

High Precision with Emulsion?

With PRECITEMP® E, Roeders is creating new possibilities in the μm range



Temperature-stable machining area during machining with emulsion (photo: Roeders GmbH)

In numerous applications, the use of oil-water-based emulsion as a cooling lubricant in machining offers great advantages. The machining process is lubricated and cooled, and the workpiece is cleaned of chips. After processing, the emulsion remaining on the workpiece evaporates to a large extent, so that time-consuming cleaning of the workpieces is often unnecessary.

However, the water contained in the emulsion leads to a cooling effect of the machining area during processing by evaporation, especially if the emulsion is atomized by machining. The temperature can drop by 10°C. This has a significant impact on the axis geometry of the machine tool, because the low temperature in the machining area affects the machine structure, cooling it down and causing significant thermally induced deformations. Depending on the size of the machine, the deviations on the workpiece can be quite significant and amount to several hundredths of a millimetre. Machining tasks with very tight tolerances cannot be carried out reliably. Especially in 5-axis machining, there can be a larger offset if a workpiece is machined in different axis positions and the zero point does not fit in relation to the 4th and 5th axes.

GEOMETRICALLY STABLE TOOL MACHINES DESPITE COOLING EFFECT

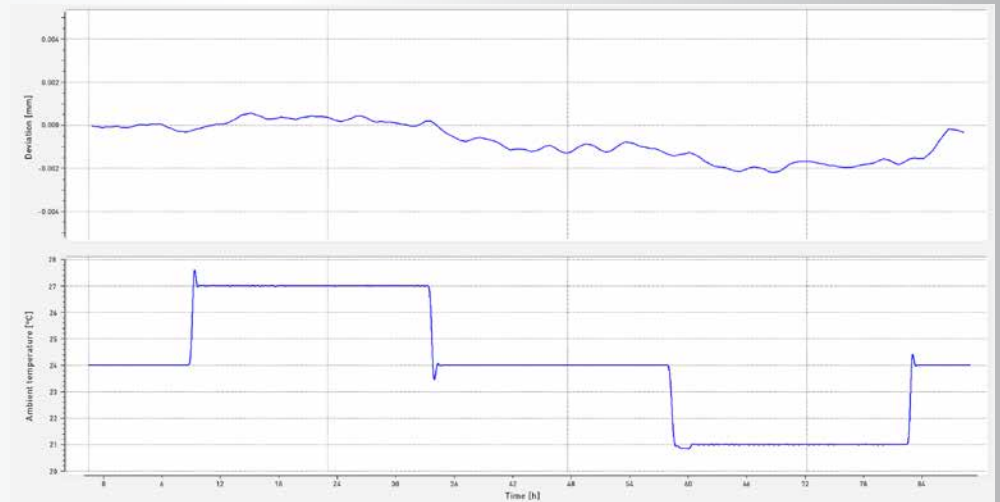
Roeders has therefore dealt intensively with the question of how, despite the cooling effect caused by evaporation of the emulsion, the tool machine can be kept geometrically stable when emulsion is used. In doing so, Roeders was able to build on the extensive previous development of PRECITEMP®, with which Roeders succeeded in keeping the RPT milling and grinding machines at very high machining accuracy even when the ambient temperature at the location of the machine fluctuates by $\pm 3^\circ\text{C}$.

Similar to PRECITEMP® for RPT machines, which are operated with minimum quantity lubrication or oil surge flushing, the concept of PRECITEMP® E for RPT machines with emulsion is not based on a single element, but on a combination of several measures. Basically, as always with Roeders machines, all heat sources such as motors etc. are thermally insulated by active temperature control, so that they cannot influence the geometry of the machine. In addition, the machine body is kept at a very constant temperature with numerous temperature control circuits. The air in the cover above the machine portal is tempered with high precision using air temperature control units. In addition, it has been possible to keep the temperature in the machining area

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Despite fluctuating ambient temperatures at the installation site, the RPT machine maintains maximum precision with an almost constant zero point.
(graphic: Roeders GmbH)



very constant, even if emulsion is not used continuously, but the machine is left standing longer in between or machining is carried out without emulsion.

QUALITY CONTROL CAN BE CARRIED OUT DIRECTLY IN THE MACHINE

The results are impressive. Even if the ambient temperature at the installation site of the machine fluctuates by $\pm 3^{\circ}\text{C}$, it still works with μm accuracy. As a result, machining can be carried out reliably precise, which brings great advantages for productivity, especially in automated systems. Interim checks of workpiece accuracy during machining are not necessary.

On the contrary, in many applications, quality control can even be carried out directly in the machine. For this, Roeders has integrated Renishaw's Productivity+™ software and HEXAGON's INSPECT software into the Roeders NC control system, which can be used to inspect geometries such as roundness, distances, parallelisms, flatness, etc., just like on a coordinate measuring machine. The measuring accuracy of the machine tool can be checked at any time with the help of a gauge similar to a quality control on a coordinate measuring machine, except that no technician from Roeders has to travel for this, but the operator can do it himself. The measurement accuracy in the μm range was proven in cooperation with the Leibniz University of Hannover. This can save the detour via the measuring room in numerous applications. The measurement protocols are comparable to those of coordinate measuring machines and are stored in the NC control system or directly on the server.

In automated systems, after machining and measuring in the machine, not only finished workpieces, but also machined and quality-controlled workpieces are stored in the shelf system of the automation, which can then be used directly in assembly. The emulsion dries away so completely that cleaning is usually not necessary.

In Roeders' own blow mould shop, many thousand blow moulds made of aluminium are machined with emulsion every year. Quality control in the machine directly after machining has been a proven practice for some time now and was an important step in keeping up with the cost pressure from competitors from

countries such as Turkey, India or China. The measuring room has been shut down.

HIGH PRECISION SIGNIFICANTLY IMPROVES PRODUCTIVITY

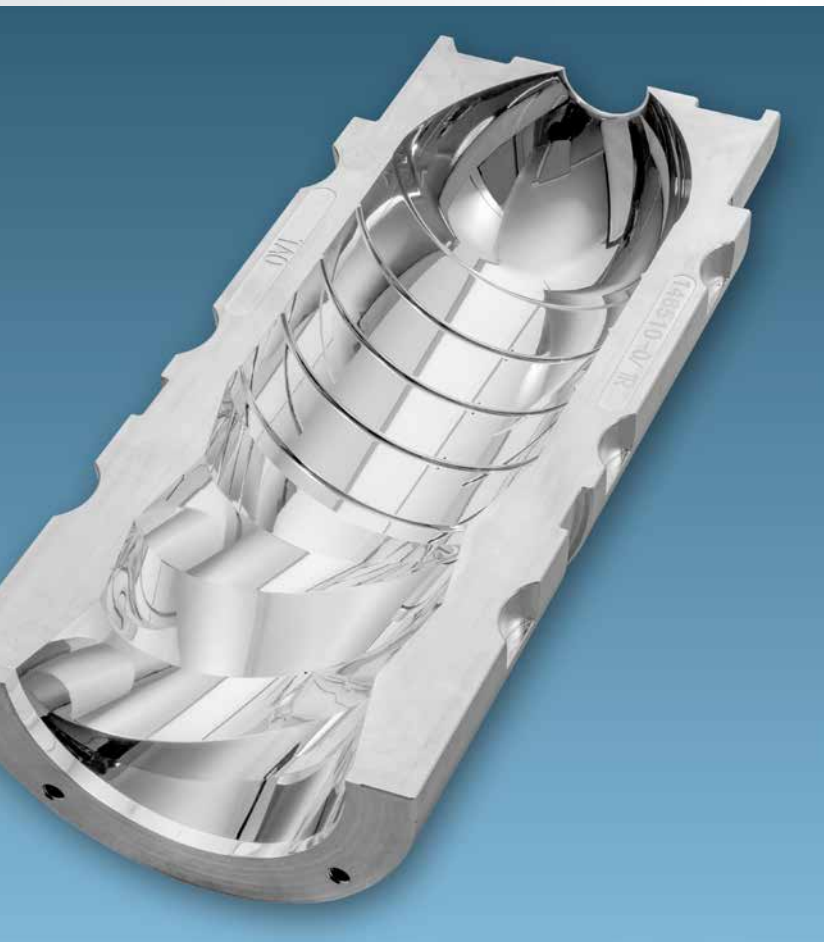
But PRECITEMP® E was developed for the customers of the Roeders machines searching precision. In addition to aluminium, PRECITEMP® E can be used to significantly improve productivity when machining ceramics, glass, stainless steel, copper, e.g. in high-precision electrode production and in other applications, thanks to reliably high precision, including measurement protocols for quality control.



Quality control directly in the machine: Measurement of a workpiece after machining (photo: Roeders GmbH)

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		Part Number : 14		Results Summary : Pass				
		Inspection Start Date and Time : 05-05-2026 14:26:56		Inspection End Date and Time : 05-05-2026 17:19:35				
Measurement Device Name : Renshaw Productivity+ Protokoll				Results In Tolerance : 139		Results Out of Tolerance : 0		
Tolerance	Type	Min	Max	Nominal	Actual	Deviation	Error	Graphic
BOHRUNG Ø8_4								
Position X	XAXIS	0,0000	0,0000	87,6072	87,6056	-0,0016	-0,0016	
Position Y	YAXIS	0,0000	0,0000	-11,5561	-11,5529	0,0032	0,0032	
Durchmesser	Diameter	0,0000	0,0000	8,0000	7,9963	-0,0037	-0,0037	
Materialzustand Distance Between BOHRUNG Ø8_4 and BOHRUNG Ø8_4	I _z	0,0000	0,0000	0,0000	0,0019	0,0019	0,0019	
BREITE_39								
Position X	XAXIS	0,0000	0,0000	-12,0000	-12,0000	0,0000	0,0000	
Position Y	YAXIS	0,0000	0,0000	0,0000	-0,0141	-0,0141	-0,0141	
Position Z	ZAXIS	0,0000	0,0000	33,0000	33,0000	0,0000	0,0000	
Angle A	Angle	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	
Angle B	Angle	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	
Angle C	Angle	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	
BREITE_14								
Position X	XAXIS	0,0000	0,0000	-45,0000	-45,0000	0,0000	0,0000	
Position Y	YAXIS	0,0000	0,0000	12,5000	12,4849	-0,0151	-0,0151	
Position Z	ZAXIS	0,0000	0,0000	26,5000	26,5000	0,0000	0,0000	
Angle A	Angle	0,0000	0,0000	0,0000	-0,0231	-0,0231	-0,0231	
Angle B	Angle	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	
Angle C	Angle	0,0000	0,0000	0,0000	0,0095	0,0095	0,0095	
BREITE_19								
Position X	XAXIS	0,0000	0,0000	34,0000	34,0000	0,0000	0,0000	
Position Y	YAXIS	0,0000	0,0000	-12,0000	-12,0074	-0,0074	-0,0074	
Position Z	ZAXIS	0,0000	0,0000	14,0000	14,0000	0,0000	0,0000	
Angle A	Angle	0,0000	0,0000	0,0000	0,0293	0,0293	0,0293	
Angle B	Angle	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	
Angle C	Angle	0,0000	0,0000	0,0000	0,0136	0,0136	0,0136	
DURCHMESSER_BOHRUNG_G6PP_A_MIN_90_CB								
Wert	Unitless	-0,0100	0,0100	60,0000	59,9989	-0,0011	0,0000	
DURCHMESSER_BOHRUNG_G6PP_A_MIN_90_CB_XMIN								
Wert	Unitless	-0,0100	0,0100	6,0000	5,9982	-0,0018	0,0000	
DURCHMESSER_BOHRUNG_G6PP_A_MIN_90_CB_XPLU								
Wert	Unitless	-0,0100	0,0100	6,0000	5,9978	-0,0022	0,0000	
BOHRUNGSABSTAND_90PP_AMIN_90_CB								
Wert	Unitless	-0,0200	0,0200	81,0000	81,0068	0,0068	0,0000	
ABSTAND_BOHRP_A_MIN_90_C180								
Wert	Unitless	-0,0200	0,0200	80,0000	80,0025	0,0025	0,0000	
DURCHMESSER_BOHRUNG_R6PP_A_MIN_90_C180_1								
Wert	Unitless	-0,0100	0,0100	8,0000	7,9973	-0,0027	0,0000	
DURCHMESSER_BOHRUNG_R6PP_A_MIN_90_C180_2								
Wert	Unitless	-0,0100	0,0100	8,0000	7,9963	-0,0037	0,0000	
Units Linear: mm / Angular: (deg)		Tolerance Standard Productivity+		Page 5 of 5				

Blow mould produced and measured from the raw block on the machine with emulsion in the Roeders blow mould shop (photo: Roeders GmbH)

Measurement protocol with clear tolerance information, measurement of the workpiece directly in the milling machine (graphic: Roeders GmbH)

IMPROVED EASE OF USE

Incidentally, the ease of use of Roeders machines has also been improved when using emulsion. High rpm of the tool often lead to strong atomization and fogging in the machining area. It can take a few seconds for the emulsion mist to be removed from the machining area by the oil mist extraction system after processing, which is very annoying if the operator wants to open the door quickly. For this reason, the Roeders RPT machines with emulsion now have a flap in the cabin. This opens and allows ambient air to flow into the machine's machining area, while at the same time the extraction system briefly switches to turbo mode. This quickly ensures a clear view before the operator opens the door.

Roeders GmbH

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The innovation PRECITEMP® E was unveiled at the AMB this year. (photo: Roeders GmbH)