guide below to calculate the drill tube length.



Lo = Outer tube overall length
Li = Inner tube overall length
L1 = Guide bush length (or Pilot hole depth)
L2 = Drilling depth (L2' + L2")
L3 = Bar rest length
L4 = Length of outer tube in connector*
L5 = Length from drill tube tip and peripheral edge tip
L6 = Difference between outer tube length and inner tube length**

Outer tube overall length
Lo = L1 + L2 + L3 + L4 - L5

Inner tube overall length
Li = Lo + L6

DTC	L4*	L6**
DTC 4R (OT00 - OT13)	120	30

(mm)

To facilitate a smooth drill entry into the workpiece, make sure that the drill is inside the guiding bush or pilot hole all the way up to 5 mm over the outer tube before starting the drilling.

ETU

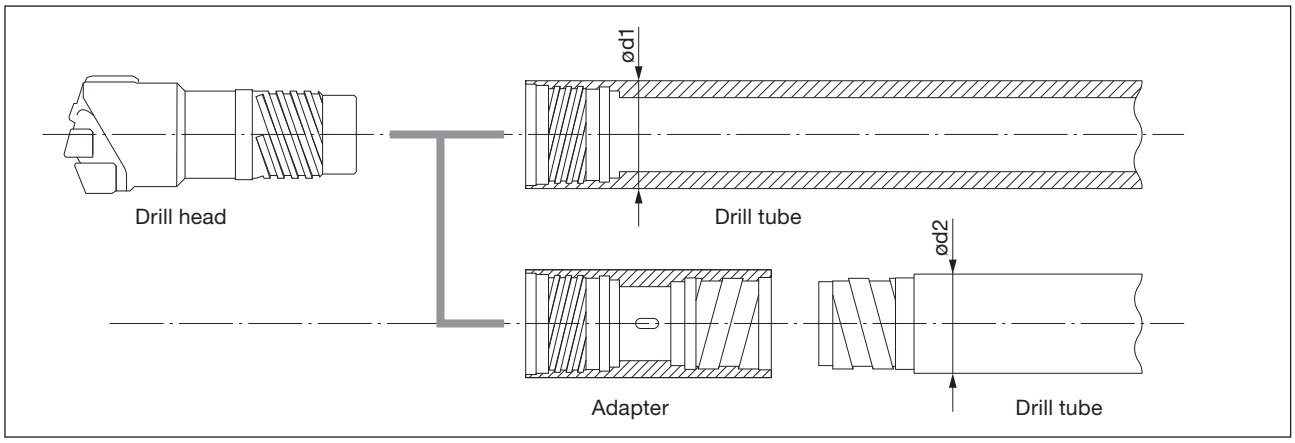
DCN-DCX	L5
18.4 - 20	20
20.01 - 24.1	23
24.11 - 28.7	24
28.71 - 33.3	27
33.31 - 36.2	26
36.21 - 40.6	29
40.61 - 43	28
43.01 - 47	30
47.01 - 51.7	29
51.71 - 56.2	32
56.21 - 58.4	34
58.41 - 65	33

Reference pages: Drill head → 15 (ETU)

Conversion adapter

Adapter for external thread - internal thread conversion

An adapter to connect with a smaller tube diameter is also available upon request.



ADPT- □ □ □ / □ □ □

SS	Single-start thread	SS	Single-start thread
TS	2-start thread	TS	2-start thread
FS	4-start thread	FS	4-start thread
ød1		ød2	
F	Internal thread	F	Internal thread
M	External thread	M	External thread

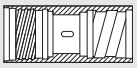
ød1 : Outer diameter of the tube that is applicable for the drill head
ød2 : Outer diameter of the tube that is connected with the adapter

Designation example

For the conversion from ST11 to UB47

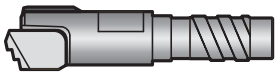
ADPT-F47FS / F47SS

ST11 UB47

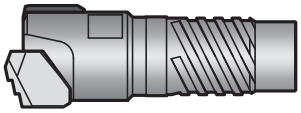


STANDARD CUTTING CONDITIONS

STS Single Tube System

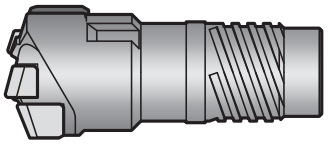


MBU



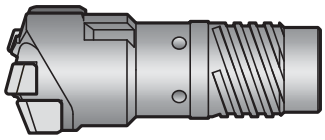
UTE

BTU (2 edges)



BTU (3 edges)

DTS Double Tube System



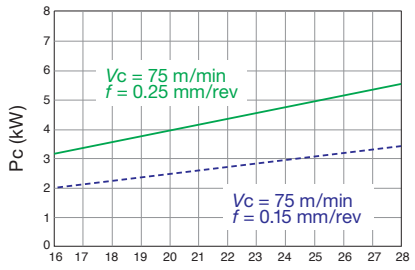
ETU (3 edges)

ISO	Workpiece material	JIS	Condition	Hardness	Cutting speed	Feed: *f* (mm/rev) Drill dia. (mm)				
						8 - 20	12.6 - 20	20.01 - 31	31.01 - 43	43.01 - 65
				(HB)	*Vc* (m/min)	MBU, UTE	BTU, ETU			
P	Carbon steel Cast steel High carbon steel Carbon tool 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
		S25C - S55C	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
			0.25 - 0.25 %C Hardened	250	70 - 130	0.05 - 0.13	0.08 - 0.15	0.1 - 0.17	0.13 - 0.2	0.16 - 0.3
		SK	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
			0.55 - 0.80 %C Hardened	300	70 - 130	0.05 - 0.1	0.08 - 0.12	0.1 - 0.15	0.13 - 0.17	0.15 - 0.28
	Low alloy steel Cast steel (alloying element < 5%)	SNC, DCr, SNCN SCM, SMn	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	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
				350	60 - 110	0.05 - 0.1	0.08 - 0.12	0.1 - 0.15	0.13 - 0.17	0.15 - 0.28
	High alloy steel, Cast steel 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	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	Martensitic	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	Austenitic	180	40 - 110	0.05 - 0.12	0.05 - 0.12	0.08 - 0.25	0.1 - 0.28	0.15 - 0.33
K	Ductile 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
	Grey 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	Aluminium alloys Wrought		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
	Aluminium alloys Cast		≤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
			≤12% Si 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 content	130	65 - 130	0.05 - 0.13	0.08 - 0.15	0.1 - 0.2	0.15 - 0.25	0.16 - 0.3
	Copper alloys		>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 alloys		Fe based alloys 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
			Fe based alloys 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
			Ni / Co based alloys 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 based alloys 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
			Ni / Co based alloys Cast	320	20 - 50	0.05 - 0.12	0.06 - 0.12	0.08 - 0.15	0.12 - 0.18	0.15 - 0.25
	Titanium alloys		α	Rm400	30 - 60	0.05 - 0.1	0.05 - 0.1	0.08 - 0.12	0.1 - 0.15	0.12 - 0.2
			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
H	Hardened steel	≥ 40 HRC			20 - 50	0.05 - 0.1	0.06 - 0.1	0.08 - 0.12	0.1 - 0.15	0.1 - 0.2

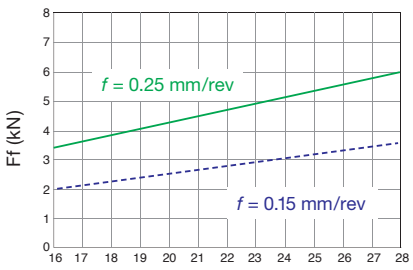
Cutting parameters shown here are relating to the basic recommendations for cutting materials given.
Cutting conditions, material hardness, and other relevant variables must be taken into considerations to determine the actual cutting parameters.

Machine setting for single tube system

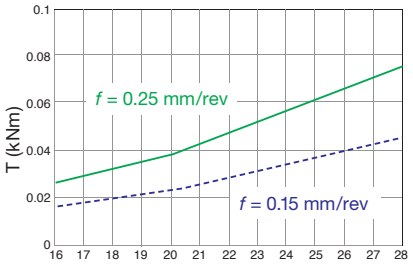
Net power



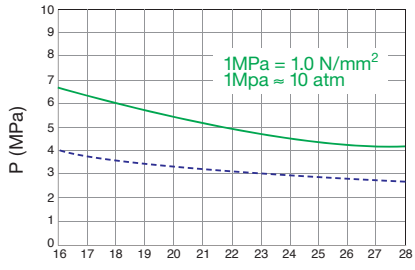
Feed force



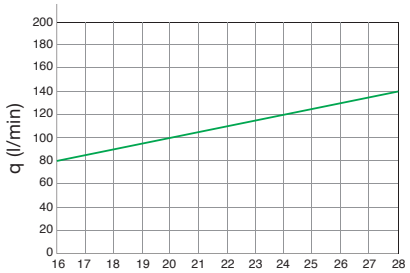
Torque



Coolant pressure

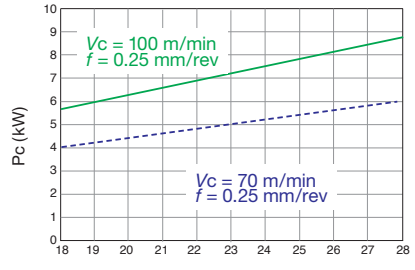


Coolant volume

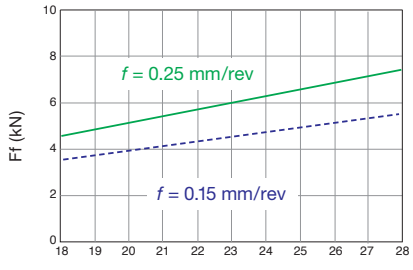


Machine setting for double tube system

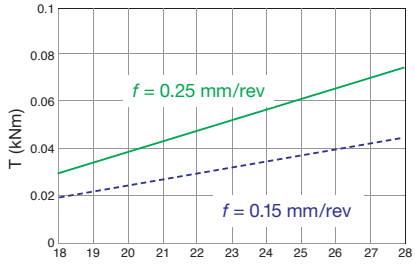
Net power



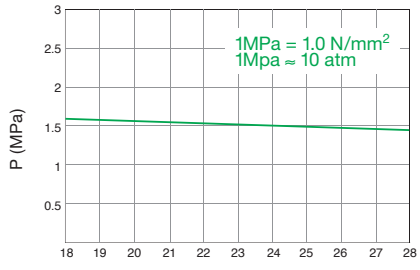
Feed force



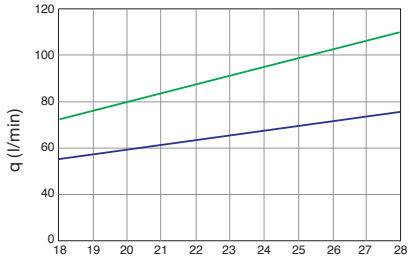
Torque



Coolant pressure



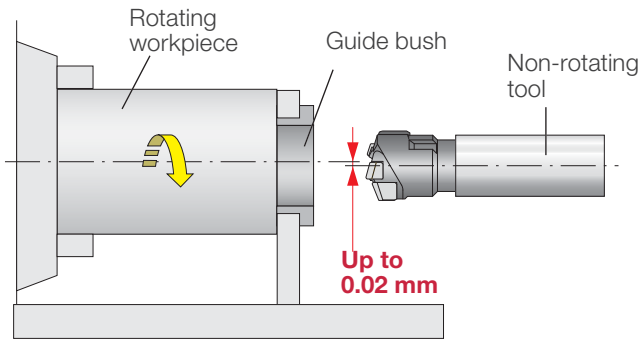
Coolant volume



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

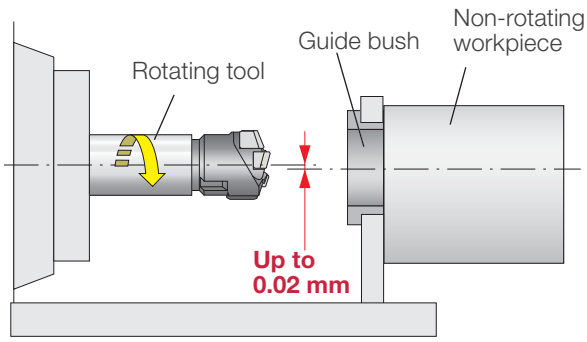
STS and DTS

Workpiece rotating system



- Only used when the workpiece and the tool axis are on the same line.
- Better hole straightness and wear resistance on guide bush are provided compared to the tool-rotating system.
- Keep the alignment between guide bush and spindle within 0.02 mm.

Tool rotating system



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

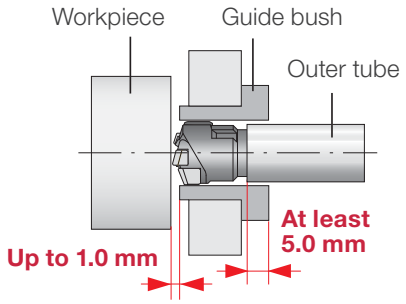
DTS

Positioning of outer tube and guide bush

Be sure to set the outer tube more than 5.0 mm into the guide bush to properly supply the coolant.

Positioning of workpiece material and guide bush

Sealing is not required for DTS because of the vacuum effect, but keep the gap between workpiece material and guide bush within 1.0 mm.



Guide bush

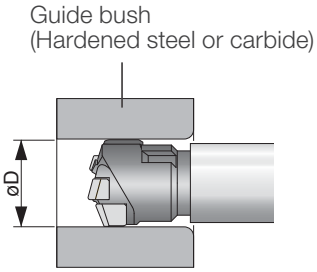
Tolerance

Guide bush tolerance should be G6 in order to keep consistent tool life and cutting accuracy. Diameters for G6 tolerance are shown on the right.

øD (mm)	G6 tolerance (mm)
16.00 - 18.00	+0.006 - +0.017
18.01 - 28.00	+0.007 - +0.020

Material

Guide bush material	System	Advantage
Hardened steel	Workpiece rotating	Economical
Carbide	Tool rotating Workpiece rotating	Long life of guide bush



Coolant

Temperature

The proper coolant temperature is 30 - 40 °C (90 - 100 °F).
If the temperature exceeds this range, the coolant will deteriorate easily and may shorten tool life and generate poor surface finish.

Filtration

The coolant must be filtered properly in order to protect guide pads and workpiece surface.

Water-soluble type

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

Coolant

Successful deep hole drilling is achieved by an optimal combination of the tool, the machine, and the coolant. Coolant plays an essential role in achieving secure and cost-efficient deep hole drilling operations. Therefore, it is very important to choose the correct type of coolant and use it appropriately.

Coolant

Coolant plays an essential role in lubricating tools, cooling cutting edges, chips, and guide pads, as well as evacuating chips when drilling. It also improves tool life, surface finish, and cutting accuracy when continuously supplied during the machining process.

1) Lubrication

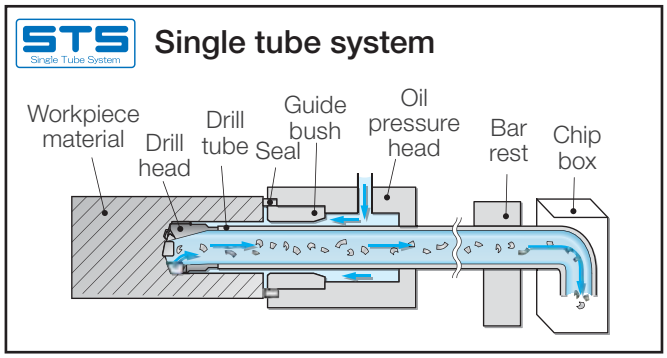
Lubrication of cutting edges and guide pads is necessary in deep hole drilling. For efficient lubrication, it is recommended to use EP (Extreme Pressure) additives which contain sulfur or chlorine.

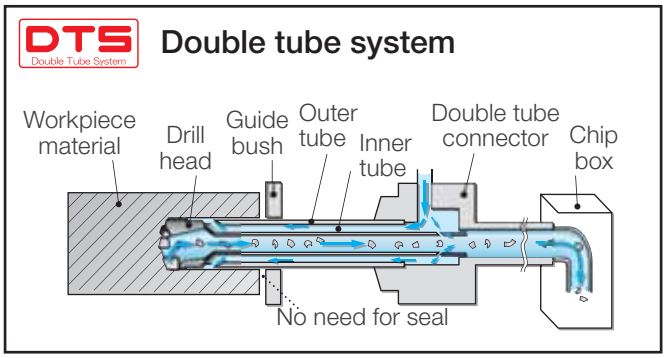
2) Temperature reduction

The ability to cool down the cutting edge and chips depends on such characteristics as thermal conductivity and relative heat. Coolant with good cooling ability increases tool life, but water-soluble coolant is not preferred in deep hole drilling because it reduces effectiveness. If water-soluble coolant is used, the recommended concentration is 10% (dilution rate 1/10) or more.

3) Chip evacuation

Coolant helps push chips through the back end of the boring bar (for STS) or inner tube (for DTS) until the chips are separated from the workpiece in general cutting conditions. The flow and the pressure of coolant are also important in order to control chip evacuation.





Coolant unit

A coolant unit is also important to obtain the best effect from the coolant.

1) Coolant pressure and volume should be fixed and continuous.

An ideal coolant unit is the one which can set any valve of coolant pressure and volume and monitor the condition with gauges. A system that can detect trapped chips by a pressure gauge, and the screw pumps with an inverter controller are both recommended.

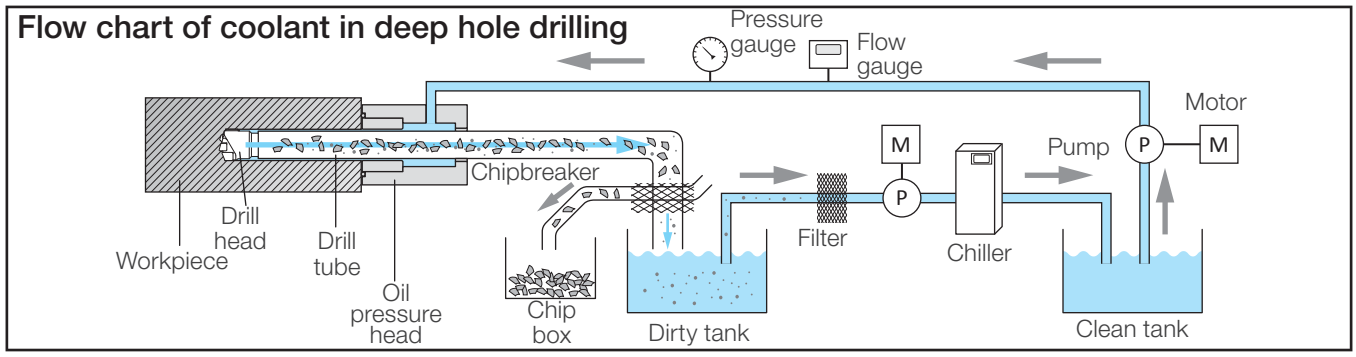
2) Coolant temperature should be maintained.

Coolant is heated by factors, such as:
- Cutting edge
- Friction on guide pad
- Contact time of heated chips and coolant
- Pump

Maintaining coolant temperature is important to keeping 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 coolant temperature should be kept between 30 - 40 °C (90 - 100 °F) throughout the cutting operation.

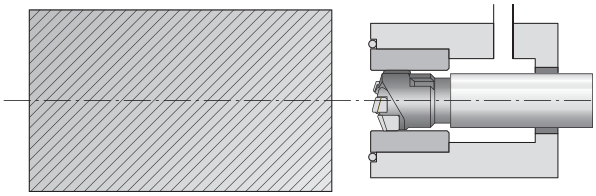
3) Filtering

Unwanted particles are contained in coolant after the cutting operations, thus filtration is necessary to remove them. The filter size should be selected carefully to catch particles but not EP additives. Filter size depends on the coolant, but around 10 - 20 µm is generally suggested. For iron-based workpieces, a magnetic separator is helpful as it decreases the frequency of filter maintenance.

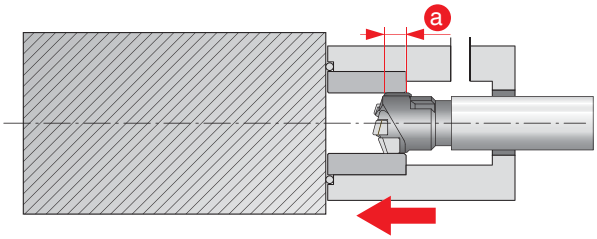


CNC drilling cycle operations

Use the CNC drilling cycle as instructed below in order to optimize the tool performance safely.

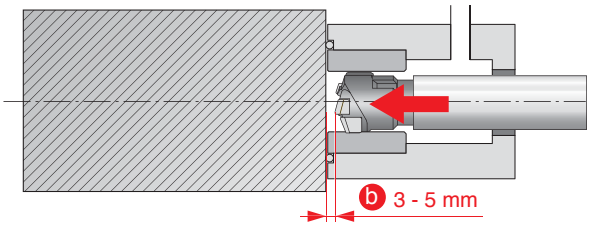


1. Start the CNC cycle operation



2. Move the oil pressure head and securely seal onto the face of the workpiece.

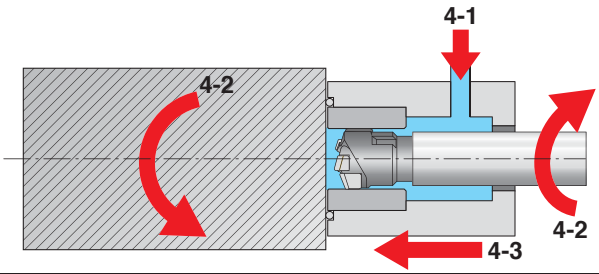
a Make sure to position the drill so that the guide pads remain inside the guide bushing when the pressure head is moved towards the workpiece face.



3. Move the BTA drill toward the workpiece

b Keep the drill 3 - 5 mm* off the face of the workpiece.

* If the machine allows this drill setting in Step 1, move on to Step 4.

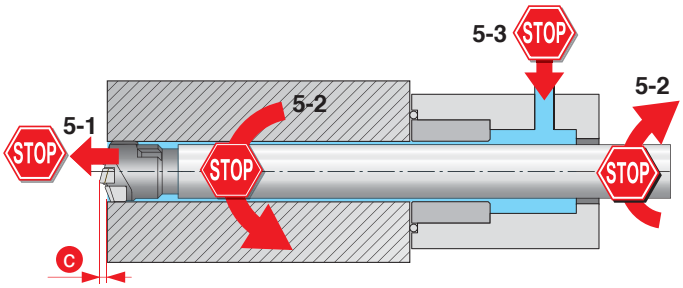


4. Start the cutting

4-1 Activate the coolant supply.

4-2 Start the rotation (of the drill, the workpiece, or the drill+workpiece).

4-3 Start the drill feed.



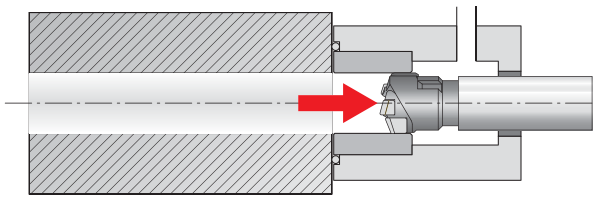
5. Stop the cutting

5-1 Stop the drill feed.

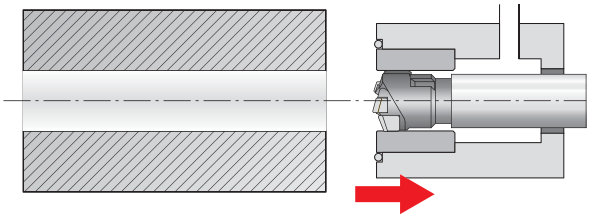
5-2 Stop the rotation.

5-3 Stop the coolant supply.

c Stop the cutting when the drill shoulder is completely through the end face of the workpiece.



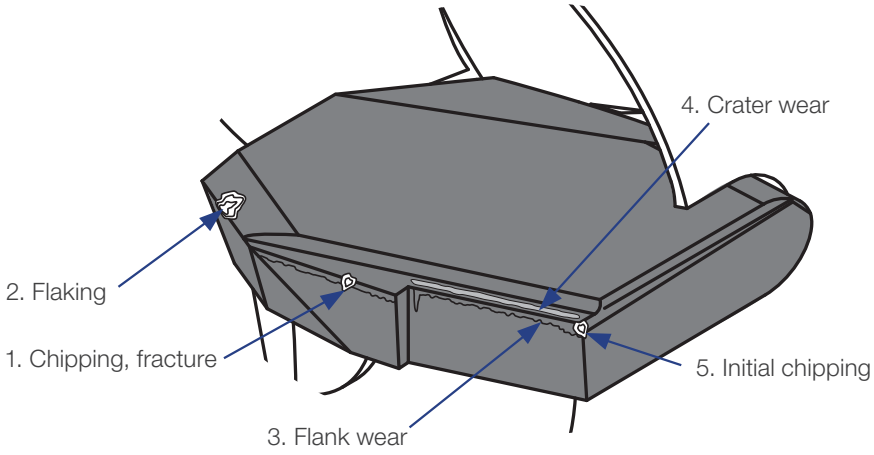
6. Return the drill to the starting point

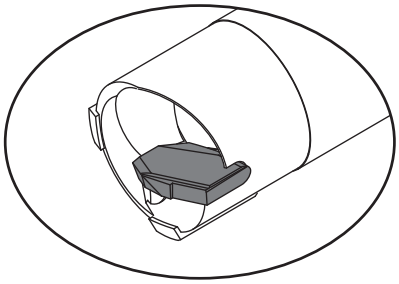


7. Return the oil pressure head to the starting point

Troubleshooting for tip wear

Examples of trouble with cutting edge





Problem	Cause	Solution	
		Grade	Cutting conditions / other
Chipping, fracture	- Excessive vibration or impact - Torn away built-up edge	- Use a tough grade	- Reduce the feed rate - Eliminate the vibration
Flaking	- Excessive vibration or impact	- Use a tough grade	- Reduce the feed rate - Eliminate the vibration
Flank wear	- Cutting speed too high - Inadequate tool toughness	- Use a grade with high wear resistance - Use a coated grade	- Reduce the cutting speed - Reduce the feed rate - Use coolant properly
Crater wear	- Cutting speed too high - Feed rate too high - Inadequate tool toughness	- Use a grade with high wear resistance - Use a coated grade	- Reduce the cutting speed - Reduce the feed rate - Use coolant properly
Initial chipping	- Inappropriate guide bush or pilot hole - Misalignment	- Use a tough grade	- Adjust or change the guide bushing or pilot hole - Reduce the feed rate - Correct the misalignment

Cutting condition and chip form

Chip form in deep hole drilling

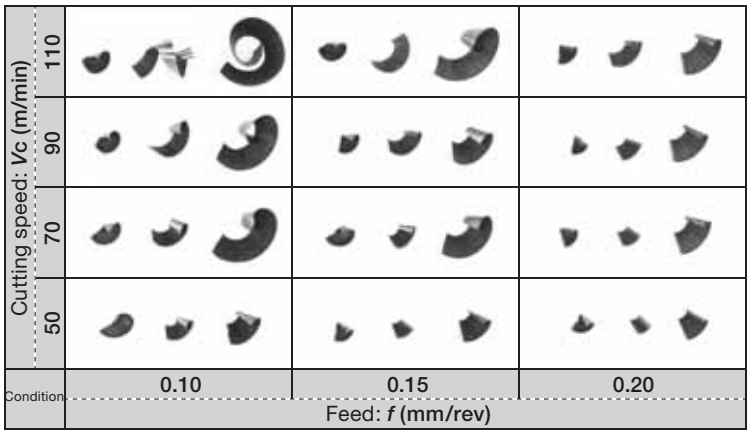
Chip form plays a key role in STS (Single tube system) and DTS (Double tube system) while large-volume and high-pressure coolant do so as well. Because chips are removed through the tube with coolant, proper chip formation is essential for smooth and steady evacuation.

How to decide the chip form

Generally, chip length should be 3 - 4 times its width, but tends to be longer with difficult-to-cut materials. In that case, chip evacuation will be improved by making chips thinner, usually by reducing the feed rate.
The graph below shows chip formation for different cutting speeds and feeds. Short chips are created by reducing the cutting speed or increasing the feed.

Chip formation

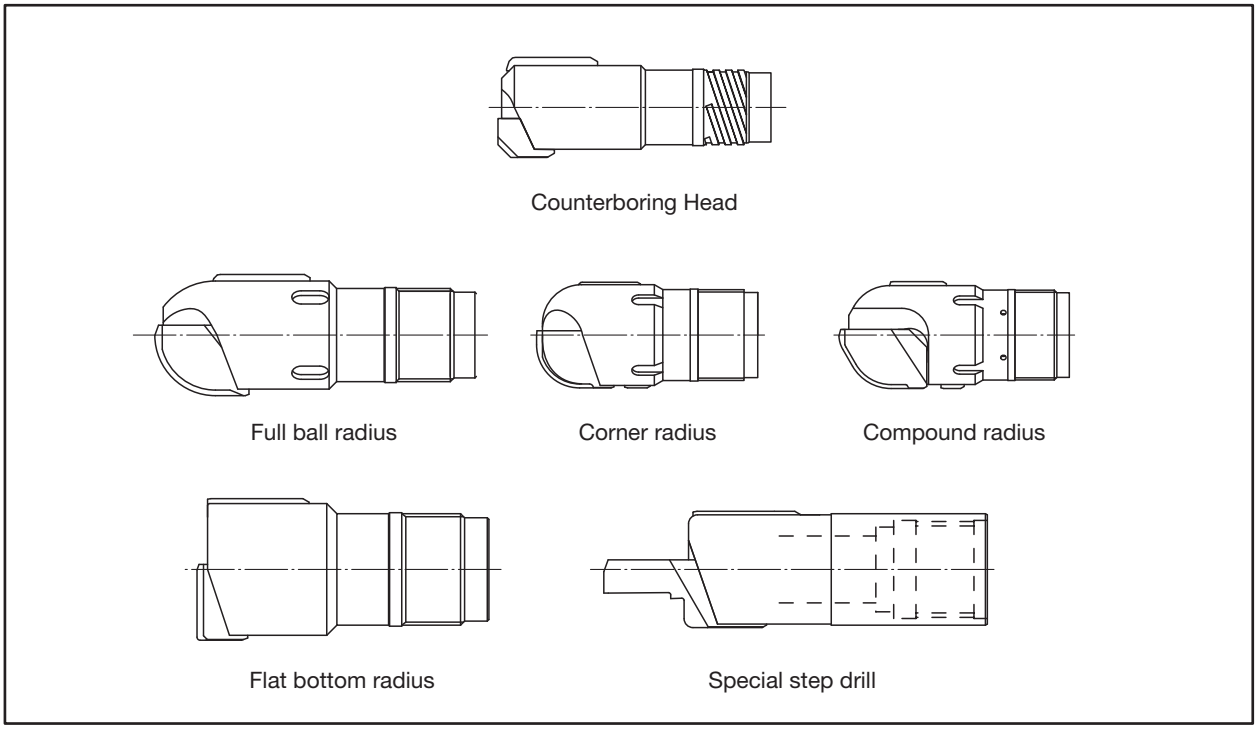
Chip formation is affected by multiple factors, such as workpiece material, chipbreaker geometry, cutting speed, feed, type of coolant, and coolant temperature. Suitable chip formation depends on cutting operation but is controllable by changing the cutting conditions.



Workpiece material: Low alloy steel (AISI4340)

Special tooling

Various types of special tooling are available upon request.
Some examples are shown below.
Please contact your sales representative for further information.



Special grade

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