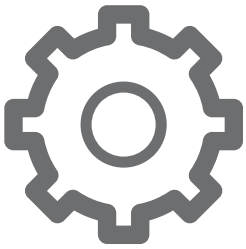


PROGNOST[®]-NT

SIL 3 Machine Protection and
Online Condition Monitoring for Rotating Equipment

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PROGNOST[®] TECHNOLOGIES

proven by experience



"PROGNOST Systems was the only vendor who was able to prove the system capabilities and customer satisfaction through reference visits on site of existing customers."

Confidence. It is essential when choosing a highly complex system responsible for your most critical assets and processes. And it's what you get in abundance with PROGNOST Systems.

To be truly reliable, a full-featured monitoring system must continually evolve from a substantial number of installations over many years of field experience. No amount of laboratory testing can simulate the characteristics of many different operating environments over extended periods of time.

PROGNOST®-NT has an unmatched track record of real-world success. So you'll have the assurance that your monitoring system will perform as promised – and the confidence that every diagnosis it generates is accurate.

At PROGNOST Systems, we encourage you to put us – and others – to the test. Insist that your vendor documents the amount of time their system has been in actual use in operating locations. Determine how long the vendor has resolved problems and implemented user suggestions from the field in order to refine the performance of their system. Contact references. Better still, visit user sites whose environments most closely match your own. Input from vendor representatives is useful, but uncensored comments from genuine users are invaluable in deciding which system will meet your expectations.

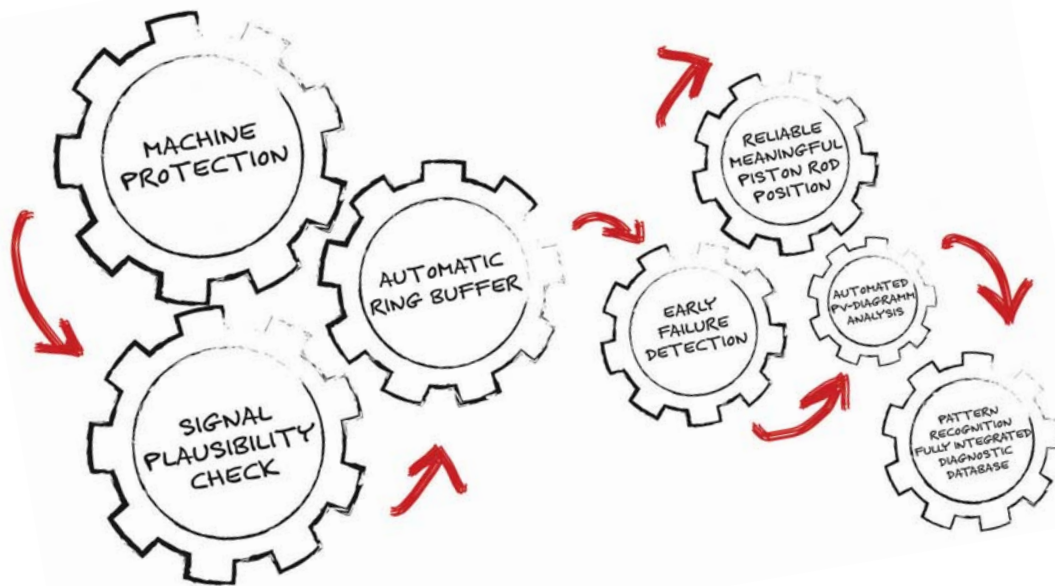
Ready to boost your confidence? Ask your local PROGNOST Systems representative to put you in contact with the PROGNOST® user community.



PROGNOST[®]-NT

in a nutshell

- 360° asset care of Rotating Equipment
- SIL 3 Machine Protection
- Modular Online Condition Monitoring
- Automated asset diagnostics
- Intuitive graphical user interface
- Customized from engineering experts by your demands and plans



PROGNOST®-SILver for signal acquisition and SIL 3 Machine Protection of all Rotating Equipment

Protection is based on vibration and critical parameters such as dynamic rod/shaft position and dynamic pressure.

Signal plausibility checks to avoid false alarms and warnings

Specialized signal processing avoids false warnings caused by broken wires, loose sensors, and other electrical failures.

Automatic 10-minute ring buffer for detailed root cause analyses (RCA)

Continuously recorded uncompressed signal data of all connected sensors (hardwired and DCS connected) are available for detailed root cause analyses. This ring buffer is automatically saved in case of an alarm, at every start/stop, or when user initiated.

Early Failure Detection

PROGNOST®-NT automatically recognizes changing machine operating conditions and adjusts the monitoring thresholds to avoid false warnings caused by variables such as changing load conditions.

Reliable and meaningful piston rod position for reciprocating compressors

Conventional monitoring methods use rod drop measurements for wear monitoring purposes only. PROGNOST®-NT uses the dynamic piston rod position for reliable rider ring wear calculation and to monitor the mechanical condition of piston rod, piston and crosshead connections.

Automated p-V diagram analyses

PROGNOST®-NT processes the online p-V diagram with dedicated analyses to optimize machinery performance and to detect leak sources, such as suction/discharge valves, packing, or piston rings. Further, it calculates dynamic piston rod loads to provide an early warning of overload.

Pattern recognition with fully integrated diagnostic database

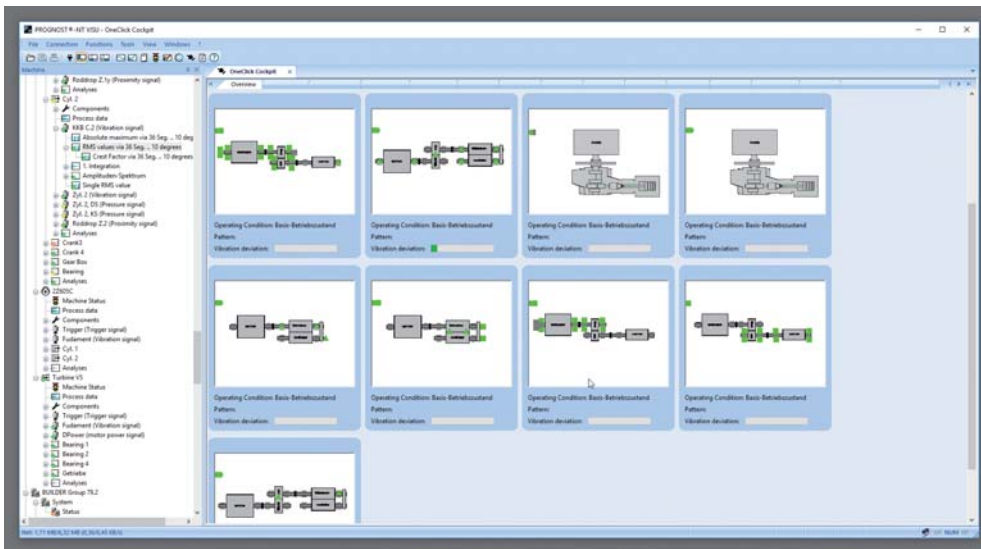
Each PROGNOST®-NT system automatically generates and saves new damage patterns when component failures occur. All major failures are analyzed and integrated as failure patterns into the systems' diagnostic database, along with more than 150 patterns derived from millions of operating hours.



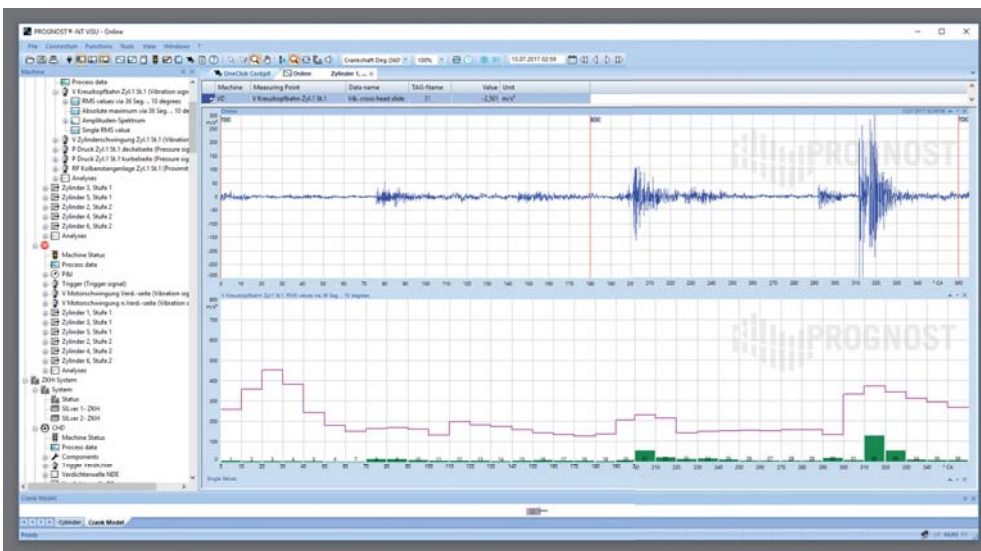
MODULAR SOFTWARE

for individual monitoring needs





OneClick Cockpit displays all machines monitored



Online crosshead vibration and segmented RMS analysis

Protection Analyses

Visualizes and saves online and trend data to provide all information required for precise root cause analyses.

Early Failure Detection

Detects developing damage at an early stage while accounting for changing operating conditions to avoid false alarms.

Wear Monitoring

Provides wear trend plots of critical components.

Performance Optimization

Evaluates the efficiency of a compressor and its sealing elements with automated p-V diagram analyses.

Lubrication Monitoring

Monitors the flow rate of every individual lubrication point by trend analysis.

Process Data Analyses

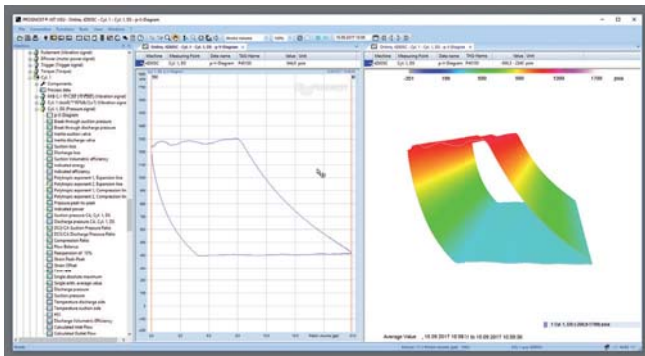
Displays and monitors defined DCS values as trends.

Component Tracking

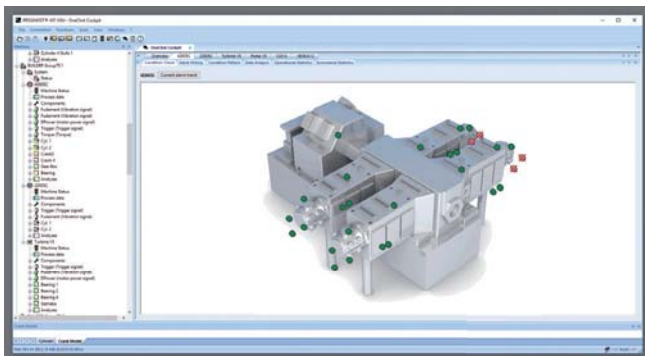
A tool for planning and tracking maintenance activities along with real-time component lifetime information.

RECIPROCATING EQUIPMENT

275 analyses and views



Machine tree, p-V diagram, and p-V diagram trend

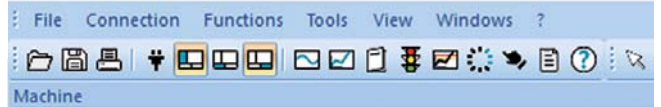


Machine status with sensor and alarm status



Crosshead vibration threshold setting per segment

PROGNOST®-NT VISU

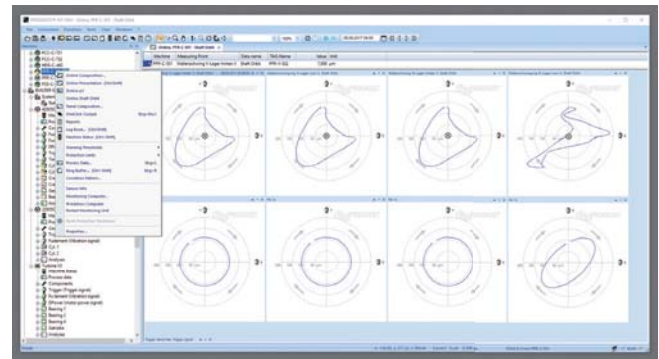


- Machine
 - Process data
 - Components
 - Trigger (Speed)
 - Fundament Velocity
 - RMS 36 segments
 - Absolute Peak 36 segments
 - Single RMS
 - Amplitude spectrum - 180°
 - Turn frequency
 - 0 - 200 Hz
 - 1 - 10 kHz
 - FFT Peak
 - FFT Peak position
 - Turn frequency
 - Non harmonic band RMS
 - Non harmonic band Peak
 - 1. Integration
 - RMS
 - Peak to Peak
 - Amplitude spectrum
- Cylinder 1
 - Components
 - Process data
 - Crosshead slide 1
 - Absolute Peak 36 segments
 - RMS 36 segments
 - Crest Factor 36 segments
 - Amplitude spectrum
 - 1,0 x Turn frequency
 - Amplitude
 - RMS
 - 200 - 10 kHz
 - FFT Peak
 - FFT Peak position
 - Vibration
 - Single RMS
 - RMS 36 segments
 - Absolute maximum 36 segments
 - Piston rod position
 - Average 36 segments
 - Rider ring wear
 - Rider ring wear projection
 - Peak to Peak
 - Peak to Peak 8 segments
 - Single position
 - Cylinder 1 head end pressure curve
 - p-V diagram
 - Break through suc/dis pressure
 - Inertia valves
 - Losses
 - Volumetric efficiency
 - Indicated energy and efficiency
 - Polytropic exponents
 - DCS/CA Pressure ratios
 - Indicated power
 - Piston rod load
 - Compression ratio
 - Flow balance

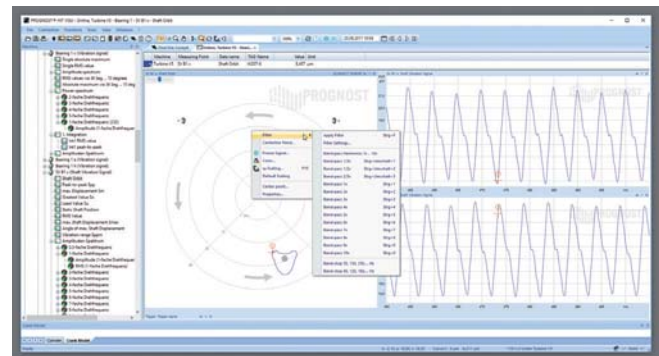
CENTRIFUGAL EQUIPMENT

188 analyses and views

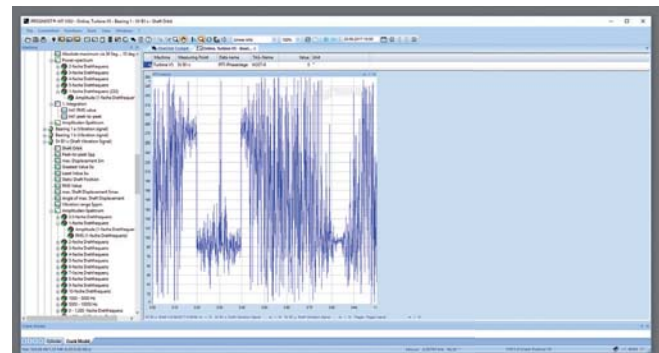
- File Connection Functions Tools View Windows ?
- Machine
- Process data
- Components
- Trigger (Rotation speed)
- Fundament Velocity
 - RMS 36 segments
 - Absolute Peak 36 segments
 - Single RMS
 - Amplitude spectrum - 180°
 - Turn frequency
 - 0 - 200 Hz
 - 1 - 10 kHz
 - FFT Peak
 - FFT Peak position
 - Turn frequency
 - Non harmonic band RMS
 - Non harmonic band Peak
- 1. Integration
 - RMS
 - Peak to Peak
- Single absolute maximum
- Drive power
 - Peak to Peak
 - Single RMS
 - Single arith. average
- Bearing 1
 - Components
 - Process data
 - Shaft vibration Bearing 1
 - Shaft Orbit
 - Peak to Peak
 - Maximum displacement Sm
 - Greatest value So
 - Least value Su
 - Static shaft position
 - RMS
 - Maximum shaft displacement Smax
 - Angle of max. shaft displacement
 - Vibration range Sppm
 - Amplitude spectrum
 - Orbit center displacement
 - Orbit displacement angle
 - Bearing 1 vertical vibration
 - Single absolute maximum
 - Single RMS
 - Amplitude spectrum
 - 1 - 10 x Turn frequency
 - 0 - 200 Hz
 - 1 kHz - 10 kHz
 - FFT Peak
 - FFT Peak position
 - Power spectrum
 - 1, Integration
 - Amplitude spectrum
 - 0,5 - 10 x Turn frequency
 - Bearing 1 axial vibration
 - Single absolute maximum
 - Single RMS
 - Amplitude spectrum



Online shaft orbit



Filtering of shaft orbit



FFT phasing of orbit



PROGNOST[®]-NT WEB APP

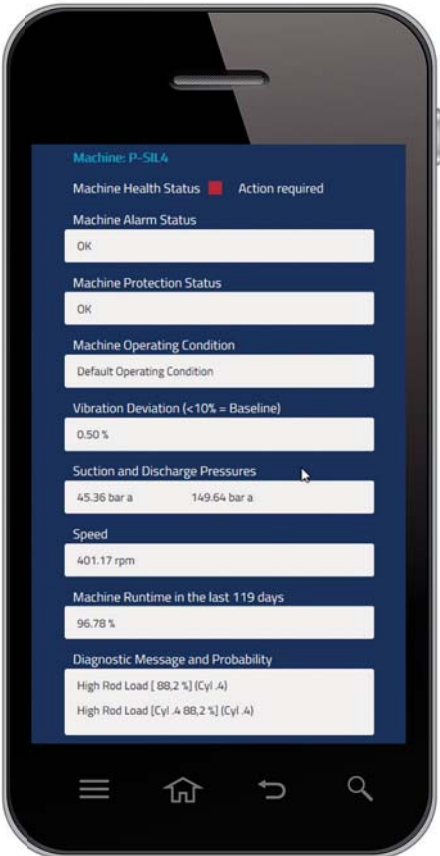
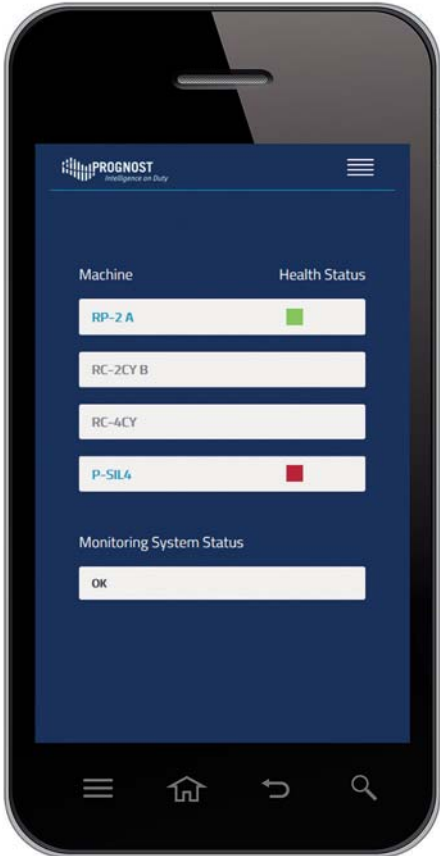
machinery health to go

- Essential machinery health information available on mobile devices
- Includes diagnostic messages and alarm status
- Cross platform HTML-based App



The PROGNOST®-NT Web App allows you to keep track of your rotating equipment and machinery health status. You receive comprehensive information and key health indicators to help you make effective maintenance decisions.

The App is HTML-based and runs on all mobile device operating systems. It is an integral part of the PROGNOST®-NT version 19 upgrade and can be activated with your existing software license.





PROGNOST®

for all your demanding monitoring tasks

- Accurate, intelligent, and powerful machinery analyses and protection based on 25 years of experience
- Proven reliable with installations worldwide on all types of critical Rotating Equipment
- Global customer support and sales network
- 24/7 customer support capability
- Made in Germany

PROGNOST®-SILver

- SIL 3 Machine Protection system



PROGNOST®-NT

- Online condition monitoring
- Automated diagnostics
- Failure pattern database
- Ring buffer

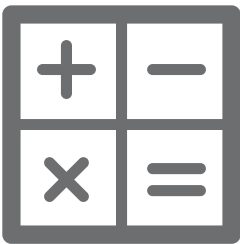
PROGNOST®-Predictor

- Online diagnostic system for
 - Gearboxes
 - Roller bearings
 - Extruder lines
- Patented Confidence Factor technology
- Number 1 solution in LDPE industry



PROGNOST®-SenSim

- Handheld device for signal simulation to perform checks
- Sensor signal simulation



VALUE CALCULATIONS (ROI)

for informed decisions

· Experience shows that effective machine protection and condition monitoring pay back quickly - especially during initial start-up or after major overhauls – and continue to provide economic value over time. Here are some widely accepted metrics you can use to assess the potential value of a PROGNOST System for your operation.



Operational benefits

A condition monitoring system positively affects equipment uptime, Mean Time Between Maintenance (MTBM), component lifetime, production rates, and Optimized Overall Operational Effectiveness (OOE) of your process and plant. Condition monitoring allows uninterrupted machine operation until scheduled shutdowns. Performance diagnostics reduce energy costs and increase asset efficiency. Early detection of sealing element failures avoids regulatory penalties and reduces greenhouse gas emissions.

Maintenance benefits

Condition monitoring reduces the number of work orders and results in better-targeted maintenance activities. It replaces outdated offline preventive maintenance measures, often performed by costly outside service companies. It reduces labor time and associated costs, with shorter MTTR (Mean Time to Repair). Moreover, increased knowledge of a failed component and operating conditions leads to more focused repair activities instead of trial-and-error.

Risk avoidance

"Risk" is the product of "consequence" and "probability," or frequency. For example, a compressor fails with a potential consequence of \$200,000 (USD) in production loss, labor costs, and spare parts. If this event occurs at a frequency of once every ten years, this represents an annual risk of \$20,000 (USD) per year, but if it occurs every two years, the annual risk is

\$100,000 (USD). Condition monitoring eliminates or greatly extends the frequency of failures for significant risk reduction.

Two methods of assessing economic incentives

Payback period: a calculation that indicates whether an investment in the system pays for itself within a defined period of time.

Return On Investment (ROI): measures the amount of return achieved by the investment in a system during a specified time relative to the money spent for it. The result is expressed as a percentage or ratio.

Realistic calculation of the benefits earned from a condition monitoring system.

Four categories should be considered:

1. Productivity (elimination of lost production)
2. Reduced downtime
3. Labor and spare parts cost savings
4. Reduced drive power consumption

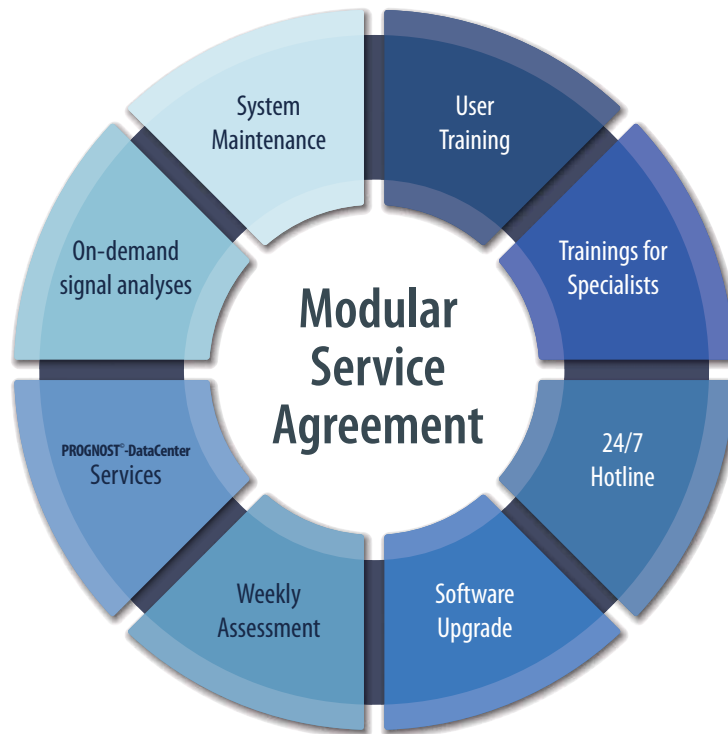
The rate at which your company recovers an investment in condition monitoring depends on factors such as the type of products manufactured, the typical amount of downtime experienced, and how thoroughly your company implements and uses the system.

Contact your PROGNOST Systems representative for calculation templates and real-life figures to support your value calculations.



CUSTOMER SUPPORT

24/7 Lifecycle support



User Seminars

- Initial Users Seminar
- Advanced Users Seminars
- Seminars for specialists

Assessment of machine condition

- Weekly service to support your personnel

Individual data analyses

- Evaluation of data, analyses, and system messages to outline possible failure scenarios
- Recommendations for maintenance actions

Machine condition reports

- Documentation of machine condition trends
- Serves as a basis for long-term maintenance planning
- Includes incident evaluations by experts and recommendations for machine overhauls

Software Upgrades

- New signal analyses
- Innovative measuring methods (e.g., torque)
- Enhanced GUI user friendliness
- Extended failure pattern database from industry peers

Phone hotline 10/5 or 24/7

- Remote access to your system
- Immediate support
- Data interpretation
- Verification of your own diagnoses
- Second opinion prior to decision making

Imprint

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