

Application report

Gildemeister GMX 400 linear

Turning / milling machine



Via 3 - function keys

of the monitoring system

Toolinspect

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Data communication:

CNC-control :

Removed material:

Digital

**Siemens 840D
steel casting**

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Advantages in connection with the tool- and process monitoring system **Toolinspect[®], in series production.**

- at the development the **simple operation and minimal imbeddings** were in the centre in the NC programme.
- **a small instruction** of the using staff is sufficient for Toolinspect
- Simple **operation via 3 – functionkeys.**
- Choose between **19 languages.**
- the system becomes (shift, milling, drill, graters, threads etc., at different CNC engines with different process.)
- Toolinspect can be operated with the common CNC controls. (**Siemens, Bosch Rexroth, Fanuc, Indramat, Bosch, Heidenhain**)
- process fluctuations are recognized automatically and the supervision limits adapt to the changes **without intervention of the operator.**
- **automatic system and data saving on an external CF card.**
- **external module with mobile -- of one's own processor.**
- Optional extension „**adaptive control**“ of rough machining to reduce the processing time.
- **automatic reconnaissance of tool change over tool magazine** and therefore no operation necessary.
- **torque and way information is selected from the CNC control.** Higher processing speed can hereby be driven.
- a more exact supervision is guaranteed selection of processings in three single Sekmente by here:
 - material touch (fluctuations)
 - middle process (constant processing)
 - finishing process (possible fluctuations)

Further information: www.mcu-gmbh.de

- **Monitoring** straight **after tool change.**
- **Process analysis** with data interpretation for technologists and export function of the actual values and machine data to **Excel.**
- **Robust flash memory**
- Optional extension: storage of up to **250 different alarm messages** for one year.

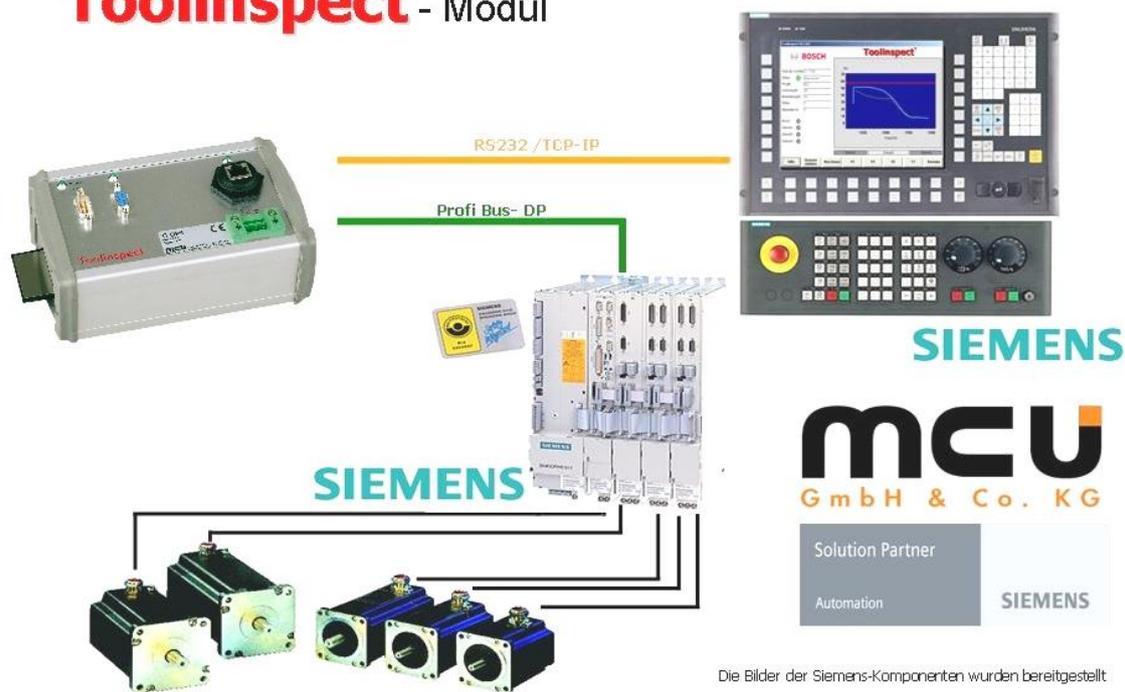
Monitoring system:

The **Toolinspect**® device is used to monitor tools on metal-cutting machines. The data, necessary for this task are normally transmitted to the device by a CNC control via a Profibus-DP interface. The monitoring strategy is automatically selected by the integrated software, according to the tool or machining process. The necessary parameters are determined and entered individually for one machine type by the machine tool manufacturer. No changes or adjustments are then necessary in the NC program or via the visualization interface.

Pic. Siemens 840D (visualization)

Siemens 840D mit Toolinspect Ti/DP1

Toolinspect - Modul



Die Bilder der Siemens-Komponenten wurden bereitgestellt
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The visualization on external Windows Computers (from Win98) gets connected via a TCP/IP or RS232 interface with the Toolinspect hardware. Alternatively the visualization can be displayed on an extra operating panel.

The technology group Gildemeister AG:

GILDEMEISTER is the leading manufacturer worldwide of cutting machine tools. The core business areas of "Turning", "Milling", "Ultrasonic" and "Laser" are complemented by automation and software solutions for machine tools and solar tracking systems. The product range includes both ECO machines for cost-effective entry into the field of standard machines as well as high-tech machines for highly complex machining jobs. With its range of user-friendly innovations, the GILDEMEISTER group meets the challenges posed by growing market requirements throughout the world and offers its customers market-driven solutions.

Turning machines from GILDEMEISTER, GRAZIANO and FAMOT, milling machines from DECKEL MAHO and ultrasonic and laser machines from SAUER carry out the most diverse processing tasks on a daily basis throughout the world. They fabricate precision parts for the automotive industry and machine mobile telephone casings for the telecommunications industry. They produce moulded parts for ski bindings, machine engine parts for the aerospace industry and manufacture high precision artificial hip joints for medical technology or laser micro cavities for the electronics industry.

A consistent market orientation on all world markets and the technological leadership of our products – these are our success factors. As a full-service provider, we also offer our customers comprehensive technological services. We have optimised our product portfolio and successfully driven the development of our group to become a full-liner in the turning, milling, ultrasonic/laser and services technologies.

The GILDEMEISTER group has the most extensive sales and service network in the industry. Nearly 6,000 employees in 70 self-operated national and international sales and service locations are available in 34 countries around the globe for our customers. The sales and service network of DECKEL MAHO GILDEMEISTER is distinctive in its focus on proximity to the market, its blanket-coverage direct sales network and customer-focused services.

Baureihe GMX 400 linear

The turning-milling centers "Made in Bielefeld" continue on their road to success - now also for smaller diameters and turning lengths - with the GMX 400 linear. Spindle motors with high torque and excellent dynamics in synchronous technology combined with a highly precise, powerful milling spindle make 6-sided machining of complex parts possible. Whether used as a counter-spindle or in the tailstock version: the highly dynamic linear drive, the absolute direct measuring systems, and the new 60/120-pocket shelf magazine, with the possibility of setting up parallel to production time, set new standards in productivity and precision.

The GMX 400 linear is controlled with the Siemens 840 Powerline, a CNC with an exceptionally powerful PLC-CPU of the newest generation, with 15" TFT color monitor, and with the optionally available programming system 3D Programmer, offering a powerful tool for simple, interactive programming with 3D-realtime simulation

Merkmale:

- 6-sided complete machining through angle-/speed synchronous hand off = high production accuracy
- Linear drive in the Z-axis ensures high dynamics and precision
- Parallel machining at main- and counter spindle, or 4-axis machining on one spindle = reduced production times
- High output turning- and milling spindle with 12,000 rpm and 120 Nm (25% DC) = high metal removal rate
- Absolute, direct measuring systems in all linear axes – reference point method unnecessary
- DMG ControlPanel with Siemens 840D powerline, 15"-TFT-screen and 3D simulation
- DMG Programmer 3D Turning (optional)

Test result:

After the installation, the machine processed flange- workpieces out of high quality steel. Over the Toolinspect system, turning, milling, drilling from 3.5 mm and threading from M6 could safely be monitored.

The operator does not need a visualization to set parameters or limits, this part is done automatically from the Toolinspect module.

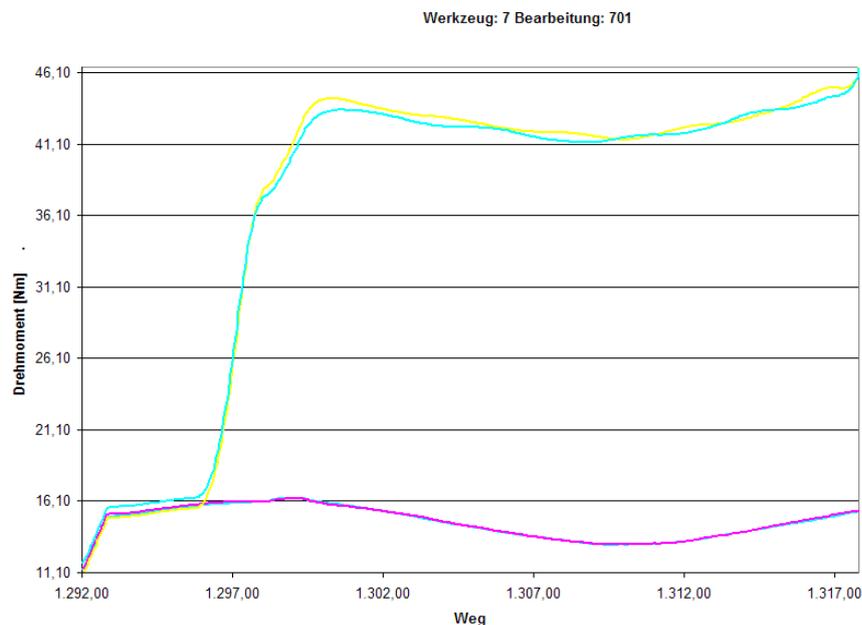
All information is shown at a text display. The machine operator only requires 3 function keys (at the Siemens 840D control) to run Toolinspect.

Basic conditions:

In general, there is diversity in all machining processes, concerning torque values and other process specific data.

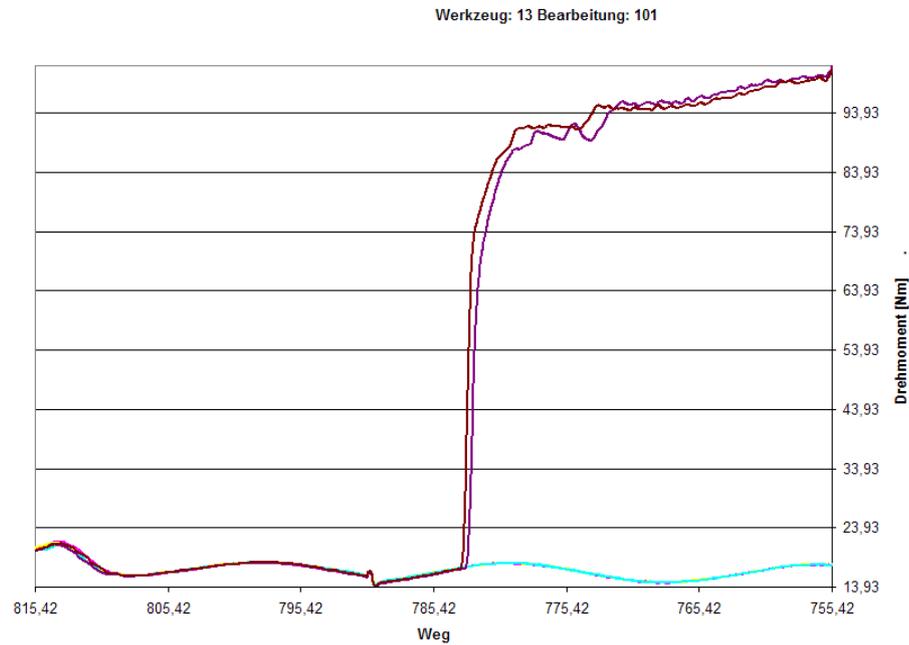
In the image 1 (VHM boring 4,0mm), very reproducible processes are represented, is guaranteed therefore the tool monitoring of the tools. We carried out watch the further a double preparation (is missing) around the signals between preparation and without tool. Also this was recognized immediately and the machine stopped.

Image: 1



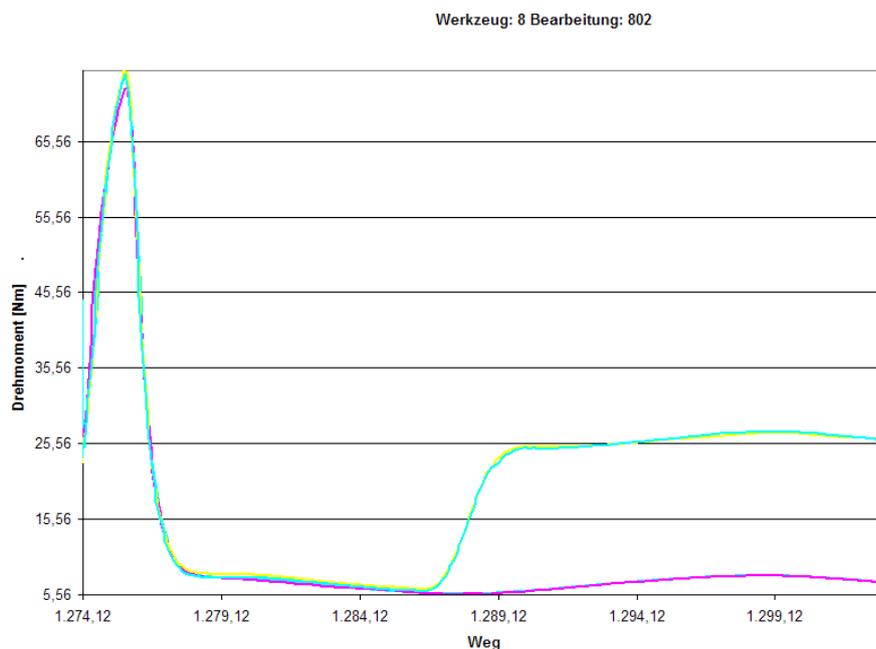
In the image 2 (turning) with a turn tool, here a chip with a thickness of 0.8 mm is worn out.

Image: 2

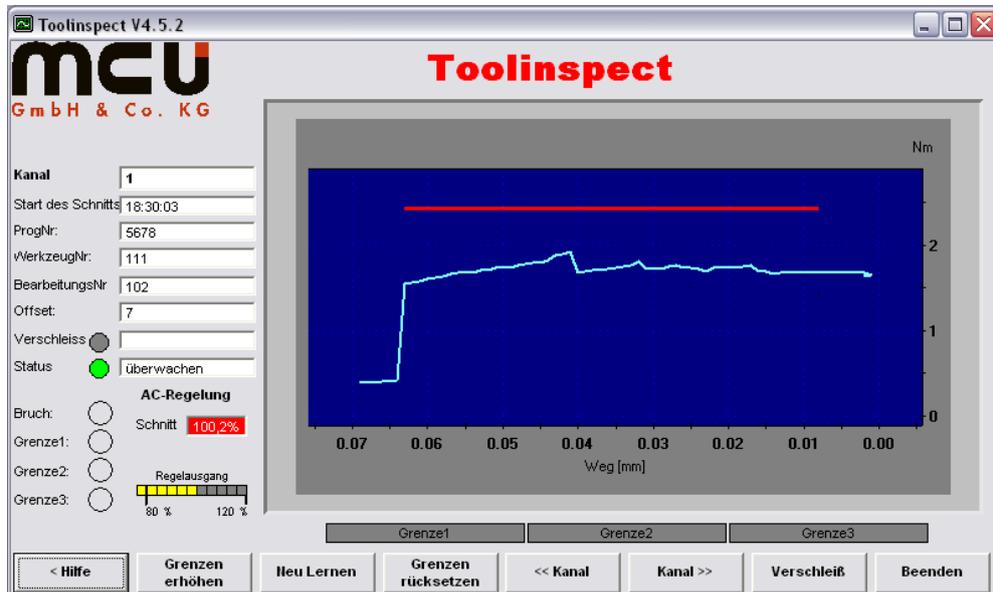


In the image 3 (machine screw tap with M8), very reproducible processes are represented, is guaranteed therefore the monitoring of the tools. In the frame of missing, the screw tap was removed. Toolinspect generated an alarm and stopped the machine.

Image: 3



Operation and visualisation : 1



“Reset limits” button

This button resets the system for the active program (the program which is displayed in the interface under Prog. no. :) to the original values and relearn is carried out.

“Relearn” button

This button is used to carry out relearn. The program-specific data (increased limits) are not reset. The limits readjust to the actual values in the following machine cycles.

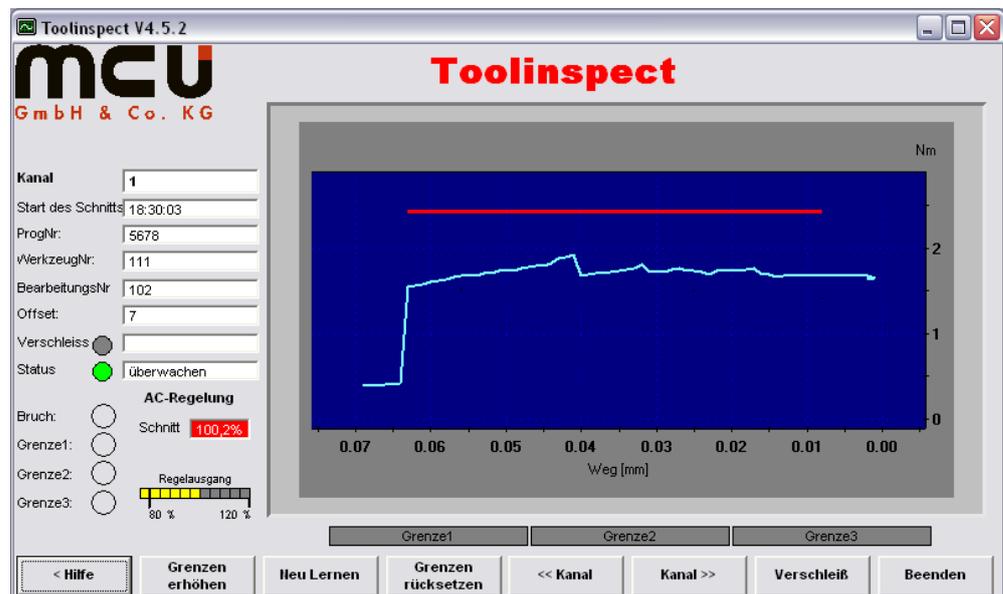
“Increase limits” button

If an incorrect message is generated by Toolinspect, the limit of the relevant fault message (switching threshold which generates a fault message) can be increased by pressing the F2 button. If this cut is reactivated in the next machine cycle, the increase of the limit is marked in yellow.

“Help” button

This button is used to call the Help function. Monitoring remains active. All histories of alarms are displayed as a sub-item “ALARMS”.

Operation and visualisation : 2



“<< Channel” button

This button is used to switch over (decrement) the active channel, e.g. from channel 2 to channel 1.

“Channel >>” button

This button is used to switch over (increment) the active channel, e.g. from channel 1 to channel 2.

“Wear” button

This button is used to visualise wear monitoring. This is an option. If the option is not activated, a demo screen appears here.

“End” button

This button ends the visualisation. Monitoring remains active.

Displays

In the left-hand section of the screen, displays show the increased and deactivated limits in yellow or orange. In the middle of this display, an alarm of the relevant limit is shown in red.

Summary:

The operation is imaginable simple and only a few modifications are required to the CNC program. The operator does not have to set any limits or parameters for monitoring. Not even at a change of the machined workpiece type or when new NC programs were written. The system adapts automatically to various operating states of the machine (wear, changes in temperature, etc) and selects the appropriate monitoring strategy automatically.

The installation was proportional easy. The modifications in the PLC program, the integration of Toolinspect into the control and the data transfer via Profibus DP is extremely flexible and well structured. It's also possible to connect **Toolinspect** via TCP-IP or a serial interface with a Windows computer.

MCU GmbH & Co. KG:

If you have any further questions concerning this application report, please contact the sales office of MCU GmbH & Co. KG in Winnenden.

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Information on the data sheet

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