

P713G

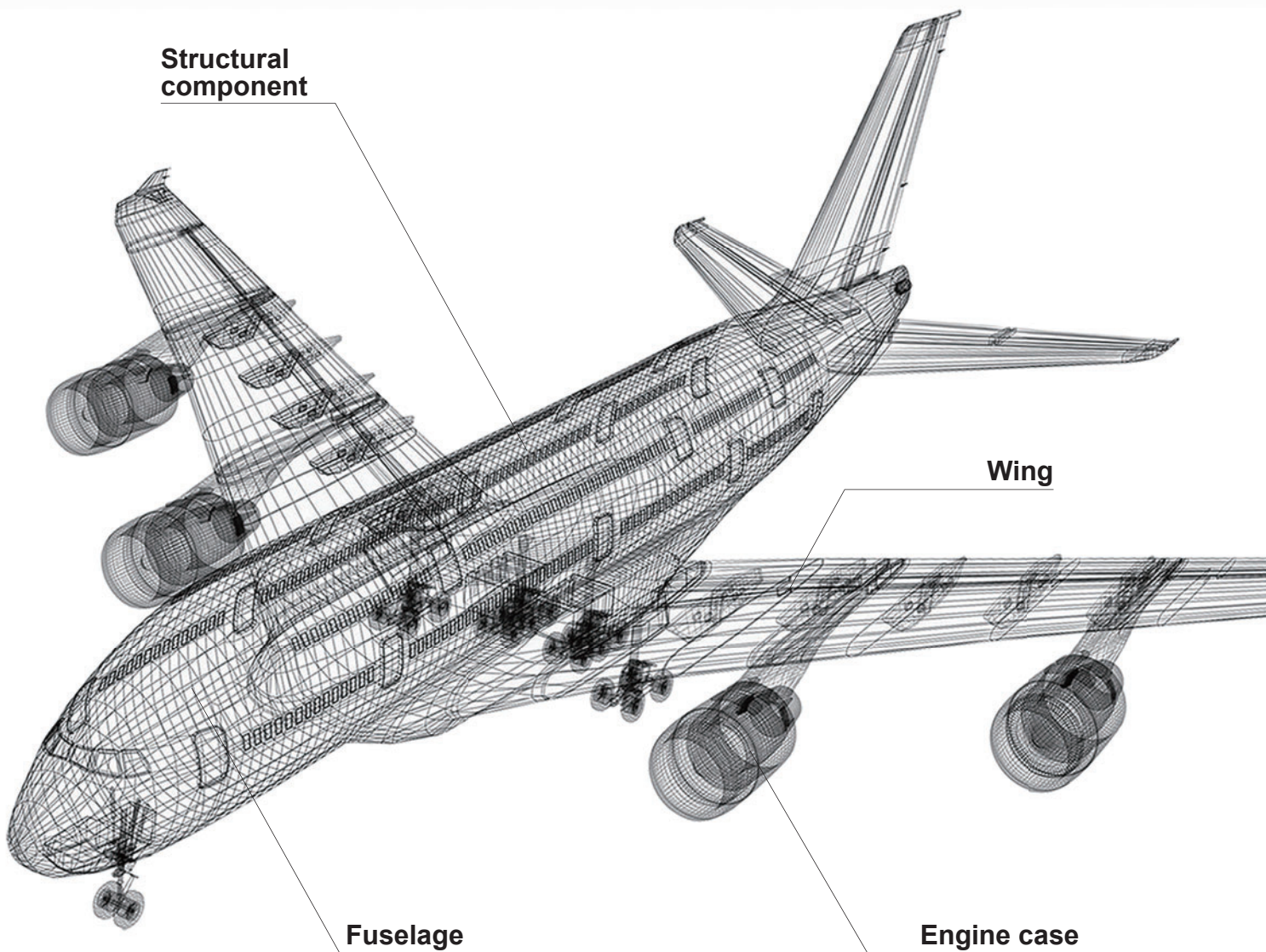
# SOLUTIONS FOR COMPOSITE



# SOLUTION

High strength carbon fiber is widely used in the aeronautic and aerospace frames and wind power generation blades for light structures that require high strength. In addition, it is effective to use tools with a high strength coating. However, delamination and burr is liable to occur during drilling.

## AEROSPACE



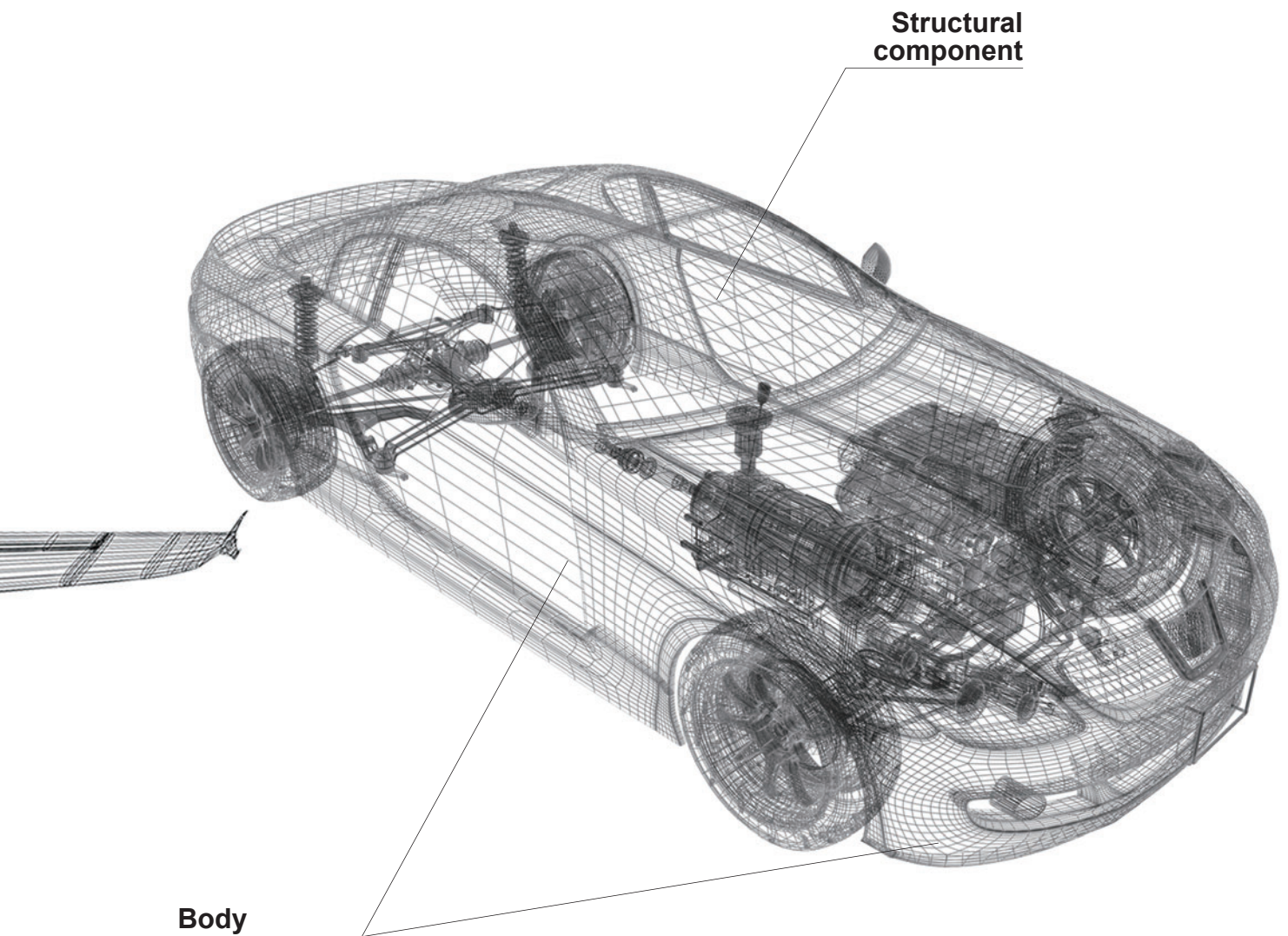
### Drilling

The CVD diamond coating and cemented carbide drill equipped with an edge shape optimized by application and high abrasion resistance provide stability that minimizes burr and delamination.

# FOR CFRP

tomobile industries, as well as in wheelchairs, F1 chassis, bicycle  
uire strength. However, the life of such tools is extremely short due  
abrasion resistance coating in composite material machining where  
ring cutting due to the laminate structure.

## AUTOMOTIVE



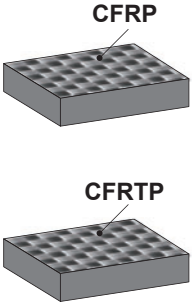


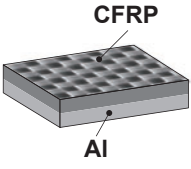


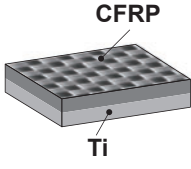

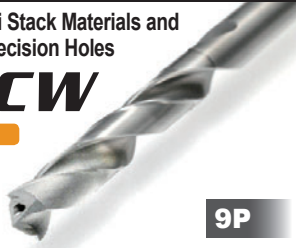


### Trimming

The end mill that combines an optimized edge shape and high wear resistance CVD diamond coating maintains high quality.

# DRILLING TOOLS

## DRILL

	 <p><b>CNC Machine</b></p>	 <p><b>Hand Tool</b></p>
 <p>CFRP</p> <p>CFRTF</p>	<p><b>CFRP</b></p> <p><b>MCC</b></p> <p>DD2105</p>  <p>5P</p> <p>The cutting edge angle = 90° setting minimizes cutting resistance in the thrust direction. This controls delamination and maintains good hole quality.</p>	<p><b>Hand Tool (CFRP)</b></p> <p><b>MCCH</b></p> <p>DT2030</p>  <p>10P</p> <p>The hand tool ultra-hard substrate with enhanced strength prevents sudden breakages and maintains high-quality holes. The double angle design controls the thrust and enables a stable cutting speed even in hand tool machining.</p>
 <p>CFRP</p> <p>Al</p>	<p><b>CFRP/Al Stack Materials</b></p> <p><b>MCA</b></p> <p>DD2110</p>  <p>6P</p> <p>The groove design that wraps up chips also minimizes gaps of CFRP and aluminum hole diameter in addition to preventing contact between the chips and the CFRP hole wall surface.</p>	<p><b>CFRP/Al Stack Materials and Hand Tools</b></p> <p><b>MCAH</b></p> <p>DT2030</p>  <p>10P</p> <p>The hand tool ultra-hard substrate with enhanced strength prevents sudden breakages and produces highly reliable hole machining. The combination of the groove shape and optimal twisting ensures compatibility of the aluminum chip dividing and discharging. This leads to stable hole machining even in CFRP and aluminum stack material machining.</p>
 <p>CFRP</p> <p>Ti</p>	<p><b>CFRP/Ti Stack Materials</b></p> <p><b>MCT</b></p> <p>TF15</p>  <p>8P</p> <p>The sharp cutting edge in titanium machining which requires good CFRP hole quality and machining that minimizes the generation of cutting heat with low thermal conductivity achieves high-quality CFRP and titanium stack material hole machining.</p>	<p><b>CFRP/Ti Stack Materials and High Precision Holes</b></p> <p><b>MCW</b></p> <p>HTI10</p>  <p>9P</p> <p>The unique cutting edge shape with V-shaped grooves on the cutting edge controls the flow of chips generated at the outer circumference. Furthermore, this minimizes the hole diameter gaps in stack materials. Burr on the hole exit side is controlled by shifting the cutting load to the rotating shaft.</p>

\*CFRTP=Carbon Fiber Reinforced Thermoplastic Resin

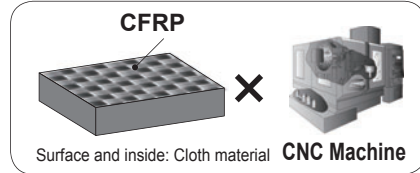
## END MILLS

Four Flutes

**DFC4JC**



The low resistance cutting edge with low helix angle reduces delamination and burrs when machining CFRP.



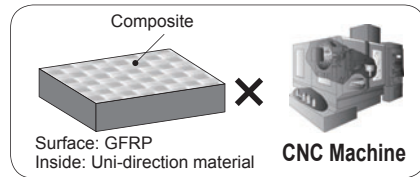
13P

Performance

**DFCJRT**



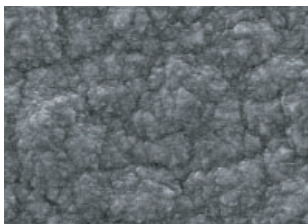
The cross-nick type cutting edge allows high efficiency machining due to lower cutting resistance and reduced temperatures.



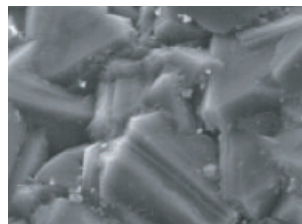
13P

### Features

#### Proprietary CVD diamond coating



New coating

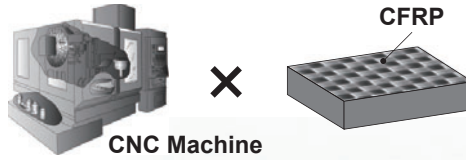


Conventional

The newly developed CVD diamond coated coating achieves outstanding abrasion resistance and smoothness due to a proprietary fine multilayer diamond crystal control technology.

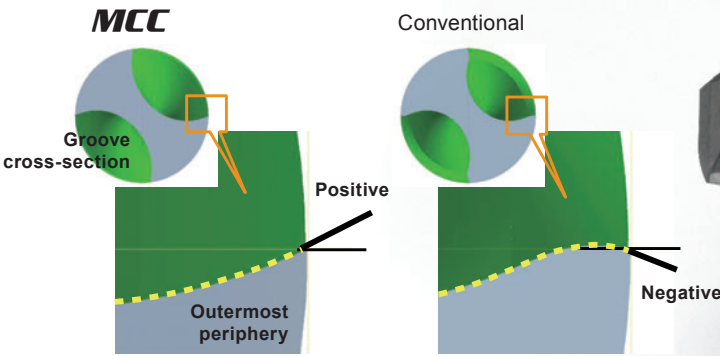
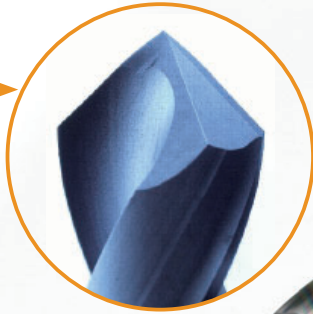
# DRILLING TOOLS

# MCC



## 90° Cutting Edge Angle

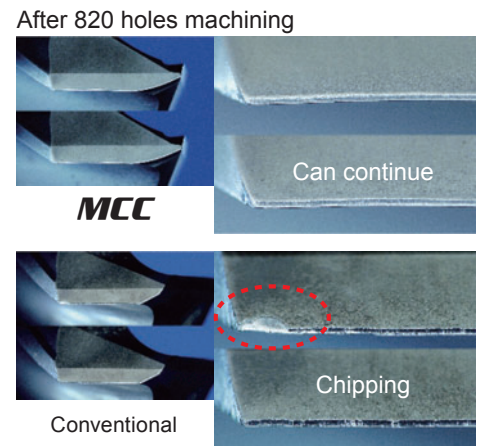
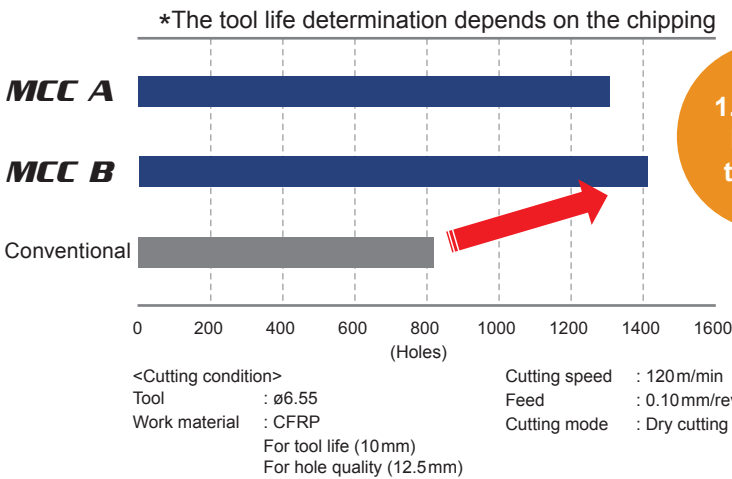
The acute cutting angle thoroughly reduces thrust and minimizes delamination.



## Strong Rake Grooves

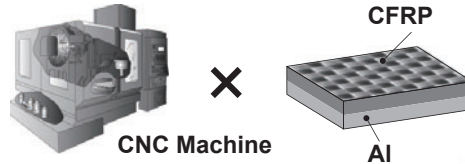
The cutting edge rake angle has been strengthened in the vertical direction on the axis of rotation. As a result, it is possible to minimize un-cutting and delamination on sharp cutting edges.

## Comparison of Tool Life and Hole (Entrance/Exit)



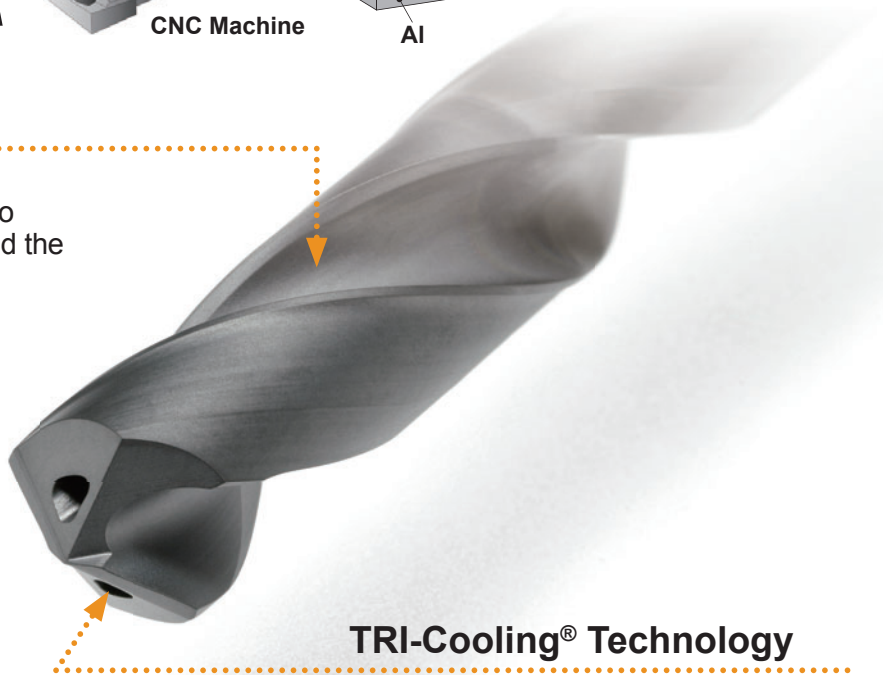
	306 holes		588 holes		MCC (1192 holes)
	MCC	Conventional	MCC	Conventional	
Entrance					
Exit					

# MCA



## New Groove Structure

The groove design that covers up chips also minimizes back counter in addition to minimizing contact between the chips and the CFRP hole wall surface.

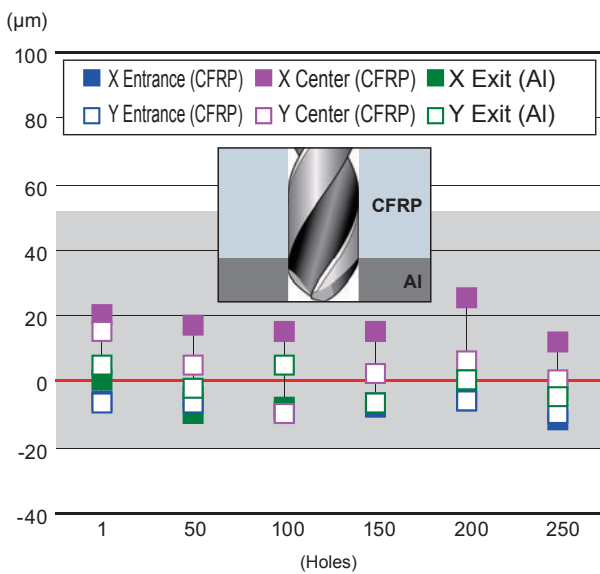


## TRI-Cooling® Technology

Controlling the cutting heat reduces deterioration of the CFRP hole precision caused by heat (improves the internal air effectiveness).

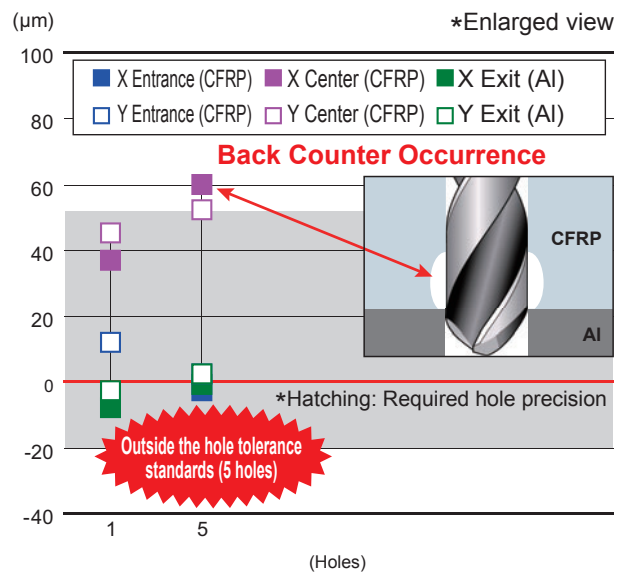
## Groove Shape Effect

# MCA



<Cutting condition>  
 Tool : 0.251" (ø6.38) CFRP  
 Work material : CFRP(11mm)+Al(5mm) Cutting speed : 100m/min  
 Feed : 0.15mm/rev

## Conventional

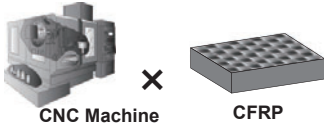


Al  
 Cutting speed : 100m/min  
 Feed : 0.15mm/rev  
 Cutting mode : Internal air

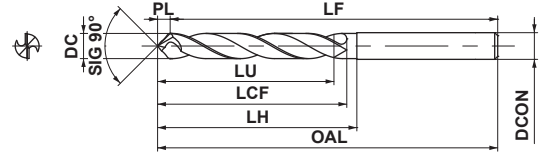
# DRILLING TOOLS

## MCC

CNC Machine / CFRP



	3<DC≤6	6<DC≤10	10<DC≤18	18<DC≤20
	0 -0.018	0 -0.022	0 -0.027	0 -0.033
	0 -0.008	0 -0.009	0 -0.011	0 -0.013



Hole Dia.		Drill Dia.		Hole Depth	Order Number	Grade	Dimensions (mm)						
AWG*	inch	DC (mm)	inch	(L/D)		DD2105	LU	LCF	LH	OAL	LF	PL	DCON
—	3/16	4.76	.1875	3	<b>MCC0476X03S060</b>	●	16.7	40	40	80	77.6	2.4	6
—	1/4	6.38	.251	3	<b>MCC0638X03S080</b>	●	22.3	50	50	90	86.8	3.2	8
—	5/16	7.96	.3125	3	<b>MCC0796X03S080</b>	●	27.9	50	50	90	86.0	4.0	8
—	3/8	9.55	.375	3	<b>MCC0955X03S100</b>	●	33.5	50	50	100	95.2	4.8	10
—	7/16	11.14	.4375	3	<b>MCC1114X03S120</b>	●	39.0	60	60	110	104.4	5.6	12

\*AWG : American Wire Gage

### RECOMMENDED CUTTING CONDITIONS

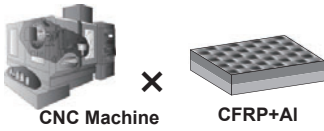
Work Material		CFRP			
Dia. DC (inch)	Dia. DC (mm)	Cutting speed (m/min)	Revolution (min <sup>-1</sup> )	Feed (Min.—Max.) (mm/rev)	Feed rate (mm/min)
<b>.1875</b>	<b>4.76</b>	100	6700	0.08 (0.05—0.12)	540
<b>.251</b>	<b>6.38</b>	100	5000	0.1 (0.05—0.12)	500
<b>.3125</b>	<b>7.96</b>	100	4000	0.1 (0.05—0.12)	400
<b>.375</b>	<b>9.55</b>	100	3400	0.1 (0.05—0.12)	340
<b>.4375</b>	<b>11.14</b>	100	2900	0.1 (0.05—0.12)	290

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

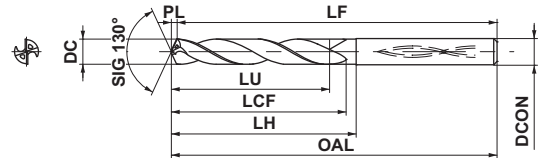


# DRILLING TOOLS

## MCA CNC Machine / CFRP + Al



	3<DC≤6	6<DC≤10	10<DC≤18	18<DC≤20
	0 -0.018	0 -0.022	0 -0.027	0 -0.033
	0 -0.008	0 -0.009	0 -0.011	0 -0.013



Hole Dia.		Drill Dia.		Hole Depth	Order Number	Grade	Dimensions (mm)						
AWG*	inch	DC (mm)	inch	(L/D)		DD2110	LU	LCF	LH	OAL	LF	PL	DCON
—	1/4	6.38	.251	5	<b>MCA0638X05S070</b>	<input type="checkbox"/>	33.4	51	51	91	89.5	1.5	7
—	3/8	9.55	.375	5	<b>MCA0955X05S100</b>	<input type="checkbox"/>	50.0	77	77	118	115.8	2.2	10

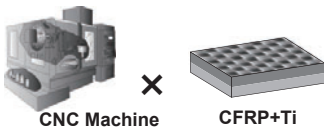
\*AWG : American Wire Gage

### RECOMMENDED CUTTING CONDITIONS

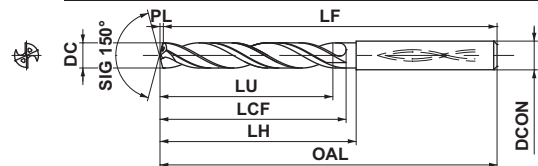
Work Material		CFRP				Aluminum Alloy (Si<5%) A6061, A7075 etc.			
Dia. DC (inch)	Dia. DC (mm)	Cutting speed (m/min)	Revolution (min <sup>-1</sup> )	Feed (Min.—Max.) (mm/rev)	Feed rate (mm/min)	Cutting speed (m/min)	Revolution (min <sup>-1</sup> )	Feed (Min.—Max.) (mm/rev)	Feed rate (mm/min)
<b>.251</b>	<b>6.38</b>	100	5000	0.15 (0.10—0.20)	750	100	5000	0.03 (0.02—0.04)	150
<b>.375</b>	<b>9.55</b>	100	3400	0.15 (0.10—0.20)	680	100	3400	0.03 (0.02—0.04)	100

1) We recommend to divide cutting conditions in each work materials.

## MCT CNC Machine / CFRP + Ti



	3<DC≤6	6<DC≤10	10<DC≤18	18<DC≤20
	0 -0.018	0 -0.022	0 -0.027	0 -0.033
	0 -0.008	0 -0.009	0 -0.011	0 -0.013



Hole Dia.		Drill Dia.		Hole Depth	Order Number	Grade	Dimensions (mm)						
AWG*	inch	DC (mm)	inch	(L/D)		TF-15	LU	LCF	LH	OAL	LF	PL	DCON
—	1/4	6.38	.251	5	<b>MCT0638X05S070</b>	<input type="checkbox"/>	32.8	47	47	96	95.1	0.9	7
—	3/8	9.55	.375	5	<b>MCT0955X05S100</b>	<input type="checkbox"/>	49.1	71	71	122	120.7	1.3	10

\*AWG : American Wire Gage

### RECOMMENDED CUTTING CONDITIONS

Work Material		CFRP				Titanium Alloy Ti-6Al-4V etc.				
Dia. DC (inch)	Dia. DC (mm)	Cutting speed (m/min)	Revolution (min <sup>-1</sup> )	Feed (Min.—Max.) (mm/rev)	Feed rate (mm/min)	Cutting speed (m/min)	Revolution (min <sup>-1</sup> )	Feed (Min.—Max.) (mm/rev)	Feed rate (mm/min)	Peck machining (mm)
<b>.251</b>	<b>6.38</b>	100	5000	0.15 (0.10—0.20)	750	15	750	0.02 (0.01—0.03)	15	1
<b>.375</b>	<b>9.55</b>	100	3400	0.15 (0.10—0.20)	680	15	500	0.02 (0.01—0.03)	10	1

1) This condition is for when internal air or mist is used.

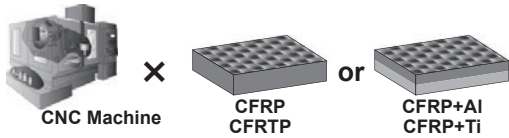
2) We recommend to divide cutting conditions in each work materials.

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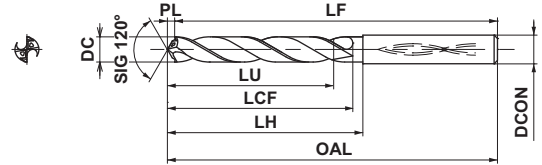
# DRILLING TOOLS

## MCW

CNC Machine / CFRP and stack material high precision



	3<DC≤6	6<DC≤10	10<DC≤18	18<DC≤20
	0	0	0	0
	-0.018	-0.022	-0.027	-0.033
	0	0	0	0
	-0.008	-0.009	-0.011	-0.013



Hole Dia.		Drill Dia.		Hole Depth	Order Number	Grade		Dimensions (mm)						
AWG*	inch	DC (mm)	inch	(L/D)		HT10	DD2110	LU	LCF	LH	OAL	LF	PL	DCON
—	1/4	6.38	.251	5	<b>MCW0638X05S070</b>	<input type="checkbox"/>	<input type="checkbox"/>	33.7	52	52	92	90.2	1.8	7
—	3/8	9.55	.375	5	<b>MCW0955X05S100</b>	<input type="checkbox"/>	<input type="checkbox"/>	50.6	73	73	119	116.2	2.8	10

\*AWG : American Wire Gage

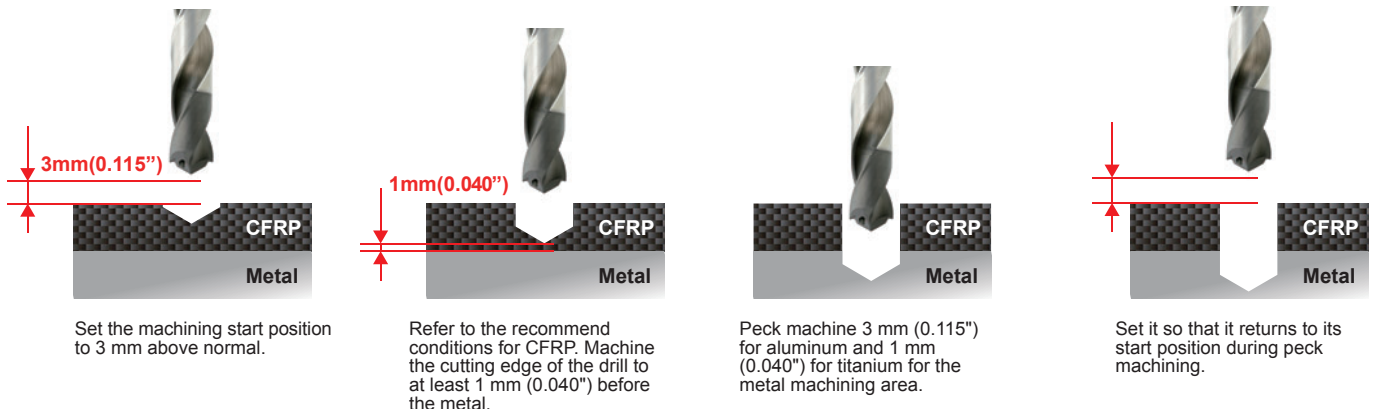
### RECOMMENDED CUTTING CONDITIONS

Work Material		CFRP				
Dia. DC (inch)	Dia. DC (mm)	Cutting speed (m/min)	Revolution (min <sup>-1</sup> )	Feed (Min.—Max.) (mm/rev)	Feed rate (mm/min)	
<b>.251</b>	<b>6.38</b>	100	5000	0.15 (0.10—0.20)	750	
<b>.375</b>	<b>9.55</b>	100	3400	0.15 (0.10—0.20)	680	

Work Material		Aluminum Alloy (Si<5%) A6061, A7075 etc.					Titanium Alloy Ti-6Al-4V etc.				
Dia. DC (inch)	Dia. DC (mm)	Cutting speed (m/min)	Revolution (min <sup>-1</sup> )	Feed (Min.—Max.) (mm/rev)	Feed rate (mm/min)	Peck machining (mm)	Cutting speed (m/min)	Revolution (min <sup>-1</sup> )	Feed (Min.—Max.) (mm/rev)	Feed rate (mm/min)	Peck machining (mm)
<b>.251</b>	<b>6.38</b>	100	5000	0.15 (0.10—0.20)	750	3	15	750	0.02 (0.01—0.03)	15	1
<b>.375</b>	<b>9.55</b>	100	3400	0.15 (0.10—0.20)	500	3	15	500	0.02 (0.01—0.03)	10	1

- 1) This condition is for when internal air or mist is used.
- 2) We recommend to divide cutting conditions in each work materials.

### Peck Machining Method (Applicable for MCT and MCW)

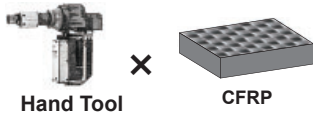


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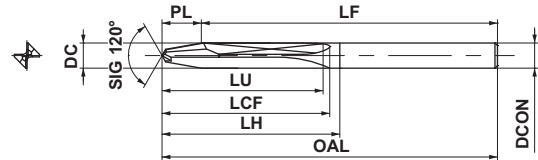
# DRILLING TOOLS

## MCCH

Hand tool / CFRP



1≤DC≤3	3<DC≤6	6<DC≤10	10<DC≤18	18<DC≤20
0 -0.014	0 -0.018	0 -0.022	0 -0.027	0 -0.033
0 -0.006	0 -0.008	0 -0.009	0 -0.011	0 -0.013

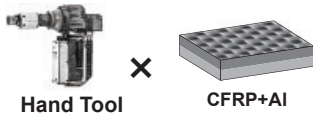


Hole Dia.		Drill Dia.		Hole Depth	Order Number	Grade	Dimensions (mm)						
AWG*	inch	DC (mm)	inch	(L/D)		DT2030	LU	LCF	LH	OAL	LF	PL	DCON
#40	—	2.5	.0985	15	MCCH0250X15S030	●	42.1	48	50	100	95.4	4.6	3
#30	—	3.26	.1285	10	MCCH0326X10S040	●	38.6	48	50	100	94.0	6.0	4
#20	—	4.1	.1615	8	MCCH0410X08S050	●	40.3	48	50	100	92.5	7.5	5
#11	—	4.86	.1915	5	MCCH0486X05S050	●	33.2	48	50	100	91.1	8.9	5
—	1/4	6.38	.251	3	MCCH0638X03S070	●	30.8	48	50	100	88.3	11.7	7
—	3/8	9.55	.375	2	MCCH0955X02S100	●	36.6	48	50	100	82.5	17.5	10

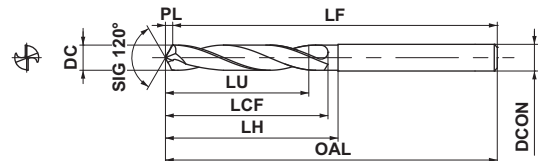
\*AWG : American Wire Gage

## MCAH

Hand tool / CFRP + AI



1≤DC≤3	3<DC≤6	6<DC≤10	10<DC≤18	18<DC≤20
0 -0.014	0 -0.018	0 -0.022	0 -0.027	0 -0.033
0 -0.006	0 -0.008	0 -0.009	0 -0.011	0 -0.013



Hole Dia.		Drill Dia.		Hole Depth	Order Number	Grade	Dimensions (mm)						
AWG*	inch	DC (mm)	inch	(L/D)		DT2030	LU	LCF	LH	OAL	LF	PL	DCON
#40	—	2.5	.0985	15	MCAH0250X15S030	●	38.2	50	50	100	99.3	0.7	3
#30	—	3.26	.1285	15	MCAH0326X15S040	●	49.8	50	50	100	99.1	0.9	4
#20	—	4.1	.1615	10	MCAH0410X10S050	●	42.2	50	50	100	98.8	1.2	5
#11	—	4.86	.1915	8	MCAH0486X08S050	●	40.3	50	50	100	98.6	1.4	5
—	1/4	6.38	.251	5	MCAH0638X05S070	●	33.7	50	50	100	98.2	1.8	7
—	3/8	9.55	.375	3	MCAH0955X03S100	●	31.5	50	50	100	97.2	2.8	10

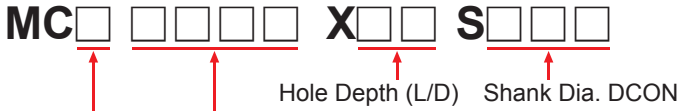
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# DRILLING TOOLS

Request sizes other than those in the inventory by inserting the code and numerical value in the  of the following model numbers. Contact our sales department for details on the dimensions.

Order number



Applications

- C : CNC Machine / CFRP
- A : CNC Machine / CFRP + AI
- T : CNC Machine / CFRP + Ti
- W : CNC Machine / CFRP and stack material high precision
- CH : Hand tool / CFRP
- AH : Hand tool / CFRP + AI

< Example >

Hole Depth (L/D)

- L/D2 → X02
- L/D10 → X10

Shank Dia. DCON

- $\phi 3\text{mm}$  → S030
- $\phi 10\text{mm}$  → S100

\*For inch sizes please convert to metric (1"= 25.4mm)

## Work material

### Type

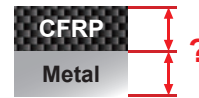
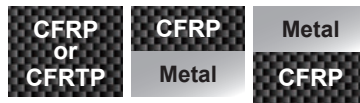
- CFRP: Thermosetting and thermoplasticity
- Type of reinforcing fiber
- Metal: Aluminum or titanium, etc.

### Combination

- CFRP or CFRTTP
- CFRP + stack materials (aluminum or titanium)
- Lap joint method

### Other

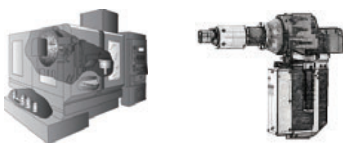
- Thickness for each work material
- Affixture of film



## Equipment

### Type

- CNC Machine
- Hand Tool
- Power feeders etc.

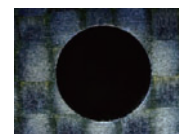


### Coolant

- Internal through
- Air, MQL and dry, etc.

## Hole Quality

- Required hole diameter (upper and lower limit of tolerance)
- Surface roughness of the hole inner wall
- Metal burr height
- CFRP and metal hole diameter gap



# MILLING TOOLS



CVD diamond coating with outstanding abrasion resistance and superior sharpness for high quality CFRP machining.

## DFC Series

CVD diamond coated end mill for CFRP machining

### Geometry for CFRP machining

#### DFC4JC

For finishing

The low resistance cutting edge with low helix angle reduces delamination and burrs when machining CFRP.

#### DFCJRT

For efficient machining

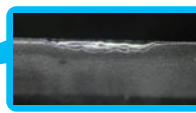
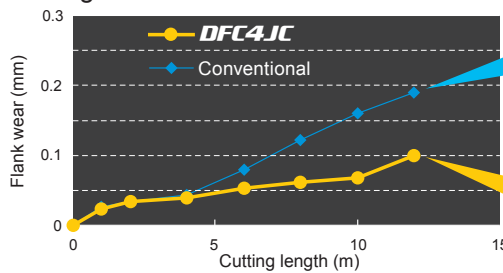
The cross-nick type cutting edge allows high efficiency machining due to lower cutting resistance and reduced temperatures.



DFC4JC

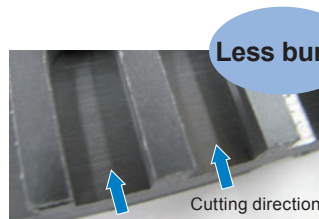
DFCJRT

#### Long tool life



End mill	DFC4JCD1000 (ø10)
Work material	CFRP (Thick: 5.3mm)
Revolution	6400min <sup>-1</sup> (200m/min)
Feed rate	800mm/min (0.03mm/tooth)
Coolant mode	Air blow

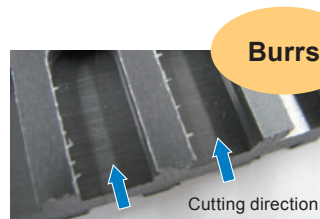
#### Excellent surface finish



Less burrs

Cutting direction

DFC4JC



Burr

Cutting direction

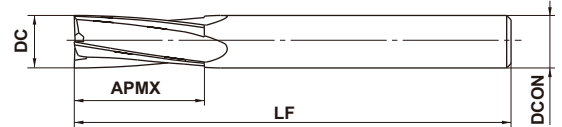
Conventional

End mill	DFC4JCD1000 (ø10)
Work material	CFRP (Thick: 6mm)
Revolution	6000min <sup>-1</sup> (188m/min)
Feed rate	750mm/min (0.03mm/tooth)
Coolant mode	Air blow

# MILLING TOOLS

## DFC4JC

End mill, Semi long cut length,  
4 flute, for CFRP



h6	6 ≤ DC ≤ 12		
	0 - 0.03		
	DCON=6	8 ≤ DCON ≤ 10	DCON=12
	0 - 0.008	0 - 0.009	0 - 0.011

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock
DFC4JCD0600	6	20	70	6	4	●
DFC4JCD0800	8	30	80	8	4	●
DFC4JCD1000	10	30	90	10	4	●
DFC4JCD1200	12	30	100	12	4	●

Please contact Mitsubishi Materials for geometries and through coolant types other than standard.

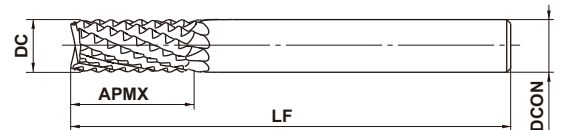
### RECOMMENDED CUTTING CONDITIONS

Work material	CFRP	
	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
Dia. DC (mm) <b>6</b>	11000	950
<b>8</b>	8000	780
<b>10</b>	6400	700
<b>12</b>	5300	650

- 1) Cutting conditions may differ considerably due to the kind of CFRP, the rigidity of the machine, or the clamping and geometry of the workpiece. Please use the left table as a standard starting point.
- 2) When high machining accuracy is needed, or large burrs or delamination occurs, we recommend reducing the feed rate.
- 3) When the depth of cut is greater than 0.8DC, we recommend reducing the feed rate.
- 4) Please take precautions against dust.

## DFCJRT

Cross-nick type end mill, Semi long cut length,  
for CFRP



h6	DCON=6	8 ≤ DCON ≤ 10	DCON=12
	0 - 0.008	0 - 0.009	0 - 0.011

Order Number	DC	APMX	LF	DCON	No. of Flutes	Stock
DFCJRTD0600	6	20	70	6	10	●
DFCJRTD0800	8	30	80	8	10	●
DFCJRTD1000	10	30	90	10	12	●
DFCJRTD1200	12	30	100	12	12	●

Please contact Mitsubishi Materials for geometries and through coolant types other than standard.

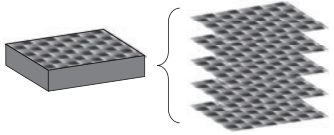
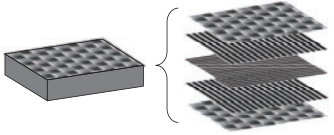
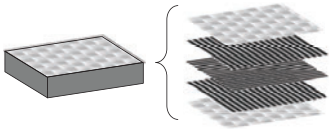


### RECOMMENDED CUTTING CONDITIONS

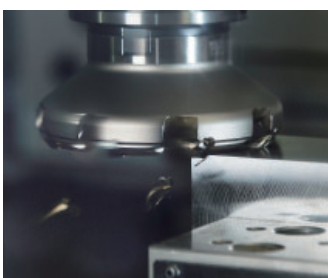
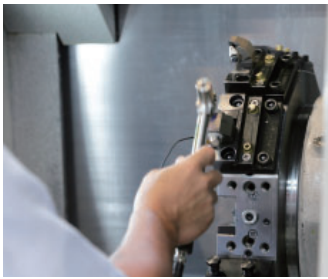
Work material	CFRP	
	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)
Dia. DC (mm) <b>6</b>	11000	1200
<b>8</b>	8000	1000
<b>10</b>	6400	900
<b>12</b>	5300	850

- 1) Cutting conditions may differ considerably due to the kind of CFRP, the rigidity of the machine, or the clamping and geometry of the workpiece. Please use the left table as a standard starting point.
- 2) When high machining accuracy is needed, or large burrs or delamination occurs, we recommend reducing the feed rate.
- 3) When the depth of cut is greater than 0.8DC, we recommend reducing the feed rate.
- 4) Please take precautions against dust.

● : Inventory maintained in Japan.

## Recommended Tools According to Type of CFRP

Type	Surface and inside: Cloth material	Surface → Cloth material Inside → Uni-direction material	Surface → Glass fiber material Inside → Uni-direction material
End mill			
<b>DFC4JC</b>	◎	○	○
<b>DFCJRT</b>	○	○	◎
Burr	 Liable to occur 		



YOUR GLOBAL CRAFTSMAN STUDIO

## RESPONSIVE, ATTRACTIVE, PROACTIVE

Mitsubishi Materials Corporation, Advanced Materials & Tools Company, offers a "Comprehensive Craftsman Studio" which addresses the individual needs and requirements of our customers' in order to make their business successful. Here the Machining Technology Center is the front-line base. It is fully equipped with advanced machines, measuring instruments, extensive cutting data, knowledge, technologies as well as having a team of highly-experienced technical staff members. All of which allows Mitsubishi Materials Corporation to offer the best solution and services for our valued customers.

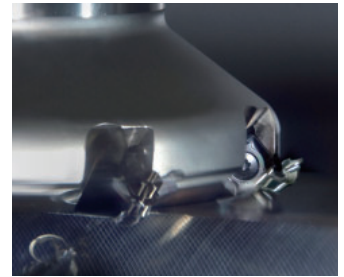


We try answering questions and demands from customers around the world by providing detailed solutions to meet our customer's expectations.



We identify the potential needs of customers and develop innovative tools to cultivate markets to widen future business possibilities.

Showing and demonstrating. Attractive events and practical seminars present the new possibilities in machining which evoke a feeling of curiosity.



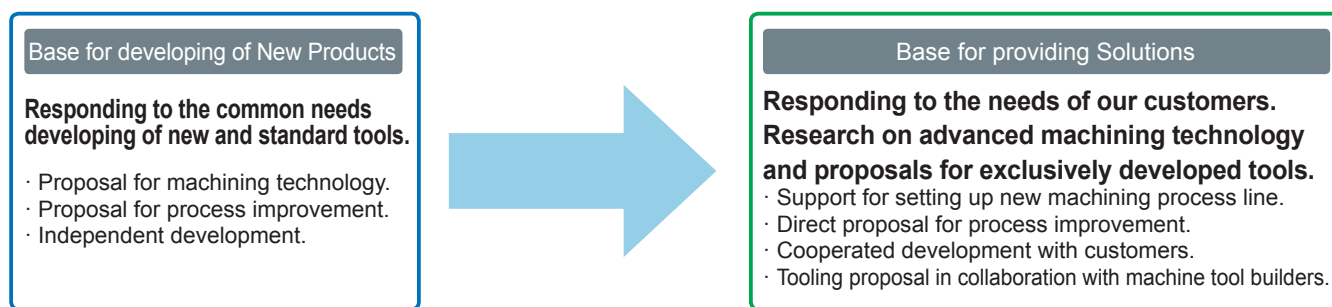




## Strengthening of total tooling solutions for our cutting tools

In order to provide our customers with a total tooling solution for our cutting tools Mitsubishi Materials has opened 2 technical centers within Japan. In addition to this there are also 4 other locations globally, Spain, North America, China and Thailand. Since establishing the Machining Technology Center (East Japan Technical Center - MTEC Saitama) in 2010, services to our valued customers are provided based on the know-how, that has been developed over the years, this in combination with the use of the latest cutting edge machine tools, measuring equipment and CAM/CAE software, allows us to provide the most suitable solution to meet our customers' needs. This experience enables effective use of the Central Japan Technical Center (MTEC Gifu) as our second technical support base in Japan. From the Central Japan Technical Center, we will strive to continue to provide various technical solutions especially for cutting tool customers in Central and West Japan. This particular region has a high density of automotive and aerospace customers.

### Direction of Research & Development



### State of the Art Machine Tools

Recently installed several of the latest machine tools, such as a high rigidity & high power horizontal machining center, a MQL function equipped machining center, a fully 5-axis controlled vertical machining center, an exclusive machining center for machining of CFRP materials, a multi-tasking machine with double head turning axis, a CNC automatic lathe with a frequency vibration cutting function.



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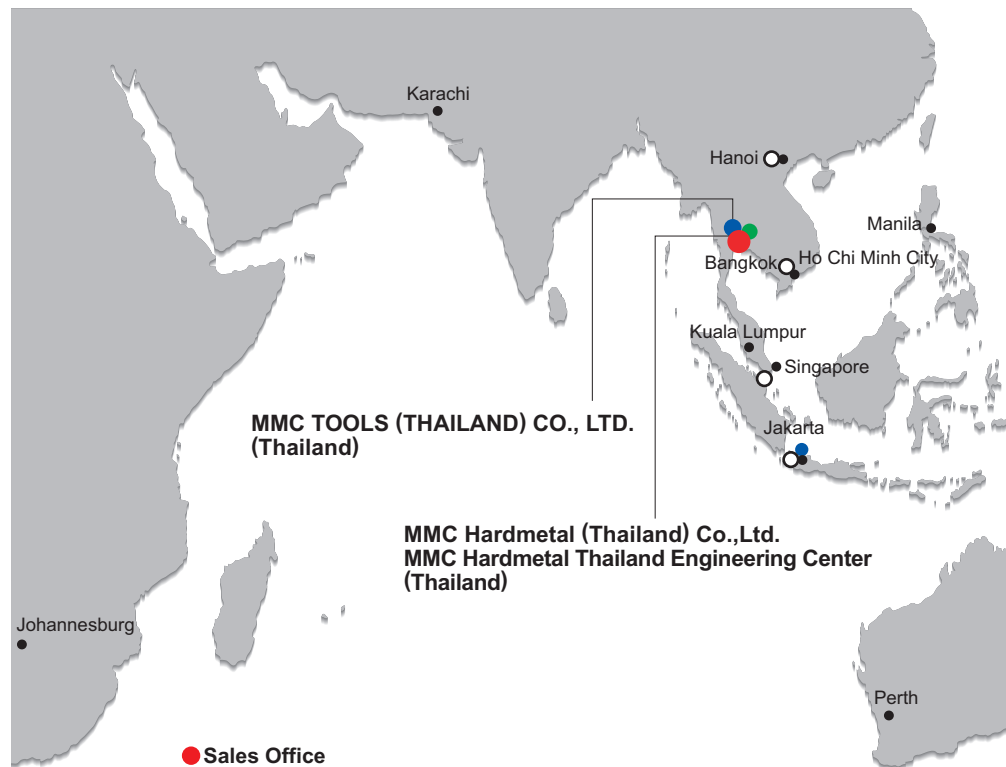
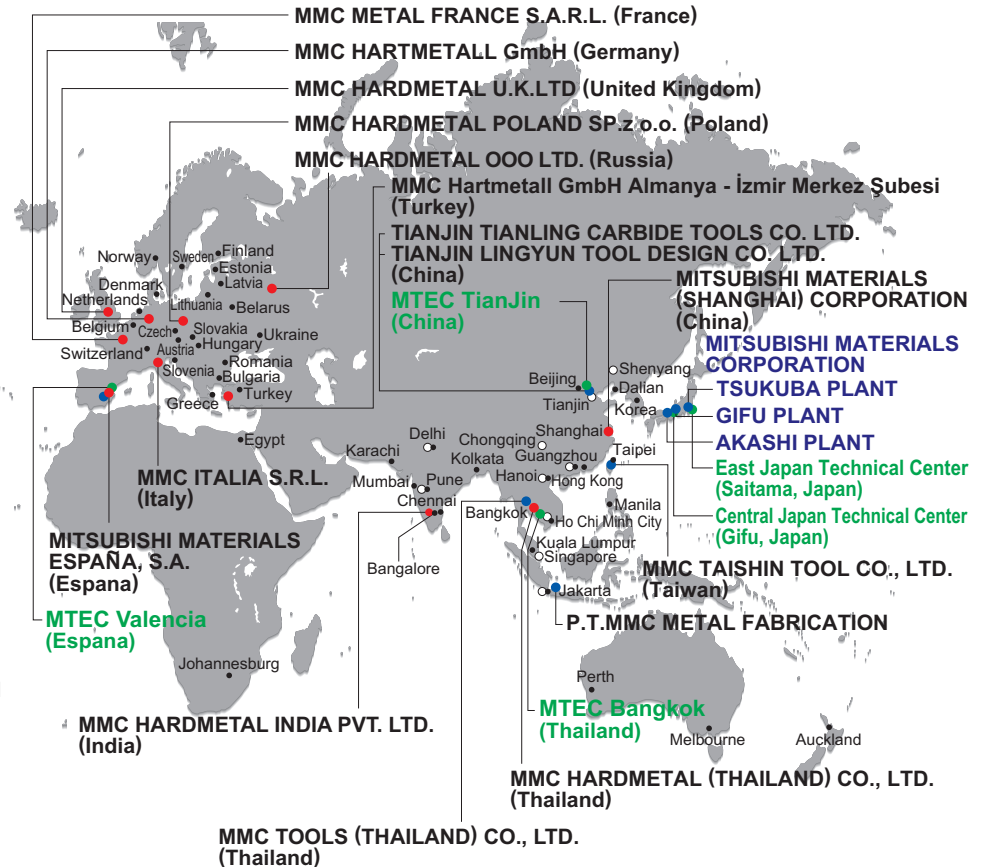
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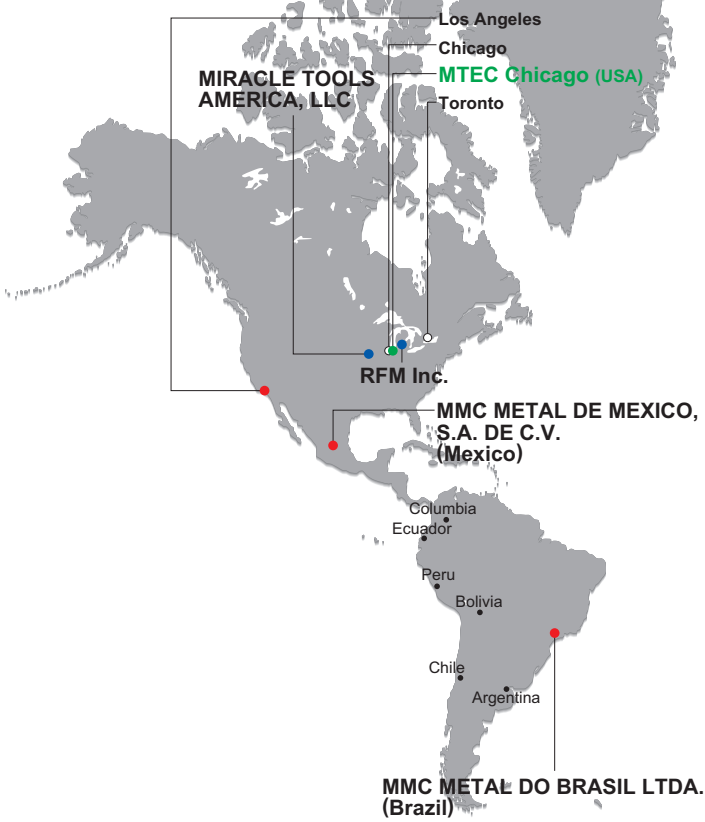
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- Technical Center
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MITSUBISHI MATERIALS TSUKUBA PLANT (JAPAN)



**QMS . EMS**  
ISO 9001 , ISO 14001  
(JSAQ080) (JSAE036)  
The Scope of the Registration:  
Design, Development and  
Production of Cemented  
Carbide Tools and Carbide  
Blanks



MITSUBISHI MATERIALS GIFU PLANT (JAPAN)



**QMS . EMS**  
ISO 9001 , ISO 14001  
(JSAQ094) (JSAE1545)  
The Scope of the Registration:  
Design, Development, and  
Production of Cutting Tools,  
Cemented Carbide Blanks,  
and Coated Products



MITSUBISHI MATERIALS AKASHI PLANT (JAPAN)



JQA-2522  
JQA-EM0941

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