TOOL-KRIB
SUPPLY COMPANY

EMUGE FRANKEN

CIRCLE SEGMENT END MILLS

UP TO 90% REDUCTION IN CYCLE TIME

**IN PARTNERSHIP WITH:** Mastercam HURCO hyperMILL HERMLE *milling at its best*

NEW POSSIBILITIES IN MACHINING

EMUGE CIRCLE SEGMENT END MILLS VASTLY REDUCE FINISH-MILLING TIMES FOR WORKPIECES FEATURING TOUGH GEOMETRIC CONTOURS.

These tools are primarily used in mold-making as well as in the production of tire molds, turbine blades, impeller blades, or blisks. Circle Segment end mills can optimize any 5-axis milling application with reduced cycle times and improved surface finishes.
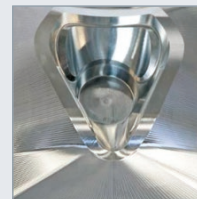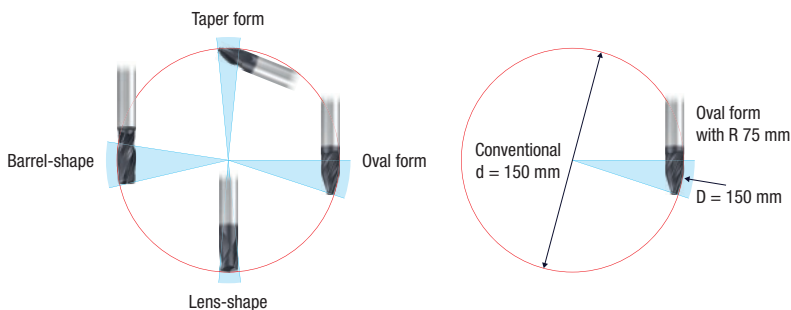
Aerospace *Medical* *Automotive*

EXPERIENCE A WHOLE NEW CLASS OF TOOLS

What makes these end mills unique is the large radii in the cutting area of the respective tool which offer entirely new possibilities in machining. The large radius simulates a ball-nose end mill with a cutting diameter of 12 to 3000 mm and even larger on request.

Taper form

Barrel-shape

Oval form

Lens-shape

Conventional d = 150 mm

Oval form with R 75 mm

D = 150 mm

# TOOL KRIB
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Supplying & Supporting Cutting Tools, Abrasives, Tool & Work Holding and Precision
Measuring for the Metalworking Industry

HOW DOES IT WORK?

EMUGE tooling design engineers worked closely with the industry leaders in CAM software to develop milling cutters that would optimize the performance of their software's capabilities to produce complex shapes with superior surface finishes. By combining advanced cutting-edge geometries with exaggerated radius profiles, Circle Segment end mills mimic large diameter cutter profiles with standard tooling sizes. For example, a 16 mm diameter end mill can produce a 500 mm radius profile in one pass. This significantly increases the step over width of the end mill and reduces the milling cycle time by up to 90%.

$a_p = 0,5$ mm $R_a = 1,22$ µm

Bull Nose End Mill

$a_p = 1,5$ mm $R_a = 0,46$ µm

Oval Form
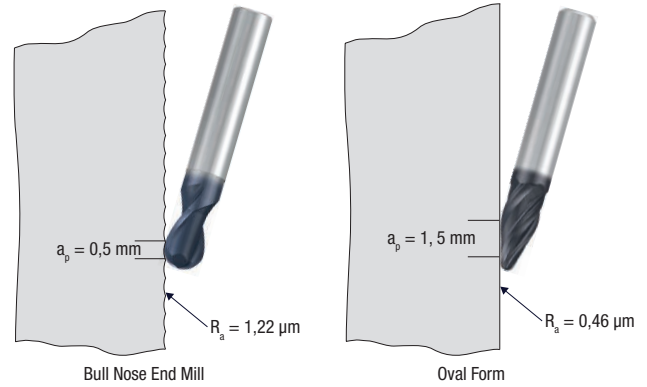
CASE STUDY: TURBO SPEED

Circle Segment end mills from EMUGE reduced cycle time by 95% on this automotive component

The true test of the success in milling is in the reduction of cycle times and the resulting part quality. An example of a challenging finishing application that demonstrated the advantages of **EMUGE Circle Segment** technology is a turbo intake header with steep sides and a continuously changing contour comprised of aluminum alloy.

The manufacturer was running a 2-flute, 0.500" ball nose end mill at 800 SFM with 0.010" stepover to complete the job in over 10 hours. The end mill lasted for 15 parts before needing replacement. To reduce cutting time, a Circle Segment end mill was introduced with an EMUGE FPC milling chuck.

Using a 12 mm Circle Segment Taper Form end mill with 3-flutes and a 250 mm radius, the cutting speed was increased to 1,900 SFM with 0.060" stepover to complete the job in only 27 minutes. Thirty parts can be milled with one Circle Segment end mill compared to 15 parts with the conventional ball nose end mill.

Both tool types produced an average surface finish of Ra 63, but the Emuge Circle Segment end mill freed hours of machine time on each job run.

The result: a $1,000 per part cost savings.

Even though the Circle Segment tool cost more than the conventional tool, the cost savings per job was 95.1%.

ESTIMATED COST SAVINGS

Workpiece Type	Turbo Intake Header
Machine Type	CNC Machine
Machining Plane	5-axis
Material	Aluminum Alloys
Sub-Material	6061 T6

	Emuge	Competitor
Application	End Milling	End Milling
Tool Price	$213.00	$55.00
Job Description		
Number of Parts	30	30
Cycle Times		
Cutting Speed (sfm)	1,900	800
Tool Life in Parts	30	15
Machining time / part (min)	27	630
Cost Data		
Machine Rate ($/hr)	$100.00	$100.00
Tool Costs / Part ($)	$7.10	$3.67
Total Machining Costs / Part ($)	$52.10	$1,053.67
Test Results		
Job Savings	$30,047.10	
Savings per Part	$1,001.57	
Percent Savings	95.1%	