

Solid Carbide Drill for Stainless Steel  
**WSTAR** Drill Series

## **MIMS**

Special drill for stainless steels added to the WSTAR series.

## **Beyond the bounds of common sense for Stainless steel drilling**

Use of a unique coolant hole geometry improves the cooling effect. **“TRI-Cooling Technology”**  
Longer tool life and efficiency of stainless steels.



- Drill sizes available in 0.1mm increments from  $\varnothing 3.0$  to  $\varnothing 20.0$ .
- L/D 3, 5 types are available as standard.
- Shank diameters are even, possible to use in combination with milling holders.  
(Possible for use with shrink-fit holders and drill collets.)

# Solid Carbide Drill for Stainless Steel

## **WSTAR** drill series

# **MMS**

## Feature

Unique coolant hole geometry for high productivity & long tool life!

### 1 Unique coolant hole geometry

Employs new **TRI-cooling** technology. Discharged coolant volume increase by unique hole shape. (Coolant holes on drills larger than  $\varnothing 6$  mm)

**PAT.P.**

### 3 Special margin to reduce cutting resistance

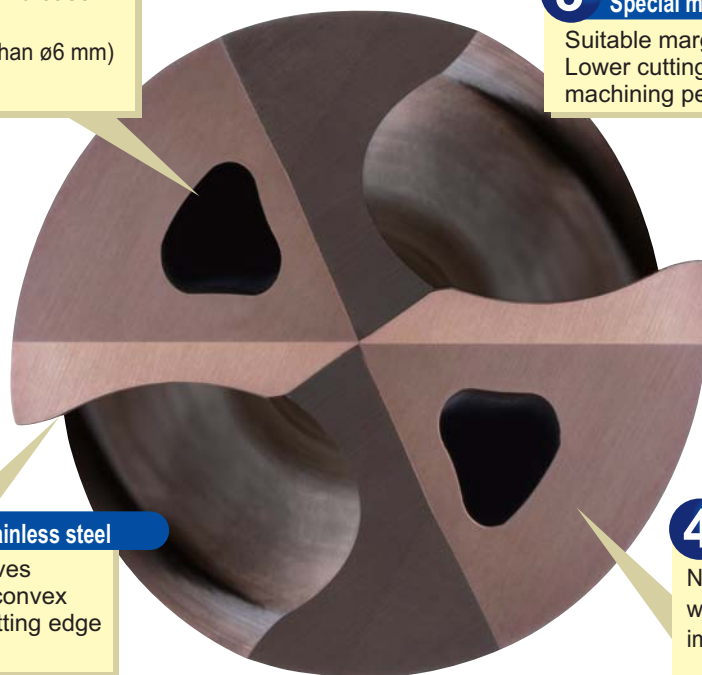
Suitable margin width for stainless steels. Lower cutting resistance offering higher machining performance.

### 2 Wavy cutting edge for stainless steel

The concave edge improves sharpness, whereas the convex edge improves overall cutting edge strength.

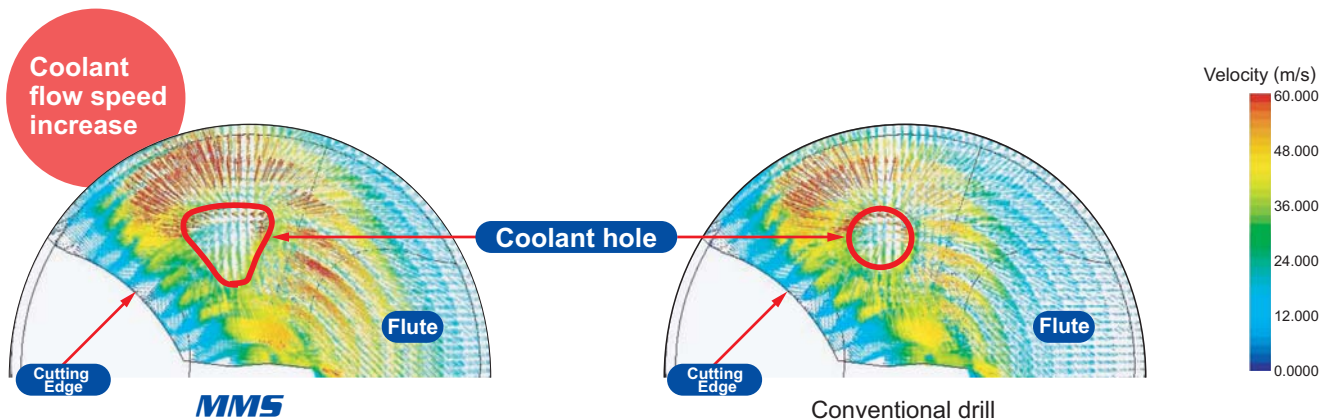
### 4 New tool grade DP7020

New substrate for stainless steels, with a PVD coating offering improved lubricity.



Compared to conventional drills, coolant volume is doubled. Improved cooling and longer tool life.

Coolant flow speed simulation (Rotation 4700rpm)



# Cutting Performance

The MMS drill generates chips that are easily evacuated leading to higher performance.

## MMS

| Feed (mm/rev) | Cutting speed (m/min) |               |               |
|---------------|-----------------------|---------------|---------------|
|               | 60                    | 80            | 100           |
| 0.2           | ○<br>Workable         | ○<br>Workable | ○<br>Workable |
| 0.3           | ○<br>Workable         | ○<br>Workable | ○<br>Workable |
| 0.35          | ○<br>Workable         | ●<br>Breakage | —             |



Easy to evacuate chip geometry

<Cutting conditions>  
 Drill :  $\phi$ 6.1mm  
 Workpiece : SUS304  
 Hole depth : 30mm (L/D=5)  
 Coolant : W.S.O  
 Emission pressure : 3MPa  
 Machine : Machining centre

## Conventional drill

| Feed (mm/rev) | Cutting speed (m/min) |               |               |
|---------------|-----------------------|---------------|---------------|
|               | 60                    | 80            | 100           |
| 0.2           | ○<br>Workable         | ○<br>Workable | ○<br>Workable |
| 0.3           | ○<br>Workable         | ●<br>Breakage | —             |
| 0.35          | ●<br>Breakage         | —             | —             |

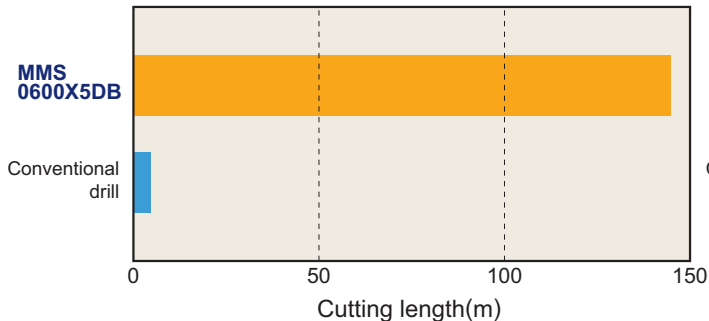


\*Above is an example, for recommended cutting conditions please refer to page 7.

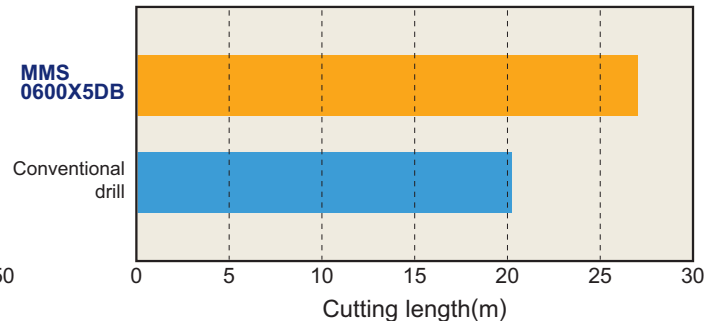
The MMS drill offer longer tool life, and can be used for various stainless steels.

### ● Austenitic stainless steel

### ● Martensitic stainless steel



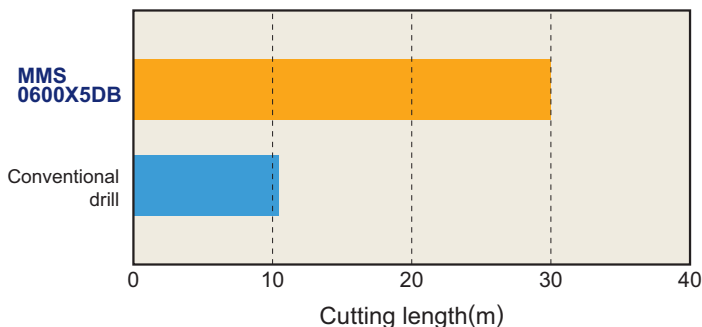
<Cutting conditions>  
 Drill :  $\phi$ 6.0mm      Feed Rate : 955mm/min (Non-step)  
 Workpiece : JIS SUS316L      Coolant : W.S.O  
 Hole depth : 30mm (L/D=5)      Emission pressure : 3MPa  
 Cutting speed : 90m/min      Machine : Machining centre  
 Feed : 0.2mm/rev



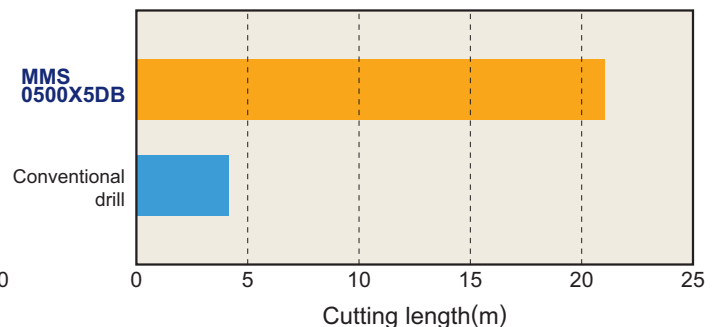
<Cutting conditions>  
 Drill :  $\phi$ 6.0mm      Feed Rate : 345mm/min (Non-step)  
 Workpiece : JIS SUS420J2      Coolant : W.S.O  
 Hole depth : 30mm (L/D=5)      Emission pressure : 3MPa  
 Cutting speed : 50m/min      Machine : Machining centre  
 Feed : 0.13mm/rev

### ● Duplex steel

### ● PH stainless steel



<Cutting conditions>  
 Drill :  $\phi$ 6.0mm      Feed Rate : 345mm/min (Non-step)  
 Workpiece : JIS SUS329J1      Coolant : W.S.O  
 Hole depth : 30mm (L/D=5)      Emission pressure : 3MPa  
 Cutting speed : 50m/min      Machine : Machining centre  
 Feed : 0.13mm/rev



<Cutting conditions>  
 Drill :  $\phi$ 5.0mm      Feed Rate : 255mm/min (Non-step)  
 Workpiece : JIS SUS630      Coolant : W.S.O  
 Hole depth : 25mm (L/D=5)      Emission pressure : 3MPa  
 Cutting speed : 50m/min      Machine : Machining centre  
 Feed : 0.08mm/rev

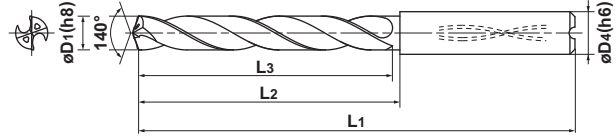
# Solid Carbide Drill for Stainless Steel

## MMS

### WSTAR Drill Series

| Carbon Steel<br>Alloy Steel | Hardened<br>Steel | Stainless<br>Steel | Cast Iron | Light Alloy | Heat Resistant<br>Alloy |
|-----------------------------|-------------------|--------------------|-----------|-------------|-------------------------|
|                             |                   | ◎                  |           |             |                         |

|                      | D1=3        | 3<D1≤6      | 6<D1≤10     | 10<D1≤18    | 18<D1≤20    |
|----------------------|-------------|-------------|-------------|-------------|-------------|
| D1 Tolerance<br>(mm) | 0<br>-0.014 | 0<br>-0.018 | 0<br>-0.022 | 0<br>-0.027 | 0<br>-0.033 |
| D4 Tolerance<br>(mm) | 0<br>-0.008 | 0<br>-0.008 | 0<br>-0.009 | 0<br>-0.011 | 0<br>-0.013 |



★When looking at the coating the colour can vary depending on the direction of viewing. This does not have any effect on the performance of the drill.

| Drill Dia.<br>D1<br>(mm) | Hole Depth<br>(l/d) | Coolant | Stock<br>DP7020 | Order Number | Dimensions (mm) |    |    |    |
|--------------------------|---------------------|---------|-----------------|--------------|-----------------|----|----|----|
|                          |                     |         |                 |              | L3              | L2 | L1 | D4 |
| 3.0                      | 3                   | Int.    | ●               | MMS0300X3DB  | 21              | 23 | 70 | 6  |
|                          | 5                   | Int.    | ●               | 0300X5DB     | 28              | 31 | 78 | 6  |
| 3.1                      | 3                   | Int.    | ●               | 0310X3DB     | 21              | 23 | 70 | 6  |
|                          | 5                   | Int.    | ●               | 0310X5DB     | 28              | 31 | 78 | 6  |
| 3.2                      | 3                   | Int.    | ●               | 0320X3DB     | 21              | 23 | 70 | 6  |
|                          | 5                   | Int.    | ●               | 0320X5DB     | 28              | 31 | 78 | 6  |
| 3.3                      | 3                   | Int.    | ●               | 0330X3DB     | 21              | 23 | 70 | 6  |
|                          | 5                   | Int.    | ●               | 0330X5DB     | 28              | 31 | 78 | 6  |
| 3.4                      | 3                   | Int.    | ●               | 0340X3DB     | 21              | 23 | 70 | 6  |
|                          | 5                   | Int.    | ●               | 0340X5DB     | 28              | 31 | 78 | 6  |
| 3.5                      | 3                   | Int.    | ●               | 0350X3DB     | 21              | 23 | 70 | 6  |
|                          | 5                   | Int.    | ●               | 0350X5DB     | 28              | 31 | 78 | 6  |
| 3.6                      | 3                   | Int.    | ●               | 0360X3DB     | 22              | 23 | 70 | 6  |
|                          | 5                   | Int.    | ●               | 0360X5DB     | 30              | 31 | 78 | 6  |
| 3.7                      | 3                   | Int.    | ●               | 0370X3DB     | 22              | 23 | 70 | 6  |
|                          | 5                   | Int.    | ●               | 0370X5DB     | 30              | 31 | 78 | 6  |
| 3.8                      | 3                   | Int.    | ●               | 0380X3DB     | 22              | 23 | 70 | 6  |
|                          | 5                   | Int.    | ●               | 0380X5DB     | 30              | 31 | 78 | 6  |
| 3.9                      | 3                   | Int.    | ●               | 0390X3DB     | 22              | 23 | 70 | 6  |
|                          | 5                   | Int.    | ●               | 0390X5DB     | 30              | 31 | 78 | 6  |
| 4.0                      | 3                   | Int.    | ●               | 0400X3DB     | 22              | 23 | 70 | 6  |
|                          | 5                   | Int.    | ●               | 0400X5DB     | 30              | 31 | 78 | 6  |
| 4.1                      | 3                   | Int.    | ●               | 0410X3DB     | 24              | 26 | 73 | 6  |
|                          | 5                   | Int.    | ●               | 0410X5DB     | 33              | 35 | 82 | 6  |
| 4.2                      | 3                   | Int.    | ●               | 0420X3DB     | 24              | 26 | 73 | 6  |
|                          | 5                   | Int.    | ●               | 0420X5DB     | 33              | 35 | 82 | 6  |
| 4.3                      | 3                   | Int.    | ●               | 0430X3DB     | 24              | 26 | 73 | 6  |
|                          | 5                   | Int.    | ●               | 0430X5DB     | 33              | 35 | 82 | 6  |
| 4.4                      | 3                   | Int.    | ●               | 0440X3DB     | 24              | 26 | 73 | 6  |
|                          | 5                   | Int.    | ●               | 0440X5DB     | 33              | 35 | 82 | 6  |
| 4.5                      | 3                   | Int.    | ●               | 0450X3DB     | 24              | 26 | 73 | 6  |
|                          | 5                   | Int.    | ●               | 0450X5DB     | 33              | 35 | 82 | 6  |
| 4.6                      | 3                   | Int.    | ●               | 0460X3DB     | 25              | 28 | 75 | 6  |
|                          | 5                   | Int.    | ●               | 0460X5DB     | 35              | 38 | 85 | 6  |
| 4.7                      | 3                   | Int.    | ●               | 0470X3DB     | 25              | 28 | 75 | 6  |
|                          | 5                   | Int.    | ●               | 0470X5DB     | 35              | 38 | 85 | 6  |
| 4.8                      | 3                   | Int.    | ●               | 0480X3DB     | 25              | 28 | 75 | 6  |
|                          | 5                   | Int.    | ●               | 0480X5DB     | 35              | 38 | 85 | 6  |

| Drill Dia.<br>D1<br>(mm) | Hole Depth<br>(l/d) | Coolant | Stock<br>DP7020 | Order Number | Dimensions (mm) |    |    |    |
|--------------------------|---------------------|---------|-----------------|--------------|-----------------|----|----|----|
|                          |                     |         |                 |              | L3              | L2 | L1 | D4 |
| 4.9                      | 3                   | Int.    | ●               | MMS0490X3DB  | 25              | 28 | 75 | 6  |
|                          | 5                   | Int.    | ●               | 0490X5DB     | 35              | 38 | 85 | 6  |
| 5.0                      | 3                   | Int.    | ●               | 0500X3DB     | 25              | 28 | 75 | 6  |
|                          | 5                   | Int.    | ●               | 0500X5DB     | 35              | 38 | 85 | 6  |
| 5.1                      | 3                   | Int.    | ●               | 0510X3DB     | 28              | 30 | 81 | 6  |
|                          | 5                   | Int.    | ●               | 0510X5DB     | 39              | 42 | 89 | 6  |
| 5.2                      | 3                   | Int.    | ●               | 0520X3DB     | 28              | 30 | 81 | 6  |
|                          | 5                   | Int.    | ●               | 0520X5DB     | 39              | 42 | 89 | 6  |
| 5.3                      | 3                   | Int.    | ●               | 0530X3DB     | 28              | 30 | 81 | 6  |
|                          | 5                   | Int.    | ●               | 0530X5DB     | 39              | 42 | 89 | 6  |
| 5.4                      | 3                   | Int.    | ●               | 0540X3DB     | 28              | 30 | 81 | 6  |
|                          | 5                   | Int.    | ●               | 0540X5DB     | 39              | 42 | 89 | 6  |
| 5.5                      | 3                   | Int.    | ●               | 0550X3DB     | 28              | 30 | 81 | 6  |
|                          | 5                   | Int.    | ●               | 0550X5DB     | 39              | 42 | 89 | 6  |
| 5.6                      | 3                   | Int.    | ●               | 0560X3DB     | 30              | 30 | 81 | 6  |
|                          | 5                   | Int.    | ●               | 0560X5DB     | 42              | 42 | 89 | 6  |
| 5.7                      | 3                   | Int.    | ●               | 0570X3DB     | 30              | 30 | 81 | 6  |
|                          | 5                   | Int.    | ●               | 0570X5DB     | 42              | 42 | 89 | 6  |
| 5.8                      | 3                   | Int.    | ●               | 0580X3DB     | 30              | 30 | 81 | 6  |
|                          | 5                   | Int.    | ●               | 0580X5DB     | 42              | 42 | 89 | 6  |
| 5.9                      | 3                   | Int.    | ●               | 0590X3DB     | 30              | 30 | 81 | 6  |
|                          | 5                   | Int.    | ●               | 0590X5DB     | 42              | 42 | 89 | 6  |
| 6.0                      | 3                   | Int.    | ●               | 0600X3DB     | 30              | 30 | 81 | 6  |
|                          | 5                   | Int.    | ●               | 0600X5DB     | 42              | 42 | 89 | 6  |
| 6.1                      | 3                   | Int.    | ●               | 0610X3DB     | 33              | 35 | 86 | 8  |
|                          | 5                   | Int.    | ●               | 0610X5DB     | 46              | 48 | 95 | 8  |
| 6.2                      | 3                   | Int.    | ●               | 0620X3DB     | 33              | 35 | 86 | 8  |
|                          | 5                   | Int.    | ●               | 0620X5DB     | 46              | 48 | 95 | 8  |
| 6.3                      | 3                   | Int.    | ●               | 0630X3DB     | 33              | 35 | 86 | 8  |
|                          | 5                   | Int.    | ●               | 0630X5DB     | 46              | 48 | 95 | 8  |
| 6.4                      | 3                   | Int.    | ●               | 0640X3DB     | 33              | 35 | 86 | 8  |
|                          | 5                   | Int.    | ●               | 0640X5DB     | 46              | 48 | 95 | 8  |
| 6.5                      | 3                   | Int.    | ●               | 0650X3DB     | 33              | 35 | 86 | 8  |
|                          | 5                   | Int.    | ●               | 0650X5DB     | 46              | 48 | 95 | 8  |
| 6.6                      | 3                   | Int.    | ●               | 0660X3DB     | 35              | 37 | 90 | 8  |
|                          | 5                   | Int.    | ●               | 0660X5DB     | 49              | 51 | 98 | 8  |
| 6.7                      | 3                   | Int.    | ●               | 0670X3DB     | 35              | 37 | 90 | 8  |
|                          | 5                   | Int.    | ●               | 0670X5DB     | 49              | 51 | 98 | 8  |

Note) Please contact Mitsubishi Carbide for any geometry that is not in the brochure (e.g. different diameter and length).

● : Inventory maintained.



| Drill Dia.<br>D1<br>(mm) | Hole Depth<br>(l/d) | Coolant | Stock<br>DP7020 | Order Number | Dimensions (mm) |    |     |    |
|--------------------------|---------------------|---------|-----------------|--------------|-----------------|----|-----|----|
|                          |                     |         |                 |              | L3              | L2 | L1  | D4 |
| 6.8                      | 3                   | Int.    | ●               | MMS0680X3DB  | 35              | 37 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0680X5DB     | 49              | 51 | 98  | 8  |
| 6.9                      | 3                   | Int.    | ●               | 0690X3DB     | 35              | 37 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0690X5DB     | 49              | 51 | 98  | 8  |
| 7.0                      | 3                   | Int.    | ●               | 0700X3DB     | 35              | 37 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0700X5DB     | 49              | 51 | 98  | 8  |
| 7.1                      | 3                   | Int.    | ●               | 0710X3DB     | 38              | 39 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0710X5DB     | 53              | 56 | 103 | 8  |
| 7.2                      | 3                   | Int.    | ●               | 0720X3DB     | 38              | 39 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0720X5DB     | 53              | 56 | 103 | 8  |
| 7.3                      | 3                   | Int.    | ●               | 0730X3DB     | 38              | 39 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0730X5DB     | 53              | 56 | 103 | 8  |
| 7.4                      | 3                   | Int.    | ●               | 0740X3DB     | 38              | 39 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0740X5DB     | 53              | 56 | 103 | 8  |
| 7.5                      | 3                   | Int.    | ●               | 0750X3DB     | 38              | 39 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0750X5DB     | 53              | 56 | 103 | 8  |
| 7.6                      | 3                   | Int.    | ●               | 0760X3DB     | 40              | 40 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0760X5DB     | 56              | 56 | 103 | 8  |
| 7.7                      | 3                   | Int.    | ●               | 0770X3DB     | 40              | 40 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0770X5DB     | 56              | 56 | 103 | 8  |
| 7.8                      | 3                   | Int.    | ●               | 0780X3DB     | 40              | 40 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0780X5DB     | 56              | 56 | 103 | 8  |
| 7.9                      | 3                   | Int.    | ●               | 0790X3DB     | 40              | 40 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0790X5DB     | 56              | 56 | 103 | 8  |
| 8.0                      | 3                   | Int.    | ●               | 0800X3DB     | 40              | 40 | 90  | 8  |
|                          | 5                   | Int.    | ●               | 0800X5DB     | 56              | 56 | 103 | 8  |
| 8.1                      | 3                   | Int.    | ●               | 0810X3DB     | 43              | 45 | 96  | 10 |
|                          | 5                   | Int.    | ●               | 0810X5DB     | 60              | 62 | 113 | 10 |
| 8.2                      | 3                   | Int.    | ●               | 0820X3DB     | 43              | 45 | 96  | 10 |
|                          | 5                   | Int.    | ●               | 0820X5DB     | 60              | 62 | 113 | 10 |
| 8.3                      | 3                   | Int.    | ●               | 0830X3DB     | 43              | 45 | 96  | 10 |
|                          | 5                   | Int.    | ●               | 0830X5DB     | 60              | 62 | 113 | 10 |
| 8.4                      | 3                   | Int.    | ●               | 0840X3DB     | 43              | 45 | 96  | 10 |
|                          | 5                   | Int.    | ●               | 0840X5DB     | 60              | 62 | 113 | 10 |
| 8.5                      | 3                   | Int.    | ●               | 0850X3DB     | 43              | 45 | 96  | 10 |
|                          | 5                   | Int.    | ●               | 0850X5DB     | 60              | 62 | 113 | 10 |
| 8.6                      | 3                   | Int.    | ●               | 0860X3DB     | 45              | 47 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0860X5DB     | 63              | 65 | 116 | 10 |
| 8.7                      | 3                   | Int.    | ●               | 0870X3DB     | 45              | 47 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0870X5DB     | 63              | 65 | 116 | 10 |
| 8.8                      | 3                   | Int.    | ●               | 0880X3DB     | 45              | 47 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0880X5DB     | 63              | 65 | 116 | 10 |
| 8.9                      | 3                   | Int.    | ●               | 0890X3DB     | 45              | 47 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0890X5DB     | 63              | 65 | 116 | 10 |
| 9.0                      | 3                   | Int.    | ●               | 0900X3DB     | 45              | 47 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0900X5DB     | 63              | 65 | 116 | 10 |
| 9.1                      | 3                   | Int.    | ●               | 0910X3DB     | 48              | 50 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0910X5DB     | 67              | 70 | 121 | 10 |
| 9.2                      | 3                   | Int.    | ●               | 0920X3DB     | 48              | 50 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0920X5DB     | 67              | 70 | 121 | 10 |

| Drill Dia.<br>D1<br>(mm) | Hole Depth<br>(l/d) | Coolant | Stock<br>DP7020 | Order Number | Dimensions (mm) |    |     |    |
|--------------------------|---------------------|---------|-----------------|--------------|-----------------|----|-----|----|
|                          |                     |         |                 |              | L3              | L2 | L1  | D4 |
| 9.3                      | 3                   | Int.    | ●               | MMS0930X3DB  | 48              | 50 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0930X5DB     | 67              | 70 | 121 | 10 |
| 9.4                      | 3                   | Int.    | ●               | 0940X3DB     | 48              | 50 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0940X5DB     | 67              | 70 | 121 | 10 |
| 9.5                      | 3                   | Int.    | ●               | 0950X3DB     | 48              | 50 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0950X5DB     | 67              | 70 | 121 | 10 |
| 9.6                      | 3                   | Int.    | ●               | 0960X3DB     | 50              | 50 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0960X5DB     | 70              | 70 | 121 | 10 |
| 9.7                      | 3                   | Int.    | ●               | 0970X3DB     | 50              | 50 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0970X5DB     | 70              | 70 | 121 | 10 |
| 9.8                      | 3                   | Int.    | ●               | 0980X3DB     | 50              | 50 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0980X5DB     | 70              | 70 | 121 | 10 |
| 9.9                      | 3                   | Int.    | ●               | 0990X3DB     | 50              | 50 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 0990X5DB     | 70              | 70 | 121 | 10 |
| 10.0                     | 3                   | Int.    | ●               | 1000X3DB     | 50              | 50 | 101 | 10 |
|                          | 5                   | Int.    | ●               | 1000X5DB     | 70              | 70 | 121 | 10 |
| 10.1                     | 3                   | Int.    | ●               | 1010X3DB     | 53              | 55 | 111 | 12 |
|                          | 5                   | Int.    | ●               | 1010X5DB     | 74              | 78 | 134 | 12 |
| 10.2                     | 3                   | Int.    | ●               | 1020X3DB     | 53              | 55 | 111 | 12 |
|                          | 5                   | Int.    | ●               | 1020X5DB     | 74              | 78 | 134 | 12 |
| 10.3                     | 3                   | Int.    | ●               | 1030X3DB     | 53              | 55 | 111 | 12 |
|                          | 5                   | Int.    | ●               | 1030X5DB     | 74              | 78 | 134 | 12 |
| 10.4                     | 3                   | Int.    | ●               | 1040X3DB     | 53              | 55 | 111 | 12 |
|                          | 5                   | Int.    | ●               | 1040X5DB     | 74              | 78 | 134 | 12 |
| 10.5                     | 3                   | Int.    | ●               | 1050X3DB     | 53              | 55 | 111 | 12 |
|                          | 5                   | Int.    | ●               | 1050X5DB     | 74              | 78 | 134 | 12 |
| 10.6                     | 3                   | Int.    | ●               | 1060X3DB     | 55              | 56 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1060X5DB     | 77              | 78 | 134 | 12 |
| 10.7                     | 3                   | Int.    | ●               | 1070X3DB     | 55              | 56 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1070X5DB     | 77              | 78 | 134 | 12 |
| 10.8                     | 3                   | Int.    | ●               | 1080X3DB     | 55              | 56 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1080X5DB     | 77              | 78 | 134 | 12 |
| 10.9                     | 3                   | Int.    | ●               | 1090X3DB     | 55              | 56 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1090X5DB     | 77              | 78 | 134 | 12 |
| 11.0                     | 3                   | Int.    | ●               | 1100X3DB     | 55              | 56 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1100X5DB     | 77              | 78 | 134 | 12 |
| 11.1                     | 3                   | Int.    | ●               | 1110X3DB     | 58              | 60 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1110X5DB     | 81              | 84 | 140 | 12 |
| 11.2                     | 3                   | Int.    | ●               | 1120X3DB     | 58              | 60 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1120X5DB     | 81              | 84 | 140 | 12 |
| 11.3                     | 3                   | Int.    | ●               | 1130X3DB     | 58              | 60 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1130X5DB     | 81              | 84 | 140 | 12 |
| 11.4                     | 3                   | Int.    | ●               | 1140X3DB     | 58              | 60 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1140X5DB     | 81              | 84 | 140 | 12 |
| 11.5                     | 3                   | Int.    | ●               | 1150X3DB     | 58              | 60 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1150X5DB     | 81              | 84 | 140 | 12 |
| 11.6                     | 3                   | Int.    | ●               | 1160X3DB     | 60              | 60 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1160X5DB     | 84              | 84 | 140 | 12 |
| 11.7                     | 3                   | Int.    | ●               | 1170X3DB     | 60              | 60 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1170X5DB     | 84              | 84 | 140 | 12 |

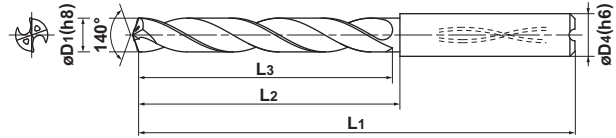
# Solid Carbide Drill for Stainless Steel

## MMS

### WSTAR Drill Series

| Carbon Steel<br>Alloy Steel | Hardened<br>Steel | Stainless<br>Steel | Cast Iron | Light Alloy | Heat Resistant<br>Alloy |
|-----------------------------|-------------------|--------------------|-----------|-------------|-------------------------|
|                             |                   | ◎                  |           |             |                         |

|                      | D1=3        | 3<D1≤6      | 6<D1≤10     | 10<D1≤18    | 18<D1≤20    |
|----------------------|-------------|-------------|-------------|-------------|-------------|
| D4 Tolerance<br>(mm) | 0<br>-0.014 | 0<br>-0.018 | 0<br>-0.022 | 0<br>-0.027 | 0<br>-0.033 |
| D1 Tolerance<br>(mm) | 0<br>-0.008 | 0<br>-0.008 | 0<br>-0.009 | 0<br>-0.011 | 0<br>-0.013 |



\*When looking at the coating the colour can vary depending on the direction of viewing. This does not have any effect on the performance of the drill.

| Drill Dia.<br>D1<br>(mm) | Hole Depth<br>(l/d) | Coolant | Stock<br>DP7020 | Order Number | Dimensions (mm) |    |     |    |
|--------------------------|---------------------|---------|-----------------|--------------|-----------------|----|-----|----|
|                          |                     |         |                 |              | L3              | L2 | L1  | D4 |
| 11.8                     | 3                   | Int.    | ●               | MMS1180X3DB  | 60              | 60 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1180X5DB     | 84              | 84 | 140 | 12 |
| 11.9                     | 3                   | Int.    | ●               | 1190X3DB     | 60              | 60 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1190X5DB     | 84              | 84 | 140 | 12 |
| 12.0                     | 3                   | Int.    | ●               | 1200X3DB     | 60              | 60 | 116 | 12 |
|                          | 5                   | Int.    | ●               | 1200X5DB     | 84              | 84 | 140 | 12 |
| 12.1                     | 3                   | Int.    | ●               | 1210X3DB     | 63              | 66 | 122 | 14 |
|                          | 5                   | Int.    | ●               | 1210X5DB     | 88              | 92 | 148 | 14 |
| 12.2                     | 3                   | Int.    | ●               | 1220X3DB     | 63              | 66 | 122 | 14 |
|                          | 5                   | Int.    | ●               | 1220X5DB     | 88              | 92 | 148 | 14 |
| 12.3                     | 3                   | Int.    | ●               | 1230X3DB     | 63              | 66 | 122 | 14 |
|                          | 5                   | Int.    | ●               | 1230X5DB     | 88              | 92 | 148 | 14 |
| 12.4                     | 3                   | Int.    | ●               | 1240X3DB     | 63              | 66 | 122 | 14 |
|                          | 5                   | Int.    | ●               | 1240X5DB     | 88              | 92 | 148 | 14 |
| 12.5                     | 3                   | Int.    | ●               | 1250X3DB     | 63              | 66 | 122 | 14 |
|                          | 5                   | Int.    | ●               | 1250X5DB     | 88              | 92 | 148 | 14 |
| 12.6                     | 3                   | Int.    | ●               | 1260X3DB     | 65              | 66 | 122 | 14 |
|                          | 5                   | Int.    | ●               | 1260X5DB     | 91              | 92 | 148 | 14 |
| 12.7                     | 3                   | Int.    | ●               | 1270X3DB     | 65              | 66 | 122 | 14 |
|                          | 5                   | Int.    | ●               | 1270X5DB     | 91              | 92 | 148 | 14 |
| 12.8                     | 3                   | Int.    | ●               | 1280X3DB     | 65              | 66 | 122 | 14 |
|                          | 5                   | Int.    | ●               | 1280X5DB     | 91              | 92 | 148 | 14 |
| 12.9                     | 3                   | Int.    | ●               | 1290X3DB     | 65              | 66 | 122 | 14 |
|                          | 5                   | Int.    | ●               | 1290X5DB     | 91              | 92 | 148 | 14 |
| 13.0                     | 3                   | Int.    | ●               | 1300X3DB     | 65              | 66 | 122 | 14 |
|                          | 5                   | Int.    | ●               | 1300X5DB     | 91              | 92 | 148 | 14 |
| 13.1                     | 3                   | Int.    | ●               | 1310X3DB     | 68              | 70 | 126 | 14 |
|                          | 5                   | Int.    | ●               | 1310X5DB     | 95              | 98 | 154 | 14 |
| 13.2                     | 3                   | Int.    | ●               | 1320X3DB     | 68              | 70 | 126 | 14 |
|                          | 5                   | Int.    | ●               | 1320X5DB     | 95              | 98 | 154 | 14 |
| 13.3                     | 3                   | Int.    | ●               | 1330X3DB     | 68              | 70 | 126 | 14 |
|                          | 5                   | Int.    | ●               | 1330X5DB     | 95              | 98 | 154 | 14 |
| 13.4                     | 3                   | Int.    | ●               | 1340X3DB     | 68              | 70 | 126 | 14 |
|                          | 5                   | Int.    | ●               | 1340X5DB     | 95              | 98 | 154 | 14 |
| 13.5                     | 3                   | Int.    | ●               | 1350X3DB     | 68              | 70 | 126 | 14 |
|                          | 5                   | Int.    | ●               | 1350X5DB     | 95              | 98 | 154 | 14 |
| 13.6                     | 3                   | Int.    | ●               | 1360X3DB     | 70              | 70 | 126 | 14 |
|                          | 5                   | Int.    | ●               | 1360X5DB     | 98              | 98 | 154 | 14 |

| Drill Dia.<br>D1<br>(mm) | Hole Depth<br>(l/d) | Coolant | Stock<br>DP7020 | Order Number | Dimensions (mm) |     |     |    |
|--------------------------|---------------------|---------|-----------------|--------------|-----------------|-----|-----|----|
|                          |                     |         |                 |              | L3              | L2  | L1  | D4 |
| 13.7                     | 3                   | Int.    | ●               | MMS1370X3DB  | 70              | 70  | 126 | 14 |
|                          | 5                   | Int.    | ●               | 1370X5DB     | 98              | 98  | 154 | 14 |
| 13.8                     | 3                   | Int.    | ●               | 1380X3DB     | 70              | 70  | 126 | 14 |
|                          | 5                   | Int.    | ●               | 1380X5DB     | 98              | 98  | 154 | 14 |
| 13.9                     | 3                   | Int.    | ●               | 1390X3DB     | 70              | 70  | 126 | 14 |
|                          | 5                   | Int.    | ●               | 1390X5DB     | 98              | 98  | 154 | 14 |
| 14.0                     | 3                   | Int.    | ●               | 1400X3DB     | 70              | 70  | 126 | 14 |
|                          | 5                   | Int.    | ●               | 1400X5DB     | 98              | 98  | 154 | 14 |
| 14.1                     | 3                   | Int.    | ●               | 1410X3DB     | 73              | 76  | 135 | 16 |
|                          | 5                   | Int.    | ●               | 1410X5DB     | 102             | 106 | 165 | 16 |
| 14.2                     | 3                   | Int.    | ●               | 1420X3DB     | 73              | 76  | 135 | 16 |
|                          | 5                   | Int.    | ●               | 1420X5DB     | 102             | 106 | 165 | 16 |
| 14.3                     | 3                   | Int.    | ●               | 1430X3DB     | 73              | 76  | 135 | 16 |
|                          | 5                   | Int.    | ●               | 1430X5DB     | 102             | 106 | 165 | 16 |
| 14.4                     | 3                   | Int.    | ●               | 1440X3DB     | 73              | 76  | 135 | 16 |
|                          | 5                   | Int.    | ●               | 1440X5DB     | 102             | 106 | 165 | 16 |
| 14.5                     | 3                   | Int.    | ●               | 1450X3DB     | 73              | 76  | 135 | 16 |
|                          | 5                   | Int.    | ●               | 1450X5DB     | 102             | 106 | 165 | 16 |
| 14.6                     | 3                   | Int.    | ●               | 1460X3DB     | 75              | 76  | 135 | 16 |
|                          | 5                   | Int.    | ●               | 1460X5DB     | 105             | 106 | 165 | 16 |
| 14.7                     | 3                   | Int.    | ●               | 1470X3DB     | 75              | 76  | 135 | 16 |
|                          | 5                   | Int.    | ●               | 1470X5DB     | 105             | 106 | 165 | 16 |
| 14.8                     | 3                   | Int.    | ●               | 1480X3DB     | 75              | 76  | 135 | 16 |
|                          | 5                   | Int.    | ●               | 1480X5DB     | 105             | 106 | 165 | 16 |
| 14.9                     | 3                   | Int.    | ●               | 1490X3DB     | 75              | 76  | 135 | 16 |
|                          | 5                   | Int.    | ●               | 1490X5DB     | 105             | 106 | 165 | 16 |
| 15.0                     | 3                   | Int.    | ●               | 1500X3DB     | 75              | 76  | 135 | 16 |
|                          | 5                   | Int.    | ●               | 1500X5DB     | 105             | 106 | 165 | 16 |
| 15.1                     | 3                   | Int.    | ●               | 1510X3DB     | 78              | 80  | 139 | 16 |
|                          | 5                   | Int.    | ●               | 1510X5DB     | 109             | 112 | 171 | 16 |
| 15.2                     | 3                   | Int.    | ●               | 1520X3DB     | 78              | 80  | 139 | 16 |
|                          | 5                   | Int.    | ●               | 1520X5DB     | 109             | 112 | 171 | 16 |
| 15.3                     | 3                   | Int.    | ●               | 1530X3DB     | 78              | 80  | 139 | 16 |
|                          | 5                   | Int.    | ●               | 1530X5DB     | 109             | 112 | 171 | 16 |
| 15.4                     | 3                   | Int.    | ●               | 1540X3DB     | 78              | 80  | 139 | 16 |
|                          | 5                   | Int.    | ●               | 1540X5DB     | 109             | 112 | 171 | 16 |
| 15.5                     | 3                   | Int.    | ●               | 1550X3DB     | 78              | 80  | 139 | 16 |
|                          | 5                   | Int.    | ●               | 1550X5DB     | 109             | 112 | 171 | 16 |

Note) Please contact Mitsubishi Carbide for any geometry that is not in the brochure (e.g. different diameter and length).

● : Inventory maintained. □ : Non stock, produced to order only.

| Drill Dia.<br>D1<br>(mm) | Hole Depth<br>(l/d) | Coolant | Stock<br>DP7020 | Order Number | Dimensions (mm) |     |     |    |
|--------------------------|---------------------|---------|-----------------|--------------|-----------------|-----|-----|----|
|                          |                     |         |                 |              | L3              | L2  | L1  | D4 |
| 15.6                     | 3                   | Int.    | ●               | MMS1560X3DB  | 80              | 80  | 139 | 16 |
|                          | 5                   | Int.    | ●               | 1560X5DB     | 112             | 112 | 171 | 16 |
| 15.7                     | 3                   | Int.    | ●               | 1570X3DB     | 80              | 80  | 139 | 16 |
|                          | 5                   | Int.    | ●               | 1570X5DB     | 112             | 112 | 171 | 16 |
| 15.8                     | 3                   | Int.    | ●               | 1580X3DB     | 80              | 80  | 139 | 16 |
|                          | 5                   | Int.    | ●               | 1580X5DB     | 112             | 112 | 171 | 16 |
| 15.9                     | 3                   | Int.    | ●               | 1590X3DB     | 80              | 80  | 139 | 16 |
|                          | 5                   | Int.    | ●               | 1590X5DB     | 112             | 112 | 171 | 16 |
| 16.0                     | 3                   | Int.    | ●               | 1600X3DB     | 80              | 80  | 139 | 16 |
|                          | 5                   | Int.    | ●               | 1600X5DB     | 112             | 112 | 171 | 16 |
| 16.1                     | 3                   | Int.    | □               | 1610X3DB     | 83              | 86  | 145 | 18 |
|                          | 5                   | Int.    | □               | 1610X5DB     | 116             | 120 | 179 | 18 |
| 16.2                     | 3                   | Int.    | □               | 1620X3DB     | 83              | 86  | 145 | 18 |
|                          | 5                   | Int.    | □               | 1620X5DB     | 116             | 120 | 179 | 18 |
| 16.3                     | 3                   | Int.    | □               | 1630X3DB     | 83              | 86  | 145 | 18 |
|                          | 5                   | Int.    | □               | 1630X5DB     | 116             | 120 | 179 | 18 |
| 16.4                     | 3                   | Int.    | □               | 1640X3DB     | 83              | 86  | 145 | 18 |
|                          | 5                   | Int.    | □               | 1640X5DB     | 116             | 120 | 179 | 18 |
| 16.5                     | 3                   | Int.    | ●               | 1650X3DB     | 83              | 86  | 145 | 18 |
|                          | 5                   | Int.    | ●               | 1650X5DB     | 116             | 120 | 179 | 18 |
| 16.6                     | 3                   | Int.    | □               | 1660X3DB     | 85              | 86  | 145 | 18 |
|                          | 5                   | Int.    | □               | 1660X5DB     | 119             | 120 | 179 | 18 |
| 16.7                     | 3                   | Int.    | □               | 1670X3DB     | 85              | 86  | 145 | 18 |
|                          | 5                   | Int.    | □               | 1670X5DB     | 119             | 120 | 179 | 18 |
| 16.8                     | 3                   | Int.    | □               | 1680X3DB     | 85              | 86  | 145 | 18 |
|                          | 5                   | Int.    | □               | 1680X5DB     | 119             | 120 | 179 | 18 |
| 16.9                     | 3                   | Int.    | □               | 1690X3DB     | 85              | 86  | 145 | 18 |
|                          | 5                   | Int.    | □               | 1690X5DB     | 119             | 120 | 179 | 18 |
| 17.0                     | 3                   | Int.    | ●               | 1700X3DB     | 85              | 86  | 145 | 18 |
|                          | 5                   | Int.    | ●               | 1700X5DB     | 119             | 120 | 179 | 18 |
| 17.1                     | 3                   | Int.    | □               | 1710X3DB     | 88              | 90  | 149 | 18 |
|                          | 5                   | Int.    | □               | 1710X5DB     | 123             | 126 | 185 | 18 |
| 17.2                     | 3                   | Int.    | □               | 1720X3DB     | 88              | 90  | 149 | 18 |
|                          | 5                   | Int.    | □               | 1720X5DB     | 123             | 126 | 185 | 18 |
| 17.3                     | 3                   | Int.    | □               | 1730X3DB     | 88              | 90  | 149 | 18 |
|                          | 5                   | Int.    | □               | 1730X5DB     | 123             | 126 | 185 | 18 |
| 17.4                     | 3                   | Int.    | □               | 1740X3DB     | 88              | 90  | 149 | 18 |
|                          | 5                   | Int.    | □               | 1740X5DB     | 123             | 126 | 185 | 18 |
| 17.5                     | 3                   | Int.    | ●               | 1750X3DB     | 88              | 90  | 149 | 18 |
|                          | 5                   | Int.    | ●               | 1750X5DB     | 123             | 126 | 185 | 18 |
| 17.6                     | 3                   | Int.    | □               | 1760X3DB     | 90              | 90  | 149 | 18 |
|                          | 5                   | Int.    | □               | 1760X5DB     | 126             | 126 | 185 | 18 |
| 17.7                     | 3                   | Int.    | □               | 1770X3DB     | 90              | 90  | 149 | 18 |
|                          | 5                   | Int.    | □               | 1770X5DB     | 126             | 126 | 185 | 18 |
| 17.8                     | 3                   | Int.    | □               | 1780X3DB     | 90              | 90  | 149 | 18 |
|                          | 5                   | Int.    | □               | 1780X5DB     | 126             | 126 | 185 | 18 |

| Drill Dia.<br>D1<br>(mm) | Hole Depth<br>(l/d) | Coolant | Stock<br>DP7020 | Order Number | Dimensions (mm) |     |     |    |
|--------------------------|---------------------|---------|-----------------|--------------|-----------------|-----|-----|----|
|                          |                     |         |                 |              | L3              | L2  | L1  | D4 |
| 17.9                     | 3                   | Int.    | □               | MMS1790X3DB  | 90              | 90  | 149 | 18 |
|                          | 5                   | Int.    | □               | 1790X5DB     | 126             | 126 | 185 | 18 |
| 18.0                     | 3                   | Int.    | ●               | 1800X3DB     | 90              | 90  | 149 | 18 |
|                          | 5                   | Int.    | ●               | 1800X5DB     | 126             | 126 | 185 | 18 |
| 18.1                     | 3                   | Int.    | □               | 1810X3DB     | 93              | 96  | 157 | 20 |
|                          | 5                   | Int.    | □               | 1810X5DB     | 130             | 134 | 191 | 20 |
| 18.2                     | 3                   | Int.    | □               | 1820X3DB     | 93              | 96  | 157 | 20 |
|                          | 5                   | Int.    | □               | 1820X5DB     | 130             | 134 | 191 | 20 |
| 18.3                     | 3                   | Int.    | □               | 1830X3DB     | 93              | 96  | 157 | 20 |
|                          | 5                   | Int.    | □               | 1830X5DB     | 130             | 134 | 191 | 20 |
| 18.4                     | 3                   | Int.    | □               | 1840X3DB     | 93              | 96  | 157 | 20 |
|                          | 5                   | Int.    | □               | 1840X5DB     | 130             | 134 | 191 | 20 |
| 18.5                     | 3                   | Int.    | ●               | 1850X3DB     | 93              | 96  | 157 | 20 |
|                          | 5                   | Int.    | ●               | 1850X5DB     | 130             | 134 | 191 | 20 |
| 18.6                     | 3                   | Int.    | □               | 1860X3DB     | 95              | 96  | 157 | 20 |
|                          | 5                   | Int.    | □               | 1860X5DB     | 133             | 134 | 195 | 20 |
| 18.7                     | 3                   | Int.    | □               | 1870X3DB     | 95              | 96  | 157 | 20 |
|                          | 5                   | Int.    | □               | 1870X5DB     | 133             | 134 | 195 | 20 |
| 18.8                     | 3                   | Int.    | □               | 1880X3DB     | 95              | 96  | 157 | 20 |
|                          | 5                   | Int.    | □               | 1880X5DB     | 133             | 134 | 195 | 20 |
| 18.9                     | 3                   | Int.    | □               | 1890X3DB     | 95              | 96  | 157 | 20 |
|                          | 5                   | Int.    | □               | 1890X5DB     | 133             | 134 | 195 | 20 |
| 19.0                     | 3                   | Int.    | ●               | 1900X3DB     | 95              | 96  | 157 | 20 |
|                          | 5                   | Int.    | ●               | 1900X5DB     | 133             | 134 | 195 | 20 |
| 19.1                     | 3                   | Int.    | □               | 1910X3DB     | 98              | 100 | 161 | 20 |
|                          | 5                   | Int.    | □               | 1910X5DB     | 137             | 140 | 201 | 20 |
| 19.2                     | 3                   | Int.    | □               | 1920X3DB     | 98              | 100 | 161 | 20 |
|                          | 5                   | Int.    | □               | 1920X5DB     | 137             | 140 | 201 | 20 |
| 19.3                     | 3                   | Int.    | □               | 1930X3DB     | 98              | 100 | 161 | 20 |
|                          | 5                   | Int.    | □               | 1930X5DB     | 137             | 140 | 201 | 20 |
| 19.4                     | 3                   | Int.    | □               | 1940X3DB     | 98              | 100 | 161 | 20 |
|                          | 5                   | Int.    | □               | 1940X5DB     | 137             | 140 | 201 | 20 |
| 19.5                     | 3                   | Int.    | ●               | 1950X3DB     | 98              | 100 | 161 | 20 |
|                          | 5                   | Int.    | ●               | 1950X5DB     | 137             | 140 | 201 | 20 |
| 19.6                     | 3                   | Int.    | □               | 1960X3DB     | 100             | 100 | 161 | 20 |
|                          | 5                   | Int.    | □               | 1960X5DB     | 140             | 140 | 201 | 20 |
| 19.7                     | 3                   | Int.    | □               | 1970X3DB     | 100             | 100 | 161 | 20 |
|                          | 5                   | Int.    | □               | 1970X5DB     | 140             | 140 | 201 | 20 |
| 19.8                     | 3                   | Int.    | □               | 1980X3DB     | 100             | 100 | 161 | 20 |
|                          | 5                   | Int.    | □               | 1980X5DB     | 140             | 140 | 201 | 20 |
| 19.9                     | 3                   | Int.    | □               | 1990X3DB     | 100             | 100 | 161 | 20 |
|                          | 5                   | Int.    | □               | 1990X5DB     | 140             | 140 | 201 | 20 |
| 20.0                     | 3                   | Int.    | ●               | 2000X3DB     | 100             | 100 | 161 | 20 |
|                          | 5                   | Int.    | ●               | 2000X5DB     | 140             | 140 | 201 | 20 |

### Recommended Cutting Conditions

| Work Material                         | No | Hardness    | Cutting Speed (m/min) | Feed (mm/rev)  |                |                |                |
|---------------------------------------|----|-------------|-----------------------|----------------|----------------|----------------|----------------|
|                                       |    |             |                       | Drill Diameter |                |                |                |
|                                       |    |             |                       | φ3.0-φ3.9      | φ4.0-φ5.9      | φ6.0-φ7.9      | φ8.0-φ9.9      |
| Ferritic, Martensitic Stainless Steel | 1  | ≤200HB      | 60-80-100             | 0.08-0.13-0.18 | 0.10-0.15-0.20 | 0.12-0.17-0.22 | 0.14-0.19-0.23 |
|                                       | 2  | >200HB      | 40-60-80              | 0.08-0.10-0.18 | 0.10-0.12-0.20 | 0.12-0.15-0.22 | 0.14-0.17-0.23 |
| PH Stainless Steel                    | 3  | <450HB      | 40-50-80              | 0.08-0.10-0.18 | 0.10-0.12-0.20 | 0.12-0.15-0.22 | 0.14-0.17-0.23 |
| Austenitic Stainless Steel            | 4  | ≤200HB      | 60-80-100             | 0.08-0.13-0.18 | 0.10-0.15-0.20 | 0.12-0.17-0.22 | 0.14-0.19-0.23 |
|                                       | 5  | >200HB      | 40-60-80              | 0.08-0.10-0.18 | 0.10-0.12-0.20 | 0.12-0.15-0.22 | 0.14-0.17-0.23 |
| Duplex Steel                          | 6  | 135HB-275HB | 40-50-80              | 0.08-0.10-0.18 | 0.10-0.12-0.20 | 0.12-0.15-0.22 | 0.14-0.17-0.23 |

| Work Material                         | No | Hardness    | Cutting Speed (m/min) | Feed (mm/rev)  |                |                |                |
|---------------------------------------|----|-------------|-----------------------|----------------|----------------|----------------|----------------|
|                                       |    |             |                       | Drill Diameter |                |                |                |
|                                       |    |             |                       | φ10.0-φ11.9    | φ12.0-φ15.9    | φ16.0-φ19.9    | φ20.0          |
| Ferritic, Martensitic Stainless Steel | 1  | ≤200HB      | 50-60-70              | 0.15-0.20-0.24 | 0.16-0.21-0.25 | 0.17-0.22-0.26 | 0.18-0.23-0.28 |
|                                       | 2  | >200HB      | 40-50-60              | 0.15-0.18-0.24 | 0.16-0.19-0.25 | 0.17-0.20-0.26 | 0.18-0.21-0.26 |
| PH Stainless Steel                    | 3  | <450HB      | 30-40-50              | 0.15-0.18-0.24 | 0.16-0.19-0.25 | 0.17-0.20-0.26 | 0.18-0.21-0.28 |
| Austenitic Stainless Steel            | 4  | ≤200HB      | 50-60-70              | 0.15-0.20-0.24 | 0.16-0.21-0.25 | 0.17-0.22-0.26 | 0.18-0.23-0.28 |
|                                       | 5  | >200HB      | 40-50-60              | 0.15-0.18-0.24 | 0.16-0.19-0.25 | 0.17-0.20-0.26 | 0.18-0.21-0.28 |
| Duplex Steel                          | 6  | 135HB-275HB | 30-40-50              | 0.15-0.18-0.24 | 0.16-0.19-0.25 | 0.17-0.20-0.26 | 0.18-0.21-0.28 |

(Note 1) Spindle through & high pressure coolant system is recommended to make stable holes.

(Note 3) Emulsion type of water coolant is recommended.

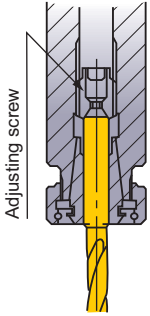
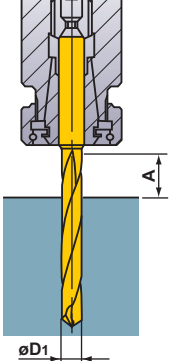
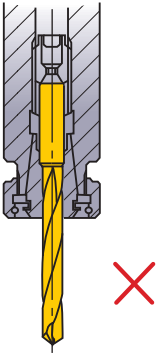
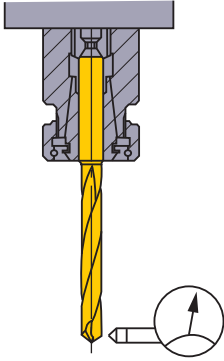
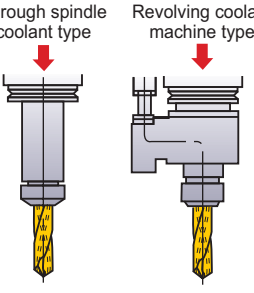
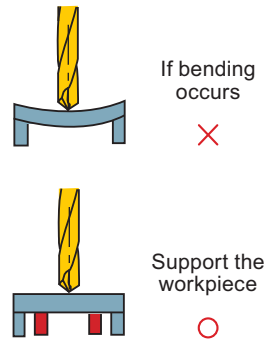
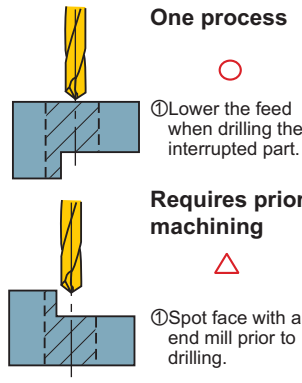
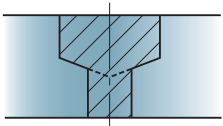
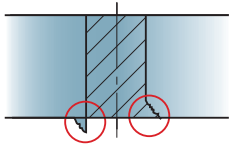
(Note 3) In non water cutting fluid, reduce the rotation by 10%-20%.

### Stainless Steel Cross Reference List

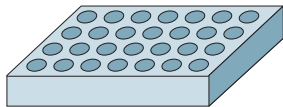
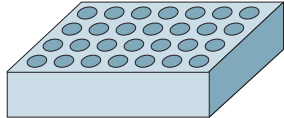
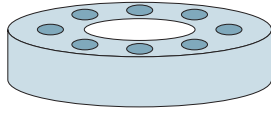
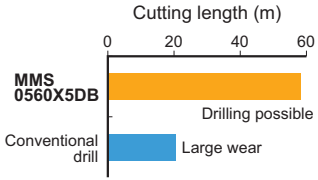
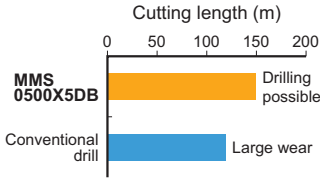
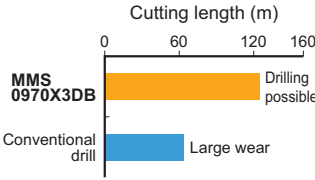
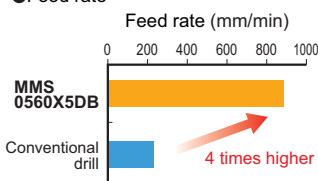
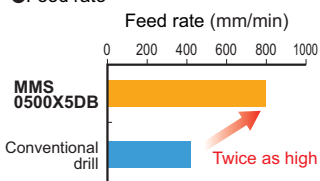
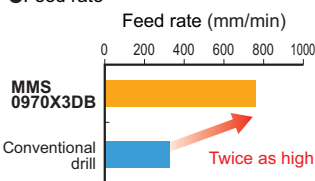
| Work Material                         | No     | Japan           | Germany |                    | USA             |
|---------------------------------------|--------|-----------------|---------|--------------------|-----------------|
|                                       |        | JIS             | W-no.   | DIN                | AIS/SAE         |
| Ferritic, Martensitic Stainless Steel | 1      | SUS416          | 1.4005  | X12CrS3            | 416             |
|                                       |        | SUS410          | 1.4006  | X10Cr13            | 410             |
|                                       |        | SUS430          | 1.4016  | X6Cr17             | 430             |
|                                       |        | SUS434          | 1.4113  | X6CrMo17           | 434             |
|                                       |        | SUS430LX        | 1.4510  | X6CrTi17           | 430Ti           |
|                                       | 2      | —               | 1.4512  | X6CrTi12           | 409             |
|                                       |        | SUS420J1        | 1.4021  | X20Cr13            | 420             |
|                                       |        | SUS431          | 1.4057  | X20CrNi17-2        | 431             |
| PH Stainless Steel                    | 3      | SUS420J2        | 1.4028  | X30Cr13            | 420             |
|                                       |        | SUS440C         | 1.4125  | X10CrMo17          | 440C            |
|                                       |        | SUS630          | 1.4542  | X5CrNiCuNb16 4     | 630 (17-4PH)    |
| Austenitic Stainless Steel            | 4      | —               | 1.4545  | —                  | S15500 (15-5PH) |
|                                       |        | SUS631          | 1.4568  | X7CrNiAl17 7       | 631 (17-7PH)    |
|                                       |        | SUS304          | 1.4301  | X5CrNi18 10        | 304             |
|                                       |        | SUS305          | 1.4303  | X5CrNi8-12         | 305             |
|                                       |        | SUS303          | 1.4305  | X12CrNiS18-9       | 303             |
|                                       | 5      | SUS304L         | 1.4307  | X2CrNi19-11        | 304L            |
|                                       |        | SUS316          | 1.4401  | X5CrNiMo17 12 2    | 316             |
|                                       |        | SUS304LN        | 1.4311  | X2CrNi18 10        | 304LN           |
|                                       |        | SUS316L         | 1.4404  | X2CrNiMo17 12 2    | 316L            |
|                                       |        | SUS316LN        | 1.4406  | X2CrNiMoN17 12 2   | 316LN           |
|                                       |        | SUS316L         | 1.4435  | X2CrNiMo18 14 3    | —               |
|                                       |        | SUS317L         | 1.4438  | X2CrNiMo18 15 4    | 317L            |
|                                       |        | —               | 1.4529  | X1NiCrMoCuN25 20 7 | N08926          |
|                                       |        | SUS321          | 1.4541  | X6CrNiTi18-10      | 321             |
|                                       |        | SUS347          | 1.4550  | X6CrNiNb18-10      | 347             |
| Duplex Steel                          | 6      | SUS316Ti        | 1.4571  | X6CrNiMoTi17 12 2  | 316Ti           |
|                                       |        | —               | 1.4362  | X2CrNiN23 4        | —               |
|                                       |        | SCS14A          | 1.4410  | X2CrNiMoN25 7 4    | S32750          |
|                                       |        | SUS329J1        | 1.4460  | X3CrNiMoN27 5 2    | 329             |
| SUS329J3L                             | 1.4462 | X2CrNiMoN22 5 3 | S31803  |                    |                 |



## Operational Guidance for the MMS Drill

|   |  |   |  |
|---|--|---|--|
| <p><b>Drill holding</b></p>  <p>Adjusting screw</p> <p>Thrust bearing type collet chuck holds the drill securely.</p>  | <p><b>Drill holding</b></p>  <p><math>A : \geq D1 \times 1.5</math></p>   | <p><b>Drill installation</b></p>  <p>Do not clamp on the flutes.</p>                  | <p><b>Installation tolerance</b></p>  <p>Runout <math>\leq 0.03\text{mm}</math></p>   |
| <p><b>Coolant method</b></p>  <p>Through spindle coolant type    Revolving coolant machine type</p> <p>Coolant pressure is approx. 0.5 - 7MPa.</p>  | <p><b>Coolant handling</b></p> <p>&lt; MMS type &gt;</p> <ol style="list-style-type: none"> <li>1) Dirt and dust particles in old coolant can clog the oil hole and prevent effective flow. Regular coolant exchange is recommended.</li> <li>2) Small particles of swarf will jam in the oil hole. Use a filter as a preventative measure. When using small diameter drills, use a fine mesh filter.</li> </ol> | <p><b>Thin workpieces</b></p>  <p>If bending occurs</p> <p>Support the workpiece</p> | <p><b>Interrupted cutting</b></p>  <p>One process</p> <p>① Lower the feed when drilling the interrupted part.</p> <p>Requires prior machining</p> <p>① Spot face with an end mill prior to drilling.</p> |
| <p><b>Stepped holes</b></p>  <ol style="list-style-type: none"> <li>① Divide the machining into two processes.</li> <li>② Drill the larger hole first.</li> </ol> <p>*Tools for chamfering and spot facing can be produced to order.</p> | <p><b>Burring and workpiece chipping</b></p>  <ol style="list-style-type: none"> <li>① Lower the feed rate when breaking through.</li> <li>② Change the point angle.</li> <li>③ Change the point angle.</li> </ol>  |   |  |

### Application Examples

| Drill              |                                 | MMS0560X5DB   |                    | MMS0500X5DB   |                    | MMS0970X3DB  |                    |
|--------------------|---------------------------------|---|--------------------|---|--------------------|--|--------------------|
| Workpiece          |                                 | Austenitic stainless steel<br>JIS SUS304(200HB)<br>Hole depth : 20mm<br> |                    | PH stainless steel<br>JIS SUS630<br>Hole depth : 30mm<br> |                    | Austenitic stainless steel<br>JIS SUS304L(200HB)<br>Hole depth : 25.4mm<br> |                    |
| Component          |                                 | Medical parts   |                    | Spinneret   |                    | Heat exchanger parts   |                    |
| Cutting Conditions | Drill                           | MMS0560X5DB   | Conventional drill | MMS0500X5DB   | Conventional drill | MMS0970X3DB  | Conventional drill |
|                    | Cutting Speed (m/min)           | 70  | 39                 | 64  | 66                 | 99   | 70                 |
|                    | Feed (mm/rev)                   | 0.22  | 0.1                | 0.2   | 0.1                | 0.23   | 0.14               |
|                    | Revolution (min <sup>-1</sup> ) | 3979  | 2217               | 4074  | 4210               | 3249   | 2297               |
|                    | Feed Rate (mm/min)              | 875   | 222                | 815   | 421                | 747  | 322                |
| Coolant            |                                 | Emulsion  |                    | Emulsion  |                    | Emulsion   |                    |
| Machine            |                                 | Machining centre  |                    | Machining centre  |                    | Machining centre   |                    |
| Result             |                                 | <p>● Tool life</p> <p>Cutting length (m)</p>                            |                    | <p>● Tool life</p> <p>Cutting length (m)</p>             |                    | <p>● Tool life</p> <p>Cutting length (m)</p>                               |                    |
|                    |                                 | <p>● Feed rate</p> <p>Feed rate (mm/min)</p>                           |                    | <p>● Feed rate</p> <p>Feed rate (mm/min)</p>            |                    | <p>● Feed rate</p> <p>Feed rate (mm/min)</p>                              |                    |

# Memo

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A series of horizontal dashed lines for writing a memo.

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Solid Carbide Drill for Stainless steel  
**WSTAR** Drill Series  
**MIMS**

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 using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc. ●Grinding or heating of cutting tools produces dust and mist. Inhaling large amount of dust or contacting with eyes and skins may harm your body.

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**Mitsubishi Carbide Home page : <http://www.mitsubishicarbide.com>**  
(Tools specifications subject to change without notice.)

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