

Makino Milling Machine Co., Ltd.  
For SMART TOOL FlashSet Mill™

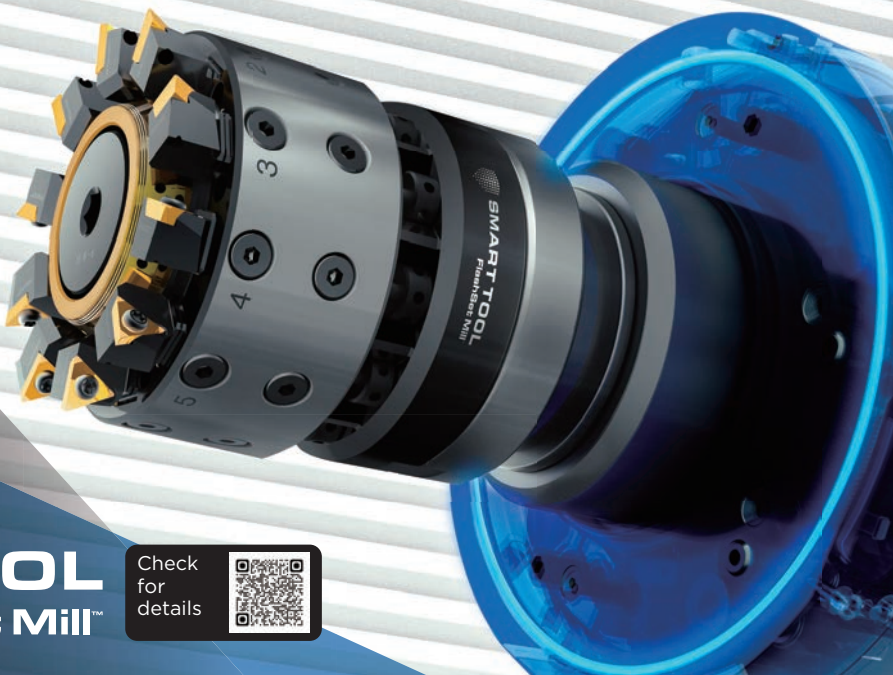
New

# WR Insert



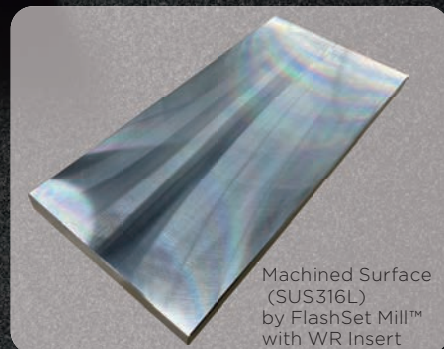
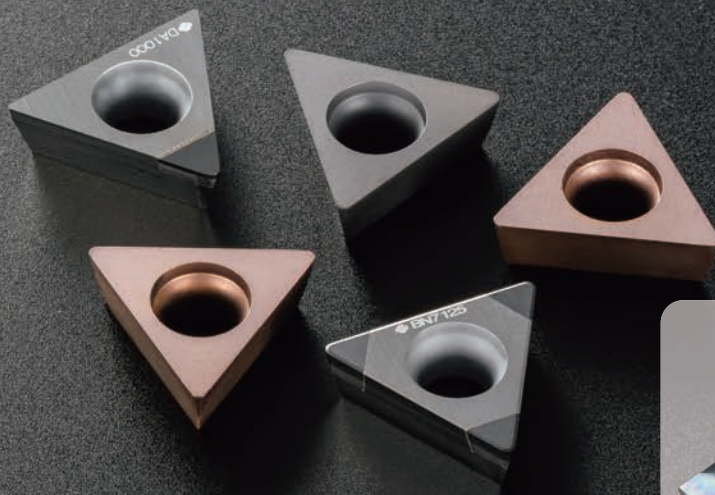
**SMART TOOL**  
FlashSet Mill™

Check  
for  
details



"SMART TOOL" is a registered trademark of Makino Milling Machine Co., Ltd.

## Superior Surface Finish with FlashSet Mill™



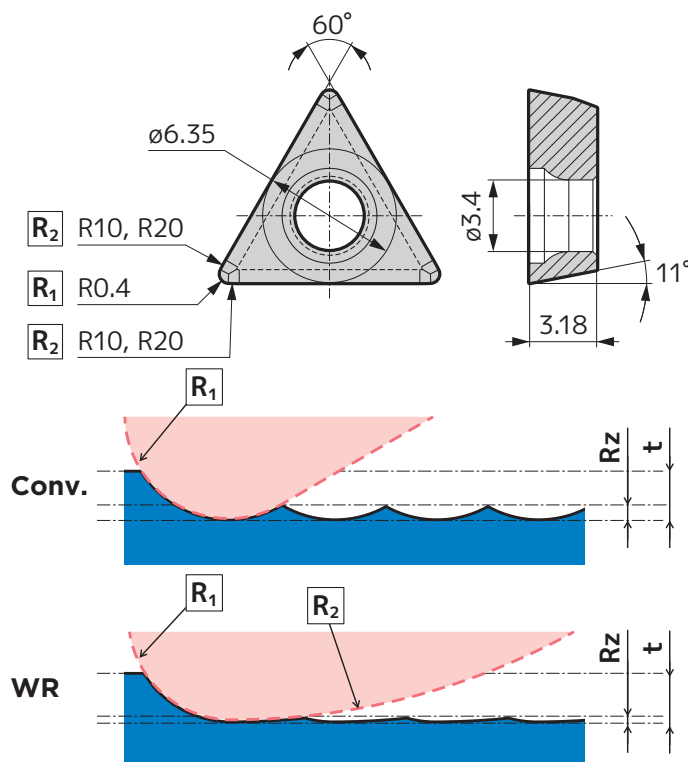
Machined Surface  
(SUS316L)  
by FlashSet Mill™  
with WR Insert

# WR Insert

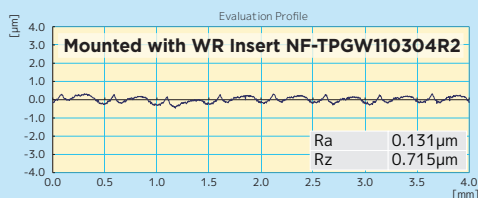
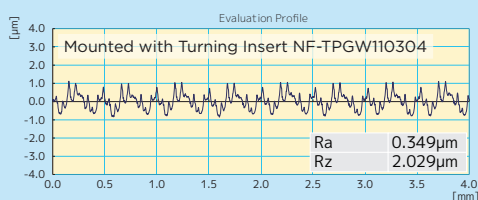


## ■ Cutting Edge Features

### High Efficiency & Superior Quality with WR



Work Material : Aluminum alloy A5052  
Tool: FlashSet Mill™  $\phi 80$  10-tooth  
Insert Grade : SUMIDIA DA1000  
Cutting Conditions  
vc: 2,500m/min  
fz: 0.05mm/t  
ap: 0.05mm ae:65mm  
Wet



### Compound Radius Cutting Edge for Excellent Surface Finish <sup>PAT.\*</sup>

\*) Patented by Makino Milling Machine Co., Ltd.

## ■ Surface Roughness Guidelines for FlashSet Mill™ with WR Inserts

Triangle symbol *1)	▽▽▽▽					▽▽▽			▽▽			▽			
Maximum height Rz	(0.05)	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	(18)	25	(35)	50	(70)	100
Arithmetic mean roughness Ra	(0.012)	0.025	0.05	0.10	0.20	0.4	0.80	1.6	3.2	6.3		12.5		25	
Application range *2)			←→												


\*1) Surface finish symbols were removed from JIS standards after the 1994 revision.

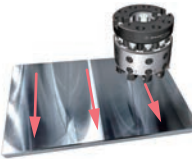
\*2) Reference values only – not guaranteed.





# WR Insert

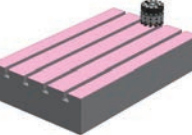
## ■ Application Examples

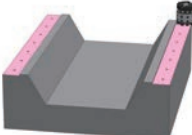
S50C Carbon Steel Plate		
	Workpiece size: 390×60×20 (mm)	
	Grade	ACU2500
	Edge geometry (R <sub>2</sub> )	R10
	Diameter (mm)	80
	Number of Teeth	10
	vc (m/min)	231
	vf (mm/min)	920
	fz (mm/t)	0.10
	ap(mm)	0.05
	ae(mm)	60
	Coolant	Wet (internal coolant)
	Results	Stable machining and excellent surface finish even on thin-walled workpieces


S50C Carbon Steel Plate		
	Workpiece size: 200×120×10 (mm)	
	Grade	ACU2500
	Edge geometry (R <sub>2</sub> )	R10
	Diameter (mm)	80
	Number of Teeth	10
	vc (m/min)	302
	vf (mm/min)	600
	fz (mm/t)	0.05
	ap(mm)	0.03
	ae(mm)	70
	Coolant	Wet (internal coolant)
	Results	Stable machining even on thin workpieces Pass-to-pass step height: 1μm

NAK80 Pre-hardened Steel Plate		
	Workpiece size: 400×250×30 (mm)	
	Grade	T4500A
	Edge geometry (R <sub>2</sub> )	R20
	Diameter (mm)	100
	Number of Teeth	12
	vc (m/min)	298
	vf (mm/min)	570
	fz (mm/t)	0.05
	ap(mm)	0.03
	ae(mm)	85
	Coolant	Wet (internal coolant)
	Results	Excellent machining accuracy and surface quality reduce subsequent polishing processes

SUS316L Stainless Steel Valve Body		
	Workpiece size: 440×160×80 (mm)	
	Grade	ACU2500
	Edge geometry (R <sub>2</sub> )	R10
	Diameter (mm)	100
	Number of Teeth	12
	vc (m/min)	201
	vf (mm/min)	768
	fz (mm/t)	0.10
	ap(mm)	0.05
	ae(mm)	80
	Coolant	Wet (internal coolant)
	Results	Excellent machining accuracy

FC300 Cast Iron T-slot Table		
	Workpiece size: 750×450×150 (mm)	
	Grade	BN7125
	Edge geometry (R <sub>2</sub> )	R10
	Diameter (mm)	100
	Number of Teeth	12
	vc (m/min)	1,414
	vf (mm/min)	2,700
	fz (mm/t)	0.05
	ap(mm)	0.02
	ae(mm)	82
	Coolant	Airblow (internal)
	Results	Excellent machining accuracy and surface quality



FC300 Cast Iron Bed Linear Guide Mounting Surface with Relief Machining		
	Workpiece size: 700×580×200 (mm)	
	Grade	BN7125
	Edge geometry (R <sub>2</sub> )	R10
	Diameter (mm)	80
	Number of Teeth	10
	vc (m/min)	1,407
	vf (mm/min)	2,800
	fz (mm/t)	0.05
	ap(mm)	0.02/0.01 (Relief machining)
	ae(mm)	60/0.5 (Relief machining)
	Coolant	Airblow (internal)
	Results	Excellent machining accuracy Corner machining possible without tool change

A5052 Aluminum Alloy Chamber		
	Workpiece size: 800×800×200 (mm)	
	Grade	DA1000
	Edge geometry (R <sub>2</sub> )	R20
	Diameter (mm)	125
	Number of Teeth	15
	vc (m/min)	2,513
	vf (mm/min)	4,800
	fz (mm/t)	0.05
	ap(mm)	0.01
	ae(mm)	100
	Coolant	Wet (internal coolant)
	Results	Excellent surface quality Reduced pass-to-pass step height

# WR Insert

## ■ Grade Features

### PVD Coated Carbide, Cermet

Work Material	Grade Classification	Grade	Hardness (HRA)	TRS (GPa)	Coating type	Coating Thickness (μm)	Features
	PVD	ACU2500	91.6	3.8	Absotech	3	<ul style="list-style-type: none"> <li>General-purpose grade covering steel, stainless steel, and cast iron machining</li> <li>Adopts a carbide substrate with excellent fracture resistance and wear resistance, plus a new coating with excellent wear resistance and chipping resistance, realising stable long tool life on various work materials</li> </ul>
	Cermet	T4500A	91.0	2.3	—	—	Tough grade with excellent fracture resistance and reduced thermal cracking





### CBN

Work Material	Grade Classification	Grade	Hardness HV(GPa)	TRS (GPa)	Features
	CBN	BN7125	41 to 44	1.9 to 2.0	General-purpose grade with excellent wear resistance, fracture resistance, and thermal shock resistance, suitable for machining of cast iron and exotic alloys

### PCD

Work Material	Grade Classification	Grade	Hardness HK(GPa)	TRS (GPa)	Features
	PCD	DA1000	50 to 60	≈ 2.60	High-density sintered material made of ultra-fine grain diamond that exhibits optimum wear and fracture resistance as well as excellent edge sharpness.





## ■ WR Insert Lineup

Grade Classification	Pcs/ Pack	Coated Carbide	Cermet	SUMIBORON	SUMIDIA	Dimensions (mm)		
ISO								
Cat. No.		ACU2500	T4500A	BN7125	DA1000	R <sub>1</sub>	R <sub>2</sub>	Shape
<b>TPGW 110304R10</b>	10	●	●	—	—	0.4	10	Round Honing
<b>TPGW 110304R20</b>		●	●	—	—	0.4	20	Round Honing
<b>3NU-TPGW 110304R10</b>	1	—	—	●	—	0.4	10	Negative Land
<b>3NU-TPGW 110304R20</b>		—	—	●	—	0.4	20	Negative Land
<b>NF-TPGW 110304R10</b>	1	—	—	—	●	0.4	10	Sharp Edge
<b>NF-TPGW 110304R20</b>		—	—	—	●	0.4	20	Sharp Edge

● mark: Standard stocked item — mark: Not available

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## ■ Recommended Cutting Conditions

ISO	Work Material	Cutting Speed vc (m/min) Min - Optimum - Max	Feed Rate fz (mm/t) Min - Optimum - Max	Depth of Cut ap (mm)	Insert Grade
	General Steel	150 - <b>230</b> - 300	0.05 - <b>0.10</b> - 0.20	up to 0.1	ACU2500 T4500A
	Pre-hardened Steel	150 - <b>200</b> - 300	0.05 - <b>0.10</b> - 0.20	up to 0.1	ACU2500 T4500A
	Stainless Steel	100 - <b>200</b> - 300	0.05 - <b>0.10</b> - 0.20	up to 0.1	ACU2500
	Cast Iron	800 - <b>1,400</b> - 2,000	0.05 - <b>0.10</b> - 0.20	up to 0.1	BN7125
	Aluminum alloys	2,000 - <b>2,500</b> - 3,000	0.05 - <b>0.10</b> - 0.20	up to 0.1	DA1000

### For inquiries about SMART TOOL FlashSet Mill™

Makino Milling Machine Co., Ltd. | Customer Application Center, Product Planning Dept., Product Development Group | TEL: +81-46-285-0720



● Very hot or lengthy chips may be discharged while the machine is in operation. Therefore, machine guards, safety goggles or other protective covers must be used. Fire safety precautions must also be considered.

### < SAFETY NOTES >

● Please handle with care as this product has sharp edges.  
● Improper cutting conditions or mis-handling of the tool may result in breakages or projectiles. Therefore, please use the tool within its recommended conditions.

● When using non-water soluble cutting oil, precautions against fire must be taken and please ensure that a fire extinguisher is placed near the machine.

 Sumitomo Electric Industries, Ltd.

## Hardmetal Division

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