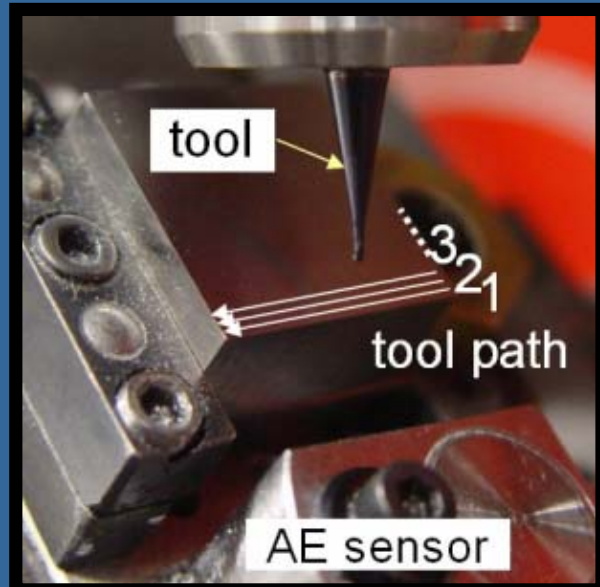
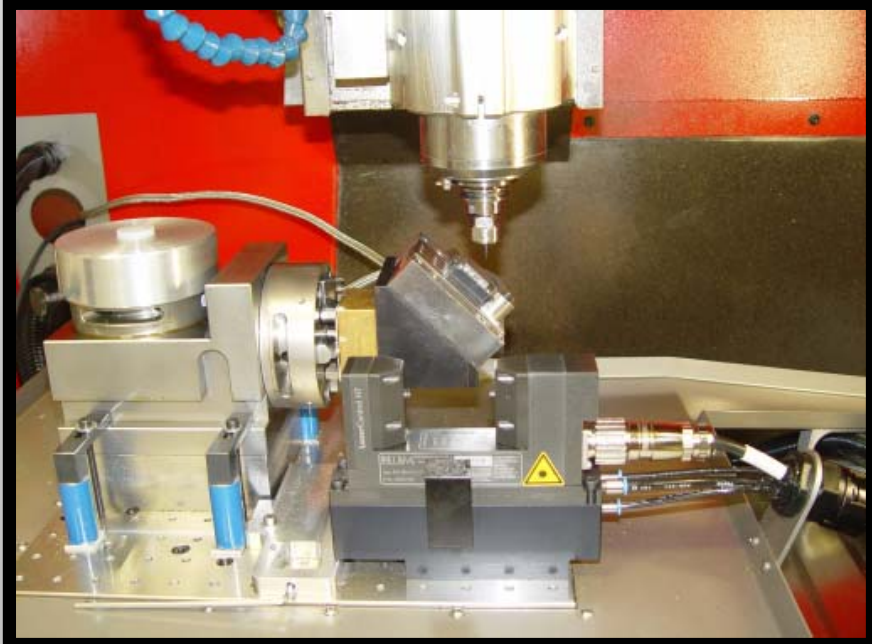


Micro-tool monitor

Micro-tool monitor

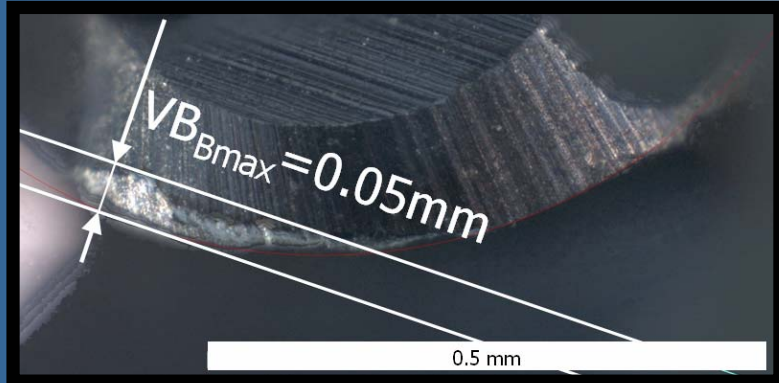


Micro-tool monitor
Hear your
micro-mill
with
Acoustic
Emission



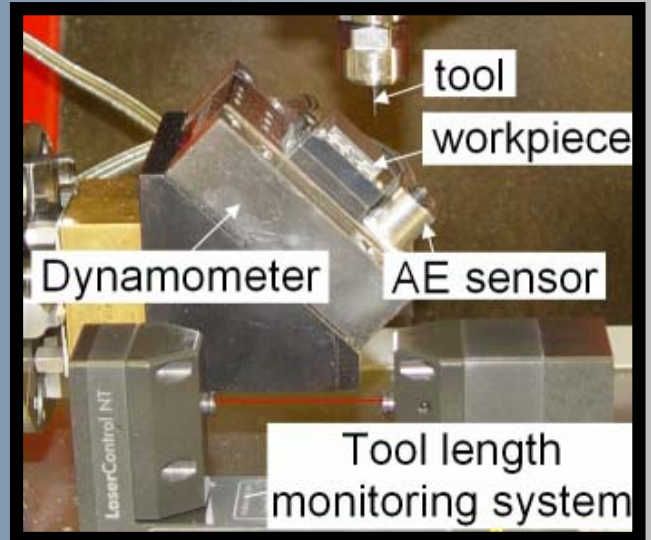
WHAT IS IT? ... FUNCTIONALITY

When end mill diameter becomes a fraction of a millimeter it is even hard to see, and its wear is impossible to monitor directly, by the operator. Some monitoring system is inevitable.



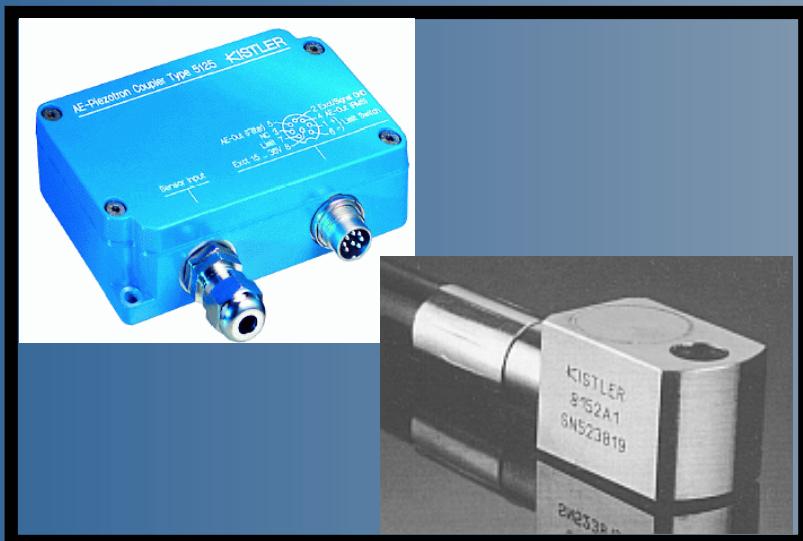
HOW DOES IT WORK? ... DESCRIPTION

In micro-machining applications, cutting force components and acoustic emission (AE) are most often used in tool condition monitoring (TCM) systems. The force signals are the best indicators of the state of the machining operation. However, because of the small diameter of the end mill, despite relatively low cutting speeds, very high spindle speeds (rpm) are used. As the bandwidth of sensors should be a few times higher than the tooth passing speed cutting force sensing system in microcutting operations can be easily excited with a frequency close to the natural frequency of the system which strongly disturbs the signal.



WHY TO USE IT? ... ADVANTAGES

The noise from disturbance sources that generally contaminates the desired signal can be minimized by using AE sensors, as AE tends to propagate at frequencies well above the characteristic frequencies attributed to machining, such as spindle RPM or natural frequencies. AE is more advantageous than force or vibration especially at the ultraprecision scale, due to its relatively superior signal/noise ratio and sensitivity. Hence, AE is particularly well-suited because of its ability to detect microscale deformation mechanisms within a relatively 'noisy' machining environment.



EXAMPLES OF ONE APPLICATION

AE_{RMS} signal average value rises gradually with the tool wear making it good tool wear indicator. It also rises immediately when the touches the workpiece – up to almost 200mV in 0.2ms. This makes AE_{RMS} signal robust and versatile mean of detecting the contact between the tool and the part and, thus, the tool integrity in process.

