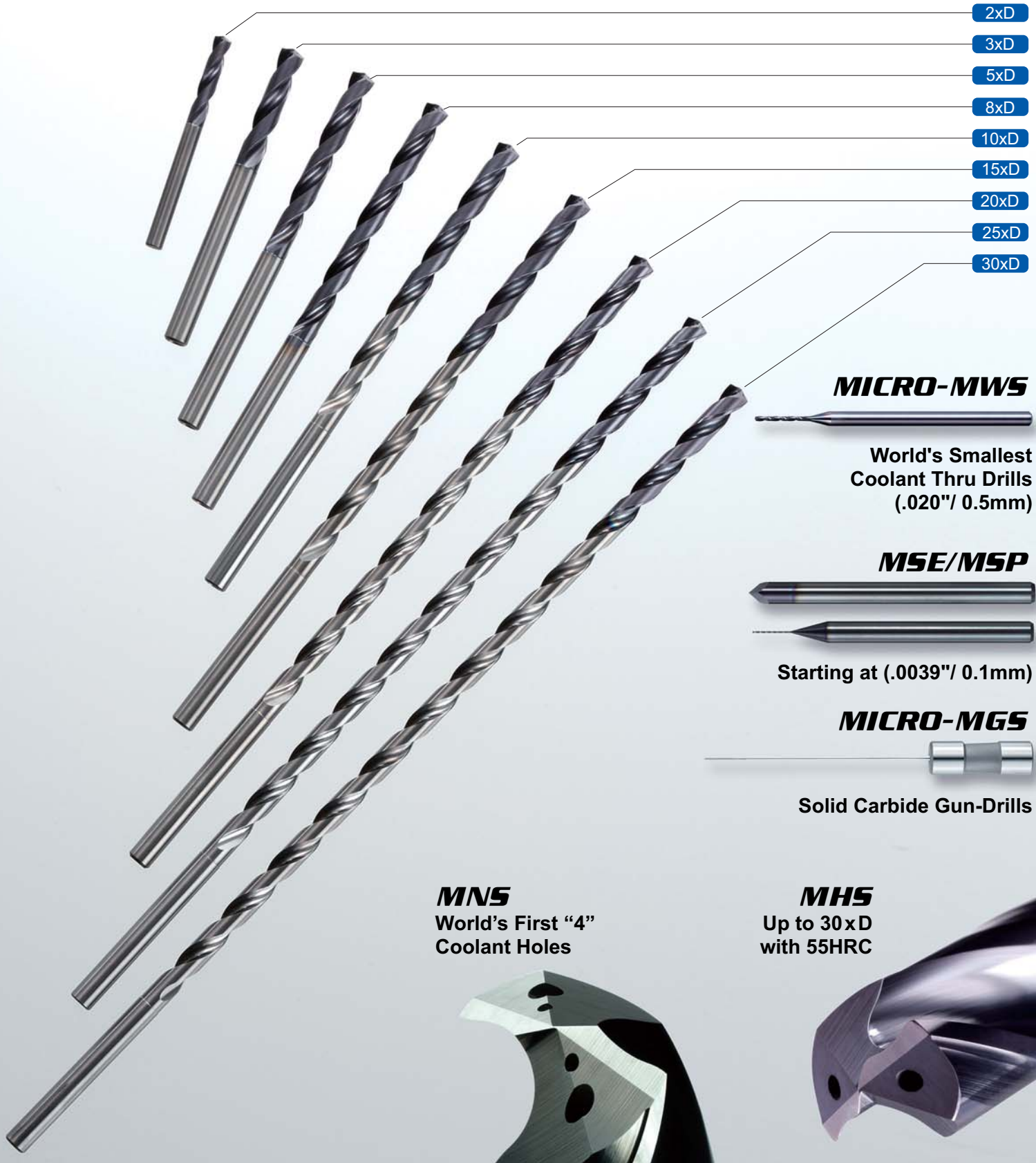
MITSUBISHI
MITSUBISHI MATERIALS

TOOL NEWS

2011.6 Update B095A

SOLID CARBIDE DRILLS



MICRO-MWS

World's Smallest Coolant Thru Drills (.020"/ 0.5mm)

MSE/MSP

Starting at (.0039"/ 0.1mm)

MICRO-MGS

Solid Carbide Gun-Drills

MNS

World's First "4" Coolant Holes

MHS

Up to 30xD with 55HRC

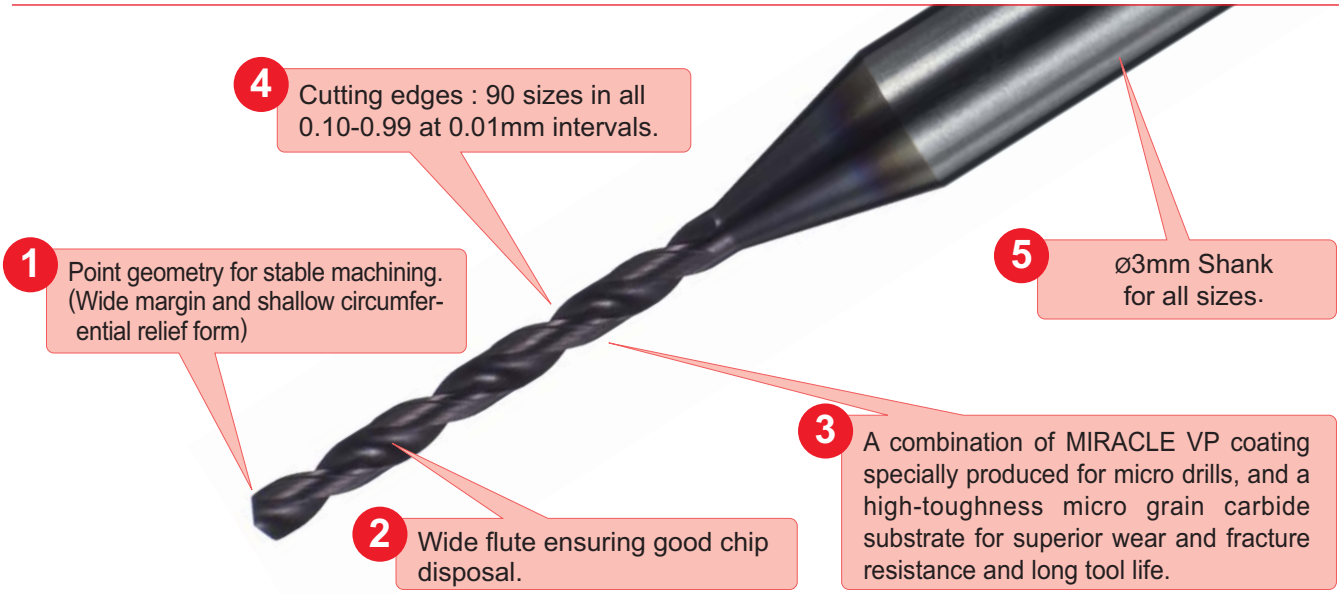
DRILLS SELECTION CHART

Drill Structure	Category	Drill Type	Product Code	Coolant	Hole Depth (l/d) INCH	Hole Depth (l/d) METRIC	Range of Size	Work Material P Mild Steel	Work Material P General Steel	Work Material H Hardened Steel	Work Material M Stainless Steel	Work Material K Cast Iron	Work Material N Light Alloy	Page Features	Page Dimensions	Page Cutting Conditions	Shape
Solid Carbide	For Micro Size Hole (≤ϕ.1200", ϕ2.95mm)	General Use	MWS	Internal	1 5 12	1 5 12 20 25 30	**INCH** ϕ.0200"—ϕ.1200" **METRIC** ϕ0.5—ϕ2.95 mm	◎	◎		◎	◎	○	P.5	P.25 P.27	P.32	
			MZE	External	2	2 3	**INCH** ϕ.0394"—ϕ.1200" **METRIC** ϕ1.0—ϕ2.9 mm	◎	◎	○	○	◎	○	P.11	P.35 P.36	P.37	
			MZS	Internal	5	3 5	**INCH** ϕ.0394"—ϕ.1200" **METRIC** ϕ1.0—ϕ2.9 mm	◎	◎		◎	◎	○	P.11	P.35 P.36	P.37	
			MSE	External	—	5	**METRIC** ϕ0.1—ϕ0.99 mm	◎	◎	○	○	◎	○	P.3	P.21	P.22	
		Starter Drill for MSE Type	MSP	External	—	—	**METRIC** ϕ0.1—ϕ0.99 mm	◎	◎	◎	◎	◎	◎	P.4	P.23	P.23	
	For General Size Hole (≥ϕ.1250", ϕ3.0mm)	General Use	MWE	External	—	2 3	**METRIC** ϕ3.0—ϕ20.0 mm	◎	◎	○	○	◎	○	P.7	P.41	P.50	
			MWS	Internal	5 8	3 5 8	**INCH** ϕ.1250"—ϕ.7812" **METRIC** ϕ3.0—ϕ25.0 mm	◎	◎		◎	◎	○	P.7	P.39 P.41	P.40 P.50	
			MZE	External	2 3	2 3	**INCH** ϕ.1250"—ϕ.7812" **METRIC** ϕ3.0—ϕ20.0 mm	◎	◎	○	○	◎	○	P.11	P.51 P.53	P.63	
			MZS	Internal	3 5	3 5	**INCH** ϕ.1250"—ϕ.7812" **METRIC** ϕ3.0—ϕ20.0 mm	◎	◎		◎	◎	○	P.11	P.51 P.53	P.63	
		Step Drill	MZS	Internal	—	3	**METRIC** ϕ4.3—ϕ8.5 mm	◎	◎		◎	◎	○	P.11	P.62	P.63	

Drill Structure	Category	Drill Type	Product Code	Coolant	Hole Depth (l/d) INCH	Hole Depth (l/d) METRIC	Range of Size	Work Material P Mild Steel	Work Material P General Steel	Work Material H Hardened Steel	Work Material M Stainless Steel	Work Material K Cast Iron	Work Material N Light Alloy	Page Features	Page Dimensions	Page Cutting Conditions	Shape
Solid Carbide	For Deep Hole (≥ l/d 10)	MWS Super Long Type	MWS	Internal	15 20 25 30	10 15 20 25 30	**INCH** ϕ.1250"—ϕ.5000" **METRIC** ϕ3.0—ϕ14.0 mm	◎	◎		◎	◎	○	P.7	P.65 P.67	P.66	
		Solid Gun Drill	MGS	Internal	—	20 — 80	**METRIC** ϕ0.7—ϕ3.0 mm	○	◎	○	◎	◎	◎	P.20	P.101	P.102	
	For Aluminum or Cast Iron	Helix Angle (10°)	MAE	External	—	3	**METRIC** ϕ3.0—ϕ16.0 mm					○	◎	P.13	P.77	P.82	
			MAS	Internal	3	3 6	**INCH** ϕ.1250"—ϕ.7812" **METRIC** ϕ3.0—ϕ16.0 mm					○	◎	P.13	P.75 P.77	P.76 P.82	
		4 coolant holes	MNS	Internal	—	5 10 20 30	**METRIC** ϕ3.0—ϕ14.0 mm						◎	P.15	P.83	P.88	
		General Use	MZE (HTi10)	External	—	2 3	**METRIC** ϕ3.0—ϕ20.0 mm					○	◎	P.11	P.53	P.63	
	For Hardened Steel	General Use	MHS	Internal	—	1 — 30	**METRIC** ϕ3.0—ϕ12.0 mm			◎				P.17	P.91	P.98	
	For Wheel Hub	Low Cutting Resistance	MHE	External	1	—	**INCH** ϕ.394"—ϕ.591"		◎					P.20	P.100	P.100	

MIRACLE® MINI STAR Drill MSE

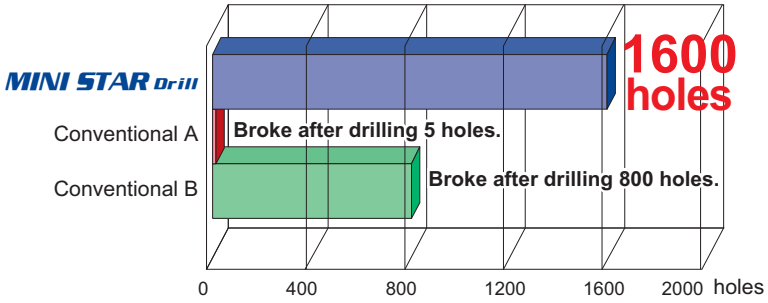
Features



Cutting performance

●Tool life evaluation (Stainless steel drilling)

Long tool life and superior resistance to welding, wear and fracture.

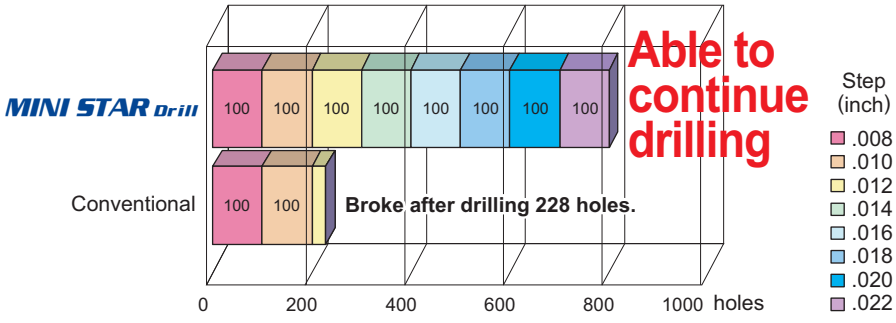


<Cutting conditions>
Tool : MSE0050SB
Workpiece : AISI 304
Cutting speed : 30 SFM (6,000min^{-1})
Feed : .0006 IPR
Hole depth : .200 inch (Blind hole)
Steps : .006 inch
Coolant : Water soluble emulsion
Machine : Machining center

●Chip disposal (Aluminum alloy drilling)

Wide flute prevents chips jamming.

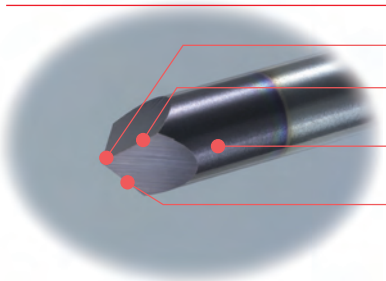
Step drilling test : The step distance was increased by .002 inch after every 100 holes drilled.



<Cutting conditions>
Tool : MSE0050SB
Workpiece : 7075 Aluminum Alloy
Cutting speed : 82 SFM (16,000min^{-1})
Feed : .003 IPR
Hole depth : .200 inch (Blind hole)
Coolant : Water soluble emulsion
Machine : Machining center

STARTER Drill MSP

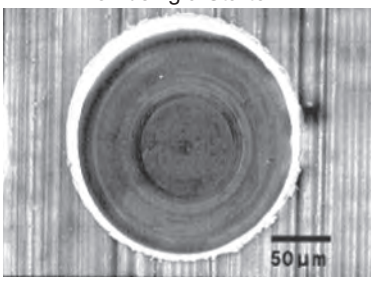
Features



- **Triangular pyramid shape helps high precision drilling.**
- **Optimize cost effectiveness by creating center holes of .118 inch to .039 inch.**
- **Long tool life ensured by MIRACLE VP coating.**
- **The same Starting / Guide drill can be used for dual purposes. Center hole drilling and a 90° chamfer angle.**

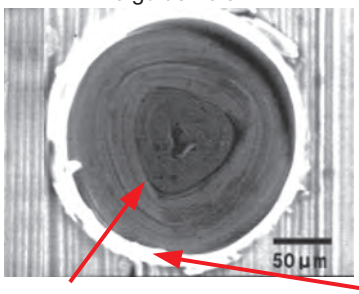
Cutting performance

When using a Starter Drill



Cuts a high-precision hole.

No guide hole



The bottom of the hole is drilled polygonally because the drill wanders.

Large burr

<Cutting conditions> Workpiece : AISI 304

(Cutting a guide hole)
Tool : MSP0300SB
Guide hole dia. : .006 inch
Revolution : 10,000min^{-1}
Cutting speed : 310 SFM
Feed : .00002 IPR
Coolant : Water soluble emulsion

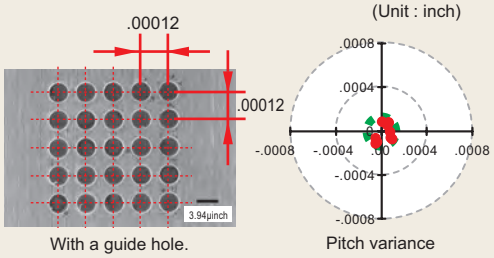
(Drilling)
Tool : MSE0020SB
Cutting speed : 20 SFM
Revolution : 10,000min^{-1}
Feed : .00007 IPR
Hole depth : .011 inch (Blind hole)
Steps : .0008 inch
Coolant : Water soluble emulsion

How to use the Spot Drill

Combined use of the Mini Star Drill and the Spot Drill enhances drilling precision and stability.

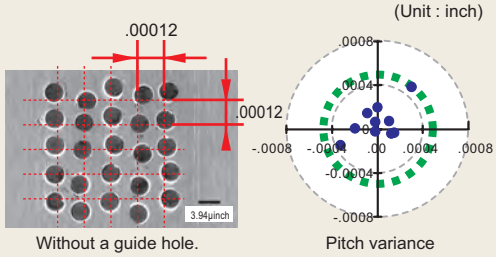
1. Comparison of hole positioning accuracy

Maximum positional variance of .00012inch. Good pitch accuracy.



With a guide hole. Pitch variance

Maximum positional variance of .0005inch will cause short tool life.



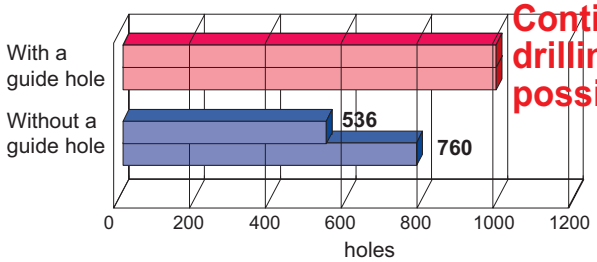
Without a guide hole. Pitch variance

<Cutting conditions>
Workpiece : AISI 304
(Cutting a guide hole)
Tool : MSP0300SB
Cutting speed : 310 SFM
Revolution : 10,000min^{-1}
Feed : .00002 IPR
Guide hole dia. : .0034 inch
Coolant : Water soluble emulsion

(Drilling)
Tool : MSE0010SB
Cutting speed : 10 SFM
Revolution : 10,000min^{-1}
Feed : .00008 IPR
Hole depth : .035 inch (Blind hole)
Steps : .0004 inch

2. Drilling stability

Stable drilling performance when using a spot drill.



Continued drilling is possible

<Cutting conditions> Workpiece : AISI 304

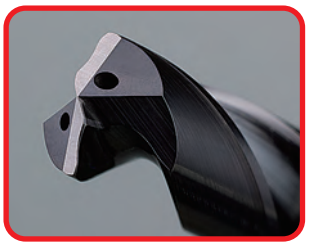
(Cutting a guide hole)
Tool : MSP0300SB
Cutting speed : 310 SFM
Revolution : 10,000min^{-1}
Feed : .00002 IPR
Guide hole dia. : .006 inch
Coolant : Water soluble emulsion

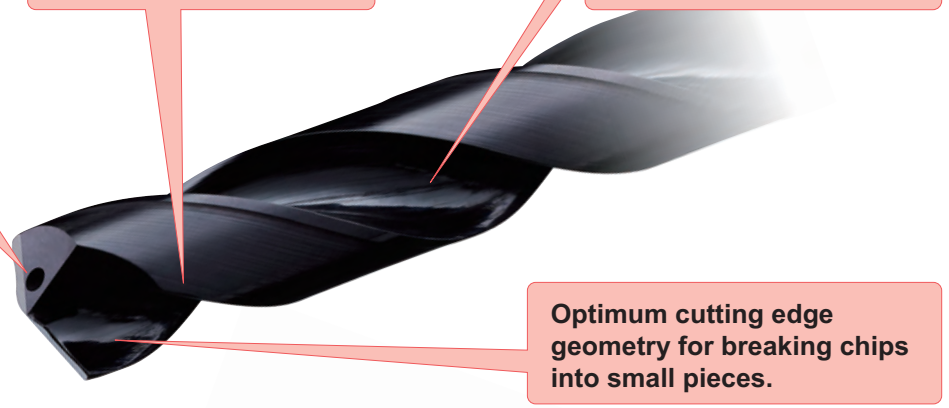
(Drilling)
Tool : MSE0020SB
Cutting speed : 20 SFM
Revolution : 10,000min^{-1}
Feed : .00008 IPR
Hole depth : .063 inch (Blind hole)
Steps : .0008 inch
Coolant : Water soluble emulsion

MICRO-MWS

Features of MWS-LB/XB/DB Type

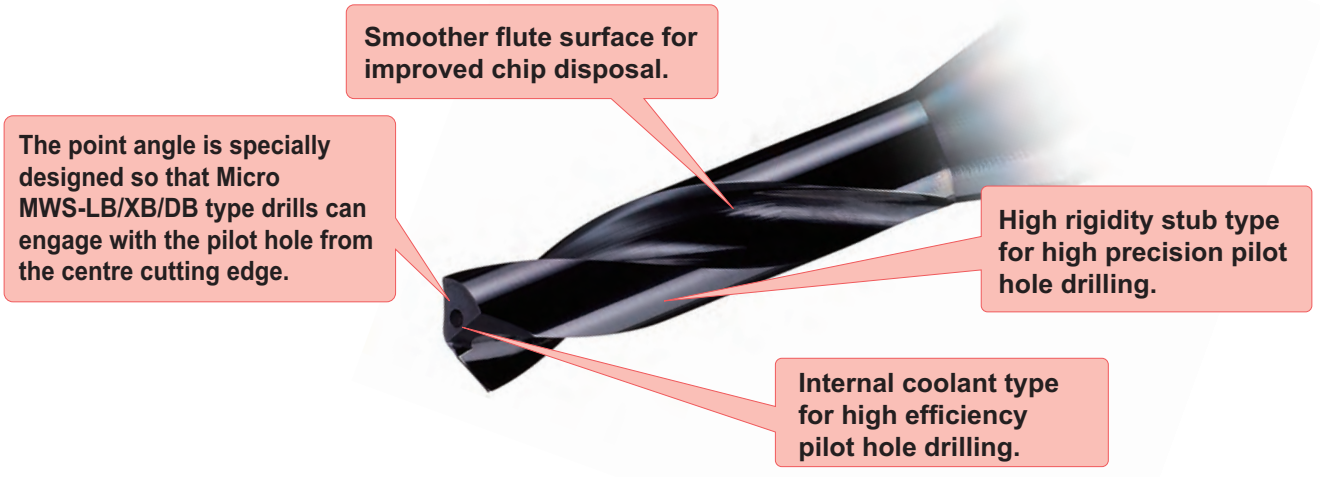
- **Through coolant holes, flute geometry and cutting edge geometry are optimised for deep micro hole drilling.**



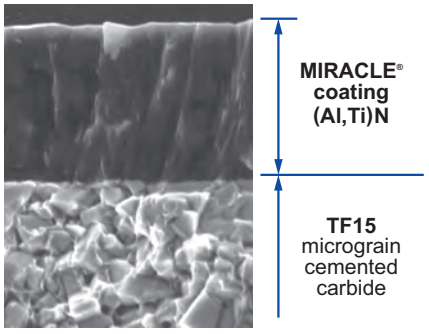


Features of MWS-SB Type

- **The MWS-SB type is a pilot drill specially designed for use with MICRO-MWS type drills, ø.0200 - .1200″ / ø0.5 - 2.95mm.**



- Long tool life **MIRACLE**® coated **VP15TF**



VP15TF

MIRACLE® Coated

Features of *VP15TF*

MIRACLE® coated **VP15TF** is ideal for drilling due to its high resistance to chip welding. Suitable for machining a wide range of workpiece materials from mild and alloy steels through to stainless steel and cast iron.

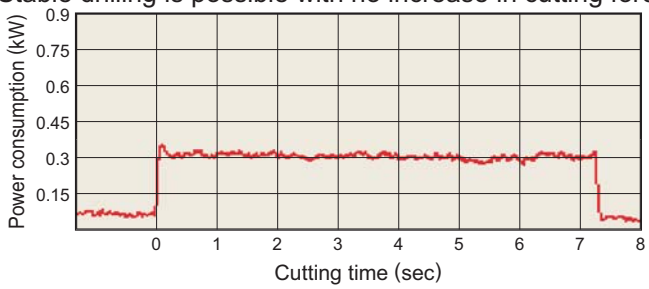
Cutting Performance

● Excellent chip disposal

Non-peck drilling is possible when drilling 2.95" depth with .100" dia. holes!

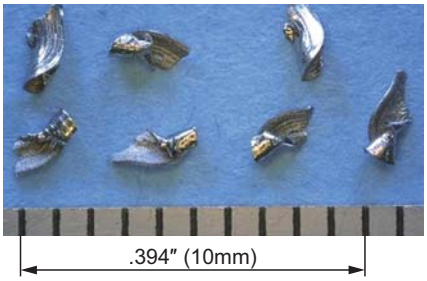
Power consumption

Stable drilling is possible with no increase in cutting forces



Chip breaking

Small broken chips



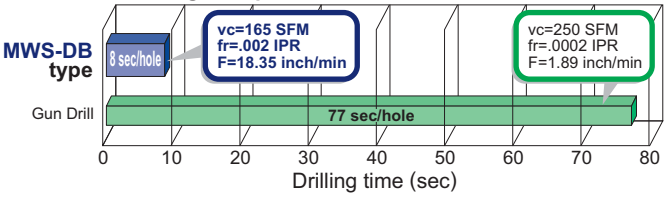
<Cutting conditions>
Workpiece : AISI 4140
Drill : MWS0255X30DB (ϕ.100 inch)
Hole depth : 2.95 inch
Cutting speed: 195 SFM
Feed : .003 IPR
Coolant : W.S.O.
Emission pressure : 5MPa (Internal coolant)
Machine : Machining center

<Cutting conditions for pilot drilling>
Drill : MWS0255SB (ϕ.100 inch)
Hole depth : .118 inch
Cutting speed: 195 SFM
Feed : .003 IPR

● Ultra productivity machining

90% cycle time reduction when drilling 2.44" depth with .081" dia. holes!

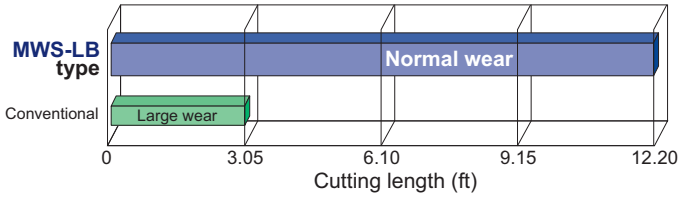
<Drilling time per hole>



<Cutting conditions for MWS-DB>
Workpiece : AISI 4140
Drill : MWS0205X30DB (ϕ.081 inch)
Hole depth : 2.44 inch
Cutting speed: 165 SFM
Feed : .002 IPR
Coolant : W.S.O.
Emission pressure : 1.5MPa (Internal coolant)
Machine : Machining center

<Cutting conditions for pilot drilling>
Drill : MWS0205SB (ϕ.081 inch)
Hole depth : .118 inch
Cutting speed : 195 SFM
Feed : .003 IPR

● Longer tool life when drilling stainless steel

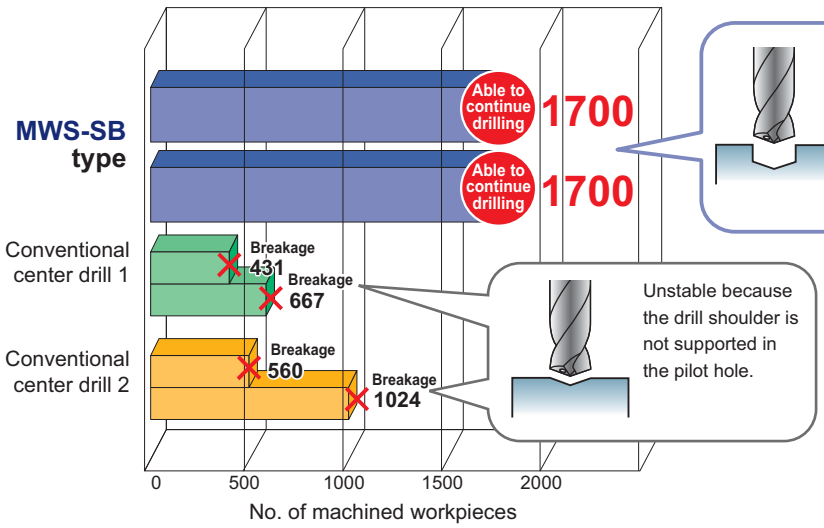


<Cutting conditions>
Workpiece : AISI 304
Drill : ϕ.098 inch
Hole depth : .512 inch
Cutting speed: 130 SFM
Feed : .002 IPR
Coolant : W.S.O.
Emission pressure : 3MPa (Internal coolant)
Machine : Machining center

Cutting Performance

● Drilling pilot holes with the MWS-SB type allows the long Mini-MWS type drills to deliver increased tool life.

Micro hole drilling using the MWS-SB type drill



Stability as the drill engages the pilot hole from the centre after the shoulder is guided into the hole.

Unstable because the drill shoulder is not supported in the pilot hole.

<Cutting conditions for MWS-LB>
Workpiece : AISI 304
Drill : MWS00250LB (ϕ.025 inch)
Hole depth : .236 inch (Blind hole)
Cutting speed: 65 SFM
Feed : .0004 IPR
Coolant : W.S.O.
Emission pressure: 5MPa (Internal coolant)
Machine : Machining center

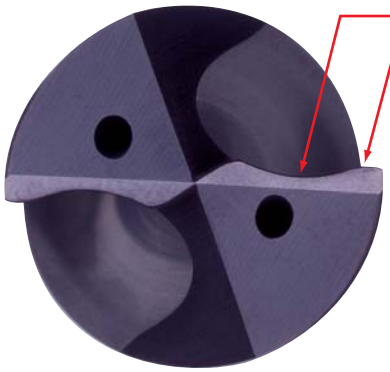
<Cutting conditions for pilot drilling>
Drill : MWS00250SB (ϕ.025 inch)
Hole depth : .031 inch
Cutting speed: 65 SFM
Feed : .0003 IPR

MIRACLE® coated WSTAR Drill
MWE/MWS

Features

● Wavy cutting edge & special flute geometry to promote smooth chip evacuation

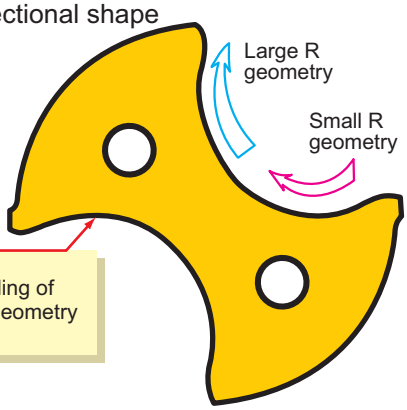
Cutting edge shape



Wavy cutting edge

The wave edge design achieves a sharp peripheral edge cutting performance with a strong initial cutting point near the center.

Cross sectional shape

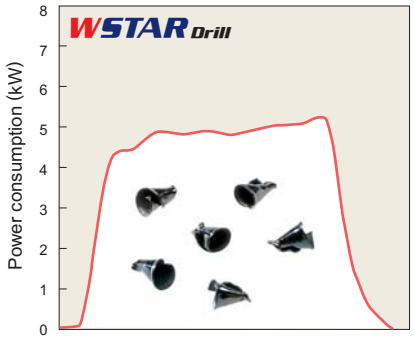


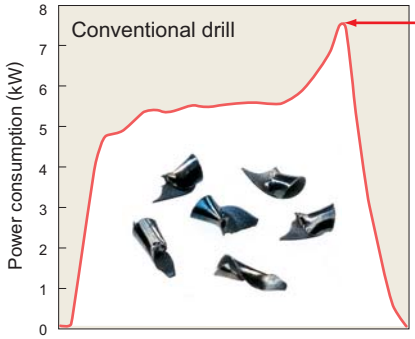
Flute geometry

The small R geometry generates initial curling of the chips and combines with the larger R geometry to promote smooth chip evacuation.

● Cutting resistance & chip geometry

WSTAR Drill lowers the cutting resistance and power consumption.
Chips are broken into a compact shape forexcellent chip disposability to prevent jamming.



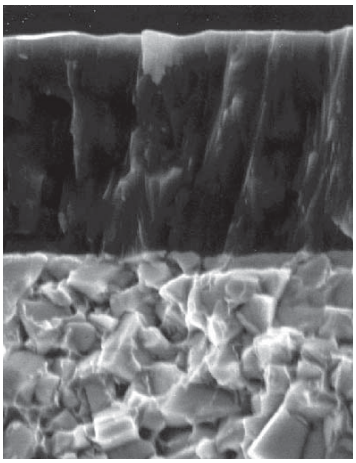


Chip packing occurred just before breaking through.

<Cutting conditions>

Workpiece	: AISI 1050 (150-180HB)
Drill diameter	: ø.472 inch (Internal coolant)
Hole depth	: 2.36 inch
Cutting speed	: 400 SFM
Feed	: .010 IPR
Coolant	: WSO
Oil pressure	: 0.5MPa

● Long tool life MIRACLE® coated VP15TF



MIRACLE® coating (Al,Ti)N

TF15 micrograin cemented carbide

VP15TF

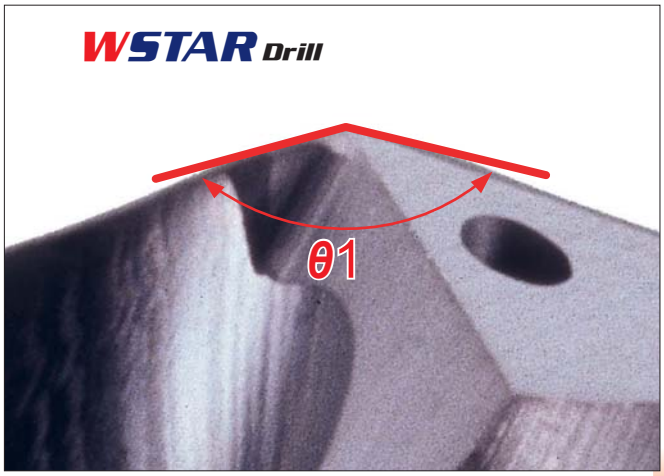
MIRACLE® Coated Features of **VP15TF**

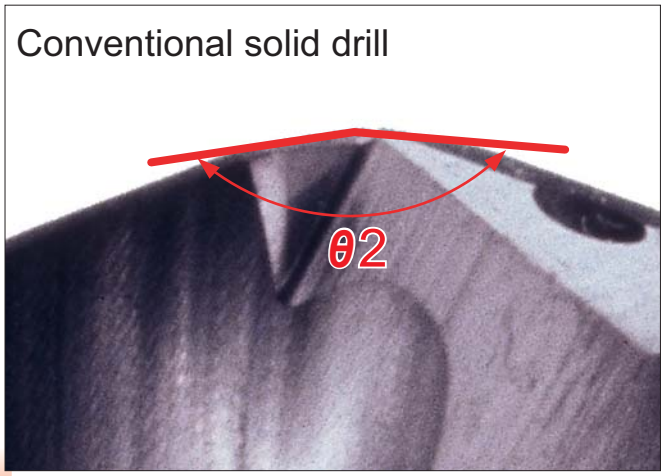
MIRACLE® coated **VP15TF** has a high welding resistance, making it suitable for machining a wide range of workpiece materials from mild steels and carbon steels, through to stainless steels and cast iron.

● Centripetal top edge geometry

Top edge geometry

The centripetal top edge geometry with a small point angle and X-thinning promotes a self centering action for accurate hole positions! ($\theta 1 < \theta 2$)

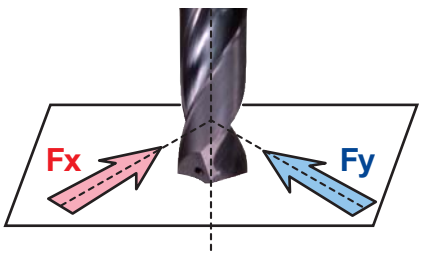


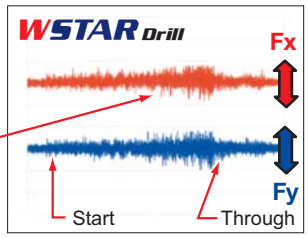


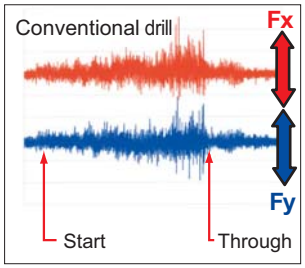
● Machining accuracy (over size)

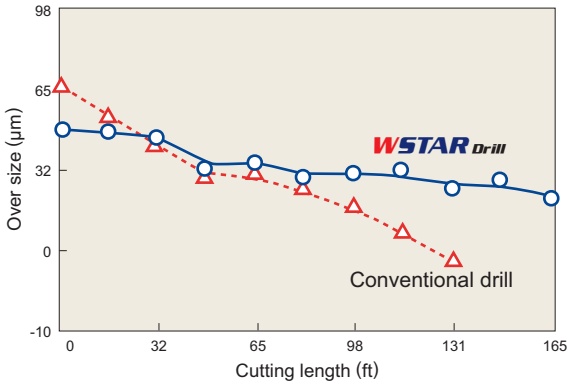
WSTAR Drill stays on center and is highly wear resistant, helping to maintain hole size accuracy !

During the complete drilling cycle, components of the horizontal forces, Fx and Fy, remain low and stable.







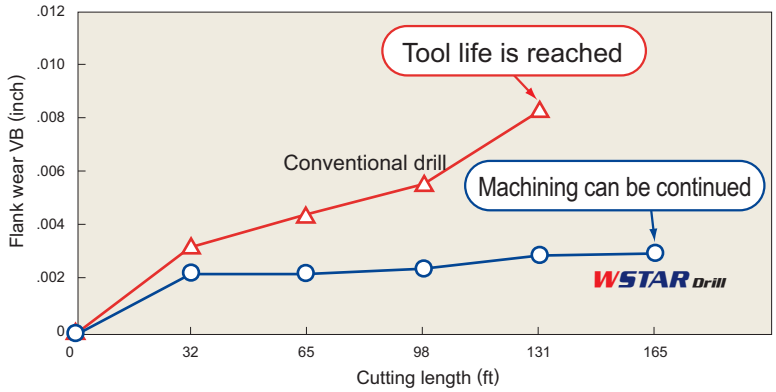


<Cutting conditions>

Workpiece	: AISI 1050 (150-180HB)	Feed	: .008 IPR
Drill diameter	: ø.3149 inch (External coolant)	Coolant	: Emulsion 10%
Cutting speed	: 265 SFM	Oil pressure	: 0.5MPa

● Tool life

WSTAR Drill has high flank and margin wear resistance !



Enlarged picture of the margin after 132 ft drilling length.

Conventional drill

WSTAR Drill

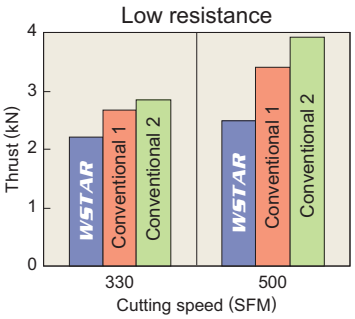
<Cutting conditions>

Workpiece	: AISI 1050 (150-180HB)	Cutting speed	: 265 SFM
		Feed	: .008 IPR
Drill diameter	: ø.3149 inch (External coolant)	Hole depth	: .984 inch (Through hole)
Coolant	: Emulsion 10%		

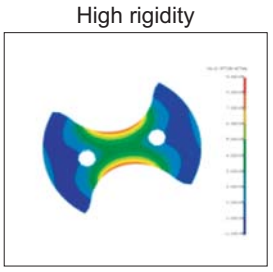
Cutting Performance

High Efficiency Drilling

Excellent chip control, low cutting resistance and high rigidity characterise the Miracle Coated WSTAR Drill.

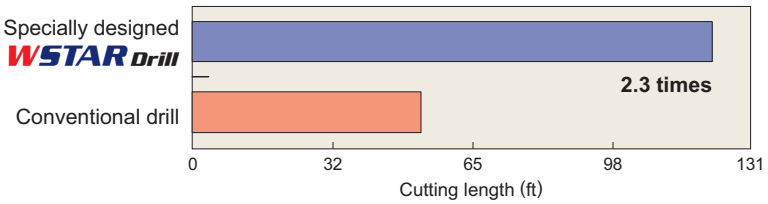


<Cutting conditions>
Workpiece : AISI 1045 (180-220HB)
Drill diameter : ø.3740 inch (Internal coolant)
Hole depth : 1.85 inch (Through hole)
W.S.O (Internal coolant)



CAE analytical result
Deflection Resistance : 20% improvement
Run Out : 10% improvement

The WSTAR Drill more than doubled tool life compared to a competitor's drill at a feed rate of .016 IPR.

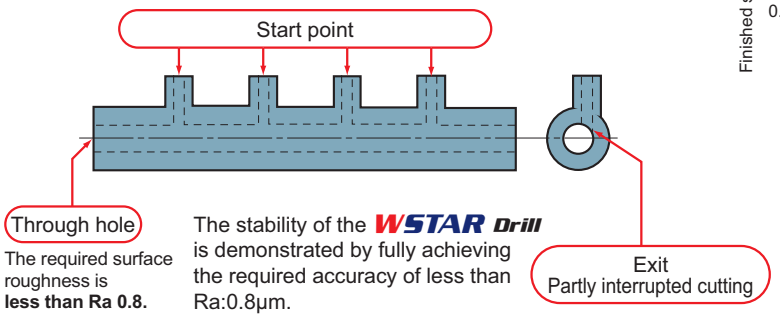


<Cutting conditions>
Workpiece : AISI 4140 (280HB)
Drill diameter : ø.4720 inch
Cutting speed : 395 SFM
Feed : .016 IPR
Hole depth : 2.13 inch (Through hole)
W.S.O (Internal coolant)

Maintaining drilling accuracy (Surface roughness)

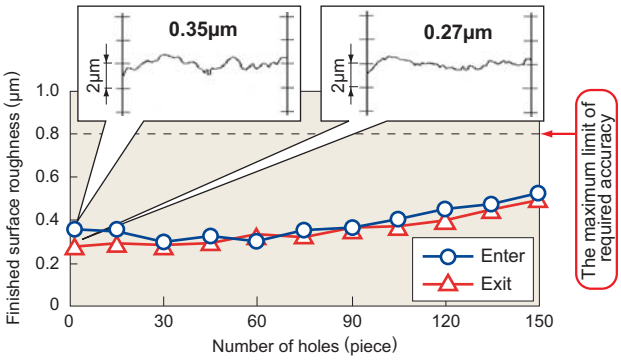
Cutting performance of the specially designed WSTAR Drill.

Due largely to the centripetal force exerted by the cutting edge configuration, the WSTAR Drill shows its ability to generate an accurate and quality machined finish.



The required surface roughness is **less than Ra 0.8.**

The stability of the WSTAR Drill is demonstrated by fully achieving the required accuracy of less than Ra:0.8µm.

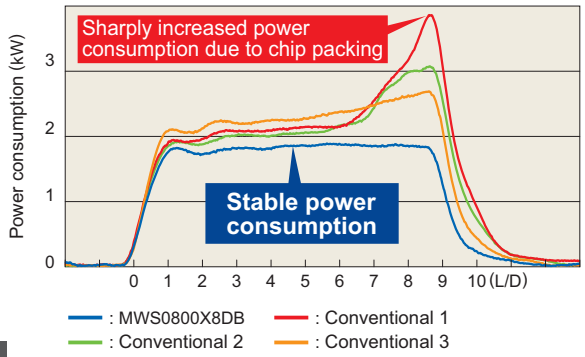


<Cutting conditions>
Workpiece : Manganese alloy (280HB)
Drill diameter : ø.1590 inch
Cutting speed : 250 SFM
Feed : .004 IPR
Hole depth : 1.30 inch (Through hole)
W.S.O (Internal coolant)

Note) Tool life of the competitor's drill after drilling 80 holes. (Surface roughness)

Stable power consumption (for 8 x D)

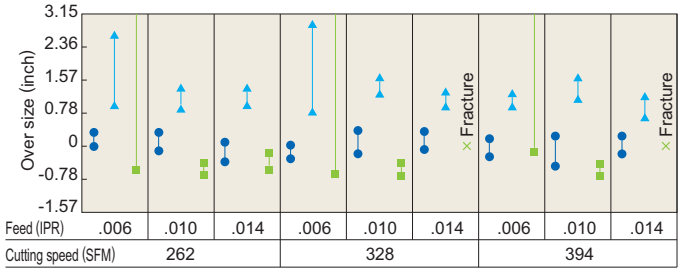
The WSTAR Drill enables continuous feed drilling of the 8xD deep hole.



<Cutting conditions>
Workpiece : AISI 1050 (Test workpiece)
Drill diameter : ø.3125 inch
Cutting speed : 330 SFM
Feed : .008 IPR
Hole depth : 2.50 inch (Through hole)
W.S.O. (Internal coolant)

● Stable over size (for 8 x D)

The WSTAR Drill delivers stable machining accuracy over a wide range of cutting conditions due to the low resistance cutting edge, high tool rigidity and good chip control.

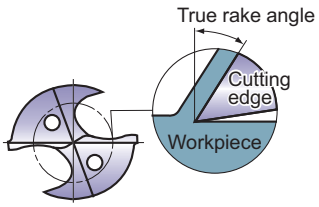


● : MWS0800X8DB
▲ : Conventional 1
■ : Conventional 2

<Cutting conditions>
Workpiece : AISI 1050 (Test workpiece)
Drill diameter : ø.3125 inch
Hole depth : 2.52 inch (Through hole)
W.S.O. (Internal coolant)

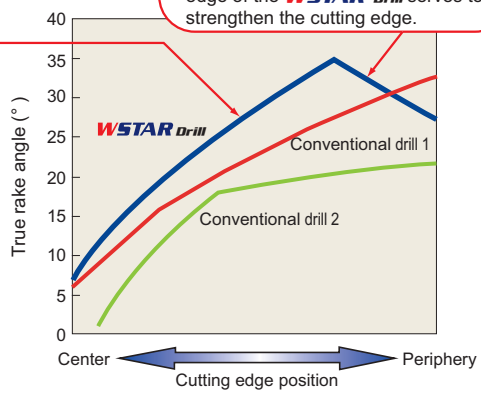
● Reliable drilling performance when machining difficult-to-cut materials

With a unique flute geometry and cutting edge rake angle, the WSTAR Drill improves drilling performance of difficult-to-cut materials.



A large concave angle engineered into the cutting edge improves the WSTAR Drill drilling performance.

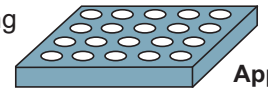
A small rake angle at the peripheral edge of the WSTAR Drill serves to strengthen the cutting edge.



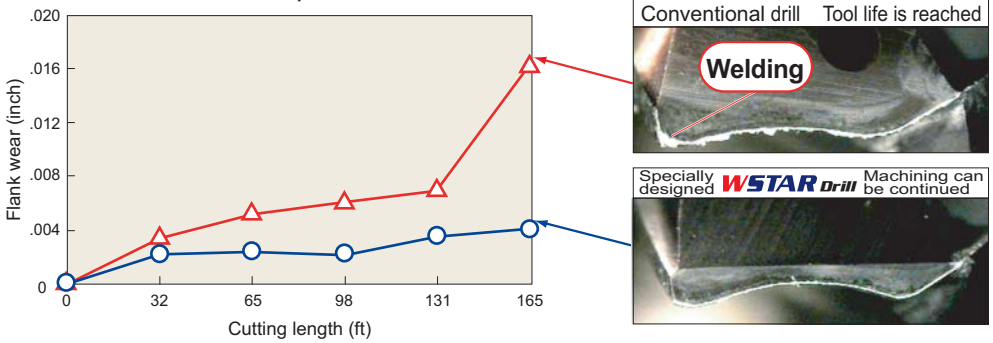
● Drilling performance in Austenitic stainless steel (AISI 304 STAINLESS STEEL)

The WSTAR Drill resists built-up edges, a common failure mechanism when machining austenitic stainless steels, thus preventing edge chipping and drill fracture.

The WSTAR Drill prevents welding on the cutting edge. Further use of the drill is possible.



Application example
workpiece : Plate (AISI 304)
Tool : MWS0800MB

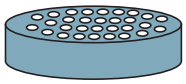


<Cutting conditions>
Workpiece : AISI 304 (190-210HB)
Drill diameter : ø.3125 inch
Cutting speed : 394 SFM
Feed : .008 IPR
Hole depth : .984 inch (Through hole)
W.S.O (Internal coolant)

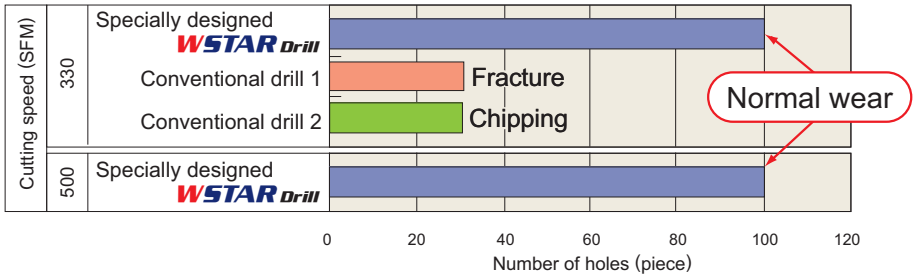
● Drilling performance in Titanium alloy (Ti-6Al-4V)

The WSTAR Drill resists deformation of the cutting edge when high cutting temperatures are generated due to the low thermal conductivity of the workpiece.

The WSTAR Drill prevents fracturing and chipping. Further use of the drill is possible.



Application example
workpiece : Plate (Titanium Alloy)
Tool : Specially designed WSTAR Drill



<Cutting conditions>
Workpiece : Ti-6Al-4V(42-45HRC)
Drill diameter : ø.3125 inch
Cutting speed : 330 SFM
: 500 SFM
Feed : .0020 IPR
Hole depth : .945 inch (Blind hole)
W.S.O (Internal coolant)

MIRACLE® coated MZE/MZS

Features

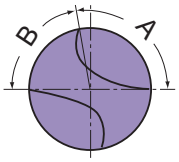
Cutting Edge Geometry

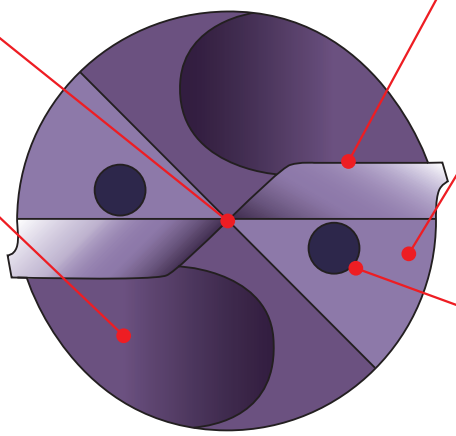
1. X thinning
Enables easy initial cutting, which leads to high accuracy cutting.

2. Straight cutting edge
Sharp but tough straight cutting edge.

3. Three rake cutting edge
Enables easy regrinding due to the three rake cutting edge.

4. Wider flute geometry
Prevents chip packing and gives excellent chip disposal due to large flute width and depth.



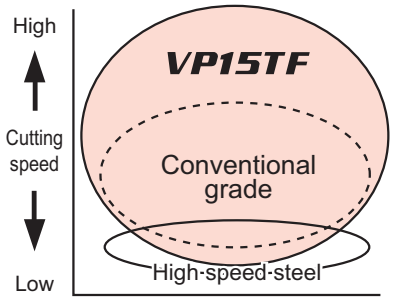


5. Oil hole
MZS type employs an internal coolant oil hole for optimal high speed machining of difficult-to-cut materials and deep hole drilling.

Grade

Cutting speed Application range

- Suitable for low to high speed machining, including application range for high speed steel.
- Suitable for use with a wide range of workpiece materials ranging from general steels through to difficult to cut materials.

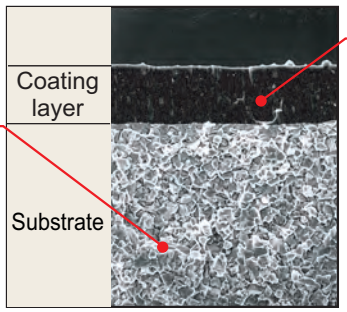


About coating ...

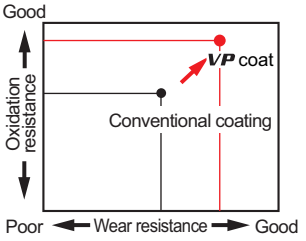
①Achieves stable tool life due to strenghthened adhesion of the coating to the substrage.
②Exhibits excellent thermal, wear, and oxidation resistance. Long tool life even under machining of hardened materials.

Cemented carbide : **TF15**

Grade	Hardness (HRA)	T.R.S (GPa)
TF15	91.5	2.5



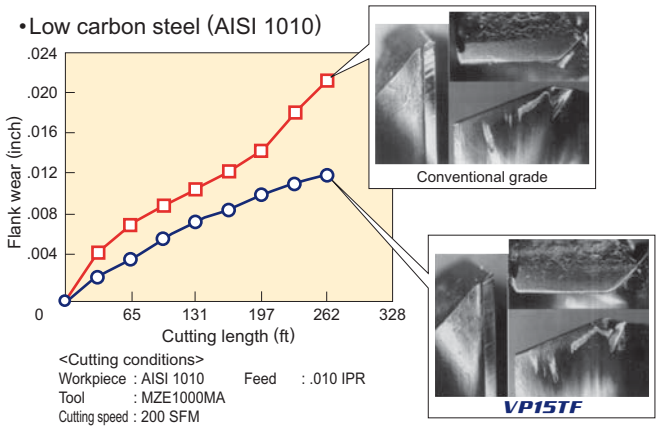
Coating : **VP** coat
(Al, Ti) N (Aluminium titanium nitride) compound



Cutting Performance

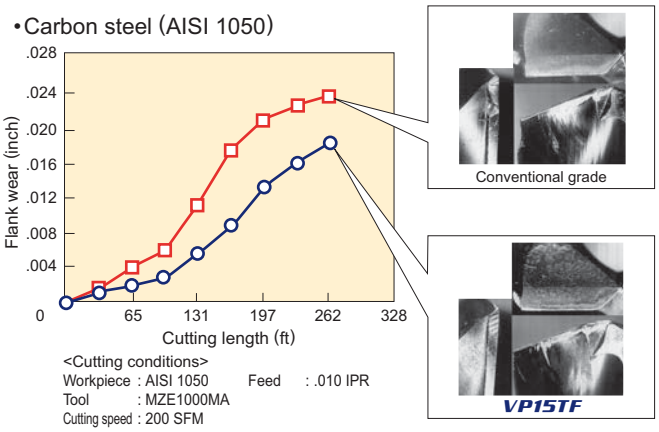
Tool Life

• Low carbon steel (AISI 1010)



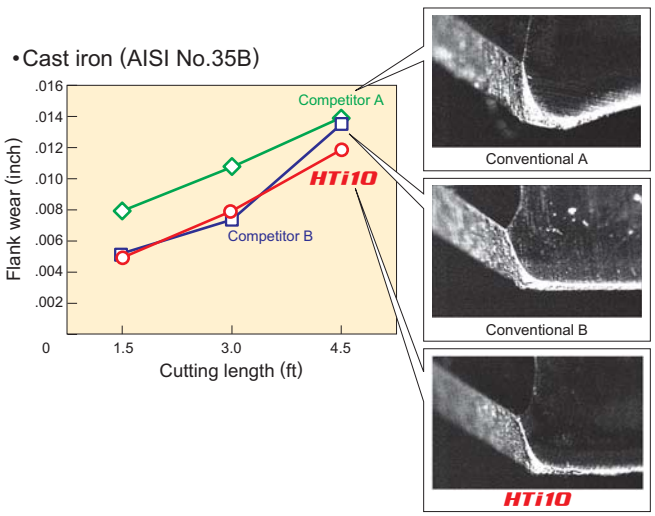
<Cutting conditions>
Workpiece : AISI 1010 Feed : .010 IPR
Tool : MZE1000MA
Cutting speed : 200 SFM

• Carbon steel (AISI 1050)



<Cutting conditions>
Workpiece : AISI 1050 Feed : .010 IPR
Tool : MZE1000MA
Cutting speed : 200 SFM

• Cast iron (AISI No.35B)



<Cutting conditions>
Workpiece : Cast iron (AISI No.35B) Feed : .008 IPR
Tool : MZE0800MA Coolant: Chronic free emulsion
Grade : HTi10 Density : 10%
Hole depth : .984 inch External coolant
Cutting speed: 260 SFM

For Aluminum Alloy and Cast Iron

MAE/MAS

Features

1. Guide Pad

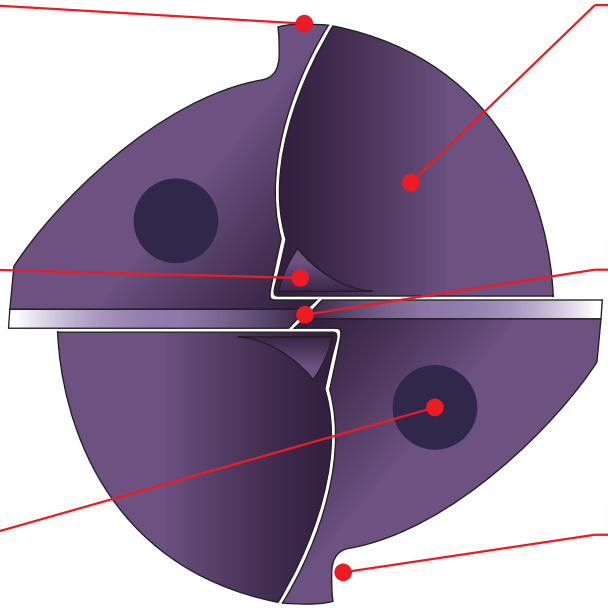
- 4 point support gives high hole accuracy.

2. Curved Cross-section

- Smooth curled chips are produced.
- Good chip control is due to efficient chip breaking.

3. Oil Hole

- Internal oil supply system makes it possible for deep hole drilling.



4. Flutes

- Employs 10° helix angle. Excellent chip discharge allows for high speed and high feed drilling.

5. Center Point

- Initial drilling noise is minimal and deflection does not occur.

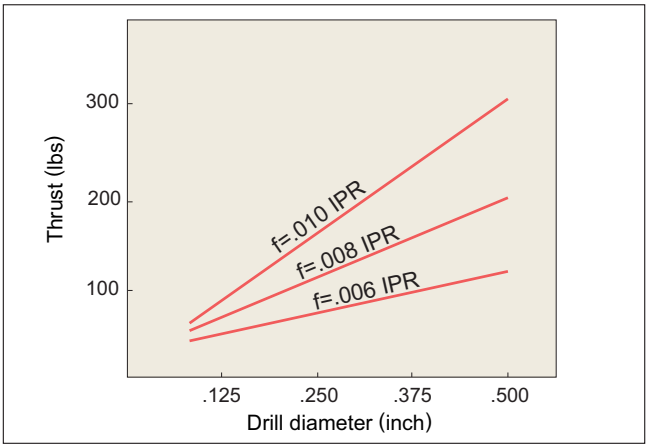
6. Secondary Flutes

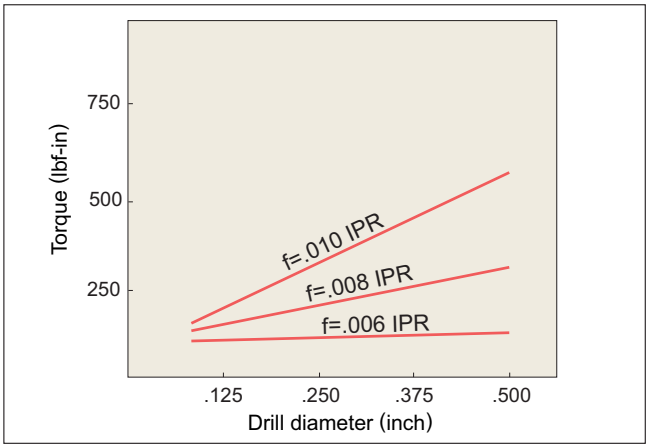
- Cutting oil penetration is effective, so welding is negligible.
- Fine chips are evacuated easily.

Cutting Performance

Cutting Resistance

Workpiece : Aluminum alloy Cutting depth : (L/D=3) through hole Cutting speed : 330 SFM Cutting fluid : WSO (10%)





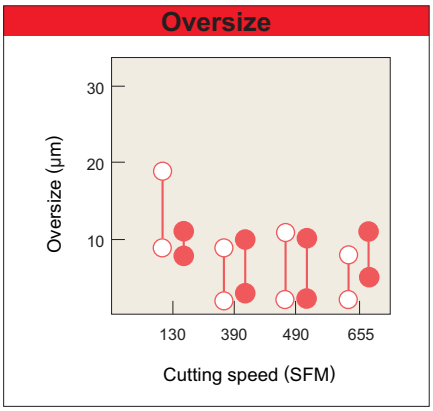
Drilling Accuracy

MAE

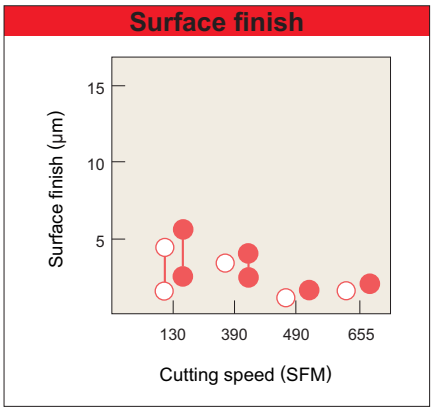
Workpiece : Aluminum alloy
Tool : MAE1100MB
Cutting fluid : WSO (10%) Cutting depth : 1.30" (L/D=3) Through hole

; Feed=.006 IPR
; Feed=.014 IPR

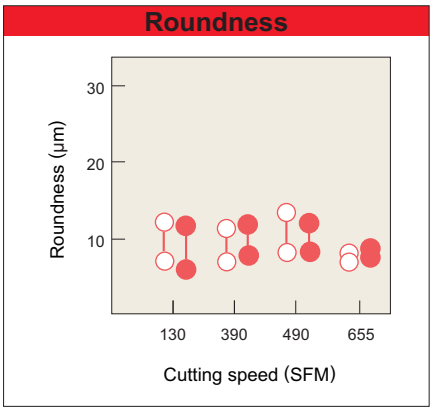
Oversize



Surface finish



Roundness

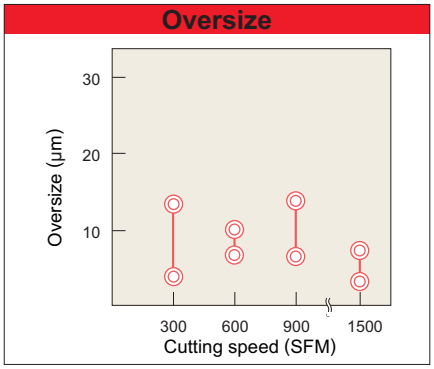


MAS

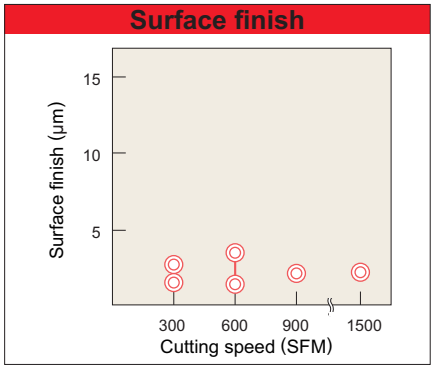
Workpiece : Aluminum alloy
Tool : MAS1000LB
Cutting fluid : WSO (10%) Cutting depth : 1.30" (L/D=3) Through hole

; Feed=.008 IPR

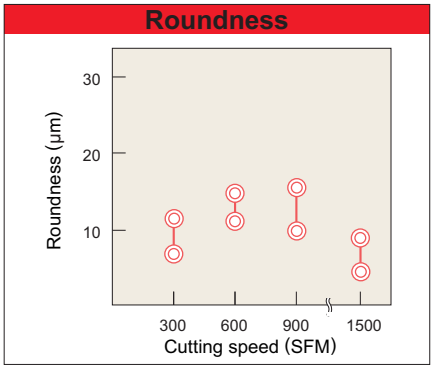
Oversize



Surface finish

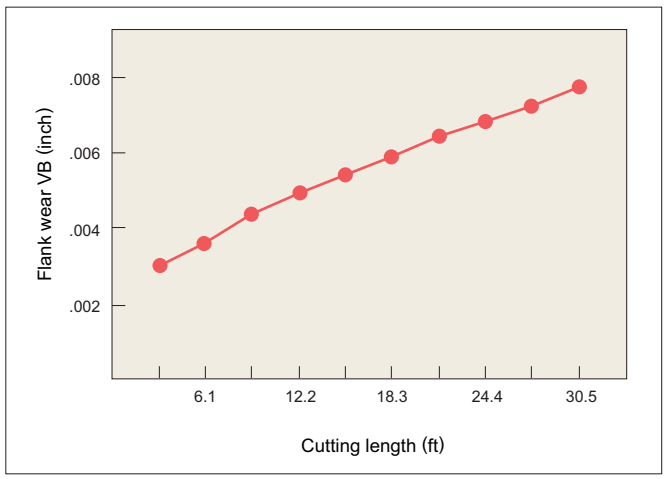


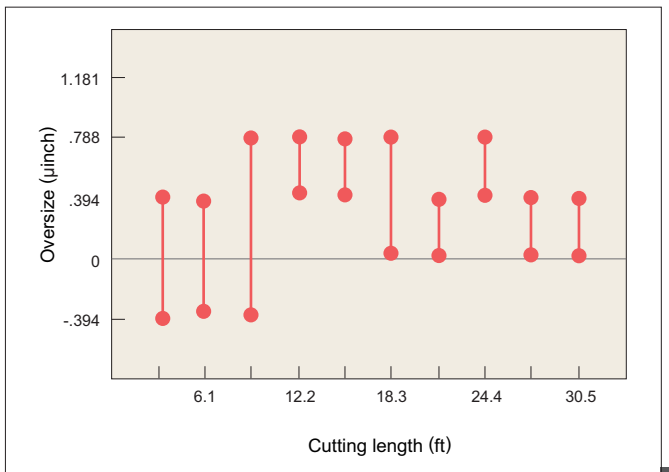
Roundness



Flank Wear and Oversize Range

Workpiece : Aluminum alloy
Tool : MAE1100MB
Cutting speed : 260 SFM
Feed : .010 IPR
Cutting depth : 1.30" (L/D=3) Through hole
Cutting fluid : WSO (10%)





For High Efficiency Machining of Aluminum Alloys

MNS

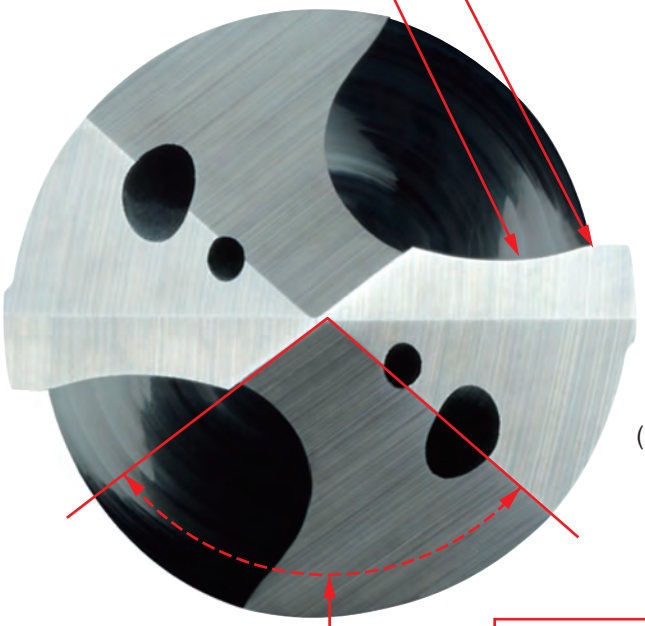
Features

Optimum flute & cutting edge geometry for machining of aluminum alloy

Cutting edge shape

Wavy cutting edge

The wave edge design achieves a sharp peripheral edge cutting performance with a strong initial cutting point near the center.



Web thinning pocket

Large thinning pocket for smooth evacuation of the chips prevents welding of the cutting edge.

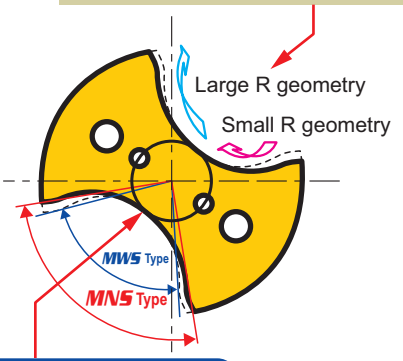
PAT. pending

Cross sectional shape

(Cutting edge shoulder cross section)

Flutes of top edge

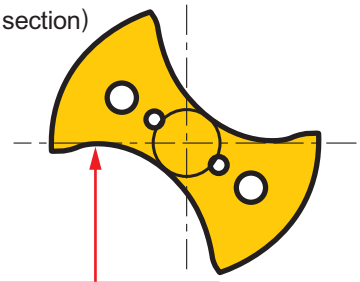
The small R geometry generates initial curling of the chips and combines with the larger geometry to promote smooth chip evacuation.



Special flute geometry

The wide flute is optimally designed for machining of aluminum alloy.

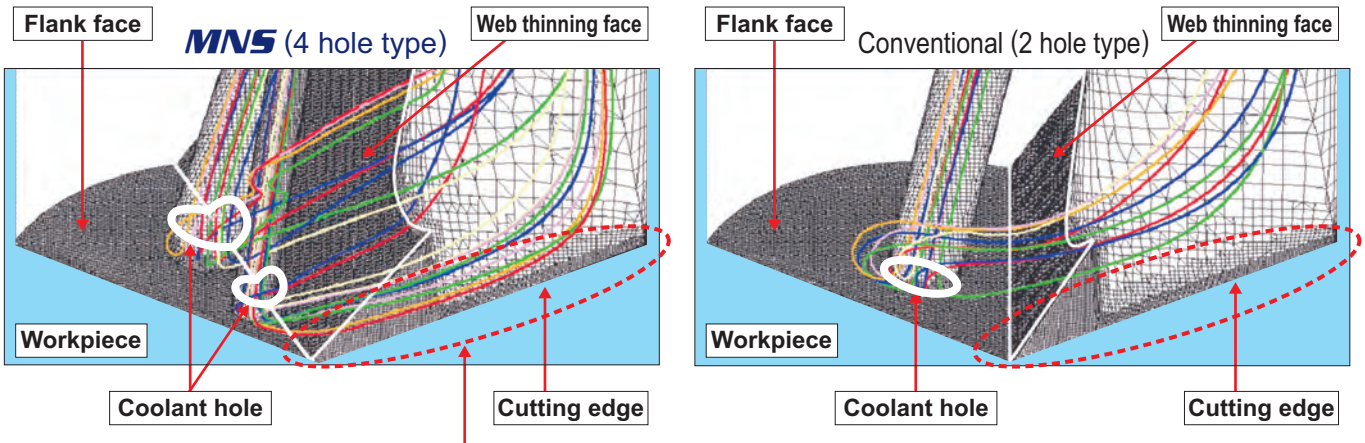
(Mid flute cross section)



Flute geometry

Large flute to prevent chip jamming.

Computerized flow simulation was used to determine the best positioning of the coolant holes



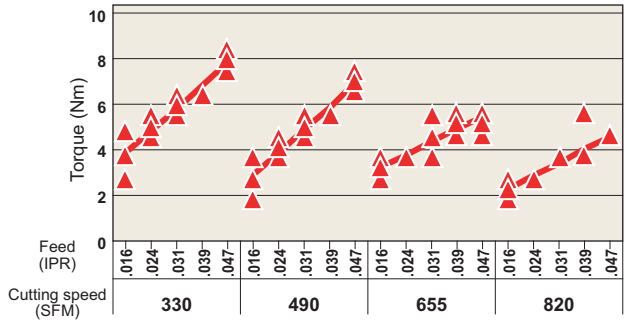
Effective lubrication at the cutting edge point and rake face that can be prone to welding

Cutting Performance

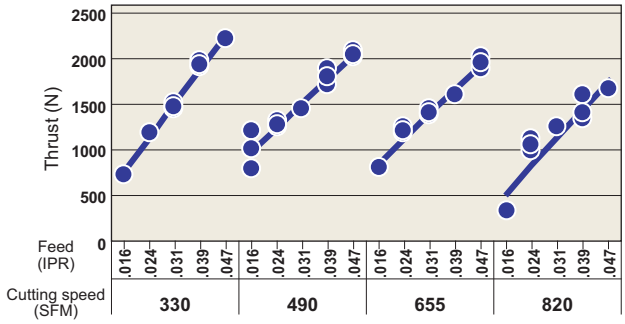
Enables stable, high feed drilling at .040 IPR!

<Cutting conditions>
Workpiece : Aluminum alloy
Machine : Machining center
Tool : MNS0600LB(L/D=5)
Hole depth : 1.18inch(L/D=5)
Coolant : W.S.O.
Emission pressure : 3MPa (Internal coolant)

● Torque



● Thrust

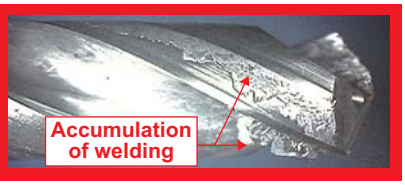


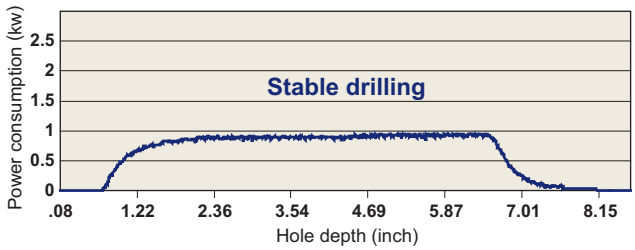
Possible to carry out non-step feed drilling of the holes up to 30xD!

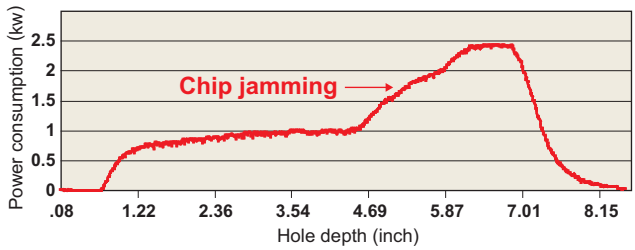
<Cutting conditions>
Workpiece : Aluminum alloy
Machine : Machining center
Tool : ø.236 inch, L/D 30 drill
Hole depth : 7.09inch(L/D=29)
Pilot drill : MAS0600MB
Pilot hole depth : .71inch
Cutting speed : 330SFM
Feed per revolution : .016IPR
Coolant : Semi-dry machining (M.Q.L.)
Emission pressure : 0.5MPa (Internal coolant)

MNS WSTAR SUPER LONG DRILL
MNS0600X30DB
(4 hole type)

Conventional long drill for aluminium (2 hole type)

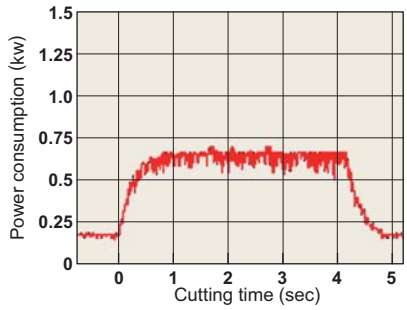
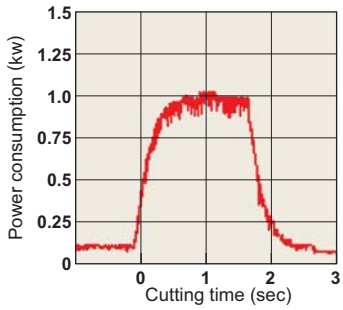
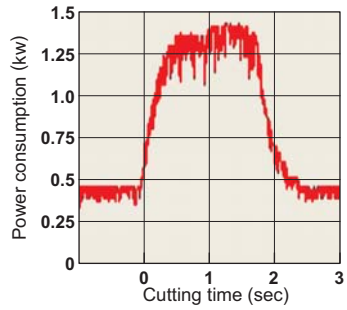






Stable drilling of deep holes in extensive material (A6082) that is difficult to machine

<Cutting conditions>
Workpiece : Aluminum alloy
Machine : Machining center
Tool : MNS0550X20DB (L/D=20)
Hole depth : 3.94 inch(L/D=18)
Pilot drill : MAS0550MB
Pilot hole depth : .59inch
Coolant : W.S.O.
Emission pressure : 1MPa (Internal coolant)

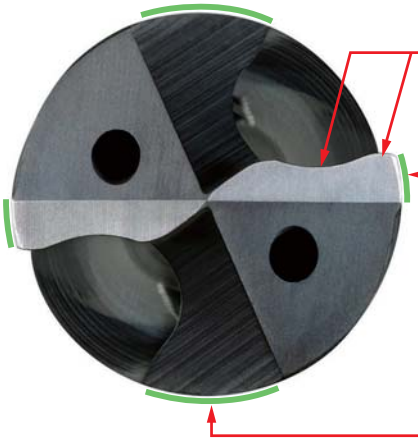
	Cutting speed: 330SFM Feed: .010IPR	Cutting speed: 330SFM Feed: .020IPR	Cutting speed: 660SFM Feed: .010IPR
Power consumption			
Chip breaking			

For hardened steels (35-55HRC), especially for Die & Mold Machining (Ejector pin hole)

MHS

Features

Stable machining can be obtained due to the unique cutting edge geometry & double margin flute



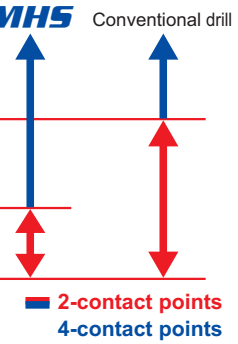
Wavy cutting edge
The wave edge design achieves a sharp peripheral edge cutting performance with a strong initial cutting point near the center.

Double margin
Unique guide pads design is used so as to reduce the drilling time, when 2 contact points are used, to ensure effective and stable drilling with 4 points in contact is used.

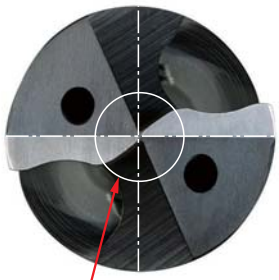
Guide pad

General guide pad location

Margin

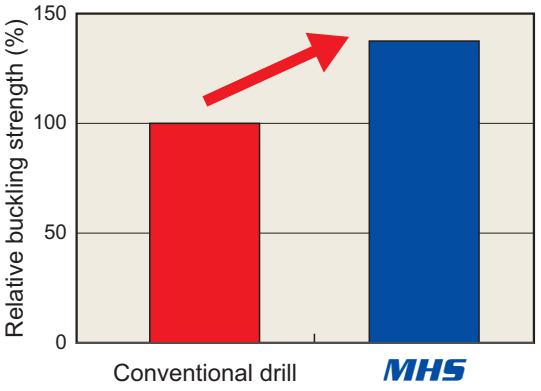


Strong geometry for stable machining of molds



Web thickness
In comparison with conventional drills a larger web thickness is used to increase overall rigidity.

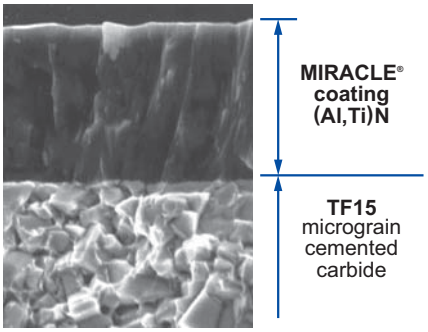
Helix angle
In comparison with conventional drills, lower helix angle is used to maintain cutting edge strength.



Higher rigidity with a 37% increase in buckling strength. (comparison with Mitsubishi Materials drills)

Tough drill tool grade

● Long tool life **MIRACLE**® coated **VP15TF**



MIRACLE® Coated

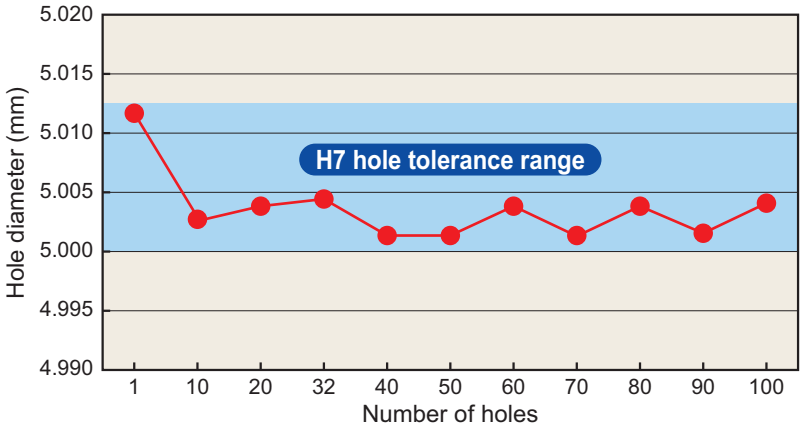
Features of *VP15TF*

MIRACLE® coated **VP15TF** is suitable for the machining of 35—55HRC mold materials.

Cutting Performance

High precision (oversize) (48–50HRC)

● **Unique geometry specially designed for die & mold machining provides superior hole accuracy!**

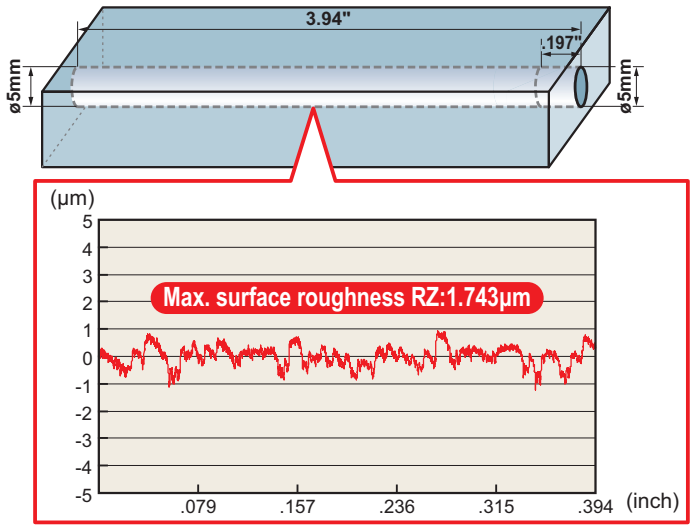


<Cutting conditions>
Workpiece : Alloy tool steel
Hardness : 48—50HRC
Drill : MHS0500L090B (ø.197 inch)
Hole depth : 2.76 inch
Cutting speed : 65 SFM
Feed : .006 IPR (Continuous)
Feed rate : 7.52 inch/min
Coolant : W.S.O.
Emission pressure : 2MPa (Internal coolant)
Machine : Machining center

<Cutting conditions for pilot drilling>
Drill : MHS0500L020B (ø.197 inch)
Hole depth : .197 inch
Cutting speed : 65 SFM
Feed : .006 IPR

High precision (surface roughness) (48–50HRC)

● **Unique geometry specially designed for die & mold machining allows for high quality holes!**

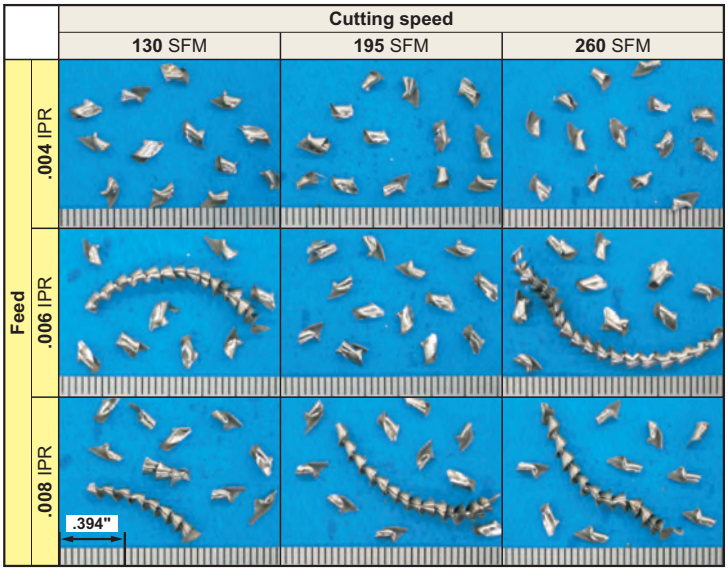


<Cutting conditions>
Workpiece : Mold steel
Hardness : 48—50HRC
Drill : MHS0500L120B (ø.197 inch)
Hole depth : 3.94 inch (Through hole)
Cutting speed : 65 SFM
Feed : .004 IPR (continuous)
Feed rate : 5 inch/min
Coolant : W.S.O.
Emission pressure : 2MPa (Internal coolant)
Machine : Machining center

<Cutting conditions for pilot drilling>
Drill : MHS0500L020B (ø.197 inch)
Hole depth : .197 inch
Cutting speed : 65 SFM
Feed : .004 IPR

High efficiency drilling (continuous feed) (40HRC)

● **Unique geometry specially designed for die & mold machining offers high efficiency deep drilling!**

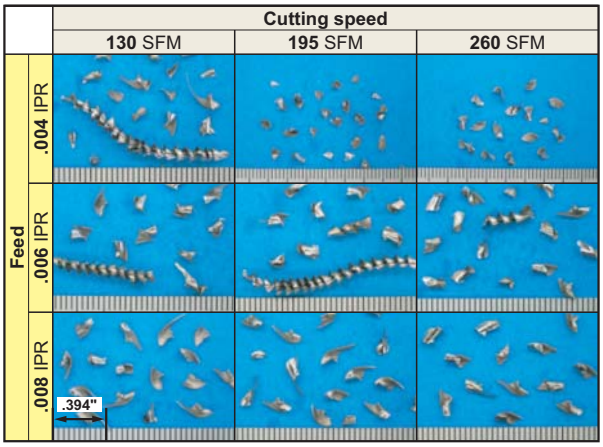


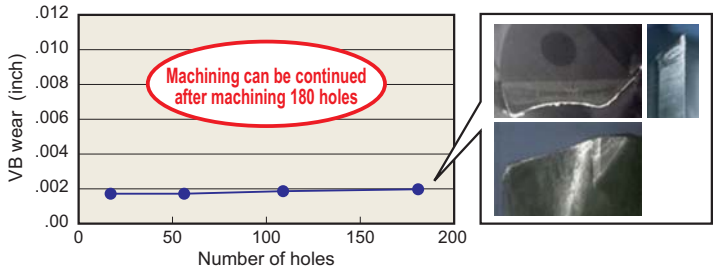
<Cutting conditions>
Workpiece : Plastic mold steel
Hardness : 40HRC
Drill : MHS0600L150B (ø.236 inch)
Hole depth : 4.52 inch
Cutting speed : 195 SFM
Feed : .006 IPR (continuous)
Feed rate : 18.78 inch/min
Coolant : W.S.O.
Emission pressure : 2MPa (Internal coolant)
Machine : Machining center

<Cutting conditions for pilot drilling>
Drill : MHS0600L030B (ø.236 inch)
Hole depth : .236 inch
Cutting speed : 195 SFM
Feed : .006 IPR

Cutting performance for different workpieces

Chromium-alloy stainless steel (33HRC)





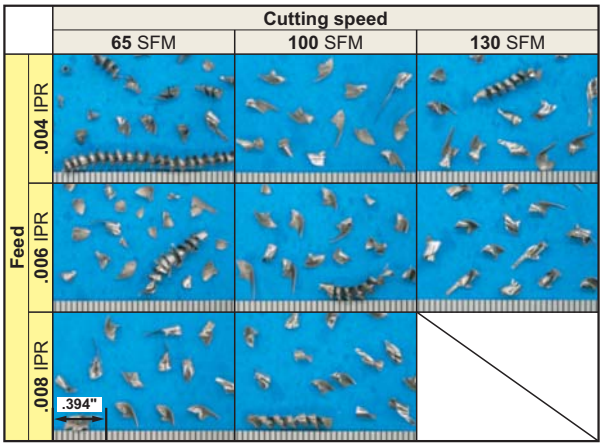
<Cutting conditions>

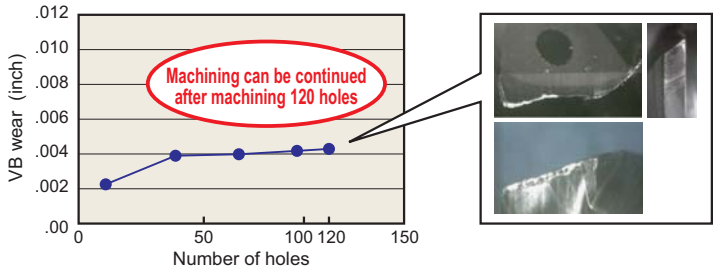
Workpiece	: Chromium-alloy stainless steel	Cutting speed	: 130 SFM
Hardness	: 33HRC	Feed	: .006 IPR (continuous)
Drill	: MHS0600L150B (ø.236 inch)	Feed rate	: 12.5 inch/min
Hole depth	: 4.52 inch (Through hole)		
Coolant	: W.S.O.		
Emission pressure	: 2MPa (Internal coolant)		

<Cutting conditions for pilot drilling>

Drill	: MHS0600L030B (ø.236 inch)
Hole depth	: .236 inch
Cutting speed	: 130 SFM
Feed	: .006 IPR

Die-cast mold steel (45HRC)





<Cutting conditions>

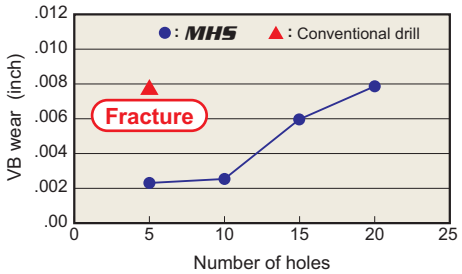
Workpiece	: Die-cast mold steel	Cutting speed	: 100 SFM
Hardness	: 45HRC	Feed	: .004 IPR (continuous)
Drill	: MHS0600L150B (ø.236 inch)	Feed rate	: 6.26 inch/min
Hole depth	: 4.52 inch		
Coolant	: W.S.O.		
Emission pressure	: 2MPa (Internal coolant)		

<Cutting conditions for pilot drilling>

Drill	: MHS0600L030B (ø.236 inch)
Hole depth	: .236 inch
Cutting speed	: 100 SFM
Feed	: .004 IPR

Mold Steel (55HRC)

● **Cutting edges after machining 5 holes**



<Cutting conditions>

Workpiece	: Mold Steel
Hardness	: 55HRC
Drill	: MHS0600L120B (ø.236 inch)
Hole depth	: 3.74 inch
Cutting speed	: 65 SFM
Feed	: .002 IPR (continuous)
Feed rate	: 2.09 inch/min
Coolant	: W.S.O.
Emission pressure	: 2MPa (Internal coolant)
Machine	: Machining centre

<Cutting conditions for pilot drilling>

Drill	: MHS0600L030B (ø.236 inch)
Hole depth	: .236 inch
Cutting speed	: 65 SFM
Feed	: .002 IPR

Micro Solid Carbide Gun Drill

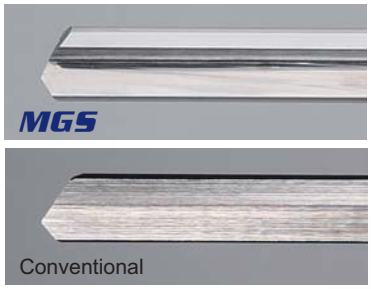
MICRO-MGS

- High precision carbide shank suitable for use with collets and shrink fit holders
- ***VP***, ***GP*** or ***UP*** coated carbide is available (produced to order only)

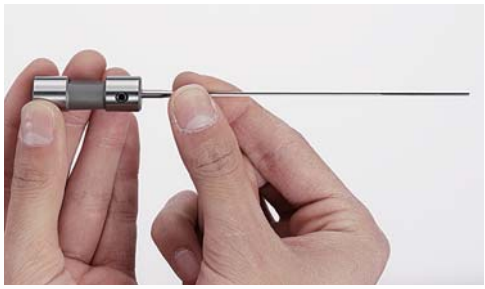
Features

●Solid carbide with through coolant holes achieves high precision drilling

●Smooth rake face & Sharp cutting edge



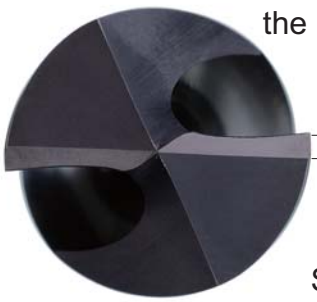
●Driver available for use on gun drill machines



Drill for WHEEL HUB

MHE

Features



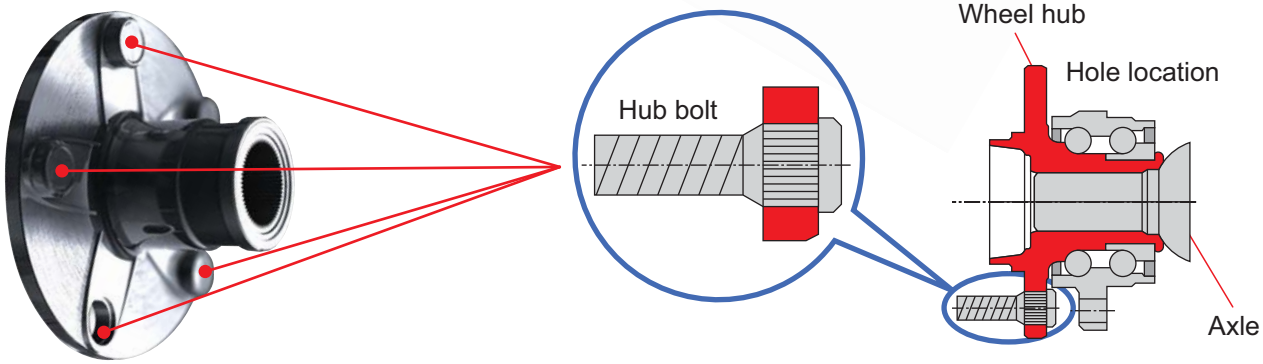
Lower cutting edge height for the prevention of work hardening

Low helix angle for high tool rigidity and stable hole accuracy.

Small point angle for stable hole accuracy

Narrow flute for better chip disposal

- **WHEEL HUB**



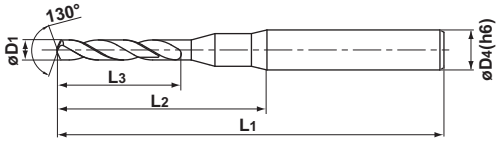
MSE

For Micro Size Hole

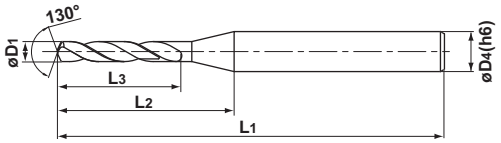
METRIC STANDARD

	0.1 ≤ D1 ≤ 3
D1 Tolerance (mm)	0 −0.009
D4 Tolerance (mm)	0 −0.006

Type A



Type B



For features, see page 3.

(Note) MSE type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Coolant	Stock VP20MF	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
0.10	Ext.	★		MSE0010SB	1.2	9.7	38	3	A
0.11	Ext.	★		0011SB	1.2	9.7	38	3	A
0.12	Ext.	★		0012SB	1.4	9.7	38	3	A
0.13	Ext.	★		0013SB	1.4	9.7	38	3	A
0.14	Ext.	★		0014SB	2	9.7	38	3	A
0.15	Ext.	★		0015SB	2	9.7	38	3	A
0.16	Ext.	★		0016SB	2	9.7	38	3	A
0.17	Ext.	★		0017SB	2	9.7	38	3	A
0.18	Ext.	★		0018SB	2	9.7	38	3	A
0.19	Ext.	★		0019SB	2	9.7	38	3	A
0.20	Ext.	★		0020SB	2.5	9.7	38	3	A
0.21	Ext.	★		0021SB	2.5	9.7	38	3	A
0.22	Ext.	★		0022SB	2.5	9.7	38	3	A
0.23	Ext.	★		0023SB	2.5	9.7	38	3	A
0.24	Ext.	★		0024SB	3	9.7	38	3	A
0.25	Ext.	★		0025SB	3	9.7	38	3	A
0.26	Ext.	★		0026SB	3	9.7	38	3	A
0.27	Ext.	★		0027SB	3	9.7	38	3	A
0.28	Ext.	★		0028SB	3	9.7	38	3	A
0.29	Ext.	★		0029SB	3	9.7	38	3	A
0.30	Ext.		★	0030SB	5	10.2	38	3	B
0.31	Ext.		★	0031SB	5	10.2	38	3	B
0.32	Ext.		★	0032SB	5	10.2	38	3	B
0.33	Ext.		★	0033SB	5	10.2	38	3	B
0.34	Ext.		★	0034SB	6	11.2	38	3	B
0.35	Ext.		★	0035SB	6	11.1	38	3	B
0.36	Ext.		★	0036SB	6	11.1	38	3	B
0.37	Ext.		★	0037SB	6	11.1	38	3	B
0.38	Ext.		★	0038SB	6	11.1	38	3	B
0.39	Ext.		★	0039SB	6	11.1	38	3	B
0.40	Ext.		★	0040SB	7	12.1	38	3	B
0.41	Ext.		★	0041SB	7	12.0	38	3	B

Drill Dia. D1 (mm)	Coolant	Stock VP20MF	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
0.42	Ext.		★	MSE0042SB	7	12.0	38	3	B
0.43	Ext.		★	0043SB	7	12.0	38	3	B
0.44	Ext.		★	0044SB	7	12.0	38	3	B
0.45	Ext.		★	0045SB	7	12.0	38	3	B
0.46	Ext.		★	0046SB	7	11.9	38	3	B
0.47	Ext.		★	0047SB	7	11.9	38	3	B
0.48	Ext.		★	0048SB	7	11.9	38	3	B
0.49	Ext.		★	0049SB	7	11.9	38	3	B
0.50	Ext.		★	0050SB	7	11.9	38	3	B
0.51	Ext.		★	0051SB	7	11.8	38	3	B
0.52	Ext.		★	0052SB	7	11.8	38	3	B
0.53	Ext.		★	0053SB	7	11.8	38	3	B
0.54	Ext.		★	0054SB	7	11.8	38	3	B
0.55	Ext.		★	0055SB	7	11.8	38	3	B
0.56	Ext.		★	0056SB	7	11.8	38	3	B
0.57	Ext.		★	0057SB	7	11.7	38	3	B
0.58	Ext.		★	0058SB	7	11.7	38	3	B
0.59	Ext.		★	0059SB	7	11.7	38	3	B
0.60	Ext.		★	0060SB	7	11.7	38	3	B
0.61	Ext.		★	0061SB	7	11.7	38	3	B
0.62	Ext.		★	0062SB	7	11.6	38	3	B
0.63	Ext.		★	0063SB	7	11.6	38	3	B
0.64	Ext.		★	0064SB	7	11.6	38	3	B
0.65	Ext.		★	0065SB	7	11.6	38	3	B
0.66	Ext.		★	0066SB	7	11.6	38	3	B
0.67	Ext.		★	0067SB	7	11.5	38	3	B
0.68	Ext.		★	0068SB	7	11.5	38	3	B
0.69	Ext.		★	0069SB	7	11.5	38	3	B
0.70	Ext.		★	0070SB	8	12.5	38	3	B
0.71	Ext.		★	0071SB	8	12.5	38	3	B
0.72	Ext.		★	0072SB	8	12.5	38	3	B
0.73	Ext.		★	0073SB	8	12.4	38	3	B

(Note) Please contact Mitsubishi Materials for special grades and geometries other than our standard products.

★ : Inventory maintained in Japan.

Drill Dia. D_1 (mm)	Coolant	Stock		Order Number	Dimensions (mm)				Type
		VP20MF	VP15TF		L_3	L_2	L_1	D_4	
0.74	Ext.		★	**MSE0074SB**	8	12.4	38	3	B
0.75	Ext.		★	**0075SB**	8	12.4	38	3	B
0.76	Ext.		★	**0076SB**	8	12.4	38	3	B
0.77	Ext.		★	**0077SB**	8	12.4	38	3	B
0.78	Ext.		★	**0078SB**	8	12.3	38	3	B
0.79	Ext.		★	**0079SB**	8	12.3	38	3	B
0.80	Ext.		★	**0080SB**	10	14.3	38	3	B
0.81	Ext.		★	**0081SB**	10	14.3	38	3	B
0.82	Ext.		★	**0082SB**	10	14.3	38	3	B
0.83	Ext.		★	**0083SB**	10	14.3	38	3	B
0.84	Ext.		★	**0084SB**	10	14.2	38	3	B
0.85	Ext.		★	**0085SB**	10	14.2	38	3	B
0.86	Ext.		★	**0086SB**	10	14.2	38	3	B

Drill Dia. D_1 (mm)	Coolant	Stock		Order Number	Dimensions (mm)				Type
		VP20MF	VP15TF		L_3	L_2	L_1	D_4	
0.87	Ext.		★	**MSE0087SB**	10	14.2	38	3	B
0.88	Ext.		★	**0088SB**	10	14.2	38	3	B
0.89	Ext.		★	**0089SB**	10	14.1	38	3	B
0.90	Ext.		★	**0090SB**	10	14.1	38	3	B
0.91	Ext.		★	**0091SB**	10	14.1	38	3	B
0.92	Ext.		★	**0092SB**	10	14.1	38	3	B
0.93	Ext.		★	**0093SB**	10	14.1	38	3	B
0.94	Ext.		★	**0094SB**	10	14.0	38	3	B
0.95	Ext.		★	**0095SB**	10	14.0	38	3	B
0.96	Ext.		★	**0096SB**	10	14.0	38	3	B
0.97	Ext.		★	**0097SB**	10	14.0	38	3	B
0.98	Ext.		★	**0098SB**	10	14.0	38	3	B
0.99	Ext.		★	**0099SB**	10	14.0	38	3	B

RECOMMENDED CUTTING CONDITIONS

Work Material		Drill Diameter / Conditions / Hardness	**ϕ0.10 – ϕ0.19 mm**			**ϕ0.20 – ϕ0.29 mm**			**ϕ0.30 – ϕ0.49 mm**		
			Revolution (min^{-1})	Feed (IPR)	Peck (inch)	Revolution (min^{-1})	Feed (IPR)	Peck (inch)	Revolution (min^{-1})	Feed (IPR)	Peck (inch)
P	General Steel Carbon Steel	≤180HB	20,000	.00008	.0008	20,000	.00012	.0016	20,000	.00016	.0020
	Alloy Steel Pre-hardened Steel	≤40HRC	20,000	.00008	.0008	20,000	.00012	.0016	20,000	.00016	.0020
M	Stainless Steel	≤200HB	20,000	.00008	.0008	18,000	.00012	.0016	15,000	.00016	.0020
K	Cast Iron	Tensile Strength ≤350MPa	20,000	.00008	.0008	20,000	.00012	.0016	20,000	.00016	.0020
N	Aluminum Alloy	–	20,000	.00016	.0020	20,000	.00024	.0040	20,000	.00080	.0118
S	Heat Resistant Alloy	–	7,000	.00004	.0008	5,000	.00008	.0016	4,000	.00012	.0020

Work Material		Drill Diameter / Conditions / Hardness	**ϕ0.50 – ϕ0.79 mm**			**ϕ0.80 – ϕ0.99 mm**		
			Revolution (min^{-1})	Feed (IPR)	Peck (inch)	Revolution (min^{-1})	Feed (IPR)	Peck (inch)
P	General Steel Carbon Steel	≤180HB	20,000	.00040	.0040	20,000	.0016	.0118
	Alloy Steel Pre-hardened Steel	≤40HRC	20,000	.00040	.0040	20,000	.0008	.0118
M	Stainless Steel	≤200HB	10,000	.00040	.0040	6,000	.0008	.0080
K	Cast Iron	Tensile Strength ≤350MPa	20,000	.00040	.0040	20,000	.0016	.0018
N	Aluminum Alloy	–	20,000	.00200	.0200	20,000	.0024	.0315
S	Heat Resistant Alloy	–	3,000	.00020	.0040	1,800	.0004	.0080

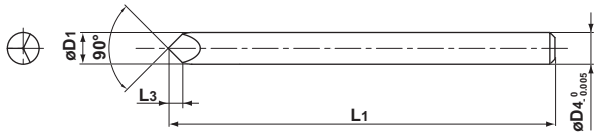
(Note)

* When drilling a hole of ϕ0.99 mm or smaller, use of the Starter Drill is recommended. (Order number: MSP0300SB, Cutting conditions: Please see Page 23.)
* Adjust the cutting conditions depending on the machine rigidity and component set up.
* When drilling depth is over 5 times the drill diameter, reduce the peck distance above.
* Use of water-soluble fluid (Diluted x 20) is necessary for drilling using the cutting conditions above. Lower the cutting speed if oil or mist coolant is used.

MSP

STARTER Drill

METRIC STANDARD



For features, see page 4.

(Note) MSP type can be used for shrink fit holders.

Order Number	Grade	Stock	Dimensions (mm)				Range of Diameter (mm)
			D1	D4	L1	L3	
MSP0300SB	**VP15TF**	●	3.0	3.0	38	1.5	**0.1—0.99**

RECOMMENDED CUTTING CONDITIONS

Order Number	Revolution (min^{-1})	Table Feed (IPR)
MSP0300SB	10,000	.00002

● : **Inventory maintained.**

REFERENCE TABLE OF PRE-HOLE DIMENSIONS

Unit : mm

Description	Cutting Dia.	Pre-hole Diameter	Pre-hole Depth
MSE0010SB	0.10	0.060–0.080	0.030–0.040
0011SB	0.11	0.066–0.088	0.033–0.044
0012SB	0.12	0.072–0.096	0.036–0.048
0013SB	0.13	0.078–0.104	0.039–0.052
0014SB	0.14	0.084–0.112	0.042–0.056
0015SB	0.15	0.090–0.120	0.045–0.060
0016SB	0.16	0.096–0.128	0.048–0.064
0017SB	0.17	0.102–0.136	0.051–0.068
0018SB	0.18	0.108–0.144	0.054–0.072
0019SB	0.19	0.114–0.152	0.057–0.076
0020SB	0.20	0.120–0.160	0.060–0.080
0021SB	0.21	0.126–0.168	0.063–0.084
0022SB	0.22	0.132–0.176	0.066–0.088
0023SB	0.23	0.138–0.184	0.069–0.092
0024SB	0.24	0.144–0.192	0.072–0.096
0025SB	0.25	0.150–0.200	0.075–0.100
0026SB	0.26	0.156–0.208	0.078–0.104
0027SB	0.27	0.162–0.216	0.081–0.108
0028SB	0.28	0.168–0.224	0.084–0.112
0029SB	0.29	0.174–0.232	0.087–0.116
0030SB	0.30	0.180–0.240	0.090–0.120
0031SB	0.31	0.186–0.248	0.093–0.124
0032SB	0.32	0.192–0.256	0.096–0.128
0033SB	0.33	0.198–0.264	0.099–0.132
0034SB	0.34	0.204–0.272	0.102–0.136
0035SB	0.35	0.210–0.280	0.105–0.140
0036SB	0.36	0.216–0.288	0.108–0.144
0037SB	0.37	0.222–0.296	0.111–0.148
0038SB	0.38	0.228–0.304	0.114–0.152
0039SB	0.39	0.234–0.312	0.117–0.156

Description	Cutting Dia.	Pre-hole Diameter	Pre-hole Depth
MSE0040SB	0.40	0.240–0.320	0.120–0.160
0041SB	0.41	0.246–0.328	0.123–0.164
0042SB	0.42	0.252–0.336	0.126–0.168
0043SB	0.43	0.258–0.344	0.129–0.172
0044SB	0.44	0.264–0.352	0.132–0.176
0045SB	0.45	0.270–0.360	0.135–0.180
0046SB	0.46	0.276–0.368	0.138–0.184
0047SB	0.47	0.282–0.376	0.141–0.188
0048SB	0.48	0.288–0.384	0.144–0.192
0049SB	0.49	0.294–0.392	0.147–0.196
0050SB	0.50	0.300–0.400	0.150–0.200
0051SB	0.51	0.306–0.408	0.153–0.204
0052SB	0.52	0.312–0.416	0.156–0.208
0053SB	0.53	0.318–0.424	0.159–0.212
0054SB	0.54	0.324–0.432	0.162–0.216
0055SB	0.55	0.330–0.440	0.165–0.220
0056SB	0.56	0.336–0.448	0.168–0.224
0057SB	0.57	0.342–0.456	0.171–0.228
0058SB	0.58	0.348–0.464	0.174–0.232
0059SB	0.59	0.354–0.472	0.177–0.236
0060SB	0.60	0.360–0.480	0.180–0.240
0061SB	0.61	0.366–0.488	0.183–0.244
0062SB	0.62	0.372–0.496	0.186–0.248
0063SB	0.63	0.378–0.504	0.189–0.252
0064SB	0.64	0.384–0.512	0.192–0.256
0065SB	0.65	0.390–0.520	0.195–0.260
0066SB	0.66	0.396–0.528	0.198–0.264
0067SB	0.67	0.402–0.536	0.201–0.268
0068SB	0.68	0.408–0.544	0.204–0.272
0069SB	0.69	0.414–0.552	0.207–0.276

Description	Cutting Dia.	Pre-hole Diameter	Pre-hole Depth
MSE0070SB	0.70	0.420–0.560	0.210–0.280
0071SB	0.71	0.426–0.568	0.213–0.284
0072SB	0.72	0.432–0.576	0.216–0.288
0073SB	0.73	0.438–0.584	0.219–0.292
0074SB	0.74	0.444–0.592	0.222–0.296
0075SB	0.75	0.450–0.600	0.225–0.300
0076SB	0.76	0.456–0.608	0.228–0.304
0077SB	0.77	0.462–0.616	0.231–0.308
0078SB	0.78	0.468–0.624	0.234–0.312
0079SB	0.79	0.474–0.632	0.237–0.316
0080SB	0.80	0.480–0.640	0.240–0.320
0081SB	0.81	0.486–0.648	0.243–0.324
0082SB	0.82	0.492–0.656	0.246–0.328
0083SB	0.83	0.498–0.664	0.249–0.332
0084SB	0.84	0.504–0.672	0.252–0.336
0085SB	0.85	0.510–0.680	0.255–0.340
0086SB	0.86	0.516–0.688	0.258–0.344
0087SB	0.87	0.522–0.696	0.261–0.348
0088SB	0.88	0.528–0.704	0.264–0.352
0089SB	0.89	0.534–0.712	0.267–0.356
0090SB	0.90	0.540–0.720	0.270–0.360
0091SB	0.91	0.546–0.728	0.273–0.364
0092SB	0.92	0.552–0.736	0.276–0.368
0093SB	0.93	0.558–0.744	0.279–0.372
0094SB	0.94	0.564–0.752	0.282–0.376
0095SB	0.95	0.570–0.760	0.285–0.380
0096SB	0.96	0.576–0.768	0.288–0.384
0097SB	0.97	0.582–0.776	0.291–0.388
0098SB	0.98	0.588–0.784	0.294–0.392
0099SB	0.99	0.594–0.792	0.297–0.396

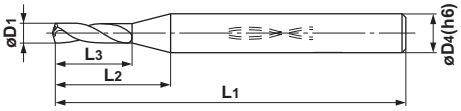
MICRO-MWS

INCH STANDARD

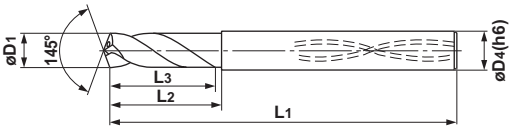
		.0200≤D1≤.0390	.0394≤D1≤.1094	D1=.1200
D1 Tolerance (inch)	SB	+.00035 0	+.00055 0	+.00071 0
	LB	0 −.00035		
	XB	0 −.00035	0 −.00055	0 −.00071
D4 Tolerance (inch)		0 −.00031	0 −.00031	0 −.00031

SB Type
(For pilot holes)

Type A

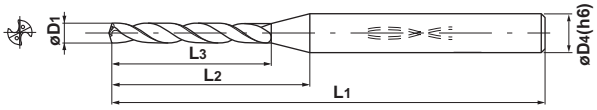


Type B

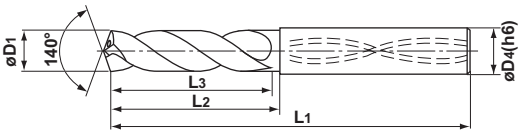


LB/XB Type

Type A



Type B



For features, see page 5.
(Note) MWS type can be used for shrink fit holders.

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4	Type
.0200	1	Int.	●	MWS00200SB	.098	.294	1.772	.1250	A
	5	Int.	●	00200LB	.315	.511	1.850	.1250	A
	12	Int.	●	00200XB	.630	.826	1.850	.1250	A
.0210	1	Int.	●	00210SB	.102	.296	1.772	.1250	A
	5	Int.	●	00210LB	.315	.509	1.850	.1250	A
	12	Int.	●	00210XB	.630	.824	1.850	.1250	A
.0225	1	Int.	●	00225SB	.114	.306	1.772	.1250	A
	5	Int.	●	00225LB	.315	.506	1.850	.1250	A
	12	Int.	●	00225XB	.630	.821	1.850	.1250	A
.0240	1	Int.	●	00240SB	.122	.311	1.772	.1250	A
	5	Int.	●	00240LB	.315	.503	1.850	.1250	A
	12	Int.	●	00240XB	.630	.818	1.850	.1250	A
.0250	1	Int.	●	00250SB	.122	.309	1.772	.1250	A
	5	Int.	●	00250LB	.315	.502	1.850	.1250	A
	12	Int.	●	00250XB	.630	.817	1.850	.1250	A
.0260	1	Int.	●	00260SB	.134	.319	1.772	.1250	A
	5	Int.	●	00260LB	.315	.500	1.850	.1250	A
	12	Int.	●	00260XB	.630	.815	1.850	.1250	A
.0280	1	Int.	●	00280SB	.142	.323	1.969	.1250	A
	5	Int.	●	00280LB	.394	.575	1.969	.1250	A
	12	Int.	●	00280XB	.787	.968	1.969	.1250	A

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4	Type
.0292	1	Int.	●	MWS00292SB	.142	.320	1.969	.1250	A
	5	Int.	●	00292LB	.394	.572	1.969	.1250	A
	12	Int.	●	00292XB	.787	.966	1.969	.1250	A
.0310	1	Int.	●	00310SB	.154	.329	1.969	.1250	A
	5	Int.	●	00310LB	.394	.569	1.969	.1250	A
	12	Int.	●	00310XB	.787	.963	1.969	.1250	A
.0312	1	Int.	●	00312SB	.154	.329	1.969	.1250	A
	5	Int.	●	00312LB	.394	.569	1.969	.1250	A
	12	Int.	●	00312XB	.787	.962	1.969	.1250	A
.0320	1	Int.	●	00320SB	.161	.335	1.969	.1250	A
	5	Int.	●	00320LB	.394	.567	1.969	.1250	A
	12	Int.	●	00320XB	.787	.961	1.969	.1250	A
.0330	1	Int.	●	00330SB	.161	.333	1.969	.1250	A
	5	Int.	●	00330LB	.394	.565	1.969	.1250	A
	12	Int.	●	00330XB	.787	.959	1.969	.1250	A
.0350	1	Int.	●	00350SB	.173	.341	1.969	.1250	A
	5	Int.	●	00350LB	.394	.562	1.969	.1250	A
	12	Int.	●	00350XB	.787	.955	1.969	.1250	A
.0360	1	Int.	●	00360SB	.181	.347	1.969	.1250	A
	5	Int.	●	00360LB	.394	.560	1.969	.1250	A
	12	Int.	●	00360XB	.787	.953	1.969	.1250	A

* Please contact us for any geometry that is not in this catalogue (e.g. different diameters and lengths can be made to order).

● : Inventory maintained.

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4	Type
.0370	1	Int.	●	MWS00370SB	.181	.345	1.969	.1250	A
	5	Int.	●	00370LB	.394	.558	1.969	.1250	A
	12	Int.	●	00370XB	.787	.952	1.969	.1250	A
.0380	1	Int.	●	00380SB	.193	.355	1.969	.1250	A
	5	Int.	●	00380LB	.394	.556	1.969	.1250	A
	12	Int.	●	00380XB	.787	.950	1.969	.1250	A
.0390	1	Int.	●	00390SB	.193	.353	1.969	.1250	A
	5	Int.	●	00390LB	.394	.554	1.969	.1250	A
	12	Int.	●	00390XB	.787	.948	1.969	.1250	A
.0394	1	Int.	●	00394SB	.197	.357	2.165	.1250	A
	12	Int.	●	00394XB	.906	1.065	2.165	.1250	A
.0400	1	Int.	●	00400SB	.197	.355	2.165	.1250	A
	12	Int.	●	00400XB	.906	1.064	2.165	.1250	A
.0410	1	Int.	●	00410SB	.204	.361	2.165	.1250	A
	12	Int.	●	00410XB	.906	1.062	2.165	.1250	A
.0420	1	Int.	●	00420SB	.205	.360	2.165	.1250	A
	12	Int.	●	00420XB	.906	1.060	2.165	.1250	A
.0430	1	Int.	●	00430SB	.213	.366	2.165	.1250	A
	12	Int.	●	00430XB	.906	1.059	2.165	.1250	A
.0465	1	Int.	●	00465SB	.236	.383	2.165	.1250	A
	12	Int.	●	00465XB	.906	1.052	2.165	.1250	A
.0520	1	Int.	●	00520SB	.252	.388	2.165	.1250	A
	12	Int.	●	00520XB	.906	1.042	2.165	.1250	A
.0550	1	Int.	●	00550SB	.276	.406	2.165	.1250	A
	12	Int.	●	00550XB	.906	1.036	2.165	.1250	A
.0591	1	Int.	●	00591SB	.291	.414	2.165	.1250	A
	12	Int.	●	00591XB	.906	1.028	2.165	.1250	A
.0625	1	Int.	●	00625SB	.315	.432	2.677	.1250	A
	12	Int.	●	00625XB	1.181	1.298	2.677	.1250	A
.0635	1	Int.	●	00635SB	.315	.430	2.677	.1250	A
	12	Int.	●	00635XB	1.181	1.296	2.677	.1250	A

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4	Type
.0670	1	Int.	●	MWS00670SB	.331	.439	2.677	.1250	A
	12	Int.	●	00670XB	1.181	1.289	2.677	.1250	A
.0700	1	Int.	●	00700SB	.354	.457	2.677	.1250	A
	12	Int.	●	00700XB	1.181	1.284	2.677	.1250	A
.0730	1	Int.	●	00730SB	.362	.459	2.677	.1250	A
	12	Int.	●	00730XB	1.181	1.278	2.677	.1250	A
.0760	1	Int.	●	00760SB	.378	.469	2.677	.1250	A
	12	Int.	●	00760XB	1.181	1.273	2.677	.1250	A
.0785	1	Int.	●	00785SB	.394	.480	2.677	.1250	A
	12	Int.	●	00785XB	1.181	1.268	2.677	.1250	A
.0810	1	Int.	●	00810SB	.402	.484	2.913	.1250	A
	12	Int.	●	00810XB	1.496	1.578	2.913	.1250	A
.0860	1	Int.	●	00860SB	.433	.506	2.913	.1250	A
	12	Int.	●	00860XB	1.496	1.569	2.913	.1250	A
.0890	1	Int.	●	00890SB	.441	.508	2.913	.1250	A
	12	Int.	●	00890XB	1.496	1.563	2.913	.1250	A
.0938	1	Int.	●	00938SB	.472	.531	2.913	.1250	A
	12	Int.	●	00938XB	1.496	1.554	2.913	.1250	A
.0960	1	Int.	●	00960SB	.480	.534	2.913	.1250	A
	12	Int.	●	00960XB	1.496	1.550	2.913	.1250	A
.1010	1	Int.	●	01010SB	.496	.541	3.189	.1250	B
	12	Int.	●	01010XB	1.772	1.772	3.189	.1250	B
.1040	1	Int.	●	01040SB	.520	.559	3.189	.1250	B
	12	Int.	●	01040XB	1.772	1.772	3.189	.1250	B
.1060	1	Int.	●	01060SB	.528	.556	3.189	.1250	B
	12	Int.	●	01060XB	1.772	1.772	3.189	.1250	B
.1094	1	Int.	●	01094SB	.551	.581	3.189	.1250	B
	12	Int.	●	01094XB	1.772	1.772	3.189	.1250	B
.1200	1	Int.	●	01200SB	.598	.608	3.425	.1250	B
	12	Int.	●	01200XB	2.047	2.047	3.425	.1250	B

CUTTING CONDITIONS P.32

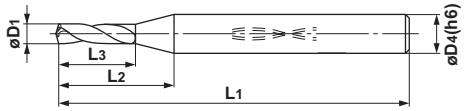
MICRO-MWS

METRIC STANDARD

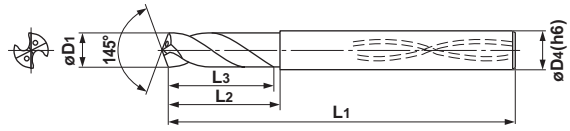
		0.5≤D1<1	1≤D1≤2.95
D1 Tolerance (mm)	MWS-SB	+0.009 0	+0.014 0
	MWS-LB/XB	0 −0.009	0 −0.014
D4 Tolerance (mm)		0 −0.006	0 −0.006

SB Type
(For pilot holes)

Type A

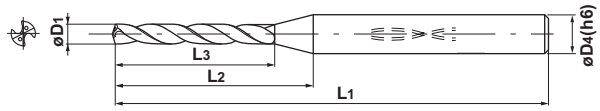


Type B

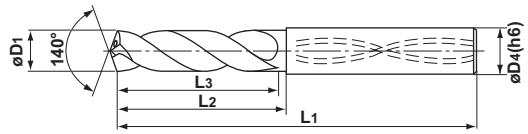


LB/XB Type

Type A



Type B



For features, see page 5.
(Note) MWS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
0.50	1	Int.	★	MWS0050SB	2.5	7.2	47	3	A
	5	Int.	★	0050LB	8	13	47	3	A
	12	Int.	★	0050XB	16	21	47	3	A
0.51	1	Int.	★	0051SB	2.6	7.2	47	3	A
	5	Int.	★	0051LB	8	13	47	3	A
	12	Int.	★	0051XB	16	21	47	3	A
0.52	1	Int.	★	0052SB	2.6	7.2	47	3	A
	5	Int.	★	0052LB	8	13	47	3	A
	12	Int.	●	0052XB	16	21	47	3	A
0.53	1	Int.	★	0053SB	2.6	7.2	47	3	A
	5	Int.	★	0053LB	8	13	47	3	A
	12	Int.	★	0053XB	16	21	47	3	A
0.54	1	Int.	★	0054SB	2.6	7.2	47	3	A
	5	Int.	★	0054LB	8	13	47	3	A
	12	Int.	★	0054XB	16	21	47	3	A
0.55	1	Int.	●	0055SB	2.6	7.2	47	3	A
	5	Int.	★	0055LB	8	13	47	3	A
	12	Int.	●	0055XB	16	21	47	3	A
0.56	1	Int.	★	0056SB	2.9	7.5	47	3	A
	5	Int.	★	0056LB	8	13	47	3	A
	12	Int.	●	0056XB	16	21	47	3	A

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
0.57	1	Int.	★	MWS0057SB	2.9	7.4	47	3	A
	5	Int.	★	0057LB	8	13	47	3	A
	12	Int.	●	0057XB	16	21	47	3	A
0.58	1	Int.	★	0058SB	2.9	7.4	47	3	A
	5	Int.	★	0058LB	8	13	47	3	A
	12	Int.	★	0058XB	16	21	47	3	A
0.59	1	Int.	★	0059SB	2.9	7.4	47	3	A
	5	Int.	★	0059LB	8	12	47	3	A
	12	Int.	★	0059XB	16	20	47	3	A
0.60	1	Int.	★	0060SB	2.9	7.4	47	3	A
	5	Int.	★	0060LB	8	12	47	3	A
	12	Int.	●	0060XB	16	20	47	3	A
0.61	1	Int.	★	0061SB	3.1	7.6	47	3	A
	5	Int.	★	0061LB	8	12	47	3	A
	12	Int.	★	0061XB	16	20	47	3	A
0.62	1	Int.	★	0062SB	3.1	7.5	47	3	A
	5	Int.	★	0062LB	8	12	47	3	A
	12	Int.	★	0062XB	16	20	47	3	A
0.63	1	Int.	★	0063SB	3.1	7.5	47	3	A
	5	Int.	★	0063LB	8	12	47	3	A
	12	Int.	★	0063XB	16	20	47	3	A

* Please contact us for any geometry that is not in this catalogue (e.g. different diameters and lengths can be made to order).

● : Inventory maintained.
★ : Inventory maintained in Japan.

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4	Type
0.64	1	Int.	★	MWS0064SB	3.1	7.5	47	3	A
	5	Int.	★	0064LB	8	12	47	3	A
	12	Int.	★	0064XB	16	20	47	3	A
0.65	1	Int.	★	0065SB	3.1	7.5	47	3	A
	5	Int.	★	0065LB	8	12	47	3	A
	12	Int.	●	0065XB	16	20	47	3	A
0.66	1	Int.	★	0066SB	3.4	7.8	47	3	A
	5	Int.	●	0066LB	8	12	47	3	A
	12	Int.	★	0066XB	16	20	47	3	A
0.67	1	Int.	★	0067SB	3.4	7.7	47	3	A
	5	Int.	★	0067LB	8	12	47	3	A
	12	Int.	★	0067XB	16	20	47	3	A
0.68	1	Int.	★	0068SB	3.4	7.7	47	3	A
	5	Int.	★	0068LB	8	12	47	3	A
	12	Int.	★	0068XB	16	20	47	3	A
0.69	1	Int.	★	0069SB	3.4	7.7	47	3	A
	5	Int.	★	0069LB	8	12	47	3	A
	12	Int.	★	0069XB	16	20	47	3	A
0.70	1	Int.	●	0070SB	3.4	7.7	47	3	A
	5	Int.	★	0070LB	8	12	47	3	A
	12	Int.	★	0070XB	16	20	47	3	A
0.71	1	Int.	★	0071SB	3.6	7.9	50	3	A
	5	Int.	★	0071LB	10	14	50	3	A
	12	Int.	★	0071XB	20	24	50	3	A
0.72	1	Int.	★	0072SB	3.6	7.9	50	3	A
	5	Int.	★	0072LB	10	14	50	3	A
	12	Int.	★	0072XB	20	24	50	3	A
0.73	1	Int.	★	0073SB	3.6	7.8	50	3	A
	5	Int.	★	0073LB	10	14	50	3	A
	12	Int.	★	0073XB	20	24	50	3	A
0.74	1	Int.	★	0074SB	3.6	7.8	50	3	A
	5	Int.	★	0074LB	10	14	50	3	A
	12	Int.	★	0074XB	20	24	50	3	A
0.75	1	Int.	★	0075SB	3.6	7.8	50	3	A
	5	Int.	●	0075LB	10	14	50	3	A
	12	Int.	●	0075XB	20	24	50	3	A
0.76	1	Int.	★	0076SB	3.9	8.1	50	3	A
	5	Int.	●	0076LB	10	14	50	3	A
	12	Int.	●	0076XB	20	24	50	3	A
0.77	1	Int.	★	0077SB	3.9	8.1	50	3	A
	5	Int.	★	0077LB	10	14	50	3	A
	12	Int.	★	0077XB	20	24	50	3	A
0.78	1	Int.	★	0078SB	3.9	8.0	50	3	A
	5	Int.	★	0078LB	10	14	50	3	A
	12	Int.	●	0078XB	20	24	50	3	A
0.79	1	Int.	★	0079SB	3.9	8.0	50	3	A
	5	Int.	★	0079LB	10	14	50	3	A
	12	Int.	★	0079XB	20	24	50	3	A

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4	Type
0.80	1	Int.	●	MWS0080SB	3.9	8.0	50	3	A
	5	Int.	●	0080LB	10	14	50	3	A
	12	Int.	●	0080XB	20	24	50	3	A
0.81	1	Int.	★	0081SB	4.1	8.2	50	3	A
	5	Int.	★	0081LB	10	14	50	3	A
	12	Int.	★	0081XB	20	24	50	3	A
0.82	1	Int.	★	0082SB	4.1	8.2	50	3	A
	5	Int.	●	0082LB	10	14	50	3	A
	12	Int.	★	0082XB	20	24	50	3	A
0.83	1	Int.	★	0083SB	4.1	8.1	50	3	A
	5	Int.	●	0083LB	10	14	50	3	A
	12	Int.	★	0083XB	20	24	50	3	A
0.84	1	Int.	★	0084SB	4.1	8.1	50	3	A
	5	Int.	★	0084LB	10	14	50	3	A
	12	Int.	★	0084XB	20	24	50	3	A
0.85	1	Int.	★	0085SB	4.1	8.1	50	3	A
	5	Int.	●	0085LB	10	14	50	3	A
	12	Int.	★	0085XB	20	24	50	3	A
0.86	1	Int.	●	0086SB	4.4	8.4	50	3	A
	5	Int.	★	0086LB	10	14	50	3	A
	12	Int.	★	0086XB	20	24	50	3	A
0.87	1	Int.	★	0087SB	4.4	8.4	50	3	A
	5	Int.	★	0087LB	10	14	50	3	A
	12	Int.	★	0087XB	20	24	50	3	A
0.88	1	Int.	★	0088SB	4.4	8.4	50	3	A
	5	Int.	★	0088LB	10	14	50	3	A
	12	Int.	★	0088XB	20	24	50	3	A
0.89	1	Int.	★	0089SB	4.4	8.3	50	3	A
	5	Int.	★	0089LB	10	14	50	3	A
	12	Int.	★	0089XB	20	24	50	3	A
0.90	1	Int.	●	0090SB	4.4	8.3	50	3	A
	5	Int.	●	0090LB	10	14	50	3	A
	12	Int.	★	0090XB	20	24	50	3	A
0.91	1	Int.	★	0091SB	4.6	8.5	50	3	A
	5	Int.	★	0091LB	10	14	50	3	A
	12	Int.	★	0091XB	20	24	50	3	A
0.92	1	Int.	★	0092SB	4.6	8.5	50	3	A
	5	Int.	★	0092LB	10	14	50	3	A
	12	Int.	★	0092XB	20	24	50	3	A
0.93	1	Int.	★	0093SB	4.6	8.5	50	3	A
	5	Int.	●	0093LB	10	14	50	3	A
	12	Int.	★	0093XB	20	24	50	3	A
0.94	1	Int.	★	0094SB	4.6	8.4	50	3	A
	5	Int.	★	0094LB	10	14	50	3	A
	12	Int.	★	0094XB	20	24	50	3	A
0.95	1	Int.	★	0095SB	4.6	8.4	50	3	A
	5	Int.	★	0095LB	10	14	50	3	A
	12	Int.	★	0095XB	20	24	50	3	A

CUTTING CONDITIONS P.32

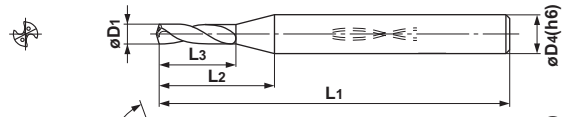
MICRO-MWS

METRIC STANDARD

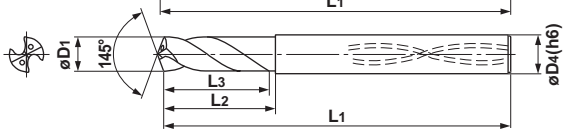
		0.5≤D1<1	1≤D1≤2.95
D1 Tolerance (mm)	MWS-SB	+0.009 0	+0.014 0
	MWS-LB/XB	0 −0.009	0 −0.014
	MWS-DB		0 −0.014
D4 Tolerance (mm)		0 −0.006	0 −0.006

SB Type
(For pilot holes)

Type A

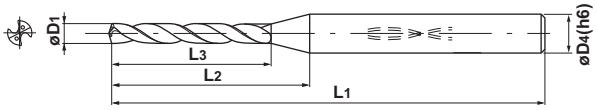


Type B

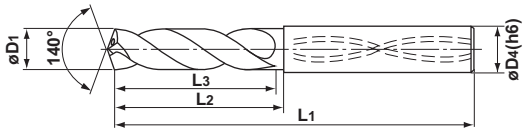


LB/XB Type

Type A



Type B



DB Type

For features, see page 5.
(Note) MWS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
0.96	1	Int.	★	MWS0096SB	4.9	8.7	50	3	A
	5	Int.	★	0096LB	10	14	50	3	A
	12	Int.	★	0096XB	20	24	50	3	A
0.97	1	Int.	●	0097SB	4.9	8.7	50	3	A
	5	Int.	●	0097LB	10	14	50	3	A
	12	Int.	★	0097XB	20	24	50	3	A
0.98	1	Int.	★	0098SB	4.9	8.7	50	3	A
	5	Int.	★	0098LB	10	14	50	3	A
	12	Int.	★	0098XB	20	24	50	3	A
0.99	1	Int.	●	0099SB	4.9	8.7	50	3	A
	5	Int.	★	0099LB	10	14	50	3	A
	12	Int.	★	0099XB	20	24	50	3	A
1.00	1	Int.	●	0100SB	5.0	8.7	55	3	A
	NEW 5	Int.	●	0100LB	11	15	55	3	A
	12	Int.	●	0100XB	23	27	55	3	A
	20	Int.	●	0100X20DB	24	28	60	3	A
	25	Int.	●	0100X25DB	28	32	66	3	A
	30	Int.	●	0100X30DB	33	37	72	3	A
1.05	1	Int.	□	0105SB	5.2	8.8	55	3	A
	20	Int.	□	0105X20DB	24	28	60	3	A
	25	Int.	●	0105X25DB	29	33	66	3	A
	30	Int.	□	0105X30DB	35	38	72	3	A

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
1.10	1	Int.	●	MWS0110SB	5.4	8.9	55	3	A
	12	Int.	●	0110XB	23	27	55	3	A
	20	Int.	★	0110X20DB	25	29	60	3	A
	25	Int.	●	0110X25DB	31	34	66	3	A
	30	Int.	★	0110X30DB	36	40	72	3	A
1.15	1	Int.	□	0115SB	5.6	9.1	55	3	A
	20	Int.	□	0115X20DB	26	30	60	3	A
	25	Int.	□	0115X25DB	32	36	66	3	A
	30	Int.	□	0115X30DB	38	41	72	3	A
1.20	1	Int.	●	0120SB	6.0	9.4	55	3	A
	12	Int.	●	0120XB	23	26	55	3	A
	20	Int.	●	0120X20DB	28	31	60	3	A
	25	Int.	●	0120X25DB	34	37	66	3	A
	30	Int.	●	0120X30DB	40	43	72	3	A
1.25	1	Int.	□	0125SB	6.2	9.5	55	3	A
	20	Int.	●	0125X20DB	29	32	68	3	A
	25	Int.	□	0125X25DB	35	38	74	3	A
	30	Int.	□	0125X30DB	41	45	82	3	A

* Please contact us for any geometry that is not in this catalogue (e.g. different diameters and lengths can be made to order).

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

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
1.30	1	Int.	●	MWS0130SB	6.4	9.6	55	3	A
	12	Int.	●	0130XB	23	26	55	3	A
	20	Int.	●	0130X20DB	30	33	68	3	A
	25	Int.	●	0130X25DB	36	40	74	3	A
	30	Int.	●	0130X30DB	43	46	82	3	A
1.35	1	Int.	□	0135SB	6.6	9.7	55	3	A
	20	Int.	□	0135X20DB	31	34	68	3	A
	25	Int.	□	0135X25DB	38	41	74	3	A
	30	Int.	□	0135X30DB	45	48	82	3	A
1.40	1	Int.	●	0140SB	7.0	10.0	55	3	A
	12	Int.	●	0140XB	23	26	55	3	A
	20	Int.	●	0140X20DB	32	35	68	3	A
	25	Int.	●	0140X25DB	39	42	74	3	A
	30	Int.	●	0140X30DB	46	49	82	3	A
1.45	1	Int.	□	0145SB	7.2	10.1	55	3	A
	20	Int.	●	0145X20DB	33	36	68	3	A
	25	Int.	□	0145X25DB	41	43	74	3	A
	30	Int.	□	0145X30DB	48	51	82	3	A
1.50	1	Int.	●	0150SB	7.4	10.2	55	3	A
	NEW 5	Int.	●	0150LB	17	20	55	3	A
	12	Int.	●	0150XB	23	26	55	3	A
	20	Int.	●	0150X20DB	35	37	68	3	A
	25	Int.	●	0150X25DB	42	45	74	3	A
	30	Int.	●	0150X30DB	50	52	82	3	A
1.55	1	Int.	□	0155SB	7.6	10.3	68	3	A
	20	Int.	●	0155X20DB	36	38	78	3	A
	25	Int.	□	0155X25DB	43	46	86	3	A
	30	Int.	□	0155X30DB	51	54	95	3	A
1.60	1	Int.	●	0160SB	8.0	10.6	68	3	A
	12	Int.	●	0160XB	30	33	68	3	A
	20	Int.	●	0160X20DB	37	39	78	3	A
	25	Int.	●	0160X25DB	45	47	86	3	A
	30	Int.	●	0160X30DB	53	55	95	3	A
1.65	1	Int.	□	0165SB	8.2	10.7	68	3	A
	20	Int.	□	0165X20DB	38	40	78	3	A
	25	Int.	□	0165X25DB	46	49	86	3	A
	30	Int.	□	0165X30DB	54	57	95	3	A
1.70	1	Int.	★	0170SB	8.4	10.8	68	3	A
	12	Int.	●	0170XB	30	32	68	3	A
	20	Int.	●	0170X20DB	39	42	78	3	A
	25	Int.	●	0170X25DB	48	50	86	3	A
	30	Int.	★	0170X30DB	56	59	95	3	A

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
1.75	1	Int.	●	MWS0175SB	8.6	10.9	68	3	A
	20	Int.	□	0175X20DB	40	43	84	3	A
	25	Int.	□	0175X25DB	49	51	94	3	A
	30	Int.	□	0175X30DB	58	60	102	3	A
1.80	1	Int.	●	0180SB	9.0	11.2	68	3	A
	12	Int.	●	0180XB	30	32	68	3	A
	20	Int.	●	0180X20DB	41	44	84	3	A
	25	Int.	●	0180X25DB	50	53	94	3	A
	30	Int.	●	0180X30DB	59	62	102	3	A
1.85	1	Int.	□	0185SB	9.2	11.3	68	3	A
	20	Int.	□	0185X20DB	43	45	84	3	A
	25	Int.	□	0185X25DB	52	54	94	3	A
	30	Int.	□	0185X30DB	61	63	102	3	A
1.90	1	Int.	★	0190SB	9.4	11.5	68	3	A
	12	Int.	★	0190XB	30	32	68	3	A
	20	Int.	●	0190X20DB	44	46	84	3	A
	25	Int.	●	0190X25DB	53	55	94	3	A
	30	Int.	●	0190X30DB	63	65	102	3	A
1.95	1	Int.	□	0195SB	9.6	11.6	68	3	A
	20	Int.	□	0195X20DB	45	47	84	3	A
	25	Int.	□	0195X25DB	55	57	94	3	A
	30	Int.	□	0195X30DB	64	66	102	3	A
2.00	1	Int.	●	0200SB	10.0	11.9	68	3	A
	NEW 5	Int.	●	0200LB	22	24	68	3	A
	12	Int.	●	0200XB	30	32	68	3	A
	20	Int.	●	0200X20DB	46	48	84	3	A
	25	Int.	●	0200X25DB	56	58	94	3	A
	30	Int.	●	0200X30DB	66	68	102	3	A
2.05	1	Int.	●	0205SB	10.2	12.0	74	3	A
	20	Int.	□	0205X20DB	47	49	94	3	A
	25	Int.	□	0205X25DB	57	59	107	3	A
	30	Int.	□	0205X30DB	68	69	118	3	A
2.10	1	Int.	●	0210SB	10.4	12.1	74	3	A
	12	Int.	●	0210XB	38	40	74	3	A
	20	Int.	★	0210X20DB	48	50	94	3	A
	25	Int.	★	0210X25DB	59	60	107	3	A
	30	Int.	●	0210X30DB	69	71	118	3	A
2.15	1	Int.	□	0215SB	10.6	12.2	74	3	A
	20	Int.	□	0215X20DB	49	51	94	3	A
	25	Int.	□	0215X25DB	60	62	107	3	A
	30	Int.	□	0215X30DB	71	73	118	3	A

CUTTING CONDITIONS P.32

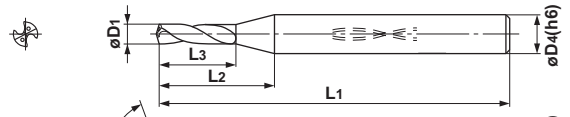
MICRO-MWS

METRIC STANDARD

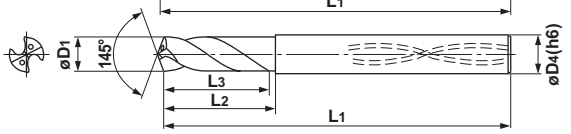
		0.5≤D1<1	1≤D1≤2.95
D1 Tolerance (mm)	MWS-SB	+0.009 0	+0.014 0
	MWS-LB/XB	0 −0.009	0 −0.014
	MWS-DB		0 −0.014
D4 Tolerance (mm)		0 −0.006	0 −0.006

SB Type
(For pilot holes)

Type A

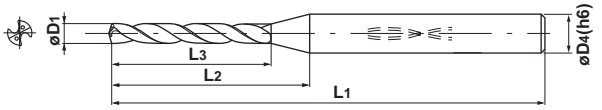


Type B

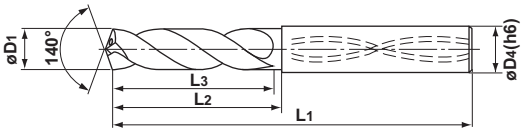


LB/XB Type

Type A



Type B



DB Type

For features, see page 5.
(Note) MWS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
2.20	1	Int.	●	MWS0220SB	11.0	12.5	74	3	A
	12	Int.	●	0220XB	38	39	74	3	A
	20	Int.	★	0220X20DB	51	52	94	3	A
	25	Int.	★	0220X25DB	62	63	107	3	A
	30	Int.	●	0220X30DB	73	74	118	3	A
2.25	1	Int.	●	0225SB	11.2	12.6	74	3	A
	20	Int.	□	0225X20DB	52	53	94	3	A
	25	Int.	□	0225X25DB	63	64	107	3	A
	30	Int.	□	0225X30DB	74	76	118	3	A
2.30	1	Int.	●	0230SB	11.4	12.7	74	3	A
	12	Int.	●	0230XB	38	39	74	3	A
	20	Int.	●	0230X20DB	53	54	94	3	A
	25	Int.	●	0230X25DB	64	66	107	3	A
	30	Int.	●	0230X30DB	76	77	118	3	A
2.35	1	Int.	●	0235SB	11.6	12.8	74	3	A
	20	Int.	●	0235X20DB	54	55	94	3	A
	25	Int.	□	0235X25DB	66	67	107	3	A
	30	Int.	□	0235X30DB	78	79	118	3	A

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
2.40	1	Int.	●	MWS0240SB	12.0	13.1	74	3	A
	12	Int.	●	0240XB	38	39	74	3	A
	20	Int.	●	0240X20DB	55	56	94	3	A
	25	Int.	●	0240X25DB	67	68	107	3	A
	30	Int.	●	0240X30DB	79	80	118	3	A
2.45	1	Int.	□	0245SB	12.2	13.2	74	3	A
	20	Int.	□	0245X20DB	56	57	94	3	A
	25	Int.	□	0245X25DB	69	70	107	3	A
	30	Int.	□	0245X30DB	81	82	118	3	A
2.50	1	Int.	●	0250SB	12.4	13.3	74	3	A
	NEW 5	Int.	●	0250LB	28	29	74	3	A
	12	Int.	●	0250XB	38	39	74	3	A
	20	Int.	●	0250X20DB	58	59	94	3	A
	25	Int.	●	0250X25DB	70	71	107	3	A
	30	Int.	●	0250X30DB	83	84	118	3	A
2.55	1	Int.	□	0255SB	12.6	12.6	81	3	B
	20	Int.	□	0255X20DB	59	59	103	3	B
	25	Int.	□	0255X25DB	71	71	117	3	B
	30	Int.	□	0255X30DB	84	84	132	3	B

* Please contact us for any geometry that is not in this catalogue (e.g. different diameters and lengths can be made to order).

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

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
2.60	1	Int.	●	MWS0260SB	13.0	13.0	81	3	B
	12	Int.	●	0260XB	45	45	81	3	B
	20	Int.	●	0260X20DB	60	60	103	3	B
	25	Int.	●	0260X25DB	73	73	117	3	B
	30	Int.	●	0260X30DB	86	86	132	3	B
2.65	1	Int.	□	0265SB	13.2	13.2	81	3	B
	20	Int.	□	0265X20DB	61	61	103	3	B
	25	Int.	□	0265X25DB	74	74	117	3	B
	30	Int.	□	0265X30DB	87	87	132	3	B
2.70	1	Int.	●	0270SB	13.4	13.4	81	3	B
	12	Int.	●	0270XB	45	45	81	3	B
	20	Int.	★	0270X20DB	62	62	103	3	B
	25	Int.	●	0270X25DB	76	76	117	3	B
	30	Int.	●	0270X30DB	89	89	132	3	B
2.75	1	Int.	□	0275SB	13.6	13.6	81	3	B
	20	Int.	□	0275X20DB	63	63	103	3	B
	25	Int.	□	0275X25DB	77	77	117	3	B
	30	Int.	□	0275X30DB	91	91	132	3	B

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
2.80	1	Int.	●	MWS0280SB	14.0	14.0	81	3	B
	12	Int.	●	0280XB	45	45	81	3	B
	20	Int.	●	0280X20DB	64	64	103	3	B
	25	Int.	●	0280X25DB	78	78	117	3	B
	30	Int.	●	0280X30DB	92	92	132	3	B
2.85	1	Int.	□	0285SB	14.2	14.2	81	3	B
	20	Int.	□	0285X20DB	66	66	103	3	B
	25	Int.	□	0285X25DB	80	80	117	3	B
	30	Int.	□	0285X30DB	94	94	132	3	B
2.90	1	Int.	●	0290SB	14.4	14.4	81	3	B
	NEW 5	Int.	●	0290LB	33	33	81	3	B
	12	Int.	●	0290XB	45	45	81	3	B
	20	Int.	★	0290X20DB	67	67	103	3	B
	25	Int.	★	0290X25DB	81	81	117	3	B
	30	Int.	★	0290X30DB	96	96	132	3	B
2.95	1	Int.	□	0295SB	14.6	14.6	81	3	B
	20	Int.	□	0295X20DB	68	68	103	3	B
	25	Int.	□	0295X25DB	83	83	117	3	B
	30	Int.	□	0295X30DB	97	97	132	3	B

RECOMMENDED CUTTING CONDITIONS

SB/LB/XB Type Drill

Work Material		Drill Diameter / Conditions / Hardness	ϕ.0197"–ϕ.0276" ϕ0.50–ϕ0.70 mm Cutting Speed (SFM)	Feed (IPR)	ϕ.0280"–ϕ.0335" ϕ0.71–ϕ0.85 mm Cutting Speed (SFM)	Feed (IPR)	ϕ.0339"–ϕ.0390" ϕ0.86–ϕ0.99mm Cutting Speed (SFM)	Feed (IPR)	ϕ.0394"–ϕ.1200" ϕ1.0–ϕ2.95 mm Cutting Speed (SFM)	Feed (IPR)
P	Mild Steel	≤180HB	165 (130–200)	.0004 (.0002–.0006)	165 (130–200)	.0008 (.0004–.0012)	165 (130–200)	.0012 (.0008–.0020)	200 (165–230)	.0031 (.0016–.0047)
P	Carbon Steel Alloy Steel	180–280HB	165 (130–200)	.0004 (.0002–.0006)	165 (130–200)	.0008 (.0004–.0012)	165 (130–200)	.0012 (.0008–.0020)	200 (165–230)	.0031 (.0016–.0047)
P	Carbon Steel Alloy Steel	280–350HB	165 (130–200)	.0004 (.0002–.0006)	165 (130–200)	.0008 (.0004–.0012)	165 (130–200)	.0012 (.0008–.0020)	165 (130–200)	.0031 (.0016–.0047)
M	Stainless Steel	≤200HB	100 (65–130)	.0003 (.0002–.0004)	100 (65–130)	.0006 (.0003–.0008)	100 (65–130)	.0008 (.0004–.0012)	100 (65–130)	.0020 (.0008–.0039)
K	Cast Iron	Tensile Strength ≤350MPa	165 (130–200)	.0006 (.0003–.0008)	165 (130–200)	.0008 (.0004–.0012)	165 (130–200)	.0016 (.0008–.0024)	165 (130–200)	.0032 (.0016–.0047)
K	Ductile Cast Iron	Tensile Strength ≤450MPa	100 (65–130)	.0004 (.0002–.0006)	100 (65–130)	.0008 (.0004–.0012)	100 (65–130)	.0012 (.0008–.0020)	100 (65–130)	.0024 (.0008–.0039)
N	Aluminium Alloy	–	200 (165–260)	.0012 (.0008–.0020)	200 (165–260)	.0016 (.0012–.0024)	200 (165–260)	.0024 (.0016–.0032)	200 (165–260)	.0039 (.0020–.0059)
S	Heat Resistant Alloy	–	35 (15–50)	.00025 (.00015–.0003)	35 (15–50)	.0004 (.0002–.0008)	35 (15–50)	.0004 (.0002–.0008)	35 (15–50)	.0012 (.0004–.0020)

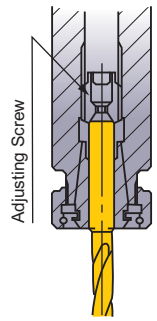
DB Type Long Drill

Work Material		Drill Diameter / Conditions / Hardness	ϕ.0394"–ϕ.0787" ϕ1.0–ϕ2.0 mm Cutting Speed (SFM)	Feed (IPR)	ϕ.0807"–ϕ.1161" ϕ2.05–ϕ2.95 mm Cutting Speed (SFM)	Feed (IPR)
P	Mild Steel	≤180HB	165 (130–200)	.0031 (.0016–.0039)	200 (165–230)	.0039 (.0031–.0047)
P	Carbon Steel Alloy Steel	180–280HB	130 (100–165)	.0028 (.0016–.0031)	165 (130–200)	.0035 (.0024–.0047)
P	Carbon Steel Alloy Steel	280–350HB	100 (65–130)	.0016 (.0012–.0024)	165 (130–200)	.0028 (.0020–.0039)
M	Stainless Steel	≤200HB	100 (65–130)	.0012 (.0004–.0020)	100 (65–130)	.0024 (.0016–.0031)
K	Cast Iron	Tensile Strength ≤350MPa	130 (100–165)	.0028 (.0016–.0031)	165 (130–200)	.0035 (.0024–.0047)
K	Ductile Cast Iron	Tensile Strength ≤450MPa	100 (65–130)	.0016 (.0012–.0024)	165 (130–200)	.0028 (.0020–.0039)
S	Heat Resistant Alloy	–	30 (15–50)	.0008 (.0004–.0012)	50 (30–65)	.0012 (.0004–.0020)

MICRO-MWS

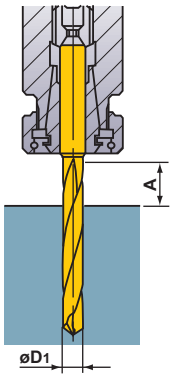
Operational Guidance for MICRO-MWS drills

Drill Holding



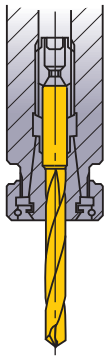
Thrust bearing type collet chuck holds the drill securely.

Drill Length



A ≥ D1 x 2

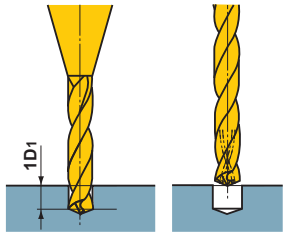
Drill Installation



NG

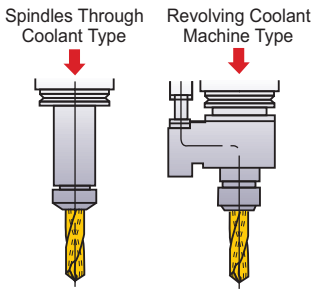
Do not clamp on the flutes.

Drill Installation



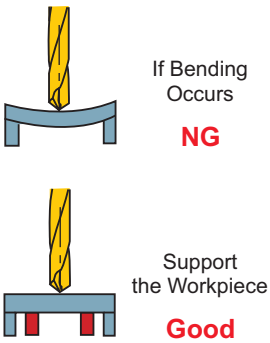
①For pilot hole drilling, use the SB type drill.
②Use the prepared hole as a guide when using a drill with an oil hole. Depending on the cutting conditions, peck feed is recommended.

Through Coolant Type



Recommended coolant pressure:
≥ 3Mpa
At least 1.5Mpa is required.

Thin Workpiece



If Bending Occurs

NG

Support the Workpiece

Good

Coolant Handling

1) Small particles of swarf will jam in the oil hole of small diameter drills. Always use a fine mesh filter as a preventative measure.

2) Dirt and dust particles adhere to the oil in old coolant and prevent an efficient flow. Regular coolant exchange is recommended.

Cautions for use

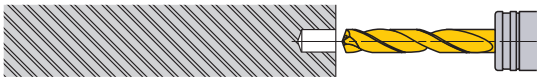
- Please use a fine mesh filter (mesh ≤ 3μm) for coolant to prevent jamming in the oil hole.
- For deep drilling with the long type drill, machining a pilot hole is recommended.
  (Otherwise, centrifugal forces may cause drill breakage.)

Operational Guidance for MWS Long Type Drills (L/D≥10)

Flat Face Drilling

●Drilling a blind hole

1. Drilling a pilot hole



①Use the SB type drill.
②Ensure a high precision hole is drilled for the guide.
③Drill depth : Approx 1D.

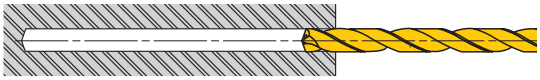
2. Initial cutting with the long type drill

①Penetrate the pilot hole at a low revolution. (Revolution speed 500-1000min^{-1}, feed rate .008—.012IPR)
②Stop the long type drill .020—.039inch short of the pilot hole bottom.

3. Drill the deep hole

①Start cutting at the recommended speed and feed with a non-peck (continuous feed) cycle.

4. Drill retraction

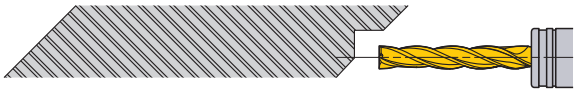


①After drilling, lower the cutting revolution about .020—.039inch short of the hole end. (Revolution speed of around 500-1000min^{-1})
②Retract the drill to the pilot hole depth starting point at a feed rate of 120 inch/min.
③Finally clear the hole at a cutting speed of 65—100SFM and feed rate of .008—.012IPR.

Irregular Face Drilling

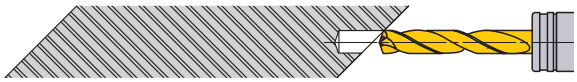
●Drilling and breaking through on irregular faces or angles

1. Spot facing



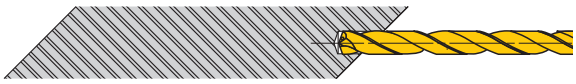
①Machine a flat on the irregular face by using an end mill or slot drill capable of spot facing. Make the spot face diameter the same size as the required deep hole diameter.

2. Drilling a pilot hole



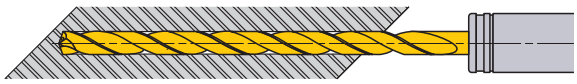
①Use a drill with a larger (flatter) point angle than the long type. The MWS-SB type is recommended.
②Ensure a high precision hole is drilled for the guide.
③Drill depth : Approx 1D.

3. Initial cutting with the long type drill



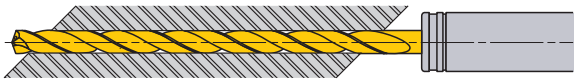
①Penetrate the pilot hole at a low revolution. (Revolution speed 500-1000min^{-1}, feed rate .008—.012IPR)
②Stop the long type drill .020—.039inch short of the pilot hole bottom.

4. Drill the deep hole



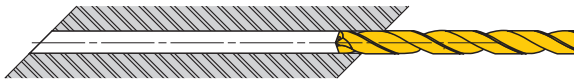
①Start cutting at the recommended speed and feed with a non-peck (continuous feed) cycle.

5. Breaking through



①When breaking through, the cutting edge can be damaged.
②Feed rate should be half the normal feed.

6. Drill retraction



①Retract the drill to the pilot hole depth starting point at a feed rate of 120 inch/min.
②Finally clear the hole at a revolution speed of 500-1000min^{-1} and feed rate of .008—.012IPR.

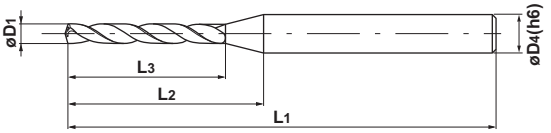
MICRO-MZE/MZS

INCH STANDARD

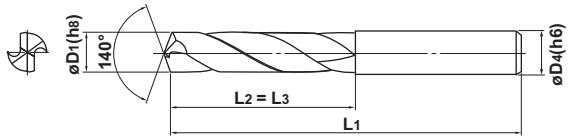
	.0394≤D1<.1094	D1=.1200
D1 Tolerance (inch)	0 −.00055	0 −.00071
D4 Tolerance (inch)	0 −.00031	0 −.00031

MZE (External coolant)

Type A

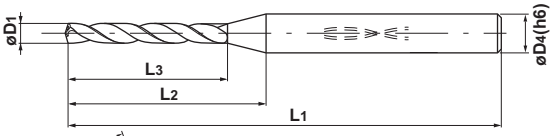


Type B

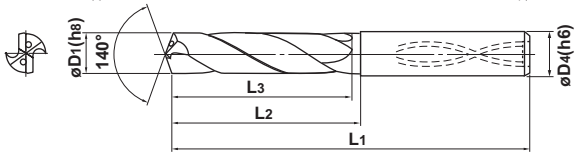


MZS (Internal coolant)

Type A



Type B



For features, see page 11.

(Note) MICRO-MZE/MZS type can be used for shrink fit holders.

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4	Type
.0394	2	Ext.	●	MZE00394SB	.236	.396	2.165	.1250	A
	5	Int.	●	MZS00394LB	.433	.593	2.165	.1250	A
.0400	2	Ext.	●	MZE00400SB	.276	.435	2.165	.1250	A
	5	Int.	●	MZS00400LB	.669	.828	2.165	.1250	A
.0410	2	Ext.	●	MZE00410SB	.276	.433	2.165	.1250	A
	5	Int.	●	MZS00410LB	.669	.826	2.165	.1250	A
.0420	2	Ext.	●	MZE00420SB	.276	.431	2.165	.1250	A
	5	Int.	●	MZS00420LB	.669	.826	2.165	.1250	A
.0430	2	Ext.	●	MZE00430SB	.276	.429	2.165	.1250	A
	5	Int.	●	MZS00430LB	.669	.822	2.165	.1250	A
.0465	2	Ext.	●	MZE00465SB	.315	.461	2.165	.1250	A
	5	Int.	●	MZS00465LB	.669	.815	2.165	.1250	A
.0520	2	Ext.	●	MZE00520SB	.354	.490	2.165	.1250	A
	5	Int.	●	MZS00520LB	.669	.805	2.165	.1250	A
.0550	2	Ext.	●	MZE00550SB	.354	.485	2.165	.1250	A
	5	Int.	●	MZS00550LB	.669	.800	2.165	.1250	A
.0591	2	Ext.	●	MZE00591SB	.354	.477	2.165	.1250	A
	5	Int.	●	MZS00591LB	.669	.792	2.165	.1250	A
.0625	2	Ext.	●	MZE00625SB	.394	.511	2.165	.1250	A
	5	Int.	●	MZS00625LB	.866	.983	2.677	.1250	A
.0635	2	Ext.	●	MZE00635SB	.394	.509	2.165	.1250	A
	5	Int.	●	MZS00635LB	.866	.981	2.677	.1250	A
.0670	2	Ext.	●	MZE00670SB	.433	.541	2.165	.1250	A
	5	Int.	●	MZS00670LB	.866	.974	2.677	.1250	A
.0700	2	Ext.	●	MZE00700SB	.433	.536	2.165	.1250	A
	5	Int.	●	MZS00700LB	.866	.969	2.677	.1250	A
.0730	2	Ext.	●	MZE00730SB	.433	.530	2.165	.1250	A
	5	Int.	●	MZS00730LB	.866	.963	2.677	.1250	A
.0760	2	Ext.	●	MZE00760SB	.433	.524	2.165	.1250	A
	5	Int.	●	MZS00760LB	.866	.957	2.677	.1250	A
.0785	2	Ext.	●	MZE00785SB	.433	.520	2.165	.1250	A
	5	Int.	●	MZS00785LB	.866	.953	2.677	.1250	A
.0810	2	Ext.	●	MZE00810SB	.630	.712	2.165	.1250	A
	5	Int.	●	MZS00810LB	1.102	1.184	2.913	.1250	A
.0860	2	Ext.	●	MZE00860SB	.630	.703	2.165	.1250	A
	5	Int.	●	MZS00860LB	1.102	1.175	2.913	.1250	A
.0890	2	Ext.	●	MZE00890SB	.630	.697	2.165	.1250	A
	5	Int.	●	MZS00890LB	1.102	1.169	2.913	.1250	A
.0938	2	Ext.	●	MZE00938SB	.630	.688	2.165	.1250	A
	5	Int.	●	MZS00938LB	1.102	1.160	2.913	.1250	A
.0960	2	Ext.	●	MZE00960SB	.630	.684	2.165	.1250	A
	5	Int.	●	MZS00960LB	1.102	1.156	2.913	.1250	A
.1010	2	Ext.	●	MZE01010SB	.630	.630	2.165	.1250	B
	5	Int.	●	MZS01010LB	1.299	1.299	3.189	.1250	B
.1040	2	Ext.	●	MZE01040SB	.630	.630	2.165	.1250	B
	5	Int.	●	MZS01040LB	1.299	1.299	3.189	.1250	B
.1060	2	Ext.	●	MZE01060SB	.630	.630	2.165	.1250	B
	5	Int.	●	MZS01060LB	1.299	1.299	3.189	.1250	B
.1094	2	Ext.	●	MZE01094SB	.630	.630	2.165	.1250	B
	5	Int.	●	MZS01094LB	1.299	1.299	3.189	.1250	B
.1200	2	Ext.	●	MZE01200SB	.709	.709	2.165	.1250	B
	5	Int.	●	MZS01200LB	1.535	1.535	3.425	.1250	B

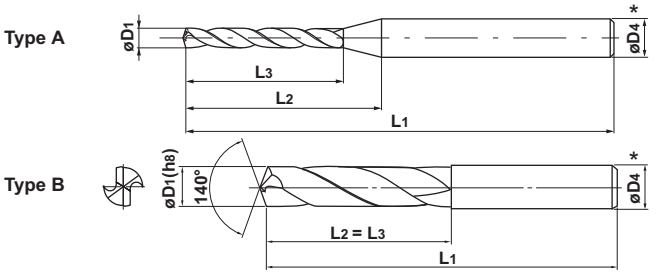
● : Inventory maintained. ★ : Inventory maintained in Japan.

METRIC STANDARD

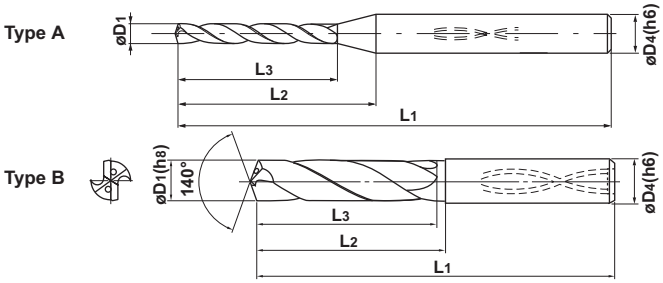
		D1<2	2≤D1≤3
D1 Tolerance (mm)		0 −0.014	0 −0.014
D4 Tolerance (mm)	MZE	0 −0.006	0 −0.014
	MZS	0 −0.006	0 −0.006

MZE (External coolant)

∗øD4<2 :h6
2≤øD4 :h8



MZS (Internal coolant)



(Note 1) MICRO-MZE···SB type can be used for shrink fit holders.
(Note 2) MICRO-MZS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
1.0	2	Ext.	★	MZE0100SB	6	8	55	2.0	A
	5	Int.	★	MZS0100LB	11	15	55	3.0	A
1.1	2	Ext.	★	MZE0110SB	7	9	55	2.0	A
	5	Int.	★	MZS0110LB	17	21	55	3.0	A
1.2	2	Ext.	★	MZE0120SB	8	9	55	2.0	A
	5	Int.	★	MZS0120LB	17	20	55	3.0	A
1.3	2	Ext.	★	MZE0130SB	8	9	55	2.0	A
	5	Int.	★	MZS0130LB	17	20	55	3.0	A
1.4	2	Ext.	★	MZE0140SB	9	10	55	2.0	A
	5	Int.	★	MZS0140LB	17	20	55	3.0	A
1.5	2	Ext.	★	MZE0150SB	9	10	55	2.0	A
	5	Int.	★	MZS0150LB	17	20	55	3.0	A
1.6	2	Ext.	★	MZE0160SB	10	10	55	2.0	B
	5	Int.	★	MZS0160LB	22	25	68	3.0	A
1.7	2	Ext.	★	MZE0170SB	10	10	55	2.0	B
	5	Int.	★	MZS0170LB	22	24	68	3.0	A
1.8	2	Ext.	★	MZE0180SB	11	11	55	2.0	B
	5	Int.	★	MZS0180LB	22	24	68	3.0	A
1.9	2	Ext.	★	MZE0190SB	11	11	55	2.0	B
	5	Int.	★	MZS0190LB	22	24	68	3.0	A
2.0	2	Ext.	★	MZE0200SA	12	12	55	2.0	B
	3	Ext.	★	MZE0200MA	16	16	55	2.0	B
	3	Int.	★	MZS0200MB	16	18	62	3.0	A
	5	Int.	★	MZS0200LB	22	24	68	3.0	A
2.1	2	Ext.	★	MZE0210SA	12	12	55	2.1	B
	3	Ext.	★	MZE0210MA	16	16	55	2.1	B
	5	Int.	★	MZS0210LB	28	30	74	3.0	A
2.2	2	Ext.	★	MZE0220SA	13	13	55	2.2	B
	3	Ext.	★	MZE0220MA	18	18	55	2.2	B
	5	Int.	★	MZS0220LB	28	29	74	3.0	A

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4	Type
2.3	2	Ext.	★	MZE0230SA	13	13	55	2.3	B
	3	Ext.	★	MZE0230MA	18	18	55	2.3	B
	3	Int.	★	MZS0230MB	20	21	66	3.0	A
	5	Int.	●	MZS0230LB	28	29	74	3.0	A
2.4	2	Ext.	●	MZE0240SA	16	16	55	2.4	B
	3	Ext.	★	MZE0240MA	20	20	55	2.4	B
	3	Int.	★	MZS0240MB	20	21	66	3.0	A
	5	Int.	●	MZS0240LB	28	29	74	3.0	A
2.5	2	Ext.	●	MZE0250SA	16	16	55	2.5	B
	3	Ext.	★	MZE0250MA	20	20	55	2.5	B
	3	Int.	★	MZS0250MB	20	21	66	3.0	A
	5	Int.	●	MZS0250LB	28	29	74	3.0	A
2.6	2	Ext.	★	MZE0260SA	16	16	55	2.6	B
	3	Ext.	★	MZE0260MA	20	20	55	2.6	B
	3	Int.	★	MZS0260MB	24	24	72	3.0	B
	5	Int.	★	MZS0260LB	33	33	81	3.0	B
2.7	2	Ext.	★	MZE0270SA	16	16	55	2.7	B
	3	Ext.	★	MZE0270MA	20	20	55	2.7	B
	3	Int.	★	MZS0270MB	24	24	72	3.0	B
	5	Int.	★	MZS0270LB	33	33	81	3.0	B
2.8	2	Ext.	●	MZE0280SA	16	16	55	2.8	B
	3	Ext.	★	MZE0280MA	21	21	60	2.8	B
	3	Int.	★	MZS0280MB	24	24	72	3.0	B
	5	Int.	●	MZS0280LB	33	33	81	3.0	B
2.9	2	Ext.	●	MZE0290SA	16	16	55	2.9	B
	3	Ext.	★	MZE0290MA	21	21	60	2.9	B
	3	Int.	★	MZS0290MB	24	24	72	3.0	B
	5	Int.	●	MZS0290LB	33	33	81	3.0	B

CUTTING CONDITIONS P.37

RECOMMENDED CUTTING CONDITIONS OF MICRO MZE/MZS DRILLS

●MZE(External Coolant)

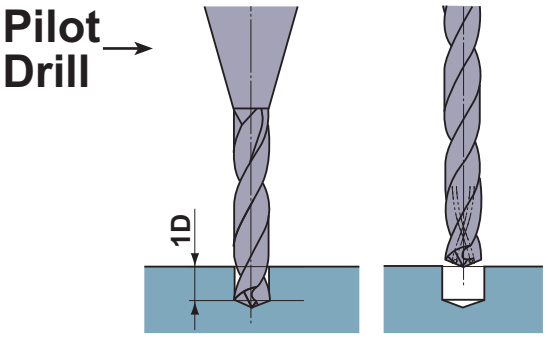
Work Material		Drill Diameter	ϕ.0394" – ϕ.1200" ϕ1.0 – ϕ2.9mm	
		Conditions / Hardness	Cutting Speed (SFM)	Feed (IPR)
P	Mild Steel	≤180HB	75	.0035
P	Carbon Steel Alloy Steel	180—280HB	65	.003
P	Carbon Steel Alloy Steel	280—350HB	55	.0025
M	Stainless Steel	≤200HB	50	.0015
K	Cast Iron	Tensile Strength ≤350MPa	80	.003
K	Ductile Cast Iron	Tensile Strength ≤450MPa	70	.003
S	Heat Resistant Alloy	—	32	.002
H	Hardened Steel	40—60HRC	32	.002

●MZS(Internal Coolant)

Work Material		Drill Diameter	ϕ.0394" – ϕ.1200" ϕ1.0 – ϕ2.9mm	
		Conditions / Hardness	Cutting Speed (SFM)	Feed (IPR)
P	Mild Steel	≤180HB	200	.0035
P	Carbon Steel Alloy Steel	180—280HB	175	.003
P	Carbon Steel Alloy Steel	280—350HB	150	.0025
M	Stainless Steel	≤200HB	100	.0015
K	Cast Iron	Tensile Strength ≤350MPa	190	.003
K	Ductile Cast Iron	Tensile Strength ≤450MPa	130	.003
N	Aluminum Alloy	—	200	.003
S	Heat Resistant Alloy	—	65	.0015

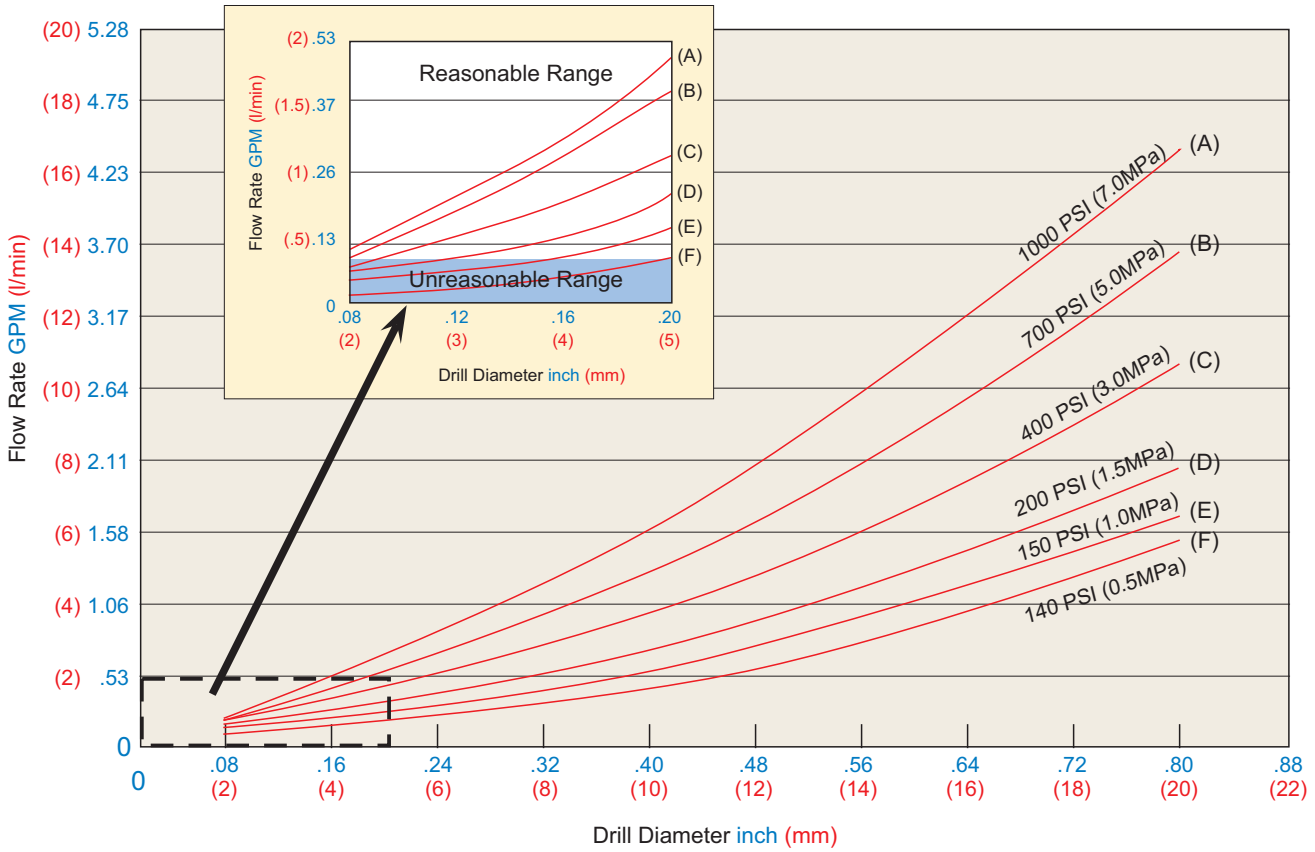
Special Application Notes:

- For safety and success, always pre-drill the hole with a pilot drill. This is especially true for drilling small sizes less than **.078" [2mm].**
- Minimum coolant pressure = **800psi** (5.5 MPa).
- Coolant must have Extreme Pressure **(EP)** Additives.
- Positive displacement type coolant pump is required.
- Coolant filter must be less than 5 microns. Fine filtration is necessary to prevent blockage of the coolant Holes.



Reasonable Coolant Flow and Pressure For MZS Drills

Flow Rate and Pressure



Performance Requirements

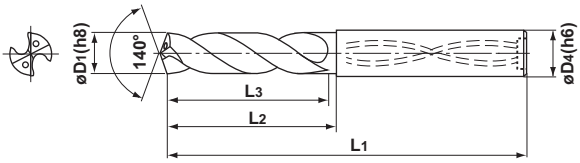
In order for micro MZS Drills to perform properly you must satisfy the following requirements.

1. High pressure pump system (800 psi or greater)
2. Filter to 5 microns
3. Runout <.0003 max.
4. Coolant with Extreme Pressure additives
5. Use MZE pilot drill
6. Recommended for rotating drill applications

INCH STANDARD

	.1250≤D1≤.2344	.2500≤D1≤.3906	.4062≤D1≤.7031	.7188≤D1≤.7812
D1 Tolerance (inch)	0 / − .00071	0 / − .00087	0 / − .00106	0 / − .00130
D4 Tolerance (inch)	0 / − .00031	0 / − .00035	0 / − .00043	0 / − .00051

MWS (Internal coolant)



For features, see page 7.

(Note 1) MWS type larger than ϕ.2031" have a recess in the end face.
(Note 2) MWS type can be used for shrink fit holders.

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.1250	5	Int.	●	MWS01250LB	1.535	1.535	3.425	.1575
	8	Int.	●	01250X8DB	1.535	1.535	3.425	.1575
.1405	5	Int.	●	01405LB	1.732	1.732	3.622	.1575
.1406	8	Int.	●	01406X8DB	1.732	1.732	3.622	.1575
.1495	5	Int.	●	01495LB	1.732	1.732	3.622	.1575
	8	Int.	●	01495X8DB	1.732	1.732	3.622	.1575
.1562	5	Int.	●	01562LB	1.732	1.732	3.622	.1575
	8	Int.	●	01562X8DB	1.732	1.732	3.622	.1575
.1590	5	Int.	●	01590LB	1.969	1.969	3.937	.1969
	8	Int.	●	01590X8DB	1.969	1.969	3.937	.1969
.1693	8	Int.	●	01693X8DB	1.969	1.969	3.937	.1969
.1719	5	Int.	●	01719LB	1.969	1.969	3.937	.1969
	8	Int.	●	01719X8DB	1.969	1.969	3.937	.1969
.1875	5	Int.	●	01875LB	2.165	2.165	4.134	.1969
	8	Int.	●	01875X8DB	2.165	2.165	4.134	.1969
.2031	5	Int.	●	02031LB	1.732	1.890	3.937	.2344
	8	Int.	●	02031X8DB	2.402	2.599	4.646	.2344
.2130	8	Int.	●	02130X8DB	2.402	2.599	4.646	.2344
.2188	5	Int.	●	02188LB	1.890	1.890	3.937	.2344
	8	Int.	●	02188X8DB	2.599	2.599	4.646	.2344
.2344	5	Int.	●	02344LB	1.890	1.890	3.937	.2344
	8	Int.	●	02344X8DB	2.599	2.599	4.646	.2344
.2500	5	Int.	●	02500LB	2.047	2.205	4.292	.2656
	8	Int.	●	02500X8DB	2.835	3.031	5.118	.2656
.2570	5	Int.	●	02570LB	2.205	2.205	4.292	.2656
	8	Int.	●	02570X8DB	3.031	3.031	5.118	.2656
.2656	5	Int.	●	02656LB	2.205	2.205	4.292	.2656
	8	Int.	●	02656X8DB	3.031	3.031	5.118	.2656
.2720	5	Int.	●	02720LB	2.205	2.205	4.292	.2720
	8	Int.	●	02720X8DB	3.031	3.031	5.118	.2720

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.2812	5	Int.	●	MWS02812LB	2.362	2.520	4.646	.3125
	8	Int.	●	02812X8DB	3.268	3.465	5.591	.3125
.2969	5	Int.	●	02969LB	2.520	2.520	4.646	.3125
	8	Int.	●	02969X8DB	3.465	3.465	5.591	.3125
.3125	5	Int.	●	03125LB	2.520	2.520	4.646	.3125
	8	Int.	●	03125X8DB	3.465	3.465	5.591	.3125
.3281	5	Int.	●	03281LB	2.677	2.835	5.000	.3438
	8	Int.	●	03281X8DB	3.701	3.898	6.063	.3438
.3320	5	Int.	●	03320LB	2.677	2.835	5.000	.3438
	8	Int.	●	03320X8DB	3.701	3.898	6.063	.3438
.3438	5	Int.	●	03438LB	2.835	2.835	5.000	.3438
	8	Int.	●	03438X8DB	3.898	3.898	6.063	.3438
.3594	5	Int.	●	03594LB	2.992	3.150	5.355	.3906
	8	Int.	●	03594X8DB	4.134	4.330	6.535	.3906
.3680	5	Int.	●	03680LB	2.992	3.150	5.355	3906
	8	Int.	●	03680X8DB	4.134	4.330	6.535	.3906
.3750	5	Int.	●	03750LB	3.150	3.150	5.355	.3906
	8	Int.	●	03750X8DB	4.330	4.330	6.535	.3906
.3906	5	Int.	●	03906LB	3.150	3.150	5.355	.3906
	8	Int.	●	03906X8DB	4.330	4.330	6.535	.3906
.4062	5	Int.	●	04062LB	3.307	3.464	5.866	.4219
	8	Int.	●	04062X8DB	4.567	4.764	7.165	.4219
.4219	5	Int.	●	04219LB	3.465	3.464	5.866	.4219
	8	Int.	●	04219X8DB	4.764	4.764	7.165	.4219
.4375	5	Int.	●	04375LB	3.622	3.780	6.221	.4688
	8	Int.	●	04375X8DB	5.000	5.197	7.638	.4688
.4531	5	Int.	●	04531LB	3.780	3.780	6.221	.4688
	8	Int.	●	04531X8DB	5.197	5.197	7.638	.4688
.4688	5	Int.	●	04688LB	3.780	3.780	6.221	.4688
	8	Int.	●	04688X8DB	5.197	5.197	7.638	.4688

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

● : Inventory maintained.

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.4844	5	Int.	●	MWS04844LB	3.937	4.095	6.575	.5000
	8	Int.	●	04844X8DB	5.433	5.630	8.110	.5000
.5000	5	Int.	●	05000LB	4.094	4.095	6.575	.5000
	8	Int.	●	05000X8DB	5.630	5.630	8.110	.5000
.5050	5	Int.	●	05050LB	4.094	4.095	6.575	.5118
.5118	5	Int.	●	05118LB	4.094	4.095	6.575	.5118
.5156	5	Int.	●	05156LB	4.250	4.409	6.922	.5469
.5312	5	Int.	●	05312LB	4.250	4.409	6.922	.5469
.5469	5	Int.	●	05469LB	4.406	4.409	6.922	.5469
.5625	5	Int.	●	05625LB	4.563	4.722	7.281	.5781
.5781	5	Int.	●	05781LB	4.719	4.722	7.281	.5781
.5937	5	Int.	●	05937LB	4.875	5.035	7.594	.6250
.6094	5	Int.	●	06094LB	4.875	5.035	7.594	.6250

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.6250	5	Int.	●	MWS06250LB	5.031	5.035	7.594	.6250
.6330	5	Int.	●	06330LB	5.197	5.354	7.913	.6563
.6406	5	Int.	●	06406LB	5.197	5.354	7.913	.6563
.6563	5	Int.	●	06563LB	5.354	5.354	7.913	.6563
.6718	5	Int.	●	06718LB	5.512	5.669	8.228	.7031
.6875	5	Int.	●	06875LB	5.512	5.669	8.228	.7031
.7031	5	Int.	●	07031LB	5.669	5.669	8.228	.7031
.7188	5	Int.	●	07188LB	5.827	5.984	8.543	.7344
.7344	5	Int.	●	07344LB	5.984	5.984	8.543	.7344
.7500	5	Int.	●	07500LB	6.142	6.299	8.858	.7812
.7580	5	Int.	●	07580LB	6.142	6.299	8.858	.7812
.7656	5	Int.	●	07656LB	6.142	6.299	8.858	.7812
.7812	5	Int.	●	07812LB	6.299	6.299	8.858	.7812

RECOMMENDED CUTTING CONDITIONS

	Work Material	Drill Diameter / Conditions / Hardness	ϕ.1250" – ϕ.2344" Cutting Speed (SFM)	ϕ.1250" – ϕ.2344" Feed (IPR)	ϕ.2500" – ϕ.3906" Cutting Speed (SFM)	ϕ.2500" – ϕ.3906" Feed (IPR)
P	Mild Steel	≤180HB	360 (160—390)	.008 (.006—.012)	430 (260—460)	.010 (.008—.014)
P	Carbon Steel Alloy Steel	180—280HB	300 (160—330)	.008 (.006—.012)	360 (230—390)	.010 (.008—.014)
P	Carbon Steel Alloy Steel	280—350HB	260 (130—300)	.008 (.006—.010)	300 (200—360)	.010 (.006—.012)
M	Stainless Steel	≤200HB	200 (70—330)	.004 (.002—.006)	260 (130—390)	.008 (.004—.010)
K	Cast Iron	Tensile Strength ≤350MPa	330 (230—390)	.010 (.006—.012)	430 (330—460)	.012 (.006—.014)
K	Ductile Cast Iron	Tensile Strength ≤450MPa	200 (100—260)	.008 (.006—.010)	230 (130—300)	.008 (.006—.012)
N	Aluminum Alloy	—	390 (260—490)	.010 (.008—.014)	490 (330—560)	.012 (.008—.020)
S	Heat Resistant Alloy	—	70 (30—80)	.004 (.002—.006)	80 (50—100)	.005 (.002—.006)

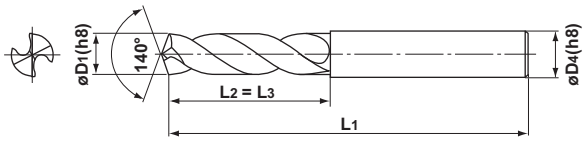
	Work Material	Drill Diameter / Conditions / Hardness	ϕ.4062" – ϕ.5469" Cutting Speed (SFM)	ϕ.4062" – ϕ.5469" Feed (IPR)	ϕ.5625" – ϕ.7812" Cutting Speed (SFM)	ϕ.5625" – ϕ.7812" Feed (IPR)
P	Mild Steel	≤180HB	490 (300—560)	.012 (.008—.016)	525 (330—590)	.014 (.008—.016)
P	Carbon Steel Alloy Steel	180—280HB	430 (260—460)	.010 (.008—.016)	460 (330—490)	.012 (.008—.016)
P	Carbon Steel Alloy Steel	280—350HB	360 (230—430)	.010 (.006—.014)	390 (295—460)	.012 (.008—.016)
M	Stainless Steel	≤200HB	300 (160—390)	.010 (.006—.012)	330 (195—390)	.010 (.006—.012)
K	Cast Iron	Tensile Strength ≤350MPa	490 (360—520)	.014 (.010—.016)	525 (390—555)	.014 (.010—.016)
K	Ductile Cast Iron	Tensile Strength ≤450MPa	300 (160—360)	.010 (.008—.016)	330 (195—360)	.012 (.008—.039)
N	Aluminum Alloy	—	520 (330—560)	.016 (.008—.032)	555 (330—590)	.020 (.008—.039)
S	Heat Resistant Alloy	—	80 (50—100)	.006 (.004—.008)	100 (80—115)	.008 (.004—.010)

MWE/MWS

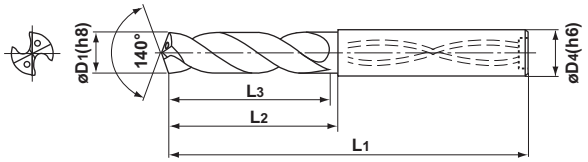
METRIC STANDARD

		D_1=3	3<D_1≤6	6<D_1≤10	10<D_1≤18	18<D_1≤25
D_1 Tolerance (mm)		$^{0}_{-0.014}$	$^{0}_{-0.018}$	$^{0}_{-0.022}$	$^{0}_{-0.027}$	$^{0}_{-0.033}$
D_4 Tolerance (mm)	MWE	$^{0}_{-0.014}$	$^{0}_{-0.018}$	$^{0}_{-0.022}$	$^{0}_{-0.027}$	$^{0}_{-0.033}$
	MWS	$^{0}_{-0.006}$	$^{0}_{-0.008}$	$^{0}_{-0.009}$	$^{0}_{-0.011}$	$^{0}_{-0.013}$

MWE (External coolant)



MWS (Internal coolant)



For features, see page 7.

(Note 1) MWS type larger than ϕ5.0 have a recess in the end face.
(Note 2) MWS type can be used for shrink fit holders.

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
3.0	2	Ext.	●	MWE0300SA	16	16	55	3.0
	3	Ext.	●	MWE0300MA	21	21	60	3.0
	3	Int.	●	MWS0300MB	24	24	72	3.0
	5	Int.	●	MWS0300LB	33	33	81	3.0
	8	Int.	●	MWS0300X8DB	35	35	81	3.0
3.1	2	Ext.	●	MWE0310SA	18	18	55	3.1
	3	Ext.	●	MWE0310MA	24	24	60	3.1
	3	Int.	●	MWS0310MB	28	28	76	4.0
	5	Int.	●	MWS0310LB	39	39	87	4.0
	8	Int.	●	MWS0310X8DB	41	41	87	4.0
3.2	2	Ext.	●	MWE0320SA	18	18	55	3.2
	3	Ext.	●	MWE0320MA	24	24	60	3.2
	3	Int.	●	MWS0320MB	28	28	76	4.0
	5	Int.	●	MWS0320LB	39	39	87	4.0
	8	Int.	●	MWS0320X8DB	41	41	87	4.0
3.3	2	Ext.	●	MWE0330SA	18	18	55	3.3
	3	Ext.	●	MWE0330MA	24	24	60	3.3
	3	Int.	●	MWS0330MB	28	28	76	4.0
	5	Int.	●	MWS0330LB	39	39	87	4.0
	8	Int.	●	MWS0330X8DB	41	41	87	4.0
3.4	2	Ext.	●	MWE0340SA	20	20	55	3.4
	3	Ext.	●	MWE0340MA	24	24	60	3.4
	3	Int.	●	MWS0340MB	28	28	76	4.0
	5	Int.	●	MWS0340LB	39	39	87	4.0
	8	Int.	●	MWS0340X8DB	41	41	87	4.0
3.5	2	Ext.	●	MWE0350SA	20	20	55	3.5
	3	Ext.	●	MWE0350MA	24	24	60	3.5
	3	Int.	●	MWS0350MB	28	28	76	4.0
	5	Int.	●	MWS0350LB	39	39	87	4.0
	8	Int.	●	MWS0350X8DB	41	41	87	4.0

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
3.6	2	Ext.	●	MWE0360SA	20	20	55	3.6
	3	Ext.	●	MWE0360MA	27	27	60	3.6
	3	Int.	●	MWS0360MB	32	32	80	4.0
	5	Int.	●	MWS0360LB	44	44	92	4.0
	8	Int.	●	MWS0360X8DB	46	46	92	4.0
3.7	2	Ext.	●	MWE0370SA	20	20	55	3.7
	3	Ext.	●	MWE0370MA	27	27	60	3.7
	3	Int.	●	MWS0370MB	32	32	80	4.0
	5	Int.	●	MWS0370LB	44	44	92	4.0
	8	Int.	●	MWS0370X8DB	46	46	92	4.0
3.8	2	Ext.	●	MWE0380SA	22	22	55	3.8
	3	Ext.	●	MWE0380MA	27	27	60	3.8
	3	Int.	●	MWS0380MB	32	32	80	4.0
	5	Int.	●	MWS0380LB	44	44	92	4.0
	8	Int.	●	MWS0380X8DB	46	46	92	4.0
3.9	2	Ext.	●	MWE0390SA	22	22	55	3.9
	3	Ext.	●	MWE0390MA	27	27	60	3.9
	3	Int.	●	MWS0390MB	32	32	80	4.0
	5	Int.	●	MWS0390LB	44	44	92	4.0
	8	Int.	●	MWS0390X8DB	46	46	92	4.0
4.0	2	Ext.	●	MWE0400SA	22	22	55	4.0
	3	Ext.	●	MWE0400MA	27	27	60	4.0
	3	Int.	●	MWS0400MB	32	32	80	4.0
	5	Int.	●	MWS0400LB	44	44	92	4.0
	8	Int.	●	MWS0400X8DB	46	46	92	4.0
4.1	2	Ext.	●	MWE0410SA	22	22	55	4.1
	3	Ext.	●	MWE0410MA	29	29	63	4.1
	3	Int.	●	MWS0410MB	36	36	86	5.0
	5	Int.	●	MWS0410LB	50	50	100	5.0
	8	Int.	●	MWS0410X8DB	52	52	100	5.0

● : Inventory maintained.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
4.2	2	Ext.	●	MWE0420SA	22	22	55	4.2
	3	Ext.	●	MWE0420MA	29	29	63	4.2
	3	Int.	●	MWS0420MB	36	36	86	5.0
	5	Int.	●	MWS0420LB	50	50	100	5.0
	8	Int.	●	MWS0420X8DB	52	52	100	5.0
4.3	2	Ext.	●	MWE0430SA	24	24	58	4.3
	3	Ext.	●	MWE0430MA	29	29	63	4.3
	3	Int.	●	MWS0430MB	36	36	86	5.0
	5	Int.	●	MWS0430LB	50	50	100	5.0
	8	Int.	●	MWS0430X8DB	52	52	100	5.0
4.4	2	Ext.	●	MWE0440SA	24	24	58	4.4
	3	Ext.	●	MWE0440MA	29	29	63	4.4
	3	Int.	●	MWS0440MB	36	36	86	5.0
	5	Int.	●	MWS0440LB	50	50	100	5.0
	8	Int.	●	MWS0440X8DB	52	52	100	5.0
4.5	2	Ext.	●	MWE0450SA	24	24	58	4.5
	3	Ext.	●	MWE0450MA	29	29	63	4.5
	3	Int.	●	MWS0450MB	36	36	86	5.0
	5	Int.	●	MWS0450LB	50	50	100	5.0
	8	Int.	●	MWS0450X8DB	52	52	100	5.0
4.6	2	Ext.	●	MWE0460SA	24	24	58	4.6
	3	Ext.	●	MWE0460MA	32	32	68	4.6
	3	Int.	●	MWS0460MB	40	40	90	5.0
	5	Int.	●	MWS0460LB	55	55	105	5.0
	8	Int.	●	MWS0460X8DB	57	57	105	5.0
4.7	2	Ext.	●	MWE0470SA	24	24	58	4.7
	3	Ext.	●	MWE0470MA	32	32	68	4.7
	3	Int.	●	MWS0470MB	40	40	90	5.0
	5	Int.	●	MWS0470LB	55	55	105	5.0
	8	Int.	●	MWS0470X8DB	57	57	105	5.0
4.8	2	Ext.	●	MWE0480SA	26	26	62	4.8
	3	Ext.	●	MWE0480MA	32	32	68	4.8
	3	Int.	●	MWS0480MB	40	40	90	5.0
	5	Int.	●	MWS0480LB	55	55	105	5.0
	8	Int.	●	MWS0480X8DB	57	57	105	5.0
4.9	2	Ext.	●	MWE0490SA	26	26	62	4.9
	3	Ext.	●	MWE0490MA	32	32	68	4.9
	3	Int.	●	MWS0490MB	40	40	90	5.0
	5	Int.	●	MWS0490LB	55	55	105	5.0
	8	Int.	●	MWS0490X8DB	57	57	105	5.0
5.0	2	Ext.	●	MWE0500SA	26	26	62	5.0
	3	Ext.	●	MWE0500MA	32	32	68	5.0
	3	Int.	●	MWS0500MB	27.5	30	82	6.0
	5	Int.	●	MWS0500LB	44	48	100	6.0
	8	Int.	●	MWS0500X8DB	57	57	105	5.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
5.1	2	Ext.	●	MWE0510SA	26	26	62	5.1
	3	Ext.	●	MWE0510MA	34	34	72	5.1
	3	Int.	●	MWS0510MB	27.5	30	82	6.0
	5	Int.	●	MWS0510LB	44	48	100	6.0
	8	Int.	●	MWS0510X8DB	61	66	118	6.0
5.2	2	Ext.	●	MWE0520SA	26	26	62	5.2
	3	Ext.	●	MWE0520MA	34	34	72	5.2
	3	Int.	●	MWS0520MB	27.5	30	82	6.0
	5	Int.	●	MWS0520LB	44	48	100	6.0
	8	Int.	●	MWS0520X8DB	61	66	118	6.0
5.3	2	Ext.	●	MWE0530SA	26	26	62	5.3
	3	Ext.	●	MWE0530MA	34	34	72	5.3
	3	Int.	●	MWS0530MB	27.5	30	82	6.0
	5	Int.	●	MWS0530LB	44	48	100	6.0
	8	Int.	●	MWS0530X8DB	61	66	118	6.0
5.4	2	Ext.	●	MWE0540SA	28	28	66	5.4
	3	Ext.	●	MWE0540MA	34	34	72	5.4
	3	Int.	●	MWS0540MB	27.5	30	82	6.0
	5	Int.	●	MWS0540LB	44	48	100	6.0
	8	Int.	●	MWS0540X8DB	61	66	118	6.0
5.5	2	Ext.	●	MWE0550SA	28	28	66	5.5
	3	Ext.	●	MWE0550MA	34	34	72	5.5
	3	Int.	●	MWS0550MB	27.5	30	82	6.0
	5	Int.	●	MWS0550LB	44	48	100	6.0
	8	Int.	●	MWS0550X8DB	61	66	118	6.0
5.6	2	Ext.	●	MWE0560SA	28	28	66	5.6
	3	Ext.	●	MWE0560MA	36	36	74	5.6
	3	Int.	●	MWS0560MB	30	30	82	6.0
	5	Int.	●	MWS0560LB	48	48	100	6.0
	8	Int.	●	MWS0560X8DB	66	66	118	6.0
5.7	2	Ext.	●	MWE0570SA	28	28	66	5.7
	3	Ext.	●	MWE0570MA	36	36	74	5.7
	3	Int.	●	MWS0570MB	30	30	82	6.0
	5	Int.	●	MWS0570LB	48	48	100	6.0
	8	Int.	●	MWS0570X8DB	66	66	118	6.0
5.8	2	Ext.	●	MWE0580SA	28	28	66	5.8
	3	Ext.	●	MWE0580MA	36	36	74	5.8
	3	Int.	●	MWS0580MB	30	30	82	6.0
	5	Int.	●	MWS0580LB	48	48	100	6.0
	8	Int.	●	MWS0580X8DB	66	66	118	6.0
5.9	2	Ext.	●	MWE0590SA	28	28	66	5.9
	3	Ext.	●	MWE0590MA	36	36	74	5.9
	3	Int.	●	MWS0590MB	30	30	82	6.0
	5	Int.	●	MWS0590LB	48	48	100	6.0
	8	Int.	●	MWS0590X8DB	66	66	118	6.0

NEXT PAGE

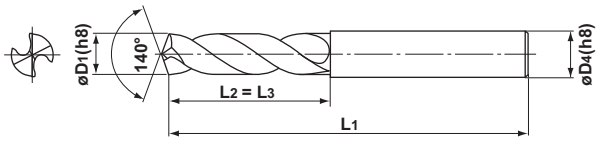
CUTTING CONDITIONS P.50

MWE/MWS

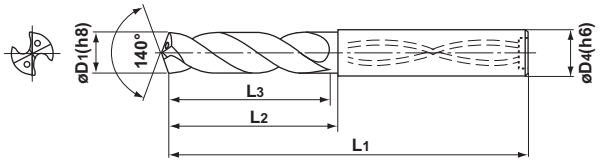
METRIC STANDARD

		D1=3	3<D1≤6	6<D1≤10	10<D1≤18	18<D1≤25
D1 Tolerance (mm)		0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
D4 Tolerance (mm)	MWE	0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
	MWS	0 −0.006	0 −0.008	0 −0.009	0 −0.011	0 −0.013

MWE (External coolant)



MWS (Internal coolant)



For features, see page 7.

(Note 1) MWS type larger than ϕ5.0 have a recess in the end face.
(Note 2) MWS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
6.0	2	Ext.	●	MWE0600SA	28	28	66	6.0
	3	Ext.	●	MWE0600MA	41	41	81	6.0
	3	Int.	●	MWS0600MB	30	30	82	6.0
	5	Int.	●	MWS0600LB	48	48	100	6.0
	8	Int.	●	MWS0600X8DB	66	66	118	6.0
6.1	2	Ext.	●	MWE0610SA	31	31	70	6.1
	3	Ext.	●	MWE0610MA	41	41	81	6.1
	3	Int.	●	MWS0610MB	32.5	35	88	7.0
	5	Int.	●	MWS0610LB	52	56	109	7.0
	8	Int.	●	MWS0610X8DB	72	77	130	7.0
6.2	2	Ext.	●	MWE0620SA	31	31	70	6.2
	3	Ext.	●	MWE0620MA	41	41	81	6.2
	3	Int.	●	MWS0620MB	32.5	35	88	7.0
	5	Int.	●	MWS0620LB	52	56	109	7.0
	8	Int.	●	MWS0620X8DB	72	77	130	7.0
6.3	2	Ext.	●	MWE0630SA	31	31	70	6.3
	3	Ext.	●	MWE0630MA	41	41	81	6.3
	3	Int.	●	MWS0630MB	32.5	35	88	7.0
	5	Int.	●	MWS0630LB	52	56	109	7.0
	8	Int.	●	MWS0630X8DB	72	77	130	7.0
6.4	2	Ext.	●	MWE0640SA	31	31	70	6.4
	3	Ext.	●	MWE0640MA	41	41	81	6.4
	3	Int.	●	MWS0640MB	32.5	35	88	7.0
	5	Int.	●	MWS0640LB	52	56	109	7.0
	8	Int.	●	MWS0640X8DB	72	77	130	7.0
6.5	2	Ext.	●	MWE0650SA	31	31	70	6.5
	3	Ext.	●	MWE0650MA	41	41	81	6.5
	3	Int.	●	MWS0650MB	32.5	35	88	7.0
	5	Int.	●	MWS0650LB	52	56	109	7.0
	8	Int.	●	MWS0650X8DB	72	77	130	7.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
6.6	2	Ext.	●	MWE0660SA	31	31	70	6.6
	3	Ext.	●	MWE0660MA	43	43	83	6.6
	3	Int.	●	MWS0660MB	35	35	88	7.0
	5	Int.	●	MWS0660LB	56	56	109	7.0
	8	Int.	●	MWS0660X8DB	77	77	130	7.0
6.7	2	Ext.	●	MWE0670SA	31	31	70	6.7
	3	Ext.	●	MWE0670MA	43	43	83	6.7
	3	Int.	●	MWS0670MB	35	35	88	7.0
	5	Int.	●	MWS0670LB	56	56	109	7.0
	8	Int.	●	MWS0670X8DB	77	77	130	7.0
6.8	2	Ext.	●	MWE0680SA	34	34	74	6.8
	3	Ext.	●	MWE0680MA	43	43	83	6.8
	3	Int.	●	MWS0680MB	35	35	88	7.0
	5	Int.	●	MWS0680LB	56	56	109	7.0
	8	Int.	●	MWS0680X8DB	77	77	130	7.0
6.9	2	Ext.	●	MWE0690SA	34	34	74	6.9
	3	Ext.	●	MWE0690MA	43	43	83	6.9
	3	Int.	●	MWS0690MB	35	35	88	7.0
	5	Int.	●	MWS0690LB	56	56	109	7.0
	8	Int.	●	MWS0690X8DB	77	77	130	7.0
7.0	2	Ext.	●	MWE0700SA	34	34	74	7.0
	3	Ext.	●	MWE0700MA	43	43	83	7.0
	3	Int.	●	MWS0700MB	35	35	88	7.0
	5	Int.	●	MWS0700LB	56	56	109	7.0
	8	Int.	●	MWS0700X8DB	77	77	130	7.0
7.1	2	Ext.	●	MWE0710SA	34	34	74	7.1
	3	Ext.	●	MWE0710MA	45	45	87	7.1
	3	Int.	●	MWS0710MB	37.5	40	94	8.0
	5	Int.	●	MWS0710LB	60	64	118	8.0
	8	Int.	●	MWS0710X8DB	83	88	142	8.0

● : Inventory maintained.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
7.2	2	Ext.	●	MWE0720SA	34	34	74	7.2
	3	Ext.	●	MWE0720MA	45	45	87	7.2
	3	Int.	●	MWS0720MB	37.5	40	94	8.0
	5	Int.	●	MWS0720LB	60	64	118	8.0
	8	Int.	●	MWS0720X8DB	83	88	142	8.0
7.3	2	Ext.	●	MWE0730SA	34	34	74	7.3
	3	Ext.	●	MWE0730MA	45	45	87	7.3
	3	Int.	●	MWS0730MB	37.5	40	94	8.0
	5	Int.	●	MWS0730LB	60	64	118	8.0
	8	Int.	●	MWS0730X8DB	83	88	142	8.0
7.4	2	Ext.	●	MWE0740SA	34	34	74	7.4
	3	Ext.	●	MWE0740MA	45	45	87	7.4
	3	Int.	●	MWS0740MB	37.5	40	94	8.0
	5	Int.	●	MWS0740LB	60	64	118	8.0
	8	Int.	●	MWS0740X8DB	83	88	142	8.0
7.5	2	Ext.	●	MWE0750SA	34	34	74	7.5
	3	Ext.	●	MWE0750MA	45	45	87	7.5
	3	Int.	●	MWS0750MB	37.5	40	94	8.0
	5	Int.	●	MWS0750LB	60	64	118	8.0
	8	Int.	●	MWS0750X8DB	83	88	142	8.0
7.6	2	Ext.	●	MWE0760SA	37	37	79	7.6
	3	Ext.	●	MWE0760MA	48	48	90	7.6
	3	Int.	●	MWS0760MB	40	40	94	8.0
	5	Int.	●	MWS0760LB	64	64	118	8.0
	8	Int.	●	MWS0760X8DB	88	88	142	8.0
7.7	2	Ext.	●	MWE0770SA	37	37	79	7.7
	3	Ext.	●	MWE0770MA	48	48	90	7.7
	3	Int.	●	MWS0770MB	40	40	94	8.0
	5	Int.	●	MWS0770LB	64	64	118	8.0
	8	Int.	●	MWS0770X8DB	88	88	142	8.0
7.8	2	Ext.	●	MWE0780SA	37	37	79	7.8
	3	Ext.	●	MWE0780MA	48	48	90	7.8
	3	Int.	●	MWS0780MB	40	40	94	8.0
	5	Int.	●	MWS0780LB	64	64	118	8.0
	8	Int.	●	MWS0780X8DB	88	88	142	8.0
7.9	2	Ext.	●	MWE0790SA	37	37	79	7.9
	3	Ext.	●	MWE0790MA	48	48	90	7.9
	3	Int.	●	MWS0790MB	40	40	94	8.0
	5	Int.	●	MWS0790LB	64	64	118	8.0
	8	Int.	●	MWS0790X8DB	88	88	142	8.0
8.0	2	Ext.	●	MWE0800SA	37	37	79	8.0
	3	Ext.	●	MWE0800MA	48	48	90	8.0
	3	Int.	●	MWS0800MB	40	40	94	8.0
	5	Int.	●	MWS0800LB	64	64	118	8.0
	8	Int.	●	MWS0800X8DB	88	88	142	8.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
8.1	2	Ext.	●	MWE0810SA	37	37	79	8.1
	3	Ext.	●	MWE0810MA	53	53	96	8.1
	3	Int.	●	MWS0810MB	42.5	45	100	9.0
	5	Int.	●	MWS0810LB	68	72	127	9.0
	8	Int.	●	MWS0810X8DB	94	99	154	9.0
8.2	2	Ext.	●	MWE0820SA	37	37	79	8.2
	3	Ext.	●	MWE0820MA	53	53	96	8.2
	3	Int.	●	MWS0820MB	42.5	45	100	9.0
	5	Int.	●	MWS0820LB	68	72	127	9.0
	8	Int.	●	MWS0820X8DB	94	99	154	9.0
8.3	2	Ext.	●	MWE0830SA	37	37	79	8.3
	3	Ext.	●	MWE0830MA	53	53	96	8.3
	3	Int.	●	MWS0830MB	42.5	45	100	9.0
	5	Int.	●	MWS0830LB	68	72	127	9.0
	8	Int.	●	MWS0830X8DB	94	99	154	9.0
8.4	2	Ext.	●	MWE0840SA	37	37	79	8.4
	3	Ext.	●	MWE0840MA	53	53	96	8.4
	3	Int.	●	MWS0840MB	42.5	45	100	9.0
	5	Int.	●	MWS0840LB	68	72	127	9.0
	8	Int.	●	MWS0840X8DB	94	99	154	9.0
8.5	2	Ext.	●	MWE0850SA	37	37	79	8.5
	3	Ext.	●	MWE0850MA	53	53	96	8.5
	3	Int.	●	MWS0850MB	42.5	45	100	9.0
	5	Int.	●	MWS0850LB	68	72	127	9.0
	8	Int.	●	MWS0850X8DB	94	99	154	9.0
8.6	2	Ext.	●	MWE0860SA	40	40	84	8.6
	3	Ext.	●	MWE0860MA	55	55	98	8.6
	3	Int.	●	MWS0860MB	45	45	100	9.0
	5	Int.	●	MWS0860LB	72	72	127	9.0
	8	Int.	●	MWS0860X8DB	99	99	154	9.0
8.7	2	Ext.	●	MWE0870SA	40	40	84	8.7
	3	Ext.	●	MWE0870MA	55	55	98	8.7
	3	Int.	●	MWS0870MB	45	45	100	9.0
	5	Int.	●	MWS0870LB	72	72	127	9.0
	8	Int.	●	MWS0870X8DB	99	99	154	9.0
8.8	2	Ext.	●	MWE0880SA	40	40	84	8.8
	3	Ext.	●	MWE0880MA	55	55	98	8.8
	3	Int.	●	MWS0880MB	45	45	100	9.0
	5	Int.	●	MWS0880LB	72	72	127	9.0
	8	Int.	●	MWS0880X8DB	99	99	154	9.0
8.9	2	Ext.	●	MWE0890SA	40	40	84	8.9
	3	Ext.	●	MWE0890MA	55	55	98	8.9
	3	Int.	●	MWS0890MB	45	45	100	9.0
	5	Int.	●	MWS0890LB	72	72	127	9.0
	8	Int.	●	MWS0890X8DB	99	99	154	9.0

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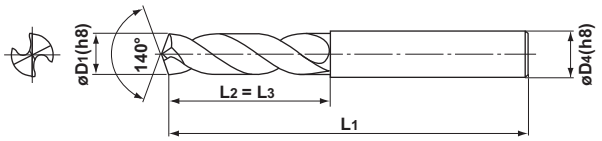
CUTTING CONDITIONS P.50

MWE/MWS

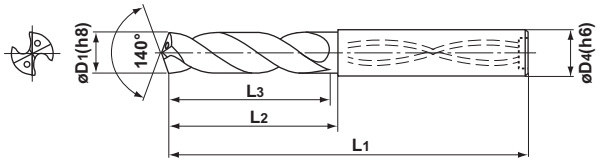
METRIC STANDARD

		D1=3	3<D1≤6	6<D1≤10	10<D1≤18	18<D1≤25
D1 Tolerance (mm)		0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
D4 Tolerance (mm)	MWE	0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
	MWS	0 −0.006	0 −0.008	0 −0.009	0 −0.011	0 −0.013

MWE (External coolant)



MWS (Internal coolant)



For features, see page 7.

(Note 1) MWS type larger than ϕ5.0 have a recess in the end face.
(Note 2) MWS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
9.0	2	Ext.	●	MWE0900SA	40	40	84	9.0
	3	Ext.	●	MWE0900MA	55	55	98	9.0
	3	Int.	●	MWS0900MB	45	45	100	9.0
	5	Int.	●	MWS0900LB	72	72	127	9.0
	8	Int.	●	MWS0900X8DB	99	99	154	9.0
9.1	2	Ext.	●	MWE0910SA	40	40	84	9.1
	3	Ext.	●	MWE0910MA	58	58	102	9.1
	3	Int.	●	MWS0910MB	47.5	50	106	10.0
	5	Int.	●	MWS0910LB	76	80	136	10.0
	8	Int.	●	MWS0910X8DB	105	110	166	10.0
9.2	2	Ext.	●	MWE0920SA	40	40	84	9.2
	3	Ext.	●	MWE0920MA	58	58	102	9.2
	3	Int.	●	MWS0920MB	47.5	50	106	10.0
	5	Int.	●	MWS0920LB	76	80	136	10.0
	8	Int.	●	MWS0920X8DB	105	110	166	10.0
9.3	2	Ext.	●	MWE0930SA	40	40	84	9.3
	3	Ext.	●	MWE0930MA	58	58	102	9.3
	3	Int.	●	MWS0930MB	47.5	50	106	10.0
	5	Int.	●	MWS0930LB	76	80	136	10.0
	8	Int.	●	MWS0930X8DB	105	110	166	10.0
9.4	2	Ext.	●	MWE0940SA	40	40	84	9.4
	3	Ext.	●	MWE0940MA	58	58	102	9.4
	3	Int.	●	MWS0940MB	47.5	50	106	10.0
	5	Int.	●	MWS0940LB	76	80	136	10.0
	8	Int.	●	MWS0940X8DB	105	110	166	10.0
9.5	2	Ext.	●	MWE0950SA	40	40	84	9.5
	3	Ext.	●	MWE0950MA	58	58	102	9.5
	3	Int.	●	MWS0950MB	47.5	50	106	10.0
	5	Int.	●	MWS0950LB	76	80	136	10.0
	8	Int.	●	MWS0950X8DB	105	110	166	10.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
9.6	2	Ext.	●	MWE0960SA	43	43	89	9.6
	3	Ext.	●	MWE0960MA	60	60	105	9.6
	3	Int.	●	MWS0960MB	50	50	106	10.0
	5	Int.	●	MWS0960LB	80	80	136	10.0
	8	Int.	●	MWS0960X8DB	110	110	166	10.0
9.7	2	Ext.	●	MWE0970SA	43	43	89	9.7
	3	Ext.	●	MWE0970MA	60	60	105	9.7
	3	Int.	●	MWS0970MB	50	50	106	10.0
	5	Int.	●	MWS0970LB	80	80	136	10.0
	8	Int.	●	MWS0970X8DB	110	110	166	10.0
9.8	2	Ext.	●	MWE0980SA	43	43	89	9.8
	3	Ext.	●	MWE0980MA	60	60	105	9.8
	3	Int.	●	MWS0980MB	50	50	106	10.0
	5	Int.	●	MWS0980LB	80	80	136	10.0
	8	Int.	●	MWS0980X8DB	110	110	166	10.0
9.9	2	Ext.	●	MWE0990SA	43	43	89	9.9
	3	Ext.	●	MWE0990MA	60	60	105	9.9
	3	Int.	●	MWS0990MB	50	50	106	10.0
	5	Int.	●	MWS0990LB	80	80	136	10.0
	8	Int.	●	MWS0990X8DB	110	110	166	10.0
10.0	2	Ext.	●	MWE1000SA	43	43	89	10.0
	3	Ext.	●	MWE1000MA	60	60	105	10.0
	3	Int.	●	MWS1000MB	50	50	106	10.0
	5	Int.	●	MWS1000LB	80	80	136	10.0
	8	Int.	●	MWS1000X8DB	110	110	166	10.0
10.1	2	Ext.	●	MWE1010SA	43	43	89	10.1
	3	Ext.	●	MWE1010MA	66	66	112	10.1
	3	Int.	●	MWS1010MB	52.5	55	116	11.0
	5	Int.	●	MWS1010LB	84	88	149	11.0
	8	Int.	●	MWS1010X8DB	116	121	182	11.0

● : Inventory maintained.

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
10.2	2	Ext.	●	MWE1020SA	43	43	89	10.2
	3	Ext.	●	MWE1020MA	66	66	112	10.2
	3	Int.	●	MWS1020MB	52.5	55	116	11.0
	5	Int.	●	MWS1020LB	84	88	149	11.0
	8	Int.	●	MWS1020X8DB	116	121	182	11.0
10.3	2	Ext.	●	MWE1030SA	43	43	89	10.3
	3	Ext.	●	MWE1030MA	66	66	112	10.3
	3	Int.	●	MWS1030MB	52.5	55	116	11.0
	5	Int.	●	MWS1030LB	84	88	149	11.0
	8	Int.	●	MWS1030X8DB	116	121	182	11.0
10.4	2	Ext.	●	MWE1040SA	43	43	89	10.4
	3	Ext.	●	MWE1040MA	66	66	112	10.4
	3	Int.	●	MWS1040MB	52.5	55	116	11.0
	5	Int.	●	MWS1040LB	84	88	149	11.0
	8	Int.	●	MWS1040X8DB	116	121	182	11.0
10.5	2	Ext.	●	MWE1050SA	43	43	89	10.5
	3	Ext.	●	MWE1050MA	66	66	112	10.5
	3	Int.	●	MWS1050MB	52.5	55	116	11.0
	5	Int.	●	MWS1050LB	84	88	149	11.0
	8	Int.	●	MWS1050X8DB	116	121	182	11.0
10.6	2	Ext.	●	MWE1060SA	43	43	89	10.6
	3	Ext.	●	MWE1060MA	68	68	114	10.6
	3	Int.	●	MWS1060MB	55	55	116	11.0
	5	Int.	●	MWS1060LB	88	88	149	11.0
	8	Int.	●	MWS1060X8DB	121	121	182	11.0
10.7	2	Ext.	●	MWE1070SA	47	47	95	10.7
	3	Ext.	●	MWE1070MA	68	68	114	10.7
	3	Int.	●	MWS1070MB	55	55	116	11.0
	5	Int.	●	MWS1070LB	88	88	149	11.0
	8	Int.	●	MWS1070X8DB	121	121	182	11.0
10.8	2	Ext.	●	MWE1080SA	47	47	95	10.8
	3	Ext.	●	MWE1080MA	68	68	114	10.8
	3	Int.	●	MWS1080MB	55	55	116	11.0
	5	Int.	●	MWS1080LB	88	88	149	11.0
	8	Int.	●	MWS1080X8DB	121	121	182	11.0
10.9	2	Ext.	●	MWE1090SA	47	47	95	10.9
	3	Ext.	●	MWE1090MA	68	68	114	10.9
	3	Int.	●	MWS1090MB	55	55	116	11.0
	5	Int.	●	MWS1090LB	88	88	149	11.0
	8	Int.	●	MWS1090X8DB	121	121	182	11.0
11.0	2	Ext.	●	MWE1100SA	47	47	95	11.0
	3	Ext.	●	MWE1100MA	68	68	114	11.0
	3	Int.	●	MWS1100MB	55	55	116	11.0
	5	Int.	●	MWS1100LB	88	88	149	11.0
	8	Int.	●	MWS1100X8DB	121	121	182	11.0

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
11.1	2	Ext.	●	MWE1110SA	47	47	95	11.1
	3	Ext.	●	MWE1110MA	71	71	118	11.1
	3	Int.	●	MWS1110MB	57.5	60	122	12.0
	5	Int.	●	MWS1110LB	92	96	158	12.0
	8	Int.	●	MWS1110X8DB	127	132	194	12.0
11.2	2	Ext.	●	MWE1120SA	47	47	95	11.2
	3	Ext.	●	MWE1120MA	71	71	118	11.2
	3	Int.	●	MWS1120MB	57.5	60	122	12.0
	5	Int.	●	MWS1120LB	92	96	158	12.0
	8	Int.	●	MWS1120X8DB	127	132	194	12.0
11.3	2	Ext.	●	MWE1130SA	47	47	95	11.3
	3	Ext.	●	MWE1130MA	71	71	118	11.3
	3	Int.	●	MWS1130MB	57.5	60	122	12.0
	5	Int.	●	MWS1130LB	92	96	158	12.0
	8	Int.	●	MWS1130X8DB	127	132	194	12.0
11.4	2	Ext.	●	MWE1140SA	47	47	95	11.4
	3	Ext.	●	MWE1140MA	71	71	118	11.4
	3	Int.	●	MWS1140MB	57.5	60	122	12.0
	5	Int.	●	MWS1140LB	92	96	158	12.0
	8	Int.	●	MWS1140X8DB	127	132	194	12.0
11.5	2	Ext.	●	MWE1150SA	47	47	95	11.5
	3	Ext.	●	MWE1150MA	71	71	118	11.5
	3	Int.	●	MWS1150MB	57.5	60	122	12.0
	5	Int.	●	MWS1150LB	92	96	158	12.0
	8	Int.	●	MWS1150X8DB	127	132	194	12.0
11.6	2	Ext.	●	MWE1160SA	47	47	95	11.6
	3	Ext.	●	MWE1160MA	73	73	121	11.6
	3	Int.	●	MWS1160MB	60	60	122	12.0
	5	Int.	●	MWS1160LB	96	96	158	12.0
	8	Int.	●	MWS1160X8DB	132	132	194	12.0
11.7	2	Ext.	●	MWE1170SA	47	47	95	11.7
	3	Ext.	●	MWE1170MA	73	73	121	11.7
	3	Int.	●	MWS1170MB	60	60	122	12.0
	5	Int.	●	MWS1170LB	96	96	158	12.0
	8	Int.	●	MWS1170X8DB	132	132	194	12.0
11.8	2	Ext.	●	MWE1180SA	47	47	95	11.8
	3	Ext.	●	MWE1180MA	73	73	121	11.8
	3	Int.	●	MWS1180MB	60	60	122	12.0
	5	Int.	●	MWS1180LB	96	96	158	12.0
	8	Int.	●	MWS1180X8DB	132	132	194	12.0
11.9	2	Ext.	●	MWE1190SA	51	51	102	11.9
	3	Ext.	●	MWE1190MA	73	73	121	11.9
	3	Int.	●	MWS1190MB	60	60	122	12.0
	5	Int.	●	MWS1190LB	96	96	158	12.0
	8	Int.	●	MWS1190X8DB	132	132	194	12.0

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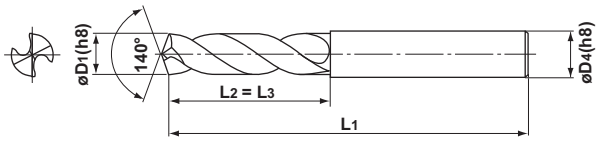
CUTTING CONDITIONS P.50

MWE/MWS

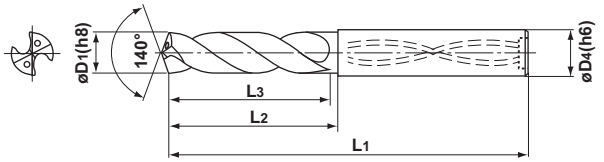
METRIC STANDARD

		D_1=3	3<D_1≤6	6<D_1≤10	10<D_1≤18	18<D_1≤25
D_1 Tolerance (mm)		0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
D_4 Tolerance (mm)	MWE	0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
	MWS	0 −0.006	0 −0.008	0 −0.009	0 −0.011	0 −0.013

MWE (External coolant)



MWS (Internal coolant)



For features, see page 7.

(Note 1) MWS type larger than ϕ5.0 have a recess in the end face.
(Note 2) MWS type can be used for shrink fit holders.

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
12.0	2	Ext.	●	MWE1200SA	51	51	102	12.0
	3	Ext.	●	MWE1200MA	73	73	121	12.0
	3	Int.	●	MWS1200MB	60	60	122	12.0
	5	Int.	●	MWS1200LB	96	96	158	12.0
	8	Int.	●	MWS1200X8DB	132	132	194	12.0
12.1	2	Ext.	●	MWE1210SA	51	51	102	12.1
	3	Ext.	●	MWE1210MA	76	76	135	12.1
	3	Int.	●	MWS1210MB	62.5	65	128	13.0
	5	Int.	●	MWS1210LB	100	104	167	13.0
12.2	2	Ext.	●	MWE1220SA	51	51	102	12.2
	3	Ext.	●	MWE1220MA	76	76	135	12.2
	3	Int.	●	MWS1220MB	62.5	65	128	13.0
	5	Int.	●	MWS1220LB	100	104	167	13.0
12.3	2	Ext.	●	MWE1230SA	51	51	102	12.3
	3	Ext.	●	MWE1230MA	76	76	135	12.3
	3	Int.	●	MWS1230MB	62.5	65	128	13.0
	5	Int.	●	MWS1230LB	100	104	167	13.0
12.4	2	Ext.	●	MWE1240SA	51	51	102	12.4
	3	Ext.	●	MWE1240MA	76	76	135	12.4
	3	Int.	●	MWS1240MB	62.5	65	128	13.0
	5	Int.	●	MWS1240LB	100	104	167	13.0
12.5	2	Ext.	●	MWE1250SA	51	51	102	12.5
	3	Ext.	●	MWE1250MA	76	76	135	12.5
	3	Int.	●	MWS1250MB	62.5	65	128	13.0
	5	Int.	●	MWS1250LB	100	104	167	13.0
	8	Int.	●	MWS1250X8DB	138	143	206	13.0
12.6	2	Ext.	●	MWE1260SA	51	51	102	12.6
	3	Ext.	●	MWE1260MA	78	78	137	12.6
	3	Int.	●	MWS1260MB	65	65	128	13.0
	5	Int.	●	MWS1260LB	104	104	167	13.0

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
12.7	2	Ext.	●	MWE1270SA	51	51	102	12.7
	3	Ext.	●	MWE1270MA	78	78	137	12.7
	3	Int.	●	MWS1270MB	65	65	128	13.0
	5	Int.	●	MWS1270LB	104	104	167	13.0
12.8	2	Ext.	●	MWE1280SA	51	51	102	12.8
	3	Ext.	●	MWE1280MA	78	78	137	12.8
	3	Int.	●	MWS1280MB	65	65	128	13.0
	5	Int.	●	MWS1280LB	104	104	167	13.0
12.9	2	Ext.	●	MWE1290SA	51	51	102	12.9
	3	Ext.	●	MWE1290MA	78	78	137	12.9
	3	Int.	●	MWS1290MB	65	65	128	13.0
	5	Int.	●	MWS1290LB	104	104	167	13.0
13.0	2	Ext.	●	MWE1300SA	51	51	102	13.0
	3	Ext.	●	MWE1300MA	78	78	137	13.0
	3	Int.	●	MWS1300MB	65	65	128	13.0
	5	Int.	●	MWS1300LB	104	104	167	13.0
	8	Int.	●	MWS1300X8DB	143	143	206	13.0
13.1	2	Ext.	●	MWE1310SA	51	51	102	13.1
	3	Ext.	●	MWE1310MA	84	84	144	13.1
	3	Int.	●	MWS1310MB	67.5	70	134	14.0
	5	Int.	●	MWS1310LB	108	112	176	14.0
13.2	2	Ext.	●	MWE1320SA	51	51	102	13.2
	3	Ext.	●	MWE1320MA	84	84	144	13.2
	3	Int.	●	MWS1320MB	67.5	70	134	14.0
	5	Int.	●	MWS1320LB	108	112	176	14.0
13.3	2	Ext.	●	MWE1330SA	54	54	107	13.3
	3	Ext.	●	MWE1330MA	84	84	144	13.3
	3	Int.	●	MWS1330MB	67.5	70	134	14.0
	5	Int.	●	MWS1330LB	108	112	176	14.0

● : Inventory maintained.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
13.4	2	Ext.	●	MWE1340SA	54	54	107	13.4
	3	Ext.	●	MWE1340MA	84	84	144	13.4
	3	Int.	●	MWS1340MB	67.5	70	134	14.0
	5	Int.	●	MWS1340LB	108	112	176	14.0
13.5	2	Ext.	●	MWE1350SA	54	54	107	13.5
	3	Ext.	●	MWE1350MA	84	84	144	13.5
	3	Int.	●	MWS1350MB	67.5	70	134	14.0
	5	Int.	●	MWS1350LB	108	112	176	14.0
	8	Int.	●	MWS1350X8DB	149	154	218	14.0
13.6	2	Ext.	●	MWE1360SA	54	54	107	13.6
	3	Ext.	●	MWE1360MA	86	86	147	13.6
	3	Int.	●	MWS1360MB	70	70	134	14.0
	5	Int.	●	MWS1360LB	112	112	176	14.0
13.7	2	Ext.	●	MWE1370SA	54	54	107	13.7
	3	Ext.	●	MWE1370MA	86	86	147	13.7
	3	Int.	●	MWS1370MB	70	70	134	14.0
	5	Int.	●	MWS1370LB	112	112	176	14.0
13.8	2	Ext.	●	MWE1380SA	54	54	107	13.8
	3	Ext.	●	MWE1380MA	86	86	147	13.8
	3	Int.	●	MWS1380MB	70	70	134	14.0
	5	Int.	●	MWS1380LB	112	112	176	14.0
13.9	2	Ext.	●	MWE1390SA	54	54	107	13.9
	3	Ext.	●	MWE1390MA	86	86	147	13.9
	3	Int.	●	MWS1390MB	70	70	134	14.0
	5	Int.	●	MWS1390LB	112	112	176	14.0
14.0	2	Ext.	●	MWE1400SA	54	54	107	14.0
	3	Ext.	●	MWE1400MA	86	86	147	14.0
	3	Int.	●	MWS1400MB	70	70	134	14.0
	5	Int.	●	MWS1400LB	112	112	176	14.0
	8	Int.	●	MWS1400X8DB	154	154	218	14.0
14.1	2	Ext.	●	MWE1410SA	56	56	111	14.1
	3	Ext.	●	MWE1410MA	89	89	151	14.1
	3	Int.	●	MWS1410MB	72.5	75	140	15.0
	5	Int.	●	MWS1410LB	116	120	185	15.0
14.2	2	Ext.	●	MWE1420SA	56	56	111	14.2
	3	Ext.	●	MWE1420MA	89	89	151	14.2
	3	Int.	●	MWS1420MB	72.5	75	140	15.0
	5	Int.	●	MWS1420LB	116	120	185	15.0
14.3	3	Ext.	●	MWE1430MA	89	89	151	14.3
	3	Int.	●	MWS1430MB	72.5	75	140	15.0
	5	Int.	●	MWS1430LB	116	120	185	15.0
14.4	3	Ext.	●	MWE1440MA	89	89	151	14.4
	3	Int.	●	MWS1440MB	72.5	75	140	15.0
	5	Int.	●	MWS1440LB	116	120	185	15.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
14.5	2	Ext.	●	MWE1450SA	56	56	111	14.5
	3	Ext.	●	MWE1450MA	89	89	151	14.5
	3	Int.	●	MWS1450MB	72.5	75	140	15.0
	5	Int.	●	MWS1450LB	116	120	185	15.0
	8	Int.	●	MWS1450X8DB	160	165	225	15.0
14.6	3	Ext.	●	MWE1460MA	91	91	153	14.6
	3	Int.	●	MWS1460MB	75	75	140	15.0
	5	Int.	●	MWS1460LB	120	120	185	15.0
14.7	3	Ext.	●	MWE1470MA	91	91	153	14.7
	3	Int.	●	MWS1470MB	75	75	140	15.0
	5	Int.	●	MWS1470LB	120	120	185	15.0
14.8	3	Ext.	●	MWE1480MA	91	91	153	14.8
	3	Int.	●	MWS1480MB	75	75	140	15.0
	5	Int.	●	MWS1480LB	120	120	185	15.0
14.9	3	Ext.	●	MWE1490MA	91	91	153	14.9
	3	Int.	●	MWS1490MB	75	75	140	15.0
	5	Int.	●	MWS1490LB	120	120	185	15.0
15.0	2	Ext.	●	MWE1500SA	56	56	111	15.0
	3	Ext.	●	MWE1500MA	91	91	153	15.0
	3	Int.	●	MWS1500MB	75	75	140	15.0
	5	Int.	●	MWS1500LB	120	120	185	15.0
	8	Int.	●	MWS1500X8DB	165	165	225	15.0
15.1	3	Ext.	●	MWE1510MA	94	94	157	15.1
	3	Int.	●	MWS1510MB	77.5	80	145	16.0
	5	Int.	●	MWS1510LB	124	128	193	16.0
15.2	2	Ext.	●	MWE1520SA	58	58	115	15.2
	3	Ext.	●	MWE1520MA	94	94	157	15.2
	3	Int.	●	MWS1520MB	77.5	80	145	16.0
	5	Int.	●	MWS1520LB	124	128	193	16.0
15.3	3	Ext.	●	MWE1530MA	94	94	157	15.3
	3	Int.	●	MWS1530MB	77.5	80	145	16.0
	5	Int.	●	MWS1530LB	124	128	193	16.0
15.4	3	Ext.	●	MWE1540MA	94	94	157	15.4
	3	Int.	●	MWS1540MB	77.5	80	145	16.0
	5	Int.	●	MWS1540LB	124	128	193	16.0
15.5	2	Ext.	●	MWE1550SA	58	58	115	15.5
	3	Ext.	●	MWE1550MA	94	94	157	15.5
	3	Int.	●	MWS1550MB	77.5	80	145	16.0
	5	Int.	●	MWS1550LB	124	128	193	16.0
	8	Int.	●	MWS1550X8DB	171	181	241	16.0
15.6	3	Ext.	●	MWE1560MA	96	96	160	15.6
	3	Int.	●	MWS1560MB	80	80	145	16.0
	5	Int.	●	MWS1560LB	128	128	193	16.0
15.7	3	Ext.	●	MWE1570MA	96	96	160	15.7
	3	Int.	●	MWS1570MB	80	80	145	16.0
	5	Int.	●	MWS1570LB	128	128	193	16.0

NEXT PAGE

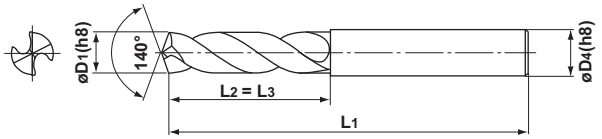
CUTTING CONDITIONS P.50

MWE/MWS

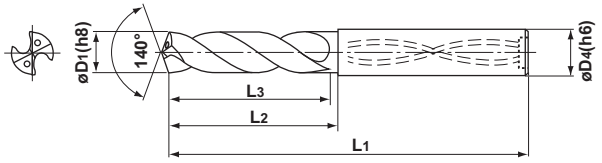
METRIC STANDARD

		D1=3	3<D1≤6	6<D1≤10	10<D1≤18	18<D1≤25
D1 Tolerance (mm)		0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
D4 Tolerance (mm)	MWE	0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
	MWS	0 −0.006	0 −0.008	0 −0.009	0 −0.011	0 −0.013

MWE (External coolant)



MWS (Internal coolant)



For features, see page 7.

(Note 1) MWS type larger than ϕ5.0 have a recess in the end face.
(Note 2) MWS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
15.8	3	Ext.	●	MWE1580MA	96	96	160	15.8
	3	Int.	●	MWS1580MB	80	80	145	16.0
	5	Int.	●	MWS1580LB	128	128	193	16.0
15.9	3	Ext.	●	MWE1590MA	96	96	160	15.9
	3	Int.	●	MWS1590MB	80	80	145	16.0
	5	Int.	●	MWS1590LB	128	128	193	16.0
16.0	2	Ext.	●	MWE1600SA	58	58	115	16.0
	3	Ext.	●	MWE1600MA	96	96	160	16.0
	3	Int.	●	MWS1600MB	80	80	145	16.0
	5	Int.	●	MWS1600LB	128	128	193	16.0
	8	Int.	●	MWS1600X8DB	176	181	241	16.0
16.2	2	Ext.	●	MWE1620SA	60	60	119	16.2
16.3	2	Ext.	●	MWE1630SA	60	60	119	16.3
16.5	2	Ext.	●	MWE1650SA	60	60	119	16.5
	3	Ext.	●	MWE1650MA	102	102	167	16.5
	3	Int.	●	MWS1650MB	82.5	85	150	17.0
	5	Int.	●	MWS1650LB	132	136	201	17.0
17.0	2	Ext.	●	MWE1700SA	60	60	119	17.0
	3	Ext.	●	MWE1700MA	102	102	167	17.0
	3	Int.	●	MWS1700MB	85	85	150	17.0
	5	Int.	●	MWS1700LB	136	136	201	17.0
NEW 17.1	3	Int.	●	MWS1710MB	87.5	90	155	18.0
17.5	2	Ext.	●	MWE1750SA	62	62	123	17.5
	3	Ext.	●	MWE1750MA	102	102	167	17.5
	3	Int.	●	MWS1750MB	87.5	90	155	18.0
	5	Int.	●	MWS1750LB	140	144	209	18.0
17.8	2	Ext.	●	MWE1780SA	62	62	123	17.8
18.0	2	Ext.	●	MWE1800SA	62	62	123	18.0
	3	Ext.	●	MWE1800MA	102	102	167	18.0
	3	Int.	●	MWS1800MB	90	90	155	18.0
	5	Int.	●	MWS1800LB	144	144	209	18.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
18.5	2	Ext.	●	MWE1850SA	64	64	127	18.5
	3	Ext.	●	MWE1850MA	114	114	179	18.5
	3	Int.	●	MWS1850MB	92.5	95	160	19.0
	5	Int.	●	MWS1850LB	148	152	217	19.0
19.0	2	Ext.	●	MWE1900SA	64	64	127	19.0
	3	Ext.	●	MWE1900MA	114	114	179	19.0
	3	Int.	●	MWS1900MB	95	95	160	19.0
	5	Int.	●	MWS1900LB	152	152	217	19.0
19.5	2	Ext.	●	MWE1950SA	66	66	131	19.5
	3	Ext.	●	MWE1950MA	114	114	179	19.5
	3	Int.	●	MWS1950MB	97.5	100	165	20.0
	5	Int.	●	MWS1950LB	156	160	225	20.0
20.0	2	Ext.	●	MWE2000SA	66	66	131	20.0
	3	Ext.	●	MWE2000MA	114	114	179	20.0
	3	Int.	●	MWS2000MB	100	100	165	20.0
	5	Int.	●	MWS2000LB	160	160	225	20.0
20.5	3	Int.	★	MWS2050MB	103	105	176	21.0
	5	Int.	★	MWS2050LB	166	168	239	21.0
21.0	3	Int.	★	MWS2100MB	105	105	176	21.0
	5	Int.	★	MWS2100LB	168	168	239	21.0
21.5	3	Int.	●	MWS2150MB	108	110	182	22.0
	5	Int.	★	MWS2150LB	174	176	248	22.0
22.0	3	Int.	★	MWS2200MB	110	110	182	22.0
	5	Int.	★	MWS2200LB	176	176	248	22.0
22.5	3	Int.	★	MWS2250MB	113	115	188	23.0
	5	Int.	★	MWS2250LB	182	184	257	23.0
23.0	3	Int.	★	MWS2300MB	115	115	188	23.0
	5	Int.	●	MWS2300LB	184	184	257	23.0
23.5	3	Int.	★	MWS2350MB	118	120	194	24.0
	5	Int.	★	MWS2350LB	190	192	266	24.0

● : Inventory maintained. ★ : Inventory maintained in Japan.

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
24.0	3	Int.	★	**MWS2400MB**	120	120	194	24.0
	5	Int.	★	**MWS2400LB**	192	192	266	24.0
24.5	3	Int.	★	**MWS2450MB**	123	125	200	25.0
	5	Int.	★	**MWS2450LB**	198	200	270	25.0

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
25.0	3	Int.	★	**MWS2500MB**	125	125	200	25.0
	5	Int.	★	**MWS2500LB**	200	200	270	25.0

RECOMMENDED CUTTING CONDITIONS

MWE (External coolant)

Work Material		Drill Diameter / Conditions / Hardness	ϕ3.0—ϕ6.0 mm ϕ.1181"—ϕ.2362" Cutting Speed (SFM)	Feed (IPR)	ϕ6.1—ϕ10.0 mm ϕ.2362"—ϕ.3937" Cutting Speed (SFM)	Feed (IPR)	ϕ10.1—ϕ14.0 mm ϕ.3937"—ϕ.5511" Cutting Speed (SFM)	Feed (IPR)	ϕ14.1—ϕ20.0 mm ϕ.5511"—ϕ.7874" Cutting Speed (SFM)	Feed (IPR)
P	Mild Steel	≤180HB	280 (115—330)	.008 (.006—.012)	280 (145—390)	.010 (.006—.014)	295 (180—390)	.012 (.008—.014)	330 (195—425)	.014 (.008—.016)
	Carbon Steel Alloy Steel	180—280HB	260 (130—310)	.008 (.006—.012)	295 (165—390)	.010 (.006—.014)	295 (195—425)	.012 (.006—.014)	295 (195—425)	.014 (.008—.016)
		280—350HB	245 (115—260)	.006 (.006—.008)	260 (145—375)	.008 (.006—.010)	280 (180—375)	.010 (.006—.012)	280 (180—375)	.012 (.008—.014)
M	Stainless Steel	≤200HB	65 (50—100)	.004 (.002—.006)	80 (50—100)	.005 (.002—.006)	80 (50—100)	.006 (.004—.008)	80 (50—100)	.008 (.004—.010)
K	Cast Iron	Tensile Strength ≤350MPa	230 (130—280)	.010 (.006—.012)	245 (165—295)	.012 (.008—.014)	260 (165—310)	.014 (.008—.016)	280 (180—310)	.016 (.012—.018)
	Ductile Cast Iron	Tensile Strength ≤450MPa	210 (115—260)	.008 (.006—.010)	230 (145—280)	.010 (.006—.012)	245 (145—295)	.012 (.008—.014)	260 (165—295)	.014 (.008—.016)
N	Aluminum Alloy	—	260 (230—295)	.008 (.004—.010)	295 (260—330)	.010 (.006—.012)	330 (295—360)	.012 (.008—.014)	360 (330—390)	.014 (.008—.016)
S	Heat Resistant Alloy	—	65 (30—80)	.004 (.002—.006)	80 (50—100)	.005 (.002—.006)	80 (50—100)	.006 (.004—.008)	100 (80—115)	.008 (.004—.010)
H	Hardened Material	40—60HRC	65 (50—80)	.004 (.002—.006)	80 (50—100)	.005 (.002—.006)	80 (50—100)	.006 (.004—.008)	100 (50—115)	.008 (.004—.010)

MWS (Internal coolant)

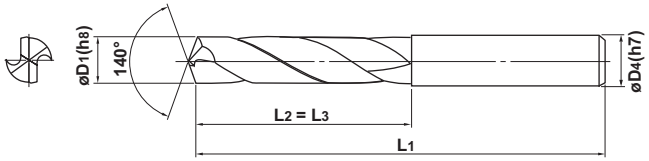
Work Material		Drill Diameter / Conditions / Hardness	ϕ3.0—ϕ6.0 mm ϕ.1181"—ϕ.2362" Cutting Speed (SFM)	Feed (IPR)	ϕ6.1—ϕ10.0 mm ϕ.2362"—ϕ.3937" Cutting Speed (SFM)	Feed (IPR)	ϕ10.1—ϕ14.0 mm ϕ.3937"—ϕ.5511" Cutting Speed (SFM)	Feed (IPR)	ϕ14.1—ϕ25.0 mm ϕ.5511"—ϕ.9843" Cutting Speed (SFM)	Feed (IPR)
P	Mild Steel	≤180HB	360 (160—390)	.008 (.006—.012)	430 (260—460)	.010 (.008—.014)	490 (300—560)	.012 (.008—.016)	520 (330—590)	.014 (.008—.016)
	Carbon Steel Alloy Steel	180—280HB	300 (160—330)	.008 (.006—.012)	360 (230—390)	.010 (.008—.014)	430 (260—460)	.010 (.008—.016)	460 (330—490)	.012 (.008—.016)
		280—350HB	260 (130—300)	.008 (.006—.010)	300 (200—360)	.010 (.006—.012)	360 (230—430)	.010 (.006—.014)	390 (300—460)	.012 (.006—.014)
M	Stainless Steel	≤200HB	200 (70—330)	.004 (.002—.006)	260 (130—390)	.008 (.004—.010)	300 (160—390)	.010 (.006—.012)	330 (200—390)	.010 (.006—.012)
K	Cast Iron	Tensile Strength ≤350MPa	330 (230—390)	.010 (.006—.012)	430 (330—460)	.012 (.006—.014)	490 (360—520)	.014 (.010—.016)	520 (390—560)	.014 (.010—.016)
	Ductile Cast Iron	Tensile Strength ≤450MPa	200 (100—260)	.008 (.006—.010)	230 (130—300)	.008 (.006—.012)	300 (160—360)	.010 (.008—.016)	330 (200—360)	.012 (.008—.016)
N	Aluminum Alloy	—	390 (260—490)	.010 (.008—.014)	490 (330—560)	.012 (.008—.020)	520 (330—560)	.016 (.008—.032)	560 (330—590)	.020 (.008—.040)
S	Heat Resistant Alloy	—	70 (30—80)	.004 (.002—.006)	80 (50—100)	.005 (.002—.006)	80 (50—100)	.006 (.004—.008)	100 (80—110)	.008 (.004—.010)

MZE/MZS

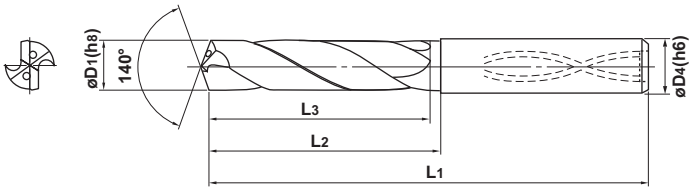
INCH STANDARD

		.1250≤D1≤.2344	.2500≤D1≤.3906	.4062≤D1≤.7031	.7188≤D1≤.7812
D1 Tolerance (inch)		0 −.00071	0 −.00087	0 −.00106	0 −.00130
D4 Tolerance (inch)	MZE	0 −.00047	0 −.00059	0 −.00071	0 −.00083
	MZS	0 −.00031	0 −.00035	0 −.00043	0 −.00051

MZE (External coolant)



MZS (Internal coolant)



For features, see page 11.
(Note 1) MZS type larger than ϕ.2031" have a recess in the end face.
(Note 2) MZS type can be used for shrink fit holders.

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.1250	2	Ext.	●	MZE01250SA	.703	.703	1.922	.1250
	3	Int.	●	MZS01250MB	1.102	1.102	2.992	.1575
	5	Int.	●	MZS01250LB	1.535	1.535	3.425	.1575
.1405	3	Int.	●	MZS01405MB	1.260	1.260	3.150	.1575
	5	Int.	●	MZS01405LB	1.732	1.732	3.622	.1575
.1406	2	Ext.	●	MZE01406SA	.781	.781	2.047	.1406
.1495	3	Int.	●	MZS01495MB	1.260	1.260	3.150	.1575
	5	Int.	●	MZS01495LB	1.732	1.732	3.622	.1575
.1562	2	Ext.	●	MZE01562SA	.875	.875	2.188	.1562
	5	Int.	●	MZS01562LB	1.732	1.732	3.622	.1575
.1590	3	Int.	●	MZS01590MB	1.417	1.417	3.386	.1969
	5	Int.	●	MZS01590LB	1.969	1.968	3.937	.1969
.1719	2	Ext.	●	MZE01719SA	.938	.938	2.281	.1719
	3	Int.	●	MZS01719MB	1.417	1.417	3.386	.1969
	5	Int.	●	MZS01719LB	1.969	1.968	3.937	.1969
.1875	2	Ext.	●	MZE01875SA	1.000	1.000	2.438	.1875
	3	Int.	●	MZS01875MB	1.575	1.574	3.543	.1969
	5	Int.	●	MZS01875LB	2.165	2.165	4.134	.1969
.2031	2	Ext.	●	MZE02031SA	1.000	1.000	2.438	.2031
	3	Int.	●	MZS02031MB	1.083	1.181	3.228	.2344
	5	Int.	●	MZS02031LB	1.732	1.890	3.937	.2344
.2165	3	Int.	●	MZS02165MB	1.083	1.181	3.228	.2344
.2188	2	Ext.	●	MZE02188SA	1.125	1.125	2.625	.2188
	3	Int.	●	MZS02188MB	1.181	1.181	3.228	.2344
	5	Int.	●	MZS02188LB	1.890	1.890	3.937	.2344
.2344	2	Ext.	●	MZE02344SA	1.125	1.125	2.625	.2344
	3	Int.	●	MZS02344MB	1.181	1.181	3.228	.2344
	5	Int.	●	MZS02344LB	1.890	1.890	3.937	.2344
.2500	3	Ext.	●	MZE02500MA	1.625	1.625	3.188	.2500
	3	Int.	●	MZS02500MB	1.280	1.378	3.465	.2656
	5	Int.	●	MZS02500LB	2.047	2.205	4.292	.2656

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.2570	3	Ext.	●	MZE02570MA	1.688	1.688	3.268	.2570
	3	Int.	●	MZS02570MB	1.378	1.378	3.465	.2656
	5	Int.	●	MZS02570LB	2.205	2.205	4.292	.2656
.2656	3	Ext.	●	MZE02656MA	1.688	1.688	3.250	.2656
	3	Int.	●	MZS02656MB	1.378	1.378	3.465	.2656
	5	Int.	●	MZS02656LB	2.205	2.205	4.292	.2656
.2720	3	Ext.	●	MZE02720MA	1.688	1.688	3.268	.2720
	3	Int.	●	MZS02720MB	1.378	1.378	3.465	.2720
	5	Int.	●	MZS02720LB	2.205	2.205	4.292	.2720
.2812	3	Ext.	●	MZE02812MA	1.750	1.750	3.438	.2812
	3	Int.	●	MZS02812MB	1.476	1.575	3.701	.3125
	5	Int.	●	MZS02812LB	2.362	2.520	4.646	.3125
.2969	3	Ext.	●	MZE02969MA	1.875	1.875	3.563	.2969
	3	Int.	●	MZS02969MB	1.575	1.575	3.701	.3125
	5	Int.	●	MZS02969LB	2.520	2.520	4.646	.3125
.3125	3	Ext.	●	MZE03125MA	1.875	1.875	3.563	.3125
	3	Int.	●	MZS03125MB	1.575	1.575	3.701	.3125
	5	Int.	●	MZS03125LB	2.520	2.520	4.646	.3125
.3281	3	Ext.	●	MZE03281MA	2.063	2.063	3.750	.3281
	3	Int.	●	MZS03281MB	1.673	1.772	3.937	.3438
	5	Int.	●	MZS03281LB	2.677	2.835	5.000	.3438
.3320	3	Ext.	●	MZE03320MA	2.087	2.087	3.780	.3320
	3	Int.	●	MZS03320MB	1.673	1.772	3.937	.3438
	5	Int.	●	MZS03320LB	2.677	2.835	5.000	.3438
.3438	3	Ext.	●	MZE03438MA	2.188	2.188	3.875	.3438
	3	Int.	●	MZS03438MB	1.772	1.772	3.937	.3438
	5	Int.	●	MZS03438LB	2.835	2.835	5.000	.3438
.3594	3	Ext.	●	MZE03594MA	2.281	2.281	4.000	.3594
	3	Int.	●	MZS03594MB	1.870	1.968	4.173	.3906
	5	Int.	●	MZS03594LB	2.992	3.150	5.355	.3906

● : Inventory maintained.

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.3680	3	Ext.	●	MZE03680MA	2.283	2.283	4.016	.3680
	3	Int.	●	MZS03680MB	1.870	1.968	4.173	.3906
	5	Int.	●	MZS03680LB	2.992	3.150	5.355	.3906
.3750	3	Ext.	●	MZE03750MA	2.375	2.375	4.125	.3750
	3	Int.	●	MZS03750MB	1.969	1.968	4.173	.3906
	5	Int.	●	MZS03750LB	3.150	3.150	5.355	.3906
.3906	3	Ext.	●	MZE03906MA	2.375	2.375	4.125	.3906
	3	Int.	●	MZS03906MB	1.969	1.968	4.173	.3906
	5	Int.	●	MZS03906LB	3.150	3.150	5.355	.3906
.4062	3	Ext.	●	MZE04062MA	2.625	2.625	4.406	.4062
	3	Int.	●	MZS04062MB	2.067	2.165	4.567	.4219
	5	Int.	●	MZS04062LB	3.307	3.465	5.866	.4219
.4219	3	Ext.	●	MZE04219MA	2.688	2.688	4.500	.4219
	3	Int.	●	MZS04219MB	2.165	2.165	4.567	.4219
	5	Int.	●	MZS04219LB	3.465	3.465	5.866	.4219
.4375	3	Ext.	●	MZE04375MA	2.813	2.813	4.625	.4375
	3	Int.	●	MZS04375MB	2.264	2.362	4.803	.4688
	5	Int.	●	MZS04375LB	3.622	3.780	6.221	.4688
.4531	3	Ext.	●	MZE04531MA	2.875	2.875	4.750	.4531
	3	Int.	●	MZS04531MB	2.362	2.362	4.803	.4688
	5	Int.	●	MZS04531LB	3.780	3.780	6.221	.4688
.4688	3	Ext.	●	MZE04688MA	2.875	2.875	4.750	.4688
	3	Int.	●	MZS04688MB	2.362	2.362	4.803	.4688
	5	Int.	●	MZS04688LB	3.780	3.780	6.221	.4688
.4844	3	Ext.	●	MZE04844MA	3.000	3.000	5.313	.4844
	3	Int.	●	MZS04844MB	2.461	2.559	5.039	.5000
	5	Int.	●	MZS04844LB	3.937	4.094	6.575	.5000
.5000	3	Ext.	●	MZE05000MA	3.063	3.063	5.375	.5000
	3	Int.	●	MZS05000MB	2.559	2.559	5.039	.5000
	5	Int.	●	MZS05000LB	4.094	4.094	6.575	.5000
.5050	3	Ext.	●	MZE05050MA	3.071	3.071	5.394	.5050
	3	Int.	●	MZS05050MB	2.559	2.559	5.039	.5118
	5	Int.	●	MZS05050LB	4.094	4.094	6.575	.5118
.5118	3	Ext.	●	MZE05118MA	3.071	3.071	5.394	.5118
	3	Int.	●	MZS05118MB	2.559	2.559	5.039	.5118
	5	Int.	●	MZS05118LB	4.094	4.094	6.575	5118
.5156	3	Ext.	●	MZE05156MA	3.344	3.344	5.688	.5156
	3	Int.	●	MZS05156MB	2.657	2.756	5.276	.5469
	5	Int.	●	MZS05156LB	4.250	4.406	6.922	.5469
.5312	3	Ext.	●	MZE05312MA	3.344	3.344	5.688	.5312
	3	Int.	●	MZS05312MB	2.657	2.756	5.276	.5469
	5	Int.	●	MZS05312LB	4.250	4.406	6.922	.5469

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.5469	3	Int.	●	MZS05469MB	2.756	2.756	5.276	.5469
	5	Int.	●	MZS05469LB	4.406	4.406	6.922	.5469
.5625	3	Ext.	●	MZE05625MA	3.500	3.500	5.938	.5625
	3	Int.	●	MZS05625MB	2.854	2.953	5.512	.5781
	5	Int.	●	MZS05625LB	4.563	4.718	7.281	.5781
.5781	3	Ext.	●	MZE05781MA	3.582	3.582	6.020	.5781
	3	Int.	●	MZS05781MB	2.953	2.953	5.512	.5781
	5	Int.	●	MZS05781LB	4.719	4.718	7.281	.5781
.5937	3	Int.	●	MZS05937MB	3.051	3.150	5.709	.6250
	5	Int.	●	MZS05937LB	4.875	5.031	7.594	.6250
.6094	3	Int.	●	MZS06094MB	3.051	3.150	5.709	.6250
	5	Int.	●	MZS06094LB	4.875	5.031	7.594	.6250
.6250	3	Ext.	●	MZE06250MA	3.780	3.780	6.299	.6250
	3	Int.	●	MZS06250MB	3.150	3.150	5.709	.6250
	5	Int.	●	MZS06250LB	5.031	5.031	7.594	.6250
.6330	3	Ext.	●	MZE06330MA	4.016	4.016	6.575	.6330
	3	Int.	●	MZS06330MB	3.248	3.347	5.906	.6563
	5	Int.	●	MZS06330LB	5.197	5.354	7.913	.6563
.6406	3	Int.	●	MZS06406MB	3.248	3.347	5.906	.6563
	5	Int.	●	MZS06406LB	5.197	5.354	7.913	.6563
.6563	3	Int.	●	MZS06563MB	3.346	3.347	5.906	.6563
	5	Int.	●	MZS06563LB	5.354	5.354	7.913	.6563
.6718	3	Int.	●	MZS06718MB	3.445	3.543	6.102	.7031
	5	Int.	●	MZS06718LB	5.512	5.669	8.228	.7031
.6875	3	Int.	●	MZS06875MB	3.445	3.543	6.102	.7031
	5	Int.	●	MZS06875LB	5.512	5.669	8.228	.7031
.7031	3	Int.	●	MZS07031MB	3.543	3.543	6.102	.7031
	5	Int.	●	MZS07031LB	5.669	5.669	8.228	.7031
.7188	3	Int.	●	MZS07188MB	3.642	3.740	6.299	.7344
	5	Int.	●	MZS07188LB	5.827	5.984	8.543	.7344
.7344	3	Int.	●	MZS07344MB	3.740	3.740	6.299	.7344
	5	Int.	●	MZS07344LB	5.984	5.984	8.543	.7344
.7500	3	Int.	●	MZS07500MB	3.839	3.937	6.496	.7812
	5	Int.	●	MZS07500LB	6.142	6.299	8.858	.7812
.7580	3	Int.	●	MZS07580MB	3.839	3.937	6.496	.7812
	5	Int.	●	MZS07580LB	6.142	6.299	8.858	.7812
.7656	3	Int.	●	MZS07656MB	3.839	3.937	6.496	.7812
	5	Int.	●	MZS07656LB	6.142	6.299	8.858	.7812
.7812	3	Int.	●	MZS07812MB	3.937	3.937	6.496	.7812
	5	Int.	●	MZS07812LB	6.299	6.299	8.858	.7812

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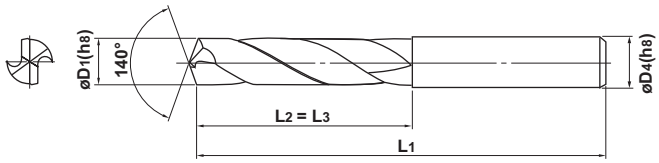
MZE/MZS

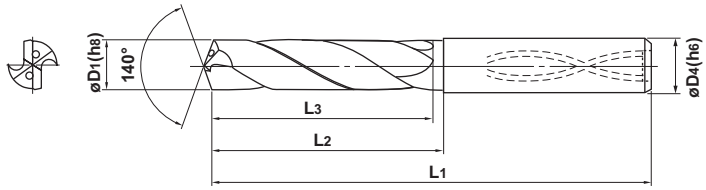
METRIC STANDARD

		D1=3	3<D1≤6	6<D1≤10	10<D1≤18	18<D1≤20
D1 Tolerance (mm)		0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
D4 Tolerance (mm)	MZE	0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
	MZS	0 −0.006	0 −0.008	0 −0.009	0 −0.011	0 −0.013

MZE (External coolant)



MZS (Internal coolant)



For features, see page 11.
(Note 1) MZS type larger than ϕ5.0 have a recess in the end face.
(Note 2) MZS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock Coated VP15TF	Stock Carbide HTi10	Order Number	Dimensions (mm) L3	L2	L1	D4
3.0	2	Ext.	●	★	MZE0300SA	16	16	55	3.0
	3	Ext.	★	★	MZE0300MA	21	21	60	3.0
	3	Int.	★		MZS0300MB	24	24	72	3.0
	5	Int.	●		MZS0300LB	33	33	81	3.0
3.1	2	Ext.	★	★	MZE0310SA	18	18	55	3.1
	3	Ext.	★	★	MZE0310MA	24	24	60	3.1
	3	Int.	★		MZS0310MB	28	28	76	4.0
	5	Int.	★		MZS0310LB	39	39	87	4.0
3.2	2	Ext.	★	★	MZE0320SA	18	18	55	3.2
	3	Ext.	★	★	MZE0320MA	24	24	60	3.2
	3	Int.	★		MZS0320MB	28	28	76	4.0
	5	Int.	★		MZS0320LB	39	39	87	4.0
3.3	2	Ext.	●	★	MZE0330SA	18	18	55	3.3
	3	Ext.	★	★	MZE0330MA	24	24	60	3.3
	3	Int.	●		MZS0330MB	28	28	76	4.0
	5	Int.	★		MZS0330LB	39	39	87	4.0
3.4	2	Ext.	●	★	MZE0340SA	20	20	55	3.4
	3	Ext.	★	★	MZE0340MA	24	24	60	3.4
	3	Int.	★		MZS0340MB	28	28	76	4.0
	5	Int.	★		MZS0340LB	39	39	87	4.0
3.5	2	Ext.	★	★	MZE0350SA	20	20	55	3.5
	3	Ext.	★	★	MZE0350MA	24	24	60	3.5
	3	Int.	★		MZS0350MB	28	28	76	4.0
	5	Int.	★		MZS0350LB	39	39	87	4.0
3.6	2	Ext.	★	★	MZE0360SA	20	20	55	3.6
	3	Ext.	★	★	MZE0360MA	27	27	60	3.6
	3	Int.	★		MZS0360MB	32	32	80	4.0
	5	Int.	★		MZS0360LB	44	44	92	4.0
3.7	2	Ext.	★	★	MZE0370SA	20	20	55	3.7
	3	Ext.	★	★	MZE0370MA	27	27	60	3.7
	3	Int.	●		MZS0370MB	32	32	80	4.0
	5	Int.	●		MZS0370LB	44	44	92	4.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock Coated VP15TF	Stock Carbide HTi10	Order Number	Dimensions (mm) L3	L2	L1	D4
3.8	2	Ext.	●	★	MZE0380SA	22	22	55	3.8
	3	Ext.	★	★	MZE0380MA	27	27	60	3.8
	3	Int.	★		MZS0380MB	32	32	80	4.0
	5	Int.	★		MZS0380LB	44	44	92	4.0
3.9	2	Ext.	●	★	MZE0390SA	22	22	55	3.9
	3	Ext.	★	★	MZE0390MA	27	27	60	3.9
	3	Int.	★		MZS0390MB	32	32	80	4.0
	5	Int.	★		MZS0390LB	44	44	92	4.0
4.0	2	Ext.	★	★	MZE0400SA	22	22	55	4.0
	3	Ext.	★	★	MZE0400MA	27	27	60	4.0
	3	Int.	●		MZS0400MB	32	32	80	4.0
	5	Int.	●		MZS0400LB	44	44	92	4.0
4.1	2	Ext.	★	★	MZE0410SA	22	22	55	4.1
	3	Ext.	★	★	MZE0410MA	29	29	63	4.1
	3	Int.	★		MZS0410MB	36	36	86	5.0
	5	Int.	★		MZS0410LB	50	50	100	5.0
4.2	2	Ext.	●	★	MZE0420SA	22	22	55	4.2
	3	Ext.	★	★	MZE0420MA	29	29	63	4.2
	3	Int.	●		MZS0420MB	36	36	86	5.0
	5	Int.	●		MZS0420LB	50	50	100	5.0
4.3	2	Ext.	★	★	MZE0430SA	24	24	58	4.3
	3	Ext.	★	★	MZE0430MA	29	29	63	4.3
	3	Int.	★		MZS0430MB	36	36	86	5.0
	5	Int.	★		MZS0430LB	50	50	100	5.0
4.4	2	Ext.	●	★	MZE0440SA	24	24	58	4.4
	3	Ext.	★	★	MZE0440MA	29	29	63	4.4
	3	Int.	★		MZS0440MB	36	36	86	5.0
	5	Int.	★		MZS0440LB	50	50	100	5.0
4.5	2	Ext.	●	★	MZE0450SA	24	24	58	4.5
	3	Ext.	★	★	MZE0450MA	29	29	63	4.5
	3	Int.	★		MZS0450MB	36	36	86	5.0
	5	Int.	★		MZS0450LB	50	50	100	5.0

● : Inventory maintained. ★ : Inventory maintained in Japan.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock		Order Number	Dimensions (mm)			
			Coated	Carbide					
			VP15TF	HTi10		L3	L2	L1	D4
4.6	2	Ext.	★	★	MZE0460SA	24	24	58	4.6
	3	Ext.	★	★	MZE0460MA	32	32	68	4.6
	3	Int.	★		MZS0460MB	40	40	90	5.0
	5	Int.	★		MZS0460LB	55	55	105	5.0
4.7	2	Ext.	★	★	MZE0470SA	24	24	58	4.7
	3	Ext.	★	★	MZE0470MA	32	32	68	4.7
	3	Int.	★		MZS0470MB	40	40	90	5.0
	5	Int.	★		MZS0470LB	55	55	105	5.0
4.8	2	Ext.	★	★	MZE0480SA	26	26	62	4.8
	3	Ext.	★	★	MZE0480MA	32	32	68	4.8
	3	Int.	★		MZS0480MB	40	40	90	5.0
	5	Int.	★		MZS0480LB	55	55	105	5.0
4.9	2	Ext.	●	★	MZE0490SA	26	26	62	4.9
	3	Ext.	★	★	MZE0490MA	32	32	68	4.9
	3	Int.	★		MZS0490MB	40	40	90	5.0
	5	Int.	★		MZS0490LB	55	55	105	5.0
5.0	2	Ext.	●	★	MZE0500SA	26	26	62	5.0
	3	Ext.	★	★	MZE0500MA	32	32	68	5.0
	3	Int.	●		MZS0500MB	27.5	30	82	6.0
	5	Int.	●		MZS0500LB	44	48	100	6.0
5.1	2	Ext.	★	★	MZE0510SA	26	26	62	5.1
	3	Ext.	★	★	MZE0510MA	34	34	72	5.1
	3	Int.	★		MZS0510MB	27.5	30	82	6.0
	5	Int.	●		MZS0510LB	44	48	100	6.0
5.2	2	Ext.	★	★	MZE0520SA	26	26	62	5.2
	3	Ext.	★	★	MZE0520MA	34	34	72	5.2
	3	Int.	★		MZS0520MB	27.5	30	82	6.0
	5	Int.	★		MZS0520LB	44	48	100	6.0
5.3	2	Ext.	★	★	MZE0530SA	26	26	62	5.3
	3	Ext.	★	★	MZE0530MA	34	34	72	5.3
	3	Int.	★		MZS0530MB	27.5	30	82	6.0
	5	Int.	★		MZS0530LB	44	48	100	6.0
5.4	2	Ext.	★	★	MZE0540SA	28	28	66	5.4
	3	Ext.	★	★	MZE0540MA	34	34	72	5.4
	3	Int.	★		MZS0540MB	27.5	30	82	6.0
	5	Int.	★		MZS0540LB	44	48	100	6.0
5.5	2	Ext.	●	★	MZE0550SA	28	28	66	5.5
	3	Ext.	★	★	MZE0550MA	34	34	72	5.5
	3	Int.	●		MZS0550MB	27.5	30	82	6.0
	5	Int.	●		MZS0550LB	44	48	100	6.0
5.6	2	Ext.	★	★	MZE0560SA	28	28	66	5.6
	3	Ext.	★	★	MZE0560MA	36	36	74	5.6
	3	Int.	★		MZS0560MB	30	30	82	6.0
	5	Int.	★		MZS0560LB	48	48	100	6.0
5.7	2	Ext.	★	★	MZE0570SA	28	28	66	5.7
	3	Ext.	★	★	MZE0570MA	36	36	74	5.7
	3	Int.	★		MZS0570MB	30	30	82	6.0
	5	Int.	★		MZS0570LB	48	48	100	6.0
5.8	2	Ext.	★	★	MZE0580SA	28	28	66	5.8
	3	Ext.	★	★	MZE0580MA	36	36	74	5.8
	3	Int.	★		MZS0580MB	30	30	82	6.0
	5	Int.	★		MZS0580LB	48	48	100	6.0
5.9	2	Ext.	★	★	MZE0590SA	28	28	66	5.9
	3	Ext.	★	★	MZE0590MA	36	36	74	5.9
	3	Int.	★		MZS0590MB	30	30	82	6.0
	5	Int.	★		MZS0590LB	48	48	100	6.0
6.0	2	Ext.	★	★	MZE0600SA	28	28	66	6.0
	3	Ext.	●	★	MZE0600MA	41	41	81	6.0
	3	Int.	●		MZS0600MB	30	30	82	6.0
	5	Int.	●		MZS0600LB	48	48	100	6.0
6.1	2	Ext.	★	★	MZE0610SA	31	31	70	6.1
	3	Ext.	★	★	MZE0610MA	41	41	81	6.1
	3	Int.	★		MZS0610MB	32.5	35	88	7.0
	5	Int.	★		MZS0610LB	52	56	109	7.0
6.2	2	Ext.	★	★	MZE0620SA	31	31	70	6.2
	3	Ext.	★	★	MZE0620MA	41	41	81	6.2
	3	Int.	★		MZS0620MB	32.5	35	88	7.0
	5	Int.	★		MZS0620LB	52	56	109	7.0
6.3	2	Ext.	★	★	MZE0630SA	31	31	70	6.3
	3	Ext.	★	★	MZE0630MA	41	41	81	6.3
	3	Int.	★		MZS0630MB	32.5	35	88	7.0
	5	Int.	★		MZS0630LB	52	56	109	7.0
6.4	2	Ext.	★	★	MZE0640SA	31	31	70	6.4
	3	Ext.	★	★	MZE0640MA	41	41	81	6.4
	3	Int.	★		MZS0640MB	32.5	35	88	7.0
	5	Int.	★		MZS0640LB	52	56	109	7.0
6.5	2	Ext.	★	★	MZE0650SA	31	31	70	6.5
	3	Ext.	★	★	MZE0650MA	41	41	81	6.5
	3	Int.	●		MZS0650MB	32.5	35	88	7.0
	5	Int.	●		MZS0650LB	52	56	109	7.0
6.6	2	Ext.	★	★	MZE0660SA	31	31	70	6.6
	3	Ext.	★	★	MZE0660MA	43	43	83	6.6
	3	Int.	★		MZS0660MB	35	35	88	7.0
	5	Int.	★		MZS0660LB	56	56	109	7.0
6.7	2	Ext.	★	★	MZE0670SA	31	31	70	6.7
	3	Ext.	★	★	MZE0670MA	43	43	83	6.7
	3	Int.	★		MZS0670MB	35	35	88	7.0
	5	Int.	●		MZS0670LB	56	56	109	7.0

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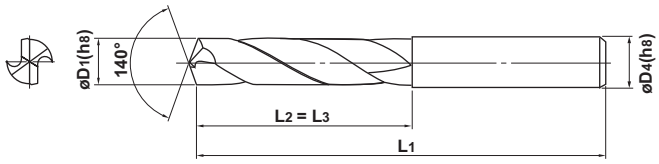
CUTTING CONDITIONS P.63

MZE/MZS

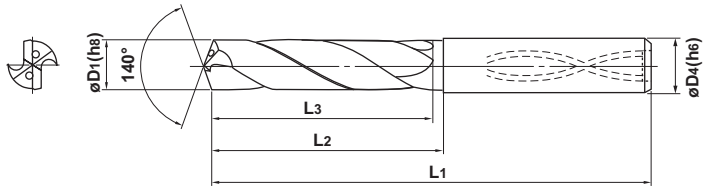
METRIC STANDARD

		D1=3	3<D1≤6	6<D1≤10	10<D1≤18	18<D1≤20
D1 Tolerance (mm)		0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
D4 Tolerance (mm)	MZE	0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
	MZS	0 −0.006	0 −0.008	0 −0.009	0 −0.011	0 −0.013

MZE (External coolant)



MZS (Internal coolant)



For features, see page 11.
(Note 1) MZS type larger than ϕ5.0 have a recess in the end face.
(Note 2) MZS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock: Coated VP15TF	Stock: Carbide HTi10	Order Number	Dimensions (mm): L3	L2	L1	D4
6.8	2	Ext.	★	★	MZE0680SA	34	34	74	6.8
	3	Ext.	●	★	MZE0680MA	43	43	83	6.8
	3	Int.	●		MZS0680MB	35	35	88	7.0
	5	Int.	●		MZS0680LB	56	56	109	7.0
6.9	2	Ext.	★	★	MZE0690SA	34	34	74	6.9
	3	Ext.	★	★	MZE0690MA	43	43	83	6.9
	3	Int.	★		MZS0690MB	35	35	88	7.0
	5	Int.	★		MZS0690LB	56	56	109	7.0
7.0	2	Ext.	★	★	MZE0700SA	34	34	74	7.0
	3	Ext.	●	★	MZE0700MA	43	43	83	7.0
	3	Int.	●		MZS0700MB	35	35	88	7.0
	5	Int.	●		MZS0700LB	56	56	109	7.0
7.1	2	Ext.	★	★	MZE0710SA	34	34	74	7.1
	3	Ext.	★	★	MZE0710MA	45	45	87	7.1
	3	Int.	★		MZS0710MB	37.5	40	94	8.0
	5	Int.	★		MZS0710LB	60	64	118	8.0
7.2	2	Ext.	★	★	MZE0720SA	34	34	74	7.2
	3	Ext.	★	★	MZE0720MA	45	45	87	7.2
	3	Int.	★		MZS0720MB	37.5	40	94	8.0
	5	Int.	★		MZS0720LB	60	64	118	8.0
7.3	2	Ext.	★	★	MZE0730SA	34	34	74	7.3
	3	Ext.	★	★	MZE0730MA	45	45	87	7.3
	3	Int.	★		MZS0730MB	37.5	40	94	8.0
	5	Int.	★		MZS0730LB	60	64	118	8.0
7.4	2	Ext.	★	★	MZE0740SA	34	34	74	7.4
	3	Ext.	★	★	MZE0740MA	45	45	87	7.4
	3	Int.	★		MZS0740MB	37.5	40	94	8.0
	5	Int.	★		MZS0740LB	60	64	118	8.0
7.5	2	Ext.	★	★	MZE0750SA	34	34	74	7.5
	3	Ext.	●	★	MZE0750MA	45	45	87	7.5
	3	Int.	●		MZS0750MB	37.5	40	94	8.0
	5	Int.	●		MZS0750LB	60	64	118	8.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock: Coated VP15TF	Stock: Carbide HTi10	Order Number	Dimensions (mm): L3	L2	L1	D4
7.6	2	Ext.	★	★	MZE0760SA	37	37	79	7.6
	3	Ext.	★	★	MZE0760MA	48	48	90	7.6
	3	Int.	★		MZS0760MB	40	40	94	8.0
	5	Int.	★		MZS0760LB	64	64	118	8.0
7.7	2	Ext.	★	★	MZE0770SA	37	37	79	7.7
	3	Ext.	★	★	MZE0770MA	48	48	90	7.7
	3	Int.	★		MZS0770MB	40	40	94	8.0
	5	Int.	★		MZS0770LB	64	64	118	8.0
7.8	2	Ext.	★	★	MZE0780SA	37	37	79	7.8
	3	Ext.	★	★	MZE0780MA	48	48	90	7.8
	3	Int.	★		MZS0780MB	40	40	94	8.0
	5	Int.	★		MZS0780LB	64	64	118	8.0
7.9	2	Ext.	★	★	MZE0790SA	37	37	79	7.9
	3	Ext.	★	★	MZE0790MA	48	48	90	7.9
	3	Int.	★		MZS0790MB	40	40	94	8.0
	5	Int.	★		MZS0790LB	64	64	118	8.0
8.0	2	Ext.	★	★	MZE0800SA	37	37	79	8.0
	3	Ext.	●	★	MZE0800MA	48	48	90	8.0
	3	Int.	●		MZS0800MB	40	40	94	8.0
	5	Int.	●		MZS0800LB	64	64	118	8.0
8.1	2	Ext.	★	★	MZE0810SA	37	37	79	8.1
	3	Ext.	★	★	MZE0810MA	53	53	96	8.1
	3	Int.	★		MZS0810MB	42.5	45	100	9.0
	5	Int.	★		MZS0810LB	68	72	127	9.0
8.2	2	Ext.	★	★	MZE0820SA	37	37	79	8.2
	3	Ext.	★	★	MZE0820MA	53	53	96	8.2
	3	Int.	★		MZS0820MB	42.5	45	100	9.0
	5	Int.	★		MZS0820LB	68	72	127	9.0
8.3	2	Ext.	★	★	MZE0830SA	37	37	79	8.3
	3	Ext.	★	★	MZE0830MA	53	53	96	8.3
	3	Int.	★		MZS0830MB	42.5	45	100	9.0
	5	Int.	★		MZS0830LB	68	72	127	9.0

● : Inventory maintained. ★ : Inventory maintained in Japan.

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock		Order Number	Dimensions (mm)			
			Coated VP15TF	Carbide HTi10		L_3	L_2	L_1	D_4
8.4	2	Ext.	★	★	**MZE0840SA**	37	37	79	8.4
	3	Ext.	★	★	**MZE0840MA**	53	53	96	8.4
	3	Int.	★		**MZS0840MB**	42.5	45	100	9.0
	5	Int.	★		**MZS0840LB**	68	72	127	9.0
8.5	2	Ext.	★	★	**MZE0850SA**	37	37	79	8.5
	3	Ext.	●	★	**MZE0850MA**	53	53	96	8.5
	3	Int.	●		**MZS0850MB**	42.5	45	100	9.0
	5	Int.	●		**MZS0850LB**	68	72	127	9.0
8.6	2	Ext.	★	★	**MZE0860SA**	40	40	84	8.6
	3	Ext.	★	★	**MZE0860MA**	55	55	98	8.6
	3	Int.	★		**MZS0860MB**	45	45	100	9.0
	5	Int.	●		**MZS0860LB**	72	72	127	9.0
8.7	2	Ext.	★	★	**MZE0870SA**	40	40	84	8.7
	3	Ext.	★	★	**MZE0870MA**	55	55	98	8.7
	3	Int.	★		**MZS0870MB**	45	45	100	9.0
	5	Int.	★		**MZS0870LB**	72	72	127	9.0
8.8	2	Ext.	★	★	**MZE0880SA**	40	40	84	8.8
	3	Ext.	★	★	**MZE0880MA**	55	55	98	8.8
	3	Int.	★		**MZS0880MB**	45	45	100	9.0
	5	Int.	★		**MZS0880LB**	72	72	127	9.0
8.9	2	Ext.	★	★	**MZE0890SA**	40	40	84	8.9
	3	Ext.	★	★	**MZE0890MA**	55	55	98	8.9
	3	Int.	★		**MZS0890MB**	45	45	100	9.0
	5	Int.	★		**MZS0890LB**	72	72	127	9.0
9.0	2	Ext.	★	★	**MZE0900SA**	40	40	84	9.0
	3	Ext.	●	★	**MZE0900MA**	55	55	98	9.0
	3	Int.	●		**MZS0900MB**	45	45	100	9.0
	5	Int.	●		**MZS0900LB**	72	72	127	9.0
9.1	2	Ext.	★	★	**MZE0910SA**	40	40	84	9.1
	3	Ext.	★	★	**MZE0910MA**	58	58	102	9.1
	3	Int.	★		**MZS0910MB**	47.5	50	106	10.0
	5	Int.	★		**MZS0910LB**	76	80	136	10.0
9.2	2	Ext.	★	★	**MZE0920SA**	40	40	84	9.2
	3	Ext.	★	★	**MZE0920MA**	58	58	102	9.2
	3	Int.	★		**MZS0920MB**	47.5	50	106	10.0
	5	Int.	★		**MZS0920LB**	76	80	136	10.0
9.3	2	Ext.	★	★	**MZE0930SA**	40	40	84	9.3
	3	Ext.	★	★	**MZE0930MA**	58	58	102	9.3
	3	Int.	★		**MZS0930MB**	47.5	50	106	10.0
	5	Int.	★		**MZS0930LB**	76	80	136	10.0
9.4	2	Ext.	★	★	**MZE0940SA**	40	40	84	9.4
	3	Ext.	★	★	**MZE0940MA**	58	58	102	9.4
	3	Int.	★		**MZS0940MB**	47.5	50	106	10.0
	5	Int.	★		**MZS0940LB**	76	80	136	10.0
9.5	2	Ext.	★	★	**MZE0950SA**	40	40	84	9.5
	3	Ext.	★	★	**MZE0950MA**	58	58	102	9.5
	3	Int.	●		**MZS0950MB**	47.5	50	106	10.0
	5	Int.	●		**MZS0950LB**	76	80	136	10.0
9.6	2	Ext.	★	★	**MZE0960SA**	43	43	89	9.6
	3	Ext.	★	★	**MZE0960MA**	60	60	105	9.6
	3	Int.	★		**MZS0960MB**	50	50	106	10.0
	5	Int.	★		**MZS0960LB**	80	80	136	10.0
9.7	2	Ext.	★	★	**MZE0970SA**	43	43	89	9.7
	3	Ext.	●	★	**MZE0970MA**	60	60	105	9.7
	3	Int.	●		**MZS0970MB**	50	50	106	10.0
	5	Int.	●		**MZS0970LB**	80	80	136	10.0
9.8	2	Ext.	★	★	**MZE0980SA**	43	43	89	9.8
	3	Ext.	★	★	**MZE0980MA**	60	60	105	9.8
	3	Int.	★		**MZS0980MB**	50	50	106	10.0
	5	Int.	★		**MZS0980LB**	80	80	136	10.0
9.9	2	Ext.	★	★	**MZE0990SA**	43	43	89	9.9
	3	Ext.	★	★	**MZE0990MA**	60	60	105	9.9
	3	Int.	★		**MZS0990MB**	50	50	106	10.0
	5	Int.	★		**MZS0990LB**	80	80	136	10.0
10.0	2	Ext.	★	★	**MZE1000SA**	43	43	89	10.0
	3	Ext.	●	★	**MZE1000MA**	60	60	105	10.0
	3	Int.	●		**MZS1000MB**	50	50	106	10.0
	5	Int.	●		**MZS1000LB**	80	80	136	10.0
10.1	2	Ext.	★	★	**MZE1010SA**	43	43	89	10.1
	3	Ext.	★	★	**MZE1010MA**	66	66	112	10.1
	3	Int.	★		**MZS1010MB**	52.5	55	116	11.0
	5	Int.	★		**MZS1010LB**	84	88	149	11.0
10.2	2	Ext.	★	★	**MZE1020SA**	43	43	89	10.2
	3	Ext.	★	★	**MZE1020MA**	66	66	112	10.2
	3	Int.	★		**MZS1020MB**	52.5	55	116	11.0
	5	Int.	★		**MZS1020LB**	84	88	149	11.0
10.3	2	Ext.	★	★	**MZE1030SA**	43	43	89	10.3
	3	Ext.	★	★	**MZE1030MA**	66	66	112	10.3
	3	Int.	★		**MZS1030MB**	52.5	55	116	11.0
	5	Int.	●		**MZS1030LB**	84	88	149	11.0
10.4	2	Ext.	★	★	**MZE1040SA**	43	43	89	10.4
	3	Ext.	★	★	**MZE1040MA**	66	66	112	10.4
	3	Int.	●		**MZS1040MB**	52.5	55	116	11.0
	5	Int.	●		**MZS1040LB**	84	88	149	11.0
10.5	2	Ext.	★	★	**MZE1050SA**	43	43	89	10.5
	3	Ext.	●	★	**MZE1050MA**	66	66	112	10.5
	3	Int.	●		**MZS1050MB**	52.5	55	116	11.0
	5	Int.	●		**MZS1050LB**	84	88	149	11.0

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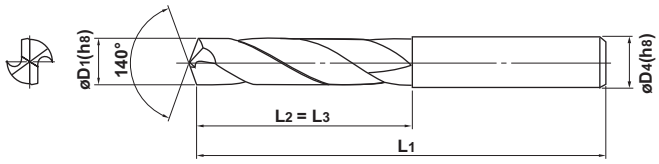
MZE/MZS

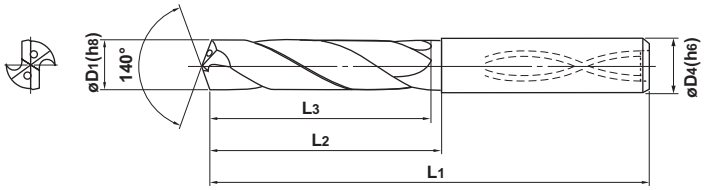
METRIC STANDARD

		D_1=3	3<D_1≤6	6<D_1≤10	10<D_1≤18	18<D_1≤20
D_1 Tolerance (mm)		0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
D_4 Tolerance (mm)	MZE	0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
	MZS	0 −0.006	0 −0.008	0 −0.009	0 −0.011	0 −0.013

MZE (External coolant)



MZS (Internal coolant)



For features, see page 11.
(Note 1) MZS type larger than ϕ5.0 have a recess in the end face.
(Note 2) MZS type can be used for shrink fit holders.

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock: Coated VP15TF	Stock: Carbide HTi10	Order Number	Dimensions (mm): L_3	L_2	L_1	D_4
10.6	2	Ext.	★	★	MZE1060SA	43	43	89	10.6
	3	Ext.	★	★	MZE1060MA	68	68	114	10.6
	3	Int.	★		MZS1060MB	55	55	116	11.0
	5	Int.	★		MZS1060LB	88	88	149	11.0
10.7	2	Ext.	★	★	MZE1070SA	47	47	95	10.7
	3	Ext.	★	★	MZE1070MA	68	68	114	10.7
	3	Int.	★		MZS1070MB	55	55	116	11.0
	5	Int.	★		MZS1070LB	88	88	149	11.0
10.8	2	Ext.	★	★	MZE1080SA	47	47	95	10.8
	3	Ext.	★	★	MZE1080MA	68	68	114	10.8
	3	Int.	★		MZS1080MB	55	55	116	11.0
	5	Int.	★		MZS1080LB	88	88	149	11.0
10.9	2	Ext.	★	★	MZE1090SA	47	47	95	10.9
	3	Ext.	★	★	MZE1090MA	68	68	114	10.9
	3	Int.	★		MZS1090MB	55	55	116	11.0
	5	Int.	★		MZS1090LB	88	88	149	11.0
11.0	2	Ext.	★	★	MZE1100SA	47	47	95	11.0
	3	Ext.	●	★	MZE1100MA	68	68	114	11.0
	3	Int.	●		MZS1100MB	55	55	116	11.0
	5	Int.	●		MZS1100LB	88	88	149	11.0
11.1	2	Ext.	★	★	MZE1110SA	47	47	95	11.1
	3	Ext.	★	★	MZE1110MA	71	71	118	11.1
	3	Int.	★		MZS1110MB	57.5	60	122	12.0
	5	Int.	★		MZS1110LB	92	96	158	12.0
11.2	2	Ext.	★	★	MZE1120SA	47	47	95	11.2
	3	Ext.	★	★	MZE1120MA	71	71	118	11.2
	3	Int.	★		MZS1120MB	57.5	60	122	12.0
	5	Int.	★		MZS1120LB	92	96	158	12.0
11.3	2	Ext.	★	★	MZE1130SA	47	47	95	11.3
	3	Ext.	★	★	MZE1130MA	71	71	118	11.3
	3	Int.	★		MZS1130MB	57.5	60	122	12.0
	5	Int.	★		MZS1130LB	92	96	158	12.0

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock: Coated VP15TF	Stock: Carbide HTi10	Order Number	Dimensions (mm): L_3	L_2	L_1	D_4
11.4	2	Ext.	★	★	MZE1140SA	47	47	95	11.4
	3	Ext.	★	★	MZE1140MA	71	71	118	11.4
	3	Int.	★		MZS1140MB	57.5	60	122	12.0
	5	Int.	★		MZS1140LB	92	96	158	12.0
11.5	2	Ext.	★	★	MZE1150SA	47	47	95	11.5
	3	Ext.	★	★	MZE1150MA	71	71	118	11.5
	3	Int.	●		MZS1150MB	57.5	60	122	12.0
	5	Int.	●		MZS1150LB	92	96	158	12.0
11.6	2	Ext.	★	★	MZE1160SA	47	47	95	11.6
	3	Ext.	★	★	MZE1160MA	73	73	121	11.6
	3	Int.	★		MZS1160MB	60	60	122	12.0
	5	Int.	★		MZS1160LB	96	96	158	12.0
11.7	2	Ext.	★	★	MZE1170SA	47	47	95	11.7
	3	Ext.	★	★	MZE1170MA	73	73	121	11.7
	3	Int.	★		MZS1170MB	60	60	122	12.0
	5	Int.	★		MZS1170LB	96	96	158	12.0
11.8	2	Ext.	★	★	MZE1180SA	47	47	95	11.8
	3	Ext.	★	★	MZE1180MA	73	73	121	11.8
	3	Int.	★		MZS1180MB	60	60	122	12.0
	5	Int.	★		MZS1180LB	96	96	158	12.0
11.9	2	Ext.	★	★	MZE1190SA	51	51	102	11.9
	3	Ext.	★	★	MZE1190MA	73	73	121	11.9
	3	Int.	★		MZS1190MB	60	60	122	12.0
	5	Int.	★		MZS1190LB	96	96	158	12.0
12.0	2	Ext.	★	★	MZE1200SA	51	51	102	12.0
	3	Ext.	●	★	MZE1200MA	73	73	121	12.0
	3	Int.	●		MZS1200MB	60	60	122	12.0
	5	Int.	●		MZS1200LB	96	96	158	12.0
12.1	2	Ext.	★	★	MZE1210SA	51	51	102	12.1
	3	Ext.	★	★	MZE1210MA	76	76	135	12.1
	3	Int.	★		MZS1210MB	62.5	65	128	13.0
	5	Int.	★		MZS1210LB	100	104	167	13.0

● : Inventory maintained. ★ : Inventory maintained in Japan.

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock		Order Number	Dimensions (mm)			
			Coated VP15TF	Carbide HTi10		L_3	L_2	L_1	D_4
12.2	2	Ext.	★	★	**MZE1220SA**	51	51	102	12.2
	3	Ext.	★	★	**MZE1220MA**	76	76	135	12.2
	3	Int.	★		**MZS1220MB**	62.5	65	128	13.0
	5	Int.	★		**MZS1220LB**	100	104	167	13.0
12.3	2	Ext.	★	★	**MZE1230SA**	51	51	102	12.3
	3	Ext.	★	★	**MZE1230MA**	76	76	135	12.3
	3	Int.	★		**MZS1230MB**	62.5	65	128	13.0
	5	Int.	★		**MZS1230LB**	100	104	167	13.0
12.4	2	Ext.	★	★	**MZE1240SA**	51	51	102	12.4
	3	Ext.	★	★	**MZE1240MA**	76	76	135	12.4
	3	Int.	★		**MZS1240MB**	62.5	65	128	13.0
	5	Int.	★		**MZS1240LB**	100	104	167	13.0
12.5	2	Ext.	★	★	**MZE1250SA**	51	51	102	12.5
	3	Ext.	●	★	**MZE1250MA**	76	76	135	12.5
	3	Int.	●		**MZS1250MB**	62.5	65	128	13.0
	5	Int.	●		**MZS1250LB**	100	104	167	13.0
12.6	2	Ext.	★	★	**MZE1260SA**	51	51	102	12.6
	3	Ext.	★	★	**MZE1260MA**	78	78	137	12.6
	3	Int.	★		**MZS1260MB**	65	65	128	13.0
	5	Int.	★		**MZS1260LB**	104	104	167	13.0
12.7	2	Ext.	★	★	**MZE1270SA**	51	51	102	12.7
	3	Ext.	★	★	**MZE1270MA**	78	78	137	12.7
	3	Int.	★		**MZS1270MB**	65	65	128	13.0
	5	Int.	★		**MZS1270LB**	104	104	167	13.0
12.8	2	Ext.	★	★	**MZE1280SA**	51	51	102	12.8
	3	Ext.	★	★	**MZE1280MA**	78	78	137	12.8
	3	Int.	★		**MZS1280MB**	65	65	128	13.0
	5	Int.	★		**MZS1280LB**	104	104	167	13.0
12.9	2	Ext.	★	★	**MZE1290SA**	51	51	102	12.9
	3	Ext.	★	★	**MZE1290MA**	78	78	137	12.9
	3	Int.	★		**MZS1290MB**	65	65	128	13.0
	5	Int.	★		**MZS1290LB**	104	104	167	13.0
13.0	2	Ext.	★	★	**MZE1300SA**	51	51	102	13.0
	3	Ext.	★	★	**MZE1300MA**	78	78	137	13.0
	3	Int.	●		**MZS1300MB**	65	65	128	13.0
	5	Int.	●		**MZS1300LB**	104	104	167	13.0
13.1	2	Ext.	★	★	**MZE1310SA**	51	51	102	13.1
	3	Ext.	★	★	**MZE1310MA**	84	84	144	13.1
	3	Int.	★		**MZS1310MB**	67.5	70	134	14.0
	5	Int.	★		**MZS1310LB**	108	112	176	14.0
13.2	2	Ext.	★	★	**MZE1320SA**	51	51	102	13.2
	3	Ext.	★	★	**MZE1320MA**	84	84	144	13.2
	3	Int.	★		**MZS1320MB**	67.5	70	134	14.0
	5	Int.	★		**MZS1320LB**	108	112	176	14.0
13.3	2	Ext.	★	★	**MZE1330SA**	54	54	107	13.3
	3	Ext.	★	★	**MZE1330MA**	84	84	144	13.3
	3	Int.	★		**MZS1330MB**	67.5	70	134	14.0
	5	Int.	★		**MZS1330LB**	108	112	176	14.0
13.4	2	Ext.	★	★	**MZE1340SA**	54	54	107	13.4
	3	Ext.	★	★	**MZE1340MA**	84	84	144	13.4
	3	Int.	★		**MZS1340MB**	67.5	70	134	14.0
	5	Int.	★		**MZS1340LB**	108	112	176	14.0
13.5	2	Ext.	★	★	**MZE1350SA**	54	54	107	13.5
	3	Ext.	★	★	**MZE1350MA**	84	84	144	13.5
	3	Int.	●		**MZS1350MB**	67.5	70	134	14.0
	5	Int.	●		**MZS1350LB**	108	112	176	14.0
13.6	2	Ext.	★	★	**MZE1360SA**	54	54	107	13.6
	3	Ext.	★	★	**MZE1360MA**	86	86	147	13.6
	3	Int.	★		**MZS1360MB**	70	70	134	14.0
	5	Int.	★		**MZS1360LB**	112	112	176	14.0
13.7	2	Ext.	★	★	**MZE1370SA**	54	54	107	13.7
	3	Ext.	★	★	**MZE1370MA**	86	86	147	13.7
	3	Int.	★		**MZS1370MB**	70	70	134	14.0
	5	Int.	★		**MZS1370LB**	112	112	176	14.0
13.8	2	Ext.	★	★	**MZE1380SA**	54	54	107	13.8
	3	Ext.	★	★	**MZE1380MA**	86	86	147	13.8
	3	Int.	★		**MZS1380MB**	70	70	134	14.0
	5	Int.	★		**MZS1380LB**	112	112	176	14.0
13.9	2	Ext.	★	★	**MZE1390SA**	54	54	107	13.9
	3	Ext.	★	★	**MZE1390MA**	86	86	147	13.9
	3	Int.	★		**MZS1390MB**	70	70	134	14.0
	5	Int.	★		**MZS1390LB**	112	112	176	14.0
14.0	2	Ext.	★	★	**MZE1400SA**	54	54	107	14.0
	3	Ext.	●	★	**MZE1400MA**	86	86	147	14.0
	3	Int.	●		**MZS1400MB**	70	70	134	14.0
	5	Int.	●		**MZS1400LB**	112	112	176	14.0
14.1	2	Ext.	★	★	**MZE1410SA**	56	56	111	14.1
	3	Ext.	★	★	**MZE1410MA**	89	89	151	14.1
	3	Int.	★		**MZS1410MB**	72.5	75	140	15.0
	5	Int.	★		**MZS1410LB**	116	120	185	15.0
14.2	2	Ext.	★	★	**MZE1420SA**	56	56	111	14.2
	3	Ext.	★	★	**MZE1420MA**	89	89	151	14.2
	3	Int.	★		**MZS1420MB**	72.5	75	140	15.0
	5	Int.	★		**MZS1420LB**	116	120	185	15.0
14.3	2	Ext.		★	**MZE1430SA**	56	56	111	14.3
	3	Ext.	★	★	**MZE1430MA**	89	89	151	14.3
	3	Int.	★		**MZS1430MB**	72.5	75	140	15.0
	5	Int.	★		**MZS1430LB**	116	120	185	15.0

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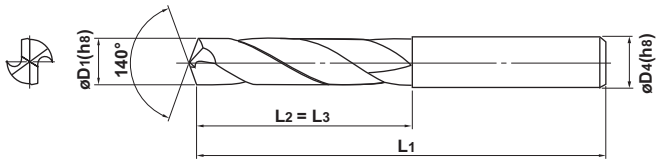
MZE/MZS

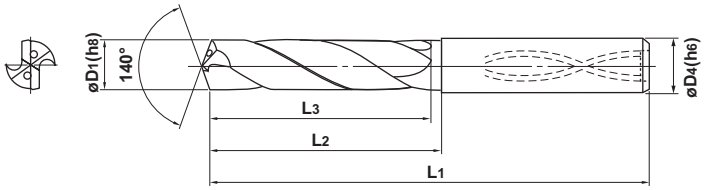
METRIC STANDARD

		D1=3	3<D1≤6	6<D1≤10	10<D1≤18	18<D1≤20
D1 Tolerance (mm)		0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
D4 Tolerance (mm)	MZE	0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
	MZS	0 −0.006	0 −0.008	0 −0.009	0 −0.011	0 −0.013

MZE (External coolant)



MZS (Internal coolant)



For features, see page 11.
(Note 1) MZS type larger than ϕ5.0 have a recess in the end face.
(Note 2) MZS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock Coated VP15TF	Stock Carbide HTi10	Order Number	Dimensions (mm) L3	L2	L1	D4
14.4	2	Ext.		★	MZE1440SA	56	56	111	14.4
	3	Ext.	★	★	MZE1440MA	89	89	151	14.4
	3	Int.	★		MZS1440MB	72.5	75	140	15.0
	5	Int.	★		MZS1440LB	116	120	185	15.0
14.5	2	Ext.	★	★	MZE1450SA	56	56	111	14.5
	3	Ext.	●	★	MZE1450MA	89	89	151	14.5
	3	Int.	●		MZS1450MB	72.5	75	140	15.0
	5	Int.	●		MZS1450LB	116	120	185	15.0
14.6	2	Ext.		★	MZE1460SA	56	56	111	14.6
	3	Ext.	★	★	MZE1460MA	91	91	153	14.6
	3	Int.	★		MZS1460MB	75	75	140	15.0
	5	Int.	★		MZS1460LB	120	120	185	15.0
14.7	2	Ext.		★	MZE1470SA	56	56	111	14.7
	3	Ext.	★	★	MZE1470MA	91	91	153	14.7
	3	Int.	★		MZS1470MB	75	75	140	15.0
	5	Int.	★		MZS1470LB	120	120	185	15.0
14.8	2	Ext.		★	MZE1480SA	56	56	111	14.8
	3	Ext.	★	★	MZE1480MA	91	91	153	14.8
	3	Int.	★		MZS1480MB	75	75	140	15.0
	5	Int.	★		MZS1480LB	120	120	185	15.0
14.9	2	Ext.		★	MZE1490SA	56	56	111	14.9
	3	Ext.	★	★	MZE1490MA	91	91	153	14.9
	3	Int.	★		MZS1490MB	75	75	140	15.0
	5	Int.	★		MZS1490LB	120	120	185	15.0
15.0	2	Ext.	★	★	MZE1500SA	56	56	111	15.0
	3	Ext.	●	★	MZE1500MA	91	91	153	15.0
	3	Int.	●		MZS1500MB	75	75	140	15.0
	5	Int.	●		MZS1500LB	120	120	185	15.0
15.1	2	Ext.		★	MZE1510SA	58	58	115	15.1
	3	Ext.	★	★	MZE1510MA	94	94	157	15.1
	3	Int.	★		MZS1510MB	77.5	80	145	16.0
	5	Int.	★		MZS1510LB	124	128	193	16.0
15.2	2	Ext.	★	★	MZE1520SA	58	58	115	15.2
	3	Ext.	★	★	MZE1520MA	94	94	157	15.2
	3	Int.	★		MZS1520MB	77.5	80	145	16.0
	5	Int.	★		MZS1520LB	124	128	193	16.0
15.3	2	Ext.		★	MZE1530SA	58	58	115	15.3
	3	Ext.	★	★	MZE1530MA	94	94	157	15.3
	3	Int.	★		MZS1530MB	77.5	80	145	16.0
	5	Int.	★		MZS1530LB	124	128	193	16.0
15.4	2	Ext.		★	MZE1540SA	58	58	115	15.4
	3	Ext.	★	★	MZE1540MA	94	94	157	15.4
	3	Int.	★		MZS1540MB	77.5	80	145	16.0
	5	Int.	★		MZS1540LB	124	128	193	16.0
15.5	2	Ext.	★	★	MZE1550SA	58	58	115	15.5
	3	Ext.	●	★	MZE1550MA	94	94	157	15.5
	3	Int.	●		MZS1550MB	77.5	80	145	16.0
	5	Int.	●		MZS1550LB	124	128	193	16.0
15.6	2	Ext.		★	MZE1560SA	58	58	115	15.6
	3	Ext.	★	★	MZE1560MA	96	96	160	15.6
	3	Int.	★		MZS1560MB	80	80	145	16.0
	5	Int.	★		MZS1560LB	128	128	193	16.0
15.7	2	Ext.		★	MZE1570SA	58	58	115	15.7
	3	Ext.	★	★	MZE1570MA	96	96	160	15.7
	3	Int.	★		MZS1570MB	80	80	145	16.0
	5	Int.	★		MZS1570LB	128	128	193	16.0
15.8	2	Ext.		★	MZE1580SA	58	58	115	15.8
	3	Ext.	★	★	MZE1580MA	96	96	160	15.8
	3	Int.	★		MZS1580MB	80	80	145	16.0
	5	Int.	★		MZS1580LB	128	128	193	16.0
15.9	2	Ext.		★	MZE1590SA	58	58	115	15.9
	3	Ext.	★	★	MZE1590MA	96	96	160	15.9
	3	Int.	★		MZS1590MB	80	80	145	16.0
	5	Int.	★		MZS1590LB	128	128	193	16.0

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

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock		Order Number	Dimensions (mm)			
			Coated	Carbide					
			VP15TF	HTi10		L3	L2	L1	D4
16.0	2	Ext.	★	★	MZE1600SA	58	58	115	16.0
	3	Ext.	●	★	MZE1600MA	96	96	160	16.0
	3	Int.	●		MZS1600MB	80	80	145	16.0
	5	Int.	●		MZS1600LB	128	128	193	16.0
16.1	2	Ext.		□	MZE1610SA	60	60	119	16.1
	3	Ext.		□	MZE1610MA	102	102	167	16.1
16.2	2	Ext.	★	□	MZE1620SA	60	60	119	16.2
	3	Ext.		□	MZE1620MA	102	102	119	16.2
16.3	2	Ext.	★	□	MZE1630SA	60	60	119	16.3
	3	Ext.		□	MZE1630MA	102	102	167	16.3
16.4	2	Ext.		□	MZE1640SA	60	60	119	16.4
	3	Ext.		□	MZE1640MA	102	102	167	16.4
16.5	2	Ext.	★	★	MZE1650SA	60	60	119	16.5
	3	Ext.	★	★	MZE1650MA	102	102	167	16.5
	3	Int.	★		MZS1650MB	82.5	85	150	17.0
	5	Int.	★		MZS1650LB	132	136	201	17.0
16.6	2	Ext.		□	MZE1660SA	60	60	119	16.6
	3	Ext.		□	MZE1660MA	102	102	167	16.6
16.7	2	Ext.		□	MZE1670SA	60	60	119	16.7
	3	Ext.		□	MZE1670MA	102	102	167	16.7
16.8	2	Ext.		□	MZE1680SA	60	60	119	16.8
	3	Ext.		□	MZE1680MA	102	102	167	16.8
16.9	2	Ext.		□	MZE1690SA	60	60	119	16.9
	3	Ext.		□	MZE1690MA	102	102	167	16.9
17.0	2	Ext.	★	★	MZE1700SA	60	60	119	17.0
	3	Ext.	●	★	MZE1700MA	102	102	167	17.0
	3	Int.	●		MZS1700MB	85	85	150	17.0
	5	Int.	●		MZS1700LB	136	136	201	17.0
17.1	2	Ext.		□	MZE1710SA	62	62	123	17.1
	3	Ext.		□	MZE1710MA	102	102	167	17.1
17.2	2	Ext.		□	MZE1720SA	62	62	123	17.2
	3	Ext.		□	MZE1720MA	102	102	167	17.2
17.3	2	Ext.		□	MZE1730SA	62	62	123	17.3
	3	Ext.		□	MZE1730MA	102	102	167	17.3
17.4	2	Ext.		□	MZE1740SA	62	62	123	17.4
	3	Ext.		□	MZE1740MA	102	102	167	17.4
17.5	2	Ext.	★	★	MZE1750SA	62	62	123	17.5
	3	Ext.	★	★	MZE1750MA	102	102	167	17.5
	3	Int.	★		MZS1750MB	87.5	90	155	18.0
	5	Int.	★		MZS1750LB	140	144	209	18.0
17.6	2	Ext.		□	MZE1760SA	62	62	123	17.6
	3	Ext.		□	MZE1760MA	102	102	167	17.6
17.7	2	Ext.		□	MZE1770SA	62	62	123	17.7
	3	Ext.		□	MZE1770MA	102	102	167	17.7

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock		Order Number	Dimensions (mm)			
			Coated	Carbide					
			VP15TF	HTi10		L3	L2	L1	D4
17.8	2	Ext.	★	□	MZE1780SA	62	62	123	17.8
	3	Ext.		□	MZE1780MA	102	102	167	17.8
17.9	2	Ext.		□	MZE1790SA	62	62	123	17.9
	3	Ext.		□	MZE1790MA	102	102	167	17.9
18.0	2	Ext.	★	★	MZE1800SA	62	62	123	18.0
	3	Ext.	★	★	MZE1800MA	102	102	167	18.0
	3	Int.	★		MZS1800MB	90	90	155	18.0
	5	Int.	★		MZS1800LB	144	144	209	18.0
18.1	2	Ext.		□	MZE1810SA	64	64	127	18.1
	3	Ext.		□	MZE1810MA	114	114	179	18.1
18.2	2	Ext.		□	MZE1820SA	64	64	127	18.2
	3	Ext.		□	MZE1820MA	114	114	179	18.2
18.3	2	Ext.		□	MZE1830SA	64	64	127	18.3
	3	Ext.		□	MZE1830MA	114	114	179	18.3
18.4	2	Ext.		□	MZE1840SA	64	64	127	18.4
	3	Ext.		□	MZE1840MA	114	114	179	18.4
18.5	2	Ext.	★	★	MZE1850SA	64	64	127	18.5
	3	Ext.	★	★	MZE1850MA	114	114	179	18.5
	3	Int.	★		MZS1850MB	92.5	95	160	19.0
	5	Int.	★		MZS1850LB	148	152	217	19.0
18.6	2	Ext.		□	MZE1860SA	64	64	127	18.6
	3	Ext.		□	MZE1860MA	114	114	179	18.6
18.7	2	Ext.		□	MZE1870SA	64	64	127	18.7
	3	Ext.		□	MZE1870MA	114	114	179	18.7
18.8	2	Ext.		□	MZE1880SA	64	64	127	18.8
	3	Ext.		□	MZE1880MA	114	114	179	18.8
18.9	2	Ext.		□	MZE1890SA	64	64	127	18.9
	3	Ext.		□	MZE1890MA	114	114	179	18.9
19.0	2	Ext.	★	★	MZE1900SA	64	64	127	19.0
	3	Ext.	★	★	MZE1900MA	114	114	179	19.0
	3	Int.	★		MZS1900MB	95	95	160	19.0
	5	Int.	★		MZS1900LB	152	152	217	19.0
19.1	2	Ext.		□	MZE1910SA	66	66	131	19.1
	3	Ext.		□	MZE1910MA	114	114	179	19.1
19.2	2	Ext.		□	MZE1920SA	66	66	131	19.2
	3	Ext.		□	MZE1920MA	114	114	179	19.2
19.3	2	Ext.		□	MZE1930SA	66	66	131	19.3
	3	Ext.		□	MZE1930MA	114	114	179	19.3
19.4	2	Ext.		□	MZE1940SA	66	66	131	19.4
	3	Ext.		□	MZE1940MA	114	114	179	19.4
19.5	2	Ext.	★	★	MZE1950SA	66	66	131	19.5
	3	Ext.	★	★	MZE1950MA	114	114	179	19.5
	3	Int.	★		MZS1950MB	97.5	100	165	20.0
	5	Int.	★		MZS1950LB	156	160	225	20.0

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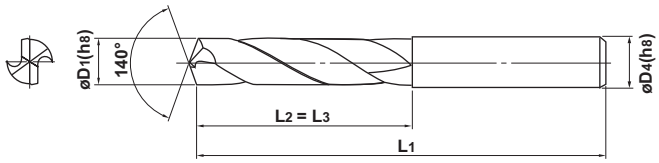
CUTTING CONDITIONS P.63

MZE/MZS

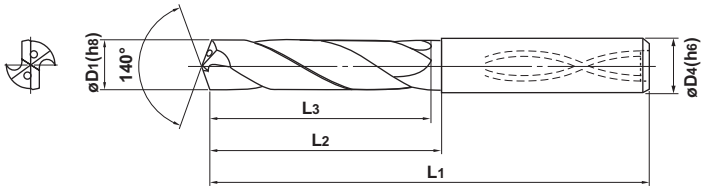
METRIC STANDARD

		D_1=3	3<D_1≤6	6<D_1≤10	10<D_1≤18	18<D_1≤20
D_1 Tolerance (mm)		0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
D_4 Tolerance (mm)	MZE	0 −0.014	0 −0.018	0 −0.022	0 −0.027	0 −0.033
	MZS	0 −0.006	0 −0.008	0 −0.009	0 −0.011	0 −0.013

MZE (External coolant)



MZS (Internal coolant)



For features, see page 11.
(Note 1) MZS type larger than ϕ5.0 have a recess in the end face.
(Note 2) MZS type can be used for shrink fit holders.

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock: Coated VP15TF	Stock: Carbide HTi10	Order Number	Dimensions (mm): L_3	L_2	L_1	D_4
19.6	2	Ext.		□	MZE1960SA	66	66	131	19.6
	3	Ext.		□	MZE1960MA	114	114	179	19.6
19.7	2	Ext.		□	MZE1970SA	66	66	131	19.7
	3	Ext.		□	MZE1970MA	114	114	179	19.7
19.8	2	Ext.		□	MZE1980SA	66	66	131	19.8
	3	Ext.		□	MZE1980MA	114	114	179	19.8

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock: Coated VP15TF	Stock: Carbide HTi10	Order Number	Dimensions (mm): L_3	L_2	L_1	D_4
19.9	2	Ext.		□	MZE1990SA	66	66	131	19.9
	3	Ext.		□	MZE1990MA	114	114	179	19.9
20.0	2	Ext.	★	★	MZE2000SA	66	66	131	20.0
	3	Ext.	★	★	MZE2000MA	114	114	179	20.0
	3	Int.	★		MZS2000MB	100	100	165	20.0
	5	Int.	★		MZS2000LB	160	160	225	20.0

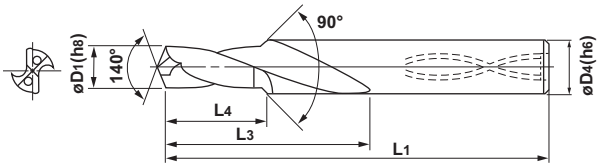
CUTTING CONDITIONS P.63

★ : Inventory maintained in Japan. □ : Non stock, produced to order only.

METRIC STANDARD

	D1=4.3, 5.1	D1=6.8	D1=8.5
D1 Tolerance (mm)	0 −0.018	0 −0.022	0 −0.022
D4 Tolerance (mm)	0 −0.009	0 −0.009	0 −0.011

MZS (Internal coolant)



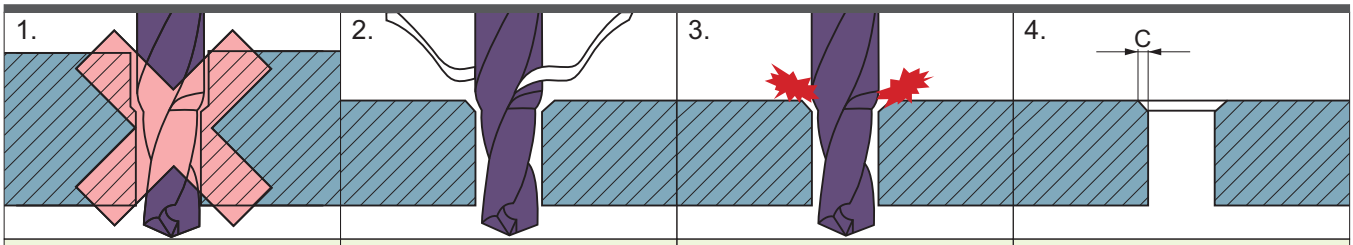
For features, see page 11.

∗1 MZS type larger than ϕ5 have a recess in the end face.
∗2 Spot face drilling is not possible (chamfering only).
∗3 For metric coarse thread.
∗4 MZS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Order Number	Thread Size	Stock VP15TF	Dimensions (mm) L4	L3	L1	D4
4.3	3	Int.	**MZS0430MM05**	M5	★	15	31	84	7.0
5.1	3	Int.	**0510MM06**	M6	★	18	36	90	8.0
6.8	3	Int.	**0680MM08**	M8	★	24	48	104	10.0
8.5	3	Int.	**0850MM10**	M10	★	30	60	122	12.0

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

CAUTION FOR USE



1.	2.	3.	4.
Spot facing as shown above is not possible due to large diameter not having a back taper. Please contact us if spot face drills are required.	Chips from chamfer machining tend to be elongated and may cause jamming. It is recommended to peck feed to reduce the length of chips.	Cutting resistance increases on initial contact with chamfer. Reduce feed at this point.	The width of the chamfer is C1.0 for M4-M6, and C1.5 for M4-M12. For widths other than those stated above consultation is needed.

CUTTING CONDITIONS P.63

MZE/MZS

RECOMMENDED CUTTING CONDITIONS OF MZE/MZS DRILLS

●MZE(External Coolant)

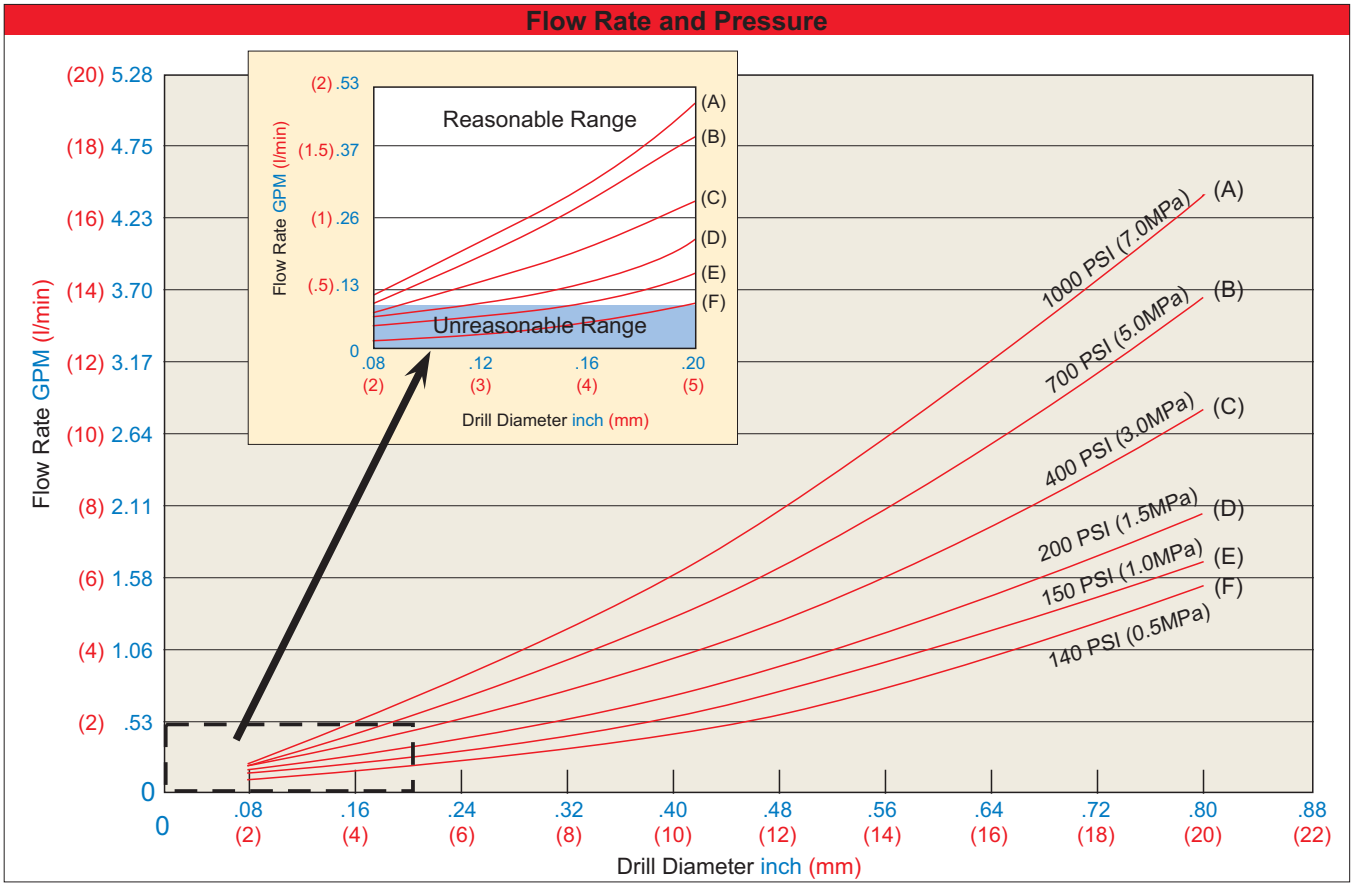
Work Material		Drill Diameter / Conditions / Hardness	ϕ.1250" – ϕ.2344" ϕ3.0 – ϕ6.0mm		ϕ.2500" – ϕ.3906" ϕ6.1 – ϕ10.0mm		ϕ.4062" – ϕ.5469" ϕ10.1 – ϕ14.0mm		ϕ.5625" – ϕ.7812" ϕ14.1 – ϕ20.0mm	
			Cutting Speed (SFM)	Feed (IPR)	Cutting Speed (SFM)	Feed (IPR)	Cutting Speed (SFM)	Feed (IPR)	Cutting Speed (SFM)	Feed (IPR)
P	Mild Steel	≤180HB	150	.008	180	.010	215	.012	230	.014
P	Carbon Steel Alloy Steel	180–280HB	130	.008	165	.010	195	.012	215	.014
P	Carbon Steel Alloy Steel	280–350HB	115	.006	150	.008	180	.010	195	.012
M	Stainless Steel	≤200HB	65	.004	80	.0048	80	.006	80	.008
K	Cast Iron	Tensile Strength ≤350MPa	165	.010	195	.012	230	.014	230	.016
K	Ductile Cast Iron	Tensile Strength ≤450MPa	150	.008	180	.010	215	.012	230	.014
N	Aluminum Alloy	–	260	.008	295	.010	330	.012	360	.014
S	Heat Resistant Alloy	–	65	.004	80	.005	80	.006	98	.008
H	Hardened Steel	40–60HRC	65	.004	80	.0048	80	.006	100	.008

●MZS(Internal Coolant)

Work Material		Drill Diameter / Conditions / Hardness	ϕ.1250" – ϕ.2344" ϕ3.0 – ϕ6.0mm		ϕ.2500" – ϕ.3906" ϕ6.1 – ϕ10.0mm		ϕ.4062" – ϕ.5469" ϕ10.1 – ϕ14.0mm		ϕ.5625" – ϕ.7812" ϕ14.1 – ϕ20.0mm	
			Cutting Speed (SFM)	Feed (IPR)	Cutting Speed (SFM)	Feed (IPR)	Cutting Speed (SFM)	Feed (IPR)	Cutting Speed (SFM)	Feed (IPR)
P	Mild Steel	≤180HB	260	.008	425	.010	460	.012	490	.014
P	Carbon Steel Alloy Steel	180–280HB	230	.008	360	.008	395	.010	425	.012
P	Carbon Steel Alloy Steel	280–350HB	195	.006	230	.008	260	.010	295	.012
M	Stainless Steel	≤200HB	130	.004	230	.008	260	.010	295	.010
K	Cast Iron	Tensile Strength ≤350MPa	330	.010	425	.012	460	.014	490	.014
K	Ductile Cast Iron	Tensile Strength ≤450MPa	195	.008	230	.008	260	.010	295	.012
N	Aluminum Alloy	–	390	.008	490	.012	525	.016	555	.019
S	Heat Resistant Alloy	–	65	.004	80	.005	85	.006	98	.008

Reasonable Coolant Flow and Pressure For MZS Drills

Flow Rate and Pressure

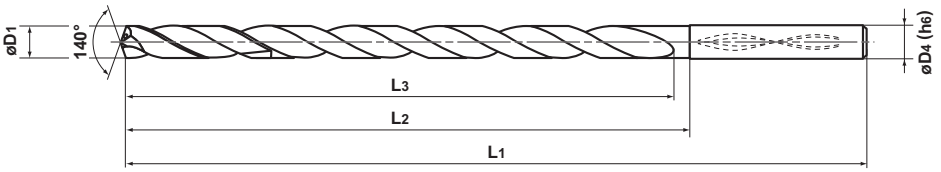


MWS...DB

Super Long Type

INCH STANDARD

	.1250≤D1≤.2344	.2500≤D1≤.3906	.4062≤D1≤.500
D1 Tolerance (inch)	− .00098 − .00169	− .00130 − .00217	− .00161 − .00268
D4 Tolerance (inch)	0 − .00031	0 − .00035	0 − .00043



For features, see page 7.

(Note 1) MWS type with ϕ.1969" or larger diameter has a recess in the end face.
(Note 2) MWS type can be used for shrink fit holders.

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.1250	15	Int.	●	MWS01250X15DB	2.480	2.598	4.488	.1575
	20	Int.	●	01250X20DB	3.189	3.307	5.197	.1575
	25	Int.	●	01250X25DB	3.858	3.976	5.866	.1575
	30	Int.	●	01250X30DB	4.567	4.685	6.575	.1575
.1406	15	Int.	●	01406X15DB	2.835	2.953	4.843	.1575
	20	Int.	●	01406X20DB	3.622	3.740	5.630	.1575
	25	Int.	●	01406X25DB	4.409	4.528	6.417	.1575
	30	Int.	●	01406X30DB	5.197	5.315	7.205	.1575
.1495	15	Int.	●	01495X15DB	2.835	2.953	4.843	.1575
	20	Int.	●	01495X20DB	3.622	3.740	5.630	.1575
	25	Int.	●	01495X25DB	4.409	4.528	6.417	.1575
	30	Int.	●	01495X30DB	5.197	5.315	7.205	.1575
.1562	15	Int.	●	01562X15DB	2.835	2.953	4.843	.1575
	20	Int.	●	01562X20DB	3.622	3.740	5.630	.1575
	25	Int.	●	01562X25DB	4.409	4.528	6.417	.1575
	30	Int.	●	01562X30DB	5.197	5.315	7.205	.1575
.1590	15	Int.	●	01590X15DB	3.189	3.307	5.276	.1969
	20	Int.	●	01590X20DB	4.094	4.213	6.181	.1969
	25	Int.	●	01590X25DB	4.961	5.079	7.047	.1969
	30	Int.	●	01590X30DB	5.866	5.984	7.953	.1969
.1693	15	Int.	●	01693X15DB	3.189	3.307	5.276	.1969
	20	Int.	●	01693X20DB	4.094	4.213	6.181	.1969
	25	Int.	●	01693X25DB	4.961	5.079	7.047	.1969
	30	Int.	●	01693X30DB	5.866	5.984	7.953	.1969
.1719	15	Int.	●	01719X15DB	3.189	3.307	5.276	.1969
	20	Int.	●	01719X20DB	4.094	4.213	6.181	.1969
	25	Int.	●	01719X25DB	4.961	5.079	7.047	.1969
	30	Int.	●	01719X30DB	5.866	5.984	7.953	.1969
.1875	15	Int.	●	01875X15DB	3.543	3.661	5.630	.1969
	20	Int.	●	01875X20DB	4.528	4.646	6.614	.1969
	25	Int.	●	01875X25DB	5.512	5.630	7.598	.1969
	30	Int.	●	01875X30DB	6.496	6.614	8.583	.1969

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.2031	15	Int.	●	MWS02031X15DB	3.898	4.016	6.063	.2344
	20	Int.	●	02031X20DB	5.000	5.118	7.165	.2344
	25	Int.	●	02031X25DB	6.063	6.181	8.228	.2344
	30	Int.	●	02031X30DB	7.165	7.283	9.331	.2344
.2130	15	Int.	●	02130X15DB	3.898	4.016	6.063	.2344
	20	Int.	●	02130X20DB	5.000	5.118	7.165	.2344
	25	Int.	●	02130X25DB	6.063	6.181	8.228	.2344
	30	Int.	●	02130X30DB	7.165	7.283	9.331	.2344
.2188	15	Int.	●	02188X15DB	4.252	4.370	6.417	.2344
	20	Int.	●	02188X20DB	5.433	5.551	7.598	.2344
	25	Int.	●	02188X25DB	6.614	6.732	8.780	.2344
	30	Int.	●	02188X30DB	7.795	7.913	9.961	.2344
.2344	15	Int.	●	02344X15DB	4.252	4.370	6.417	.2344
	20	Int.	●	02344X20DB	5.433	5.551	7.598	.2344
	25	Int.	●	02344X25DB	6.614	6.732	8.780	.2344
	30	Int.	●	02344X30DB	7.795	7.913	9.961	.2344
.2500	15	Int.	●	02500X15DB	4.606	4.724	6.811	.2656
	20	Int.	●	02500X20DB	5.906	6.024	8.110	.2656
	25	Int.	●	02500X25DB	7.165	7.283	9.370	.2656
	30	Int.	●	02500X30DB	8.465	8.583	10.669	.2656
.2570	15	Int.	●	02570X15DB	4.961	5.079	7.165	.2656
	20	Int.	●	02570X20DB	6.339	6.457	8.543	.2656
	25	Int.	●	02570X25DB	7.717	7.835	9.921	.2656
	30	Int.	●	02570X30DB	9.094	9.213	11.299	.2656
.2656	15	Int.	●	02656X15DB	4.961	5.079	7.165	.2656
	20	Int.	●	02656X20DB	6.339	6.457	8.543	.2656
	25	Int.	●	02656X25DB	7.717	7.835	9.921	.2656
	30	Int.	●	02656X30DB	9.094	9.213	11.299	.2656
.2720	15	Int.	●	02720X15DB	4.961	5.079	7.165	.2720
	20	Int.	●	02720X20DB	6.339	6.457	8.543	.2720
	25	Int.	●	02720X25DB	7.717	7.835	9.921	.2720
	30	Int.	●	02720X30DB	9.094	9.213	11.299	.2720

● : Inventory maintained.

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.2812	15	Int.	●	MWS02812X15DB	5.315	5.433	7.559	.3125
	20	Int.	●	02812X20DB	6.811	6.929	9.055	.3125
	25	Int.	●	02812X25DB	8.268	8.386	10.512	.3125
	30	Int.	●	02812X30DB	9.764	9.882	12.008	.3125
.2969	15	Int.	●	02969X15DB	5.669	5.787	7.913	.3125
	20	Int.	●	02969X20DB	7.244	7.362	9.488	.3125
	25	Int.	●	02969X25DB	8.819	8.937	11.063	.3125
	30	Int.	●	02969X30DB	10.394	10.512	12.638	.3125
.3125	15	Int.	●	03125X15DB	5.669	5.787	7.913	.3125
	20	Int.	●	03125X20DB	7.244	7.362	9.488	.3125
	25	Int.	●	03125X25DB	8.819	8.937	11.063	.3125
	30	Int.	●	03125X30DB	10.394	10.512	12.638	.3125
.3281	15	Int.	●	03281X15DB	6.024	6.142	8.307	.3438
	20	Int.	●	03281X20DB	7.717	7.835	10.000	.3438
	25	Int.	●	03281X25DB	9.370	9.488	11.654	.3438
.3320	15	Int.	●	03320X15DB	6.024	6.142	8.307	.3438
	20	Int.	●	03320X20DB	7.717	7.835	10.000	.3438
	25	Int.	●	03320X25DB	9.370	9.488	11.654	.3438
.3438	15	Int.	●	03438X15DB	6.378	6.496	8.661	.3438
	20	Int.	●	03438X20DB	8.150	8.268	10.433	.3438
	25	Int.	●	03438X25DB	9.921	10.039	12.205	.3438
.3594	15	Int.	●	03594X15DB	6.732	6.850	9.016	.3906
	20	Int.	●	03594X20DB	8.622	8.740	10.906	.3906
	25	Int.	●	03594X25DB	10.472	10.591	12.756	.3906

Drill Dia. D1 (inch)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (inch) L3	L2	L1	D4
.3680	15	Int.	●	MWS03680X15DB	6.732	6.850	9.016	.3906
	20	Int.	●	03680X20DB	8.622	8.740	10.906	.3906
	25	Int.	●	03680X25DB	10.472	10.591	12.756	.3906
.3750	15	Int.	●	03750X15DB	7.087	7.205	9.370	.3906
	20	Int.	●	03750X20DB	9.055	9.173	11.339	.3906
	25	Int.	●	03750X25DB	11.024	11.142	13.307	.3906
.3906	15	Int.	●	03906X15DB	7.087	7.205	9.370	.3906
	20	Int.	●	03906X20DB	9.055	9.173	11.339	.3906
	25	Int.	●	03906X25DB	11.024	11.142	13.307	.3906
.4062	15	Int.	●	04062X15DB	7.441	7.559	9.961	.4219
	20	Int.	●	04062X20DB	9.528	9.646	12.047	.4219
.4219	15	Int.	●	04219X15DB	7.795	7.913	10.315	.4219
	20	Int.	●	04219X20DB	9.961	10.079	12.480	.4219
.4375	15	Int.	●	04375X15DB	8.150	8.268	10.709	.4688
	20	Int.	●	04375X20DB	10.433	10.551	12.992	.4688
.4531	15	Int.	●	04531X15DB	8.504	8.622	11.063	.4688
	20	Int.	●	04531X20DB	10.866	10.984	13.425	.4688
.4688	15	Int.	●	04688X15DB	8.504	8.622	11.063	.4688
	20	Int.	●	04688X20DB	10.866	10.984	13.425	.4688
.4844	15	Int.	●	04844X15DB	8.858	8.976	11.457	.5000
.5000	15	Int.	●	05000X15DB	9.213	9.331	11.811	.5000

RECOMMENDED CUTTING CONDITIONS

MWS (Internal coolant)

Work Material		Drill Diameter / Conditions / Hardness	ϕ.1250"—ϕ.2344" ϕ3.0—ϕ6.0 mm Cutting Speed (SFM)	Feed (IPR)	ϕ.2500"—ϕ.3906" ϕ6.5—ϕ10.0 mm Cutting Speed (SFM)	Feed (IPR)	ϕ.4062"—ϕ.5000" ϕ10.5—ϕ14.0 mm Cutting Speed (SFM)	Feed (IPR)
P	Mild Steel	≤180HB	300 (160—390)	.008 (.006—.012)	360 (260—460)	.010 (.008—.014)	430 (300—560)	.012 (.008—.016)
	Carbon Steel Alloy Steel	180—280HB	260 (160—330)	.008 (.006—.012)	300 (230—390)	.010 (.008—.014)	360 (260—460)	.010 (.008—.016)
		280—350HB	230 (130—300)	.008 (.006—.010)	260 (200—360)	.010 (.006—.012)	300 (230—430)	.010 (.006—.014)
M	Stainless Steel	≤200HB	160 (70—330)	.004 (.002—.006)	230 (130—390)	.008 (.004—.010)	260 (160—390)	.010 (.006—.012)
K	Cast Iron	Tensile Strength ≤350MPa	300 (230—390)	.010 (.006—.012)	360 (330—460)	.012 (.006—.014)	430 (360—520)	.014 (.010—.016)
	Ductile Cast Iron	Tensile Strength ≤450MPa	160 (100—260)	.008 (.006—.010)	200 (130—300)	.008 (.006—.012)	260 (160—360)	.010 (.008—.016)
N	Aluminum Alloy	—	330 (260—490)	.010 (.008—.014)	430 (330—560)	.012 (.008—.020)	460 (330—560)	.016 (.008—.032)
S	Heat Resistant Alloy	—	70 (30—80)	.004 (.002—.006)	70 (50—100)	.005 (.002—.006)	70 (50—100)	.006 (.004—.008)

(Note 1) A pilot hole is required in order to use.
(Note 2) Please raise to cutting speed after inserted in a pilot hole.
(Note 3) Please use the Pilot hole drills diameter is same as long drill diameter or bigger than +.00197"diameter.

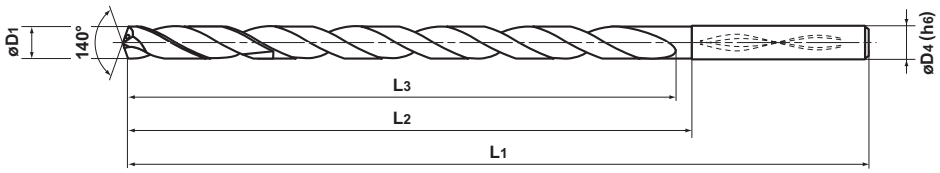
HOW TO USE P.74

MWS...DB

Super Long Type

METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤14
D1 Tolerance (mm)	−0.017 −0.031	−0.025 −0.043	−0.033 −0.055	−0.041 −0.068
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011



For features, see page 7.

(Note 1) MWS type with ϕ5.0 or larger diameter has a recess in the end face.
(Note 2) MWS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
3.0	10	Int.	●	MWS0300X10DB	39	42	90	3.0
	15	Int.	●	0300X15DB	54	57	105	3.0
	20	Int.	●	0300X20DB	69	72	120	3.0
	25	Int.	●	0300X25DB	84	87	135	3.0
	30	Int.	●	0300X30DB	99	102	150	3.0
3.1	10	Int.	★	0310X10DB	46	49	97	4.0
	15	Int.	●	0310X15DB	63	66	114	4.0
	20	Int.	●	0310X20DB	81	84	132	4.0
	25	Int.	★	0310X25DB	98	101	149	4.0
	30	Int.	★	0310X30DB	116	119	167	4.0
3.2	10	Int.	●	0320X10DB	46	49	97	4.0
	15	Int.	●	0320X15DB	63	66	114	4.0
	20	Int.	★	0320X20DB	81	84	132	4.0
	25	Int.	★	0320X25DB	98	101	149	4.0
	30	Int.	●	0320X30DB	116	119	167	4.0
3.3	10	Int.	●	0330X10DB	46	49	97	4.0
	15	Int.	●	0330X15DB	63	66	114	4.0
	20	Int.	●	0330X20DB	81	84	132	4.0
	25	Int.	★	0330X25DB	98	101	149	4.0
	30	Int.	●	0330X30DB	116	119	167	4.0
3.4	10	Int.	★	0340X10DB	46	49	97	4.0
	15	Int.	●	0340X15DB	63	66	114	4.0
	20	Int.	★	0340X20DB	81	84	132	4.0
	25	Int.	★	0340X25DB	98	101	149	4.0
	30	Int.	★	0340X30DB	116	119	167	4.0
3.5	10	Int.	●	0350X10DB	46	49	97	4.0
	15	Int.	●	0350X15DB	63	66	114	4.0
	20	Int.	●	0350X20DB	81	84	132	4.0
	25	Int.	●	0350X25DB	98	101	149	4.0
	30	Int.	●	0350X30DB	116	119	167	4.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
3.6	10	Int.	●	MWS0360X10DB	52	55	103	4.0
	15	Int.	★	0360X15DB	72	75	123	4.0
	20	Int.	●	0360X20DB	92	95	143	4.0
	25	Int.	★	0360X25DB	112	115	163	4.0
	30	Int.	★	0360X30DB	132	135	183	4.0
3.7	10	Int.	★	0370X10DB	52	55	103	4.0
	15	Int.	●	0370X15DB	72	75	123	4.0
	20	Int.	★	0370X20DB	92	95	143	4.0
	25	Int.	★	0370X25DB	112	115	163	4.0
	30	Int.	●	0370X30DB	132	135	183	4.0
3.8	10	Int.	★	0380X10DB	52	55	103	4.0
	15	Int.	●	0380X15DB	72	75	123	4.0
	20	Int.	●	0380X20DB	92	95	143	4.0
	25	Int.	★	0380X25DB	112	115	163	4.0
	30	Int.	★	0380X30DB	132	135	183	4.0
3.9	10	Int.	★	0390X10DB	52	55	103	4.0
	15	Int.	●	0390X15DB	72	75	123	4.0
	20	Int.	●	0390X20DB	92	95	143	4.0
	25	Int.	★	0390X25DB	112	115	163	4.0
	30	Int.	●	0390X30DB	132	135	183	4.0
4.0	10	Int.	●	0400X10DB	52	55	103	4.0
	15	Int.	●	0400X15DB	72	75	123	4.0
	20	Int.	●	0400X20DB	92	95	143	4.0
	25	Int.	●	0400X25DB	112	115	163	4.0
	30	Int.	●	0400X30DB	132	135	183	4.0
4.1	10	Int.	●	0410X10DB	59	62	112	5.0
	15	Int.	●	0410X15DB	81	84	134	5.0
	20	Int.	●	0410X20DB	104	107	157	5.0
	25	Int.	★	0410X25DB	126	129	179	5.0
	30	Int.	●	0410X30DB	149	152	202	5.0

● : Inventory maintained. ★ : Inventory maintained in Japan.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
4.2	10	Int.	●	MWS0420X10DB	59	62	112	5.0
	15	Int.	●	0420X15DB	81	84	134	5.0
	20	Int.	★	0420X20DB	104	107	157	5.0
	25	Int.	★	0420X25DB	126	129	179	5.0
	30	Int.	★	0420X30DB	149	152	202	5.0
4.3	10	Int.	●	0430X10DB	59	62	112	5.0
	15	Int.	●	0430X15DB	81	84	134	5.0
	20	Int.	●	0430X20DB	104	107	157	5.0
	25	Int.	★	0430X25DB	126	129	179	5.0
	30	Int.	★	0430X30DB	149	152	202	5.0
4.4	10	Int.	★	0440X10DB	59	62	112	5.0
	15	Int.	●	0440X15DB	81	84	134	5.0
	20	Int.	●	0440X20DB	104	107	157	5.0
	25	Int.	★	0440X25DB	126	129	179	5.0
	30	Int.	★	0440X30DB	149	152	202	5.0
4.5	10	Int.	●	0450X10DB	59	62	112	5.0
	15	Int.	●	0450X15DB	81	84	134	5.0
	20	Int.	●	0450X20DB	104	107	157	5.0
	25	Int.	●	0450X25DB	126	129	179	5.0
	30	Int.	●	0450X30DB	149	152	202	5.0
4.6	10	Int.	●	0460X10DB	65	68	118	5.0
	15	Int.	●	0460X15DB	90	93	143	5.0
	20	Int.	●	0460X20DB	115	118	168	5.0
	25	Int.	●	0460X25DB	140	143	193	5.0
	30	Int.	★	0460X30DB	165	168	218	5.0
4.7	10	Int.	★	0470X10DB	65	68	118	5.0
	15	Int.	★	0470X15DB	90	93	143	5.0
	20	Int.	★	0470X20DB	115	118	168	5.0
	25	Int.	★	0470X25DB	140	143	193	5.0
	30	Int.	★	0470X30DB	165	168	218	5.0
4.8	10	Int.	★	0480X10DB	65	68	118	5.0
	15	Int.	●	0480X15DB	90	93	143	5.0
	20	Int.	★	0480X20DB	115	118	168	5.0
	25	Int.	★	0480X25DB	140	143	193	5.0
	30	Int.	●	0480X30DB	165	168	218	5.0
4.9	10	Int.	●	0490X10DB	65	68	118	5.0
	15	Int.	●	0490X15DB	90	93	143	5.0
	20	Int.	★	0490X20DB	115	118	168	5.0
	25	Int.	★	0490X25DB	140	143	193	5.0
	30	Int.	★	0490X30DB	165	168	218	5.0
5.0	10	Int.	●	0500X10DB	65	68	118	5.0
	15	Int.	●	0500X15DB	90	93	143	5.0
	20	Int.	●	0500X20DB	115	118	168	5.0
	25	Int.	●	0500X25DB	140	143	193	5.0
	30	Int.	●	0500X30DB	165	168	218	5.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
5.1	10	Int.	★	MWS0510X10DB	72	75	127	6.0
	15	Int.	●	0510X15DB	99	102	154	6.0
	20	Int.	●	0510X20DB	127	130	182	6.0
	25	Int.	★	0510X25DB	154	157	209	6.0
	30	Int.	★	0510X30DB	182	185	237	6.0
5.2	10	Int.	●	0520X10DB	72	75	127	6.0
	15	Int.	●	0520X15DB	99	102	154	6.0
	20	Int.	★	0520X20DB	127	130	182	6.0
	25	Int.	★	0520X25DB	154	157	209	6.0
	30	Int.	★	0520X30DB	182	185	237	6.0
5.3	10	Int.	●	0530X10DB	72	75	127	6.0
	15	Int.	●	0530X15DB	99	102	154	6.0
	20	Int.	●	0530X20DB	127	130	182	6.0
	25	Int.	●	0530X25DB	154	157	209	6.0
	30	Int.	★	0530X30DB	182	185	237	6.0
5.4	10	Int.	●	0540X10DB	72	75	127	6.0
	15	Int.	●	0540X15DB	99	102	154	6.0
	20	Int.	★	0540X20DB	127	130	182	6.0
	25	Int.	★	0540X25DB	154	157	209	6.0
	30	Int.	★	0540X30DB	182	185	237	6.0
5.5	10	Int.	●	0550X10DB	72	75	127	6.0
	15	Int.	●	0550X15DB	99	102	154	6.0
	20	Int.	●	0550X20DB	127	130	182	6.0
	25	Int.	●	0550X25DB	154	157	209	6.0
	30	Int.	●	0550X30DB	182	185	237	6.0
5.6	10	Int.	★	0560X10DB	78	81	133	6.0
	15	Int.	★	0560X15DB	108	111	163	6.0
	20	Int.	★	0560X20DB	138	141	193	6.0
	25	Int.	★	0560X25DB	168	171	223	6.0
	30	Int.	★	0560X30DB	198	201	253	6.0
5.7	10	Int.	●	0570X10DB	78	81	133	6.0
	15	Int.	●	0570X15DB	108	111	163	6.0
	20	Int.	●	0570X20DB	138	141	193	6.0
	25	Int.	●	0570X25DB	168	171	223	6.0
	30	Int.	★	0570X30DB	198	201	253	6.0
5.8	10	Int.	●	0580X10DB	78	81	133	6.0
	15	Int.	★	0580X15DB	108	111	163	6.0
	20	Int.	●	0580X20DB	138	141	193	6.0
	25	Int.	★	0580X25DB	168	171	223	6.0
	30	Int.	★	0580X30DB	198	201	253	6.0
5.9	10	Int.	★	0590X10DB	78	81	133	6.0
	15	Int.	★	0590X15DB	108	111	163	6.0
	20	Int.	★	0590X20DB	138	141	193	6.0
	25	Int.	★	0590X25DB	168	171	223	6.0
	30	Int.	★	0590X30DB	198	201	253	6.0

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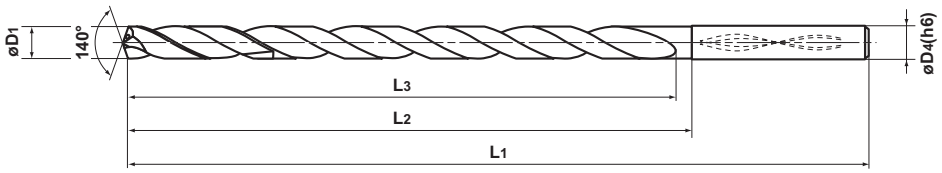
CUTTING CONDITIONS P.66

MWS...DB

Super Long Type

METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤14
D1 Tolerance (mm)	−0.017 −0.031	−0.025 −0.043	−0.033 −0.055	−0.041 −0.068
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011



For features, see page 7.

(Note 1) MWS type with ϕ5.0 or larger diameter has a recess in the end face.
(Note 2) MWS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
6.0	10	Int.	●	MWS0600X10DB	78	81	133	6.0
	15	Int.	●	0600X15DB	108	111	163	6.0
	20	Int.	●	0600X20DB	138	141	193	6.0
	25	Int.	●	0600X25DB	168	171	223	6.0
	30	Int.	●	0600X30DB	198	201	253	6.0
6.1	10	Int.	★	0610X10DB	85	88	141	7.0
	15	Int.	★	0610X15DB	117	120	173	7.0
	20	Int.	★	0610X20DB	150	153	206	7.0
	25	Int.	★	0610X25DB	182	185	238	7.0
	30	Int.	●	0610X30DB	215	218	271	7.0
6.2	10	Int.	●	0620X10DB	85	88	141	7.0
	15	Int.	●	0620X15DB	117	120	173	7.0
	20	Int.	●	0620X20DB	150	153	206	7.0
	25	Int.	●	0620X25DB	182	185	238	7.0
	30	Int.	●	0620X30DB	215	218	271	7.0
6.3	10	Int.	●	0630X10DB	85	88	141	7.0
	15	Int.	★	0630X15DB	117	120	173	7.0
	20	Int.	★	0630X20DB	150	153	206	7.0
	25	Int.	★	0630X25DB	182	185	238	7.0
	30	Int.	★	0630X30DB	215	218	271	7.0
6.4	10	Int.	●	0640X10DB	85	88	141	7.0
	15	Int.	●	0640X15DB	117	120	173	7.0
	20	Int.	●	0640X20DB	150	153	206	7.0
	25	Int.	●	0640X25DB	182	185	238	7.0
	30	Int.	●	0640X30DB	215	218	271	7.0
6.5	10	Int.	★	0650X10DB	85	88	141	7.0
	15	Int.	★	0650X15DB	117	120	173	7.0
	20	Int.	●	0650X20DB	150	153	206	7.0
	25	Int.	★	0650X25DB	182	185	238	7.0
	30	Int.	●	0650X30DB	215	218	271	7.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
6.6	10	Int.	★	MWS0660X10DB	91	94	147	7.0
	15	Int.	●	0660X15DB	126	129	182	7.0
	20	Int.	★	0660X20DB	161	164	217	7.0
	25	Int.	★	0660X25DB	196	199	252	7.0
	30	Int.	★	0660X30DB	231	234	287	7.0
6.7	10	Int.	★	0670X10DB	91	94	147	7.0
	15	Int.	●	0670X15DB	126	129	182	7.0
	20	Int.	★	0670X20DB	161	164	217	7.0
	25	Int.	★	0670X25DB	196	199	252	7.0
	30	Int.	★	0670X30DB	231	234	287	7.0
6.8	10	Int.	★	0680X10DB	91	94	147	7.0
	15	Int.	●	0680X15DB	126	129	182	7.0
	20	Int.	●	0680X20DB	161	164	217	7.0
	25	Int.	★	0680X25DB	196	199	252	7.0
	30	Int.	★	0680X30DB	231	234	287	7.0
6.9	10	Int.	★	0690X10DB	91	94	147	7.0
	15	Int.	●	0690X15DB	126	129	182	7.0
	20	Int.	★	0690X20DB	161	164	217	7.0
	25	Int.	★	0690X25DB	196	199	252	7.0
	30	Int.	★	0690X30DB	231	234	287	7.0
7.0	10	Int.	●	0700X10DB	91	94	147	7.0
	15	Int.	●	0700X15DB	126	129	182	7.0
	20	Int.	●	0700X20DB	161	164	217	7.0
	25	Int.	●	0700X25DB	196	199	252	7.0
	30	Int.	●	0700X30DB	231	234	287	7.0
7.1	10	Int.	★	0710X10DB	98	101	155	8.0
	15	Int.	●	0710X15DB	135	138	192	8.0
	20	Int.	★	0710X20DB	173	176	230	8.0
	25	Int.	★	0710X25DB	210	213	267	8.0
	30	Int.	★	0710X30DB	248	251	305	8.0

●: Inventory maintained. ★: Inventory maintained in Japan.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
7.2	10	Int.	★	MWS0720X10DB	98	101	155	8.0
	15	Int.	★	0720X15DB	135	138	192	8.0
	20	Int.	●	0720X20DB	173	176	230	8.0
	25	Int.	★	0720X25DB	210	213	267	8.0
	30	Int.	★	0720X30DB	248	251	305	8.0
7.3	10	Int.	★	0730X10DB	98	101	155	8.0
	15	Int.	●	0730X15DB	135	138	192	8.0
	20	Int.	★	0730X20DB	173	176	230	8.0
	25	Int.	★	0730X25DB	210	213	267	8.0
	30	Int.	★	0730X30DB	248	251	305	8.0
7.4	10	Int.	★	0740X10DB	98	101	155	8.0
	15	Int.	●	0740X15DB	135	138	192	8.0
	20	Int.	★	0740X20DB	173	176	230	8.0
	25	Int.	★	0740X25DB	210	213	267	8.0
	30	Int.	★	0740X30DB	248	251	305	8.0
7.5	10	Int.	●	0750X10DB	98	101	155	8.0
	15	Int.	●	0750X15DB	135	138	192	8.0
	20	Int.	★	0750X20DB	173	176	230	8.0
	25	Int.	★	0750X25DB	210	213	267	8.0
	30	Int.	★	0750X30DB	248	251	305	8.0
7.6	10	Int.	★	0760X10DB	104	107	161	8.0
	15	Int.	★	0760X15DB	144	147	201	8.0
	20	Int.	★	0760X20DB	184	187	241	8.0
	25	Int.	★	0760X25DB	224	227	281	8.0
	30	Int.	★	0760X30DB	264	267	321	8.0
7.7	10	Int.	●	0770X10DB	104	107	161	8.0
	15	Int.	●	0770X15DB	144	147	201	8.0
	20	Int.	★	0770X20DB	184	187	241	8.0
	25	Int.	★	0770X25DB	224	227	281	8.0
	30	Int.	★	0770X30DB	264	267	321	8.0
7.8	10	Int.	★	0780X10DB	104	107	161	8.0
	15	Int.	●	0780X15DB	144	147	201	8.0
	20	Int.	●	0780X20DB	184	187	241	8.0
	25	Int.	●	0780X25DB	224	227	281	8.0
	30	Int.	★	0780X30DB	264	267	321	8.0
7.9	10	Int.	●	0790X10DB	104	107	161	8.0
	15	Int.	★	0790X15DB	144	147	201	8.0
	20	Int.	★	0790X20DB	184	187	241	8.0
	25	Int.	★	0790X25DB	224	227	281	8.0
	30	Int.	★	0790X30DB	264	267	321	8.0
8.0	10	Int.	●	0800X10DB	104	107	161	8.0
	15	Int.	●	0800X15DB	144	147	201	8.0
	20	Int.	●	0800X20DB	184	187	241	8.0
	25	Int.	★	0800X25DB	224	227	281	8.0
	30	Int.	●	0800X30DB	264	267	321	8.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
8.1	10	Int.	●	MWS0810X10DB	111	114	169	9.0
	15	Int.	★	0810X15DB	153	156	211	9.0
	20	Int.	★	0810X20DB	196	199	254	9.0
	25	Int.	★	0810X25DB	238	241	296	9.0
	30	Int.	★	0810X30DB	281	284	339	9.0
8.2	10	Int.	★	0820X10DB	111	114	169	9.0
	15	Int.	★	0820X15DB	153	156	211	9.0
	20	Int.	★	0820X20DB	196	199	254	9.0
	25	Int.	★	0820X25DB	238	241	296	9.0
	30	Int.	●	0820X30DB	281	284	339	9.0
8.3	10	Int.	★	0830X10DB	111	114	169	9.0
	15	Int.	★	0830X15DB	153	156	211	9.0
	20	Int.	★	0830X20DB	196	199	254	9.0
	25	Int.	★	0830X25DB	238	241	296	9.0
	30	Int.	★	0830X30DB	281	284	339	9.0
8.4	10	Int.	★	0840X10DB	111	114	169	9.0
	15	Int.	★	0840X15DB	153	156	211	9.0
	20	Int.	★	0840X20DB	196	199	254	9.0
	25	Int.	★	0840X25DB	238	241	296	9.0
	30	Int.	★	0840X30DB	281	284	339	9.0
8.5	10	Int.	●	0850X10DB	111	114	169	9.0
	15	Int.	●	0850X15DB	153	156	211	9.0
	20	Int.	●	0850X20DB	196	199	254	9.0
	25	Int.	★	0850X25DB	238	241	296	9.0
	30	Int.	●	0850X30DB	281	284	339	9.0
8.6	10	Int.	★	0860X10DB	117	120	175	9.0
	15	Int.	★	0860X15DB	162	165	220	9.0
	20	Int.	★	0860X20DB	207	210	265	9.0
	25	Int.	★	0860X25DB	252	255	310	9.0
	30	Int.	★	0860X30DB	297	300	355	9.0
8.7	10	Int.	●	0870X10DB	117	120	175	9.0
	15	Int.	★	0870X15DB	162	165	220	9.0
	20	Int.	★	0870X20DB	207	210	265	9.0
	25	Int.	★	0870X25DB	252	255	310	9.0
	30	Int.	★	0870X30DB	297	300	355	9.0
8.8	10	Int.	★	0880X10DB	117	120	175	9.0
	15	Int.	★	0880X15DB	162	165	220	9.0
	20	Int.	★	0880X20DB	207	210	265	9.0
	25	Int.	★	0880X25DB	252	255	310	9.0
	30	Int.	★	0880X30DB	297	300	355	9.0
8.9	10	Int.	★	0890X10DB	117	120	175	9.0
	15	Int.	★	0890X15DB	162	165	220	9.0
	20	Int.	★	0890X20DB	207	210	265	9.0
	25	Int.	★	0890X25DB	252	255	310	9.0
	30	Int.	★	0890X30DB	297	300	355	9.0

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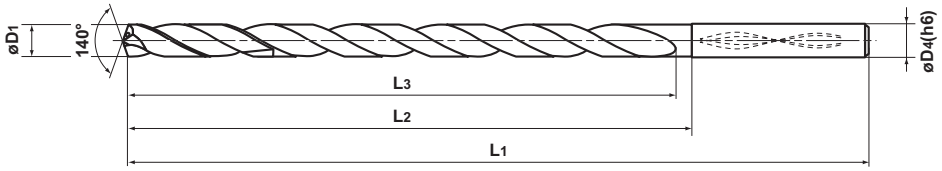
CUTTING CONDITIONS P.66

MWS...DB

Super Long Type

METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤14
D1 Tolerance (mm)	−0.017 −0.031	−0.025 −0.043	−0.033 −0.055	−0.041 −0.068
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011



For features, see page 7.

(Note 1) MWS type with ϕ5.0 or larger diameter has a recess in the end face.
(Note 2) MWS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
9.0	10	Int.	●	MWS0900X10DB	117	120	175	9.0
	15	Int.	●	0900X15DB	162	165	220	9.0
	20	Int.	●	0900X20DB	207	210	265	9.0
	25	Int.	★	0900X25DB	252	255	310	9.0
	30	Int.	★	0900X30DB	297	300	355	9.0
9.1	10	Int.	★	0910X10DB	124	127	182	10.0
	15	Int.	★	0910X15DB	171	174	229	10.0
	20	Int.	★	0910X20DB	219	222	277	10.0
	25	Int.	★	0910X25DB	266	269	324	10.0
	30	Int.	★	0910X30DB	314	317	372	10.0
9.2	10	Int.	★	0920X10DB	124	127	182	10.0
	15	Int.	★	0920X15DB	171	174	229	10.0
	20	Int.	★	0920X20DB	219	222	277	10.0
	25	Int.	★	0920X25DB	266	269	324	10.0
	30	Int.	★	0920X30DB	314	317	372	10.0
9.3	10	Int.	●	0930X10DB	124	127	182	10.0
	15	Int.	●	0930X15DB	171	174	229	10.0
	20	Int.	★	0930X20DB	219	222	277	10.0
	25	Int.	★	0930X25DB	266	269	324	10.0
	30	Int.	★	0930X30DB	314	317	372	10.0
9.4	10	Int.	★	0940X10DB	124	127	182	10.0
	15	Int.	★	0940X15DB	171	174	229	10.0
	20	Int.	★	0940X20DB	219	222	277	10.0
	25	Int.	★	0940X25DB	266	269	324	10.0
	30	Int.	★	0940X30DB	314	317	372	10.0
9.5	10	Int.	●	0950X10DB	124	127	182	10.0
	15	Int.	★	0950X15DB	171	174	229	10.0
	20	Int.	●	0950X20DB	219	222	277	10.0
	25	Int.	●	0950X25DB	266	269	324	10.0
	30	Int.	●	0950X30DB	314	317	372	10.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
9.6	10	Int.	●	MWS0960X10DB	130	133	188	10.0
	15	Int.	●	0960X15DB	180	183	238	10.0
	20	Int.	★	0960X20DB	230	233	288	10.0
	25	Int.	★	0960X25DB	280	283	338	10.0
	30	Int.	★	0960X30DB	330	333	388	10.0
9.7	10	Int.	★	0970X10DB	130	133	188	10.0
	15	Int.	●	0970X15DB	180	183	238	10.0
	20	Int.	★	0970X20DB	230	233	288	10.0
	25	Int.	★	0970X25DB	280	283	338	10.0
	30	Int.	★	0970X30DB	330	333	388	10.0
9.8	10	Int.	●	0980X10DB	130	133	188	10.0
	15	Int.	★	0980X15DB	180	183	238	10.0
	20	Int.	★	0980X20DB	230	233	288	10.0
	25	Int.	★	0980X25DB	280	283	338	10.0
	30	Int.	★	0980X30DB	330	333	388	10.0
9.9	10	Int.	●	0990X10DB	130	133	188	10.0
	15	Int.	★	0990X15DB	180	183	238	10.0
	20	Int.	★	0990X20DB	230	233	288	10.0
	25	Int.	★	0990X25DB	280	283	338	10.0
	30	Int.	★	0990X30DB	330	333	388	10.0
10.0	10	Int.	●	1000X10DB	130	133	188	10.0
	15	Int.	●	1000X15DB	180	183	238	10.0
	20	Int.	★	1000X20DB	230	233	288	10.0
	25	Int.	★	1000X25DB	280	283	338	10.0
	30	Int.	●	1000X30DB	330	333	388	10.0
10.1	10	Int.	★	1010X10DB	137	140	201	11.0
	15	Int.	★	1010X15DB	189	192	253	11.0
	20	Int.	★	1010X20DB	242	245	306	11.0
	25	Int.	★	1010X25DB	294	297	358	11.0

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

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
10.2	10	Int.	★	MWS1020X10DB	137	140	201	11.0
	15	Int.	●	1020X15DB	189	192	253	11.0
	20	Int.	★	1020X20DB	242	245	306	11.0
	25	Int.	★	1020X25DB	294	297	358	11.0
10.3	10	Int.	★	1030X10DB	137	140	201	11.0
	15	Int.	★	1030X15DB	189	192	253	11.0
	20	Int.	★	1030X20DB	242	245	306	11.0
	25	Int.	★	1030X25DB	294	297	358	11.0
10.4	10	Int.	★	1040X10DB	137	140	201	11.0
	15	Int.	★	1040X15DB	189	192	253	11.0
	20	Int.	★	1040X20DB	242	245	306	11.0
	25	Int.	★	1040X25DB	294	297	358	11.0
10.5	10	Int.	★	1050X10DB	137	140	201	11.0
	15	Int.	●	1050X15DB	189	192	253	11.0
	20	Int.	★	1050X20DB	242	245	306	11.0
	25	Int.	★	1050X25DB	294	297	358	11.0
10.6	10	Int.	●	1060X10DB	143	146	207	11.0
	15	Int.	★	1060X15DB	198	201	262	11.0
	20	Int.	★	1060X20DB	253	256	317	11.0
	25	Int.	★	1060X25DB	308	311	372	11.0
10.7	10	Int.	●	1070X10DB	143	146	207	11.0
	15	Int.	★	1070X15DB	198	201	262	11.0
	20	Int.	●	1070X20DB	253	256	317	11.0
	25	Int.	★	1070X25DB	308	311	372	11.0
10.8	10	Int.	●	1080X10DB	143	146	207	11.0
	15	Int.	★	1080X15DB	198	201	262	11.0
	20	Int.	●	1080X20DB	253	256	317	11.0
	25	Int.	★	1080X25DB	308	311	372	11.0
10.9	10	Int.	●	1090X10DB	143	146	207	11.0
	15	Int.	★	1090X15DB	198	201	262	11.0
	20	Int.	★	1090X20DB	253	256	317	11.0
	25	Int.	★	1090X25DB	308	311	372	11.0
11.0	10	Int.	●	1100X10DB	143	146	207	11.0
	15	Int.	●	1100X15DB	198	201	262	11.0
	20	Int.	★	1100X20DB	253	256	317	11.0
	25	Int.	●	1100X25DB	308	311	372	11.0
11.1	10	Int.	●	1110X10DB	150	153	215	12.0
	15	Int.	★	1110X15DB	207	210	272	12.0
	20	Int.	●	1110X20DB	265	268	330	12.0
	25	Int.	★	1110X25DB	322	325	387	12.0
11.2	10	Int.	★	1120X10DB	150	153	215	12.0
	15	Int.	●	1120X15DB	207	210	272	12.0
	20	Int.	★	1120X20DB	265	268	330	12.0
	25	Int.	★	1120X25DB	322	325	387	12.0
11.3	10	Int.	★	MWS1130X10DB	150	153	215	12.0
	15	Int.	★	1130X15DB	207	210	272	12.0
	20	Int.	★	1130X20DB	265	268	330	12.0
	25	Int.	★	1130X25DB	322	325	387	12.0
11.4	10	Int.	★	1140X10DB	150	153	215	12.0
	15	Int.	★	1140X15DB	207	210	272	12.0
	20	Int.	★	1140X20DB	265	268	330	12.0
	25	Int.	★	1140X25DB	322	325	387	12.0
11.5	10	Int.	★	1150X10DB	150	153	215	12.0
	15	Int.	★	1150X15DB	207	210	272	12.0
	20	Int.	★	1150X20DB	265	268	330	12.0
	25	Int.	●	1150X25DB	322	325	387	12.0
11.6	10	Int.	★	1160X10DB	156	159	221	12.0
	15	Int.	★	1160X15DB	216	219	281	12.0
	20	Int.	★	1160X20DB	276	279	341	12.0
	25	Int.	★	1160X25DB	336	339	401	12.0
11.7	10	Int.	★	1170X10DB	156	159	221	12.0
	15	Int.	★	1170X15DB	216	219	281	12.0
	20	Int.	★	1170X20DB	276	279	341	12.0
	25	Int.	★	1170X25DB	336	339	401	12.0
11.8	10	Int.	★	1180X10DB	156	159	221	12.0
	15	Int.	★	1180X15DB	216	219	281	12.0
	20	Int.	★	1180X20DB	276	279	341	12.0
	25	Int.	●	1180X25DB	336	339	401	12.0
11.9	10	Int.	●	1190X10DB	156	159	221	12.0
	15	Int.	★	1190X15DB	216	219	281	12.0
	20	Int.	★	1190X20DB	276	279	341	12.0
	25	Int.	★	1190X25DB	336	339	401	12.0
12.0	10	Int.	●	1200X10DB	156	159	221	12.0
	15	Int.	★	1200X15DB	216	219	281	12.0
	20	Int.	★	1200X20DB	276	279	341	12.0
	25	Int.	●	1200X25DB	336	339	401	12.0
12.1	10	Int.	□	1210X10DB	163	166	229	13.0
	15	Int.	□	1210X15DB	225	228	291	13.0
	20	Int.	□	1210X20DB	288	291	354	13.0
12.2	10	Int.	□	1220X10DB	163	166	229	13.0
	15	Int.	□	1220X15DB	225	228	291	13.0
	20	Int.	□	1220X20DB	288	291	354	13.0
12.3	10	Int.	□	1230X10DB	163	166	229	13.0
	15	Int.	□	1230X15DB	225	228	291	13.0
	20	Int.	□	1230X20DB	288	291	354	13.0
12.4	10	Int.	□	1240X10DB	163	166	229	13.0
	15	Int.	□	1240X15DB	225	228	291	13.0
	20	Int.	□	1240X20DB	288	291	354	13.0

NEXT PAGE

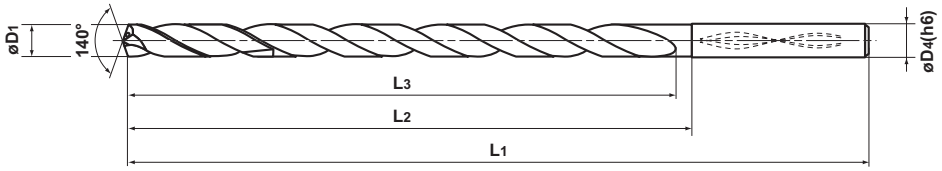
CUTTING CONDITIONS P.66

MWS...DB

Super Long Type

METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤14
D1 Tolerance (mm)	−0.017 −0.031	−0.025 −0.043	−0.033 −0.055	−0.041 −0.068
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011



For features, see page 7.

(Note 1) MWS type with ϕ5.0 or larger diameter has a recess in the end face.
(Note 2) MWS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
12.5	10	Int.	●	MWS1250X10DB	163	166	229	13.0
	15	Int.	●	1250X15DB	225	228	291	13.0
	20	Int.	★	1250X20DB	288	291	354	13.0
12.6	10	Int.	□	1260X10DB	169	172	235	13.0
	15	Int.	□	1260X15DB	234	237	300	13.0
	20	Int.	□	1260X20DB	299	302	365	13.0
12.7	10	Int.	□	1270X10DB	169	172	235	13.0
	15	Int.	□	1270X15DB	234	237	300	13.0
	20	Int.	●	1270X20DB	299	302	365	13.0
12.8	10	Int.	□	1280X10DB	169	172	235	13.0
	15	Int.	□	1280X15DB	234	237	300	13.0
	20	Int.	□	1280X20DB	299	302	365	13.0
12.9	10	Int.	□	1290X10DB	169	172	235	13.0
	15	Int.	□	1290X15DB	234	237	300	13.0
	20	Int.	□	1290X20DB	299	302	365	13.0
13.0	10	Int.	●	1300X10DB	169	172	235	13.0
	15	Int.	●	1300X15DB	234	237	300	13.0
	20	Int.	★	1300X20DB	299	302	365	13.0
13.1	10	Int.	□	1310X10DB	176	179	243	14.0
	15	Int.	□	1310X15DB	243	246	310	14.0
	20	Int.	●	1310X20DB	311	314	378	14.0
13.2	10	Int.	□	1320X10DB	176	179	243	14.0
	15	Int.	□	1320X15DB	243	246	310	14.0
	20	Int.	□	1320X20DB	311	314	378	14.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
13.3	10	Int.	●	MWS1330X10DB	176	179	243	14.0
	15	Int.	□	1330X15DB	243	246	310	14.0
	20	Int.	□	1330X20DB	311	314	378	14.0
13.4	10	Int.	□	1340X10DB	176	179	243	14.0
	15	Int.	□	1340X15DB	243	246	310	14.0
	20	Int.	□	1340X20DB	311	314	378	14.0
13.5	10	Int.	●	1350X10DB	176	179	243	14.0
	15	Int.	●	1350X15DB	243	246	310	14.0
	20	Int.	★	1350X20DB	311	314	378	14.0
13.6	10	Int.	□	1360X10DB	182	185	249	14.0
	15	Int.	□	1360X15DB	252	255	319	14.0
	20	Int.	□	1360X20DB	322	325	389	14.0
13.7	10	Int.	□	1370X10DB	182	185	249	14.0
	15	Int.	□	1370X15DB	252	255	319	14.0
	20	Int.	●	1370X20DB	322	325	389	14.0
13.8	10	Int.	□	1380X10DB	182	185	249	14.0
	15	Int.	□	1380X15DB	252	255	319	14.0
	20	Int.	□	1380X20DB	322	325	389	14.0
13.9	10	Int.	□	1390X10DB	182	185	249	14.0
	15	Int.	□	1390X15DB	252	255	319	14.0
	20	Int.	□	1390X20DB	322	325	389	14.0
14.0	10	Int.	●	1400X10DB	182	185	249	14.0
	15	Int.	●	1400X15DB	252	255	319	14.0
	20	Int.	●	1400X20DB	322	325	389	14.0

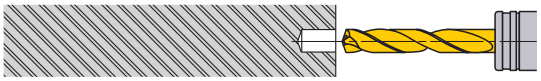
● : Inventory maintained. ★ : Inventory maintained in Japan.
□ : Non stock, produced to order only.

Operational Guidance for the MWS...DB Drill

Flat Face Drilling

●Drilling a blind hole

1. Drilling a pilot hole



①Use a drill with a larger (flatter) point angle than the super long type. Mitsubishi type MZE, MZS, MWE or MWS is recommended.
②Use a drill with the same diameter as the deep hole drill.
③Drill depth : Approx 2-3D or deeper.
④Ensure a high precision hole is drilled for the guide.

2. Initial cutting with the long type drill.

①Penetrate the guide hole at low revolution. (Cutting speed 65-100 SFM, feed rate .008-.012 IPR)
②Stop the long type drill .039-.118 inch short of the guide hole bottom.

3. Drill the deep hole

①Start cutting at the recommended speed and feed with a non-peck (continuous feed) cycle.

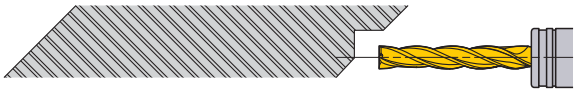
4. Drill retraction

①After drilling, lower the cutting revolution about .039-.079 inch short of the hole end. (Cutting speed of around 65-100 SFM)
②Retract the drill to the pilot hole depth starting point at a feed rate of 120 inch/min.
③Finally, clear the hole at a cutting speed of 65-100 SFM and feed rate of .008-.012 IPR.

Irregular Face Drilling

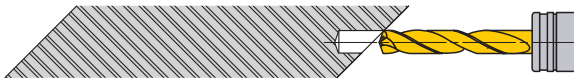
●Drilling and breaking through on irregular faces or angles

1. Spot facing



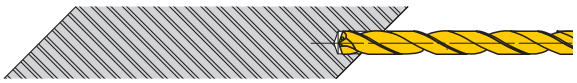
①Machine a flat or the irregular face by using an end mill or slot drill capable of spot facing. Make the spot face diameter the same size as the required deep hole diameter.

2. Drilling a pilot hole



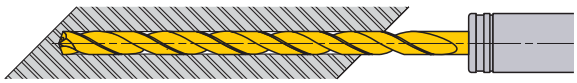
①Use a drill with a larger (flatter) point angle than the super long type. Mitsubishi type MZE, MZS, MWE or MWS is recommended.
②Use a drill with the same diameter as the deep hole drill.
③Drill depth : Approx 2-3D or deeper.
④Ensure a high precision hole is drilled for the guide.

3. Initial cutting with the long type drill



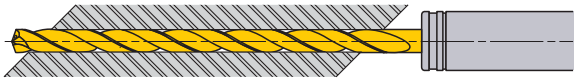
①Penetrate the guide hole at a low revolution. (Cutting speed 65-100 SFM, feed rate .008-.012 IPR)
②Stop the long type drill .039-.118 inch short of the guide hole bottom.

4. Drill the deep hole



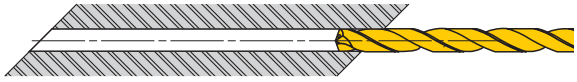
①Start cutting at the recommended speed and feed with a non-peck (continuous feed) cycle.

5. Breaking through



①When breaking through, the cutting edge can be damaged.
②A feed rate of .002-.004 IPR is recommended.

6. Drill retraction



①Finally clear the hole at a cutting speed of 65-100 SFM.
②Retract the drill to the pilot hole depth starting point at a feed rate of 120 inch/min.

CUTTING CONDITIONS P.66

MAS

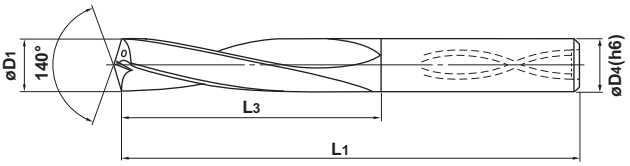
For Aluminum
For Cast iron

INCH STANDARD

L/D=3

Internal Coolant

	.1250<D1≤.2344	.2500<D1≤.3906	.4062<D1≤.7031	.7188<D1≤.7812
D1 Tolerance (inch)	+ .00020 0	+ .00020 0	+ .00020 0	+ .00020 0
D4 Tolerance (inch)	0 − .00031	0 − .00035	0 − .00043	0 − .00051



For features, see page 13.

(Note 1) MAS type larger than ϕ.2031" have a recess in the end face.
(Note 2) MAS type can be used for shrink fit holders.

Helix Angle : 10°

Drill Dia. D1 (inch)	Order Number	Stock HTi10	Dimensions (inch) L3	L1	D4	Tap Drill Sizes
.1250	MAS01250MB	●	.945	2.520	.157	
.1406	01406MB	●	1.102	2.677	.157	
.1495	01495MB	●	1.102	2.677	.157	10-24NC
.1563	01563MB	●	1.102	2.677	.157	
.1590	01590MB	●	1.220	2.795	.197	10-32NF
.1719	01719MB	●	1.220	2.795	.197	
.1875	01875MB	●	1.299	2.874	.197	
.2031	02031MB	●	1.417	2.992	.236	
.2165	02165MB	●	1.417	2.992	.236	
.2188	02188MB	●	1.535	3.110	.236	
.2344	02344MB	●	1.535	3.110	.236	
.2500	02500MB	●	1.654	3.307	.276	1/16-27NS
.2570	02570MB	●	1.654	3.307	.276	5/16-18NC
.2656	02656MB	●	1.654	3.307	.276	
.2720	02720MB	●	1.654	3.307	.276	5/16-24NF
.2812	02812MB	●	1.890	3.543	.315	
.2969	02969MB	●	1.890	3.543	.315	
.3125	03125MB	●	1.890	3.543	.315	3/8-16NC
.3281	03281MB	●	1.969	3.701	.354	1/8-27NPT
.3320	03320MB	●	1.969	3.701	.354	3/8-24NF
.3438	03438MB	●	1.969	3.701	.354	
.3594	03594MB	●	2.087	3.819	.394	
.3680	03680MB	●	2.087	3.819	.394	7/16-14NC
.3750	03750MB	●	2.087	3.819	.394	
.3906	03906MB	●	2.087	3.819	.394	7/16-20NF
.4062	04062MB	●	2.165	3.976	.433	

Drill Dia. D1 (inch)	Order Number	Stock HTi10	Dimensions (inch) L3	L1	D4	Tap Drill Sizes
.4219	MAS04219MB	●	2.165	3.976	.433	1/2-13, 1/2-12
.4375	04375MB	●	2.362	4.173	.472	1/4-18NPT
.4531	04531MB	●	2.362	4.173	.472	1/2-20, 1/4-18NS
.4688	04688MB	●	2.362	4.173	.472	
.4844	04844MB	●	2.559	4.528	.512	9/16-12NC
.5000	05000MB	●	2.559	4.528	.512	
.5118	05118MB	●	2.559	4.528	.512	
.5156	05156MB	●	2.756	4.724	.551	9/16-18NF
.5312	05312MB	●	2.756	4.724	.551	5/8-11NC
.5469	05469MB	●	2.756	4.724	.551	
.5625	05625MB	●	2.835	5.118	.591	3/8-18NPT
.5781	05781MB	●	2.835	5.118	.591	5/8-18NF
.5937	05937MB	●	2.992	5.276	.630	3/8-18NS
.6094	06094MB	●	2.992	5.276	.630	
.6250	06250MB	●	2.992	5.276	.630	
.6406	06406MB	●	3.150	5.433	.669	
.6563	06563MB	●	3.150	5.433	.669	3/4-10NC
.6718	06718MB	●	3.346	5.630	.709	
.6875	06875MB	●	3.346	5.630	.709	3/4-16NF
.7031	07031MB	●	3.346	5.630	.709	1/2-14NPT
.7188	07188MB	●	3.543	5.827	.748	
.7344	07344MB	●	3.543	5.827	.748	7/8-9, 1/2-14NS
.7500	07500MB	●	3.740	6.024	.787	
.7656	07656MB	●	3.740	6.024	.787	
.7812	07812MB	●	3.740	6.024	.787	

● : Inventory maintained.

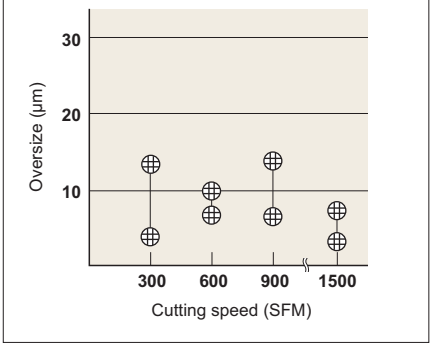
RECOMMENDED CUTTING CONDITIONS

	Work Material	Drill Dia. ϕ.1250" – ϕ.2344"		Drill Dia. ϕ.2500" – ϕ.3906"		Drill Dia. ϕ.4062" – ϕ.7812"	
		Cutting Speed (SFM)	Feed (IPR)	Cutting Speed (SFM)	Feed (IPR)	Cutting Speed (SFM)	Feed (IPR)
N	Aluminum Alloy Casting	330 (195—490)	.006 (.002—.012)	390 (260—555)	.008 (.004—.012)	490 (330—655)	.010 (.004—.016)
N	Aluminum Alloy Die Casting	390 (260—555)	.005 (.002—.010)	490 (330—590)	.006 (.002—.010)	525 (390—655)	.008 (.004—.012)
K	Cast Iron	195 (130—260)	.006 (.004—.008)	260 (195—360)	.008 (.004—.012)	330 (230—425)	.012 (.008—.016)
K	Ductile Cast Iron	145 (100—195)	.004 (.002—.006)	195 (130—260)	.005 (.002—.008)	260 (195—330)	.008 (.004—.012)

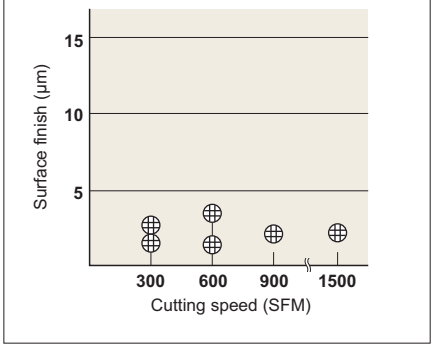
MACHINED HOLE ACCURACY

Tool : MAS1000LB Workpiece : 330Aluminum Feed : .008inch/rev Drilled Depth : 2.36inch (Through hole) WSO (10%)

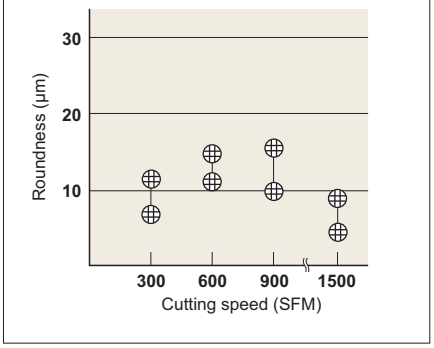
Oversize



Surface Roughness



Roundness



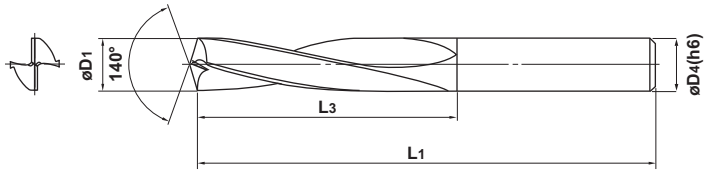
MAE/MAS

For Aluminum
For Cast iron

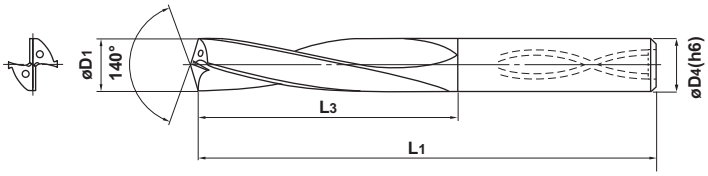
METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤16
D1 Tolerance (mm)	+0.005 0	+0.005 0	+0.005 0	+0.005 0
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011

MAE (External Coolant)



MAS (Internal Coolant)



For features, see page 13.

(Note 1) MAS type bigger than ϕ5 have a recess in the end face.
(Note 2) MAE/MAS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock HTi10	Order Number	Dimensions (mm) L3	L1	D4
3.0	3	Ext.	★	MAE0300MB	21	61	3.0
	3	Int.	□	MAS0300MB	21	61	3.0
	6	Int.	★	MAS0300LB	30	70	3.0
3.1	3	Ext.	★	MAE0310MB	24	64	4.0
	3	Int.	□	MAS0310MB	24	64	4.0
	6	Int.	★	MAS0310LB	34	74	4.0
3.2	3	Ext.	★	MAE0320MB	24	64	4.0
	3	Int.	□	MAS0320MB	24	64	4.0
	6	Int.	★	MAS0320LB	34	74	4.0
3.3	3	Ext.	★	MAE0330MB	24	64	4.0
	3	Int.	□	MAS0330MB	24	64	4.0
	6	Int.	★	MAS0330LB	34	74	4.0
3.4	3	Ext.	★	MAE0340MB	24	64	4.0
	3	Int.	□	MAS0340MB	24	64	4.0
	6	Int.	★	MAS0340LB	34	74	4.0
3.5	3	Ext.	★	MAE0350MB	24	64	4.0
	3	Int.	□	MAS0350MB	24	64	4.0
	6	Int.	★	MAS0350LB	34	74	4.0
3.6	3	Ext.	★	MAE0360MB	28	68	4.0
	3	Int.	□	MAS0360MB	28	68	4.0
	6	Int.	★	MAS0360LB	40	80	4.0
3.65	3	Ext.	★	★MAE0365MB	28	68	4.0
	3	Int.	□	★MAS0365MB	28	68	4.0
	6	Int.	★	★MAS0365LB	40	80	4.0
3.7	3	Ext.	★	MAE0370MB	28	68	4.0
	3	Int.	□	MAS0370MB	28	68	4.0
	6	Int.	★	MAS0370LB	40	80	4.0
3.8	3	Ext.	★	MAE0380MB	28	68	4.0
	3	Int.	□	MAS0380MB	28	68	4.0
	6	Int.	★	MAS0380LB	40	80	4.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock HTi10	Order Number	Dimensions (mm) L3	L1	D4
3.9	3	Ext.	★	MAE0390MB	28	68	4.0
	3	Int.	□	MAS0390MB	28	68	4.0
	6	Int.	★	MAS0390LB	40	80	4.0
4.0	3	Ext.	★	MAE0400MB	28	68	4.0
	3	Int.	□	MAS0400MB	28	68	4.0
	6	Int.	★	MAS0400LB	40	80	4.0
4.1	3	Ext.	★	MAE0410MB	31	71	5.0
	3	Int.	□	MAS0410MB	31	71	5.0
	6	Int.	★	MAS0410LB	44	84	5.0
4.2	3	Ext.	★	MAE0420MB	31	71	5.0
	3	Int.	□	MAS0420MB	31	71	5.0
	6	Int.	★	MAS0420LB	44	84	5.0
4.3	3	Ext.	★	MAE0430MB	31	71	5.0
	3	Int.	□	MAS0430MB	31	71	5.0
	6	Int.	★	MAS0430LB	44	84	5.0
4.4	3	Ext.	★	MAE0440MB	31	71	5.0
	3	Int.	□	MAS0440MB	31	71	5.0
	6	Int.	★	MAS0440LB	44	84	5.0
4.5	3	Ext.	★	MAE0450MB	31	71	5.0
	3	Int.	□	MAS0450MB	31	71	5.0
	6	Int.	★	MAS0450LB	44	84	5.0
4.6	3	Ext.	★	★MAE0460MB	33	73	5.0
	3	Int.	□	★MAS0460MB	33	73	5.0
	6	Int.	★	★MAS0460LB	48	88	5.0
4.7	3	Ext.	★	MAE0470MB	33	73	5.0
	3	Int.	□	MAS0470MB	33	73	5.0
	6	Int.	★	MAS0470LB	48	88	5.0
4.8	3	Ext.	★	MAE0480MB	33	73	5.0
	3	Int.	□	MAS0480MB	33	73	5.0
	6	Int.	★	MAS0480LB	48	88	5.0

(Note) ★ : Standard hole size for rolled thread tap.

★ : Inventory maintained in Japan. □ : Non stock, produced to order only.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock HTi10	Order Number	Dimensions (mm) L3	L1	D4
4.9	3	Ext.	★	MAE0490MB	33	73	5.0
	3	Int.	□	MAS0490MB	33	73	5.0
	6	Int.	★	MAS0490LB	48	88	5.0
5.0	3	Ext.	★	MAE0500MB	33	73	5.0
	3	Int.	★	MAS0500MB	33	73	5.0
	6	Int.	★	MAS0500LB	48	88	5.0
5.1	3	Ext.	★	MAE0510MB	36	76	6.0
	3	Int.	□	MAS0510MB	36	76	6.0
	6	Int.	★	MAS0510LB	52	92	6.0
5.2	3	Ext.	★	MAE0520MB	36	76	6.0
	3	Int.	□	MAS0520MB	36	76	6.0
	6	Int.	★	MAS0520LB	52	92	6.0
5.3	3	Ext.	★	MAE0530MB	36	76	6.0
	3	Int.	□	MAS0530MB	36	76	6.0
	6	Int.	★	MAS0530LB	52	92	6.0
5.4	3	Ext.	★	MAE0540MB	36	76	6.0
	3	Int.	□	MAS0540MB	36	76	6.0
	6	Int.	★	MAS0540LB	52	92	6.0
5.5	3	Ext.	★	★MAE0550MB	36	76	6.0
	3	Int.	★	★MAS0550MB	36	76	6.0
	6	Int.	★	★MAS0550LB	52	92	6.0
5.6	3	Ext.	★	MAE0560MB	39	79	6.0
	3	Int.	□	MAS0560MB	39	79	6.0
	6	Int.	★	MAS0560LB	57	97	6.0
5.7	3	Ext.	★	MAE0570MB	39	79	6.0
	3	Int.	□	MAS0570MB	39	79	6.0
	6	Int.	★	MAS0570LB	57	97	6.0
5.8	3	Ext.	★	MAE0580MB	39	79	6.0
	3	Int.	□	MAS0580MB	39	79	6.0
	6	Int.	★	MAS0580LB	57	97	6.0
5.9	3	Ext.	★	MAE0590MB	39	79	6.0
	3	Int.	□	MAS0590MB	39	79	6.0
	6	Int.	★	MAS0590LB	57	97	6.0
6.0	3	Ext.	★	MAE0600MB	39	79	6.0
	3	Int.	★	MAS0600MB	39	79	6.0
	6	Int.	★	MAS0600LB	57	97	6.0
6.1	3	Ext.	★	MAE0610MB	42	84	7.0
	3	Int.	□	MAS0610MB	42	84	7.0
	6	Int.	★	MAS0610LB	62	104	7.0
6.2	3	Ext.	★	MAE0620MB	42	84	7.0
	3	Int.	□	MAS0620MB	42	84	7.0
	6	Int.	★	MAS0620LB	62	104	7.0
6.3	3	Ext.	★	MAE0630MB	42	84	7.0
	3	Int.	□	MAS0630MB	42	84	7.0
	6	Int.	★	MAS0630LB	62	104	7.0
6.4	3	Ext.	★	MAE0640MB	42	84	7.0
	3	Int.	□	MAS0640MB	42	84	7.0
	6	Int.	★	MAS0640LB	62	104	7.0
6.5	3	Ext.	★	MAE0650MB	42	84	7.0
	3	Int.	★	MAS0650MB	42	84	7.0
	6	Int.	★	MAS0650LB	62	104	7.0
6.6	3	Ext.	★	MAE0660MB	42	84	7.0
	3	Int.	□	MAS0660MB	42	84	7.0
	6	Int.	★	MAS0660LB	65	107	7.0
6.7	3	Ext.	★	MAE0670MB	42	84	7.0
	3	Int.	□	MAS0670MB	42	84	7.0
	6	Int.	★	MAS0670LB	65	107	7.0
6.8	3	Ext.	★	MAE0680MB	42	84	7.0
	3	Int.	★	MAS0680MB	42	84	7.0
	6	Int.	★	MAS0680LB	65	107	7.0
6.9	3	Ext.	★	MAE0690MB	42	84	7.0
	3	Int.	□	MAS0690MB	42	84	7.0
	6	Int.	★	MAS0690LB	65	107	7.0
7.0	3	Ext.	★	MAE0700MB	42	84	7.0
	3	Int.	★	MAS0700MB	42	84	7.0
	6	Int.	★	MAS0700LB	65	107	7.0
7.1	3	Ext.	★	MAE0710MB	48	90	8.0
	3	Int.	□	MAS0710MB	48	90	8.0
	6	Int.	★	MAS0710LB	68	110	8.0
7.2	3	Ext.	★	MAE0720MB	48	90	8.0
	3	Int.	□	MAS0720MB	48	90	8.0
	6	Int.	★	MAS0720LB	68	110	8.0
7.3	3	Ext.	★	MAE0730MB	48	90	8.0
	3	Int.	□	MAS0730MB	48	90	8.0
	6	Int.	★	MAS0730LB	68	110	8.0
7.35	3	Ext.	★	★MAE0735MB	48	90	8.0
	3	Int.	★	★MAS0735MB	48	90	8.0
	6	Int.	★	★MAS0735LB	68	110	8.0
7.4	3	Ext.	★	MAE0740MB	48	90	8.0
	3	Int.	□	MAS0740MB	48	90	8.0
	6	Int.	★	MAS0740LB	68	110	8.0
7.5	3	Ext.	★	MAE0750MB	48	90	8.0
	3	Int.	□	MAS0750MB	48	90	8.0
	6	Int.	★	MAS0750LB	68	110	8.0
7.6	3	Ext.	★	MAE0760MB	48	90	8.0
	3	Int.	□	MAS0760MB	48	90	8.0
	6	Int.	★	MAS0760LB	72	114	8.0
7.7	3	Ext.	★	MAE0770MB	48	90	8.0
	3	Int.	□	MAS0770MB	48	90	8.0
	6	Int.	★	MAS0770LB	72	114	8.0

NEXT PAGE

CUTTING CONDITIONS P.82

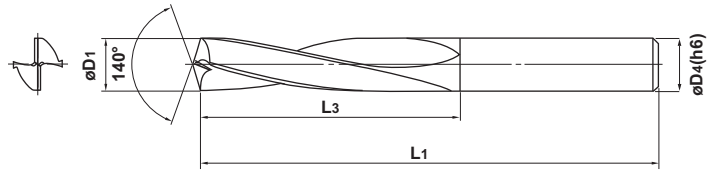
MAE/MAS

For Aluminum
For Cast iron

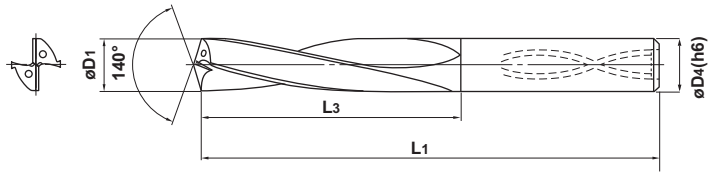
METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤16
D1 Tolerance (mm)	+0.005 0	+0.005 0	+0.005 0	+0.005 0
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011

MAE (External Coolant)



MAS (Internal Coolant)



For features, see page 13.

(Note 1) MAS type bigger than ϕ5 have a recess in the end face.
(Note 2) MAE/MAS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock HTi10	Order Number	Dimensions (mm) L3	L1	D4
7.8	3	Ext.	★	MAE0780MB	48	90	8.0
	3	Int.	□	MAS0780MB	48	90	8.0
	6	Int.	★	MAS0780LB	72	114	8.0
7.9	3	Ext.	★	MAE0790MB	48	90	8.0
	3	Int.	□	MAS0790MB	48	90	8.0
	6	Int.	★	MAS0790LB	72	114	8.0
8.0	3	Ext.	★	MAE0800MB	48	90	8.0
	3	Int.	★	MAS0800MB	48	90	8.0
	6	Int.	★	MAS0800LB	72	114	8.0
8.1	3	Ext.	★	MAE0810MB	50	94	9.0
	3	Int.	□	MAS0810MB	50	94	9.0
	6	Int.	★	MAS0810LB	75	119	9.0
8.2	3	Ext.	★	MAE0820MB	50	94	9.0
	3	Int.	□	MAS0820MB	50	94	9.0
	6	Int.	★	MAS0820LB	75	119	9.0
8.3	3	Ext.	★	MAE0830MB	50	94	9.0
	3	Int.	□	MAS0830MB	50	94	9.0
	6	Int.	★	MAS0830LB	75	119	9.0
8.4	3	Ext.	★	MAE0840MB	50	94	9.0
	3	Int.	□	MAS0840MB	50	94	9.0
	6	Int.	★	MAS0840LB	75	119	9.0
8.5	3	Ext.	★	MAE0850MB	50	94	9.0
	3	Int.	★	MAS0850MB	50	94	9.0
	6	Int.	★	MAS0850LB	75	119	9.0
8.6	3	Ext.	★	MAE0860MB	50	94	9.0
	3	Int.	□	MAS0860MB	50	94	9.0
	6	Int.	★	MAS0860LB	77	121	9.0
8.7	3	Ext.	★	MAE0870MB	50	94	9.0
	3	Int.	□	MAS0870MB	50	94	9.0
	6	Int.	★	MAS0870LB	77	121	9.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock HTi10	Order Number	Dimensions (mm) L3	L1	D4
8.8	3	Ext.	★	MAE0880MB	50	94	9.0
	3	Int.	□	MAS0880MB	50	94	9.0
	6	Int.	★	MAS0880LB	77	121	9.0
8.9	3	Ext.	★	MAE0890MB	50	94	9.0
	3	Int.	□	MAS0890MB	50	94	9.0
	6	Int.	★	MAS0890LB	77	121	9.0
9.0	3	Ext.	★	MAE0900MB	50	94	9.0
	3	Int.	★	MAS0900MB	50	94	9.0
	6	Int.	★	MAS0900LB	77	121	9.0
9.1	3	Ext.	★	MAE0910MB	53	97	10.0
	3	Int.	□	MAS0910MB	53	97	10.0
	6	Int.	★	MAS0910LB	81	125	10.0
9.2	3	Ext.	★	MAE0920MB	53	97	10.0
	3	Int.	□	MAS0920MB	53	97	10.0
	6	Int.	★	MAS0920LB	81	125	10.0
9.21	3	Ext.	★	★MAE0921MB	53	97	10.0
	3	Int.	★	★MAS0921MB	53	97	10.0
	6	Int.	★	★MAS0921LB	81	125	10.0
9.3	3	Ext.	★	MAE0930MB	53	97	10.0
	3	Int.	□	MAS0930MB	53	97	10.0
	6	Int.	★	MAS0930LB	81	125	10.0
9.4	3	Ext.	★	MAE0940MB	53	97	10.0
	3	Int.	□	MAS0940MB	53	97	10.0
	6	Int.	★	MAS0940LB	81	125	10.0
9.5	3	Ext.	★	MAE0950MB	53	97	10.0
	3	Int.	★	MAS0950MB	53	97	10.0
	6	Int.	★	MAS0950LB	81	125	10.0
9.6	3	Ext.	★	MAE0960MB	53	97	10.0
	3	Int.	□	MAS0960MB	53	97	10.0
	6	Int.	★	MAS0960LB	81	125	10.0

(Note) ★ : Standard hole size for rolled thread tap.

★ : Inventory maintained in Japan. □ : Non stock, produced to order only.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock HTi10	Order Number	Dimensions (mm) L3	L1	D4
9.7	3	Ext.	★	MAE0970MB	53	97	10.0
	3	Int.	□	MAS0970MB	53	97	10.0
	6	Int.	★	MAS0970LB	81	125	10.0
9.8	3	Ext.	★	MAE0980MB	53	97	10.0
	3	Int.	□	MAS0980MB	53	97	10.0
	6	Int.	★	MAS0980LB	81	125	10.0
9.9	3	Ext.	★	MAE0990MB	53	97	10.0
	3	Int.	□	MAS0990MB	53	97	10.0
	6	Int.	★	MAS0990LB	81	125	10.0
10.0	3	Ext.	★	MAE1000MB	53	97	10.0
	3	Int.	★	MAS1000MB	53	97	10.0
	6	Int.	★	MAS1000LB	81	125	10.0
10.1	3	Ext.	□	MAE1010MB	55	101	11.0
	3	Int.	□	MAS1010MB	55	101	11.0
	6	Int.	□	MAS1010LB	89	135	11.0
10.2	3	Ext.	□	MAE1020MB	55	101	11.0
	3	Int.	□	MAS1020MB	55	101	11.0
	6	Int.	□	MAS1020LB	89	135	11.0
10.3	3	Ext.	★	MAE1030MB	55	101	11.0
	3	Int.	★	MAS1030MB	55	101	11.0
	6	Int.	★	MAS1030LB	89	135	11.0
10.4	3	Ext.	□	MAE1040MB	55	101	11.0
	3	Int.	□	MAS1040MB	55	101	11.0
	6	Int.	□	MAS1040LB	89	135	11.0
10.5	3	Ext.	★	MAE1050MB	55	101	11.0
	3	Int.	★	MAS1050MB	55	101	11.0
	6	Int.	★	MAS1050LB	89	135	11.0
10.6	3	Ext.	□	MAE1060MB	55	101	11.0
	3	Int.	□	MAS1060MB	55	101	11.0
	6	Int.	□	MAS1060LB	89	135	11.0
10.7	3	Ext.	□	MAE1070MB	55	101	11.0
	3	Int.	□	MAS1070MB	55	101	11.0
	6	Int.	□	MAS1070LB	89	135	11.0
10.8	3	Ext.	□	MAE1080MB	55	101	11.0
	3	Int.	□	MAS1080MB	55	101	11.0
	6	Int.	□	MAS1080LB	89	135	11.0
10.9	3	Ext.	□	MAE1090MB	55	101	11.0
	3	Int.	□	MAS1090MB	55	101	11.0
	6	Int.	□	MAS1090LB	89	135	11.0
11.0	3	Ext.	★	MAE1100MB	55	101	11.0
	3	Int.	★	MAS1100MB	55	101	11.0
	6	Int.	★	MAS1100LB	89	135	11.0
11.08	3	Ext.	★	★MAE1108MB	60	106	12.0
	3	Int.	★	★MAS1108MB	60	106	12.0
	6	Int.	★	★MAS1108LB	94	140	12.0
11.1	3	Ext.	□	MAE1110MB	60	106	12.0
	3	Int.	□	MAS1110MB	60	106	12.0
	6	Int.	□	MAS1110LB	94	140	12.0
11.2	3	Ext.	□	MAE1120MB	90	106	12.0
	3	Int.	□	MAS1120MB	90	106	12.0
	6	Int.	□	MAS1120LB	94	140	12.0
11.3	3	Ext.	□	MAE1130MB	60	106	12.0
	3	Int.	□	MAS1130MB	60	106	12.0
	6	Int.	□	MAS1130LB	94	140	12.0
11.4	3	Ext.	□	MAE1140MB	60	106	12.0
	3	Int.	□	MAS1140MB	60	106	12.0
	6	Int.	□	MAS1140LB	94	140	12.0
11.5	3	Ext.	□	MAE1150MB	60	106	12.0
	3	Int.	□	MAS1150MB	60	106	12.0
	6	Int.	□	MAS1150LB	94	140	12.0
11.6	3	Ext.	□	MAE1160MB	60	106	12.0
	3	Int.	□	MAS1160MB	60	106	12.0
	6	Int.	□	MAS1160LB	94	140	12.0
11.7	3	Ext.	□	MAE1170MB	60	106	12.0
	3	Int.	□	MAS1170MB	60	106	12.0
	6	Int.	□	MAS1170LB	94	140	12.0
11.8	3	Ext.	□	MAE1180MB	60	106	12.0
	3	Int.	□	MAS1180MB	60	106	12.0
	6	Int.	□	MAS1180LB	94	140	12.0
11.9	3	Ext.	□	MAE1190MB	60	106	12.0
	3	Int.	□	MAS1190MB	60	106	12.0
	6	Int.	□	MAS1190LB	94	140	12.0
12.0	3	Ext.	★	MAE1200MB	60	106	12.0
	3	Int.	★	MAS1200MB	60	106	12.0
	6	Int.	★	MAS1200LB	94	140	12.0
12.1	3	Ext.	□	MAE1210MB	65	115	13.0
	3	Int.	□	MAS1210MB	65	115	13.0
	6	Int.	□	MAS1210LB	100	150	13.0
12.2	3	Ext.	□	MAE1220MB	65	115	13.0
	3	Int.	□	MAS1220MB	65	115	13.0
	6	Int.	□	MAS1220LB	100	150	13.0
12.3	3	Ext.	□	MAE1230MB	65	115	13.0
	3	Int.	□	MAS1230MB	65	115	13.0
	6	Int.	□	MAS1230LB	100	150	13.0
12.4	3	Ext.	□	MAE1240MB	65	115	13.0
	3	Int.	□	MAS1240MB	65	115	13.0
	6	Int.	□	MAS1240LB	100	150	13.0
12.5	3	Ext.	★	MAE1250MB	65	115	13.0
	3	Int.	★	MAS1250MB	65	115	13.0
	6	Int.	★	MAS1250LB	100	150	13.0

NEXT PAGE

CUTTING CONDITIONS P.82

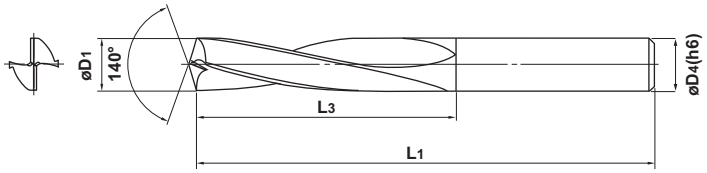
MAE/MAS

For Aluminum
For Cast iron

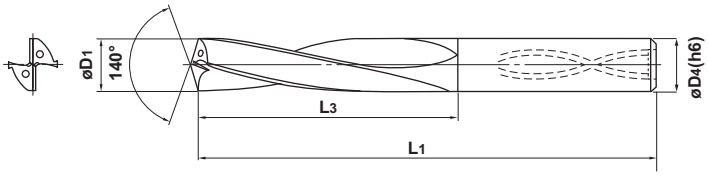
METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤16
D1 Tolerance (mm)	+0.005 0	+0.005 0	+0.005 0	+0.005 0
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011

MAE (External Coolant)



MAS (Internal Coolant)



For features, see page 13.

(Note 1) MAS type bigger than ϕ5 have a recess in the end face.
(Note 2) MAE/MAS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock HTi10	Order Number	Dimensions (mm) L3	L1	D4
12.6	3	Ext.	□	MAE1260MB	65	115	13.0
	3	Int.	□	MAS1260MB	65	115	13.0
	6	Int.	□	MAS1260LB	100	150	13.0
12.7	3	Ext.	□	MAE1270MB	65	115	13.0
	3	Int.	□	MAS1270MB	65	115	13.0
	6	Int.	□	MAS1270LB	100	150	13.0
12.8	3	Ext.	□	MAE1280MB	65	115	13.0
	3	Int.	□	MAS1280MB	65	115	13.0
	6	Int.	□	MAS1280LB	100	150	13.0
12.9	3	Ext.	□	MAE1290MB	65	115	13.0
	3	Int.	□	MAS1290MB	65	115	13.0
	6	Int.	□	MAS1290LB	100	150	13.0
12.96	3	Ext.	★	★MAE1296MB	65	115	13.0
	3	Int.	★	★MAS1296MB	65	115	13.0
	6	Int.	★	★MAS1296LB	100	150	13.0
13.0	3	Ext.	★	MAE1300MB	65	115	13.0
	3	Int.	★	MAS1300MB	65	115	13.0
	6	Int.	★	MAS1300LB	100	150	13.0
13.1	3	Ext.	□	MAE1310MB	70	120	14.0
	3	Int.	□	MAS1310MB	70	120	14.0
	6	Int.	□	MAS1310LB	110	160	14.0
13.2	3	Ext.	□	MAE1320MB	70	120	14.0
	3	Int.	□	MAS1320MB	70	120	14.0
	6	Int.	□	MAS1320LB	110	160	14.0
13.3	3	Ext.	□	MAE1330MB	70	120	14.0
	3	Int.	□	MAS1330MB	70	120	14.0
	6	Int.	□	MAS1330LB	110	160	14.0
13.4	3	Ext.	□	MAE1340MB	70	120	14.0
	3	Int.	□	MAS1340MB	70	120	14.0
	6	Int.	□	MAS1340LB	110	160	14.0
13.5	3	Ext.	★	MAE1350MB	70	120	14.0
	3	Int.	★	MAS1350MB	70	120	14.0
	6	Int.	★	MAS1350LB	110	160	14.0
13.6	3	Ext.	□	MAE1360MB	70	120	14.0
	3	Int.	□	MAS1360MB	70	120	14.0
	6	Int.	□	MAS1360LB	110	160	14.0
13.7	3	Ext.	□	MAE1370MB	70	120	14.0
	3	Int.	□	MAS1370MB	70	120	14.0
	6	Int.	□	MAS1370LB	110	160	14.0
13.8	3	Ext.	□	MAE1380MB	70	120	14.0
	3	Int.	□	MAS1380MB	70	120	14.0
	6	Int.	□	MAS1380LB	110	160	14.0
13.9	3	Ext.	□	MAE1390MB	70	120	14.0
	3	Int.	□	MAS1390MB	70	120	14.0
	6	Int.	□	MAS1390LB	110	160	14.0
14.0	3	Ext.	★	★MAE1400MB	70	120	14.0
	3	Int.	★	★MAS1400MB	70	120	14.0
	6	Int.	★	★MAS1400LB	110	160	14.0
14.1	3	Ext.	□	MAE1410MB	72	130	15.0
	3	Int.	□	MAS1410MB	72	130	15.0
	6	Int.	□	MAS1410LB	115	173	15.0
14.2	3	Ext.	□	MAE1420MB	72	130	15.0
	3	Int.	□	MAS1420MB	72	130	15.0
	6	Int.	□	MAS1420LB	115	173	15.0
14.3	3	Ext.	□	MAE1430MB	72	130	15.0
	3	Int.	□	MAS1430MB	72	130	15.0
	6	Int.	□	MAS1430LB	115	173	15.0
14.4	3	Ext.	□	MAE1440MB	72	130	15.0
	3	Int.	□	MAS1440MB	72	130	15.0
	6	Int.	□	MAS1440LB	115	173	15.0

(Note) ★ : Standard hole size for rolled thread tap.

★ : Inventory maintained in Japan. □ : Non stock, produced to order only.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant (Int./Ext.)	Stock HTi10	Order Number	Dimensions (mm) L3	L1	D4
14.5	3	Ext.	□	MAE1450MB	72	130	15.0
	3	Int.	□	MAS1450MB	72	130	15.0
	6	Int.	□	MAS1450LB	115	173	15.0
14.6	3	Ext.	□	MAE1460MB	72	130	15.0
	3	Int.	□	MAS1460MB	72	130	15.0
	6	Int.	□	MAS1460LB	115	173	15.0
14.7	3	Ext.	□	MAE1470MB	72	130	15.0
	3	Int.	□	MAS1470MB	72	130	15.0
	6	Int.	□	MAS1470LB	115	173	15.0
14.8	3	Ext.	□	MAE1480MB	72	130	15.0
	3	Int.	□	MAS1480MB	72	130	15.0
	6	Int.	□	MAS1480LB	115	173	15.0
14.9	3	Ext.	□	MAE1490MB	72	130	15.0
	3	Int.	□	MAS1490MB	72	130	15.0
	6	Int.	□	MAS1490LB	115	173	15.0
14.96	3	Ext.	★	★MAE1496MB	72	130	15.0
	3	Int.	★	★MAS1496MB	72	130	15.0
	6	Int.	★	★MAS1496LB	115	173	15.0
15.0	3	Ext.	★	MAE1500MB	72	130	15.0
	3	Int.	★	MAS1500MB	72	130	15.0
	6	Int.	★	MAS1500LB	115	173	15.0
15.1	3	Ext.	□	MAE1510MB	76	134	16.0
	3	Int.	□	MAS1510MB	76	134	16.0
	6	Int.	□	MAS1510LB	120	178	16.0
15.2	3	Ext.	□	MAE1520MB	76	134	16.0
	3	Int.	□	MAS1520MB	76	134	16.0
	6	Int.	□	MAS1520LB	120	178	16.0
15.3	3	Ext.	□	MAE1530MB	76	134	16.0
	3	Int.	□	MAS1530MB	76	134	16.0
	6	Int.	□	MAS1530LB	120	178	16.0
15.4	3	Ext.	□	MAE1540MB	76	134	16.0
	3	Int.	□	MAS1540MB	76	134	16.0
	6	Int.	□	MAS1540LB	120	178	16.0
15.5	3	Ext.	□	MAE1550MB	76	134	16.0
	3	Int.	□	MAS1550MB	76	134	16.0
	6	Int.	□	MAS1550LB	120	178	16.0
15.6	3	Ext.	□	MAE1560MB	76	134	16.0
	3	Int.	□	MAS1560MB	76	134	16.0
	6	Int.	□	MAS1560LB	120	178	16.0
15.7	3	Ext.	□	MAE1570MB	76	134	16.0
	3	Int.	□	MAS1570MB	76	134	16.0
	6	Int.	□	MAS1570LB	120	178	16.0
15.8	3	Ext.	□	★MAE1580MB	76	134	16.0
	3	Int.	□	★MAS1580MB	76	134	16.0
	6	Int.	□	★MAS1580LB	120	178	16.0
15.9	3	Ext.	□	MAE1590MB	76	134	16.0
	3	Int.	□	MAS1590MB	76	134	16.0
	6	Int.	□	MAS1590LB	120	178	16.0
16.0	3	Ext.	★	MAE1600MB	76	134	16.0
	3	Int.	★	MAS1600MB	76	134	16.0
	6	Int.	★	MAS1600LB	120	178	16.0

RECOMMENDED CUTTING CONDITIONS

	Work Material	Tool	Drill Diameter ø3.0–ø6.0 mm ø.118"–ø236" Cutting Speed (SFM)	Feed (IPR)	Drill Diameter ø6.0–ø10.0 mm ø.240"–ø394" Cutting Speed (SFM)	Feed (IPR)	Drill Diameter ø10.0–ø16.0 mm ø.398"–ø630" Cutting Speed (SFM)	Feed (IPR)
N	Cast Aluminum Alloy	MAE	295 (130–460)	.006 (.002–.012)	330 (165–490)	.008 (.004–.012)	395 (195–560)	.010 (.004–.016)
N	Die Cast Aluminum Alloy	MAE	330 (195–490)	.005 (.002–.010)	360 (230–525)	.006 (.002–.010)	425 (260–590)	.008 (.004–.012)
K	Cast Iron	MAE	130 (65–195)	.006 (.004–.008)	195 (130–260)	.008 (.004–.012)	260 (195–330)	.012 (.008–.016)
K	Ductile Cast Iron	MAE	100 (65–130)	.004 (.002–.006)	130 (65–195)	.005 (.002–.008)	195 (130–260)	.008 (.004–.012)
N	Cast Aluminum Alloy	MAS	300 (195–490)	.006 (.002–.012)	390 (260–555)	.008 (.004–.012)	490 (330–655)	.010 (.004–.016)
N	Die Cast Aluminum Alloy	MAS	390 (260–555)	.005 (.002–.010)	490 (330–590)	.006 (.002–.010)	525 (390–655)	.008 (.004–.012)
K	Cast Iron	MAS	195 (130–260)	.006 (.004–.008)	260 (195–360)	.008 (.004–.012)	330 (230–425)	.012 (.008–.016)
K	Ductile Cast Iron	MAS	145 (100–195)	.004 (.002–.006)	195 (130–260)	.005 (.002–.008)	260 (195–330)	.008 (.004–.012)

Hole and Drill Diameters for Thread

Thread Size	Thread Tapping: Super Burnish Drill Diameter (øD1mm)	Thread Tapping: Hole Diameter Tolerance (ømm) Max	Thread Tapping: Hole Diameter Tolerance (ømm) Min	Roll Thread Tapping: Super Burnish Drill Diameter (øD1mm)	Roll Thread Tapping: Hole Diameter Tolerance (ømm) Max	Roll Thread Tapping: Hole Diameter Tolerance (ømm) Min
M4x0.7	3.3	3.242	3.422	3.65	3.65	3.7
M5x0.8	4.2	4.134	4.334	4.6	4.59	4.66
M6x1.0	5.0	4.917	5.153	5.5	5.48	5.57
M8x1.25	6.8	6.647	6.912	7.35	7.34	7.41
M10x1.5	8.5	8.376	8.676	9.21	9.18	9.28
M12x1.75	10.3	10.106	10.441	11.08	11.05	11.15
M14x2	12.0	11.835	12.21	12.96	12.92	13.04
M16x2	14.0	13.835	14.21	14.96	14.92	15.04

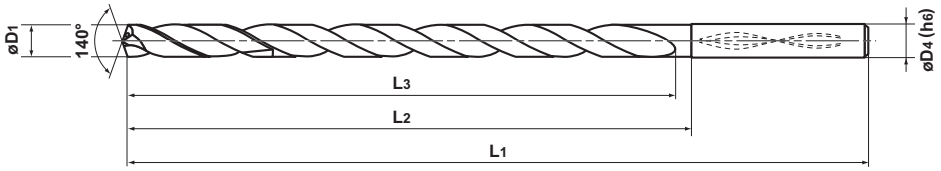
MNS/MNS...DB

For Aluminum

METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤14
D1 Tolerance (mm)	0 −0.014	0 −0.018	0 −0.022	0 −0.027
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011

●4.5 or smaller diameter drills are designed with 2 coolant holes.



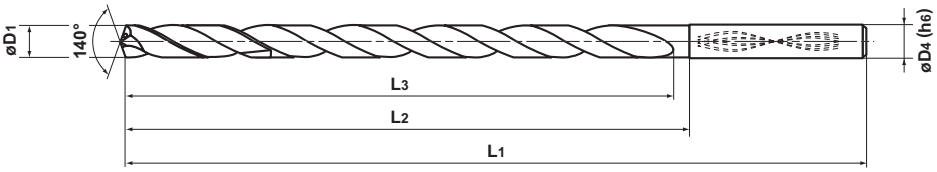
For features, see page 15.

(Note) MNS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock TF15	Order Number	Dimensions (mm) L3	L2	L1	D4
3.0	5	Int.	★	MNS0300LB	33	33	81	3.0
	10	Int.	★	0300X10DB	39	42	90	3.0
	20	Int.	★	0300X20DB	69	72	120	3.0
	30	Int.	★	0300X30DB	99	102	150	3.0
3.1	5	Int.	★	0310LB	39	39	87	4.0
	10	Int.	□	0310X10DB	46	49	97	4.0
	20	Int.	□	0310X20DB	81	84	132	4.0
	30	Int.	□	0310X30DB	116	119	167	4.0
3.2	5	Int.	★	0320LB	39	39	87	4.0
	10	Int.	★	0320X10DB	46	49	97	4.0
	20	Int.	★	0320X20DB	81	84	132	4.0
	30	Int.	★	0320X30DB	116	119	167	4.0
3.3	5	Int.	★	0330LB	39	39	87	4.0
	10	Int.	□	0330X10DB	46	49	97	4.0
	20	Int.	□	0330X20DB	81	84	132	4.0
	30	Int.	□	0330X30DB	116	119	167	4.0
3.4	5	Int.	★	0340LB	39	39	87	4.0
	10	Int.	★	0340X10DB	46	49	97	4.0
	20	Int.	★	0340X20DB	81	84	132	4.0
	30	Int.	★	0340X30DB	116	119	167	4.0
3.5	5	Int.	★	0350LB	39	39	87	4.0
	10	Int.	□	0350X10DB	46	49	97	4.0
	20	Int.	□	0350X20DB	81	84	132	4.0
	30	Int.	□	0350X30DB	116	119	167	4.0
3.6	5	Int.	★	0360LB	44	44	92	4.0
	10	Int.	★	0360X10DB	52	55	103	4.0
	20	Int.	★	0360X20DB	92	95	143	4.0
	30	Int.	★	0360X30DB	132	135	183	4.0
3.7	5	Int.	★	0370LB	44	44	92	4.0
	10	Int.	□	0370X10DB	52	55	103	4.0
	20	Int.	□	0370X20DB	92	95	143	4.0
	30	Int.	□	0370X30DB	132	135	183	4.0
3.8	5	Int.	★	MNS0380LB	44	44	92	4.0
	10	Int.	□	0380X10DB	52	55	103	4.0
	20	Int.	□	0380X20DB	92	95	143	4.0
	30	Int.	□	0380X30DB	132	135	183	4.0
3.9	5	Int.	★	0390LB	44	44	92	4.0
	10	Int.	★	0390X10DB	52	55	103	4.0
	20	Int.	★	0390X20DB	92	95	143	4.0
	30	Int.	★	0390X30DB	132	135	183	4.0
4.0	5	Int.	★	0400LB	44	44	92	4.0
	10	Int.	★	0400X10DB	52	55	103	4.0
	20	Int.	★	0400X20DB	92	95	143	4.0
	30	Int.	★	0400X30DB	132	135	183	4.0
4.1	5	Int.	★	0410LB	50	50	100	5.0
	10	Int.	□	0410X10DB	59	62	112	5.0
	20	Int.	□	0410X20DB	104	107	157	5.0
	30	Int.	□	0410X30DB	149	152	202	5.0
4.2	5	Int.	★	0420LB	50	50	100	5.0
	10	Int.	□	0420X10DB	59	62	112	5.0
	20	Int.	□	0420X20DB	104	107	157	5.0
	30	Int.	□	0420X30DB	149	152	202	5.0
4.3	5	Int.	★	0430LB	50	50	100	5.0
	10	Int.	□	0430X10DB	59	62	112	5.0
	20	Int.	□	0430X20DB	104	107	157	5.0
	30	Int.	□	0430X30DB	149	152	202	5.0
4.4	5	Int.	★	0440LB	50	50	100	5.0
	10	Int.	□	0440X10DB	59	62	112	5.0
	20	Int.	□	0440X20DB	104	107	157	5.0
	30	Int.	□	0440X30DB	149	152	202	5.0
4.5	5	Int.	★	0450LB	50	50	100	5.0
	10	Int.	□	0450X10DB	59	62	112	5.0
	20	Int.	□	0450X20DB	104	107	157	5.0
	30	Int.	□	0450X30DB	149	152	202	5.0

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

★ : Inventory maintained in Japan. □ : Non stock, produced to order only.



Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock TF15	Order Number	Dimensions (mm) L3	L2	L1	D4
4.6	5	Int.	★	MNS0460LB	55	55	105	5.0
	10	Int.	□	0460X10DB	65	68	118	5.0
	20	Int.	□	0460X20DB	115	118	168	5.0
	30	Int.	□	0460X30DB	165	168	218	5.0
4.7	5	Int.	★	0470LB	55	55	105	5.0
	10	Int.	□	0470X10DB	65	68	118	5.0
	20	Int.	□	0470X20DB	115	118	168	5.0
	30	Int.	□	0470X30DB	165	168	218	5.0
4.8	5	Int.	★	0480LB	55	55	105	5.0
	10	Int.	□	0480X10DB	65	68	118	5.0
	20	Int.	□	0480X20DB	115	118	168	5.0
	30	Int.	□	0480X30DB	165	168	218	5.0
4.9	5	Int.	★	0490LB	55	55	105	5.0
	10	Int.	★	0490X10DB	65	68	118	5.0
	20	Int.	★	0490X20DB	115	118	168	5.0
	30	Int.	★	0490X30DB	165	168	218	5.0
5.0	5	Int.	★	0500LB	44	44	100	6.0
	10	Int.	★	0500X10DB	65	68	118	5.0
	20	Int.	★	0500X20DB	115	118	168	5.0
	30	Int.	★	0500X30DB	165	168	218	5.0
5.1	5	Int.	★	0510LB	44	44	100	6.0
	10	Int.	★	0510X10DB	72	75	127	6.0
	20	Int.	★	0510X20DB	127	130	182	6.0
	30	Int.	★	0510X30DB	182	185	237	6.0
5.2	5	Int.	★	0520LB	44	44	100	6.0
	10	Int.	□	0520X10DB	72	75	127	6.0
	20	Int.	□	0520X20DB	127	130	182	6.0
	30	Int.	□	0520X30DB	182	185	237	6.0
5.3	5	Int.	★	0530LB	44	44	100	6.0
	10	Int.	□	0530X10DB	72	75	127	6.0
	20	Int.	□	0530X20DB	127	130	182	6.0
	30	Int.	□	0530X30DB	182	185	237	6.0
5.4	5	Int.	★	0540LB	44	44	100	6.0
	10	Int.	□	0540X10DB	72	75	127	6.0
	20	Int.	□	0540X20DB	127	130	182	6.0
	30	Int.	□	0540X30DB	182	185	237	6.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock TF15	Order Number	Dimensions (mm) L3	L2	L1	D4
5.5	5	Int.	★	MNS0550LB	44	44	100	6.0
	10	Int.	★	0550X10DB	72	75	127	6.0
	20	Int.	★	0550X20DB	127	130	182	6.0
	30	Int.	★	0550X30DB	182	185	237	6.0
5.6	5	Int.	★	0560LB	48	48	100	6.0
	10	Int.	□	0560X10DB	78	81	133	6.0
	20	Int.	□	0560X20DB	138	141	193	6.0
	30	Int.	□	0560X30DB	198	201	253	6.0
5.7	5	Int.	★	0570LB	48	48	100	6.0
	10	Int.	□	0570X10DB	78	81	133	6.0
	20	Int.	□	0570X20DB	138	141	193	6.0
	30	Int.	□	0570X30DB	198	201	253	6.0
5.8	5	Int.	★	0580LB	48	48	100	6.0
	10	Int.	□	0580X10DB	78	81	133	6.0
	20	Int.	□	0580X20DB	138	141	193	6.0
	30	Int.	□	0580X30DB	198	201	253	6.0
5.9	5	Int.	★	0590LB	48	48	100	6.0
	10	Int.	□	0590X10DB	78	81	133	6.0
	20	Int.	□	0590X20DB	138	141	193	6.0
	30	Int.	□	0590X30DB	198	201	253	6.0
6.0	5	Int.	★	0600LB	48	48	100	6.0
	10	Int.	★	0600X10DB	78	81	133	6.0
	20	Int.	★	0600X20DB	138	141	193	6.0
	30	Int.	★	0600X30DB	198	201	253	6.0
6.1	5	Int.	★	0610LB	52	52	109	7.0
	10	Int.	★	0610X10DB	85	88	141	7.0
	20	Int.	★	0610X20DB	150	153	206	7.0
	30	Int.	★	0610X30DB	215	218	271	7.0
6.2	5	Int.	★	0620LB	52	52	109	7.0
	10	Int.	□	0620X10DB	85	88	141	7.0
	20	Int.	□	0620X20DB	150	153	206	7.0
	30	Int.	□	0620X30DB	215	218	271	7.0
6.3	5	Int.	★	0630LB	52	52	109	7.0
	10	Int.	□	0630X10DB	85	88	141	7.0
	20	Int.	□	0630X20DB	150	153	206	7.0
	30	Int.	□	0630X30DB	215	218	271	7.0

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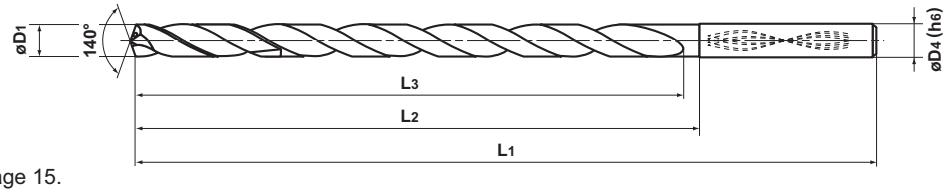
CUTTING CONDITIONS P.88

MNS/MNS...DB

For Aluminum

METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤14
D1 Tolerance (mm)	0 −0.014	0 −0.018	0 −0.022	0 −0.027
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011



For features, see page 15.
(Note) MNS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock TF15	Order Number	Dimensions (mm) L3	L2	L1	D4
6.4	5	Int.	★	MNS0640LB	52	52	109	7.0
	10	Int.	□	0640X10DB	85	88	141	7.0
	20	Int.	□	0640X20DB	150	153	206	7.0
	30	Int.	□	0640X30DB	215	218	271	7.0
6.5	5	Int.	★	0650LB	52	52	109	7.0
	10	Int.	★	0650X10DB	85	88	141	7.0
	20	Int.	★	0650X20DB	150	153	206	7.0
	30	Int.	★	0650X30DB	215	218	271	7.0
6.6	5	Int.	★	0660LB	56	56	109	7.0
	10	Int.	□	0660X10DB	91	94	147	7.0
	20	Int.	□	0660X20DB	161	164	217	7.0
	30	Int.	□	0660X30DB	231	234	287	7.0
6.7	5	Int.	★	0670LB	56	56	109	7.0
	10	Int.	★	0670X10DB	91	94	147	7.0
	20	Int.	★	0670X20DB	161	164	217	7.0
	30	Int.	★	0670X30DB	231	234	287	7.0
6.8	5	Int.	★	0680LB	56	56	109	7.0
	10	Int.	□	0680X10DB	91	94	147	7.0
	20	Int.	□	0680X20DB	161	164	217	7.0
	30	Int.	□	0680X30DB	231	234	287	7.0
6.9	5	Int.	★	0690LB	56	56	109	7.0
	10	Int.	□	0690X10DB	91	94	147	7.0
	20	Int.	□	0690X20DB	161	164	217	7.0
	30	Int.	□	0690X30DB	231	234	287	7.0
7.0	5	Int.	★	0700LB	56	56	109	7.0
	10	Int.	★	0700X10DB	91	94	147	7.0
	20	Int.	★	0700X20DB	161	164	217	7.0
	30	Int.	★	0700X30DB	231	234	287	7.0
7.1	5	Int.	★	0710LB	60	64	118	8.0
	10	Int.	□	0710X10DB	98	101	155	8.0
	20	Int.	□	0710X20DB	173	176	230	8.0
	30	Int.	□	0710X30DB	248	251	305	8.0
7.2	5	Int.	★	0720LB	60	64	118	8.0
	10	Int.	★	0720X10DB	98	101	155	8.0
	20	Int.	★	0720X20DB	173	176	230	8.0
	30	Int.	★	0720X30DB	248	251	305	8.0
7.3	5	Int.	★	MNS0730LB	60	64	118	8.0
	10	Int.	□	0730X10DB	98	101	155	8.0
	20	Int.	□	0730X20DB	173	176	230	8.0
	30	Int.	□	0730X30DB	248	251	305	8.0
7.4	5	Int.	★	0740LB	60	64	118	8.0
	10	Int.	□	0740X10DB	98	101	155	8.0
	20	Int.	□	0740X20DB	173	176	230	8.0
	30	Int.	□	0740X30DB	248	251	305	8.0
7.5	5	Int.	★	0750LB	60	64	118	8.0
	10	Int.	□	0750X10DB	98	101	155	8.0
	20	Int.	□	0750X20DB	173	176	230	8.0
	30	Int.	□	0750X30DB	248	251	305	8.0
7.6	5	Int.	★	0760LB	64	64	118	8.0
	10	Int.	□	0760X10DB	104	107	161	8.0
	20	Int.	□	0760X20DB	184	187	241	8.0
	30	Int.	□	0760X30DB	264	267	321	8.0
7.7	5	Int.	★	0770LB	64	64	118	8.0
	10	Int.	□	0770X10DB	104	107	161	8.0
	20	Int.	□	0770X20DB	184	187	241	8.0
	30	Int.	□	0770X30DB	264	267	321	8.0
7.8	5	Int.	★	0780LB	64	64	118	8.0
	10	Int.	★	0780X10DB	104	107	161	8.0
	20	Int.	★	0780X20DB	184	187	241	8.0
	30	Int.	★	0780X30DB	264	267	321	8.0
7.9	5	Int.	★	0790LB	64	64	118	8.0
	10	Int.	□	0790X10DB	104	107	161	8.0
	20	Int.	□	0790X20DB	184	187	241	8.0
	30	Int.	□	0790X30DB	264	267	321	8.0
8.0	5	Int.	★	0800LB	64	64	118	8.0
	10	Int.	★	0800X10DB	104	107	161	8.0
	20	Int.	★	0800X20DB	184	187	241	8.0
	30	Int.	★	0800X30DB	264	267	321	8.0
8.1	5	Int.	★	0810LB	68	72	127	9.0
	10	Int.	□	0810X10DB	111	114	169	9.0
	20	Int.	□	0810X20DB	196	199	254	9.0
	30	Int.	□	0810X30DB	281	284	339	9.0

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

★ : Inventory maintained in Japan. □ : Non stock, produced to order only.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock TF15	Order Number	Dimensions (mm) L3	L2	L1	D4
8.2	5	Int.	★	MNS0820LB	68	72	127	9.0
	10	Int.	□	0820X10DB	111	114	169	9.0
	20	Int.	□	0820X20DB	196	199	254	9.0
	30	Int.	□	0820X30DB	281	284	339	9.0
8.3	5	Int.	★	0830LB	68	72	127	9.0
	10	Int.	□	0830X10DB	111	114	169	9.0
	20	Int.	□	0830X20DB	196	199	254	9.0
	30	Int.	□	0830X30DB	281	284	339	9.0
8.4	5	Int.	★	0840LB	68	72	127	9.0
	10	Int.	□	0840X10DB	111	114	169	9.0
	20	Int.	□	0840X20DB	196	199	254	9.0
	30	Int.	□	0840X30DB	281	284	339	9.0
8.5	5	Int.	★	0850LB	68	72	127	9.0
	10	Int.	□	0850X10DB	111	114	169	9.0
	20	Int.	□	0850X20DB	196	199	254	9.0
	30	Int.	□	0850X30DB	281	284	339	9.0
8.6	5	Int.	★	0860LB	72	72	127	9.0
	10	Int.	□	0860X10DB	117	120	175	9.0
	20	Int.	□	0860X20DB	207	210	265	9.0
	30	Int.	□	0860X30DB	297	300	355	9.0
8.7	5	Int.	★	0870LB	72	72	127	9.0
	10	Int.	□	0870X10DB	117	120	175	9.0
	20	Int.	□	0870X20DB	207	210	265	9.0
	30	Int.	□	0870X30DB	297	300	355	9.0
8.8	5	Int.	★	0880LB	72	72	127	9.0
	10	Int.	□	0880X10DB	117	120	175	9.0
	20	Int.	□	0880X20DB	207	210	265	9.0
	30	Int.	□	0880X30DB	297	300	355	9.0
8.9	5	Int.	★	0890LB	72	72	127	9.0
	10	Int.	□	0890X10DB	117	120	175	9.0
	20	Int.	□	0890X20DB	207	210	265	9.0
	30	Int.	□	0890X30DB	297	300	355	9.0
9.0	5	Int.	★	0900LB	72	72	127	9.0
	10	Int.	★	0900X10DB	117	120	175	9.0
	20	Int.	★	0900X20DB	207	210	265	9.0
	30	Int.	★	0900X30DB	297	300	355	9.0
9.1	5	Int.	★	0910LB	76	80	136	10.0
	10	Int.	□	0910X10DB	124	127	182	10.0
	20	Int.	□	0910X20DB	219	222	277	10.0
	30	Int.	□	0910X30DB	314	317	372	10.0
9.2	5	Int.	★	0920LB	76	80	136	10.0
	10	Int.	□	0920X10DB	124	127	182	10.0
	20	Int.	□	0920X20DB	219	222	277	10.0
	30	Int.	□	0920X30DB	314	317	372	10.0
9.3	5	Int.	★	0930LB	76	80	136	10.0
	10	Int.	□	0930X10DB	124	127	182	10.0
	20	Int.	□	0930X20DB	219	222	277	10.0
	30	Int.	□	0930X30DB	314	317	372	10.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock TF15	Order Number	Dimensions (mm) L3	L2	L1	D4
9.4	5	Int.	★	MNS0940LB	76	80	136	10.0
	10	Int.	□	0940X10DB	124	127	182	10.0
	20	Int.	□	0940X20DB	219	222	277	10.0
	30	Int.	□	0940X30DB	314	317	372	10.0
9.5	5	Int.	★	0950LB	76	80	136	10.0
	10	Int.	□	0950X10DB	124	127	182	10.0
	20	Int.	□	0950X20DB	219	222	277	10.0
	30	Int.	□	0950X30DB	314	317	372	10.0
9.6	5	Int.	★	0960LB	80	80	136	10.0
	10	Int.	□	0960X10DB	130	133	188	10.0
	20	Int.	□	0960X20DB	230	233	288	10.0
	30	Int.	□	0960X30DB	330	333	388	10.0
9.7	5	Int.	★	0970LB	80	80	136	10.0
	10	Int.	□	0970X10DB	130	133	188	10.0
	20	Int.	□	0970X20DB	230	233	288	10.0
	30	Int.	□	0970X30DB	330	333	388	10.0
9.8	5	Int.	★	0980LB	80	80	136	10.0
	10	Int.	★	0980X10DB	130	133	188	10.0
	20	Int.	★	0980X20DB	230	233	288	10.0
	30	Int.	★	0980X30DB	330	333	388	10.0
9.9	5	Int.	★	0990LB	80	80	136	10.0
	10	Int.	□	0990X10DB	130	133	188	10.0
	20	Int.	□	0990X20DB	230	233	288	10.0
	30	Int.	□	0990X30DB	330	333	388	10.0
10.0	5	Int.	★	1000LB	80	80	136	10.0
	10	Int.	★	1000X10DB	130	133	188	10.0
	20	Int.	★	1000X20DB	230	233	288	10.0
	30	Int.	★	1000X30DB	330	333	388	10.0
10.1	5	Int.	★	1010LB	84	88	149	11.0
	10	Int.	□	1010X10DB	137	140	201	11.0
	20	Int.	□	1010X20DB	242	245	306	11.0
10.2	5	Int.	★	1020LB	84	88	149	11.0
	10	Int.	□	1020X10DB	137	140	201	11.0
	20	Int.	□	1020X20DB	242	245	306	11.0
10.3	5	Int.	★	1030LB	84	88	149	11.0
	10	Int.	□	1030X10DB	137	140	201	11.0
	20	Int.	□	1030X20DB	242	245	306	11.0
10.4	5	Int.	★	1040LB	84	88	149	11.0
	10	Int.	□	1040X10DB	137	140	201	11.0
	20	Int.	□	1040X20DB	242	245	306	11.0
10.5	5	Int.	★	1050LB	84	88	149	11.0
	10	Int.	★	1050X10DB	137	140	201	11.0
	20	Int.	★	1050X20DB	242	245	306	11.0
10.6	5	Int.	★	1060LB	88	88	149	11.0
	10	Int.	□	1060X10DB	143	146	207	11.0
	20	Int.	□	1060X20DB	253	256	317	11.0

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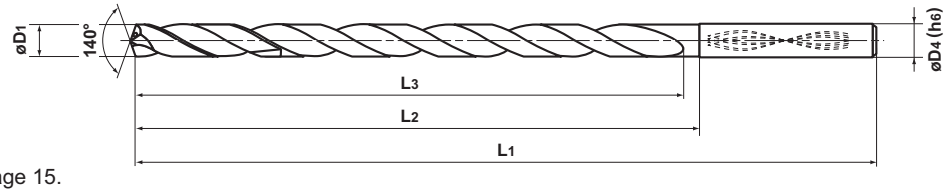
CUTTING CONDITIONS P.88

MNS/MNS...DB

For Aluminum

METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤14
D1 Tolerance (mm)	0 −0.014	0 −0.018	0 −0.022	0 −0.027
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011



For features, see page 15.
(Note) MNS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock TF15	Order Number	Dimensions (mm) L3	L2	L1	D4
	5	Int.	★	MNS1070LB	88	88	149	11.0
10.7	10	Int.	□	1070X10DB	143	146	207	11.0
	20	Int.	□	1070X20DB	253	256	317	11.0
	5	Int.	★	1080LB	88	88	149	11.0
10.8	10	Int.	□	1080X10DB	143	146	207	11.0
	20	Int.	□	1080X20DB	253	256	317	11.0
	5	Int.	★	1090LB	88	88	149	11.0
10.9	10	Int.	□	1090X10DB	143	146	207	11.0
	20	Int.	□	1090X20DB	253	256	317	11.0
	5	Int.	★	1100LB	88	88	149	11.0
11.0	10	Int.	★	1100X10DB	143	146	207	11.0
	20	Int.	★	1100X20DB	253	256	317	11.0
	5	Int.	★	1110LB	92	96	158	12.0
11.1	10	Int.	□	1110X10DB	150	153	215	12.0
	20	Int.	□	1110X20DB	265	268	330	12.0
	5	Int.	★	1120LB	92	96	158	12.0
11.2	10	Int.	□	1120X10DB	150	153	215	12.0
	20	Int.	□	1120X20DB	265	268	330	12.0
	5	Int.	★	1130LB	92	96	158	12.0
11.3	10	Int.	□	1130X10DB	150	153	215	12.0
	20	Int.	□	1130X20DB	265	268	330	12.0
	5	Int.	★	1140LB	92	96	158	12.0
11.4	10	Int.	□	1140X10DB	150	153	215	12.0
	20	Int.	□	1140X20DB	265	268	330	12.0
	5	Int.	★	1150LB	92	96	158	12.0
11.5	10	Int.	□	1150X10DB	150	153	215	12.0
	20	Int.	□	1150X20DB	265	268	330	12.0
	5	Int.	★	1160LB	96	96	158	12.0
11.6	10	Int.	□	1160X10DB	156	159	221	12.0
	20	Int.	□	1160X20DB	276	279	341	12.0
	5	Int.	★	1170LB	96	96	158	12.0
11.7	10	Int.	□	1170X10DB	156	159	221	12.0
	20	Int.	□	1170X20DB	276	279	341	12.0
	5	Int.	★	1180LB	96	96	158	12.0
11.8	10	Int.	□	1180X10DB	156	159	221	12.0
	20	Int.	□	1180X20DB	276	279	341	12.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock TF15	Order Number	Dimensions (mm) L3	L2	L1	D4
	5	Int.	★	MNS1190LB	96	96	158	12.0
11.9	10	Int.	□	1190X10DB	156	159	221	12.0
	20	Int.	□	1190X20DB	276	279	341	12.0
	5	Int.	★	1200LB	96	96	158	12.0
12.0	10	Int.	★	1200X10DB	156	159	221	12.0
	20	Int.	★	1200X20DB	276	279	341	12.0
	5	Int.	★	1210LB	100	104	167	13.0
12.1	10	Int.	□	1210X10DB	163	166	229	13.0
	20	Int.	□	1210X20DB	288	291	354	13.0
	5	Int.	★	1220LB	100	104	167	13.0
12.2	10	Int.	□	1220X10DB	163	166	229	13.0
	20	Int.	□	1220X20DB	288	291	354	13.0
	5	Int.	★	1230LB	100	104	167	13.0
12.3	10	Int.	□	1230X10DB	163	166	229	13.0
	20	Int.	□	1230X20DB	288	291	354	13.0
	5	Int.	★	1240LB	100	104	167	13.0
12.4	10	Int.	□	1240X10DB	163	166	229	13.0
	20	Int.	□	1240X20DB	288	291	354	13.0
	5	Int.	★	1250LB	100	104	167	13.0
12.5	10	Int.	□	1250X10DB	163	166	229	13.0
	20	Int.	□	1250X20DB	288	291	354	13.0
	5	Int.	★	1260LB	104	104	167	13.0
12.6	10	Int.	□	1260X10DB	169	172	235	13.0
	20	Int.	□	1260X20DB	299	302	365	13.0
	5	Int.	★	1270LB	104	104	167	13.0
12.7	10	Int.	□	1270X10DB	169	172	235	13.0
	20	Int.	□	1270X20DB	299	302	365	13.0
	5	Int.	★	1280LB	104	104	167	13.0
12.8	10	Int.	□	1280X10DB	169	172	235	13.0
	20	Int.	□	1280X20DB	299	302	365	13.0
	5	Int.	★	1290LB	104	104	167	13.0
12.9	10	Int.	□	1290X10DB	169	172	235	13.0
	20	Int.	□	1290X20DB	299	302	365	13.0
	5	Int.	★	1300LB	104	104	167	13.0
13.0	10	Int.	★	1300X10DB	169	172	235	13.0
	20	Int.	★	1300X20DB	299	302	365	13.0

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

★ : Inventory maintained in Japan. □ : Non stock, produced to order only.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock TF15	Order Number	Dimensions (mm) L3	L2	L1	D4
13.1	5	Int.	★	**MNS1310LB**	108	112	176	14.0
	10	Int.	□	**1310X10DB**	176	179	243	14.0
	20	Int.	□	**1310X20DB**	311	314	378	14.0
13.2	5	Int.	★	**1320LB**	108	112	176	14.0
	10	Int.	□	**1320X10DB**	176	179	243	14.0
	20	Int.	□	**1320X20DB**	311	314	378	14.0
13.3	5	Int.	★	**1330LB**	108	112	176	14.0
	10	Int.	□	**1330X10DB**	176	179	243	14.0
	20	Int.	□	**1330X20DB**	311	314	378	14.0
13.4	5	Int.	★	**1340LB**	108	112	176	14.0
	10	Int.	□	**1340X10DB**	176	179	243	14.0
	20	Int.	□	**1340X20DB**	311	314	378	14.0
13.5	5	Int.	★	**1350LB**	108	112	176	14.0
	10	Int.	□	**1350X10DB**	176	179	243	14.0
	20	Int.	□	**1350X20DB**	311	314	378	14.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock TF15	Order Number	Dimensions (mm) L3	L2	L1	D4
13.6	5	Int.	★	**MNS1360LB**	112	112	176	14.0
	10	Int.	□	**1360X10DB**	182	185	249	14.0
	20	Int.	□	**1360X20DB**	322	325	389	14.0
13.7	5	Int.	★	**1370LB**	112	112	176	14.0
	10	Int.	□	**1370X10DB**	182	185	249	14.0
	20	Int.	□	**1370X20DB**	322	325	389	14.0
13.8	5	Int.	★	**1380LB**	112	112	176	14.0
	10	Int.	□	**1380X10DB**	182	185	249	14.0
	20	Int.	□	**1380X20DB**	322	325	389	14.0
13.9	5	Int.	★	**1390LB**	112	112	176	14.0
	10	Int.	□	**1390X10DB**	182	185	249	14.0
	20	Int.	□	**1390X20DB**	322	325	389	14.0
14.0	5	Int.	★	**1400LB**	112	112	176	14.0
	10	Int.	★	**1400X10DB**	182	185	249	14.0
	20	Int.	★	**1400X20DB**	322	325	389	14.0

RECOMMENDED CUTTING CONDITIONS

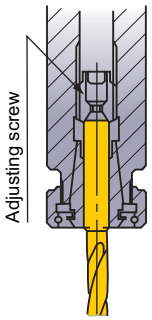
Work Material		Order Number	Drill Diameter ϕ3.0—ϕ6.0 mm ϕ.1181″—ϕ.2362″ Cutting Speed (SFM)	Feed (IPR)	ϕ6.1—ϕ10.0 mm ϕ.2401″—ϕ.3937″ Cutting Speed (SFM)	Feed (IPR)	ϕ10.1—ϕ14.0 mm ϕ.3976″—ϕ.5512″ Cutting Speed (SFM)	Feed (IPR)
N	Aluminum Alloy Casting Aluminum Die Casting	MNS...LB	260—490	.008—.020	330—655	.012—.039	490—820	.012—.039
		MNS...DB	195—395	.008—.020	260—490	.012—.039	395—655	.012—.039
	Wrought Aluminum Alloy	MNS...LB	260—490	.006—.012	330—655	.008—.016	490—655	.008—.016
		MNS...DB	195—395	.006—.012	260—490	.008—.016	395—655	.008—.016

(Note 1) When using the drill with a length over l/d 10, it is necessary to use a prep holes as a guide. (If no prep-hole is used then drill breakage can occur)

(Note 2) For pilot hole drilling, Mitsubishi Materials MNS-LB, MAE-MB or MAS-MB drill is recommended.

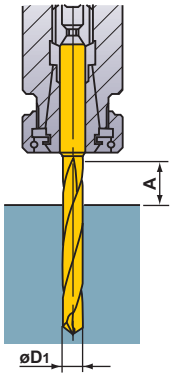
Operational Guidance for the MNS-LB Drill

Drill holding



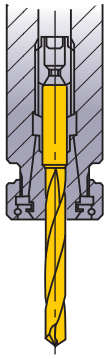
Thrust bearing type collet chuck holds the drill securely.

Drill length



A : ≥ D1 x 1.5

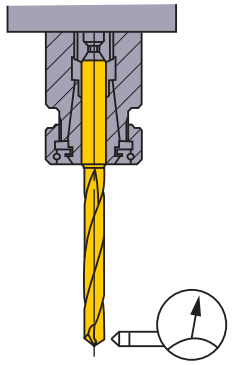
Drill installation



NG

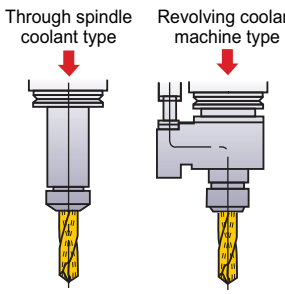
Do not clamp on the flutes.

Installation tolerance



Runout ≤ .001″

Coolant method (MNS)



Coolant pressure is approx. 0.5 - 7MPa.

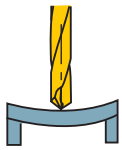
Coolant handling

< MNS type >

1) Dirt and dust particles in old coolant can clog the oil hole and prevent effective flow. Regular coolant exchange is recommended.

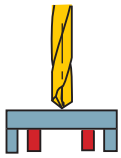
2) Small particles of swarf will jam in the oil hole. Use a filter as a preventative measure. When using small diameter drills, use a fine mesh filter.

Thin workpieces



If bending occurs

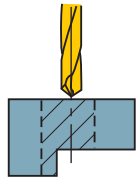
NG



Support the workpiece

Good

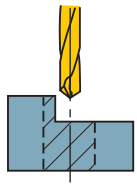
Interrupted cutting



One process

Good

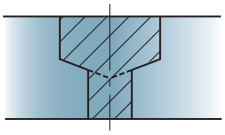
①Lower the feed when drilling the interrupted part.



Requires prior machining

①Spot face with an end mill prior to drilling.

Stepped holes

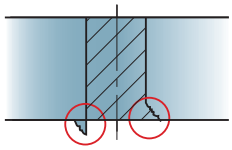


①Divide the machining into two processes.

②Drill the larger hole first.

*Tools for chamfering and spot facing can be produced to order.

Burring and workpiece chipping



①Lower the feed rate when breaking through.

②Add a chamfer.

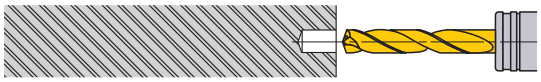
③Change the point angle.

Operational Guidance for the MNS-DB Drill

Flat Face Drilling

●Drilling a blind hole

1. Drilling a pilot hole

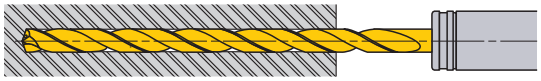


①Use a drill with a larger (flatter) point angle than the super long type. Mitsubishi type MNS-LB, MAE-MB or MAS-MB drill is recommended.
②Ensure a high precision hole is drilled for the guide.
③Drill depth : Approx 1D or deeper.
(Adjust the pilot hole depth according to the length of the super long type.)

2. Initial cutting with the long type drill

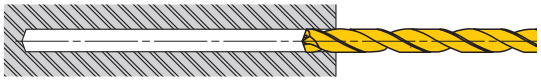
①Penetrate the pilot hole at low revolution. (Cutting speed 65-100SFM, feed rate .008-.012 IPR)
②Stop the long type drill .039-.118 inch short of the pilot hole bottom.

3. Drill the deep hole



①Start cutting at the recommended speed and feed with a non-peck (continuous feed) cycle.

4. Drill retraction

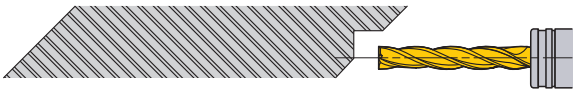


①After drilling, lower the cutting revolution about .039-.079 inch short of the hole end. (Cutting speed of around 65-100 SFM)
②Retract the drill to the pilot hole depth starting point at a feed rate of 120 inch/min.
③Finally, clear the hole at a cutting speed of 65-100 SFM and feed rate of .008-.012IPR.

Irregular Face Drilling

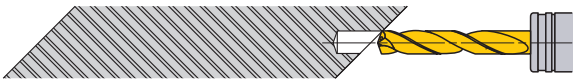
●Drilling and breaking through on irregular faces or angles

1. Spot facing



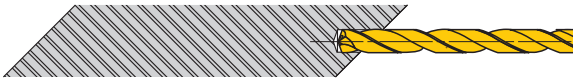
①Machine a flat or the irregular face by using an end mill or slot drill capable of spot facing. Make the spot face diameter the same size as the required deep hole diameter.

2. Drilling a pilot hole



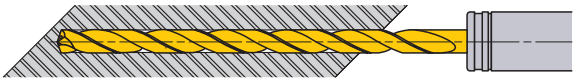
①Use a drill with a larger (flatter) point angle than the super long type. Mitsubishi type MNS-LB, MAE-MB or MAS-MB drill is recommended.
②Ensure a high precision hole is drilled for the guide.
③Drill depth : Approx 1D or deeper.
(Adjust the pilot hole depth according to the length of the super long type.)

3. Initial cutting with the long type drill



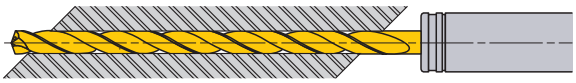
①Penetrate the pilot hole at a low revolution. (Cutting speed 20m-30m/min, feed rate .008-.012 IPR)
②Stop the long type drill .039-.118 inch short of the pilot hole bottom.

4. Drill the deep hole



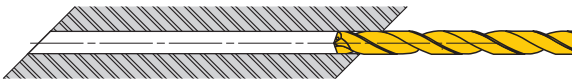
①Start cutting at the recommended speed and feed with a non-peck (continuous feed) cycle.

5. Breaking through



①When breaking through, the cutting edge can be damaged.
②A feed rate of .002-.004 IPR is recommended.

6. Drill retraction



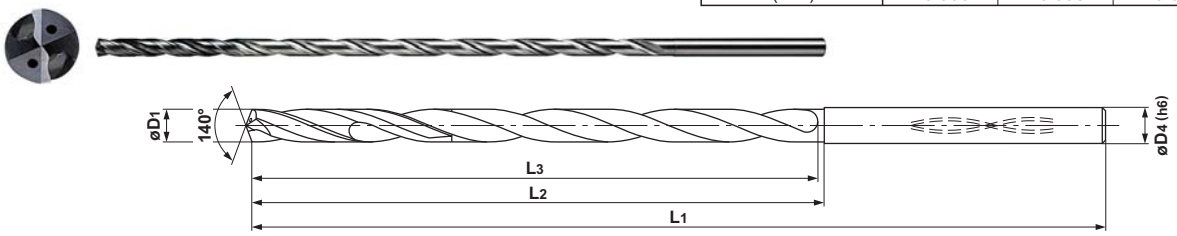
①Finally clear the hole at a cutting speed of 65-100 SFM.
②Retract the drill to the pilot hole depth starting point at a feed rate of 120 inch/min.

MHS

For Hardened Steel

METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤12
D1 Tolerance (mm)	+0.010 −0.002	+0.010 −0.002	+0.010 −0.005	+0.010 −0.008
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011



For features, see page 17.
(Note 1) MHS type can be used for shrink fit holders.
(Note 2) Use the shortest type in the respective diameter as a pilot drill.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
3.0	4	Int.	★	MHS0300L020B	19.0	20	70	4.0
	10	Int.	★	0300L040B	39.0	40	90	4.0
	17	Int.	★	0300L060B	59.0	60	110	4.0
	27	Int.	★	0300L090B	89.0	90	140	4.0
3.1	4	Int.	□	0310L020B	19.5	20	70	4.0
	10	Int.	□	0310L040B	39.5	40	90	4.0
	17	Int.	□	0310L060B	59.5	60	110	4.0
	26	Int.	□	0310L090B	89.5	90	140	4.0
3.2	4	Int.	□	0320L020B	19.5	20	70	4.0
	10	Int.	□	0320L040B	39.5	40	90	4.0
	16	Int.	□	0320L060B	59.5	60	110	4.0
	25	Int.	□	0320L090B	89.5	90	140	4.0
3.3	3	Int.	□	0330L020B	19.5	20	70	4.0
	9	Int.	□	0330L040B	39.5	40	90	4.0
	16	Int.	□	0330L060B	59.5	60	110	4.0
	25	Int.	□	0330L090B	89.5	90	140	4.0
3.4	3	Int.	□	0340L020B	19.5	20	70	4.0
	9	Int.	□	0340L040B	39.5	40	90	4.0
	15	Int.	□	0340L060B	59.5	60	110	4.0
	24	Int.	□	0340L090B	89.5	90	140	4.0
3.5	3	Int.	★	0350L020B	19.5	20	70	4.0
	9	Int.	★	0350L040B	39.5	40	90	4.0
	14	Int.	★	0350L060B	59.5	60	110	4.0
	23	Int.	★	0350L090B	89.5	90	140	4.0
3.6	3	Int.	□	0360L020B	20.0	20	70	4.0
	9	Int.	□	0360L040B	40.0	40	90	4.0
	14	Int.	□	0360L060B	60.0	60	110	4.0
	22	Int.	□	0360L090B	90.0	90	140	4.0
	31	Int.	□	0360L120B	120.0	120	170	4.0
3.7	3	Int.	□	0370L020B	20.0	20	70	4.0
	8	Int.	□	0370L040B	40.0	40	90	4.0
	14	Int.	□	0370L060B	60.0	60	110	4.0
	22	Int.	□	0370L090B	90.0	90	140	4.0
	30	Int.	□	0370L120B	120.0	120	170	4.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
3.8	3	Int.	□	MHS0380L020B	20.0	20	70	4.0
	8	Int.	□	0380L040B	40.0	40	90	4.0
	13	Int.	□	0380L060B	60.0	60	110	4.0
	21	Int.	□	0380L090B	90.0	90	140	4.0
	29	Int.	□	0380L120B	120.0	120	170	4.0
3.9	3	Int.	□	0390L020B	20.0	20	70	4.0
	8	Int.	□	0390L040B	40.0	40	90	4.0
	13	Int.	□	0390L060B	60.0	60	110	4.0
	21	Int.	□	0390L090B	90.0	90	140	4.0
	28	Int.	□	0390L120B	120.0	120	170	4.0
4.0	2	Int.	★	0400L020B	20.0	20	70	4.0
	7	Int.	★	0400L040B	40.0	40	90	4.0
	12	Int.	★	0400L060B	60.0	60	110	4.0
	20	Int.	★	0400L090B	90.0	90	140	4.0
	27	Int.	★	0400L120B	120.0	120	170	4.0
4.1	2	Int.	□	0410L020B	18.5	20	70	6.0
	7	Int.	□	0410L040B	38.5	40	90	6.0
	12	Int.	□	0410L060B	58.5	60	110	6.0
	19	Int.	□	0410L090B	88.5	90	140	6.0
	26	Int.	□	0410L120B	118.5	120	170	6.0
4.2	2	Int.	□	0420L020B	18.5	20	70	6.0
	7	Int.	□	0420L040B	38.5	40	90	6.0
	11	Int.	□	0420L060B	58.5	60	110	6.0
	19	Int.	□	0420L090B	88.5	90	140	6.0
	26	Int.	□	0420L120B	118.5	120	170	6.0
4.3	2	Int.	□	0430L020B	18.5	20	70	6.0
	6	Int.	□	0430L040B	38.5	40	90	6.0
	11	Int.	□	0430L060B	58.5	60	110	6.0
	18	Int.	□	0430L090B	88.5	90	140	6.0
	25	Int.	□	0430L120B	118.5	120	170	6.0
4.4	2	Int.	□	0440L020B	18.5	20	70	6.0
	6	Int.	□	0440L040B	38.5	40	90	6.0
	11	Int.	□	0440L060B	58.5	60	110	6.0
	18	Int.	□	0440L090B	88.5	90	140	6.0
	24	Int.	□	0440L120B	118.5	120	170	6.0

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

★ : Inventory maintained in Japan. □ : Non stock, produced to order only.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
4.5	2	Int.	★	MHS0450L020B	18.5	20	70	6.0
	6	Int.	★	0450L040B	38.5	40	90	6.0
	10	Int.	★	0450L060B	58.5	60	110	6.0
	17	Int.	★	0450L090B	88.5	90	140	6.0
	24	Int.	★	0450L120B	118.5	120	170	6.0
4.6	2	Int.	□	0460L020B	19.0	20	70	6.0
	6	Int.	□	0460L040B	39.0	40	90	6.0
	10	Int.	□	0460L060B	59.0	60	110	6.0
	17	Int.	□	0460L090B	89.0	90	140	6.0
	23	Int.	□	0460L120B	119.0	120	170	6.0
	30	Int.	□	0460L150B	149.0	150	200	6.0
4.7	2	Int.	□	0470L020B	19.0	20	70	6.0
	6	Int.	□	0470L040B	39.0	40	90	6.0
	10	Int.	□	0470L060B	59.0	60	110	6.0
	16	Int.	□	0470L090B	89.0	90	140	6.0
	23	Int.	□	0470L120B	119.0	120	170	6.0
	29	Int.	□	0470L150B	149.0	150	200	6.0
4.8	1	Int.	□	0480L020B	19.0	20	70	6.0
	6	Int.	□	0480L040B	39.0	40	90	6.0
	10	Int.	□	0480L060B	59.0	60	110	6.0
	16	Int.	□	0480L090B	89.0	90	140	6.0
	22	Int.	□	0480L120B	119.0	120	170	6.0
	29	Int.	□	0480L150B	149.0	150	200	6.0
4.9	1	Int.	□	0490L020B	19.0	20	70	6.0
	5	Int.	□	0490L040B	39.0	40	90	6.0
	10	Int.	□	0490L060B	59.0	60	110	6.0
	16	Int.	□	0490L090B	89.0	90	140	6.0
	22	Int.	□	0490L120B	119.0	120	170	6.0
	28	Int.	□	0490L150B	149.0	150	200	6.0
5.0	1	Int.	★	0500L020B	19.0	20	70	6.0
	5	Int.	★	0500L040B	39.0	40	90	6.0
	9	Int.	★	0500L060B	59.0	60	110	6.0
	15	Int.	★	0500L090B	89.0	90	140	6.0
	21	Int.	★	0500L120B	119.0	120	170	6.0
	27	Int.	★	0500L150B	149.0	150	200	6.0
5.1	3	Int.	□	0510L030B	29.5	30	80	6.0
	9	Int.	□	0510L060B	59.5	60	110	6.0
	15	Int.	□	0510L090B	89.5	90	140	6.0
	21	Int.	□	0510L120B	119.5	120	170	6.0
	27	Int.	□	0510L150B	149.5	150	200	6.0
5.2	3	Int.	□	0520L030B	29.5	30	80	6.0
	9	Int.	□	0520L060B	59.5	60	110	6.0
	15	Int.	□	0520L090B	89.5	90	140	6.0
	20	Int.	□	0520L120B	119.5	120	170	6.0
	26	Int.	□	0520L150B	149.5	150	200	6.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
5.3	3	Int.	□	MHS0530L030B	29.5	30	80	6.0
	9	Int.	□	0530L060B	59.5	60	110	6.0
	14	Int.	□	0530L090B	89.5	90	140	6.0
	20	Int.	□	0530L120B	119.5	120	170	6.0
	26	Int.	□	0530L150B	149.5	150	200	6.0
5.4	3	Int.	□	0540L030B	29.5	30	80	6.0
	9	Int.	□	0540L060B	59.5	60	110	6.0
	14	Int.	□	0540L090B	89.5	90	140	6.0
	20	Int.	□	0540L120B	119.5	120	170	6.0
	25	Int.	□	0540L150B	149.5	150	200	6.0
5.5	3	Int.	★	0550L030B	29.5	30	80	6.0
	8	Int.	★	0550L060B	59.5	60	110	6.0
	14	Int.	★	0550L090B	89.5	90	140	6.0
	19	Int.	★	0550L120B	119.5	120	170	6.0
	25	Int.	★	0550L150B	149.5	150	200	6.0
5.6	3	Int.	□	0560L030B	30.0	30	80	6.0
	8	Int.	□	0560L060B	60.0	60	110	6.0
	14	Int.	□	0560L090B	90.0	90	140	6.0
	19	Int.	□	0560L120B	120.0	120	170	6.0
	24	Int.	□	0560L150B	150.0	150	200	6.0
5.7	3	Int.	□	0570L030B	30.0	30	80	6.0
	8	Int.	□	0570L060B	60.0	60	110	6.0
	13	Int.	□	0570L090B	90.0	90	140	6.0
	19	Int.	□	0570L120B	120.0	120	170	6.0
	24	Int.	□	0570L150B	150.0	150	200	6.0
5.8	3	Int.	□	0580L030B	30.0	30	80	6.0
	8	Int.	□	0580L060B	60.0	60	110	6.0
	13	Int.	□	0580L090B	90.0	90	140	6.0
	18	Int.	□	0580L120B	120.0	120	170	6.0
	23	Int.	□	0580L150B	150.0	150	200	6.0
5.9	3	Int.	□	0590L030B	30.0	30	80	6.0
	8	Int.	□	0590L060B	60.0	60	110	6.0
	13	Int.	□	0590L090B	90.0	90	140	6.0
	18	Int.	□	0590L120B	120.0	120	170	6.0
	23	Int.	□	0590L150B	150.0	150	200	6.0
6.0	2	Int.	★	0600L030B	30.0	30	80	6.0
	7	Int.	★	0600L060B	60.0	60	110	6.0
	12	Int.	★	0600L090B	90.0	90	140	6.0
	17	Int.	★	0600L120B	120.0	120	170	6.0
	22	Int.	★	0600L150B	150.0	150	200	6.0
6.1	2	Int.	□	0610L030B	28.5	30	80	8.0
	7	Int.	□	0610L060B	58.5	60	110	8.0
	12	Int.	□	0610L090B	88.5	90	140	8.0
	17	Int.	□	0610L120B	118.5	120	170	8.0
	22	Int.	□	0610L150B	148.5	150	200	8.0

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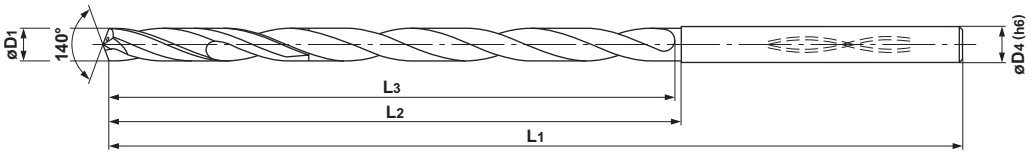
CUTTING CONDITIONS P.98

MHS

For Hardened Steel

METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤12
D1 Tolerance (mm)	+0.010 −0.002	+0.010 −0.002	+0.010 −0.005	+0.010 −0.008
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011



For features, see page 17.
(Note 1) MHS type can be used for shrink fit holders.
(Note 2) Use the shortest type in the respective diameter as a pilot drill.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
6.2	2	Int.	□	MHS0620L030B	28.5	30	80	8.0
	7	Int.	□	0620L060B	58.5	60	110	8.0
	12	Int.	□	0620L090B	88.5	90	140	8.0
	17	Int.	□	0620L120B	118.5	120	170	8.0
	21	Int.	□	0620L150B	148.5	150	200	8.0
6.3	2	Int.	□	0630L030B	28.5	30	80	8.0
	7	Int.	□	0630L060B	58.5	60	110	8.0
	12	Int.	□	0630L090B	88.5	90	140	8.0
	16	Int.	□	0630L120B	118.5	120	170	8.0
	21	Int.	□	0630L150B	148.5	150	200	8.0
6.4	2	Int.	□	0640L030B	28.5	30	80	8.0
	7	Int.	□	0640L060B	58.5	60	110	8.0
	11	Int.	□	0640L090B	88.5	90	140	8.0
	16	Int.	□	0640L120B	118.5	120	170	8.0
	21	Int.	□	0640L150B	148.5	150	200	8.0
6.5	2	Int.	★	0650L030B	28.5	30	80	8.0
	6	Int.	★	0650L060B	58.5	60	110	8.0
	11	Int.	★	0650L090B	88.5	90	140	8.0
	16	Int.	★	0650L120B	118.5	120	170	8.0
	20	Int.	★	0650L150B	148.5	150	200	8.0
6.6	2	Int.	□	0660L030B	29.0	30	80	8.0
	6	Int.	□	0660L060B	59.0	60	110	8.0
	11	Int.	□	0660L090B	89.0	90	140	8.0
	16	Int.	□	0660L120B	119.0	120	170	8.0
	20	Int.	□	0660L150B	149.0	150	200	8.0
	28	Int.	□	0660L200B	199.0	200	250	8.0
6.7	2	Int.	□	0670L030B	29.0	30	80	8.0
	6	Int.	□	0670L060B	59.0	60	110	8.0
	11	Int.	□	0670L090B	89.0	90	140	8.0
	15	Int.	□	0670L120B	119.0	120	170	8.0
	20	Int.	□	0670L150B	149.0	150	200	8.0
	27	Int.	□	0670L200B	199.0	200	250	8.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
6.8	2	Int.	□	MHS0680L030B	29.0	30	80	8.0
	6	Int.	□	0680L060B	59.0	60	110	8.0
	11	Int.	□	0680L090B	89.0	90	140	8.0
	15	Int.	□	0680L120B	119.0	120	170	8.0
	19	Int.	□	0680L150B	149.0	150	200	8.0
	27	Int.	□	0680L200B	199.0	200	250	8.0
6.9	2	Int.	□	0690L030B	29.0	30	80	8.0
	6	Int.	□	0690L060B	59.0	60	110	8.0
	10	Int.	□	0690L090B	89.0	90	140	8.0
	15	Int.	□	0690L120B	119.0	120	170	8.0
	19	Int.	□	0690L150B	149.0	150	200	8.0
	26	Int.	□	0690L200B	199.0	200	250	8.0
7.0	2	Int.	★	0700L030B	29.0	30	80	8.0
	6	Int.	★	0700L060B	59.0	60	110	8.0
	10	Int.	★	0700L090B	89.0	90	140	8.0
	14	Int.	★	0700L120B	119.0	120	170	8.0
	19	Int.	★	0700L150B	149.0	150	200	8.0
	26	Int.	★	0700L200B	199.0	200	250	8.0
7.1	2	Int.	□	0710L030B	29.5	30	80	8.0
	6	Int.	□	0710L060B	59.5	60	110	8.0
	10	Int.	□	0710L090B	89.5	90	140	8.0
	14	Int.	□	0710L120B	119.5	120	170	8.0
	19	Int.	□	0710L150B	149.5	150	200	8.0
	26	Int.	□	0710L200B	199.5	200	250	8.0
7.2	2	Int.	□	0720L030B	29.5	30	80	8.0
	6	Int.	□	0720L060B	59.5	60	110	8.0
	10	Int.	□	0720L090B	89.5	90	140	8.0
	14	Int.	□	0720L120B	119.5	120	170	8.0
	18	Int.	□	0720L150B	149.5	150	200	8.0
	25	Int.	□	0720L200B	199.5	200	250	8.0

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

★ : Inventory maintained in Japan. □ : Non stock, produced to order only.

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
7.3	2	Int.	□	**MHS0730L030B**	29.5	30	80	8.0
	6	Int.	□	**0730L060B**	59.5	60	110	8.0
	10	Int.	□	**0730L090B**	89.5	90	140	8.0
	14	Int.	□	**0730L120B**	119.5	120	170	8.0
	18	Int.	□	**0730L150B**	149.5	150	200	8.0
	25	Int.	□	**0730L200B**	199.5	200	250	8.0
7.4	1	Int.	□	**0740L030B**	29.5	30	80	8.0
	6	Int.	□	**0740L060B**	59.5	60	110	8.0
	10	Int.	□	**0740L090B**	89.5	90	140	8.0
	14	Int.	□	**0740L120B**	119.5	120	170	8.0
	18	Int.	□	**0740L150B**	149.5	150	200	8.0
	24	Int.	□	**0740L200B**	199.5	200	250	8.0
7.5	1	Int.	★	**0750L030B**	29.5	30	80	8.0
	5	Int.	★	**0750L060B**	59.5	60	110	8.0
	9	Int.	★	**0750L090B**	89.5	90	140	8.0
	13	Int.	★	**0750L120B**	119.5	120	170	8.0
	17	Int.	★	**0750L150B**	149.5	150	200	8.0
	24	Int.	★	**0750L200B**	199.5	200	250	8.0
7.6	1	Int.	□	**0760L030B**	30.0	30	80	8.0
	5	Int.	□	**0760L060B**	60.0	60	110	8.0
	9	Int.	□	**0760L090B**	90.0	90	140	8.0
	13	Int.	□	**0760L120B**	120.0	120	170	8.0
	17	Int.	□	**0760L150B**	150.0	150	200	8.0
	24	Int.	□	**0760L200B**	200.0	200	250	8.0
	30	Int.	□	**0760L250B**	250.0	250	300	8.0
7.7	1	Int.	□	**0770L030B**	30.0	30	80	8.0
	5	Int.	□	**0770L060B**	60.0	60	110	8.0
	9	Int.	□	**0770L090B**	90.0	90	140	8.0
	13	Int.	□	**0770L120B**	120.0	120	170	8.0
	17	Int.	□	**0770L150B**	150.0	150	200	8.0
	23	Int.	□	**0770L200B**	200.0	200	250	8.0
	30	Int.	□	**0770L250B**	250.0	250	300	8.0
7.8	1	Int.	□	**0780L030B**	30.0	30	80	8.0
	5	Int.	□	**0780L060B**	60.0	60	110	8.0
	9	Int.	□	**0780L090B**	90.0	90	140	8.0
	13	Int.	□	**0780L120B**	120.0	120	170	8.0
	17	Int.	□	**0780L150B**	150.0	150	200	8.0
	23	Int.	□	**0780L200B**	200.0	200	250	8.0
	30	Int.	□	**0780L250B**	250.0	250	300	8.0
7.9	1	Int.	□	**0790L030B**	30.0	30	80	8.0
	5	Int.	□	**0790L060B**	60.0	60	110	8.0
	9	Int.	□	**0790L090B**	90.0	90	140	8.0
	13	Int.	□	**0790L120B**	120.0	120	170	8.0
	16	Int.	□	**0790L150B**	150.0	150	200	8.0
	23	Int.	□	**0790L200B**	200.0	200	250	8.0
	29	Int.	□	**0790L250B**	250.0	250	300	8.0

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
8.0	1	Int.	★	**MHS0800L030B**	30.0	30	80	8.0
	5	Int.	★	**0800L060B**	60.0	60	110	8.0
	9	Int.	★	**0800L090B**	90.0	90	140	8.0
	12	Int.	★	**0800L120B**	120.0	120	170	8.0
	16	Int.	★	**0800L150B**	150.0	150	200	8.0
	22	Int.	★	**0800L200B**	200.0	200	250	8.0
	29	Int.	★	**0800L250B**	250.0	250	300	8.0
8.1	2	Int.	□	**0810L040B**	38.5	40	100	10.0
	8	Int.	□	**0810L090B**	88.5	90	150	10.0
	12	Int.	□	**0810L120B**	118.5	120	180	10.0
	16	Int.	□	**0810L150B**	148.5	150	210	10.0
	22	Int.	□	**0810L200B**	198.5	200	260	10.0
	28	Int.	□	**0810L250B**	248.5	250	310	10.0
8.2	2	Int.	□	**0820L040B**	38.5	40	100	10.0
	8	Int.	□	**0820L090B**	88.5	90	150	10.0
	12	Int.	□	**0820L120B**	118.5	120	180	10.0
	16	Int.	□	**0820L150B**	148.5	150	210	10.0
	22	Int.	□	**0820L200B**	198.5	200	260	10.0
	28	Int.	□	**0820L250B**	248.5	250	310	10.0
8.3	2	Int.	□	**0830L040B**	38.5	40	100	10.0
	8	Int.	□	**0830L090B**	88.5	90	150	10.0
	12	Int.	□	**0830L120B**	118.5	120	180	10.0
	15	Int.	□	**0830L150B**	148.5	150	210	10.0
	21	Int.	□	**0830L200B**	198.5	200	260	10.0
	27	Int.	□	**0830L250B**	248.5	250	310	10.0
8.4	2	Int.	□	**0840L040B**	38.5	40	100	10.0
	8	Int.	□	**0840L090B**	88.5	90	150	10.0
	12	Int.	□	**0840L120B**	118.5	120	180	10.0
	15	Int.	□	**0840L150B**	148.5	150	210	10.0
	21	Int.	□	**0840L200B**	198.5	200	260	10.0
	27	Int.	□	**0840L250B**	248.5	250	310	10.0
8.5	2	Int.	★	**0850L040B**	38.5	40	100	10.0
	8	Int.	★	**0850L090B**	88.5	90	150	10.0
	11	Int.	★	**0850L120B**	118.5	120	180	10.0
	15	Int.	★	**0850L150B**	148.5	150	210	10.0
	21	Int.	★	**0850L200B**	198.5	200	260	10.0
	27	Int.	★	**0850L250B**	248.5	250	310	10.0
8.6	2	Int.	□	**0860L040B**	39.0	40	100	10.0
	8	Int.	□	**0860L090B**	89.0	90	150	10.0
	11	Int.	□	**0860L120B**	119.0	120	180	10.0
	15	Int.	□	**0860L150B**	149.0	150	210	10.0
	21	Int.	□	**0860L200B**	199.0	200	260	10.0
	26	Int.	□	**0860L250B**	249.0	250	310	10.0
8.7	2	Int.	□	**0870L040B**	39.0	40	100	10.0
	8	Int.	□	**0870L090B**	89.0	90	150	10.0
	11	Int.	□	**0870L120B**	119.0	120	180	10.0
	15	Int.	□	**0870L150B**	149.0	150	210	10.0
	20	Int.	□	**0870L200B**	199.0	200	260	10.0
	26	Int.	□	**0870L250B**	249.0	250	310	10.0

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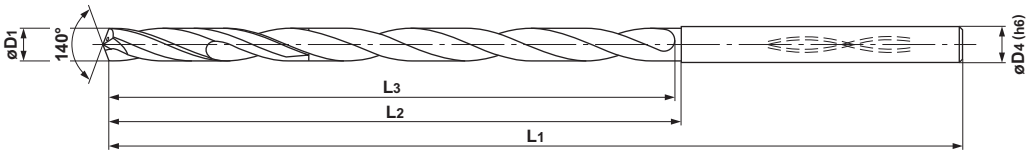
CUTTING CONDITIONS P.98

MHS

For Hardened Steel

METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤12
D1 Tolerance (mm)	+0.010 −0.002	+0.010 −0.002	+0.010 −0.005	+0.010 −0.008
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011



For features, see page 17.
(Note 1) MHS type can be used for shrink fit holders.
(Note 2) Use the shortest type in the respective diameter as a pilot drill.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
8.8	2	Int.	□	MHS0880L040B	39.0	40	100	10.0
	8	Int.	□	0880L090B	89.0	90	150	10.0
	11	Int.	□	0880L120B	119.0	120	180	10.0
	14	Int.	□	0880L150B	149.0	150	210	10.0
	20	Int.	□	0880L200B	199.0	200	260	10.0
	26	Int.	□	0880L250B	249.0	250	310	10.0
8.9	2	Int.	□	0890L040B	39.0	40	100	10.0
	7	Int.	□	0890L090B	89.0	90	150	10.0
	11	Int.	□	0890L120B	119.0	120	180	10.0
	14	Int.	□	0890L150B	149.0	150	210	10.0
	20	Int.	□	0890L200B	199.0	200	260	10.0
	25	Int.	□	0890L250B	249.0	250	310	10.0
9.0	2	Int.	★	0900L040B	39.0	40	100	10.0
	7	Int.	★	0900L090B	89.0	90	150	10.0
	11	Int.	★	0900L120B	119.0	120	180	10.0
	14	Int.	★	0900L150B	149.0	150	210	10.0
	20	Int.	★	0900L200B	199.0	200	260	10.0
	25	Int.	★	0900L250B	249.0	250	310	10.0
9.1	2	Int.	□	0910L040B	39.5	40	100	10.0
	7	Int.	□	0910L090B	89.5	90	150	10.0
	11	Int.	□	0910L120B	119.5	120	180	10.0
	14	Int.	□	0910L150B	149.5	150	210	10.0
	19	Int.	□	0910L200B	199.5	200	260	10.0
	25	Int.	□	0910L250B	249.5	250	310	10.0
	30	Int.	□	0910L300B	299.5	300	360	10.0
9.2	2	Int.	□	0920L040B	39.5	40	100	10.0
	7	Int.	□	0920L090B	89.5	90	150	10.0
	10	Int.	□	0920L120B	119.5	120	180	10.0
	14	Int.	□	0920L150B	149.5	150	210	10.0
	19	Int.	□	0920L200B	199.5	200	260	10.0
	25	Int.	□	0920L250B	249.5	250	310	10.0
	30	Int.	□	0920L300B	299.5	300	360	10.0

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
9.3	2	Int.	□	MHS0930L040B	39.5	40	100	10.0
	7	Int.	□	0930L090B	89.5	90	150	10.0
	10	Int.	□	0930L120B	119.5	120	180	10.0
	14	Int.	□	0930L150B	149.5	150	210	10.0
	19	Int.	□	0930L200B	199.5	200	260	10.0
	24	Int.	□	0930L250B	249.5	250	310	10.0
	30	Int.	□	0930L300B	299.5	300	360	10.0
9.4	2	Int.	□	0940L040B	39.5	40	100	10.0
	7	Int.	□	0940L090B	89.5	90	150	10.0
	10	Int.	□	0940L120B	119.5	120	180	10.0
	13	Int.	□	0940L150B	149.5	150	210	10.0
	19	Int.	□	0940L200B	199.5	200	260	10.0
	24	Int.	□	0940L250B	249.5	250	310	10.0
	29	Int.	□	0940L300B	299.5	300	360	10.0
9.5	2	Int.	★	0950L040B	39.5	40	100	10.0
	7	Int.	★	0950L090B	89.5	90	150	10.0
	10	Int.	★	0950L120B	119.5	120	180	10.0
	13	Int.	★	0950L150B	149.5	150	210	10.0
	18	Int.	★	0950L200B	199.5	200	260	10.0
	24	Int.	★	0950L250B	249.5	250	310	10.0
	29	Int.	★	0950L300B	299.5	300	360	10.0
9.6	2	Int.	□	0960L040B	40.0	40	100	10.0
	7	Int.	□	0960L090B	90.0	90	150	10.0
	10	Int.	□	0960L120B	120.0	120	180	10.0
	13	Int.	□	0960L150B	150.0	150	210	10.0
	18	Int.	□	0960L200B	200.0	200	260	10.0
	24	Int.	□	0960L250B	250.0	250	310	10.0
	29	Int.	□	0960L300B	300.0	300	360	10.0
9.7	2	Int.	□	0970L040B	40.0	40	100	10.0
	7	Int.	□	0970L090B	90.0	90	150	10.0
	10	Int.	□	0970L120B	120.0	120	180	10.0
	13	Int.	□	0970L150B	150.0	150	210	10.0
	18	Int.	□	0970L200B	200.0	200	260	10.0
	23	Int.	□	0970L250B	250.0	250	310	10.0
	28	Int.	□	0970L300B	300.0	300	360	10.0

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

★ : Inventory maintained in Japan. □ : Non stock, produced to order only.

Drill Dia. D_1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L_3	L_2	L_1	D_4
9.8	2	Int.	□	**MHS0980L040B**	40.0	40	100	10.0
	7	Int.	□	**0980L090B**	90.0	90	150	10.0
	10	Int.	□	**0980L120B**	120.0	120	180	10.0
	13	Int.	□	**0980L150B**	150.0	150	210	10.0
	18	Int.	□	**0980L200B**	200.0	200	260	10.0
	23	Int.	□	**0980L250B**	250.0	250	310	10.0
	28	Int.	□	**0980L300B**	300.0	300	360	10.0
9.9	2	Int.	□	**0990L040B**	40.0	40	100	10.0
	7	Int.	□	**0990L090B**	90.0	90	150	10.0
	10	Int.	□	**0990L120B**	120.0	120	180	10.0
	13	Int.	□	**0990L150B**	150.0	150	210	10.0
	18	Int.	□	**0990L200B**	200.0	200	260	10.0
	23	Int.	□	**0990L250B**	250.0	250	310	10.0
	28	Int.	□	**0990L300B**	300.0	300	360	10.0
10.0	1	Int.	★	**1000L040B**	40.0	40	100	10.0
	6	Int.	★	**1000L090B**	90.0	90	150	10.0
	9	Int.	★	**1000L120B**	120.0	120	180	10.0
	12	Int.	★	**1000L150B**	150.0	150	210	10.0
	17	Int.	★	**1000L200B**	200.0	200	260	10.0
	22	Int.	★	**1000L250B**	250.0	250	310	10.0
	27	Int.	★	**1000L300B**	300.0	300	360	10.0
10.1	1	Int.	□	**1010L040B**	38.5	40	100	12.0
	6	Int.	□	**1010L090B**	88.5	90	150	12.0
	9	Int.	□	**1010L120B**	118.5	120	180	12.0
	12	Int.	□	**1010L150B**	148.5	150	210	12.0
	17	Int.	□	**1010L200B**	198.5	200	260	12.0
	22	Int.	□	**1010L250B**	248.5	250	310	12.0
	27	Int.	□	**1010L300B**	298.5	300	360	12.0
10.2	1	Int.	□	**1020L040B**	38.5	40	100	12.0
	6	Int.	□	**1020L090B**	88.5	90	150	12.0
	9	Int.	□	**1020L120B**	118.5	120	180	12.0
	12	Int.	□	**1020L150B**	148.5	150	210	12.0
	17	Int.	□	**1020L200B**	198.5	200	260	12.0
	22	Int.	□	**1020L250B**	248.5	250	310	12.0
	27	Int.	□	**1020L300B**	298.5	300	360	12.0
10.3	1	Int.	□	**1030L040B**	38.5	40	100	12.0
	6	Int.	□	**1030L090B**	88.5	90	150	12.0
	9	Int.	□	**1030L120B**	118.5	120	180	12.0
	12	Int.	□	**1030L150B**	148.5	150	210	12.0
	17	Int.	□	**1030L200B**	198.5	200	260	12.0
	22	Int.	□	**1030L250B**	248.5	250	310	12.0
	26	Int.	□	**1030L300B**	298.5	300	360	12.0
10.4	1	Int.	□	**1040L040B**	38.5	40	100	12.0
	6	Int.	□	**1040L090B**	88.5	90	150	12.0
	9	Int.	□	**1040L120B**	118.5	120	180	12.0
	12	Int.	□	**1040L150B**	148.5	150	210	12.0
	17	Int.	□	**1040L200B**	198.5	200	260	12.0
	21	Int.	□	**1040L250B**	248.5	250	310	12.0
	26	Int.	□	**1040L300B**	298.5	300	360	12.0
10.5	1	Int.	★	**MHS1050L040B**	38.5	40	100	12.0
	6	Int.	★	**1050L090B**	88.5	90	150	12.0
	9	Int.	★	**1050L120B**	118.5	120	180	12.0
	12	Int.	★	**1050L150B**	148.5	150	210	12.0
	16	Int.	★	**1050L200B**	198.5	200	260	12.0
	21	Int.	★	**1050L250B**	248.5	250	310	12.0
	26	Int.	★	**1050L300B**	298.5	300	360	12.0
10.6	1	Int.	□	**1060L040B**	39.0	40	100	12.0
	6	Int.	□	**1060L090B**	89.0	90	150	12.0
	9	Int.	□	**1060L120B**	119.0	120	180	12.0
	12	Int.	□	**1060L150B**	149.0	150	210	12.0
	16	Int.	□	**1060L200B**	199.0	200	260	12.0
	21	Int.	□	**1060L250B**	249.0	250	310	12.0
	26	Int.	□	**1060L300B**	299.0	300	360	12.0
10.7	1	Int.	□	**1070L040B**	39.0	40	100	12.0
	6	Int.	□	**1070L090B**	89.0	90	150	12.0
	9	Int.	□	**1070L120B**	119.0	120	180	12.0
	11	Int.	□	**1070L150B**	149.0	150	210	12.0
	16	Int.	□	**1070L200B**	199.0	200	260	12.0
	21	Int.	□	**1070L250B**	249.0	250	310	12.0
	25	Int.	□	**1070L300B**	299.0	300	360	12.0
10.8	1	Int.	□	**1080L040B**	39.0	40	100	12.0
	6	Int.	□	**1080L090B**	89.0	90	150	12.0
	9	Int.	□	**1080L120B**	119.0	120	180	12.0
	11	Int.	□	**1080L150B**	149.0	150	210	12.0
	16	Int.	□	**1080L200B**	199.0	200	260	12.0
	21	Int.	□	**1080L250B**	249.0	250	310	12.0
	25	Int.	□	**1080L300B**	299.0	300	360	12.0
10.9	1	Int.	□	**1090L040B**	39.0	40	100	12.0
	6	Int.	□	**1090L090B**	89.0	90	150	12.0
	8	Int.	□	**1090L120B**	119.0	120	180	12.0
	11	Int.	□	**1090L150B**	149.0	150	210	12.0
	16	Int.	□	**1090L200B**	199.0	200	260	12.0
	20	Int.	□	**1090L250B**	249.0	250	310	12.0
	25	Int.	□	**1090L300B**	299.0	300	360	12.0
11.0	1	Int.	★	**1100L040B**	39.0	40	100	12.0
	6	Int.	★	**1100L090B**	89.0	90	150	12.0
	8	Int.	★	**1100L120B**	119.0	120	180	12.0
	11	Int.	★	**1100L150B**	149.0	150	210	12.0
	16	Int.	★	**1100L200B**	199.0	200	260	12.0
	20	Int.	★	**1100L250B**	249.0	250	310	12.0
	25	Int.	★	**1100L300B**	299.0	300	360	12.0
11.1	1	Int.	□	**1110L040B**	39.5	40	100	12.0
	6	Int.	□	**1110L090B**	89.5	90	150	12.0
	8	Int.	□	**1110L120B**	119.5	120	180	12.0
	11	Int.	□	**1110L150B**	149.5	150	210	12.0
	15	Int.	□	**1110L200B**	199.5	200	260	12.0
	20	Int.	□	**1110L250B**	249.5	250	310	12.0
	24	Int.	□	**1110L300B**	299.5	300	360	12.0

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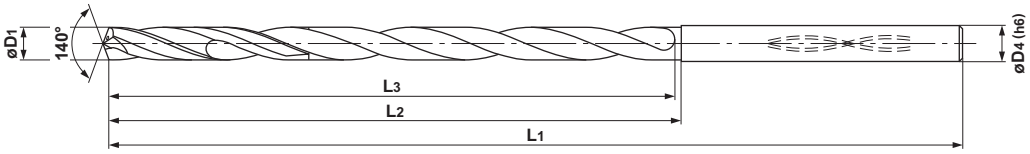
CUTTING CONDITIONS P.98

MHS

For Hardened Steel

METRIC STANDARD

	D1=3	3<D1≤6	6<D1≤10	10<D1≤12
D1 Tolerance (mm)	+0.010 −0.002	+0.010 −0.002	+0.010 −0.005	+0.010 −0.008
D4 Tolerance (mm)	0 −0.006	0 −0.008	0 −0.009	0 −0.011



For features, see page 17.
(Note 1) MHS type can be used for shrink fit holders.
(Note 2) Use the shortest type in the respective diameter as a pilot drill.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock VP15TF	Order Number	Dimensions (mm) L3	L2	L1	D4
11.2	1	Int.	□	MHS1120L040B	39.5	40	100	12.0
	5	Int.	□	1120L090B	89.5	90	150	12.0
	8	Int.	□	1120L120B	119.5	120	180	12.0
	11	Int.	□	1120L150B	149.5	150	210	12.0
	15	Int.	□	1120L200B	199.5	200	260	12.0
	20	Int.	□	1120L250B	249.5	250	310	12.0
	24	Int.	□	1120L300B	299.5	300	360	12.0
11.3	1	Int.	□	1130L040B	39.5	40	100	12.0
	5	Int.	□	1130L090B	89.5	90	150	12.0
	8	Int.	□	1130L120B	119.5	120	180	12.0
	11	Int.	□	1130L150B	149.5	150	210	12.0
	15	Int.	□	1130L200B	199.5	200	260	12.0
	20	Int.	□	1130L250B	249.5	250	310	12.0
	24	Int.	□	1130L300B	299.5	300	360	12.0
11.4	1	Int.	□	1140L040B	39.5	40	100	12.0
	5	Int.	□	1140L090B	89.5	90	150	12.0
	8	Int.	□	1140L120B	119.5	120	180	12.0
	11	Int.	□	1140L150B	149.5	150	210	12.0
	15	Int.	□	1140L200B	199.5	200	260	12.0
	19	Int.	□	1140L250B	249.5	250	310	12.0
	24	Int.	□	1140L300B	299.5	300	360	12.0
11.5	1	Int.	★	1150L040B	39.5	40	100	12.0
	5	Int.	★	1150L090B	89.5	90	150	12.0
	8	Int.	★	1150L120B	119.5	120	180	12.0
	10	Int.	★	1150L150B	149.5	150	210	12.0
	15	Int.	★	1150L200B	199.5	200	260	12.0
	19	Int.	★	1150L250B	249.5	250	310	12.0
	24	Int.	★	1150L300B	299.5	300	360	12.0
11.6	1	Int.	□	1160L040B	40.0	40	100	12.0
	5	Int.	□	1160L090B	90.0	90	150	12.0
	8	Int.	□	1160L120B	120.0	120	180	12.0
	10	Int.	□	1160L150B	150.0	150	210	12.0
	15	Int.	□	1160L200B	200.0	200	260	12.0
	19	Int.	□	1160L250B	250.0	250	310	12.0
	23	Int.	□	1160L300B	300.0	300	360	12.0
11.7	1	Int.	□	MHS1170L040B	40.0	40	100	12.0
	5	Int.	□	1170L090B	90.0	90	150	12.0
	8	Int.	□	1170L120B	120.0	120	180	12.0
	10	Int.	□	1170L150B	150.0	150	210	12.0
	15	Int.	□	1170L200B	200.0	200	260	12.0
	19	Int.	□	1170L250B	250.0	250	310	12.0
	23	Int.	□	1170L300B	300.0	300	360	12.0
11.8	1	Int.	□	1180L040B	40.0	40	100	12.0
	5	Int.	□	1180L090B	90.0	90	150	12.0
	8	Int.	□	1180L120B	120.0	120	180	12.0
	10	Int.	□	1180L150B	150.0	150	210	12.0
	14	Int.	□	1180L200B	200.0	200	260	12.0
	19	Int.	□	1180L250B	250.0	250	310	12.0
	23	Int.	□	1180L300B	300.0	300	360	12.0
11.9	1	Int.	□	1190L040B	40.0	40	100	12.0
	5	Int.	□	1190L090B	90.0	90	150	12.0
	8	Int.	□	1190L120B	120.0	120	180	12.0
	10	Int.	□	1190L150B	150.0	150	210	12.0
	14	Int.	□	1190L200B	200.0	200	260	12.0
	19	Int.	□	1190L250B	250.0	250	310	12.0
	23	Int.	□	1190L300B	300.0	300	360	12.0
12.0	1	Int.	★	1200L040B	40.0	40	100	12.0
	5	Int.	★	1200L090B	90.0	90	150	12.0
	7	Int.	★	1200L120B	120.0	120	180	12.0
	10	Int.	★	1200L150B	150.0	150	210	12.0
	14	Int.	★	1200L200B	200.0	200	260	12.0
	18	Int.	★	1200L250B	250.0	250	310	12.0
	22	Int.	★	1200L300B	300.0	300	360	12.0

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

★ : Inventory maintained in Japan. □ : Non stock, produced to order only.

RECOMMENDED CUTTING CONDITIONS

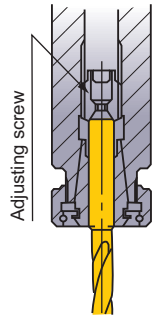
Work Material		Drill Diameter	ϕ3.0—ϕ6.0 mm ϕ.1181″—ϕ.2362″		ϕ6.1—ϕ10.0 mm ϕ.2401″—ϕ.3937″		ϕ10.1—ϕ12.0 mm ϕ.3976″—ϕ.4724″	
		Conditions / Hardness	Cutting Speed (SFM)	Feed (IPR)	Cutting Speed (SFM)	Feed (IPR)	Cutting Speed (SFM)	Feed (IPR)
H	Heat-treated steel Pre-hardened steel	—40HRC	130—230	.004—.008	130—230	.006—.010	130—230	.008—.012
		40—50HRC	65—165	.002—.006	65—165	.004—.008	65—165	.006—.010
		50—55HRC	30—100	.001—.004	30—100	.002—.006	30—100	.002—.008

Note 1) When using the drill with a length over l/d 10, it is necessary to use a prep holes as a guide. (If no prep-hole is used then drill breakage can occur)

Note 2) Use the shortest flute drill in the respective size as a pilot drill.

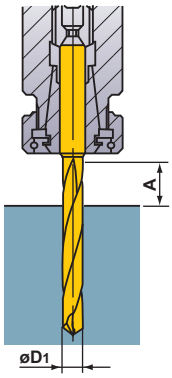
Operational Guidance for the MHS Drill

Drill holding



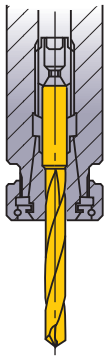
Thrust bearing type collet chuck holds the drill securely.

Drill length



A : ≥ D1 x 1.5

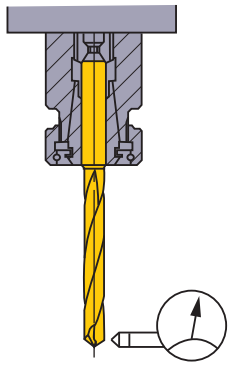
Drill installation



NG

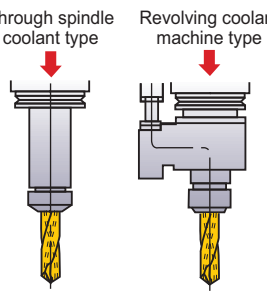
Do not clamp on the flutes.

Installation tolerance



Runout ≤ .001″

Coolant method (MHS)



Coolant pressure is approx. 0.5 - 7MPa.

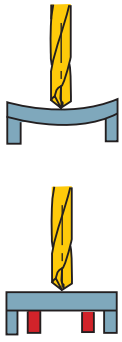
Coolant handling

< MHS type >

1) Dirt and dust particles in old coolant can clog the oil hole and prevent effective flow. Regular coolant exchange is recommended.

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.

Thin workpieces



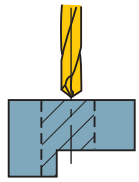
If bending occurs

NG

Support the workpiece

Good

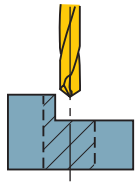
Interrupted cutting



One process

Good

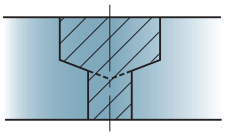
①Lower the feed when drilling the interrupted part.



Requires prior machining

①Spot face with an end mill prior to drilling.

Stepped holes

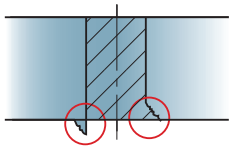


①Divide the machining into two processes.

②Drill the larger hole first.

*Tools for chamfering and spot facing can be produced to order.

Burring and workpiece chipping



①Lower the feed rate when breaking through.

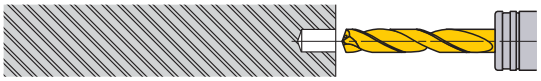
②Change the point angle.

Operational Guidance for the MHS long type Drill (L/D≥10)

Flat Face Drilling

●Drilling a blind hole

1. Drilling a pilot hole



①Use a drill with a larger (flatter) point angle than the super long type. Use the shortest flute possible.
②Ensure a high precision hole is drilled for the guide.
③Drill depth : Approx 1D or deeper.
(Adjust the pilot hole depth according to the length of the super long type.)

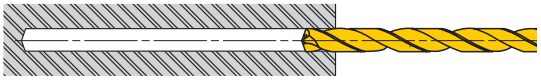
2. Initial cutting with the long type drill

①Penetrate the pilot hole at low revolution. (Cutting speed 65-100 SFM, feed rate .008-.012 IPR)
②Stop the long type drill .039-.118 inch short of the pilot hole bottom.

3. Drill the deep hole

①Start cutting at the recommended speed and feed with a non-peck (continuous feed) cycle.

4. Drill retraction

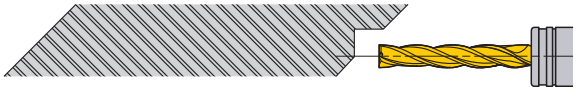


①After drilling, lower the cutting revolution about .039-.079 inch short of the hole end. (Cutting speed of around 65-100 SFM)
②Retract the drill to the pilot hole depth starting point at a feed rate of 120 inch/min.
③Finally, clear the hole at a cutting speed of 65-100 SFM and feed rate of .008-.012 IPR.

Irregular Face Drilling

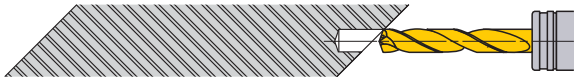
●Drilling and breaking through on irregular faces or angles

1. Spot facing



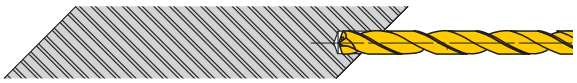
①Machine a flat or the irregular face by using an end mill or slot drill capable of spot facing. Make the spot face diameter the same size as the required deep hole diameter.

2. Drilling a pilot hole



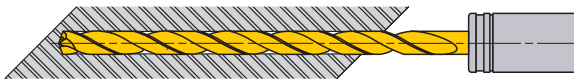
①Use a drill with a larger (flatter) point angle than the super long type. Use the shortest flute possible.
②Ensure a high precision hole is drilled for the guide.
③Drill depth : Approx 1D or deeper.
(Adjust the pilot hole depth according to the length of the super long type.)

3. Initial cutting with the long type drill



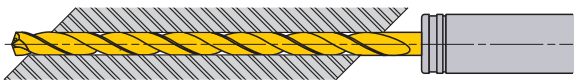
①Penetrate the pilot hole at a low revolution. (Cutting speed 65-100 SFM, feed rate .008-.012 IPR)
②Stop the long type drill .039-.118 inch short of the pilot hole bottom.

4. Drill the deep hole



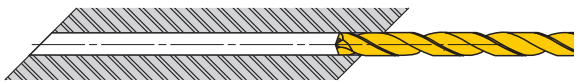
①Start cutting at the recommended speed and feed with a non-peck (continuous feed) cycle.

5. Breaking through



①When breaking through, the cutting edge can be damaged.
②A feed rate of .001-.004 IPR is recommended.

6. Drill retraction



①Finally clear the hole at a cutting speed of 65-100 SFM.
②Retract the drill to the pilot hole depth starting point at a feed rate of 120 inch/min.

MHE

For Wheel Hub

- Designed for machining of wheel hub.
- Drill diameter range : From .394" to .591"
  Drill length : For 1 x D_1 (D_1:Drill diameter)
- Non stock, produced as special order only.

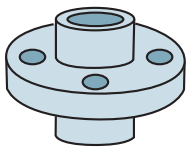
For features, see page 20.

RECOMMENDED CUTTING CONDITIONS

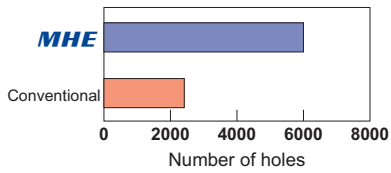
Work Material		Hardness	ϕ.394" – ϕ.591"	
			Cutting Speed (SFM)	Feed (IPR)
P	Carbon Steel	<180HB	245 (195–295)	.010 (.006–.012)

(Note) The above cutting conditions should be used as a guide and need to be adjusted according to the machine rigidity, workpiece clamping and shape.

APPLICATION EXAMPLES

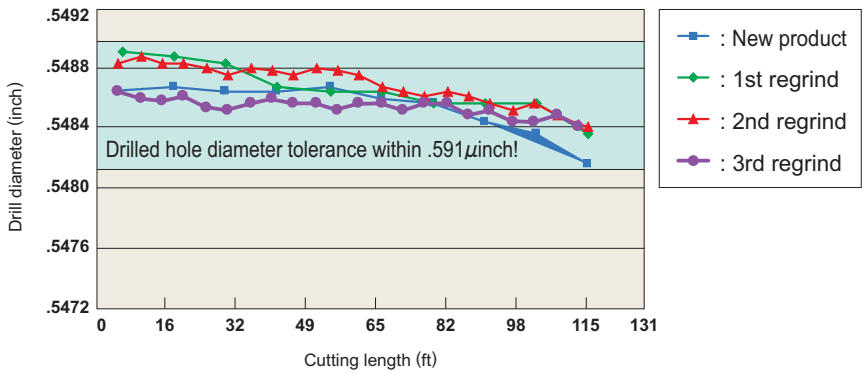


Tool : ϕ.500" x 4" x .500"
Component : Hub
Workpiece : Carbon steel
Cutting speed : 195 SFM
Feed : .006 IPR
Coolant : WSO



CUTTING PERFORMANCE

Hole Accuracy



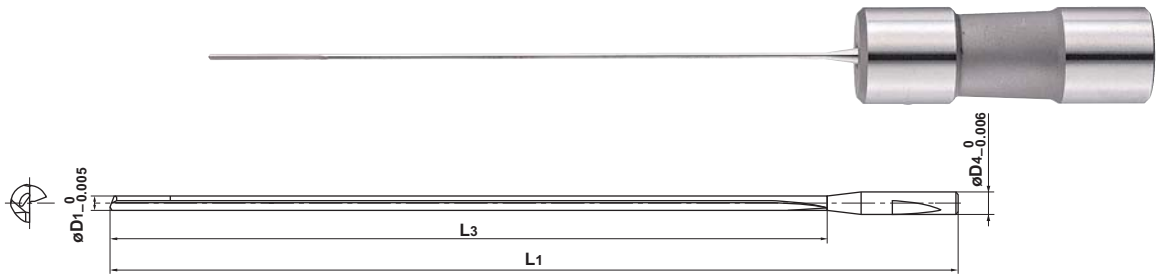
Chip Geometry

Chip breaking properties
The workpiece surface is not damaged due to the fine chips that were generated.

MICRO-MGS

Solid Gun Drill

METRIC STANDARD



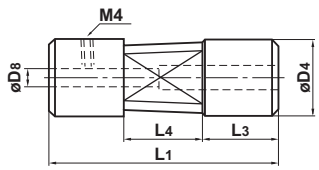
For features, see page 20.
(Note) MGS type can be used for shrink fit holders.

Drill Dia. D1 (mm)	Hole Depth (l/d)	Coolant	Stock HTi10	Order Number	Dimensions (mm) L3	L1	D4
0.7	50	Int.	★	MGS0070L040B	40	80	3
	80	Int.	★	0070L060B	60	100	3
0.8	45	Int.	★	0080L040B	40	80	3
	70	Int.	★	0080L060B	60	100	3
0.9	40	Int.	★	0090L040B	40	80	3
	60	Int.	★	0090L060B	60	100	3
1.0	35	Int.	★	0100L040B	40	80	3
	55	Int.	★	0100L060B	60	100	3
	75	Int.	★	0100L080B	80	120	3
1.1	30	Int.	★	0110L040B	40	80	3
	50	Int.	★	0110L060B	60	100	3
	65	Int.	★	0110L080B	80	120	3
1.2	30	Int.	★	0120L040B	40	80	3
	45	Int.	★	0120L060B	60	100	3
	60	Int.	★	0120L080B	80	120	3
1.3	40	Int.	★	0130L060B	60	100	3
	55	Int.	★	0130L080B	80	120	3
	70	Int.	★	0130L100B	100	140	3
1.4	35	Int.	★	0140L060B	60	100	3
	50	Int.	★	0140L080B	80	120	3
	65	Int.	★	0140L100B	100	140	3
1.5	35	Int.	★	0150L060B	60	100	3
	50	Int.	★	0150L080B	80	120	3
	60	Int.	★	0150L100B	100	140	3
1.6	30	Int.	★	0160L060B	60	100	3
	45	Int.	★	0160L080B	80	120	3
	55	Int.	★	0160L100B	100	140	3
1.7	30	Int.	★	0170L060B	60	100	3
	40	Int.	★	0170L080B	80	120	3
	55	Int.	★	0170L100B	100	140	3
1.8	30	Int.	★	MGS0180L060B	60	100	3
	40	Int.	★	0180L080B	80	120	3
	50	Int.	★	0180L100B	100	140	3
1.9	25	Int.	★	0190L060B	60	100	3
	35	Int.	★	0190L080B	80	120	3
	45	Int.	★	0190L100B	100	140	3
2.0	25	Int.	★	0200L060B	60	100	3
	35	Int.	★	0200L080B	80	120	3
	45	Int.	★	0200L100B	100	140	3
2.1	35	Int.	★	0210L080B	80	120	3
	40	Int.	★	0210L100B	100	140	3
2.2	30	Int.	★	0220L080B	80	120	3
	40	Int.	★	0220L100B	100	140	3
2.3	30	Int.	★	0230L080B	80	120	3
	40	Int.	★	0230L100B	100	140	3
2.4	30	Int.	★	0240L080B	80	120	3
	35	Int.	★	0240L100B	100	140	3
2.5	25	Int.	★	0250L080B	80	120	3
	35	Int.	★	0250L100B	100	140	3
2.6	25	Int.	★	0260L080B	80	120	3
	35	Int.	★	0260L100B	100	140	3
2.7	25	Int.	★	0270L080B	80	120	3
	30	Int.	★	0270L100B	100	140	3
2.8	25	Int.	★	0280L080B	80	120	3
	30	Int.	★	0280L100B	100	140	3
2.9	20	Int.	★	0290L080B	80	120	3
	30	Int.	★	0290L100B	100	140	3
3.0	20	Int.	★	0300L080B	80	120	3
	30	Int.	★	0300L100B	100	140	3

(Note) Contact Mitsubishi Materials regarding coated products (***VP***, ***GP*** and ***UP*** coated carbide).

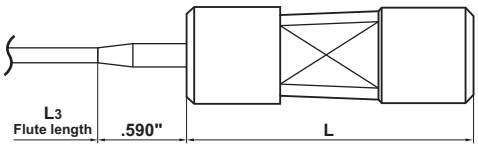
★ : Inventory maintained in Japan.

DRIVER



Order Number	Stock	Dimensions (inch)					Clamp Screw	Wrench
		D4	D8	L1	L3	L4		
MGD38	★	.500	.118	1.500	.496	.500	HSS04004	HKY20F
MGD70	★	.500	.118	2.756	.984	.787	HSS04004	HKY20F

When connected with a driver.



RECOMMENDED CUTTING CONDITIONS

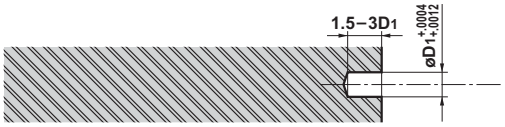
	Work Material	Drill Diameter / Conditions / Hardness	ϕ0.7 – ϕ3.0 mm Cutting speed (SFM)	Feed (IPR)
P	Mild Steel	<180HB	230	.0004
P	Carbon Steel Alloy Steel	180–280HB	164	.0003
P		280–350HB	130	.0002
M	Stainless Steel	<200HB	130	.0002
K	Cast Iron	Tensile Strength <350MPa	230	.0008
K	Ductile Cast Iron	Tensile Strength <450MPa	130	.0006
N	Aluminum Alloys	–	360	.0008
N	Copper Alloys	–	230	.0008

Special Application Notes :

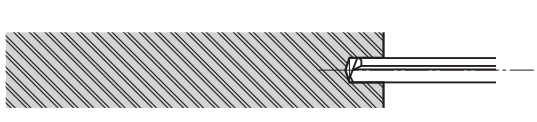
- For safety and success, high pressure coolant is required. (Minimum coolant pressure=1,000PSI)
- Coolant filter must be less than 5 microns. Fine filtration is necessary to prevent blockage of the coolant holes.
- A pilot hole or guide bushing is required.

HOW TO USE

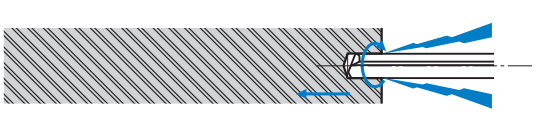
1. Pilot hole drilling.
(Mitsubishi's MZE, MZS, MWE or MWS is recommended.)



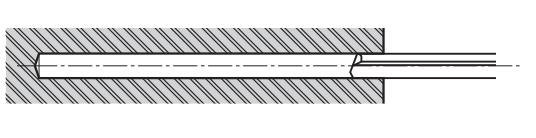
2. Drill is inserted into the pilot hole.
(Drill is not rotating.)



3. Coolant is turned ON, raise cutting speed and feed to the recommended cutting condition.



4. Return to "Pos 2" after drilling end, coolant turned OFF and drill rotation is stopped.



For your safety
●Do not touch sharp parts or chips without wearing gloves. ●Use tools under recommended cutting conditions, and exchange tools before excessive wear occurs. ●Chips become extremely hot, scattered over and may be stretched. Ensure safety guards and goggles are used. ●In case of using non-water soluble oil, make sure to have a fire prevention countermeasure. ●Use the provided wrench, and ensure the inserts and spare parts are damped securely.

MITSUBISHI MATERIALS CORPORATION

MITSUBISHI MATERIALS U.S.A. CORPORATION

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

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