Double Z Geometry

DIA EDGE

WSF406W

FACE MILLING CUTTER FOR CAST IRON MACHINING
WITH AN ADJUSTABLE RUN-OUT SYSTEM

ABOUT OUR BRAND

Your manufacturing success is our success.

It's simple. We want to provide high-quality cutting tool products that help deliver unparalleled performance and control for you to manufacture precisely perfect products every day.

Our long heritage of building partnerships through cutting tool solutions to metal working manufacturers, like yours, has given Mitsubishi Materials USA a solid reputation as an industry leader. We understand the importance of getting it right the first time by delivering high-quality cutting tool product brands to help overcome machining challenges to improve machining processes.

Your success is our success and is the driving force behind our innovative products. Our product brands, DIAEDGE and MOLDINO, are trusted globally in the metal manufacturing and die & mold industries for delivering expertly-designed manufactured tools of the trade for highly specialized industries like yours.

With the acquisition of MOLDINO Tool Engineering, Ltd, our traditional Mitsubishi Materials USA cutting tool product line is now sold under the DIAEDGE product brand name.

Brands you can trust:

MITSUBISHI MATERIALS U.S.A.

TRUSTED PRODUCT BRANDS

DIAEDGE MOLDINO

Face Milling Cutter for Cast Iron Machining with an Adjustable Run-Out System

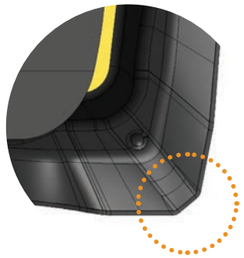
WSF406W NEW

Low Cutting Resistance Insert and Adjustable Cutting Edge Run-Out Produce an Improved Surface Finish and Increased Productivity

Tough and Sharp Inserts for Low Cutting Resistance

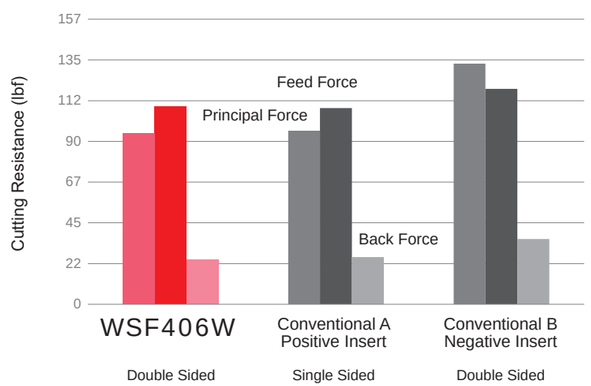
MITSUBISHI MATERIAL's uniquely developed proprietary "Double Sided, Z Geometry" insert combines the features of conventional positive and negative rake inserts to achieve low resistance and sharpness. In addition, the chamfer geometry suppresses edge chipping that tends to occur during cast iron machining.

Double Sided, Z Geometry



Chamfer Geometry

Double sided insert with positive insert cutting resistance



Reduces negative insert cutting resistance by 23%

<Cutting Conditions>
Workpiece Material : AISI No. 45 B
Tool : WSF406WR12516EN
Insert : SNMU1206C05ZNER-M (MC520)
Cutting Speed : vc=525 SFM
Feed per Tooth : fz=.004 IPT
Depth of Cut : ap=.118 inch
Width of Cut : ae=3.937 inch
Cutting Mode : Dry Cutting

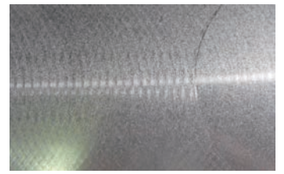
Easy-to-use Adjustable Run-out System

The M-Class insert gives a great cost performance ratio and allows for axial cutting edge adjustments of 0.01 mm or less. This helps to achieve surface finishes of Ra 1.6 µm or less over a wide range of feeds and speeds.

High precision machining is possible over a wide range of cutting conditions.

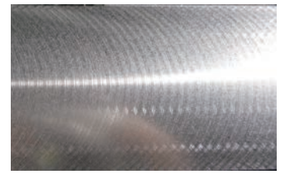
Finish Cutting Conditions

Ra : .024 µ-inch



fz=.004 IPT , ap=.012 inch

Ra : .053 µ-inch



fz=.012 IPT , ap=.059 inch

<Cutting Conditions>
Workpiece Material : AISI No. 45 B
Tool : WSF406WR12516EN
(Minur Cutting Edge
Run-out Accuracy : .118 µ-inch)
Insert : SNMU1206C05ZNER-M (MC520)
Cutting Speed : vc=820 SFM
Cutting Mode : Dry Cutting

Achieves High Accuracy with a Simple Operation

Cutting edge run-out is easily altered by turning the adjustment screw.

①Loosen the adjustment screw.

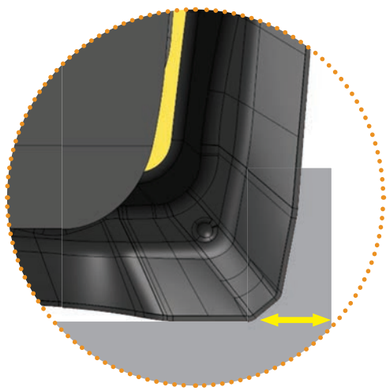
②Locate the insert and tighten so accurate adjustment can be made.

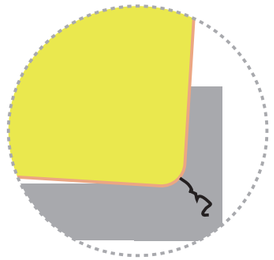
③Turn the adjustment screw until the insert is in the required position.

④Fully tighten the insert clamp.

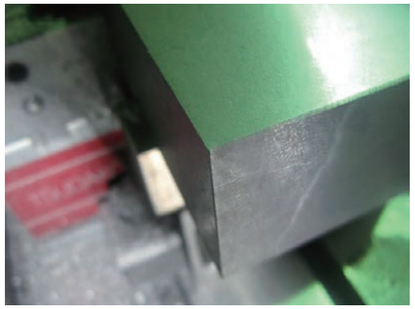
Chamfer Geometry Prevents Chipping of the Workpiece Material

The insert corner is chamfered to provide extra material thickness at the corner to prevent workpiece material cracking.

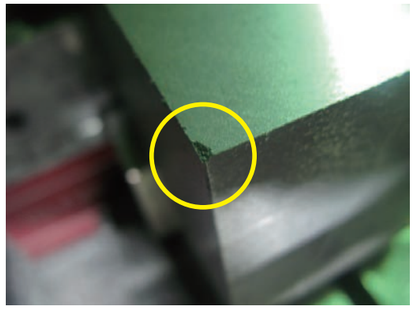




A thin edge is prone to cracks.



WSF406W



Conventional

<Cutting Conditions>
Workpiece Material : AISI No. 45 B
Tool : WSF406WR12516EN
Insert : SNMU1206C05ZNER-M (MC520)
Cutting Speed : vc=525 SFM
Feed per Tooth : fz=.004 IPT
Depth of Cut : ap=.118 inch
Width of Cut : ae=3.937 inch
Cutting Mode : Dry Cutting

Cutting Performance

Comparison of Surface Finishes for Each Depth of Cut and Feed: AISI No. 45 B

Achieves an Ra of .063 µ-inch or less for a wide range of feeds and depth of cut.

<Cutting Conditions>
Workpiece Material : AISI No. 45 B
Tool : WSF406WR12516EN
Insert : SNMU1206C05ZNER-M (MC520)
Cutting Speed : vc=820 SFM
Width of Cut : ae=3.937 inch
Cutting Mode : Dry Cutting
Minur Cutting Edge
Run-out Accuracy=.118 µ-inch

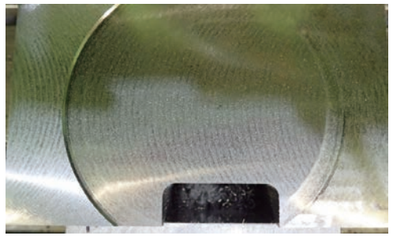
Depth of Cut : ap

	.004 IPT	.008 IPT	.012 IPT
.118 inch	Ra : .032 µ-inch		
.059 inch	Ra : .033 µ-inch	Ra : .041 µ-inch	Ra : .053 µ-inch
.012 inch	Ra : .024 µ-inch	Ra : .035 µ-inch	Ra : .049 µ-inch

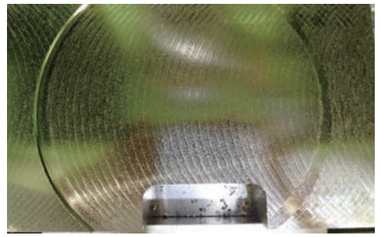
Feed per Tooth : IPT

Comparison of Surface Finish for Wiper Insert : AISI No. 35 B

Achieves excellent finished surface accuracy compared to conventional wiper inserts.



Conventional Ra .048 µ-inch



WSF406W Ra .033 µ-inch

<Cutting Conditions>
Workpiece Material : AISI No. 35 B
Tool : WSF406WR12516EN
Insert : SNMU1206C05ZNER-M(MC520) 15 teeth
WNGU1206ZNER5C-M(MC520) 1 teeth
Cutting Speed : vc=820 SFM
Feed per Tooth : fz=.008 IPT
Depth of Cut : ap=.039 inch
Width of Cut : ae=3.937 inch

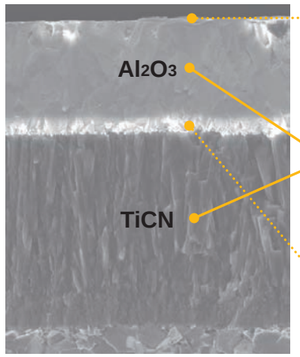
CVD Coated Carbide Grade for Cast Iron Milling

MC520 NEW

Ideal for machining grey cast iron due to the improved peeling resistance of the coating layer.

Improved Peeling Resistance

By optimizing the coating layer and improving the adhesion with the cemented carbide base material, the plastic deformation of the cutting edge is suppressed. The coating layer has an excellent resistance to peeling, thereby providing longer tool life.



All Black Super-Even Coating

The new, smoother than standard surface coating prevents welding and edge chipping to allow reliable and stable cutting.

Nano-texture Coating Technology

The optimized crystal growth, and the Nano-texture coating technology provide outstanding wear and chipping resistance.

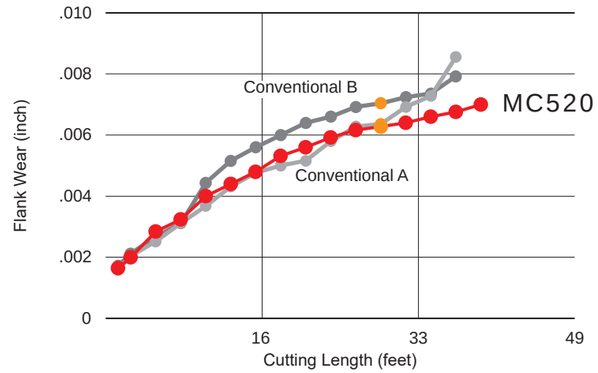
TOUGH-grip Coating Technology

The degree of adhesion between the coating layers has been improved exponentially allowing for greater strength and toughness.

Machining Performance

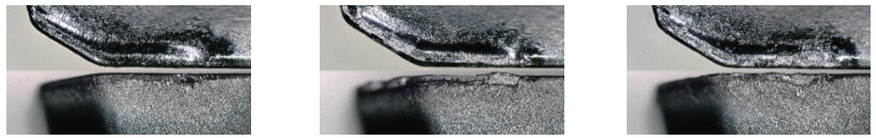
Comparison of Wear Resistance ; AISI No. 45 B

The MC520 provides excellent wear resistance when machining gray cast iron.



<Cutting Conditions>
Workpiece Material : AISI No. 45 B
Tool : WSF406WR12516EN
Insert : SNMU1206C05ZNER-M
Cutting Speed : vc=985 SFM
Feed per Tooth : fz=.008 IPT
Depth of Cut : ap=.079 inch
Cutting Mode : Dry Cutting, Single Insert Center Cut

After Machining Cutting Length 26 feet



MC520 | Conventional A | Conventional B

FACE MILLING
<HIGH EFFICIENCY CUTTING FOR CAST IRON>

84° KAPR | F | R

WSF406W

NEW

P | M | **K** | N | S | H

Metric Standard

Fig.1
ø80

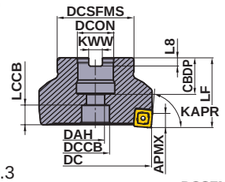


Fig.2
ø100
ø125
ø160

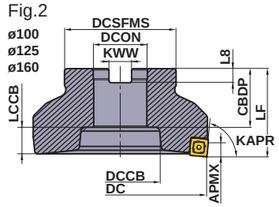
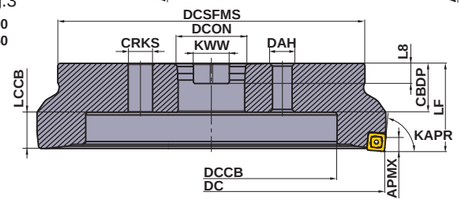


Fig.3
ø200
ø250



Right hand tool holder only.

■ Arbor Type

KAPR : 84°
DCON = inch size

(mm)

DC	Order Number	Stock R	⁎1 Coolant Hole	⁎2 No.T	LF	DCON	WT (kg)	APMX	RPMX (min⁻¹)	Fig.
80	**WSF406WR08006CN**	★	N	6	50	25.4	1.2	7.0	7,800	1
80	**WSF406WR08009CN**	★	N	9	50	25.4	1.2	7.0	7,800	1
100	**WSF406WR10008DN**	★	N	8	50	31.75	1.7	7.0	7,000	2
100	**WSF406WR10012DN**	★	N	12	50	31.75	1.7	7.0	7,000	2
125	**WSF406WR12510EN**	★	N	10	63	38.1	3.3	7.0	6,250	2
125	**WSF406WR12516EN**	★	N	16	63	38.1	3.2	7.0	6,250	2
160	**WSF406WR16014FN**	★	N	14	63	50.8	5	7.0	5,500	2
160	**WSF406WR16020FN**	★	N	20	63	50.8	4.9	7.0	5,500	2
200	**WSF406WR20016KN**	★	N	16	63	47.625	8.6	7.0	4,900	3
200	**WSF406WR20024KN**	★	N	24	63	47.625	8.5	7.0	4,900	3
250	**WSF406WR25022KN**	★	N	22	63	47.625	14	7.0	4,400	3
250	**WSF406WR25032KN**	★	N	32	63	47.625	13.9	7.0	4,400	3

⁎1 Y=Yes, N=No
⁎2 Number of Teeth
Note1) A set bolt for the arbor is not supplied with the body. Please refer to page 11 to find the correct type of set bolt to order.

Mounting Dimensions

(mm)

DC	Order Number	DCON	CBDP	DAH	DCCB	CRKS	LCCB	DCSFMS	KWW	L8	Fig.
80	**WSF406WR080**	25.4	34	13	20	—	14	55	9.5	6	1
100	**WSF406WR100**	31.75	32	—	46	—	16	70	12.7	8	2
125	**WSF406WR125**	38.1	42	—	56	—	19	80	15.9	10	2
160	**WSF406WR160**	50.8	45	—	80	—	16	100	19.1	11	2
200	**WSF406WR200**	47.625	35	18	140	M16	26	175	25.4	14.22	3
250	**WSF406WR250**	47.625	35	18	180	M16	26	220	25.4	14.22	3

★ : **Stocked in Japan**

Spare Parts

Tool Holder Type		 ⁎		
	Wedge	Clamp Screw	Wrench	Adjustable Run-Out System
WSF406W	CWSF406N	LS0622T	TKY15T	ADW04

⁎ Clamp Torque (lbf-in) : LS0622T = 53

■ Parts Sold Separately
Set Bolt

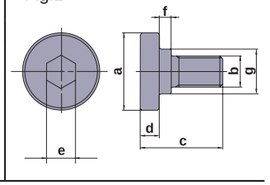
(mm)

Tool Holder Type	Set Bolt Order Number	Fig.	a	b	c	d	e	f	g
WSF406WR080	HSC12035	1	18	M12x1.75	47	12	10	–	–
WSF406WR100	–	2	40	M16x2	43	10	14	6	23
WSF406WR125	–	2	50	M20x2.5	54	14	17	6	27
WSF406WR160	–	2	65	M24x3	59	14	17	10	37
WSF406WR200	–	1	24	M16x2	61-	16	14	–	–
WSF406WR250	–	1	24	M16x2	61-	16	14	–	–

Geometry

Fig.1

Fig.2



Note 1) Please purchase the appropriate set bolt after confirming the reference dimensions. The items with an order number listed under the Set Bolt columns are also sold by MITSUBISHI MATERIALS.

Face Milling Cutter for Cast Iron Machining with an Adjustable Run-Out System

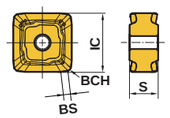
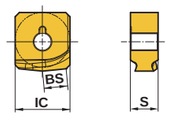
■ Inserts

(inch)

Workpiece Material													
	K	Cast Irons			◆								

This is the selection guideline for WSF406W.
Please note that the cutting conditions differ depending on multiple factors, for more details refer to the Recommended Cutting Conditions

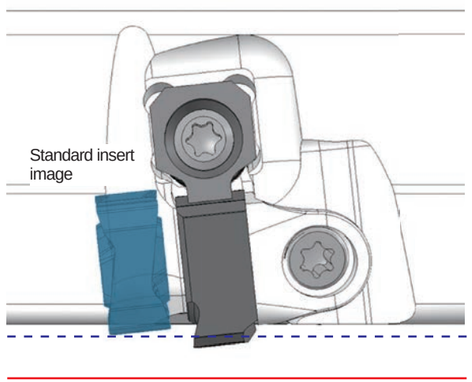
Edge Preparation :
E : Round

Shape	Order Number	Class	Edge Preparation	Coated				IC	S	BS	BCH	Geometry
				MC520								
NEW 	**SNMU1206C05ZNER-M**	M	E	★				.500	.244	.063	.020	
NEW  Wiper	**WNGU1206ZNER5C-M**	G	E	★				.484	.244	.205	–	

How to Use Wiper Insert for Best Results

●The WSF406W can obtain a good surface finish when using a standard insert due to the adjustable run-out system, but by using a wiper insert an excellent surface finish can be achieved without having to set a high accuracy face run out.
When a wiper insert is mounted, aim to set the standard insert run out accuracy to within .0016 inch.

●Just one wiper insert is enough to achieve excellent finished surfaces.
However, if the feed per revolution is greater than .197 IPR, attach two or more wiper inserts so that they are evenly spaced in the cutter body and set the run out accuracy between multiple wiper inserts to within .0001 inch before use.



By figure image

Please set the wiper insert to protrude by up to .0028 inch

★ : Stocked in Japan (10 inserts in one case)

Cutting Conditions (Guide) :
● : Stable Cutting ◕ : General Cutting ✣ : Unstable Cutting

Recommended Cutting Conditions

■ Dry Cutting

(inch)

Workpiece Material		Properties	Cutting Conditions	Depth of Cut **ap**	Cutting Speed **vc** (SFM)	Feed per Tooth **fz** (IPT)	Width of Cut **ae**
K	Gray Cast Irons	Tensile Strength ≤350MPa	●	ap≤.020 inch	985(820—1150)	.005(.003—.008)	≤.8DC
				ap≤.079 inch	820(690—985)	.006(.004—.010)	≤.8DC
				.079 inch <ap≤.157 inch	720(620—850)	.005(.004—.008)	≤.8DC
				.157 inch <ap≤.298 inch	655(590—755)	.004(.003—.006)	≤.8DC
			◕	ap≤.020 inch	820(690—985)	.005(.003—.008)	≤.8DC
				ap≤.079 inch	720(620—850)	.006(.004—.010)	≤.8DC
				.079 inch <ap≤.157 inch	655(590—755)	.005(.004—.008)	≤.8DC
				.157 inch <ap≤.298 inch	590(525—690)	.004(.003—.006)	≤.8DC
			✣	ap≤.020 inch	720(620—850)	.005(.003—.008)	≤.8DC
				ap≤.079 inch	655(590—755)	.006(.004—.010)	≤.8DC
				.079 inch <ap≤.157 inch	590(525—690)	.005(.004—.008)	≤.8DC
				.157 inch <ap≤.298 inch	490(330—590)	.004(.003—.006)	≤.8DC
	Ductile Cast Irons	Tensile Strength ≤450MPa	●	ap≤.020 inch	755(655—820)	.005(.003—.008)	≤.8DC
				ap≤.079 inch	655(560—755)	.006(.004—.010)	≤.8DC
				.079 inch <ap≤.157 inch	590(490—690)	.005(.004—.008)	≤.8DC
				.157 inch <ap≤.298 inch	525(425—620)	.004(.003—.006)	≤.8DC
			◕	ap≤.020 inch	655(560—755)	.005(.003—.008)	≤.8DC
				ap≤.079 inch	590(490—690)	.006(.004—.010)	≤.8DC
				.079 inch <ap≤.157 inch	525(425—620)	.005(.004—.008)	≤.8DC
				.157 inch <ap≤.298 inch	460(360—560)	.004(.003—.006)	≤.8DC
			✣	ap≤.020 inch	590(490—655)	.005(.003—.008)	≤.8DC
				ap≤.079 inch	525(425—620)	.006(.004—.010)	≤.8DC
				.079 inch <ap≤.157 inch	460(360—560)	.005(.004—.008)	≤.8DC
				.157 inch <ap≤.298 inch	395(295—490)	.004(.003—.006)	≤.8DC
	Ductile Cast Irons	Tensile Strength ≤800MPa	●	ap≤.020 inch	755(655—820)	.005(.003—.008)	≤.8DC
				ap≤.079 inch	655(560—755)	.006(.004—.010)	≤.8DC
				.079 inch <ap≤.157 inch	590(490—690)	.005(.004—.008)	≤.8DC
				.157 inch <ap≤.298 inch	525(425—620)	.004(.003—.006)	≤.8DC
			◕	ap≤.020 inch	655(560—755)	.005(.003—.008)	≤.8DC
				ap≤.079 inch	590(490—690)	.006(.004—.010)	≤.8DC
				.079 inch <ap≤.157 inch	525(425—620)	.005(.004—.008)	≤.8DC
				.157 inch <ap≤.298 inch	460(360—560)	.004(.003—.006)	≤.8DC
			✣	ap≤.020 inch	590(490—690)	.005(.003—.008)	≤.8DC
				ap≤.079 inch	525(425—620)	.006(.004—.010)	≤.8DC
				.079 inch <ap≤.157 inch	460(360—560)	.005(.004—.008)	≤.8DC
				.157 inch <ap≤.298 inch	395(295—490)	.004(.003—.006)	≤.8DC

Note 1) Refer to the table above for more details on how to set the cutting conditions according the usage.
Note 2) When using a wiper insert, the cutting conditions for the finishing area are ap≤.020 inch.

MTEC MACHINING TECHNOLOGY & EDUCATION CENTER

Welcome to our new world-class Machining Technology and Education Center (MTEC) in Mooresville, NC providing year round support and services to North America.

ABOUT MTEC

TOOLING PROPOSALS & EVALUATION

We will review your current processes or outline a new process. From this review, we will improve productivity, analyze programming methods and output a solution with programming, tooling and time savings.

MACHINING SIMULATION

Using the latest CAD/CAM software and our cutting tool experience, we will outline a new process using proper machining techniques to maximize tool life and productivity.

TECHNICAL SUPPORT

Dedicated local professionals to answer any of your order, product or technical questions.

TRAINING

We are excited to offer several levels of training with goals to reach our highest level--Craftsman Machining Technology. At MTEC NC, we will train using a combination of classroom and hands-on machine time to develop skills and real-world understanding of materials, tools and applications. In addition to multi-day courses, we will have Machining Technology skills seminars, as well as seminars from our partners to complement our apprentice level courses, our journeyman courses, and up to our craftsman level courses.

PROCESS IMPROVEMENTS

Review of the complete part processing and recommend changes of speed, feed, new tooling, reduction of passes, modifying programming and other solutions to reduce cycle time, save money and be proactive.

ONLINE TRAINING

Our FREE e-learning program offers 11 courses in drilling, milling, turning, threading, tool grades and workpiece materials. Once each course is completed, you will be given the opportunity to print a certificate.

- Basic Drilling
- Basic Milling
- Basic Turning
- Advanced Drilling
- Advanced End Milling
- Advanced Turning
- Basic Threading
- Advanced Face Milling
- Basic Workpiece Materials
- Tool Grades
- Advanced Workpiece Materials

TRAINING COURSES

Programs are designed for several levels of skill development – from basic understanding to advance manufacturing with digital solutions, complementing to your valued experience in CNC machining environment. Participate in machining demonstrations with Mitsubishi Materials' skilled engineers. Discover methods to reduce setup and cycle time, optimize programs and enhance your knowledge base.

Information on course schedule, course description, and accommodations

MTECTRAINING.INFO

Follow the QR Code for a virtual facility tour

DIA EDGE

MITSUBISHI MATERIALS U.S.A. CORPORATION

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Mooresville, NC 28117
Main: 980.312.3100
Fax: 704.746.9292

Chicago Office (Engineering)

300 N. Martingale Road, Suite 500
Schaumburg, IL 60173
Main: 847.252.6300
Fax: 847.519.1732

Toronto Office (Canada Branch)

3535 Laird Road, Units 15 & 16
Mississauga, Ontario, Canada L5L 5Y7
Main: 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 C.P. 76246 MEXICO
Main: +52.442.221.61.36
Fax: +52.442.221.61.34

Detroit Office (Moldino CS)

41700 Gardenbrook Road, Suite 120
Novi, MI 48375
Main: 248.308.2620
Fax: 248.308.2627

For Your Safety

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

MITSUBISHI MATERIALS U.S.A.

Product Brands Crafted by Mitsubishi Materials U.S.A.

DIA EDGE MOLDINO

www.diaedgetools.com
www.mmus-carbide.com

Tools specifications subject to change without notice.

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