

*A process monitoring system for tool and machine protection, collision detection, and tool–workpiece contact monitoring for adaptive machining control.*

## KEY BENEFITS

- Machine and tool protection – preventing crashes
- Nonconforming product reduction – early anomaly detection
- Productivity increase – optimization of cutting conditions

## KEY FEATURES

- Tool–workpiece contact detection
- Tool wear detection, including rotary tools
- Automatic stop in case of tool breakage
- Collision detection and machine stop
- Spindle and bearing diagnostics
- Cutting force measurement
- Real-time data transmission
- Live support

## APPLICATION EXAMPLES

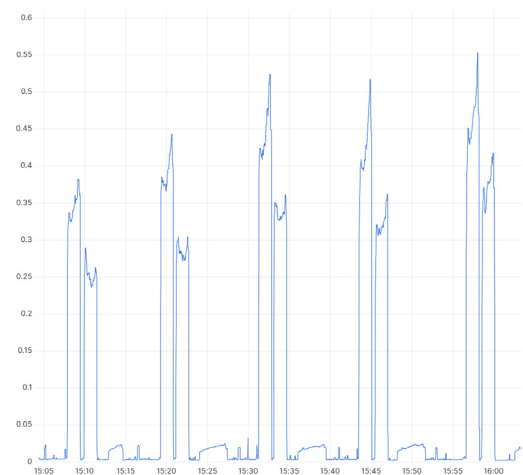
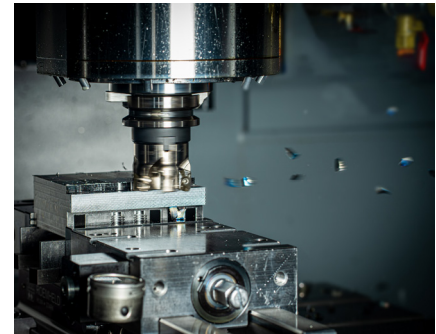
Tool and process monitoring, including rotary tools

### Technologies

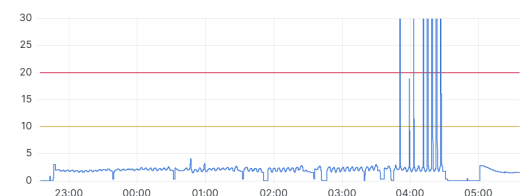
- Turning
- Milling
- Sawing
- Drilling
- Tapping

### Production types

- Serial production
- Single-part and large-part manufacturing



*Wear of the cutting tool - Lathe*



*Wear of the cutting blade - Saw*

## TECHNICAL PARAMETERS

The system includes a monitoring unit, sensors, and signal processing modules. These components together form a tool for monitoring tool and process condition.

### Functions

- Tool–workpiece contact detection
- Tool wear detection
- Tool breakage detection
- Collision detection
- Machine stop on collision
- Condition monitoring
- Notifications
- Alarms

### User Interface

- RAROG (operator panel software) at the machine – live data, trends, states, alarms
- Signal tower
- Cloud 4dot web application – IDA and Grafana
- Mobile application – Grafana

### Unit Outputs

- Digital outputs
- OPC UA, extendable to customer requirements
- REST API from the unit

### Cloud (4dot servers)

- REST API from the cloud
- Email notifications

### Inputs

- Vibration sensors
- Strain (force) sensors
- Digital signals 0/24V DC
- Cabling up to 100 m (longer distances to be consulted with 4dot)

### Monitoring unit for 4 or 8 cards

- Vibration cards: 3 inputs each
- Strain cards: 4 inputs each
- Digital signal cards: 8 inputs each
- Power supply: 9–30 V
- Mounting: standalone or DIN rail

### Remote Management

- Internet connection including LTE and 5G
- Data transmission to 4dot cloud (4dot servers)
- Remote configuration and management

## EXTENSIONS

One hardware solution is designed for technical diagnostics and process monitoring. The applications are designed so that sensors can be used for multiple measurements in most cases, simplifying data collection, processing, and interpretation.

### Main extensions include

- Cutting force measurement
- Technical diagnostics
- Condition monitoring of bearings and spindles
- Condition monitoring of linear guides and ball screws

## SERVICES

Through our hardware, data, and analysis we provide insight into the core of the process as well as into individual machine components. Thanks to real-time and historical data transmission, we can provide live real-time technical support without waiting for our technicians to be on-site.

### RAW

Regular raw data collection and transmission to 4dot cloud for detailed analysis; includes 24/7 access to the web application, automatic data processing, and software updates.

### Engineering

Advanced data evaluation and analysis optimization by 4dot engineers; includes automated analysis, email notifications, and 8/5 technical support.

### Proactive

A proactive approach focused on maximum machine availability; includes on-demand condition checks and management of user visualizations in the web application.

## SECURITY

- Data redundancy
- Data encryption

## CONTACT

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