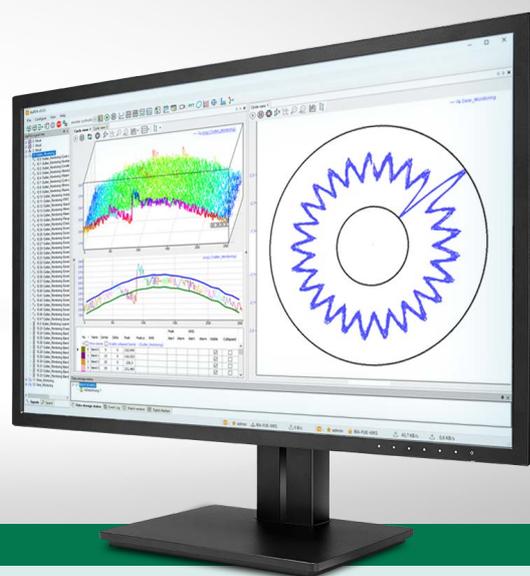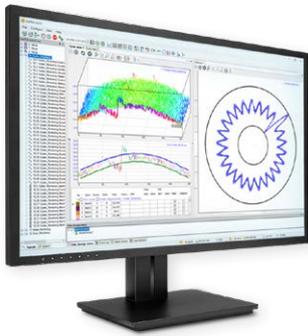iba

Online monitoring of cyclical processes for quality assurance and machine diagnosis

ibaInCycle
Monitor and analyze cyclical processes online

Monitoring and analysis of cyclical processes with ibaInCycle

ibaInCycle monitors cyclically recurring and rotating processes online. A precise forecast of quality features is therefore possible already during production. Implementing measures promptly can prevent damage and malfunctions of machines or plants, thereby ensuring the product quality.

Identifying early-stage process changes and anomalies

ibaInCycle is an add-on to ibaPDA and monitors all types of cyclically repeating processes, such as recurring processes, but also rotating machine parts, i.e. rollers, gears, etc.

ibaInCycle makes it possible to detect anomalies in the process at an early stage, in particular wear on machines and resulting deviations in product quality. This means you are able to take measures promptly to avoid damage and ensure quality.

Thanks to the comprehensive detection and analysis of the processes, impacts on product quality and the machine condition can be reliably predicted. This means that production downtimes can be avoided, plant availability can be increased, quality can be ensured and, last but not least, maintenance costs can be reduced.
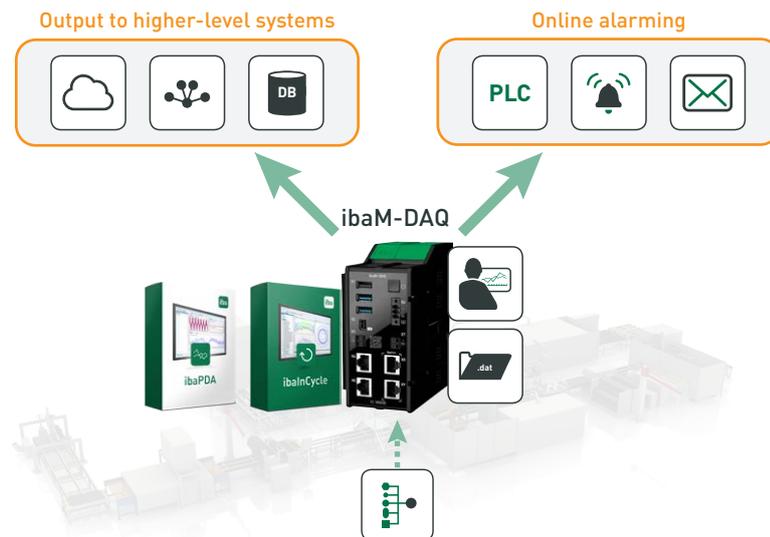
At a glance

› Online monitoring and analysis of cyclical processes (recurring process steps, rotating mechanics)
› Identifying process anomalies
› Automatic alarming in real time
› Saving raw data for detailed analysis in measurement files
› Outputting characteristic values for the long term analysis in higher-level systems
› Online visualization of measured data and characteristic values
› Self-learning module for different process conditions (auto-adapting)
› Reference curves for various process conditions
› Individual definition of warning and alarm limits
› Comprehensive configuration options

Application examples
ibaInCycle is ideal for a number of applications, such as:

› Monitoring saw blade wear
› Monitoring sequential processes in plants and on machines
› Monitoring step responses and roll stand characteristics
› Motor and gear monitoring

› Robot/handling systems, especially for monitoring traverse movements (load and/or reference runs)
› Monitoring recurring production steps, such as
  - presses (force, displacement and pressure curves)
  - injection molding
  - crane monitoring ...

Online process monitoring with ibaInCycle and ibaM-DAQ right on a machine

Compact standalone solution

It is not only possible to operate ibaInCycle on a central system, but also on the edge device ibaM-DAQ. This compact monitoring solution can be used right on the machine on site as a standalone solution.

ibaM-DAQ is a processor module of the modular measurement system ibaMAQS. Via the Ethernet interfaces, process data can be recorded directly at the machine. With the interface module ibaM-FO-2IO, further iba devices can be connected via fiber optics.

Functionality of ibaInCycle

Process signals from cyclical processes ideally exhibit similar behavior within a cycle. ibaInCycle compares the "learned" good process with the actual process signal and calculates meaningful characteristic values. The user recognizes deviations immediately and can evaluate and response to these accordingly.

ibaInCycle can monitor not only single signals but also vectors. Vectors are grouped signals that are acquired across the width of a product, for example, such as the signals of a flatness mea-

surement system or the different zones of a temperature scanner.

ibaInCycle provides different modules, which are configured in the ibaPDA I/O Manager:

› The InCycle Expert module offers a variety of individual configuration options for analyzing the cycles.
› The InCycle Auto-Adapting module automatically learns the behavior of the cycles in different process conditions and uses this as a reference to automatically identify deviations.

Meaningful characteristic values

The InCycle Expert module makes it possible to divide process cycles evenly into any number of ranges and freely define meaningful characteristic values for any range:

› Minimum / maximum / average
› Range / changes
› RMS / standard deviation

With both versions, central or local system, the analysis and characteristic value calculation occur in ongoing operation.

Alarming in real time

The characteristic values of any area are monitored for changes.

For processes consisting of several steps, the cycles can be divided into several sub-cycles. All characteristic values can be recorded as a signal, visualized and monitored to make sure they do not exceed limit values. The user is automatically alarmed in real time.
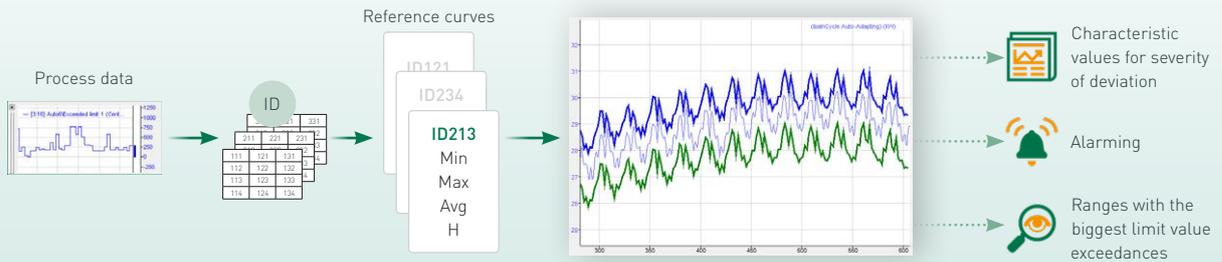
Output to higher-level systems

The characteristic values can be output to higher-level systems, such as databases and cloud systems, for a long term analysis. The measurement files with the raw data can be used for detailed analyses.

Demonstrative visualization

The cycle view, which was developed specifically for ibaInCycle, offers several demonstrative types of visualization. In the waterfall view, cycle changes over time are displayed particularly clearly. The results of the different areas are displayed graphically and in tabular form. For rotating processes, the circle view offers the ideal way to visualize the process behavior over time to, for example, unambiguously identify the position of a defective tooth in the gear.

Monitoring with the Auto-Adapting module

Process data → ID → Reference curves (ID121, ID234, **ID213** Min Max Avg H) →

- Characteristic values for severity of deviation
- Alarming
- Ranges with the biggest limit value exceedances

After the "good" curves have been learned for different process conditions, deviations are immediately displayed during the process.

Automatically learn process sequence

The Auto-Adapting module is capable of learning the ideal process sequence from a number of curves. In the learning phase, a reference curve is learned for this purpose, which also takes different process conditions into consideration, such as different material properties, geometries, temperatures, speeds, etc.
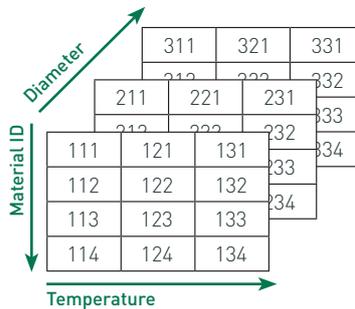
The Auto-Adapting module therefore distinguishes between measurements for any number of defined process conditions. The process conditions are defined with an unambiguous process ID.

The adjacent graphic shows the example of a matrix for differ-

ent process conditions, which take different materials, temperatures and diameters of the product into consideration.

Automatic monitoring and alarming

In the monitoring phase, the Auto-Adapting module compares the reference curve with the measured

curve. In the process, permitted deviations can be individually defined using warning and alarm limits. The quantification of deviations already makes it possible to estimate the extent to which possible damage has advanced.

The user is therefore always informed of the machine or plant status and the quality of production and can respond at any time depending on the quality.

Licensing

An ibaPDA basic license is required to use ibaInCycle. 4 InCycle modules can be used per ibaInCycle license.

Order no.	Name	Description
30.681215	ibaInCycle	Analysis of cyclical processes, 4 modules
30.770064	ibaPDA-64	Basic package server/client bundle for 64 signals
30.770128	ibaPDA-128	Basic package server/client bundle for 128 signals
30.770256	ibaPDA-256	Basic package server/client bundle for 256 signals
30.770512	ibaPDA-512	Basic package server/client bundle for 512 signals
30.771024	ibaPDA-1024	Basic package server/client bundle for 1024 signals

Additional licenses with a higher number of signals are available for ibaPDA