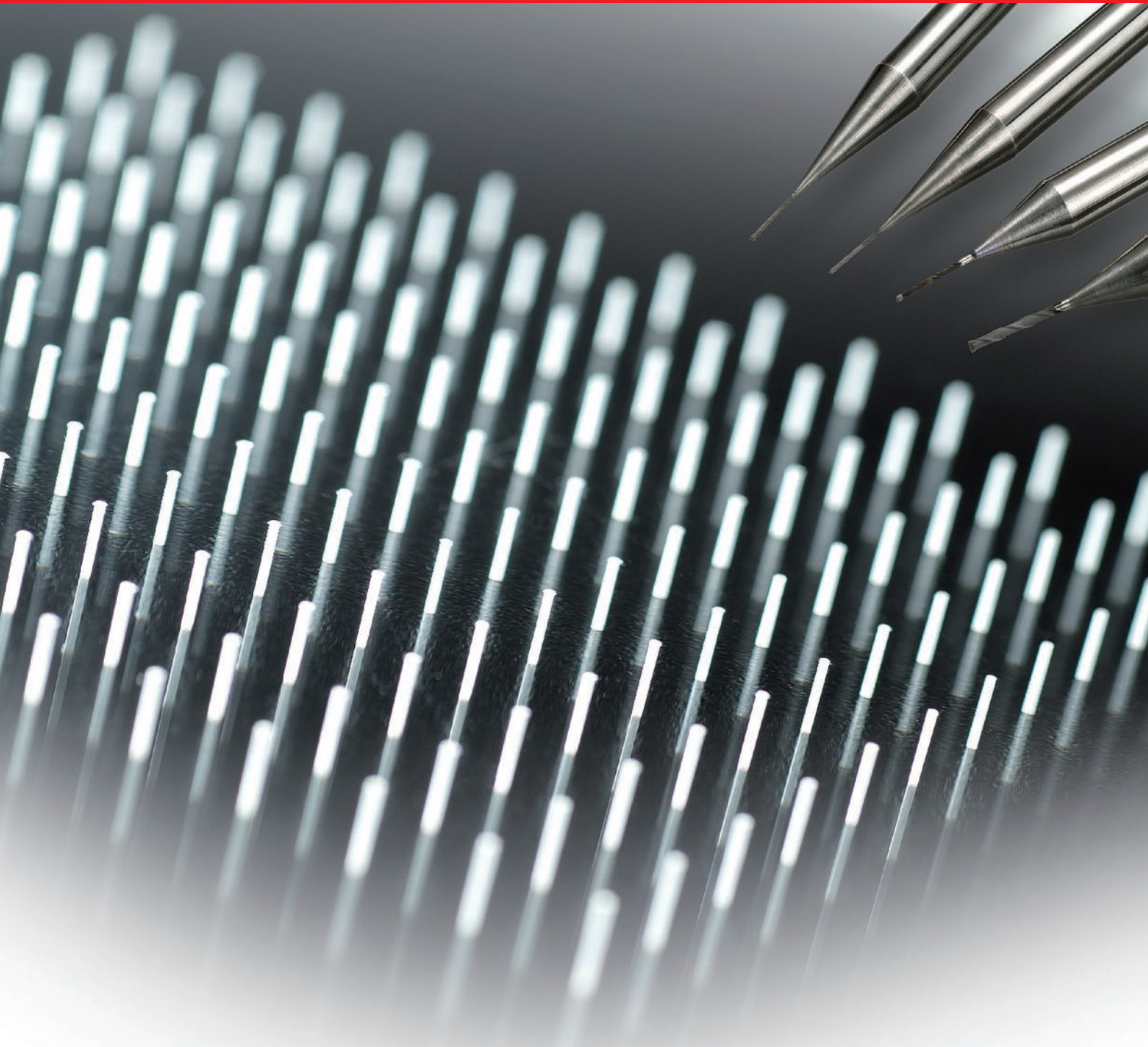


Diamond Coated Drill Series

For Hard, Brittle Materials **DC-BSS**

For Non-ferrous Materials **DC-SSS DC-SSM**



**Ideal for drilling fine ceramics,
quartz glass and non-ferrous metals.**

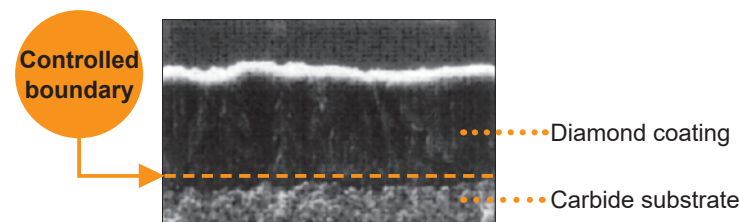
Diamond Coated Drill Series

For Hard, Brittle Materials **DC-BSS**

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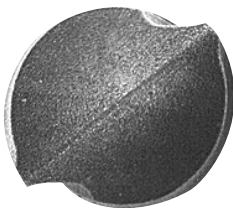
Unique diamond coating

A unique plasma CVD technique is used to obtain high adhesion of the coating to the carbide substrate for excellent wear resistance.



	Natural Diamond	CVD Diamond	DLC
Hardness (HV)	10,000	7,000—10,000	1,000—7,000
Crystal Structure	Cubic	Cubic	Amorphous

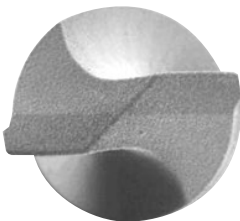
DC-BSS



Suitable for drilling of non-ferrous and hard and brittle materials that cannot be machined with conventional drills.

Employs a point geometry optimized for high tool rigidity. (Patented)

DC-SSS DC-SSM



Suitable for drilling high silicon aluminium alloys, graphite and machinable ceramics.

Long tool life and high precision drilling.

Drill Selection Guideline

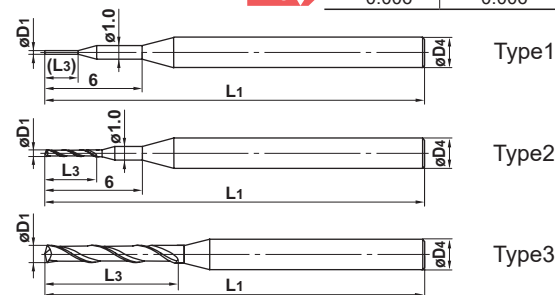
			DC-BSS	DC-SSS DC-SSM
Hard Brittle Materials	Fine ceramics	Aluminium Nitride AlN	◎	○
		Alumina Al ₂ O ₃	◎	○
		Zirconia ZrO ₂	◎	△
		Silicon Carbide SiC	○	△
		Silicon Nitride Si ₃ N ₄	△	×
	Sapphire Ruby Barium Titanate PZT		○	×
	Quartz glass	SiO ₂	◎	○
	Cemented carbide		○	○
Non-ferrous Materials	Graphite Machinable ceramics Green ceramics		×	◎
	MMC FRP		×	◎
	Aluminium alloy		×	◎
	Copper, Brass Copper alloy Magnesium Alloy		×	◎

◎ : First recommendation, ○ : Machinable, △ : Some can be machined, × : Not machinable





	$0.05 \leq D_1 < 0.2$	$0.2 \leq D_1 \leq 3$
$\uparrow \downarrow$	$\begin{matrix} 0 \\ -0.009 \end{matrix}$	$\begin{matrix} 0 \\ -0.014 \end{matrix}$
$h_6 \uparrow$	$\begin{matrix} 0 \\ -0.006 \end{matrix}$	$\begin{matrix} 0 \\ -0.006 \end{matrix}$



Unit : mm

● For machining materials such as sintered ceramics and quartz glass that cannot be machined with conventional drills.

Order Number	Drill Dia. D1	Flute Length L3	Overall Length L1	Shank Dia. D4	Stock	Type	Short Delivery
DCBSSD0005	0.05	(0.5)	38	3	□	1	◎
D0006	0.06	(0.6)	38	3	□	1	◎
D0007	0.07	0.7	38	3	□	2	◎
D0008	0.08	0.8	38	3	□	2	◎
D0009	0.09	0.9	38	3	□	2	

DC-SSS

Short, For non-ferrous materials



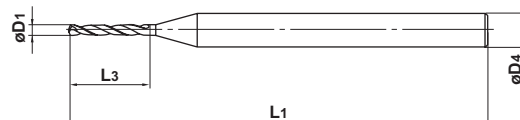
D₁ ≥ 1

D₁ ≥ 1.5

0.2 ≤ D₁ ≤ 2



0
-0.014
0
-0.006



- Original diamond coating technology ensures excellent film adherence, for stable drilling without flaking or chipping.

Unit : mm

Order Number	Drill Dia. D ₁	Flute Length L ₃	Overall Length L ₁	Shank Dia. D ₄	Stock
DCSSSD0020	0.2	2	38	3	●
D0030	0.3	3	38	3	●
D0040	0.4	4	38	3	●
D0050	0.5	4	38	3	●
D0060	0.6	5	38	3	●
D0070	0.7	5	38	3	●
D0080	0.8	6	38	3	●
D0090	0.9	6	38	3	●
D0100					

RECOMMENDED CUTTING CONDITIONS**DC-BSS**

Work Material	Aluminium nitride				Alumina				Zirconia			
Dia. (mm)	Cutting speed (m/min)	Revolution (min ⁻¹)	Feed rate (mm/rev)	Step (mm)	Cutting speed (m/min)	Revolution (min ⁻¹)	Feed rate (mm/rev)	Step (mm)	Cutting speed (m/min)	Revolution (min ⁻¹)	Feed rate (mm/rev)	Step (mm)
0.05	3	20,000	0.000015	0.001	3	20,000	0.00001	0.001	3	20,000	0.00001	0.001
0.08	5	20,000	0.00003	0.003	5	20,000	0.00002	0.002	5	20,000	0.00002	0.001
0.1	6	20,000	0.0002	0.01	6	20,000	0.0001	0.005	6	20,000	0.0001	0.003
0.16	9	18,000	0.0002	0.01	9	18,000	0.0001	0.005	9	18,000	0.0001	0.003
0.2	9	15,000	0.0002	0.01	9	15,000	0.0001	0.005	9	15,000	0.0001	0.003
0.32	12	12,000	0.0002	0.01	12	12,000	0.0001	0.005	12	12,000	0.0001	0.003
0.4	15	12,000	0.0002	0.01								

DC-SSS DC-SSM

Short / Medium, For non-ferrous materials

DC-SSS, DC-SSM

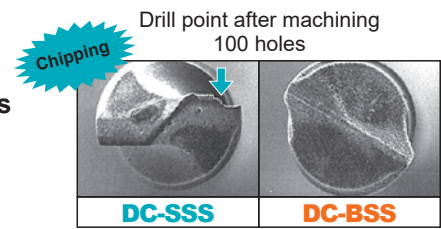
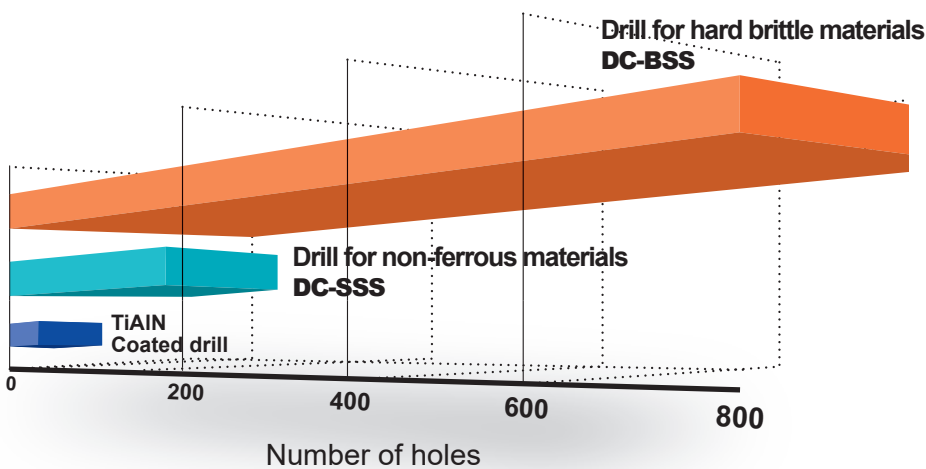
Work Material	Aluminium alloy		Aluminium alloy		Copper Copper alloy		Graphite Machineable Ceramics		MMC FRP	
Dia. (mm)	Revolution (min ⁻¹)	Feed rate (mm/rev)	Revolution (min ⁻¹)	Feed rate (mm/rev)	Revolution (min ⁻¹)	Feed rate (mm/rev)	Revolution (min ⁻¹)	Feed rate (mm/rev)	Revolution (min ⁻¹)	Feed rate (mm/rev)
0.2	20000	0.006	10000	0.003	20000	0.003	20000	0.01	10000	0.003
0.5	20000	0.02	10000	0.01	20000	0.01	20000	0.03	10000	0.01
1.0	20000	0.04	10000	0.02	20000	0.02	20000	0.05	10000	0.02
1.5	20000	0.05	10000	0.02	16000	0.02	16000	0.08	10000	0.02
2.0	20000	0.06	9000	0.03	11000	0.03	11000	0.10	9000	0.03
2.5	18500	0.08	7500	0.04	10000	0.04	10000	0.12	7500	0.04
3.0	17000	0.10	6000	0.05	8500	0.05	8500	0.15	6000	0.05

- 1) When drilling very hard work materials, reduce the feed.
- 2) Please use water soluble coolant or grinding fluid.
- 3) When drilling deep holes, moderate the cutting conditions.</

Technical Data

Cutting performance 1

Machining of Quartz Glass

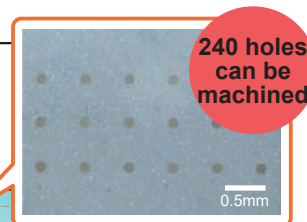
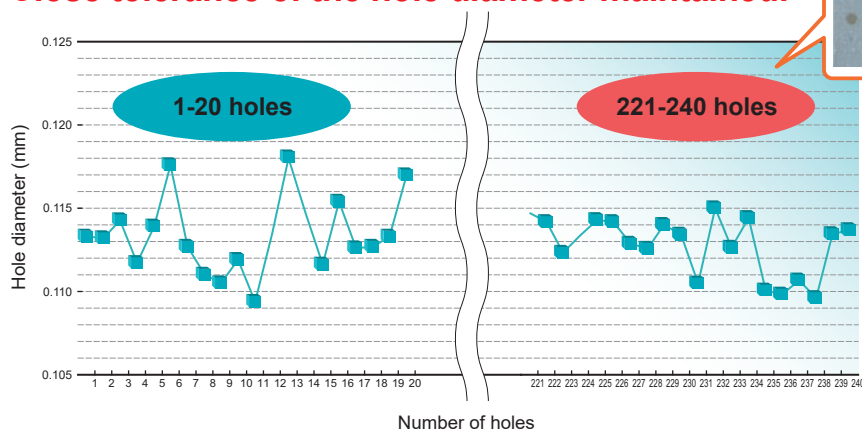


Drill	DC-BSS ø0.4
Workpiece	Quartz glass
Revolution	32,000min ⁻¹
Feed rate	10mm/min (0.31µm/rev)
Step feed	0.1mm
Hole depth	4mm blind
Machining method	Oil coolant

Cutting performance 2

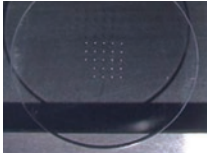
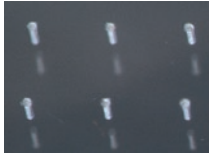
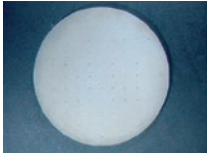
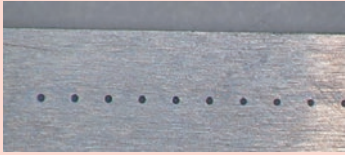
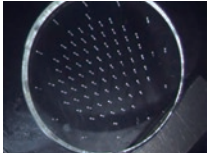
Machining of Alumina

Close tolerance of the hole diameter maintained!



Application examples

■ DC-BSS

Work Material	Size	Cutting Conditions				Results
		Revolution	Feed Rate	Hole Depth	Machining Method	
Sapphire	DC-BSS ø0.1	24,000min ⁻¹	2mm/min	0.85mm (Blind)	Step feed drilling Water soluble coolant	23 holes can be machined. Cannot be machined with an electroplated diamond tool.  
Zirconia ZrO ₂	DC-BSS ø0.2	20,000min ⁻¹	1mm/min	1mm (Blind)	Step feed drilling Water soluble coolant	100 holes can be machined. 
Aluminium Nitride AlN	DC-BSS ø0.13	12,000min ⁻¹	2mm/min	1mm (Blind)	Step feed drilling Water soluble coolant	No tool wear even after machining 82 holes.  
Silicon Carbide SiC	DC-BSS ø0.2 x 2	15,000min ⁻¹	1mm/min	1mm (Blind)	Step feed drilling Water soluble coolant	16 holes can be machined. With an electroplated diamond tool, tool life is reached within 0-2 holes. 
Quartz Glass SiO ₂	DC-BSS ø0.5 Neck Length 12mm Customised products	24,000min ⁻¹	10mm/min	11mm (Through)	Step feed drilling Water soluble coolant	Deep hole drilling (22D) is available. 800 holes can be machined.  

Application examples

■ DC-SSS, DC-SSM

Work Material	Size	Cutting Conditions				Results	
		Revolution	Feed Rate	Hole Depth	Machining Method		
High Silicon Aluminium Alloy	DC-SSM ø3.0	6,000min ⁻¹	0.10mm/rev	3mm (Blind)	Emulsion	Possible to machine up to 40,000 holes. Carbide drill: Diameter wear 0.02mm. DC-SSM: No diameter wear (10 times longer tool life)	
Aluminium Alloy (JIS A7075)	DC-SSS ø2.0	32,000min ⁻¹	0.094mm/rev	6mm (Through)	Emulsion Step feed drilling	HSS drill: Possible to machine up to 20,000 holes. DC-SSS: 300,000 holes. The DC-SSS left less burrs and the time on burr removal was shortened by 85%.	
Copper (Copper Electrode)	DC-SSS ø0.9	18,000min ⁻¹	0.017mm/rev	4mm (Blind)	Emulsion Step feed drilling	Carbide drill: Possible to machine up to 1,000 holes. DC-SSS: 6,000 holes. Hole size accuracy can be maintained with less diameter wear.	
Graphite	DC-SSS ø0.5	10,000min ⁻¹	0.08mm/rev	3mm (Blind)	Dry Step feed drilling	Carbide drill: Possible to machine up to 7,000 holes. DC-SSS: Over 50,000 holes. Wandering can be reduced to 0.015mm. Hole size accuracy can be maintained with less diameter wear.	
Hard Brittle Materials	Machinable Ceramics	DC-SSS ø1.0	5,000min ⁻¹	0.02mm/rev	5mm (Through)	Emulsion Step feed drilling	The DC-SSS can machine 50 times larger number of holes than the carbide drill. * Care should be taken to prevent the cutting edge from chipping when entering and exiting the workpiece.
	Quartz Glass	DC-SSS ø0.6	10,000min ⁻¹	0.5µm/rev	3mm (Through)	Emulsion Step feed drilling	DC-SSS: 300 holes can be machined (no damage). * Care should be taken to prevent the cutting edge from chipping when entering and exiting the workpiece. (When simultaneously machining cover plates)
	Alumina Nitride Ceramics	DC-SSS ø0.2	8,000min ⁻¹	0.1µm/rev	1.5mm (Through)	Emulsion Step feed drilling	Carbide drill: 30 holes can be machined. DC-SSS: Over 250 holes. Hole size accuracy can be maintained



Diamond Coated Drill Series

DC-BSS

DC-SSS/DC-SSM

For Your Safety

●Don't handle inserts and chips without gloves. ●Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage. ●Please use safety covers and wear safety glasses. ●When using compounded cutting oils, please take fire precautions. ●When attaching inserts or spare parts, please use only the correct wrench or driver. ●When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

 **MITSUBISHI MATERIALS CORPORATION**

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<http://www.mitsubishicarbide.com/en/>
(Tools specifications subject to change without notice.)

EXP-13-E009
2019.11.(-)