NORDMANN
Tool Monitoring

TOOL MONITORING AND
PROCESS CONTROL SYSTEMS
FOR ALL TYPES OF
CUTTING MACHINE TOOLS
Nordmann GmbH & Co. KG was founded in 1989 by Dr.-Ing. Klaus Nordmann as a "technology-oriented company" with the support of the Federal Minister for Research. Since then we have grown to about 40 employees. The support was based on two inventions by Dr. Nordmann - the Acoustic Emission Hydrophon (sensor SEH) to monitor acoustic emission using a cooling jet as wave guide and an electromagnetic sensor for non-contact detection of the dynamic portion of the torque while drilling.

Our systems, with their multilingual menu structure, are in use around the world. Because we use different methods of measurement (mainly acoustic emission, force, effective power), we are capable of monitoring all types of metal cutting machine tools.

Some of the sensors are non-contact so that they can measure in the immediate vicinity of the tool.

Today we are a leading supplier of highly sensitive measurement systems and sensors for tool monitoring.

Test us with a first piece of equipment, which we will also install for trials.

"Although we mass produce tool monitoring systems, our strengths lie in the adaptation to special installation situations, in fulfilling customer desires, and in rapid on-site service."

Experience since 1986 in the field of tool monitoring and process control systems for all types of cutting machine tools.

Dr.-Ing. Klaus Nordmann
CEO

references

The following list is a small selection of companies which trust tool monitoring systems made by Nordmann. Our export-share amount is 35%. World-wide, we have sold about 11,345 systems (March 2012).

- Audi
- Austrian Airlines
- BMW
- Bosch
- Braun
- Buderus
- Carl Benzinger
- Chopard
- Citizen
- Continental
- Daimler
- Deutz AG
- EWAG
- Ford
- General Motors
- Harley-Davidson
- Hewlett Packard
- I.T.S.
- Imoberdorf
- Index
- Klingelnberg
- Mikron
- NGK
- Precitrame
- Schaeffler
- Schütte
- Siemens
- Stihl
- Studer
- Technica
- Variomatic
- VW
- Witzig & Frank

WHO WE ARE AND WHAT WE DO

We have placed special emphasis on the monitoring of difficult cases, for example the monitoring of very small tools and multi-spindle drill heads. Several patents have been issued for this.
**TOOL MONITORS**

- Only one system with only one user interface for all types of machines
- Identical user interface for the integration in PC operation computers and a standalone tool monitor for controls without a PC operation computer
- Low expense for storage of the function modules and simple maintenance thanks to the use of identical components in the various structural shapes for the tool monitors.

### Technical Features

- Monitoring with the aid of force, effective power, torque, acoustic emission, and displacement transducers
- Parallel and time independent monitoring of each channel
- Color graphics display with touch-screen for simple operation
- Automatic error detecting and correction of the limit values
- Free scaling, including zoom function for the curves
- Rapid adaptability to new situations using a menu-driven user interface
- Made in Switzerland
Extensive sensor palette for the most divergent measurement values and areas of application. Therefore even difficult monitoring tasks can be solved (e.g. miniature tools, multi-spindle drill heads, machining in hardened material, grinding with the smallest grinding wheel, machines with many work stations, etc.)

**SENSORS**

- **SEH**
  Acoustic Emission Hydrophon
  (Using a coolant jet as waveguide; The "Original")

- **SEA-Mini**
  Acoustic Emission Sensor

- **SEA-Feder (patented)**
  SEA with a Spring Steel as Waveguide

- **SEP**
  Acoustic Emission Processor
  (For all acoustic sensors)

- **DMA**
  Non-Contact Torque Sensor

- **BDA-Kralle (patented)**
  Strain Sensor in Form of a Claw
  (For force measurement on cam levers in multispindle lathes)

- **DMS-Kralle**
  Strain Sensor
  (For unidirectional force measurement on turret-housings, e.g.)

- **RSA**
  Rotating Acoustic Emission Sensor

- **WLM-3**
  3-Phase-Effective Power Measurement Unit
  (Our mainly used sensor)

- **SEA-Feder (patented)**
  SEA with a Spring Steel as Waveguide

- **SEA-Mini**
  Acoustic Emission Sensor

- **DMS-Kralle**
  Strain Sensor
  (For unidirectional force measurement on turret-housings, e.g.)

- **PDA**
  Piezo-Electric Strain Transducer
  (For multidirectional measurement on turret-housings, e.g.)
Monitoring acoustic emission, for example by using a cooling jet as wave guide (SEH). This allows tool breakage detection for the smallest tools. A very common application is also gap control for grinding machines. All of the acoustic emission sensors are low-noise (SEA-Mini, SEA-Feder, RSA). An impedance converter is located in the sensor, to have an interference free transmission in the coaxial-cable to the Acoustic-Emission-Processor SEP, which amplifies, filters and rectifies the measured values of all acoustic emission sensors.

The effective power module (WLM) was the standard in measurement of effective power in frequency controlled spindle motors. Our later development (WLM-3) halves the smallest drill bit and milling diameters that can be monitored compared with common equipment.

All machine parts are deformed under the influence of tool forces. We measure these deformations in the nanometer range with eddy current distance sensors and give force measurement for this (BDA-L, BDA-Kralle). Further sensors use strain gauges (DMS-Kralle) or piezo-electric elements (PDA).

Other sensors verify the length of workpieces (WLT) or postprocess the breakage of drills and taps mechanically (PCS-100). The impact sensors APS-L (-Q) and APS-BDA control by a barrier of coolant jet, produced by a coolant jet nozzle, the existence of the tool tip.
EXAMPLES OF APPLICATION

THIS IS WHERE TOOL MONITORING HAPPENS

Acoustic Emission Hydrophon SEH at boring tool

Acoustic Emission Hydrophon SEH monitoring the process of dressing a grinding wheel

Strain Sensor BDA-Kralle on the cam lever in a multispindle lathe

Strain Sensor BDA-Kralle measuring the feed force in a multispindle lathe

Acoustic Emission Sensor SEA-Feder picking up the acoustic waves from the workpiece spindle

Acoustic Emission Sensor SEA-Mini on a tool block

Acoustic Emission Sensor SEA-Mini on the tool slide

Electrical cabinet of a rotary table machine with 3-Phase-Effective Power Measurement units (WLM-3)
AREAS OF EXPERTISE

Applications:
- Control-integrated tool monitoring for open CNC control panels
- Monitoring micro tools as well (breakage, wear)
- Integrated acoustic work piece dimension control (patented)
- Gap elimination for grinding

Sensor Technology:
- Acoustic emission measurement based on a jet of cooling lubricant acting as an acoustic wave conductor
- Contactless acoustic emission sensors
- Easy retrofitable force-sensors
- High sensitive power measurement

BENEFITS

Extensive sensor palette for the most divergent measurement values and areas of application. Therefore even difficult monitoring tasks can be solved (e.g. miniature tools, multi-spindle drill heads, machining in hardened material, etc.).

Upgradable as unified system on all machine controls, independent of type and year of construction, whether with or without PC as a workstation.

Universal Profibus interface, configurable for all machine controls that can transfer internal driving data to the Profibus.

Particularly good monitoring strategy for the recognition of the smallest breakages with turning, drilling and cutting.

Very user-friendly pull down menus, quick access softkeys, graphic adjustment of the limit values and automatic envelope correction.

Development, production, sale, installation and service all from one company.

Service worldwide and quick on-the-spot support.

MAIN POTENTIALS

Tool cost reduction
Ability to use more economical tools as premature tool life end is indicated as appropriate (e.g.) ≈ 20%

Increase in use of the machine tool
Reduction in air cutting: Reduction in machining time through the use of higher feed speeds until cutting begins (e.g.) ≈ 10%

Avoiding of scrap production and re-touching work
Prevention of tool breakage and excessive tool wear (e.g.) ≈ 5%

Machine cost reduction
Protection of the machine when large tools break or during a crash (e.g.) ≈ 3%

Avoiding of complaints about sorting out bad parts
Detection of short pieces due to other process irregularities and sorting them out with control of a scrap gate (e.g.) ≈ 5%

Total cost reduction: ≈ 30%
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