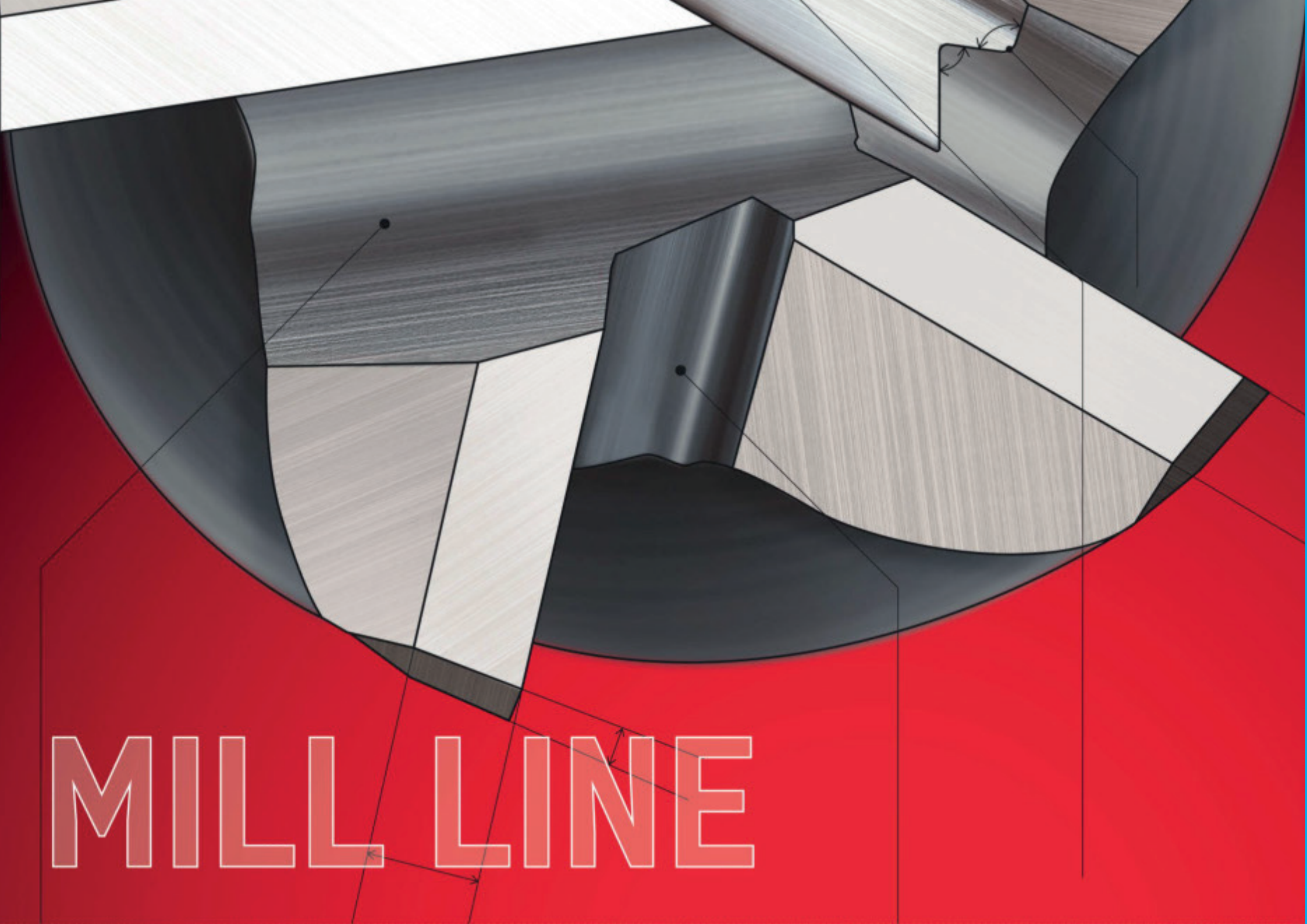

MILL LINE

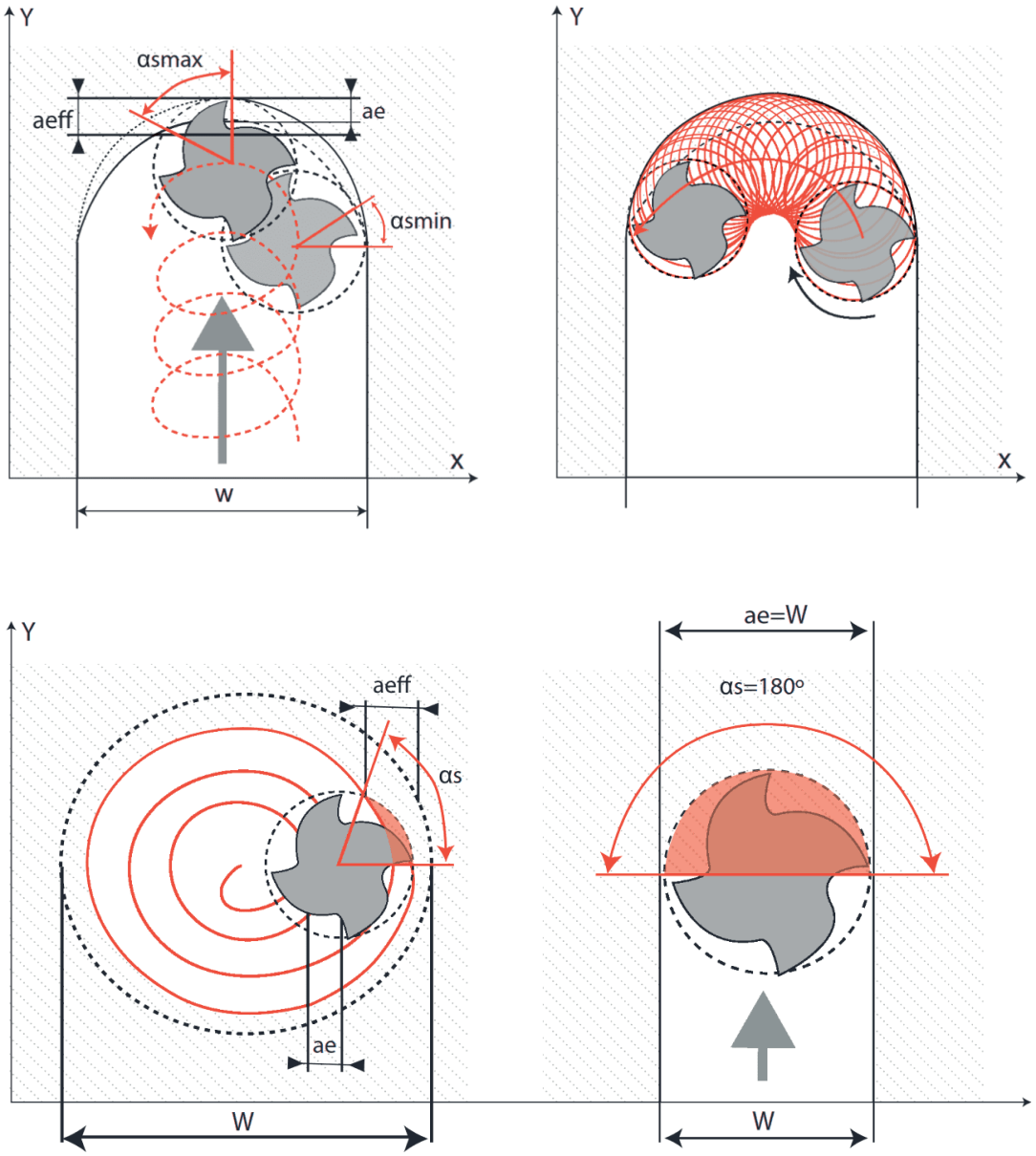
MANUFACTURING TOLERANCES FOR ENDMILLS

	Tolerance d1 (mm)			Tolerance precision Ball Nose (mm)			Tolerance standard Ball Nose(mm)			Tolerance d2 (shank)
Ø	0,5 5,0	6,0 12,0	16,0 20,0	Rad. 0,5 1,25	Rad. 1,50 3,00	Rad. 4,00 6,00	Rad. 0,5 2,50	Rad. 3,00 6,00	Rad. 8,00 10,00	0,5 20,0
Serie 90	+ 0,000 - 0,01	- 0,01 - 0,025	- 0,015 - 0,03	-	-	-	+/- 0,005	+/- 0,01	+/- 0,015	h6
Serie 91				-	-	-				
Serie 92				+/- 0,005	+/- 0,007	+/- 0,01	-	-	-	
Serie 93							-	-	-	
Serie 94				-	-	-	+/- 0,005	+/- 0,01	+/- 0,015	
Serie 96	+ 0,000 / -0,02		-	-	-	-	-	-	-	

TROCHOIDAL SYSTEM

Trochoidal Speed Cutting System is a new machining cycle which combines circular milling with a forward moving. Thereby, huge cross-sections can be processed with low cutting forces and high speeds.

ae: width of cut
aeff: effective width of cut
W: Bore diameter / slot width
α: angle of cutting bow



Circular milling vs. Full-slot milling

APPLICATION INDICATIONS AND SOLUTIONS FOR MILLING

Problem	Cause	Solution
Vibrations on the milling cutter	• Cutting speed is too high • Feed rate is too low • Tool clamping is not unstable • Tool is too long • Tool is too unstable • Flute length too great	• Reduce cutting speed • Increase feed rate • Check the clamping device or replace • If possible, choose the quickest possible process • Use a stronger shaft • If possible, choose the quickest possible process
Vibrations on the workpiece	• Clamping is not stable enough	• Check tool clamping and optimize if appropriate
Cutter breakage	• Tool wear • Incorrect cutting specifications • Vibrations • Conventional milling • Tool stability • Workpiece stability	• Replace or re-sharpen tool in good time • Match cutting specifications to the work • Reduce rotation speed • Mill in synchronism • If possible, choose the quickest possible process • Check clamping device and optimize if appropriate
Breakage of the cutting edge	• Tool stability • Workpiece stability • Vibrations • Feed rate is too high • Conventional milling • Cutting material too brittle • Incorrect tool	• If possible, choose the quickest possible process • Check clamping device and optimize if necessary • Reduce rotation speed • Reduce feed rate • Mill in synchronism • Replace with a tool made from a higher quality cutting material • Select the tool according to the work
Milled slot is too small less than the diameter of the tool	• Too much tool wear	• Replace or re-sharpen tool in good time
Milled slot is too large less than the diameter of the tool	• Tool run-out error	• Minimize run-out error
Service life is too short	• Reaming is too intense • Incorrect tool chosen • Incorrect front rake angle • Lip clearance of the tool is incorrect	• Use a coated tool • Adjust tool to the work • Select a tool with the correct front rake angle • Correctly grind or re-sharpen the tool