

Micro Solid Carbide Drills

MSE

MIRACLE MINI STAR Drill

Micro Solid Carbide Drills (under 1mm) for Machining Small Diameter Precision Metal Parts.

Available in sizes from $\varnothing 0.1$ - $\varnothing 0.99$
90 standard drills



For cutting a guide hole
STARTER Drill

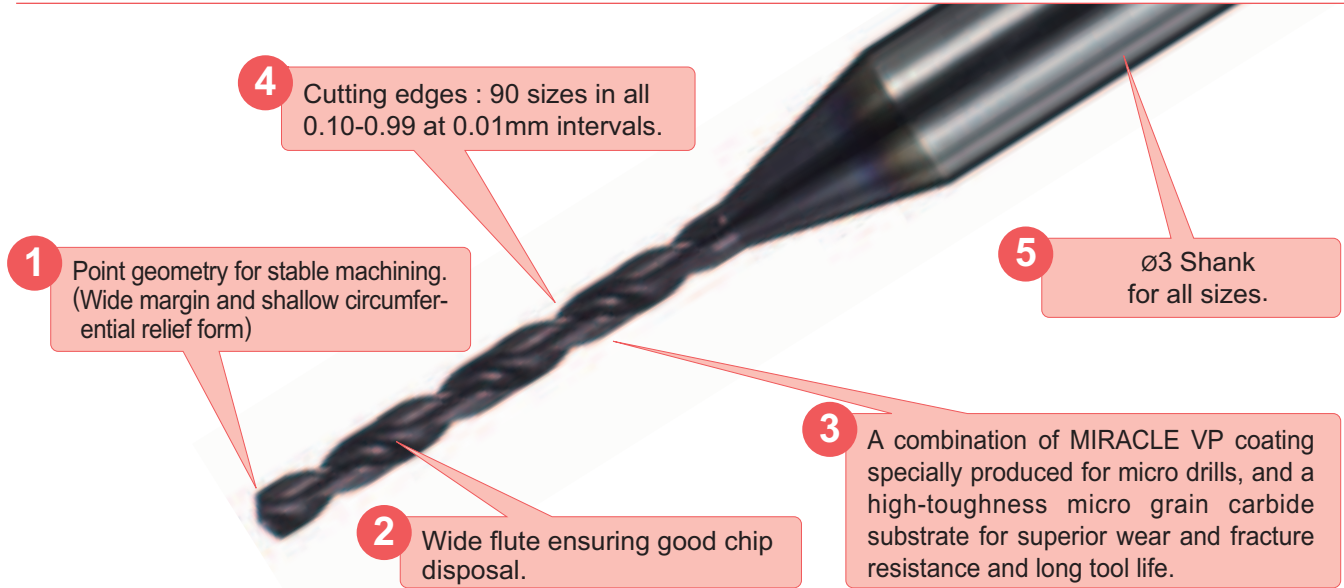
Triangular, pyramid point
shape for high precision
guide hole.

Micro Solid Carbide Drills

MSE

MIRACLE MINI STAR Drill

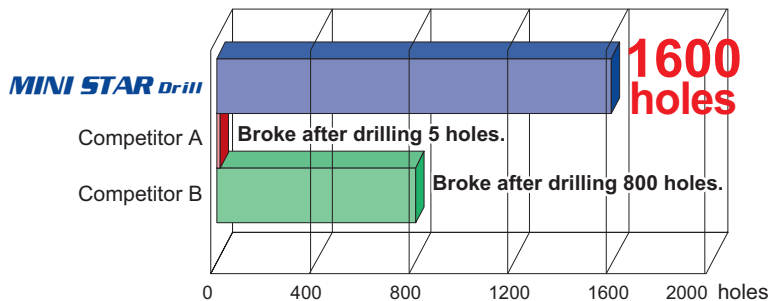
Features



Cutting performance

● Tool life evaluation (Stainless steel drilling)

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



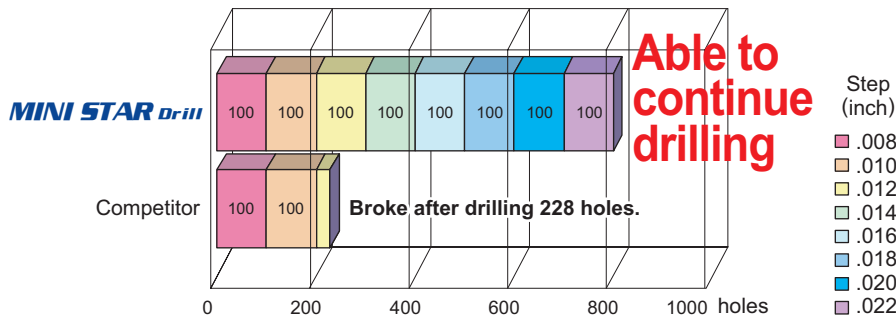
<Cutting conditions>

Tool : MSE0050SB
 Workpiece : Stainless Steel
 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.

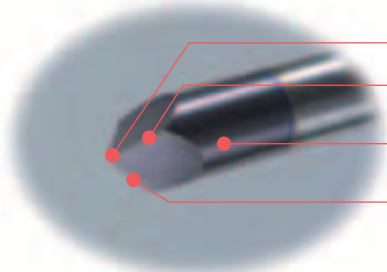


<Cutting conditions>

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

Features

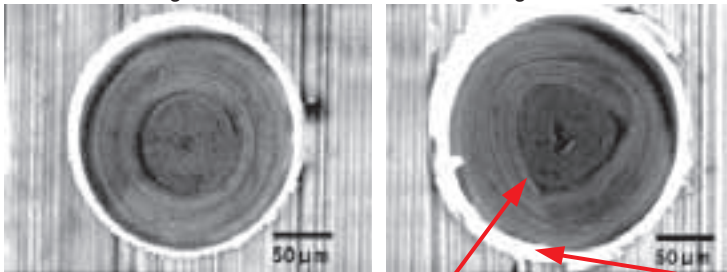


- Triangular pyramid shape helps high precision drilling.
- Optimize cost effectiveness by creating center holes of 0.118 inch to 0.039 inch.
- Long tool life ensured by MIRACLE VP15TF coating.
- The same Starting / Guide drill can be used for dual purposes. Center hole drilling and a 90° chamfer angle.

Cutting performance

When using a Starter Drill

No guide hole



<Cutting conditions> Workpiece : 304 stainless steel
 (Cutting a guide hole) (Drilling)
 Tool : MSP0300SB Tool : MSE0020SB
 Guide hole dia. : .006 inch Cutting speed : 20 SFM
 Revolution : 10,000min⁻¹ Revolution : 10,000min⁻¹
 Cutting speed : 310 SFM Feed : .00007 IPR
 Feed : .00002 IPR Hole depth : .011 inch Blind hole
 Coolant : Water soluble emulsion Steps : .0008 inch
 Coolant : Water soluble emulsion

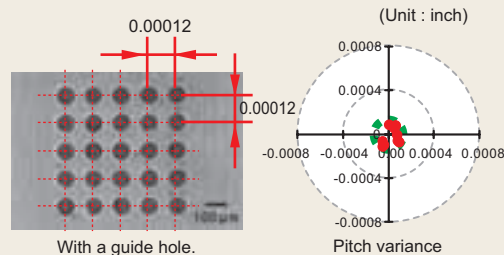
Cuts a high-precision hole. The bottom of the hole is drilled polygonally because the drill wanders. Large burr

How to use the Spot Drill

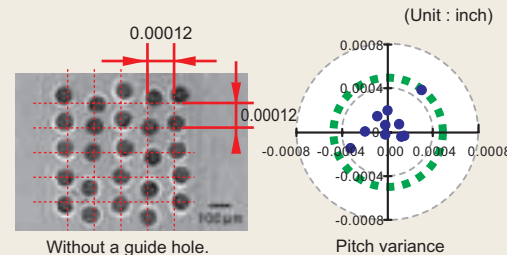
Combined use of the Mini Star Drill and the Spot Drill enhances drilling precision and stability.

1. Comparison of hole positioning accuracy

Maximum positional variance of 0.00012inch. Good pitch accuracy.



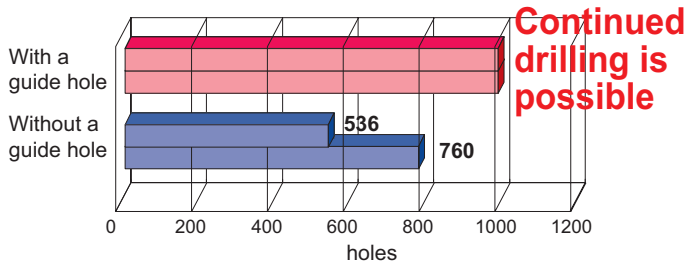
Maximum positional variance of 0.0005inch will cause short tool life.



<Cutting conditions>
 Workpiece : 304 Stainless Steel
 (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.



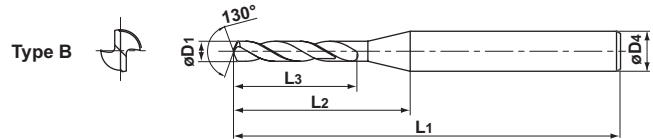
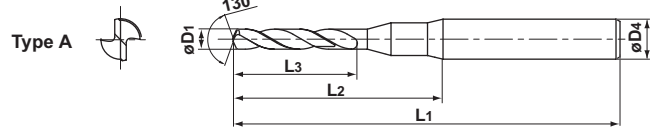
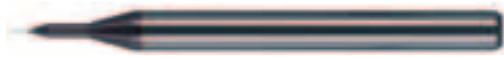
<Cutting conditions> Workpiece : 304 Stainless Steel
 (Cutting a guide hole) Tool : MSP0300SB
 Cutting speed : 310 SFM
 Revolution : 10,000min⁻¹
 Feed : .00002 IPR
 Guide hole dia. : .006 inch
 Coolant : Water soluble emulsion
 (Drilling) Tool : MSE0020SB
 Cutting speed : 20 SFM
 Revolution : 10,000min⁻¹
 Feed : .00008 IPR
 Hole depth : .063 inch Blind hole
 Steps : .0008 inch
 Coolant : Water soluble emulsion

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MSE MIRACLE MINI STAR Drill

METRIC STANDARD

D1	0.10 ≤ D1 ≤ 0.99
Tolerance (mm)	0 -0.009



D1 Drill dia. (mm)	Coolant	Stock		Order Number	Dimensions (mm)				Type
		VP20MF	VP15TF		L3	L2	L1	D4	
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

D1 Drill dia. (mm)	Coolant	Stock		Order Number	Dimensions (mm)				Type
		VP20MF	VP15TF		L3	L2	L1	D4	
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
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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.

Drill Dia. D1 (mm)	Coolant	Stock		Order Number	Dimensions (mm)				Type
		VP20MF	VP15TF		L3	L2	L1	D4	
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. D1 (mm)	Coolant	Stock		Order Number	Dimensions (mm)				Type
		VP20MF	VP15TF		L3	L2	L1	D4	
0.87	Ext.	★	★	MSE 0087SB	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	ø0.10 – 0.19mm			ø0.20 – 0.29mm			ø0.30 – 0.49mm		
			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
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

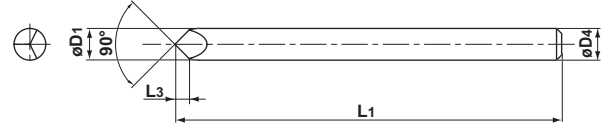
Work Material	Drill Diameter	Conditions Hardness	ø0.50 – 0.79mm			ø0.80 – 0.99mm		
			Revolution (min ⁻¹)	Feed (IPR)	Peck (inch)	Revolution (min ⁻¹)	Feed (IPR)	Peck (inch)
P General Steel Carbon Steel	≤180HB		20,000	.00040	.0040	20,000	.0016	.0118
			Alloy Steel Pre-hardened Steel	≤40HRC	20,000	.00040	.0040	20,000
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 ø0.99 mm or smaller, use of the Starter Drill is recommended. (Order number: MSP0300SB, Cutting conditions: Please see P5.)
- * 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

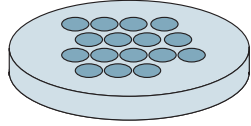
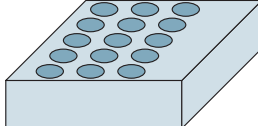
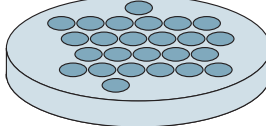
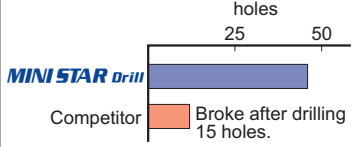
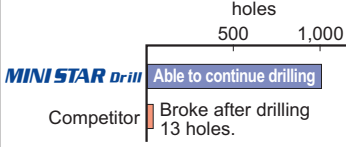
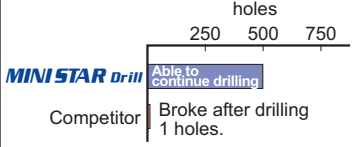


Order Number	Grade	Stock	Dimensions (mm)				Range of Diameter (mm)
			D1	D4	L1	L3	
MSP0300SB	VP15TF	●	3.0	3.0	38	1.5	0.1—0.99

RECOMMENDED CUTTING CONDITIONS

Order Number	Revolution (min ⁻¹)	Table Feed (IPR)
MSP0300SB	10,000	.00002

Application examples

Tool		MSE0050SB	MSE0050SB	MSE0099SB
Workpiece		Heat resistant alloy (Inconel 718)	Pre-hardened steel (45HRC)	Aluminum alloy
		 .207 inch Through hole	 .236 inch Blind hole	 .197 inch Blind hole
Component		Test piece	Plate	Plate
Cutting conditions	Cutting speed (SFM)	15	80	260
	Feed (IPR)	.0002	.0004	.0032
	Revolution (min ⁻¹)	3,000	15,000	25,000
	Steps (inch)	.0039	.0039	.0389
	Coolant	Water soluble oil	Mist	Water soluble oil
Machine		Machining center	Machining center	Machining center
Result		A competitor's product broke after drilling 15 holes. The MINI STAR Drill tool life was 47 holes.	A competitor's drill broke after 13 holes. The MINI STAR Drill was able to drill 100 holes and was in a suitable condition to continue drilling.	A competitor's product broke after drilling one hole due to chip jamming. MINI STAR Drills were able to drill reliably even with a large peck distance.
				

For your safety

●Do not touch cutting 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 spanner, and ensure the inserts and spare parts are damped securely.


MITSUBISHI MATERIALS CORPORATION


Mitsubishi Plant
ISO 9001-2000
Registration No. JSA40 050
Osaka Plant
ISO 9001-2000
Registration No. JSA40 054



Mitsubishi Plant
ISO 14001-1996
Registration No. JSAE 036



MITSUBISHI MATERIALS U.S.A. CORPORATION

17401 Eastman Street, Irvine, California 92614, U.S.A
TEL. 949-862-5100 FAX. 949-862-5180

Customer Service: (800)523-800 Technical Support: (800)486-2341

Chicago Branch Office: 2401 Hassell Road, Northwest Tech Centre, Suite 1540, Hoffman Estates, Illinois 60195, U.S.A
TEL. 847-285-6900 FAX. 847-285-3405

Detroit Branch Office: 39303 Country Club Drive, Suite A-1, Farmington Hills, Michigan 48331, U.S.A
TEL. 248-489-1000 FAX. 248-489-3008

Toront Branch Office: 6535 Millcreek Drive, Unit 63 & 64, Mississauga, Ontario, Canada L5N 2M2
TEL. 905-814-0240 FAX. 905-814-0245


MMC METAL DE MEXICO S.A. DE C.V.

Av. La Cañada No.16, Parque Industrial Bernardo Quintana, El Marques, Queretaro, CP 76246 Mexico
TEL. 011-52-442-221-6136/011-52-442-221-6137/011-52-442-221-6150 FAX. 011-52-442-221-6134

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