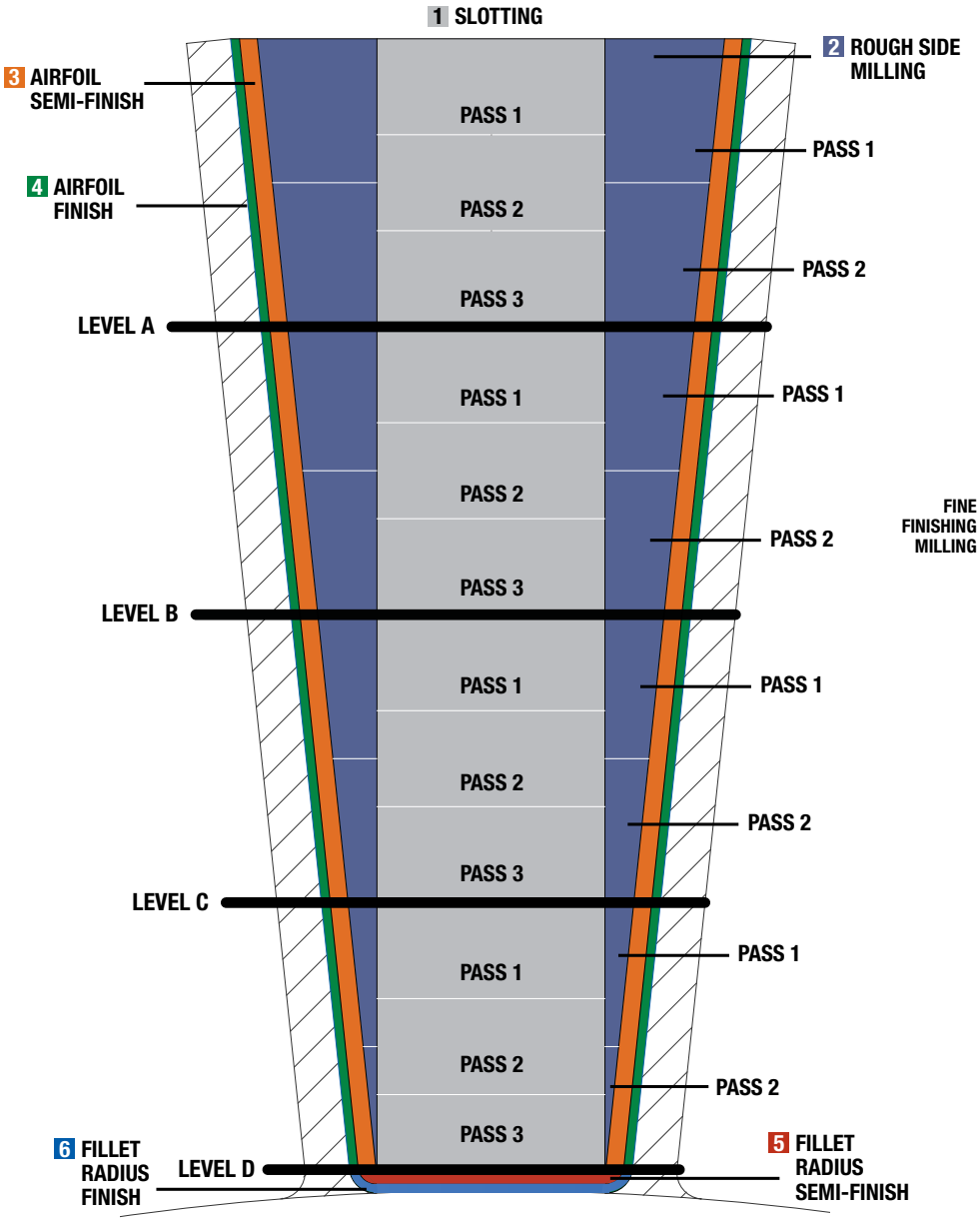
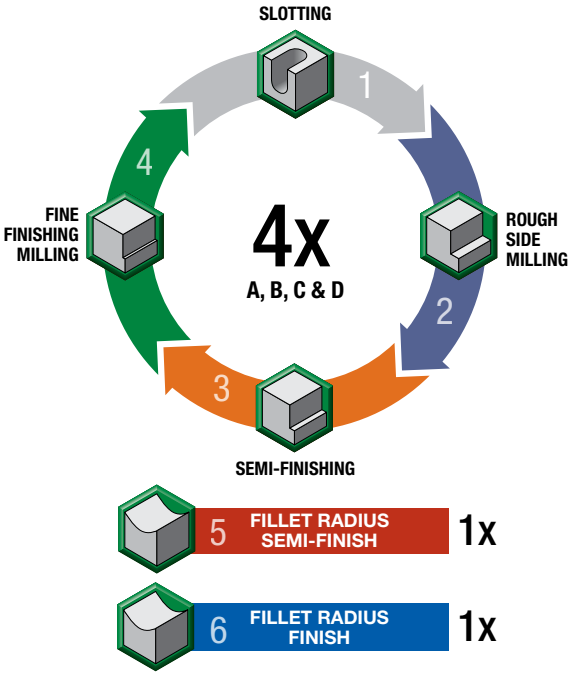
Integral Blade Rotor (IBR)

Titanium Airfoil Milling





The WIDIA-Hanita™ end mills IBR machining tools are specifically designed to match a multi-level machining process for the airfoils, followed by the fillet feature, which works for roughing and finishing operations. In this machining strategy, the opening is machined on 4 levels, simultaneously creating the opening and finishing the sides of the airfoil at the desired surface finish requirements.

WIDIA™
MACHINING BRILLIANCE

For more information, please contact your local Authorized Distributor or visit widia.com.

Integral Blade Rotor (IBR)

Titanium Blade Milling

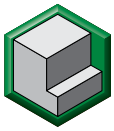
WIDIA HANITA

1

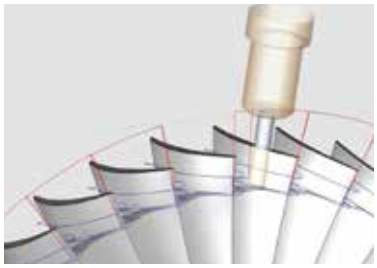
	SLOTTING level A to D 3 passes per level	
Tool Dimensions	16mm — 6 Flutes	
Description	Special Rougher End Mill	
Series	Based on 4U80	
Vc	55 m/min	180 SFM
S (RPM)	1,095	
F_z	0,04–0,05mm	0.0016–0.002"
F	260–330 mm/min	10.3–12.9 IPM
Ap	11,5mm	0.453"
Ae	16mm	0.630"

See page 28 for product details.

2

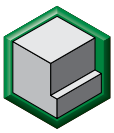


	ROUGH SIDE MILLING level A to D 2 passes per level	
Tool Dimensions	16mm — 6 Flutes	
Description	Special Rougher End Mill	
Series	Based on 4U80	
Vc	55 m/min	180 SFM
S (RPM)	1,095	
F_z	0,04–0,05mm	0.0016–0.002"
F	260–330 mm/min	10.3–12.9 IPM
Ap	17,25mm	0.679"
Ae	2–4mm	0.079–0.157"

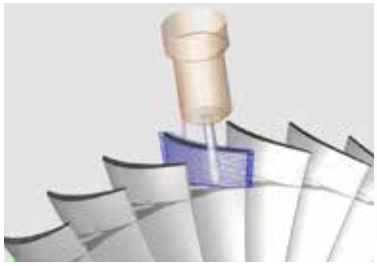


See page 28 for product details.

3

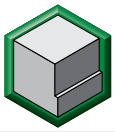


	SEMI-FINISHING level A to D 18 passes per level	
Tool Dimensions	10mm — 4 Flutes	
Description	Standard and Special End Mill	
Series	Based on 4969	
Vc	80 m/min	262 SFM
S (RPM)	2,548	
F_z	0,12mm	0.005"
F	1,200 mm/min	48 IPM
Ap	2mm	0.079"
Ae	1mm	0.039"

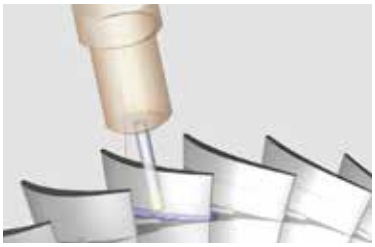


See page 28 for product details.

4



	FINISH AIRFOIL level A to D 44 passes per level	
Tool Dimensions	10mm — 4 Flutes	
Description	Special End Mill	
Series	8mm — 3 Flutes	
Vc	80 m/min	262 SFM
S (RPM)	2,548	
F_z	0,1mm	0.0040"
F	1,020 mm/min	40 IPM
Ap	0,8mm	0.0315"
Ae	0,5mm	0.020"



Integral Blade Rotor (IBR) continued

Integral Blade Rotor (IBR)

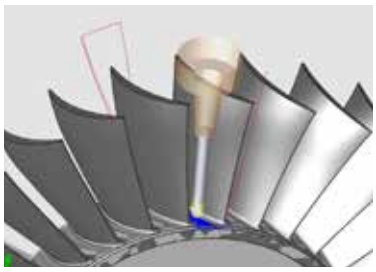
Titanium Blade Milling

Integral Blade Rotor (IBR) continued

WIDIA HANITA

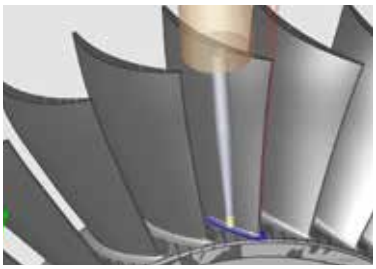
5

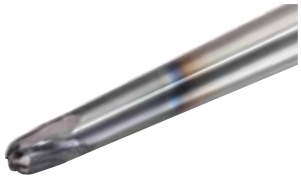
FILLET RADIUS SEMI-FINISH		
Tool Dimensions	16 x 16 x 32-48 x 100 x R-0.5	
Description	Special Ball Nose End Mill	
Series	8mm — 3 Flutes	
Vc	80 m/min	262 SFM
S (RPM)	3,185	
F_z	0,1mm	0.004"
F	950 mm/min	37.6 IPM
Ap	0,8–1,5mm	0.0315–0.059"
Ae	0,5–1mm	0.020–0.039"



6

FILLET RADIUS FINISH		
Tool Dimensions	16 x 16 x 32-48 x 100 x R-0.5	
Description	Special Ball Nose End Mill	
Series	6mm — 4 Flutes	
Vc	80 m/min	262 SFM
S (RPM)	4,246	
F_z	0,06mm	0.0024"
F	1,020 mm/min	40 IPM
Ap	0,5mm	0.020"
Ae	0,3mm	0.012"





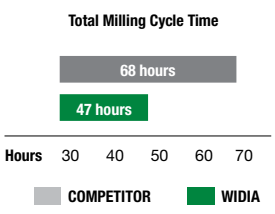
WIDIA™ SHINING MOMENT

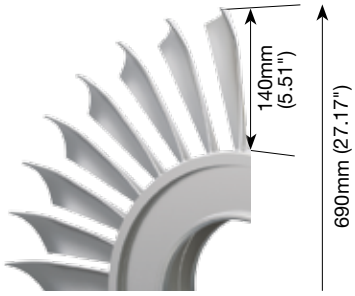
CYCLE TIME REDUCTION! 47 HOURS VS 68 HOURS AND 25% TOOL COST SAVINGS!

Titanium

IBR- Stage I

Specifications	COMPETITOR	WIDIA
	IBR- Stage I	
Workpiece Material	Titanium	
Diameter	690mm	
Length of Blade	140mm	
Number of Blades	32	
Total Milling Cycle Time	68 Hours	47 Hours





WIDIA MACHINING BRILLIANCE

For more information, please contact your local Authorized Distributor or visit widia.com.

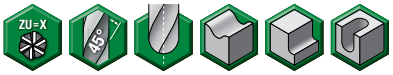
Aerospace Product Details

High-Performance Roughers

- Shallow pitch rougher.
- 4–6 flutes with variable spacing.
- Regular length of cut.
- Stainless steel and high-temp alloys.
- Center cutting.

	Series	Grade	(ZU) Flutes	(D1) Diameter Range
Inch	4U80	ALTIN-MT	4	5/16–1"
			6	5/8–1"
Metric			4	6–12mm
			6	16–25mm

High-Performance Solid Carbide End Mills • Roughing



- Center cutting.
- Flat shallow profile.
- Standard items listed. Additional styles and coatings made-to-order.
- Roughing profile also on radii portion of end mill.

	Series	Grade	(ZU) Flutes	(D1) Diameter Range
Inch	4969	WP15PE	4	.3937–.9843"
Metric				10–25mm

High-Performance Solid Carbide End Mills • VariMill™

- Unequal flute spacing.
- Center cutting.
- Ramping angle 3°.
- Optimized for difficult-to-machine workpiece materials.
- Semi-finishing to finishing applications.
- High-speed machining capability.
- Standard items listed. Additional styles and coatings made-to-order.

	Series	Grade	(ZU) Flutes	(D1) Diameter Range
Inch	7VNX	WS15PE	7	3/8–1"
Metric	77NE			10–25mm

High-Performance Solid Carbide End Mills • VariMill

- Shallow pitch rougher.
- 4–6 flutes with variable spacing.
- Regular length of cut.
- Stainless steel and high-temp alloys.
- Center cutting.

	Series	Grade	(ZU) Flutes	(D1) Diameter Range
Inch	5V0T	ALTIN-MT	5	1/4–3/4"
Metric	57N8			6–25mm

WIDIA™
MACHINING BRILLIANCE

For more information, please contact your local Authorized Distributor or visit widia.com.

X-Feed™

- Designed for high-feed rates.
- 6 flutes and 3 x D diameter neck reach.
- Designed for circular plunging and ramping, 3D machining, face milling, and pocketing applications.
- Stainless steel and high-temp alloys.
- Improved tool life due to reduced radial forces.

	Series	Grade	(ZU) Flutes	(D1) Diameter Range
Inch	**7FNS**	ALTIN-MT	6	1/4–1"
Metric	**70NS**			6–25mm

New Advances products launching January 1, 2019

Solid Carbide Drills

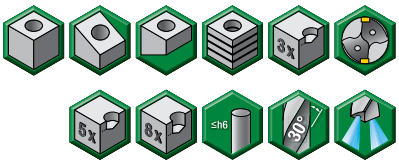
- Low thrust.
- Excellent centering capabilities.
- Easy to regrind.
- Reduces risk of chip jamming and catastrophic failure.
- Improves hole straightness.
- Improves hole alignment when drilling through cross holes and inclined exits.

Series	Grade	L:D	(D1) Inch Diameter	(D1) Metric Diameter
TDD105Z	WU20PD	15xD	.1181–.5118"	3–13mm
TDD106Z		20xD		
TDD107Z		25xD		
TDD108Z		30xD		

All-Star items (not all diameters are included in the program.)

Solid Carbide Drills

- Excellent chip flow due to flute design and finish.
- New coating enables higher cutting speeds.
- Higher feed rates on stainless steels and duplex.
- Available for custom solutions, as well as step-drilling.
- Real 8 x D drill lengths.
- Cylindrical shank h6 for perfect runout.
- Double-margin design for critical operations.

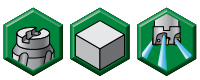


Series	Grade	L:D	(D1) Inch Diameter	(D1) Metric Diameter
TDS	WK15PD	3xD	.1181–.7874"	3–20mm
		5xD		
		8xD		

All-Star items (not all diameters are included in the program.)

Face Mills • Victory™ M1200 Series

- Twelve cutting edges.
- High feed rates for rough face milling.
- Use standard M1200 inserts.
- Do not load wiper inserts.



Series	Cutting Edges	(ZU) Flutes	(D1) Inch Diameter	(D1) Metric Diameter	All-Star
M1200™ Shell Mill	12	4	2"	50,8mm	NO
		5	2.5"	63,5mm	NO
		6	3"	76,2mm	YES
		8	4"	101,6mm	YES
		9	5"	127mm	NO

AEROSPACE

BENEFITS OF THIS BROCHURE

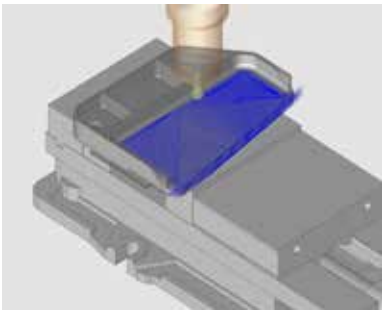
Advanced milling methods (i.e., high-speed, trochoidal, etc.) were used, which enabled the use of higher feeds and speeds beyond traditional methods published by WIDIA™. Use of tooling in advanced-application parameters is highly dependent on proper application of machining programming methods. Users may want to also want to consult their CAM system supplier on programming techniques for advanced milling.

ILLUSTRATED PROCESS STEPS

For each component, see actual strategies and tooling technologies specifically designed for aerospace.

1

	ROUGHING HIGH MACHINING (ROUGH BIG POCKET)	
Tool Dimensions	12 x 12 x 26 x 83 x R-3.0	
Description	Special VariMill III™ End Mill	
Series	77NE 7 Flute	7VNX 7 Flute
Vc	115 m/min	378 SFM
S (RPM)	3,052	3,052
F_z	0,1mm	0.0039"
F	2,136 mm/min	84 IPM
Ap	24mm	0.094"
Ae	0,6mm	0.0236"



WIDIA SHINING MOMENTS

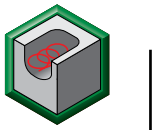
Each component includes a real-life customer case where WIDIA tooling technology and machining strategy came together to increase productivity and reduce cost!

WIDIA™ SHINING MOMENT

	COMPETITOR	WIDIA
	Roughing AIRFOIL	
Specifications	**16x16x15x83xR-1 6 Flutes**	**Based on 77NE 7 Flute**
Workpiece Material	Titanium	
Width	230mm	
Length of Blade	420mm	
Total Milling Cycle Time	93 Minutes	62 Minutes

APPLICATION PARAMETERS

This cutting data shows real-life application parameters.



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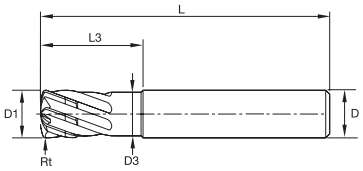
Description	Special VariMill III™ End Mill	
Series	77NE 7 Flute	7VNX 7 Flute
Vc	115 m/min	378 SFM
S (RPM)	3,052	3,052
F_z	0,1mm	0.0039"
F	2,136 mm/min	84 IPM
Ap	24mm	0.094"
Ae	0,6mm	0.0236"

D1	=	12
D	=	12
Ap1 max	=	26
L	=	83
Rt	=	3.0



S (RPM)	=	Spindle Speed
Fz [IPT]	=	Feed per Tooth
F	=	Feed
Ap	=	Axial Depth of Cut
Ae	=	Radial Width of Cut
D1	=	Outer Diameter Tool
Rt	=	Radius
L	=	Length