Influence of machine housing on the thermal TCP displacement

F. Pavliček[1], P. Hernández Becerro, J. Mayr[1,2], S. Weikert[1], K. Wegener[1,2]

[1]Inspire AG, Technoparkstrasse 1, 8005 Zurich, Switzerland

[2]ETH Zurich IWF, Leonhardstrasse 21, 8092 Zurich, Switzerland

pavlicek@inspire.ethz.ch

Abstract

The paper investigates the influences of the machine housing on thermally induced tool centre point (TCP)-displacements. The TCP-displacements in three directions are measured with a setup similar to the R-Test measurement setup. Furthermore, the temperatures on various significant key components, such as drives and large surfaces, are investigated. Also, environmental temperatures are measured with eight temperature sensors placed around the machine tool.

As the focus of this work is how the machine housing influences the thermal displacements, the machine tool is therefor investigated with demounted housing. An alternating sequence of twice running a NC program, representing the axes movements during tool grinding, being followed by measuring TCP-displacements is conducted over six hours. In a second step the machine housing is rebuilt and the six hours alternating sequence is repeated. The measurements show that temperatures near heat sources, for example the Y-axis near the Y-drive, rise much faster with the machine housing in place (see figure 1). The different temperature distributions arising with and without housing significantly change the transient TCP-displacements measured.

The work shows the importance of taking into consideration machine housing in research for developing strategies to reduce their influence on the thermally induced TCP-displacements.

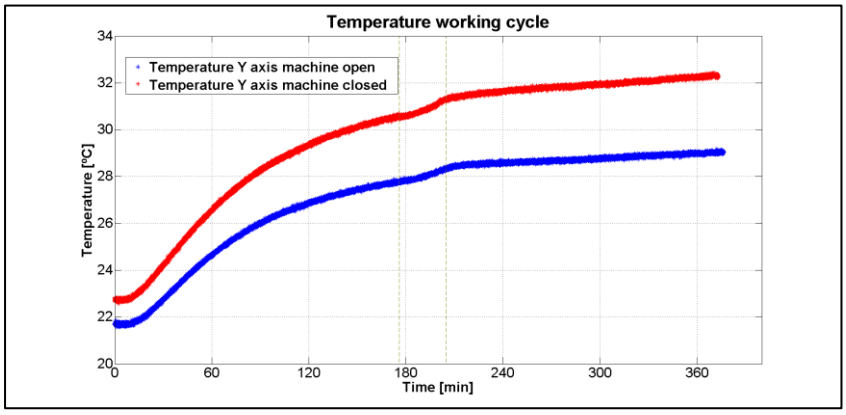

Figure 1: Temperature of the Y-axis for “machine open” and “machine closed”