

CMTK – CONDITION MONITORING TOOLKIT

The plug-and-play system for monitoring the condition of your equipment



An alarm that promises good things

Less unplanned downtime
and more productivity





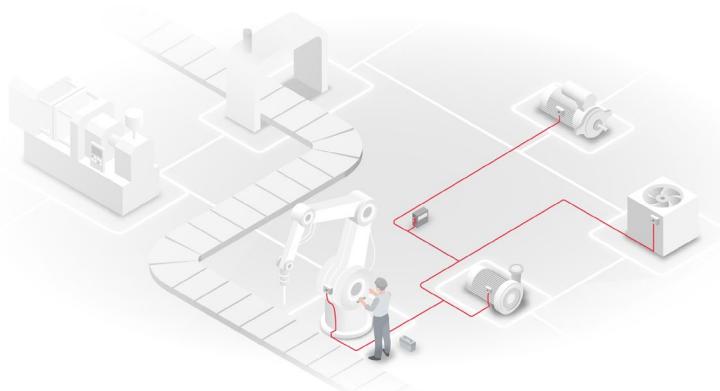
CMTK

The basis for your condition monitoring system



Plug-and-play commissioning

The CMTK is ready to use right out of the box. The sensor data is automatically interpreted, loaded into the integrated database, and then visualized. The system can be optimally adapted to your needs in just a few simple steps.



Keep informed

Easily set up notifications when sensor data indicates a specific machine behavior. Use the interactive BCM Assistant to define monitoring tasks for different machine types.



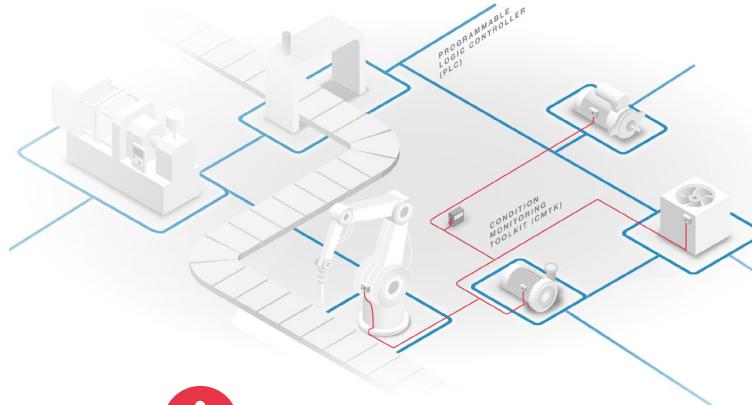
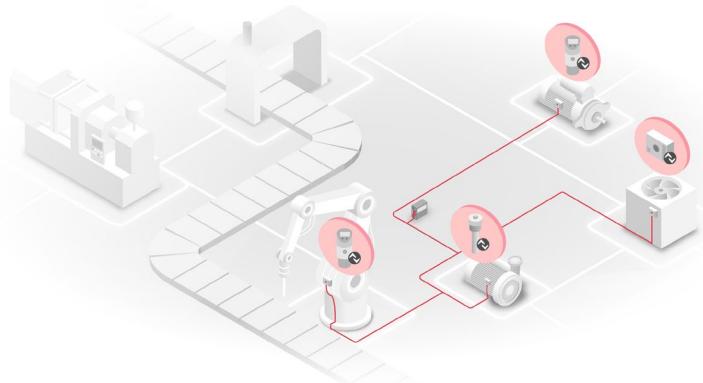
CMTK

The basis for your condition monitoring system



High compatibility with many sensors

Combine the CMTK with all IO-Link sensors available on the market. For example, our all-rounder, the BCM sensor, offers functions such as vibration analysis in the time and frequency domains as well as temperature monitoring.



Standalone system

The CMTK can operate completely independently of your plants' existing IT and automation networks. This way, you avoid additional data traffic and minimize disruption to your existing systems.



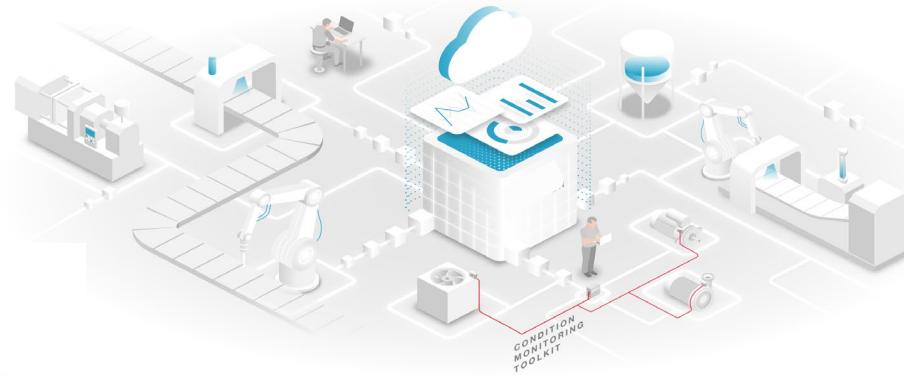
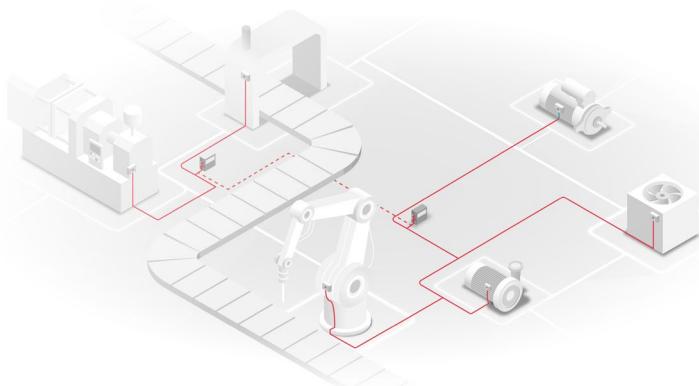
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The basis for your condition monitoring system



Unlimited expandability

Expand the CMTK with up to five IO-Link masters to integrate up to 44 IO-Link sensors. If that's not enough, you can modularly expand additional CMTK devices with the connected IO-Link masters, allowing you to scale up your condition monitoring system as needed.



Connected upwards

The CMTK provides its data via OPC/UA and MQTT so that you can further process it in local networks or cloud systems.

Product Highlights

Beyond a network module





CMTK

The basis for your condition monitoring system

User-friendly software

- Easy system setup and customization thanks to our plug-and-play approach.
- The software runs locally on the hardware and can be accessed via a web browser.
- One-time payment, no hidden license or subscription fees.
- Modular expansion thanks to the new app concept.
- Continuous development, e.g., through new apps.



Powerful hardware

- ARM 64-bit quad-core processor, 1.8 GHz
- 4 GB RAM
- Internal memory: 32 GB eMMC
- SD card support
- Ports for connecting four IO-Link devices
- 2 LAN ports
- IP20

Modular extensions

- Up to five IO-Link masters for integrating as many as 40 additional IO-Link devices
- Analog-to-digital converter for integrating analog sensors and PT100 or PT1000 temperature sensors



CMTK

Sensor data is automatically interpreted, stored and visualized

Connected Devices

Upload IODD Set logging interval Notifications Account

BAV MA-NC-00025-01

Port	Product Name	State	Details
1	BES M12EH1-L01C40B-S04G-L04 (ADSS)	Device connected	Details
2	BOS R254K-UUI-LH11-S4 (ADSS)	Device connected	Details
3	No device found	No device connected	Details
4	No device found	No device connected	Details

BNI EIP-508-105-Z067

192.168.10.67

Remove master

Port	Product Name	State	Details
0	No device found	No device connected	Details
1	BCM R16E-004-CI02-01,5 S4	Device connected	Details
2	No device found	No device connected	Details
3	No device found	No device connected	Details
4	No device found	No device connected	Details
5	No device found	No device connected	Details
6	No device found	No device connected	Details
7	No device found	No device connected	Details

Plug-and-play
Automatic detection of IO-Link devices, option to easily upload IODDs.

Easy configuration
Change sensor profiles and parameters using a simple interface.

All information at hand
Access to additional sensor information such as operating hours, firmware version and much more.



CMTK

Visualize sensor data, monitor thresholds and identify trends

Visualization

[Reinitialize](#)

Home > Dashboards > Master 2

Alarms

port1: Ball Pass Frequency Inner Race (BPFI) X [g] | Current rotational speed [RPM]

Firing for 2s
> 1 instance

View alert rule

Switch to live view

Dashboard

Settings

Connected Devices

Visualization

BCM Assistant

Notifications

Account

Switch to live view

Add Share Last 10 minutes

Master 1

port1

0.16 g

0.14 g

0.12 g

0.1 g

0.08 g

0.06 g

0.04 g

0.02 g

0 g

2500 RPM

2000 RPM

1500 RPM

1000 RPM

500 RPM

0 RPM

Ball Pass Frequency Inner Race (BPFI) X [g]

Ball Pass Frequency Inner Race (BPFI) Y [g]

Ball Pass Frequency Inner Race (BPFI) Z [g]

Ball Pass Frequency Outer Race (BPFO) X [g]

Ball Pass Frequency Outer Race (BPFO) Y [g]

Ball Pass Frequency Outer Race (BPFO) Z [g]

Ball Spin Frequency (BSF) X [g]

Ball Spin Frequency (BSF) Y [g]

Ball Spin Frequency (BSF) Z [g]

Current rotational speed [RPM]

0 13:01:00 13:02:00 13:03:00 13:04:00 13:05:00 13:06:00 13:07:00 13:08:00 13:09:00 13:10:00

i

- Easy to set up**
Generate visualization automatically based on the connected sensors.
- All information in one dashboard**
Monitor current sensor values and thresholds or identify trends.
- Highly customizable**
Customize charts, alarms, and more to suit your needs.



CMTK

Customize your system according to your needs
– simple, fast and modularly expandable

The screenshot shows the Balluff CMTK web interface. The main area is a dashboard displaying three connected devices:

- Radial Fan** (Standort: Production hall 10): Status: Device connected, Notifications: 8, Messages: 1, Device information: open.
- Electric Motor** (Standort: Production hall 10, Hostname/IP: http://192.168.10.99:80): Status: Device connected, Notifications: 152, Messages: 1, Device information: open.
- Centrifugal pump** (Standort: Production hall 10, Hostname/IP: http://192.168.10.55:80): Status: Device connected, Notifications: 5, Messages: 1, Device information: open.

The sidebar on the left includes the following links:

- Dashboard
- Settings
- Connected Devices
- Visualization
- BCM Assistant

A help icon with an 'i' is located in the top right corner of the dashboard area.

Expandable IO-Link ports
Expand the number of IO-Link ports with up to five additional IO-Link masters, each with 8 ports.

Multi-CMTK
Display and access multiple CMTKs via a central dashboard.

Daisy-Chain
For easy cabling, you can daisy-chain multiple CMTK modules and IO-Link masters in a row.



CMTK

Quick and easy integration – perfect data source for your IT systems

MQTT

Authentication and Connection Safety

- Secure port 8883 enabled (TLS encrypted)
- Unsecure port 1883 enabled
- No authentication required (via port 8883 / 1883)

Standard user: user

Password *

MQTT Topics

balluff/cmtk/masterX/iolink/devices

deviceAlias

events

units

data

fromdevice

Quality of Service: At most once (QoS 0)

Schema

```
{
  "data": {
    "isValid": boolean,
    "items": {
      "pd_name1: number | boolean | string | number[]",
      // ...
      "pd_nameN: number | boolean | string | number[]"
    }
  },
  "timestamp: string,
  "type: string
}
```

Example

```
{
  "data": {
    "isValid":true,
    "items":{
      "Contact Temperature Contact Temperature":33.8575980698,
      "Status Bits Contact Temperature Lower Alarm Status":false,
      "Status Bits Contact Temperature Upper Alarm Status":false,
      "Status Bits Main-Alarm a-RMS Magnitude Status":false,
      "Status Bits Main-Alarm a-RMS X Status":false,
      "Status Bits Main-Alarm a-RMS Y Status":false,
      "Status Bits Main-Alarm a-RMS Z Status":false,
      "Status Bits Main-Alarm v-RMS Magnitude Status":false,
      "Status Bits Main-Alarm v-RMS X Status":false,
      "Status Bits Main-Alarm v-RMS Y Status":false,
      "Status Bits Main-Alarm v-RMS Z Status":false,
      "Status Bits Pre-Alarm a-RMS Magnitude Status":false,
      "Status Bits Pre-Alarm a-RMS X Status":false
    }
  }
}
```

CANCEL **SAVE**

- Communication with IT systems**

Send data easily and conveniently to your host systems (e.g., cloud applications, local databases) via MQTT or OPC-UA.

- Communication with the PLC**

Capture additional machine data directly from the PLC via OPC UA. Conversely, you can also provide data to the PLC.

- Versatile data**

Subscribe to process data, status information and alarms



Ordering Information

Network technology, power supply
and sensors



CMTK

Ordering information & accessories

CMTK – Condition Monitoring Toolkit

BNI00L2



1 IO-Link masters for expanding the IO-Link ports

- **BNI00L1:** 8x IO-Link, entry-level version with outstanding cost-benefit ratio
- **BNI00K6:** 8x IO-Link, with display, robust metal housing for extreme conditions



2 IO-Link hubs for the integration of analog sensors

- **BNI00AJ:** 8x analog, Voltage: 0...10 V/-10...10 V/0...5 V/-5...5 V/5...10 V, Current: 4...20 mA/ 0...20 mA, Temperature: Pt100/Pt1000/ Thermocouple Type J & K



3 Power supplies and switches

- **BAE0111:** Power supply unit for the control cabinet (3.12 A)
- **BNI0067:** Unmanaged switch with 8x Ethernet TCP 10Base-T/100Base-TX



4 Smart BCM Condition Monitoring Sensors

- **BCM0001:** Standard version with vibration and temperature
- **BCM0004:** Advanced version with vibration and temperature
- **BCM0003:** Premium version with frequency analysis

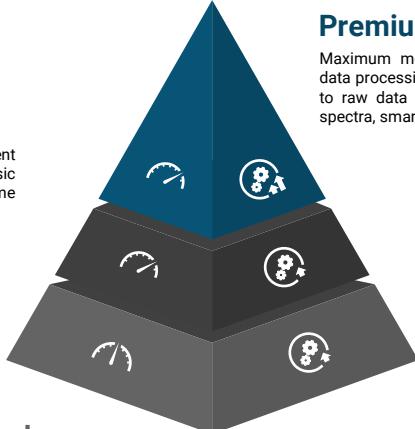


BCM Family

Always find the right solution

Advanced

Maximum measurement performance and basic data processing: time domain analysis

**Standard**

Basic measurement performance and basic data processing: Time domain analysis

Premium

Maximum measurement performance and data processing: frequency analysis, access to raw data and high-resolution frequency spectra, smart RPM input



2...1,800 Hz ($\pm 10\%$)
2...2,500 Hz (3 dB)

-25...70 °C

Vibration analysis in time domain

Get BCM0001

2...4,500 Hz ($\pm 10\%$)
2...6,000 Hz (3 dB)

-40...80 °C

Vibration analysis in time domain

Get BCM0004

2...4,500 Hz ($\pm 10\%$)
2...6,000 Hz (3 dB)

-40...80 °C

Vibration analysis in time domain

Vibration analysis in frequency domain
Smart RPM input

Access to raw acceleration data and frequency spectra

Get BCM0003

Continuous enhancement

Through new app concept





CMTK

Continuous enhancement through new app concept

1 Online App Store

Download the required app free of charge from our online platform.

[Visit our App Store](#)

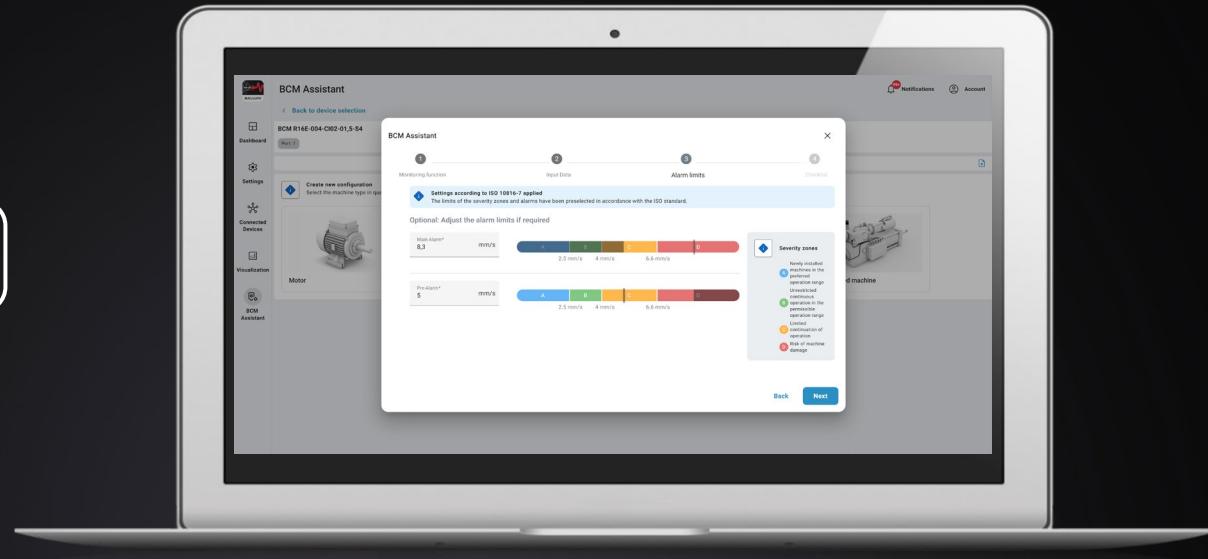
2 CMTK App Manager

Install the app on your CMTK and get started straight away.

BCM ASSISTANT



Always perfectly configured





BCM Assistant

Configure precisely for your needs with minimal effort



Perfectly configured

Customize your BCM sensors perfectly to your individual application.



Convenient to use

The intuitive user interface allows you to achieve your set-up quickly and conveniently.



Quick to implement

Complete the configuration of your BCM sensors in just a few minutes.



Versatile in use

In addition to various ISO standards for a wide range of machine types, you also have access to an extensive bearing database with more than 160,000 types.





BCM Assistant

Configure precisely for your
needs with minimal effort

BCM Assistant

BCM R16E-004-CI02-01,5-S4

Port 1

Dashboard

Settings

Connected Devices

Visualization

BCM Assistant

Back to device selection

Notifications

Account

Create new configuration

Select the machine type in question to start the assistant for configuring the sensor. The machine type can only be selected for the initial configuration and cannot be changed for additional configurations.

Motor

Pump

Fan

Compressor

User-defined machine

1 Start the assistant and select which machine type (e.g., pump) you want to monitor.



BCM Assistant

Configure precisely for your needs
with minimal effort

The screenshot shows the BCM Assistant software interface. On the left, a sidebar has icons for Dashboard, Settings, Connected Devices, Visualization, and BCM Assistant, with 'BCM Assistant' selected. The main area shows a device configuration for 'BCM R16E-004-CI02-01,5-S4' with 'Port 1' and 'Machine type: Pump'. A central modal window is open, titled 'BCM Assistant' with a step indicator '1 Monitoring function'. It lists five monitoring functions: 'ISO 10816-7' (grayed out), 'Temperature' (grayed out), 'Bearing frequencies' (selected, highlighted in blue), and 'User-defined peak' and 'User-defined RMS' (grayed out). A 'Next' button is at the bottom right of the modal. A callout at the bottom left points to the 'Temperature' option with the text '② Select a monitoring function (e.g., bearing frequencies) that the sensor should perform.'

② Select a monitoring function (e.g., bearing frequencies) that the sensor should perform.



BCM Assistant

Configure precisely for your needs
with minimal effort

The screenshot shows the BCM Assistant software interface. On the left, there is a sidebar with icons for Dashboard, Settings, Connected Devices, Visualization, and BCM Assistant. The main area is titled 'BCM Assistant' and shows a device configuration for 'BCM R16E-004-CI02-01,5-S4'. A sub-menu is open for 'BCM Assistant' with steps 1 through 4. Step 1 is 'Monitoring function', Step 2 is 'Input Data', Step 3 is 'Alarm limits', and Step 4 is 'Checklist'. Step 3 is currently active and shows a search interface for selecting a bearing. The search bar contains 'Bearing code 6002'. The results table has columns for 'Bearing code', 'Bearing type', 'Manufacturer', 'Outer', 'Width', 'Quantity of rolling elements', and a help icon. The results show various bearings from manufacturers like ZKL, KOYO, NTN, SKF, and FAG. The first result is '6002ARS' from KOYO. At the bottom of the search interface are 'Back' and 'Next' buttons. A callout at the bottom left points to the search interface with the text: '3 Select a bearing from our extensive database. With more than 160,000 types, you are sure to find the right one.'

3 Select a bearing from our extensive database. With more than 160,000 types, you are sure to find the right one.



BCM Assistant

Configure precisely for your needs
with minimal effort

The screenshot shows the BCM Assistant software interface. On the left, a sidebar has 'BCM Assistant' selected. The main area is titled 'BCM Assistant' and shows a monitoring function for 'Bearing 6002 from SKF'. A message box indicates that the bearing was selected from the database, meaning frequency factors are automatically applied. Below this, there are sections for 'Inner race', 'Outer race', and 'Rolling elements', each with a frequency factor and a frequency window setting of ± 5%. At the bottom of the main window are 'Back' and 'Next' buttons. The status bar at the bottom has a circled '4' and the text: 'You will receive an overview of the automatically set bearing frequencies (BPFI, BPFO, BSF)'.

BCM Assistant

BCM R16E-004-CI02-01,5-S4

Monitoring function

Input Data

Alarm limits

Checklist

Bearing 6002 from SKF was selected from database. You have selected a bearing from the database. This means that the frequency factors have been automatically applied and can no longer be changed.

Optional: If required, you can adjust the frequency window ⓘ

Inner race

Frequency factor* 5,4119

Frequency window ± 5 %

Outer race

Frequency factor* 3,5881

Frequency window ± 5 %

Rolling elements

Frequency factor* 2,3661

Frequency window ± 5 %

Back Next

4 You will receive an overview of the automatically set bearing frequencies (BPFI, BPFO, BSF).



BCM Assistant

Configure precisely for your
needs with minimal effort

The screenshot shows the BCM Assistant software interface. On the left is a sidebar with icons for Dashboard, Settings, Connected Devices, Visualization, and BCM Assistant. The main area shows a device configuration for 'BCM R16E-004-CI02-01,5-S4' with 'Port: 1' and 'Machine type: Pump'. A central modal window is open, titled 'BCM Assistant' with a progress bar at the top. The progress bar has four steps: 1. Monitoring function (completed), 2. Input Data, 3. Alarm limits, and 4. Checklist. Step 1 is highlighted with a green checkmark and the text 'Setup of the monitoring function completed'. Below this, it says 'Assign a name to your monitoring function.' with a text input field containing 'Application name*' and 'Bearing Pump'. It also says 'You can now upload your monitoring function directly to the sensor or create another monitoring function.' with a 'Upload monitoring function' button. Below that, it asks 'Would you like to create another monitoring function?' with a 'Create new monitoring function' link. At the bottom of the modal are 'Back' and 'Done' buttons. A large callout at the bottom left, numbered 5, says 'The configuration of your monitoring function is complete and can be uploaded to the sensor with one click.'

5 The configuration of your monitoring function is complete and can be uploaded to the sensor with one click.



BCM Assistant

Configure precisely for your needs
with minimal effort

Visualization

[Reinitialize](#)

Switch to live view

Notifications 99+

Account

Dashboard Home > Dashboards > Master 2

Alarms

port1: Ball Pass Frequency Inner Race (BPFI) X [g] | Current rotational speed [RPM]

Firing for 2s
> 1 instance

[View alert rule](#)

Dashboards

Master 1

port1 !

0.16 g
0.14 g
0.12 g
0.10 g
0.08 g
0.06 g
0.04 g
0.02 g
0 g

2500 RPM
2000 RPM
1500 RPM
1000 RPM
500 RPM

Ball Pass Frequency Inner Race (BPFI) X [g]
Ball Pass Frequency Inner Race (BPFI) Y [g]
Ball Pass Frequency Inner Race (BPFI) Z [g]
Ball Pass Frequency Outer Race (BPFO) X [g]
Ball Pass Frequency Outer Race (BPFO) Y [g]
Ball Pass Frequency Outer Race (BPFO) Z [g]
Ball Spin Frequency (BSF) X [g]
Ball Spin Frequency (BSF) Y [g]
Ball Spin Frequency (BSF) Z [g]
Current rotational speed [RPM]

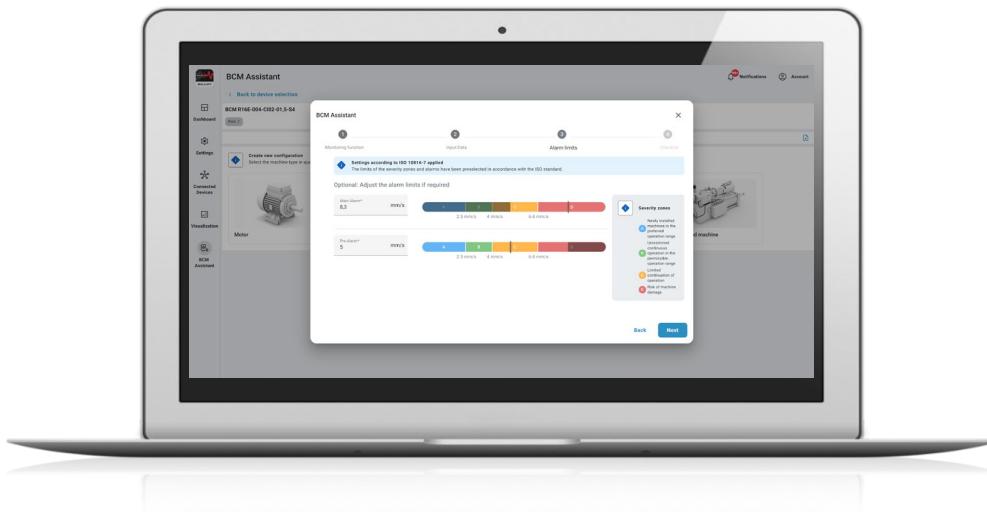
13:01:00 13:02:00 13:03:00 13:04:00 13:05:00 13:06:00 13:07:00 13:08:00 13:09:00 13:10:00

6 The sensor is perfectly configured for your application. Monitor the relevant vibration parameters.



BCM Assistant

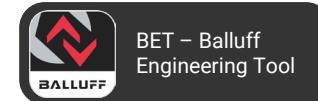
Configure precisely for your needs
with minimal effort



BCM Assistant now available!



CMTK – Condition
Monitoring Toolkit



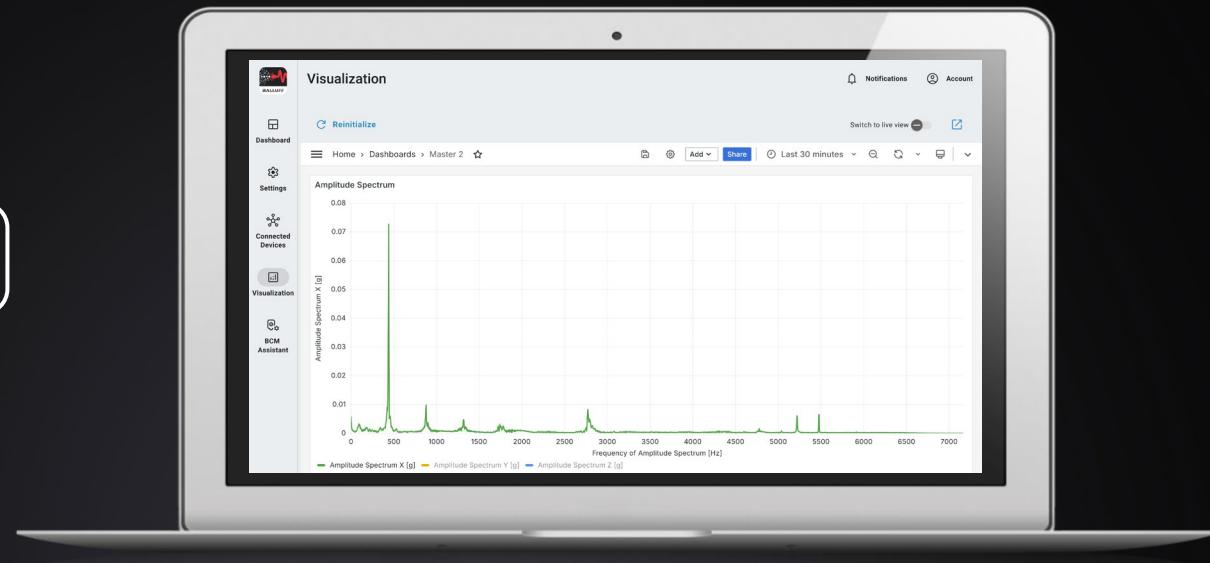
BET – Balluff
Engineering Tool



BCM VibExtract



VibExtract – Access to raw data and frequency spectra





BCM VibExtract

For full access to raw acceleration data and frequency spectra



Maximized data access

Decide for yourself which additional data should be recorded and provided by BCM Premium. Gain access to raw acceleration data and high-resolution frequency spectra.



Flexible data request

Retrieve the data packets at regular intervals (e.g., every hour) or link this to specific events.



Versatile in use

Analyze the data directly on the device or make the data packets available for downstream analyses, e.g., in the cloud.





BCM VibExtract

For full access to raw acceleration data and frequency spectra

Visualization
The raw acceleration data and frequency spectra are visualized with just one click.

Frequency spectra
Record 6 high-resolution frequency spectra (amplitude and envelope spectra) for all three measurement axes.

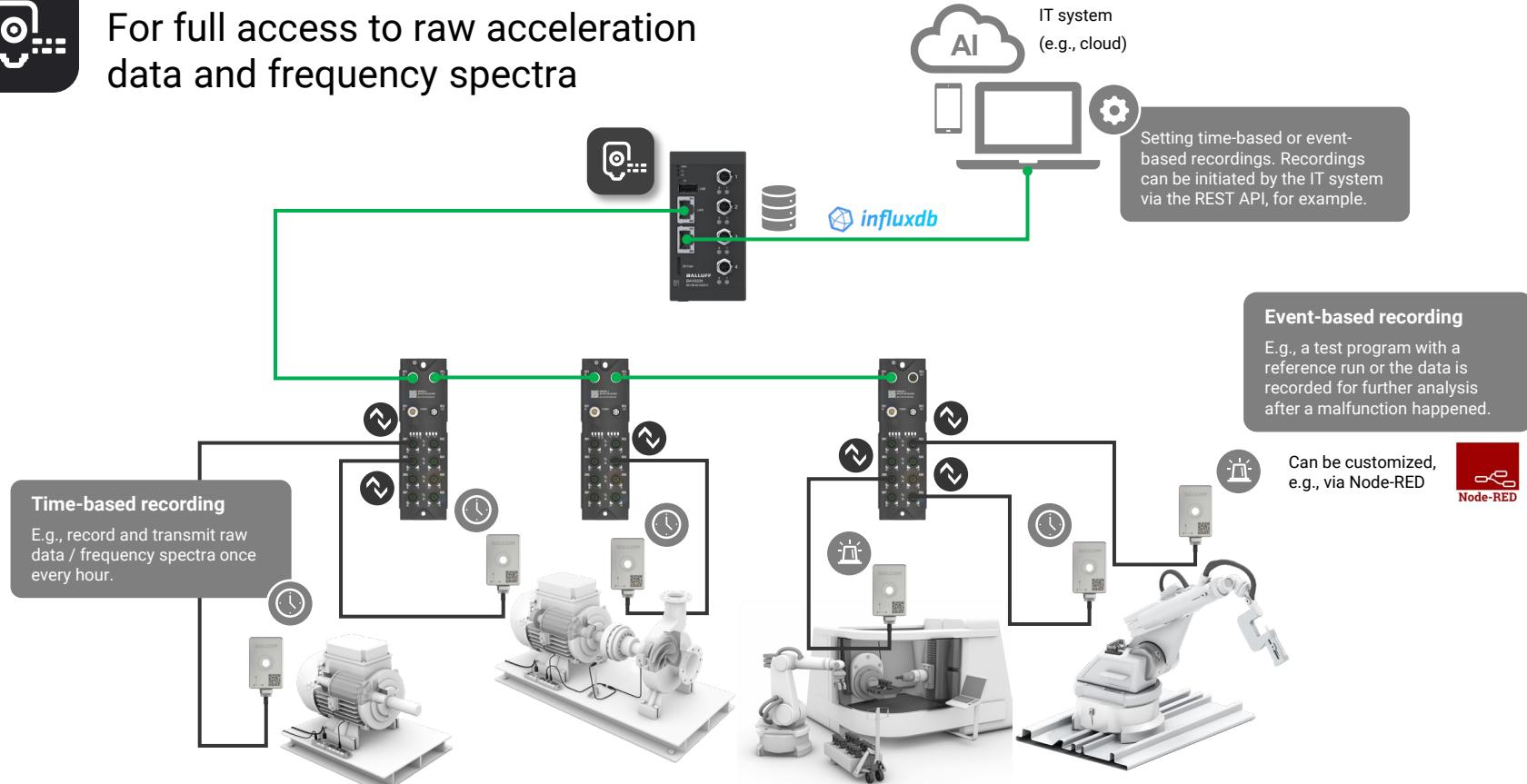
Acceleration raw data
Raw data is always recorded for 15 s. You can decide whether one (15 s), two (7.5 s / axis) or all three (5 s / axis) measurement axes are recorded.





BCM VibExtract

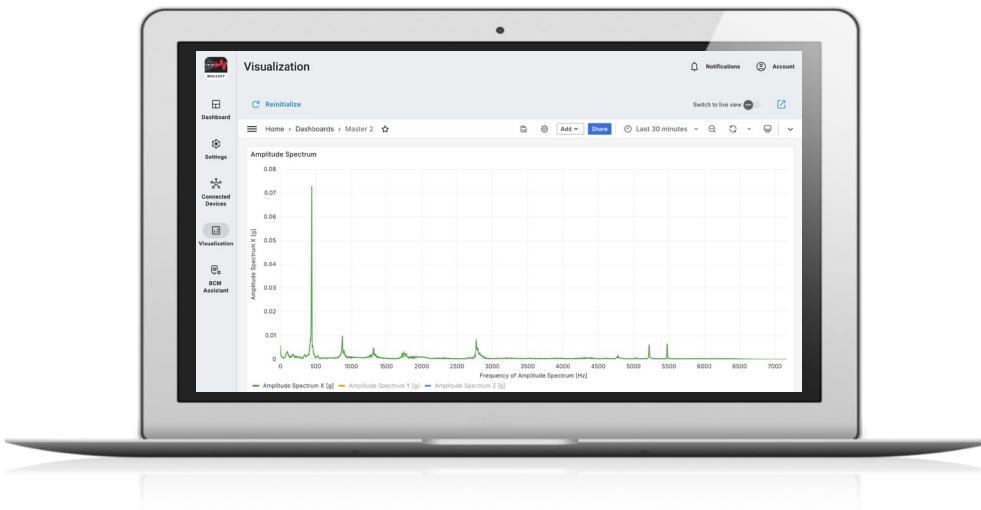
For full access to raw acceleration data and frequency spectra





BCM VibExtract

For full access to raw acceleration data and frequency spectra



BCM VibExtract
now available!



BALLUFF
A GLOBAL PROMISE.



innovating automation