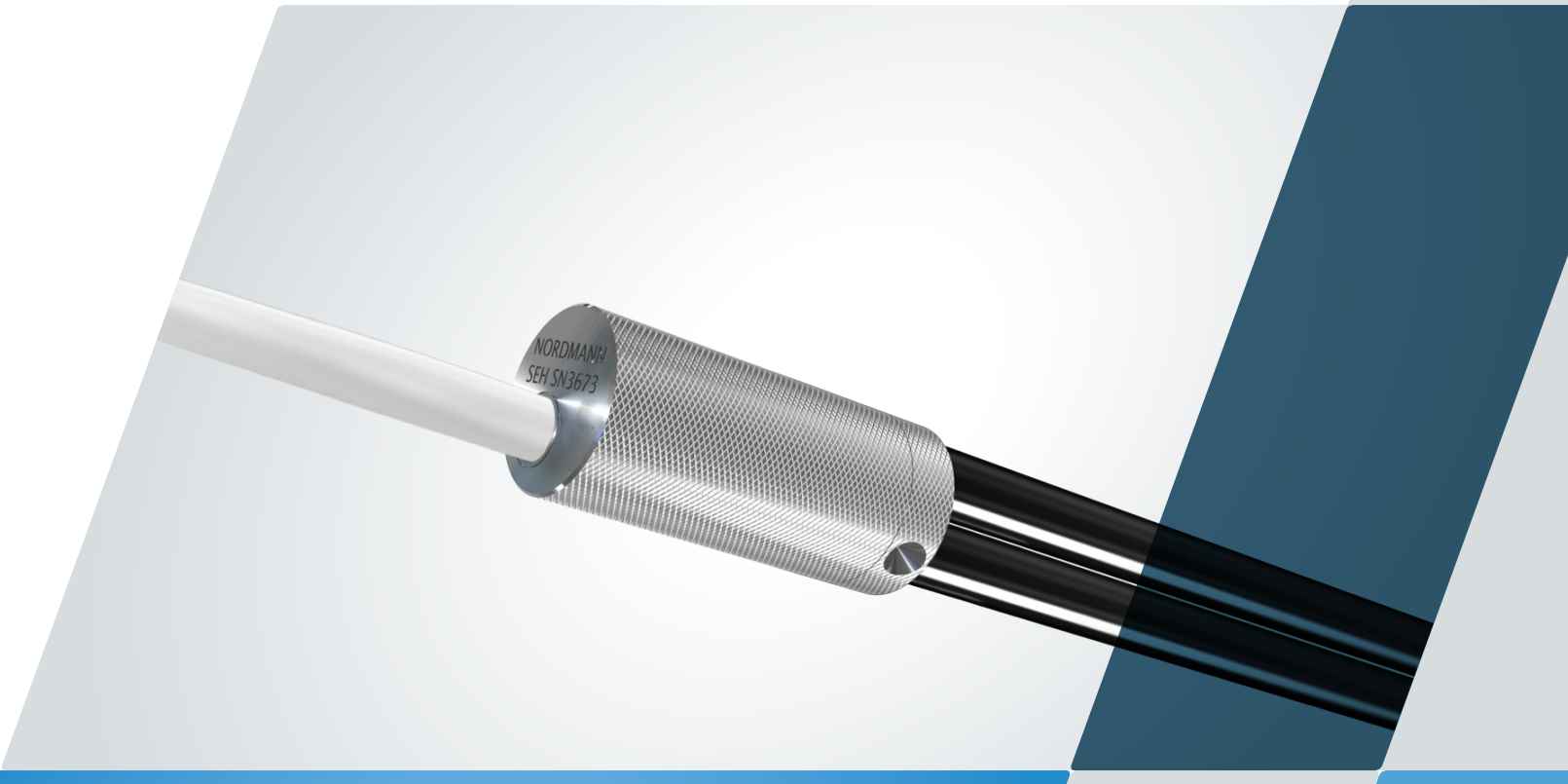
TOOL MONITORING AND PROCESS CONTROL SYSTEMS FOR ALL TYPES OF CUTTING MACHINE TOOLS



www.nordmann.eu

NORDMANN
TOOL MONITORING

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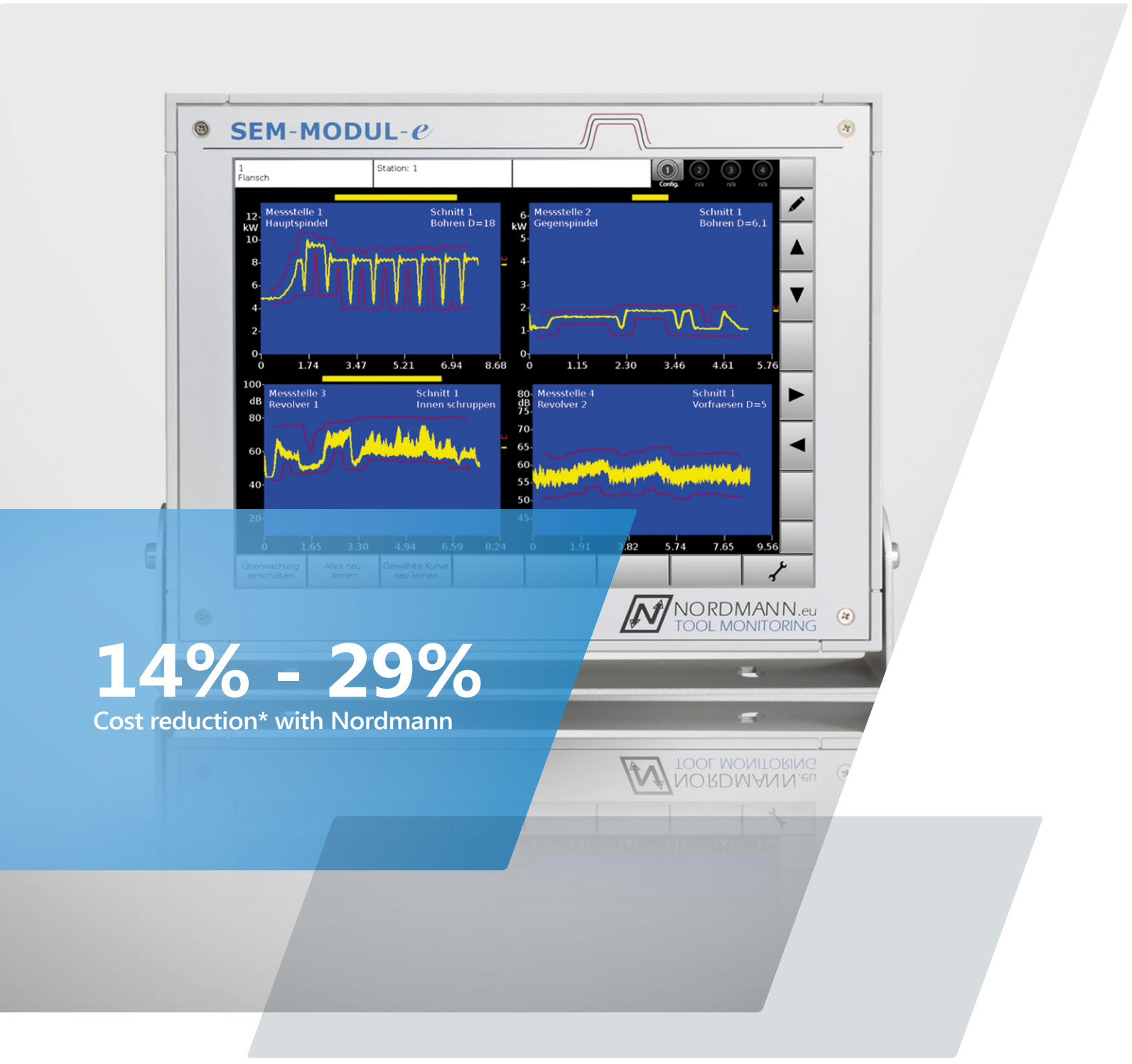


14% - 29%

Cost reduction* with Nordmann

*based on purchase price and operation expenses of the machine tool

WHO WE ARE AND WHAT WE DO

"Altough 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." **Dr.-Ing. Klaus Nordmann,** CEO

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 of Research. The support was based on two inventions by Dr. Nordmannn - the Acoustic Emission Hydrophon (sensor SEH) to monitor acoustic emission using a cooling jet as a wave guide and an electromagnetic sensor for non-contact detection of the dynamic portion of the torque while drilling (sensor EMS-DYN).

Software and hardware development, production and sales take place at the company building in Hürth near Cologne (Germany) as well as at Nordmann International in Pfäffikon (Switzerland).

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 rotating tools.

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

Our export share is **35%**. Worldwide we have sold about **14.805 Systeme** (August 2018).

REFERENCES

The following list is a small selection of companies which trust tool monitoring systems made by Nordmann:

- 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
- RIELLO
- SCHAEFFLER
- SCHÜTTE
- SIEMENS
- STIHL
- STUDER
- TECHNICA
- VARIOMATIC
- VW
- WITZIG & FRANK

TOOL MONITORS

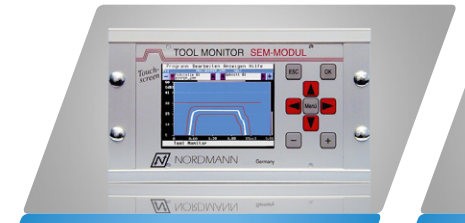
- Systems with only **one** user interface for all types of machines

- Identical user interface for the integration in PC operation computers and a stand-alone 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

SEM-MODUL

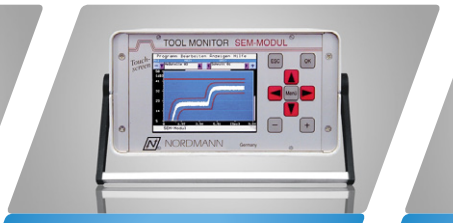
THE STANDARD



SEM-Modul

Panel mounted unit

Monitoring unit and display in one housing



SEM-Modul

Table-top unit

Monitoring unit and display in one housing

SEM-Modul

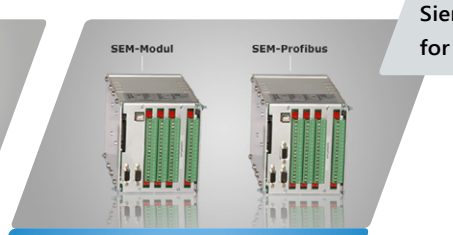
Flat display

Works together with SEM-modul in DIN-rail housing

SinTerm

Terminal software

SEM-Profibus on the monitor of the CNC control unit Sinumerik 840D / 840D sl



SEM-Modul /- Profibus

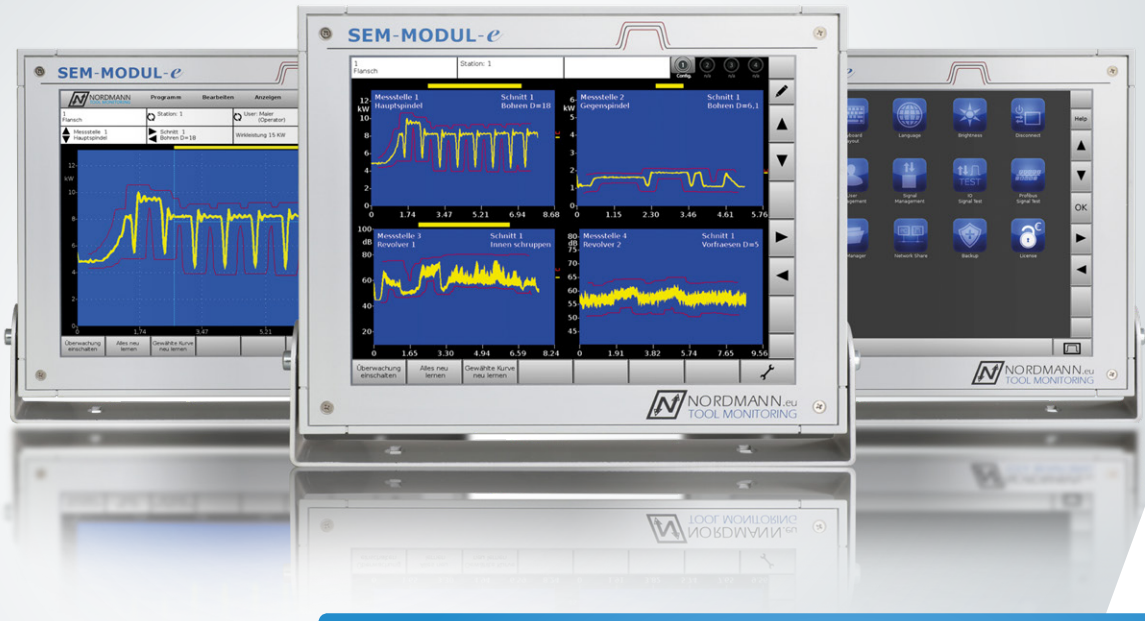
DIN-rail housing

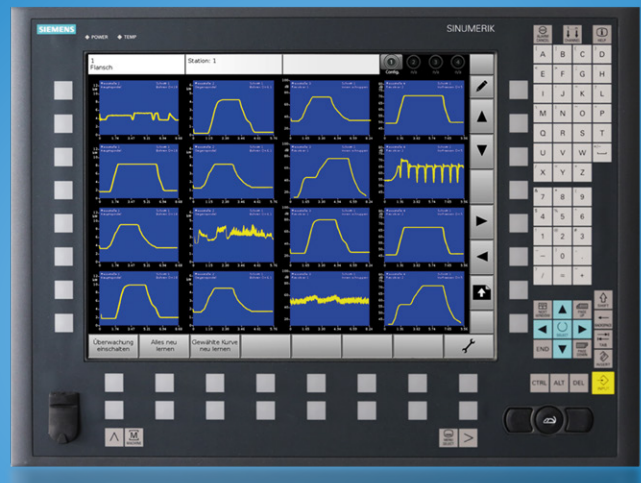
Needs flat display or monitor of the CNC control unit for operation (SEM-Profibus: „Siemens Product Partner"-certified)

Siemens Product Partner for SINUMERIK Systems

Technical Features

- Monitoring with the aid of force, effective power, torque, acoustic emission, and displacement transducers with up to 16 measuring points
- Parallel and time independent monitoring of each channel
- Color graphics display with touch-screen for simple operation
- Rapid adaptability to new situations using a menu-driven user interface
- Automatic error detecting and correction of the limit values
- Free scaling, including zoom function for the curves
- Made in Switzerland





Siemens Product Partner for SINUMERIK Systems

ADVANCED SOFTWARE FEATURES

- Any number of simultaneously displayed measurement curves
- Contains up to 4 independently monitored Tool Monitors respectively stations

SEM-MODUL-*e*

THE **NEW**

INNOVATIVE OPERATING CONCEPT
Recent development of user-friendly, intuitive operation

LARGE 10,4" Touch-Display
Further developed touch panel with even better functionality

EXTENSIVE INTERFACES
USB / Profibus / Ethernet / VGA

EFFICIENT AND NEW DESIGN
50% less than SEM-Modul

TECHNICAL DATA

PROTECTION CLASS	IP 20	(Display: IP 54)
DIMENSIONS (W x H x D)	Central unit: 122 x 133 x 110 mm	(Display: 271 x 228 x 44 mm)
POWER INPUT	Central unit: 16 Watt (40 Watt when connected to 8 analogue sensors)	(Display: 20 Watt)
CONNECTIONS	1 x Ethernet (for measurement curve display and operation) 3 x Profibus (for digital measured values and control signals) 4 x USB Master (for data back-up and printing)	
RESOLUTION OF THE A/D CONVERTER	16 Bit, 0,1ms scan time per measuring point independent of the number of measuring points	
OPTOCOUPLER OUTPUTS	15 normally open contacts for a wear and breakage message, feed release, data receipt (handshake)	
RELAY OUTPUTS	4 potential-free normally open contacts for a wear and breakage message (1A / 24V)	
MONITORING STRATEGIES	Monitoring of effective power, acoustic emission, torque, power, force, hydraulic pressure, distance and/or laser light with static limits and envelope curves (tolerance range) concerning time elapsed (unsmoothed, smoothed and the dynamic part) and average value. Apportionment of the machining task into cuts.	
MEASURING POINTS / SENSORS	8 analogue sensors (±10V). With the Siemens compile cycle, 24 axes can be monitored using internal drive data (or up to 50 measuring points per synchronised action)	
LIMITS PER MEASURING POINTS AND CUT	Unlimited, even limit above (below) curve, limit above (below) the average height, upper (lower) envelope, minimum limit, time limit	
SPECIAL FEATURES	Signal manager / file manager / Any number of simultaneously displayed measurement curves / backup possibility / Ethernet (remote service, remote control) / user groups administration / tool tips / printable screenshots / online user manual / and much more	

SENSORS

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

SEA-Mini
Acoustic Emission Sensor

RSA
Rotating Acoustic Emission Sensor
(Berührungslose Messwertübertragung)

SEP
Acoustic Emission Processor
(For all acoustic sensors)

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

BDA-Kralle
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.)

PDA
Piezo-Electric Strain Transducer
(For multidirectional measurement on turret-housings, e.g.)

BDA-L
Displacement Transducers
(For feed force measurement)

ADDM
Sensor Adjustment Module
(For BDA-L, BDA-Kralle)

Here are the basic sensors from our product line-up. The complete program can be found on **www.nordmann.eu**

• Monitoring acoustic emission, for example, by using a cooling jet as wave guide **(SEH)**. This allows tool breakage detection for the smallest tools. Another 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 latest 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 **(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 through a barrier of coolant jet, produced by a coolant jet nozzle, the existence of the tool tip.

DA
Pressure Transmitter
(Feed force measurement in hydraulic drives)

BDA-L M8 x 50
Control of Workpiece or Tool Running True

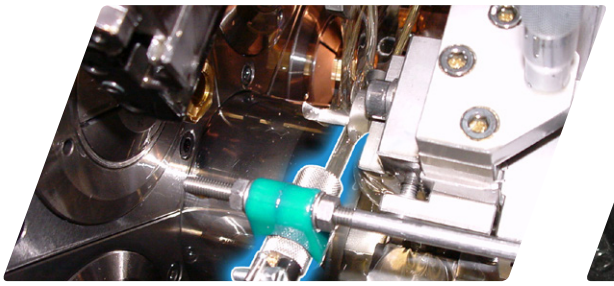
WLT
Workpiece Length Detector
(For multispindle lathes)

PCS-100
Swing Arm Style Sensor
(Post process control of drill breakage)

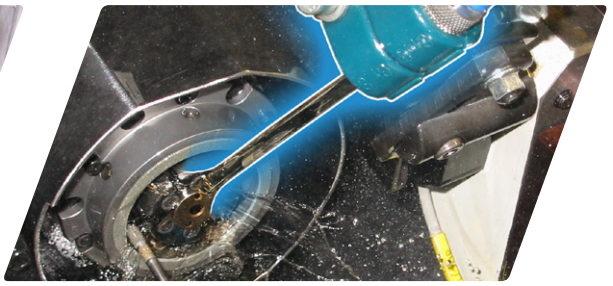
APS-L, APS-Q
Acoustic Impact Sensor
(For coolant jet barriers)

APS-BDA
Impact Pressure Sensor
(For coolant jet barriers)

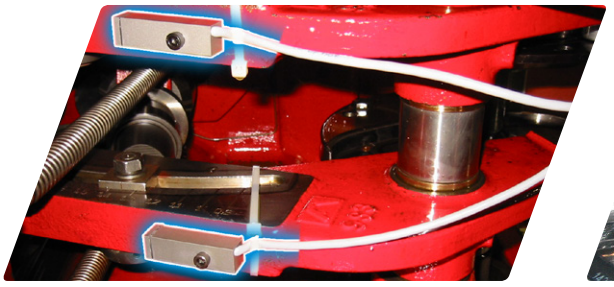
EXAMPLES OF APPLICATION



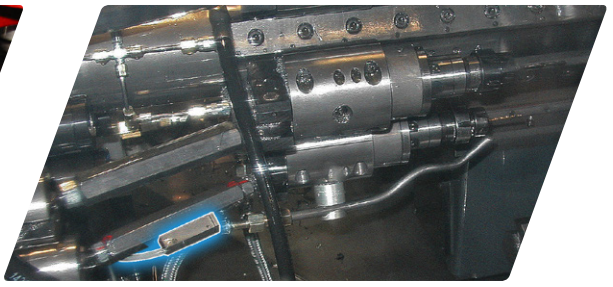
Acoustic Emission Hydrophon SEH at boring tool



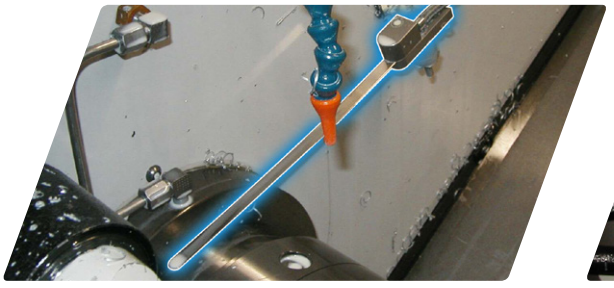
Acoustic Emission Hydrophon SEH monitoring the process of dressing a grinding wheel



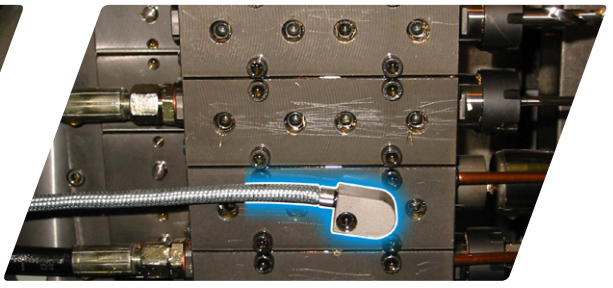
Strain Sensor BDA-Kralle on the cam lever in a multispindle lathe



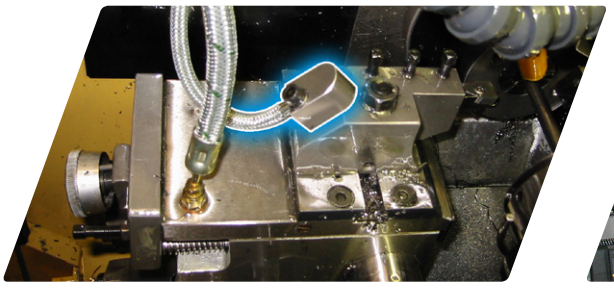
Strain Sensor BDA-Kralle measuring the feed force in a multispindle lathe



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)

WHY NORDMANN?

• 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, hard turning, etc.).

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

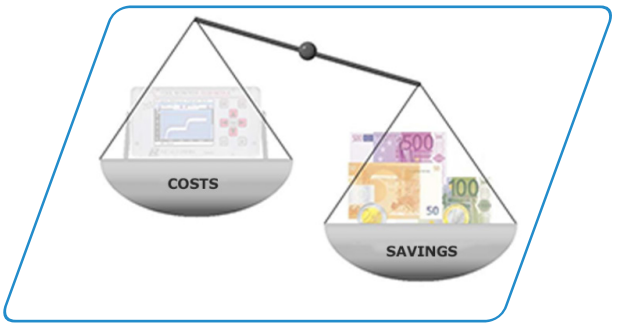
• Universal Profibus interface, configurable for all machine controls that can transfer internal driving data to the Profibus.

• 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.



THE BENEFITS OF NORDMANN-TOOL MONITORING

SAVINGS

Tool cost reduction
• Extension of the tool change interval
• Ability to use more economical tools
• Avoiding of tool breakage
≈ 13%

Increase in use of the machine tool
(resulting in the need for fewer machine tools)
• Unsupervised runs (Continuation of production during breaks / night shift)
• Ability to use higher speed feed safely
• Reduction in air cutting (Measurement curve display, detection of the start of the cut)
• Less downtimes as a result of breakages
≈ 20%

Avoiding of scrap production, rework and claim
• In-process dimension control
• Detection of too short parts and and to small oversize
• Chatter detection
• Stop at too high tool wear and breakage
≈ 4%

Machine cost reduction
• Immediate stop at breakage of bigger tools protects the machine as well
• Avoiding of cutting oil fires
≈ 3%

COST REDUCTION* WITH NORDMANN: 14% - 29%

*based on purchase price and operation expenses of the machine tool

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