

Process Monitoring System *ToolScope*

Unique Selling Point

Growing Automation Increases the Demand for more Process- and Machine Tool Monitoring!

The *ToolScope* - System is based on the latest technology of process and machine tool monitoring. A special, patented method for statistical process monitoring not only detects breakage but also recognises considerably smaller process deviation. In addition to already existing methods, this unique system offers process monitoring during a running process.

ToolScope adds considerable value to your production

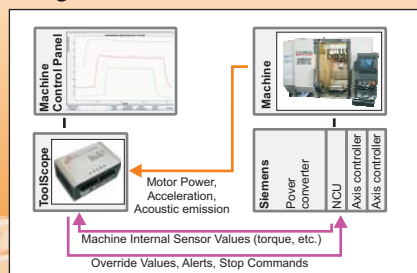
Not only the latest technology is an advantage to already existing systems. Also the modularity and user friendly operation provides a simple and safe application of the system in many different areas.

Highlights

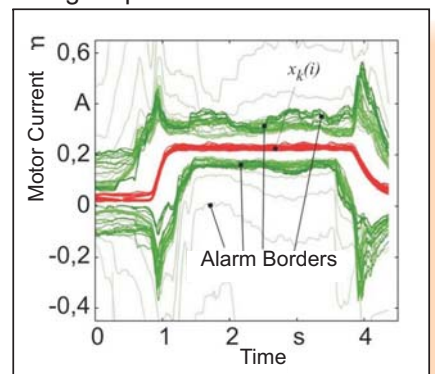
- ✦ Online visualization of processes (oscilloscope function) to support set up procedures, i.e. instant detection of chip blocking.
- ✦ 6-Sigma process control - self-learning statistical process control and quality monitoring during a running process.
- ✦ Process control: improvement of the primary processing time by process acceleration when tools running at low capacity and speed reduction when a certain tool force is exceeded.

- ✦ Detection of breakage without learning (1plusX)
- ✦ Monitoring without additional sensors. The sensor data are directly gathered from the CNC via Profibus.
- ✦ Automatic documentation
- ✦ Analysing analog sensor signals with up to 10 kHz.
- ✦ Monitoring of different sensor signals possible.
- ✦ Production data acquisition (PDA, automatic shift logbook, online status visualisation of all connected machines.
- ✦ Condition Monitoring: vibration and wear i.e. on bearings, axes, spindles or tools.
- ✦ Operation via HMI of the control unit of the machine tool or via touch screen.

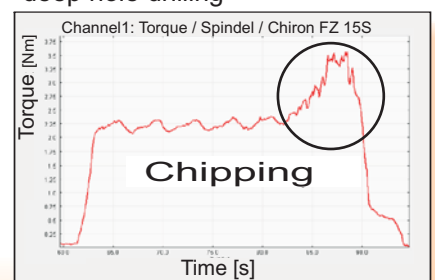
Integration into the machine tool



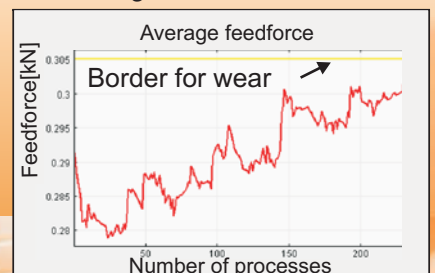
Selflearning borders of the 6-Sigma process control



Detected chipping during deep hole drilling



Monitoring wear



Data Specification

Technical Data

Measurement	Data	Note
IPC-Version	400 x 220 x 110	
Top Hat Rail module	200 x 140 x 110	
PanelPC-Version	410 x 320 x 90	15" Display
Interfaces	Sample rate	Note
	approx. 20 - 30 Hz	instructions see below
	approx. 100 - 500 Hz	
TCP/IP		
Analog input channels	up to 10 Hz	8 Input, during monitoring perhaps lower sample rate
Digital in-/output channels		8 In-/output channels each
Profibus connection		
Requirements for compile cycle Sample rate approx. 100 Hz	Drive hardware: SIMODRIVE 611D based drive system, digital drive, delivers digital current-/torque information Control hardware: SINUMERIK 840D, • NCU: 572.3 resp. 573.2 or higher (572.2 only SW4.4), • storage min. 32 MB, • PROFIBUS interface	
Requirements for compile cycle Sample rate approx. 100 - 500 Hz	Additional to the above mentioned requirements: Control software: SINUMERIK 840D, NC-Software >= 06.03	
Visualisation with the user interface		
Requirement	at least Windows 95, Network card	
Start monitoring with the Tool Scope system		
Monitoring can automatically be started by changing from G0 to G1. Furthermore the processes can automatically be stored in reference to the tool number, workpiece number, program name, etc.		
Functionality		
Visualisation	Each process can easily and continuously be visualised (oscilloscope function)	
Data logging	Each process is automatically stored on the main board (logbook)	
Filtering	The system offers a variety of filters such as average value, effective value, RMS, variable, etc. as standard for the filtering of the input signals.	
Monitoring breakage	The basic system contains a self learning algorithm to recognise breakage. The tolerance bands are simply and automatically identified.	
Monitoring wear	The system offers tracing and monitoring of wear. By setting signal borders the operator can be warned in due time to identify worn tools.	
Online statistical process control (optional)	With this monitoring algorithm minimal process deviations such as wear, larger cavities, change in material can be recognised during consistent processes. This equals quality control during a running process.	
Adaptive Control (optional)	With the adaptive control the feed will be optimised, so that the effective power of the tool is as steady as possible. The main time during scrubbing can be considerably reduced. Furthermore the tool can be protected by reducing the feed when the effective	
WP 1+X (optional)	With this monitoring strategy already from lot size 1 the process and the tool can be monitored. Here the system is also self learning.	