CONDITION MONITORING SENSORS

Intelligent vibration analysis
for machine monitoring

An alarm that promises good things

Less unplanned downtime and more productivity

*„Our **Condition Monitoring Sensors** represent a completely new generation of intelligent sensors. Measuring vibrations and processing them directly on the device using special algorithms is a turning point in predictive maintenance.“*

Christian Seyfried, Product Manager

BCM Family

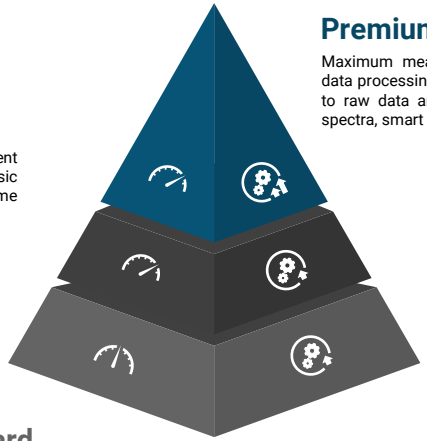
Always find the right solution

Premium

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

Advanced

Maximum measurement performance and basic data processing: time domain analysis



Standard

Basic measurement performance and basic data processing: Time domain analysis

Standard	Advanced	Premium
$420	$480	$530
		
2…1,800 Hz (±10 %) 2…2,500 Hz (3 dB)	2…4,500 Hz (±10 %) 2…6,000 Hz (3 dB)	2…4,500 Hz (±10 %) 2…6,000 Hz (3 dB)
-25…70 °C	-40…80 °C	-40…80 °C
Vibration analysis in time domain	Vibration analysis in time domain	Vibration analysis in time domain
		Vibration analysis in frequency domain
		Smart RPM input
		Access to raw acceleration data and frequency spectra
Get BCM0001	Get BCM0004	Get BCM0003

BCM Family

Key points at a glance

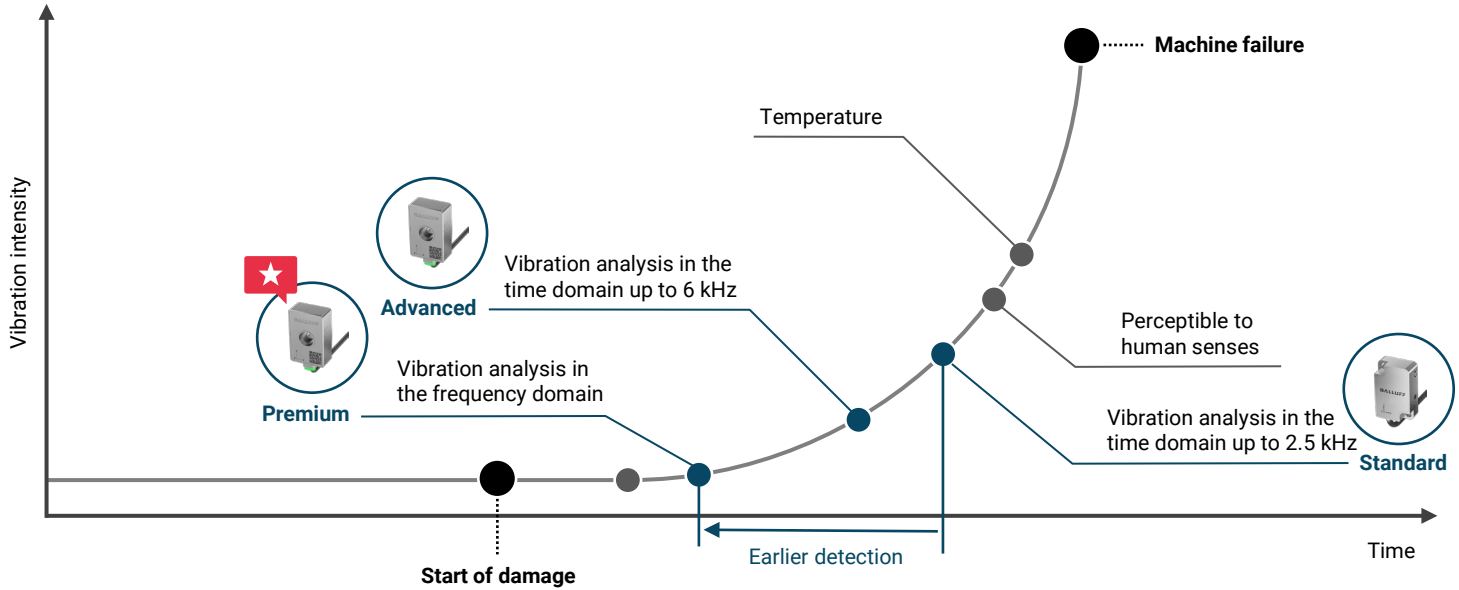
Properties	Advanced / Premium	Standard
		
Measurement performance	2…4,500 Hz (±10 %) 2…6,000 Hz (3 dB) ★★★	2…1,800 Hz (±10 %) 2…2,500 Hz (3 dB) ★★☆
Operating temperature	-40…80 °C ★★☆	-25…70 °C ★☆☆
Communication interface	IO-Link + SIO ★★★	IO-Link ★★☆
Data transmission	Up to 24 process values simultaneously ★★★	4 process values simultaneously ★★☆
Data preprocessing		
Vibration time domain	RMS, Peak, Max, Crest Factor, Skewness, Kurtosis ★★★	RMS, Peak, Max, Crest Factor, Skewness, Kurtosis ★★★
*Vibration frequency domain	Amplitude spectrum, envelope spectrum NEW	⊖
***Raw recording**	15 s acceleration raw data, amplitude and envelope spectra for all 3 measurement axes NEW	⊖

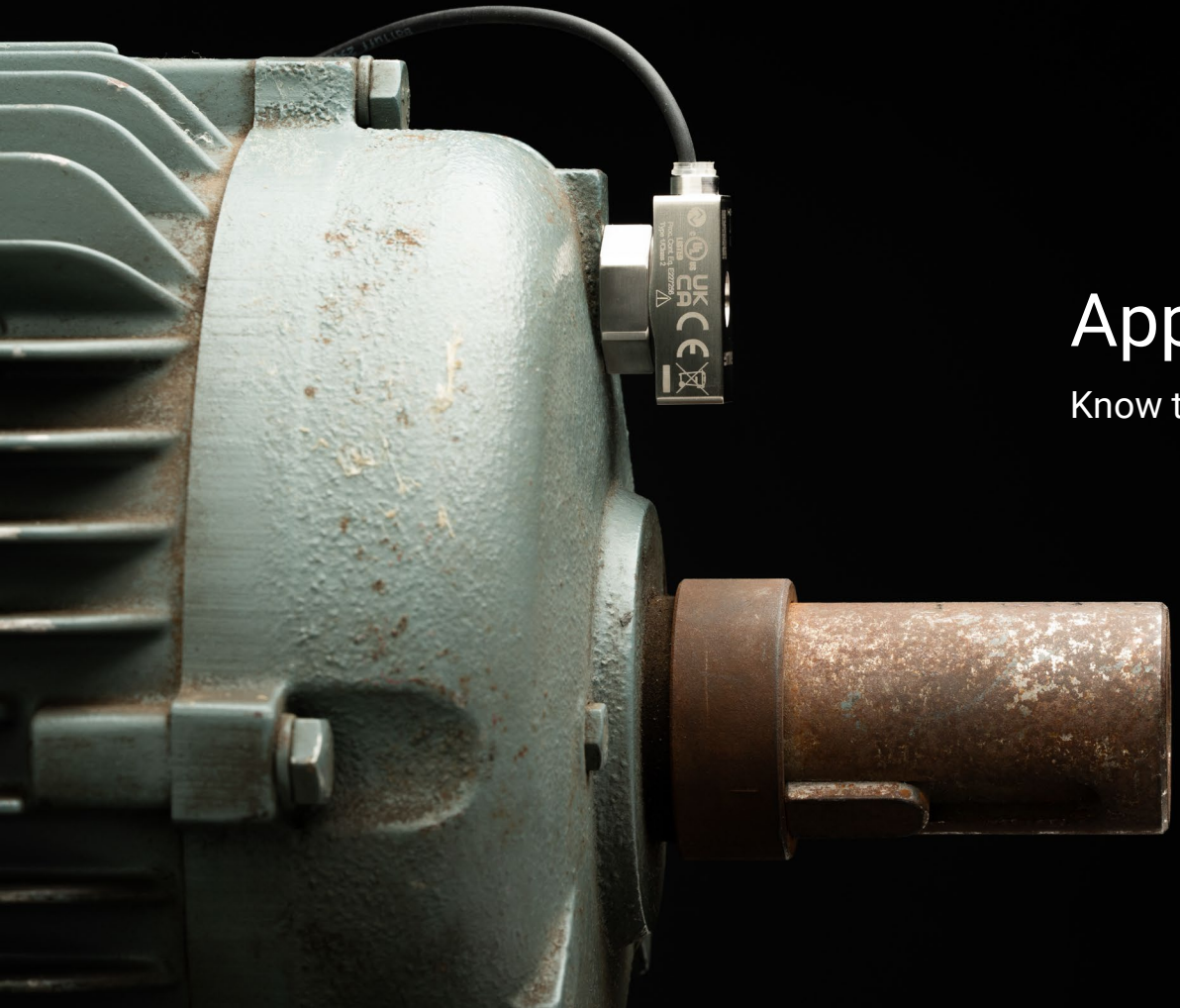
*These functions are only available in the Premium Line!

BCM Family

Detect bearing damage early and accurately

Bearing damage can be detected early and reliably through vibration analysis in the frequency domain – long before values rise in the time domain. For high precision bearing requirements, long replacement part lead times, or high failure costs, the BCM Premium Line is the ideal option.



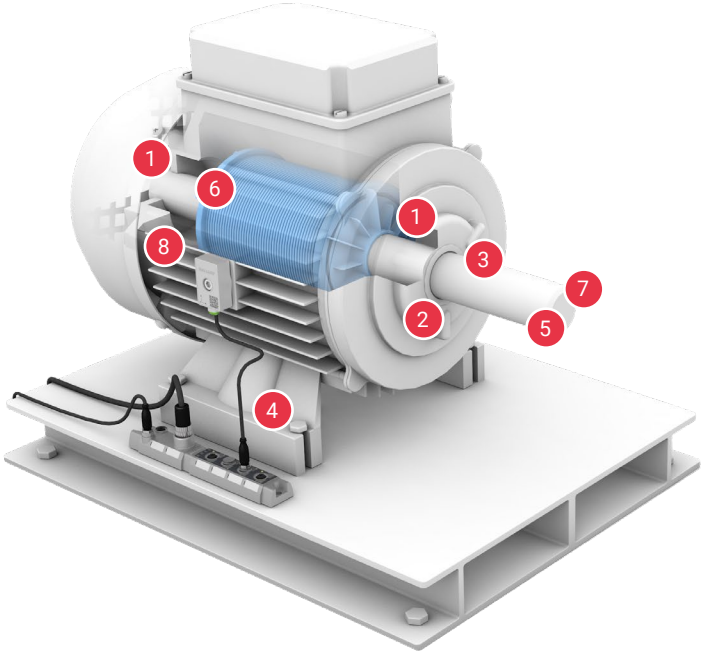


Applications

Know the condition of your equipment

BCM Family

Stay on top of your motor’s condition



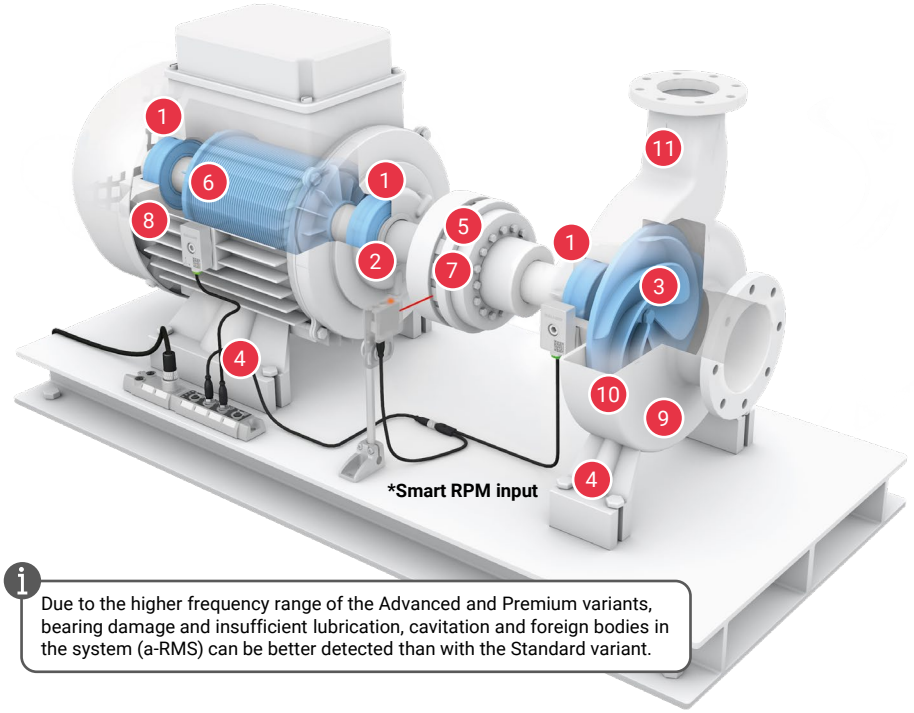
1. Bearing damage (a-Peak, Crest Factor, *bearing frequencies)
2. Lack of lubrication, friction (a-RMS, temperature)
3. Imbalance (v-RMS, *rotation frequency)
4. Loosening (v-RMS)
5. Misalignment (v-RMS)
6. Electrical failures (rotor/stator) (v-RMS, temperature)
7. Coupling wear (v-RMS)
8. Resonance (v-RMS, *resonant frequencies)

Due to the higher frequency range of the Advanced and Premium variants, bearing damage and insufficient lubrication (a-RMS) can be better detected than with the Standard variant.

BCM Family

Keep your pump’s performance in check

1. Bearing damage (a-Peak, Crest Factor, ***bearing frequencies**)
2. Lack of lubrication, friction (a-RMS, temperature)
3. Imbalance (v-RMS, ***rotation frequency**)
4. Loosening (v-RMS)
5. Misalignment (v-RMS)
6. Electrical failures (rotor/stator) (v-RMS, temperature)
7. Coupling wear (v-RMS)
8. Resonance (v-RMS)
9. Cavitation (a-Peak, Crest Factor, ***frequency analysis**)
10. Flow fluctuation (v-RMS, ***resonant frequencies**)
11. Contamination (a-Peak)

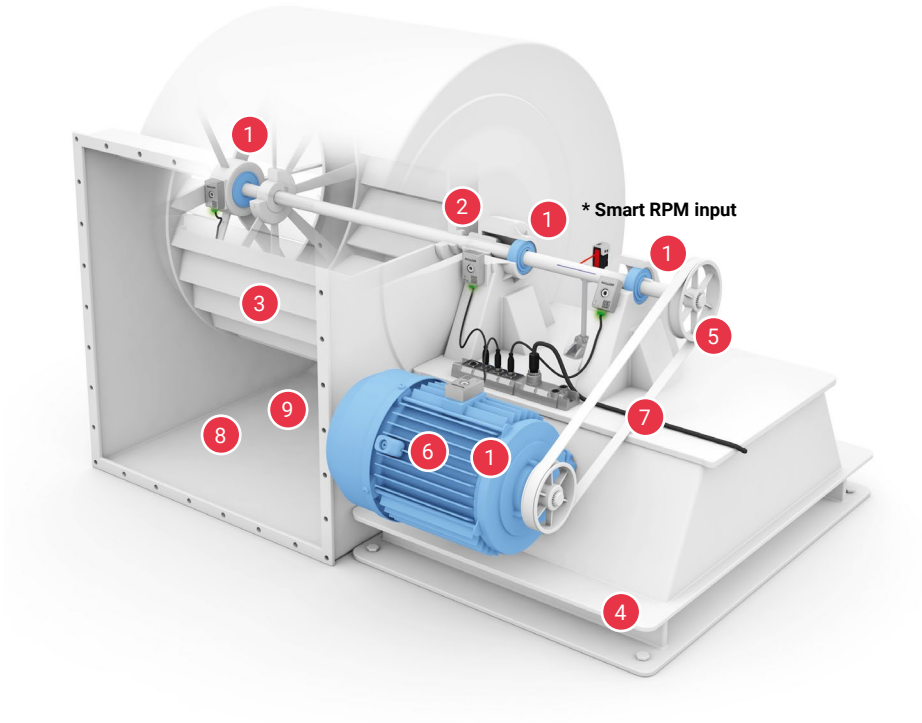


Due to the higher frequency range of the Advanced and Premium variants, bearing damage and insufficient lubrication, cavitation and foreign bodies in the system (a-RMS) can be better detected than with the Standard variant.

BALLUFF

BCM Family

Track your fan’s health with ease



1. Bearing damage (a-Peak, Crest Factor, ***bearing frequencies**)
2. Lack of lubrication, friction (a-RMS, temperature)
3. Imbalance (v-RMS, ***rotation frequency**)
4. Loosening (v-RMS)
5. Misalignment (v-RMS)
6. Electrical failures (rotor/stator) (v-RMS, temperature)
7. Belt damage (v-RMS)
8. Flow fluctuation (v-RMS, ***resonant frequencies**)
9. Contamination (a-Peak)

Standard	Advanced	*Premium
		

Due to the higher frequency range of the Advanced and Premium variants, bearing damage, insufficient lubrication and contamination (a-RMS) can be better detected than with the Standard variant.

Product highlights

BCM Advanced / Premium

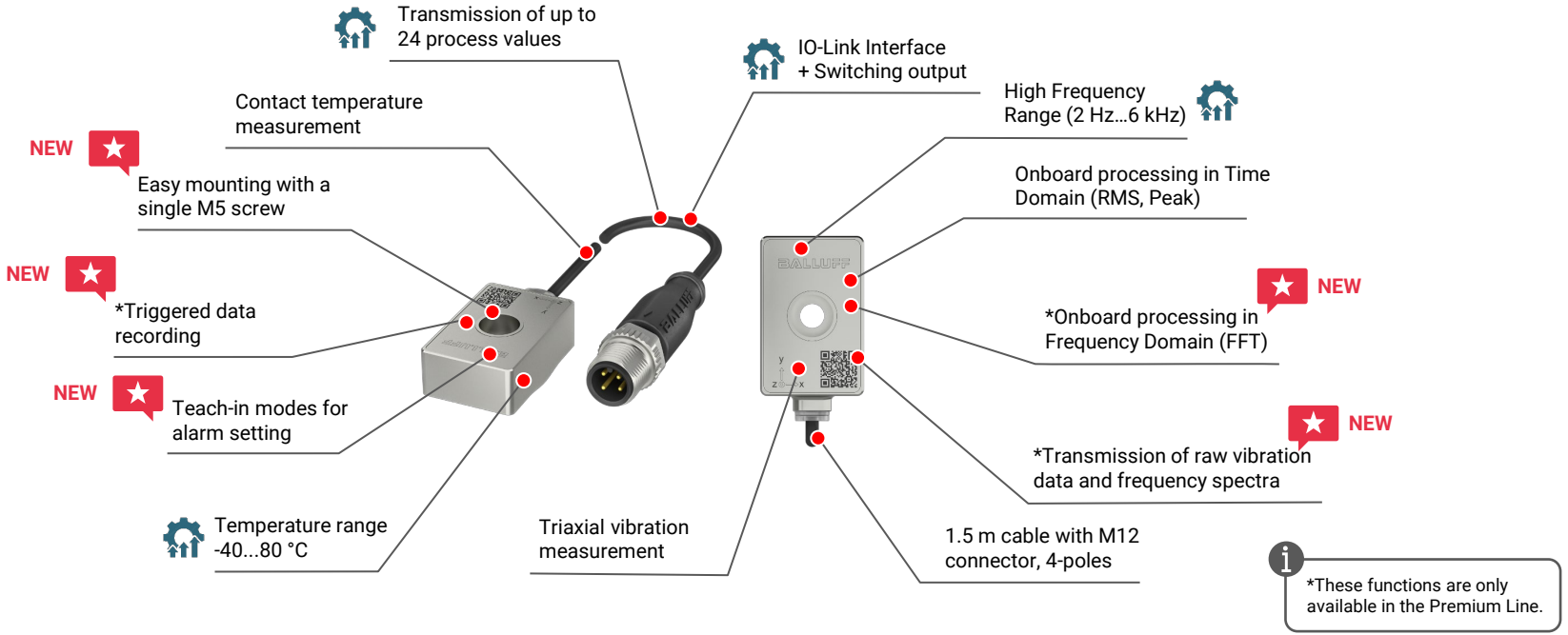
BCM Advanced / Premium

Sets new standards for condition monitoring

- Detect potential machine downtimes at the earliest possible stage.
- Utilize specialized algorithms, such as frequency analysis (FFT) for bearing diagnostics, to reliably identify critical conditions.
- Benefit from the high performance of vibration measurement to better detect high-frequency critical phenomena.
- The innovative housing concept allows for easy, quick, and safe installation – especially as a retrofit solution.
- Take advantage of access to raw acceleration data and high-resolution frequency spectra for individual analysis.

BCM Advanced / Premium

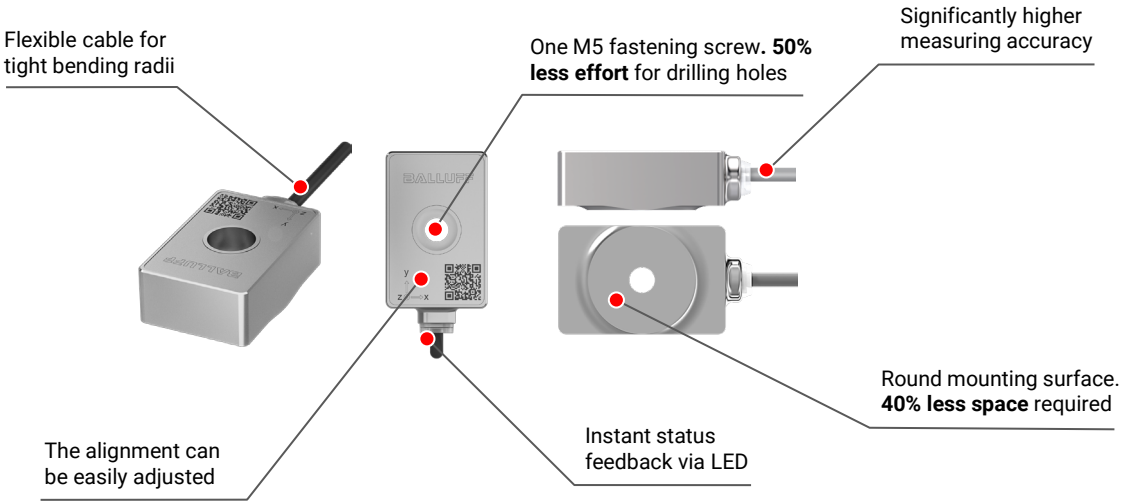
All functions at a glance



BCM Advanced / Premium

Designed for simplicity – installed in no time

Click here for more details!



BALLUFF

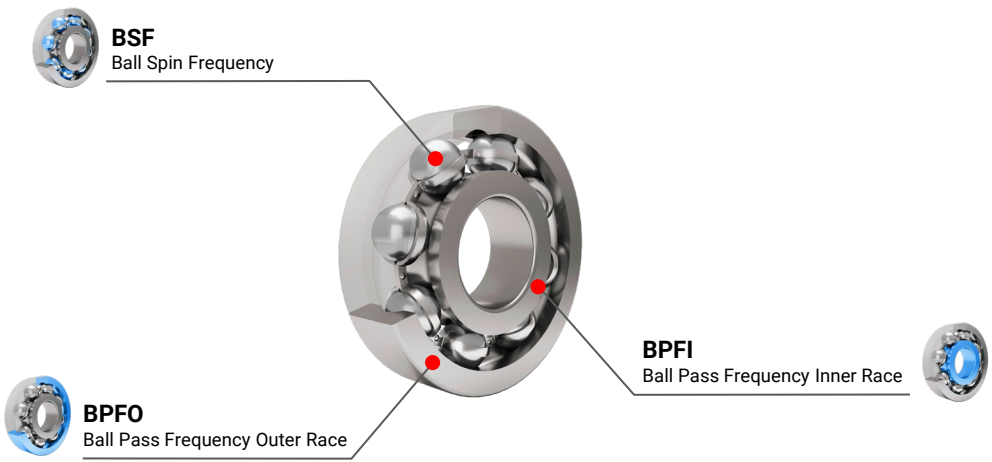
Deep Dive

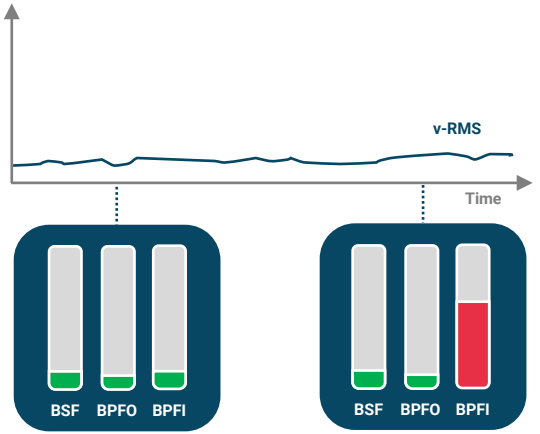
Bearing monitoring with BCM Premium

BCM Premium

Keeping Track of Bearing Frequencies

When a rolling bearing rotates, the various bearing components rotate at different frequencies. A ball, for example, completes several full rotations during one complete revolution of the inner race. The relevant frequencies are continuously monitored and if one of the characteristic values changes over time, bearing damage can be clearly identified – and long before it has serious consequences.

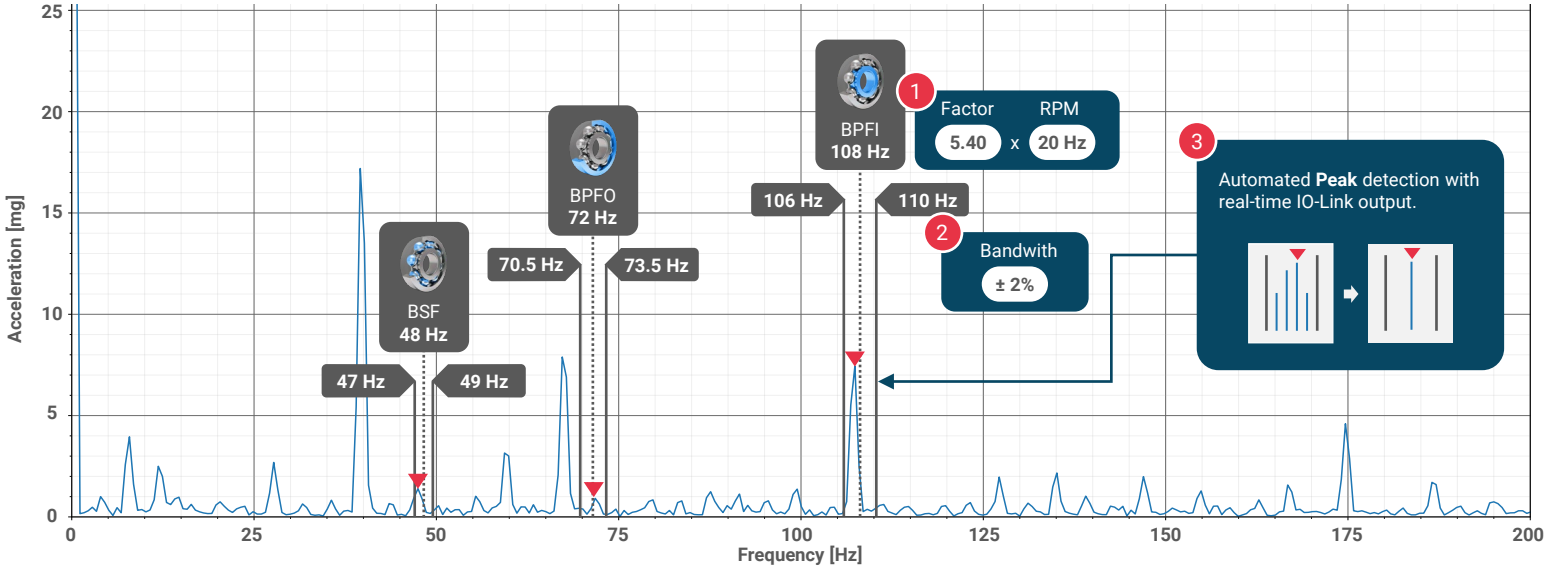




BCM Premium

Evaluation of the envelope spectrum (e-FFT)

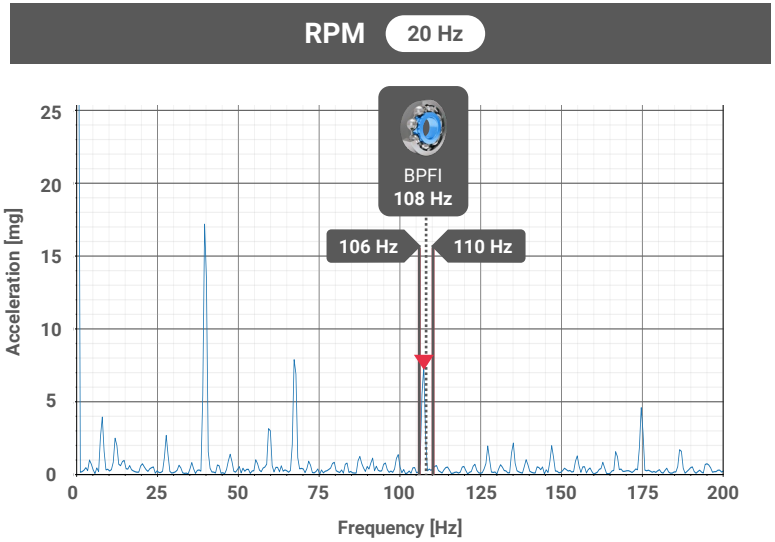
The frequency factors for BSF, BPFI, and BPFO are derived from the bearing geometry and can be uploaded to the sensor. By combining them with the current rotational speed, the bearing frequencies are dynamically calculated. These frequency factors can be configured using our BCM Assistant, which features a comprehensive bearing database with more than 160,000 entries.

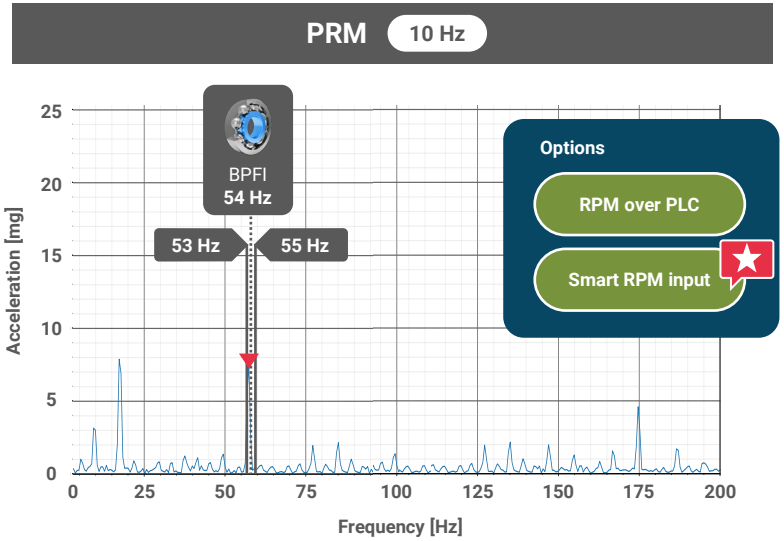


BCM Premium

Automatic adjustment of frequency bands

To ensure the sensor always monitors the correct frequencies, it must know the current rotational speed. With this information, the sensor can dynamically adjust the frequency bands, ensuring that valid data is continuously provided.



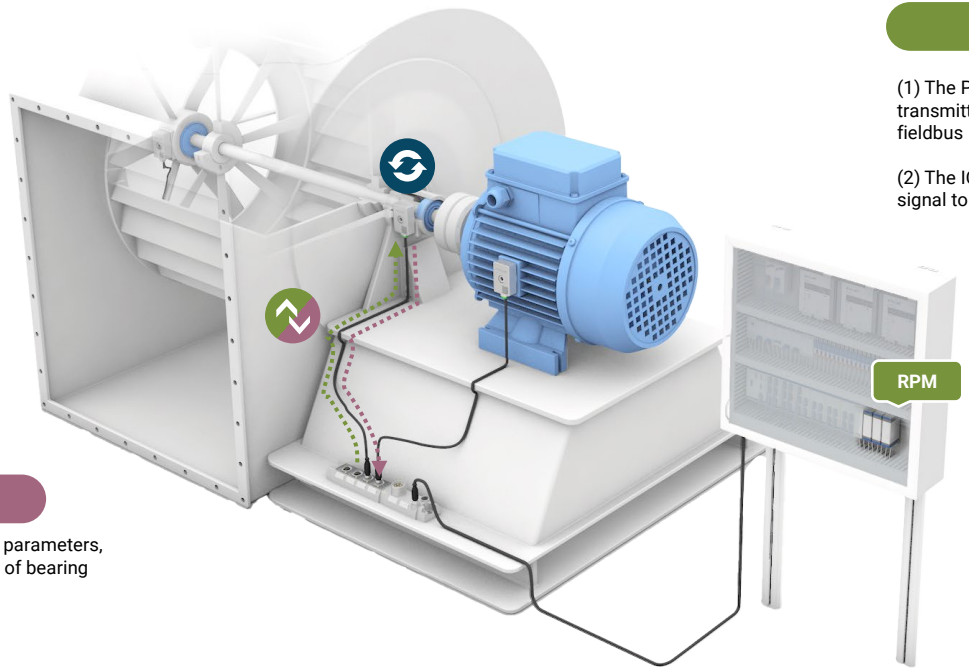


BCM Premium

The PLC sets the pace – RPM input via IO-Link

Onboard processing

(3) The BCM performs RPM-dependent data processing



External RPM input

(1) The PLC provides the RPM, which is transmitted to the IO-Link master over the fieldbus

(2) The IO-Link master transmits the RPM signal to the BCM over IO-Link

IO-Link communication

(4) Transmission of vibration parameters, such as characteristic values of bearing frequencies, via IO-Link

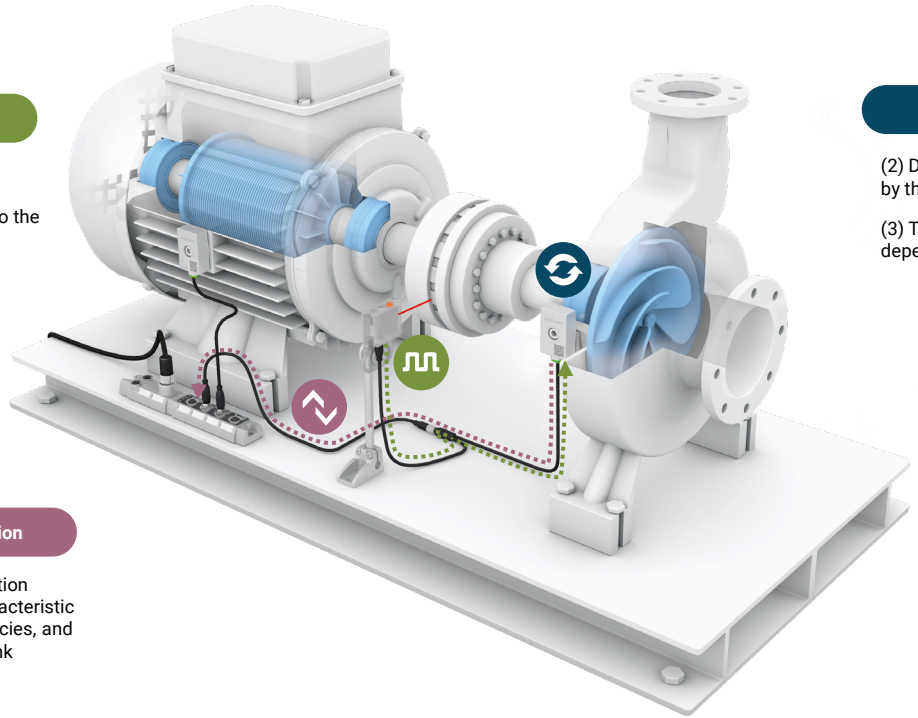
Click here for more details!

BCM Premium

Sensors work together – Smart RPM input

External RPM input

(1) Transmission of the pulse signal from any binary sensor with PNP or push-pull switching output directly to the BCM



Onboard processing

(2) Determination of the RPM by the BCM

(3) The BCM performs RPM-dependent data processing

IO-Link communication

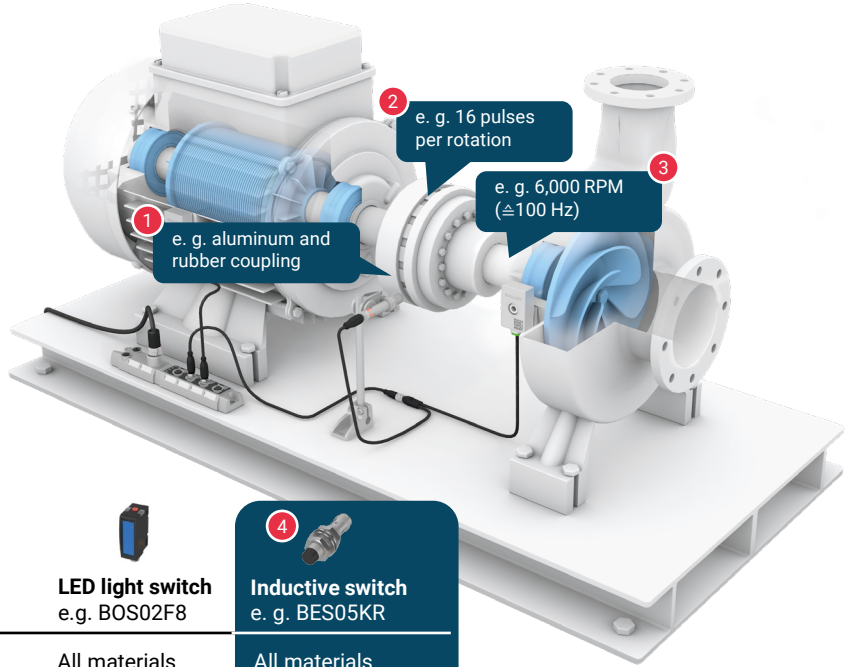
(4) Transmission of vibration parameters, such as characteristic values of bearing frequencies, and the current RPM via IO-Link

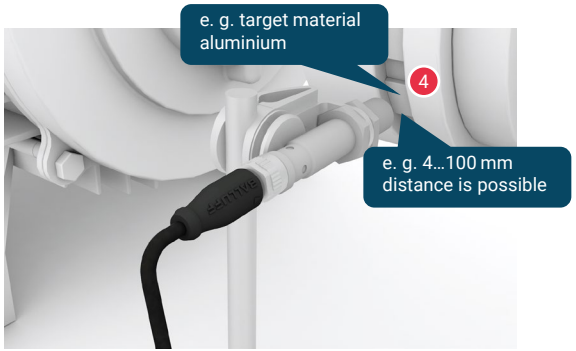
Click here for more details!

BCM Advanced / Premium

Smart RPM input – find the right sensor

1. Identify a suitable position on the drive shaft of the bearing to generate an RPM-dependent pulse signal.
   Note: couplings, shafts, gears, impellers, fan wheels
2. Define the number of switching pulses per revolution.
3. Determine the maximum rotational speed of the drive shaft.
4. Check the conditions of the specific installation situation and select a suitable sensor technology.





	Contrast sensor e. g. BOS02EM	LED light switch e.g. BOS02F8	4 Inductive switch e. g. BES05KR
Target	All materials	All materials	All materials
Range	≤ 250 mm	≤ 200 mm	≤ 8 mm
Rate	4,000 Hz	700 Hz	2,000 Hz

16 pulses x 100 Hz
Min. measuring rate = **1,600 Hz**

Ordering Information

Sensors, mounting accessories,
network technology

BCM Family

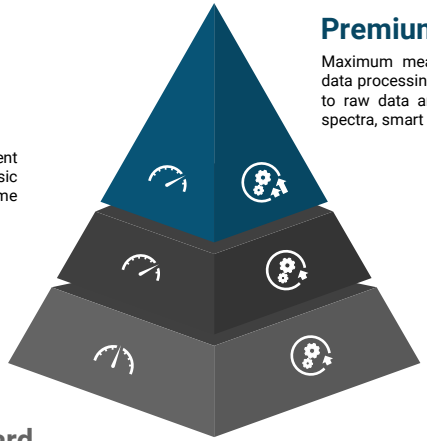
Always find the right solution

Premium

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

Advanced

Maximum measurement performance and basic data processing: time domain analysis



Standard

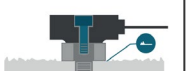
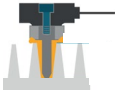
Basic measurement performance and basic data processing: Time domain analysis

Standard	Advanced	Premium
$420	$480	$530
		
2…1,800 Hz (±10 %) 2…2,500 Hz (3 dB)	2…4,500 Hz (±10 %) 2…6,000 Hz (3 dB)	2…4,500 Hz (±10 %) 2…6,000 Hz (3 dB)
-25…70 °C	-40…80 °C	-40…80 °C
Vibration analysis in time domain	Vibration analysis in time domain	Vibration analysis in time domain
		Vibration analysis in frequency domain
		Smart RPM input
		Access to raw acceleration data and frequency spectra
Get BCM0001	Get BCM0004	Get BCM0003

BALLUFF

BCM Family

Mounting made easy – Find the right accessory

Criteria	Screw mounting	Screw-in adapter	Adhesive mounting	Adhesive adapter	Cooling fin adapter	Magnetic mounts
						
No additional threaded mounting hole required	✗	✓	✓	✓	✓	✓
Uneven mounting surfaces acceptable	✗	✗	✓	✓	✓	✗
Easy to apply on curved surfaces	✗	✗	✓	✓	✗	✓
Re-alignment of measurement axes possible afterwards	✓	✓	✗	✓	✓	✓
Non-destructive removal in case of replacement	✓	✓	✗	✓	✓	✓
No impact on measurement accuracy	✓	✓	✓	✓	✗	✗
No additional mounting accessories required	✓	✓	✗	✗	✗	✓

BALLUFF

BCM Family

Mounting Accessories for Standard Line

BCM – Condition Monitoring Sensors

Standard

BCM0001: Standard version with vibration and temperature

Advanced

BCM0004: Advanced version with vibration and temperature

Premium

BCM0003: Premium version with integrated frequency analysis

Choose the appropriate mounting accessories for your sensors.

1 Magnetic mounts

- **BAM03FA:** Magnetic mount for flat surfaces

2 Screw-in adapters

- **BAM04A1:** Adapter to M5
- **BAM04A2:** Adapter to M6
- **BAM04A3:** Adapter to M8
- **BAM04A4:** Adapter to M10

3 Adhesive adapters

- **BAM03HF:** Adapter for flat surfaces
- **BAM04K4:** Cooling fins S
- **BAM04K5:** Cooling fins M
- **BAM04K6:** Cooling fins L

BALLUFF

BCM Family

Mounting Accessories for Advanced & Premium Line

BCM – Condition Monitoring Sensors

Standard

BCM0001: Standard version with vibration and temperature

Advanced

BCM0004: Advanced version with vibration and temperature

Premium

BCM0003: Premium version with integrated frequency analysis

Choose the appropriate mounting accessories for your sensors.

1 Magnetic mounts

- **BAM049U:** Magnetic mount for flat surfaces
- **BAM04L6:** Magnetic mount for curved surfaces

2 Screw-in Adapters

- **BAM049N:** Adapter to M6
- **BAM049P:** Adapter to M8
- **BAM049R:** Adapter to M10
- **BAM049T:** Adapter to M12

3 Adhesive adapters

- **BAM049J:** Adapter for flat surfaces
- **BAM049K:** Cooling fins S
- **BAM049L:** Cooling fins M
- **BAM049M:** Cooling fins L

BCM Family

Accessories for Smart RPM input

BCM – Condition Monitoring Sensors

Standard

BCM0001: Standard version with vibration and temperature

Advanced

BCM0004: Advanced version with vibration and temperature

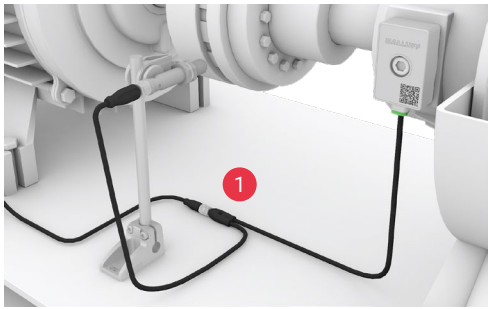
Premium

BCM0003: Premium version with integrated frequency analysis

Use the following accessories for Smart RPM input.

1 Y-connector for RPM input

- **BCC0K6M:** 0.3m/0.6m
- **BCC0K6N:** 0.3m/1.0m
- **BCC0K6P:** 0.6m/1.0m
- **BCC0K6R:** 1.0m/2.0m



2 Sensors for RPM measurement

- **BES05KR:** Inductive switch (2,000 Hz)
- **BOS02F8:** Photoelectric sensor (700 Hz)
- **BOS02EM:** Contrast sensor (4,000 Hz)

BALLUFF

BCM Family

Integration made easy – The perfect network solution

BCM – Condition Monitoring Sensors

Standard

BCM0001: Standard version with vibration and temperature

Advanced

BCM0004: Advanced version with vibration and temperature

Premium

BCM0003: Premium version with integrated frequency analysis

Choose a network solution that fits your application.

1 IO-Link Master for integration into control systems

- **Black Line:** The core solution with a strong price-performance ratio.
  e.g., **BNI00L3**

- **Silver Line:** Focused on specialized applications requiring extra robustness.
  e.g., **BNI00K6**

- **Washdown Line:** Designed for applications in IP69K environments.
  e.g., **BNI00HZ**

2 CMTK – Condition Monitoring Toolkit for IT integration

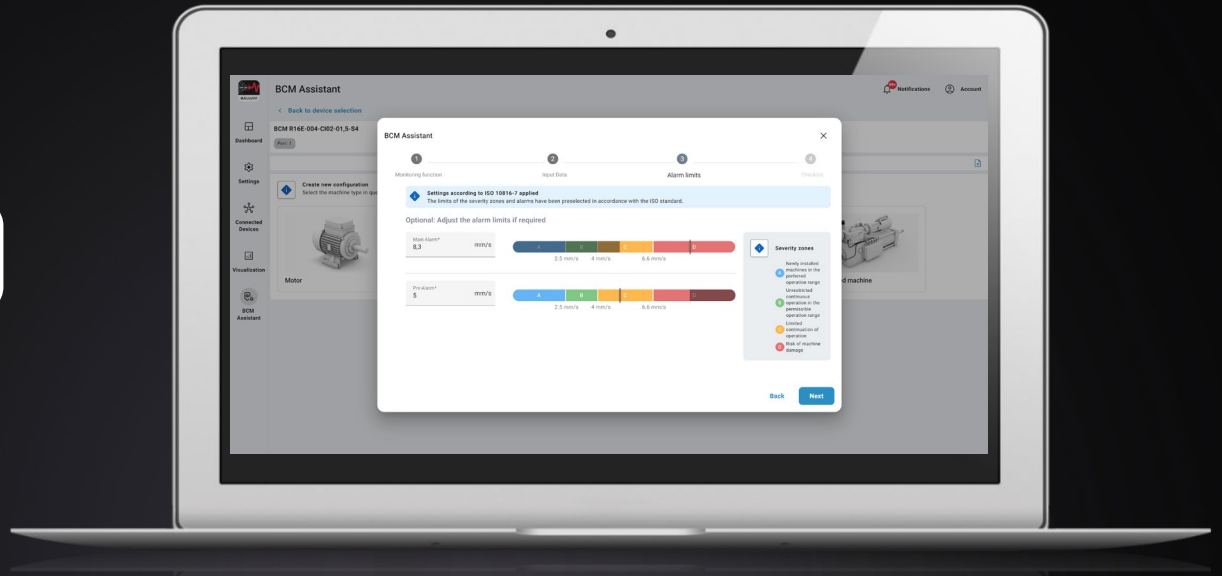
- **BNI00L2**: Edge gateway with 4x IO-Link, expandable up to 40x IO-Link via a maximum of 5 IO-Link Masters.

Can be combined with 1. Choose between Black, Silver, and Washdown Line.

BALLUFF

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.

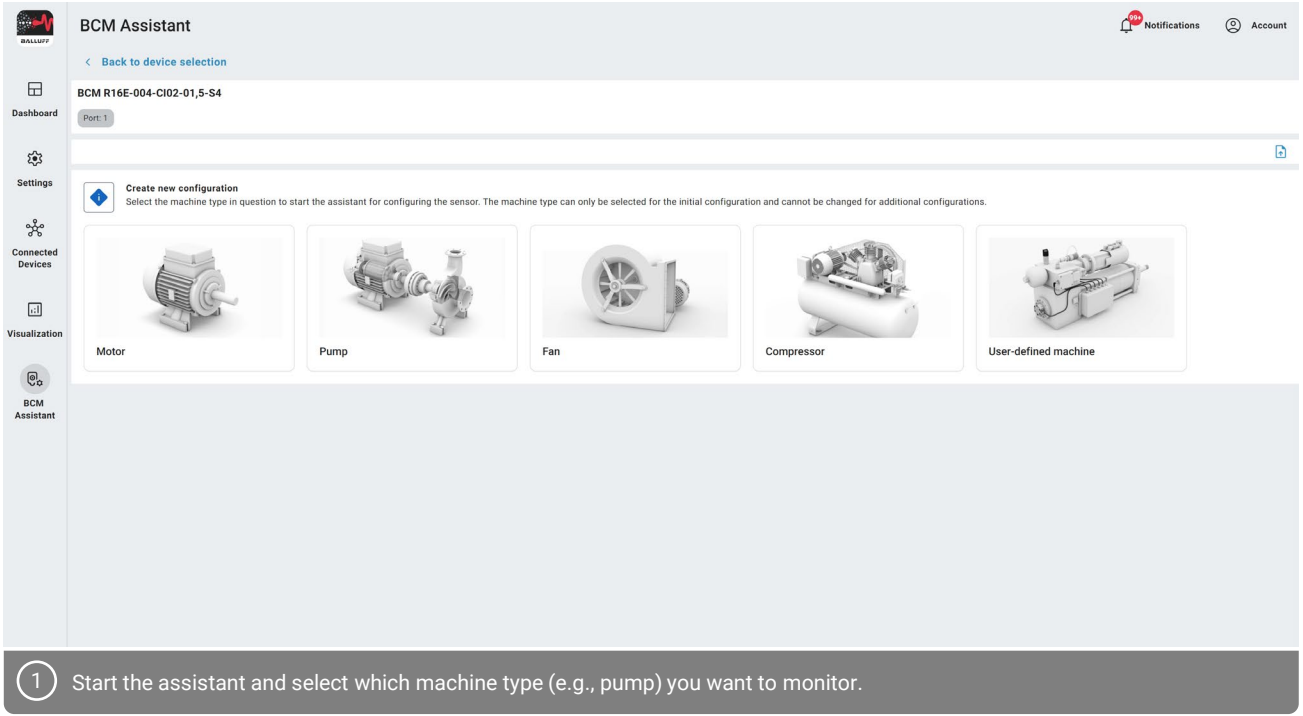
Convenient to use
The intuitive user interface allows you to achieve your set-up quickly and conveniently.

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

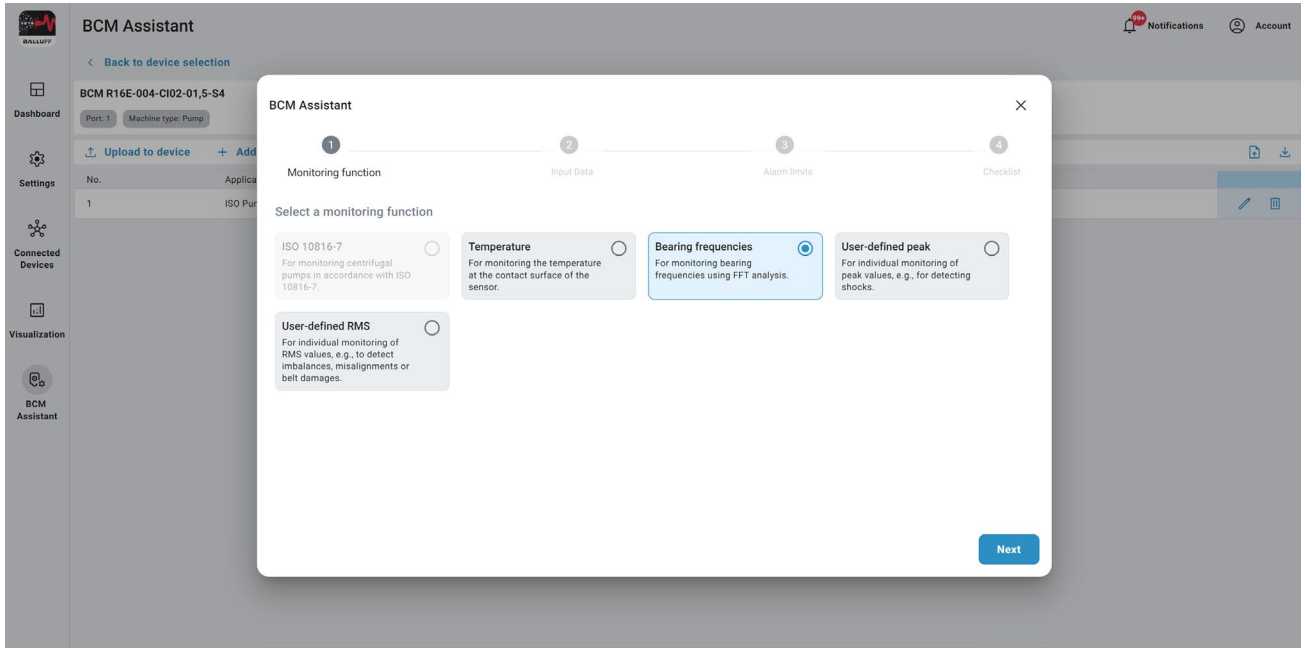
Configure precisely for your needs with minimal effort



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

BCM Assistant

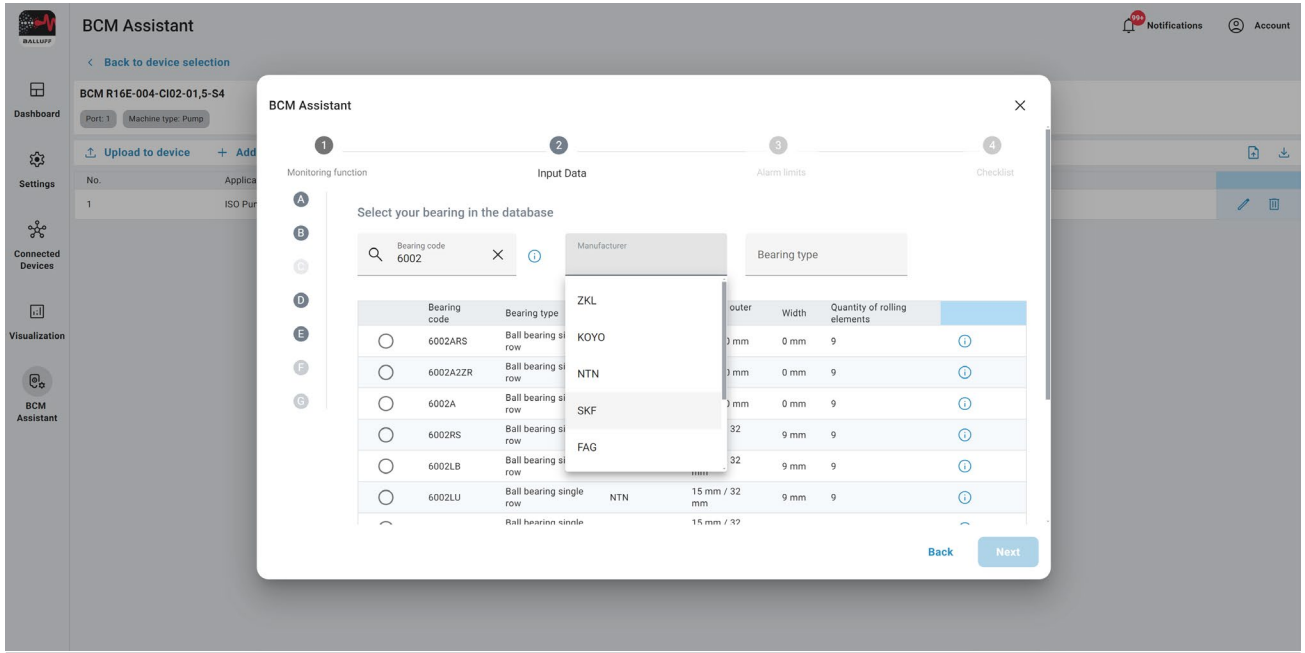
Configure precisely for your needs with minimal effort



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

BCM Assistant

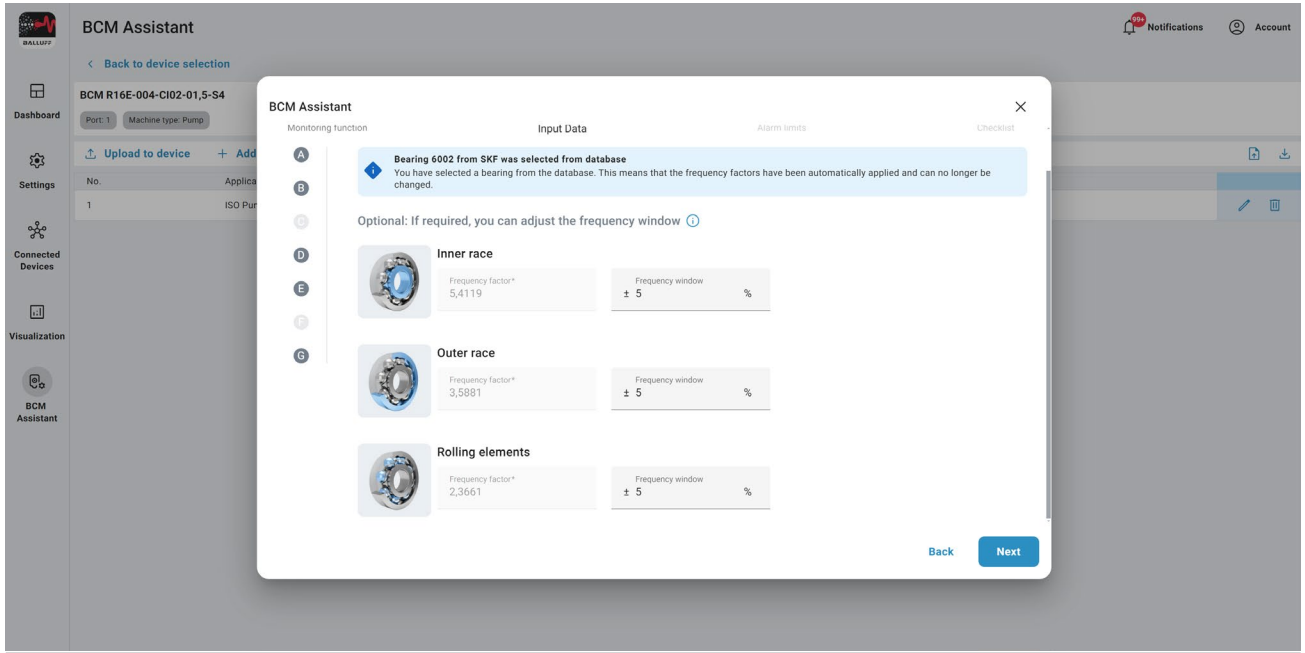
Configure precisely for your needs with minimal effort



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

BCM Assistant

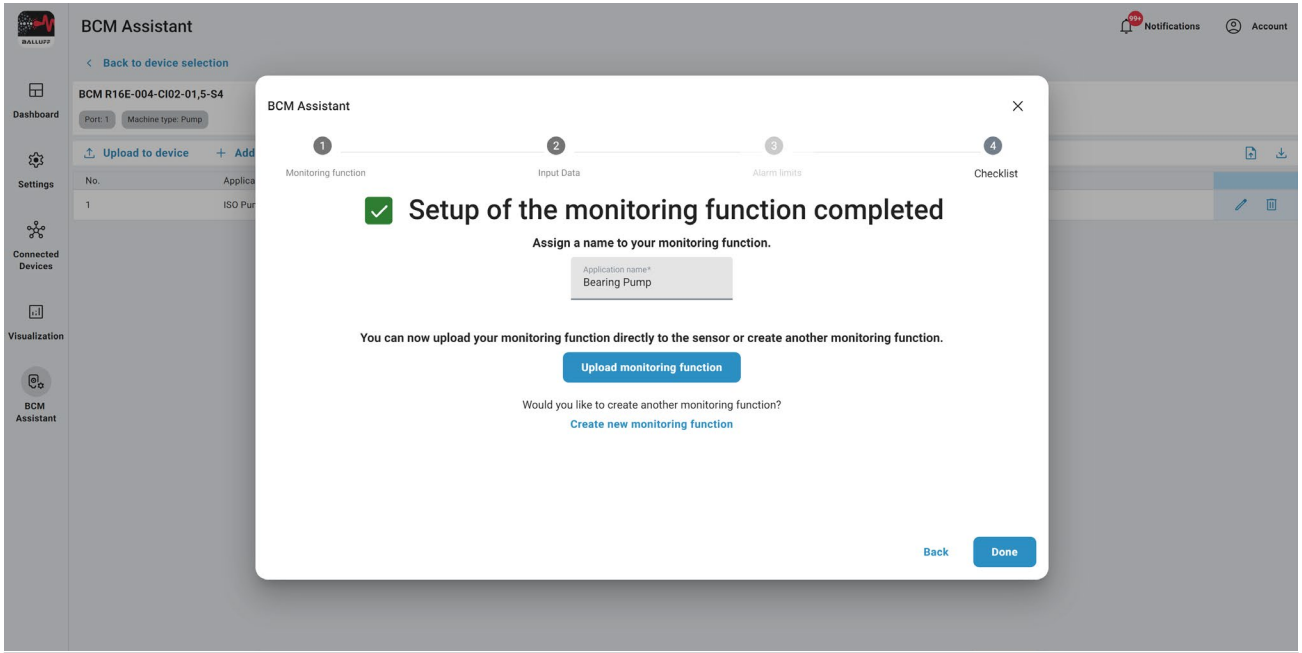
Configure precisely for your needs with minimal effort



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

BCM Assistant

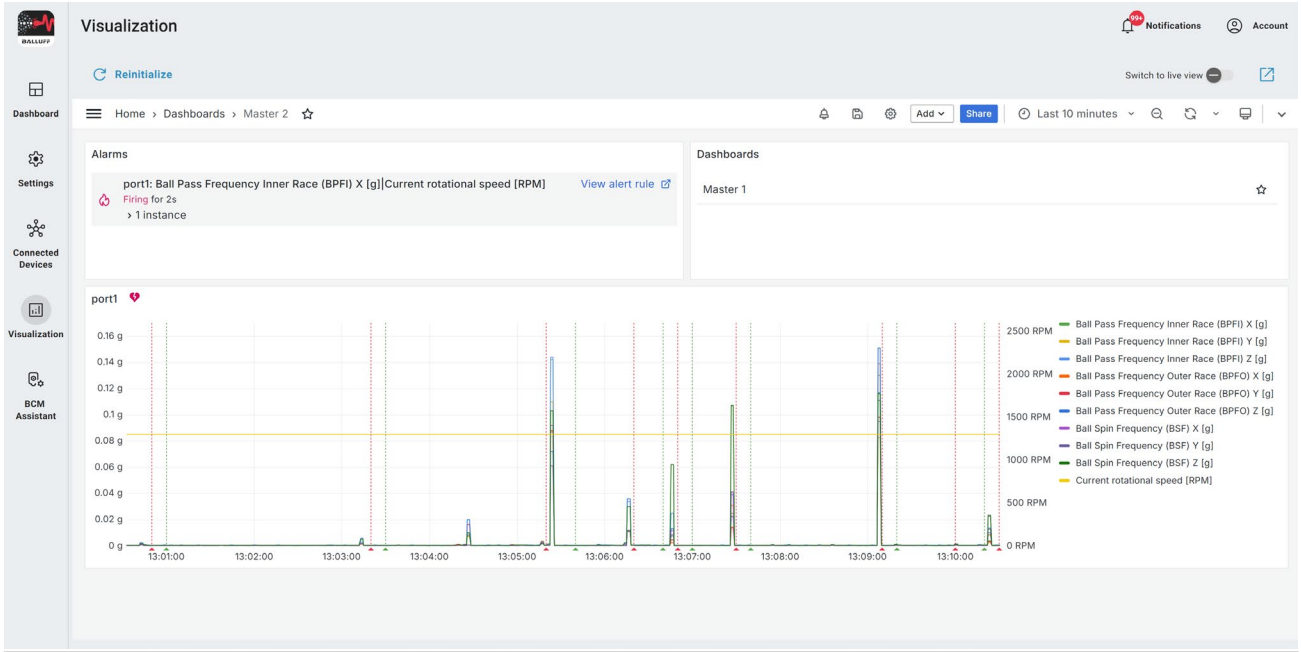
Configure precisely for your needs with minimal effort



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

BCM Assistant

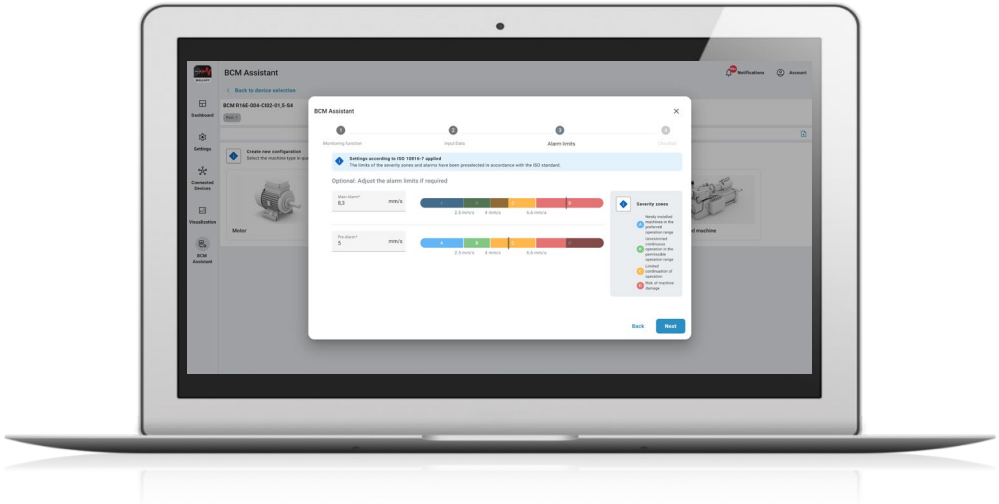
Configure precisely for your needs with minimal effort



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

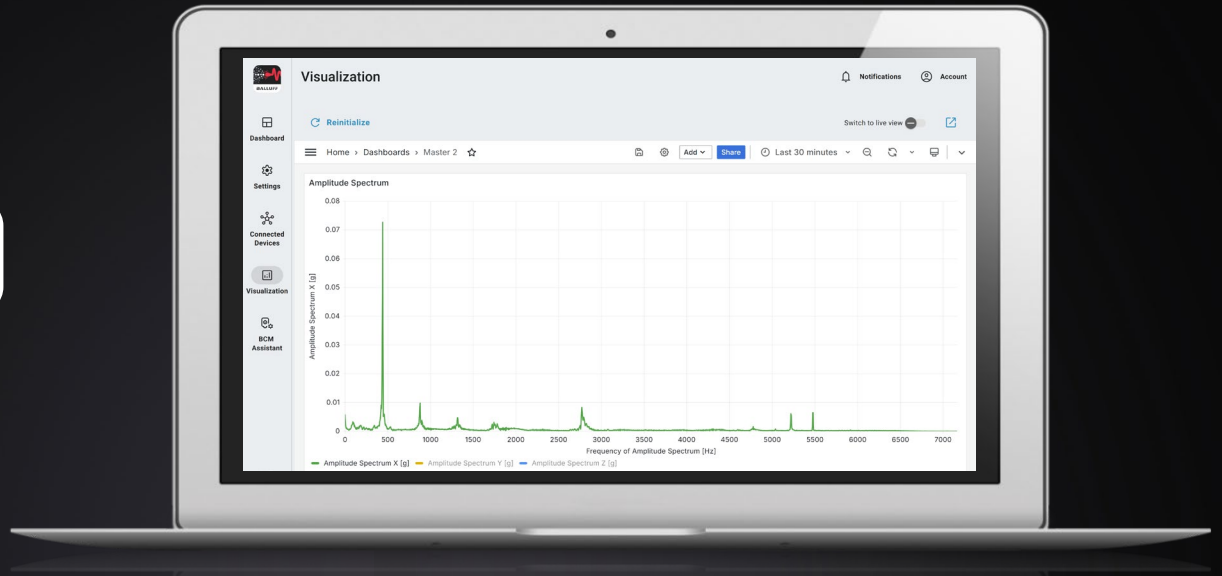
Scan me

BET – Balluff Engineering Tool

Scan me

BCM VibExtract

VibExtract – Access to raw data and frequency spectra



BCM VibExtract

For full access to raw acceleration data and frequency spectra

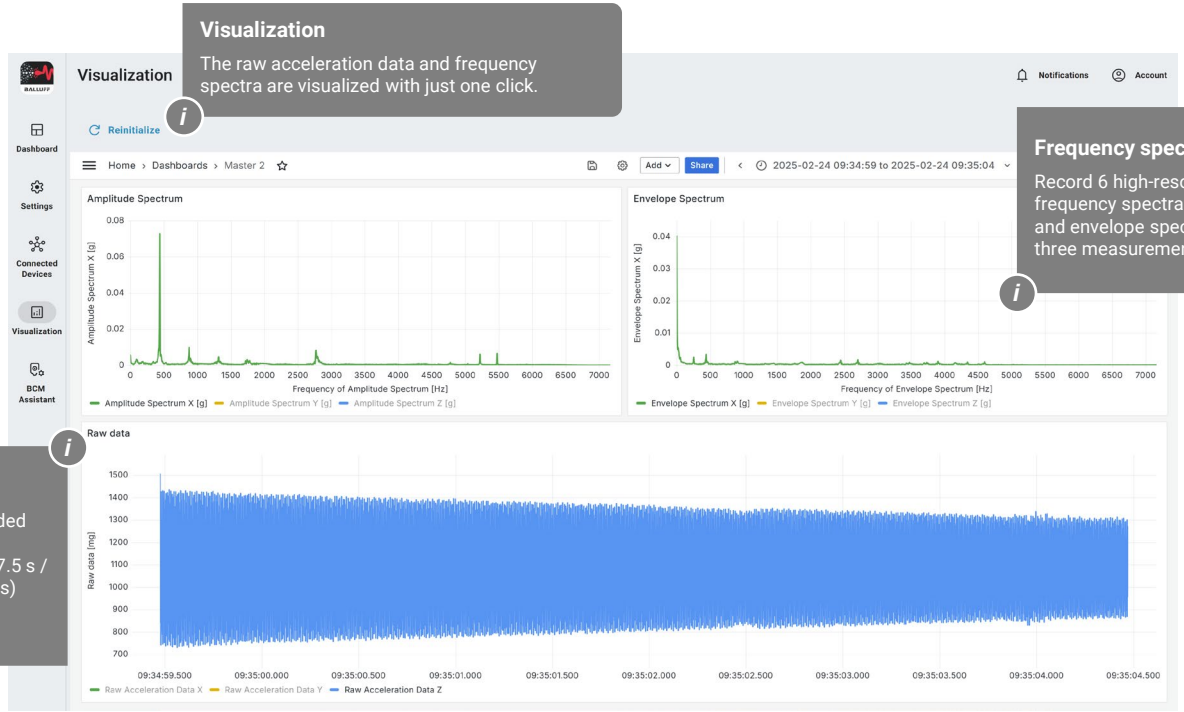
Maximized data access
Decide for yourself which additional data should be recorded and provided by BCM Premium. Gain access to raw acceleration data and high-resolution frequency spectra.

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.

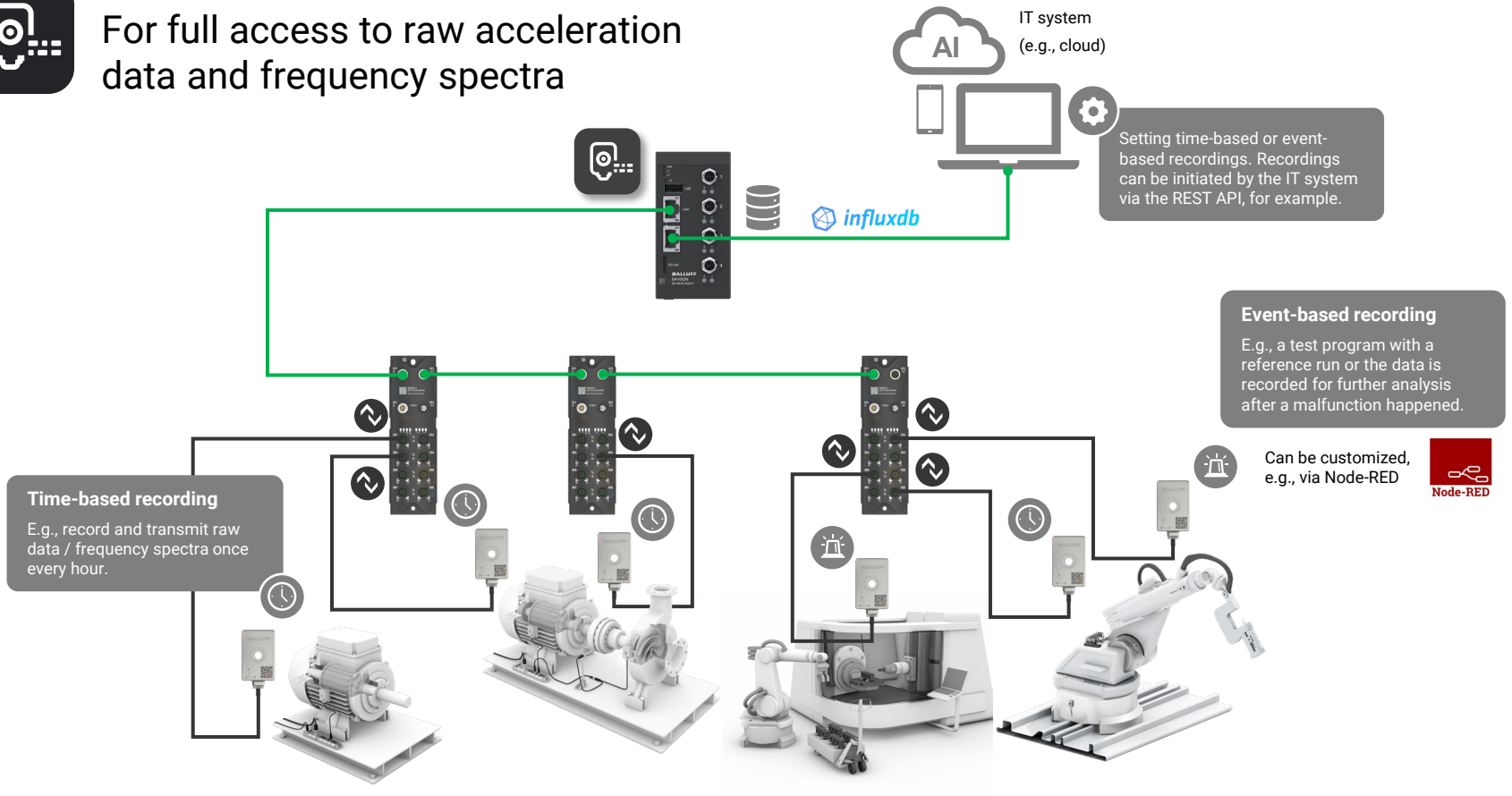
BCM VibExtract

For full access to raw acceleration data and frequency spectra



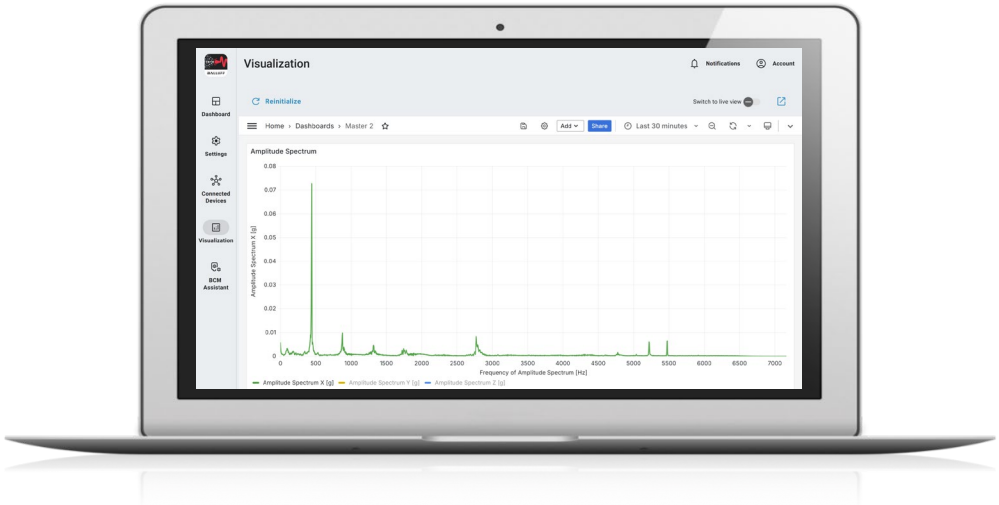
BCM VibExtract

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!

CMTK – Condition Monitoring Toolkit

Scan me

BALLUFF

BALLUFF
A GLOBAL PROMISE.

innovating automation

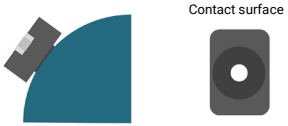
BALLUFF

BCM Family

Comparison – Single and Dual Screw Design

Back to overview

Single Screw Design (BCM Advanced & Premium)



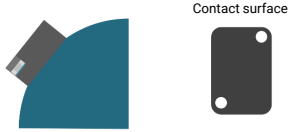
ADVANTAGES

- It's easier to drill only one hole.
- Already known in the industry.
- Tools already exist that can create a round contact surface with a centered hole in a single step.
- It is sufficient if the screw is tightened strongly enough so that it cannot loosen.
- The alignment of the measurement axes can be done during installation and adjusted if necessary.

DISADVANTAGES

- If the screw is not properly tightened, the sensor can rotate.
- In case of replacement, it is more likely that the new sensor is not aligned identically.

Dual Screw Design (BCM Standard)



ADVANTAGES

- Unwanted rotation due to a loose screw is significantly hindered.

DISADVANTAGES

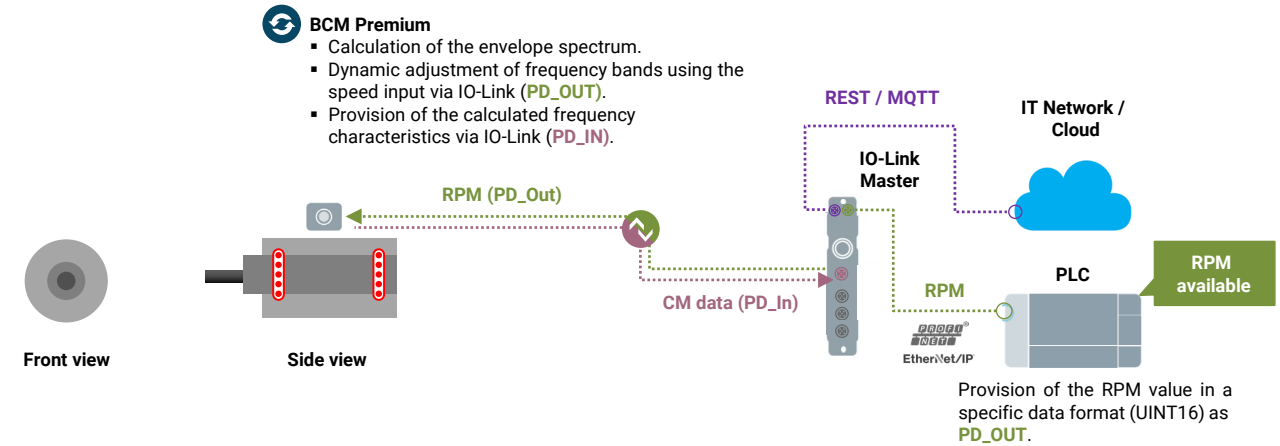
- Complicated manufacturing of the two holes, as nearly perfect alignment is necessary. Subsequent adjustment of the alignment is not possible.
- The screws must be tightened with exactly the same torque to avoid housing tension, which could lead to unwanted resonances in the measurement signal.
- A large rectangular mounting surface must be prepared. The larger the contact surface, the more difficult it is to ensure consistent flatness.

BCM Premium

Dynamic RPM input from the PLC

Back to overview

Application / Sensors	Network Technology



BCM Premium

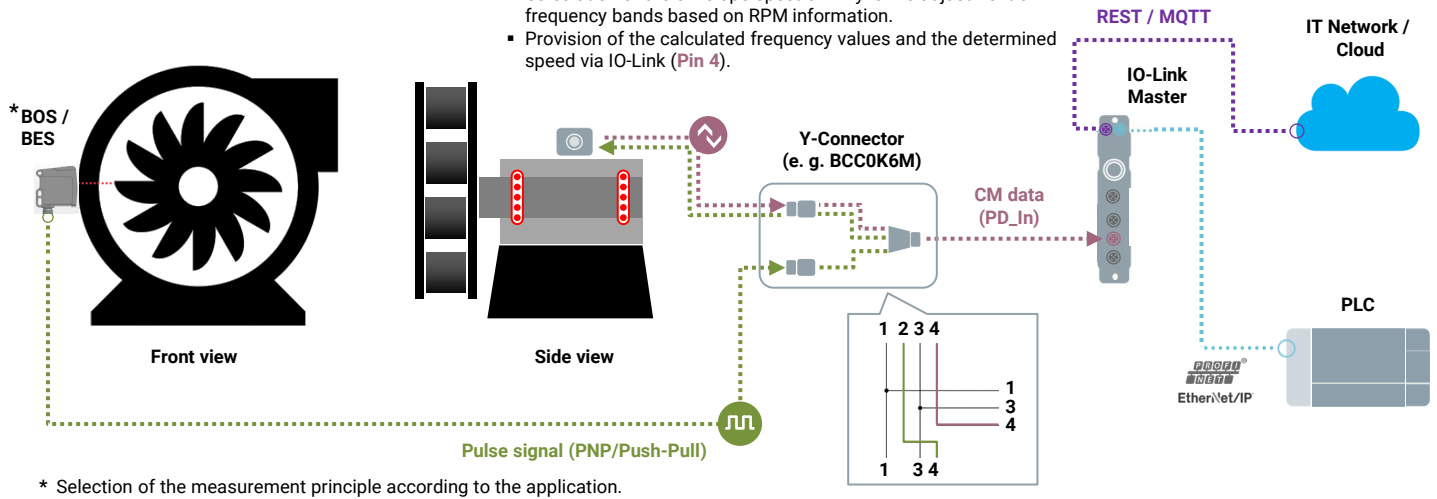
Dynamic RPM input from binary Sensor

Back to overview

Application / Sensors | **Network Technology**

BCM Premium

- Definition of a divider depending on the number of blades.
- Conversion of the pulse frequency received via Pin 2 into RPM.
- Calculation of the envelope spectrum. Dynamic adjustment of frequency bands based on RPM information.
- Provision of the calculated frequency values and the determined speed via IO-Link (Pin 4).



* Selection of the measurement principle according to the application.