1. INTRODUCTION

Today’s quality control standards stipulate an ever increasing precision of milled or otherwise produced parts. To achieve this precision, the errors and deviations of the production tools have to be measured with extremely high accuracy. Furthermore, the measurements have to be carried out with high bandwidths in order to discern aberrations at high frequencies. The PICO SCALE interferometer is ideally suited for this task.

2. METHODS

Figure 1 shows a setup of an interferometer head and object mirror designed to measure the velocity of a milling tool and at the same time oscillations that occur in the setup. The object mirror was mounted below the spindle of the milling tool. The whole tool was moved by 225 mm with the maximum speed specified by the manufacturer of 1 m s⁻¹. The velocities were calculated by the PICO SCALE interferometer in real time, and streamed alongside the position data. In this case, the streaming frequency was set to 9770 Hz, corresponding to one datapoint each 100 µs. The results of the measurement are shown in figure 2. The velocity changes between 1 m s⁻¹ and −1 m s⁻¹ as the tool moves back and forth. The smaller graph in the inset shows that not only macroscopic translations can be measured, but at the same time microscopic oscillations are visible, which are induced in the mirror mount by the acceleration and deceleration of the tool. The standard graphical user interface PICO SCALE Control is also capable of calculating the FFT of the position data. Thereby, vibration amplitudes and frequencies can be immediately seen in real time during the measurement.

3. RESULTS

Figure 2. Measurement results with a closeup on the vibration of the tool at rest.

4. SUMMARY

It was shown that the PICO SCALE interferometer can accurately measure velocities of 1 m s⁻¹ over a working range spanning 225 mm. The measurement could thus successfully verify the speed specification of the milling tool machine. Vibrations in the µm range were measured at the same time. The bandwidth of the measurement was in the range of 10 kHz, but could also be increased to the MHz range in order to reveal even higher vibration frequencies.
Sales partner / Contacts

**Headquarters**
SmarAct GmbH  
Schuette-Lanz-Strasse 9  
26135 Oldenburg  
Germany  

T: +49 441 – 800 87 90  
Email: info@smaract.com  
www.smaract.com

**France**
SmarAct GmbH  
Schuette-Lanz-Strasse 9  
26135 Oldenburg  
Germany  

T: +49 441 – 80 08 79 956  
Email: nicoul@smaract.com  
www.smaract.com

**Israel**
Trico Israel Ltd.  
P.O. Box 6172  
46150 Herzeliya  
Israel  

T: +972 9 – 950 60 74  
www.trico.co.il

**Japan**
Physix Technology Inc.  
Ichikawa-Business-Plaza  
4-2-5 Minami-yawata,  
Ichikawa-shi  
272-0023 Chiba  
Japan  

T/F: +81 47 – 370 86 00  
Email: info@physix-tech.com  
www.physix-tech.com

**South Korea**
SEUM Tronics  
Room 502, 534 Seobusaet-gil  
Geumcheon-Gu  
08505 Seoul  
Korea  

T: +82 2 868 – 10 02  
Email: hslee@seumtronics.com  
www.seumtronics.com

**USA**
SmarAct Inc.  
2140 Shattuck Ave., Suite 1103  
94704 Berkeley, CA  
United States of America  

T: +1 415 – 766 90 06  
Email: info@smaract.com  
www.smaract.com