SKF QuickCollect Sensor and QuickCollect App

CMDT 391 / CMDT 391-Ex

User Manual
Part Number **15V-090-00090-100**
Revision **C** – **May 2024**

Read this manual carefully before using the product. Failure to follow the instructions and safety precautions in this manual can result in serious injury, damage to the product or incorrect readings. Keep this manual in a safe location for future reference.

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Product Registration

Please take a moment to register your product to receive exclusive benefits offered only to our registered customers, including technical support, tracking your proof of ownership and staying informed about upgrades and special offers. (Please visit our website for more details on these benefits.)

General Product Information

General information such as datasheets and catalogues are published on the Condition Monitoring Systems site on SKF.com. Supporting product information can also be downloaded from the SKF Technical Support self-service web portal.

Product Support Contact Information

Repair *and* ***Calibration Services*** – Submit a Return Authorization (RA) request to arrange for repair or calibration of your product. You will receive an RA number and shipping instructions usually within 48 business hours.

Product Sales – For information on purchasing condition monitoring products, services and support on products out of warranty, please contact your local SKF sales office or distributor.

How to request Technical Support – Please open a support case using the Technical Support group's self-help portal at www.skf.com/cm/tsg. Once your support case is submitted, a technician will contact you to begin working on your issue. For urgent issues we are available at these times:

- Monday through Friday, 5:00 a.m. to 4:00 p.m. Pacific Time
  Phone: +1 800 523 7514 within the US or +1 858 496 3627 outside the US.
- Monday through Friday, 8:00 a.m. to 4:00 p.m. Central European Time
  Phone: +46 31 337 65 00.
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  Phone: +60 16 699 9506.

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1 Safety messages

Warning! *Your safety is extremely important! Read and follow all warnings in this document before handling and operating the equipment. You can be seriously injured, and equipment and data can be damaged if you do not follow the safety warnings.*

Warning! *Warning messages can alert you to an operating procedure, practice, condition, or statement that must be strictly observed to prevent equipment damage or destruction, or corruption or loss of data.*

Important! *Important messages means that there is a risk of product or property damage if the instruction is not heeded.*

1.1 Personnel safety

- Dress properly. Do not wear loose clothing or jewellery. Keep your hair, clothing, and gloves away from moving parts.
- Do not overreach. Always keep proper footing and balance to enable better control of the device during unexpected situations.
- Use safety equipment. Always wear eye protection. Non-slip safety shoes, hard hat and hearing protection must be used in the appropriate settings.
- Do not repair or adjust energized equipment alone, under any circumstances. Someone capable of providing first aid must always be present for your safety.
- Persons working on or near high-voltage equipment should be familiar with approved industrial first-aid methods.
- Never open or work on energised electrical systems unless authorised by a responsible authority. Energized electrical systems are dangerous and electric shocks from energized systems can be fatal. Always ensure that the necessary permission or permit to work has been obtained before commencing any work.
- Always obtain first aid or medical attention immediately after sustaining an injury. Never neglect an injury, no matter how superficial it initially seems.

1.2 Device safety

- If the device has been dropped, check for damage before using. Device service must be performed only by qualified SKF repair personnel.
- Do not attempt to open the device.
- Use only accessories recommended or provided by SKF or the manufacturer.

1.3 Energized equipment

Never work on energized equipment unless authorized by a responsible authority. Energized electrical equipment is dangerous. Electrical shock from energized equipment can cause death. If you must perform authorized emergency work on energized equipment, be sure that you comply strictly with approved safety regulations.

1.4 Hazardous locations

Hazardous instructions are included with this device and must be followed in accordance with the safety instructions provided with the device.

1.5 No submersion / immersion

This equipment has been designed to be splash and dust resistant. However, avoid direct contact with water, wet surfaces, or condensing humidity. If the instrument is subjected to these conditions, adverse operation may result, and there is a risk of serious injury or damage should electrical shock or fire occurs. Allow the instrument to dry thoroughly before operation.

1.6 Avoid damage and injury

To avoid costly damage to the instrument or injury from a falling instrument, place the device on a solid stable surface when not in use and do not place any heavy objects on it.
Use a damp, clean cloth for cleaning. Do not use cleaning fluids, abrasives, or aerosols. They could cause damage, fire, or electrical shock.

1.7 Specific conditions of use

The Ex approved version of the QuickCollect sensor, CMDT 391-Ex, must be used in accordance with the safety instructions provided with that device.

Agency approvals for the CMDT 391-Ex with CMAC 8010-Ex cable:

	Ex ib IIC T4 Gb –20 °C ≤ Ta ≤ +60 °C
	Ex ib IIC T4 Gb –20 °C ≤ Ta ≤ +60 °C Class I, Zone 1, AEx ib IIC T4 Gb –20 °C ≤ Ta ≤ +60 °C IS Class I, Div. 2, Group A, B, C, D, T4

2 SKF QuickCollect sensor

2.1 System overview

The SKF QuickCollect sensor is part of the SKF QuickCollect system, which also includes SKF mobile apps and SKF Machine Health software. This system is used by service, reliability, operations, or maintenance personnel as part of a walk-around data collection program. With the SKF QuickCollect sensor which can be connected to a smart phone or tablet, the user can monitor hundreds of assets per day and thousands of assets per month. The data can be analysed on the spot in real time.

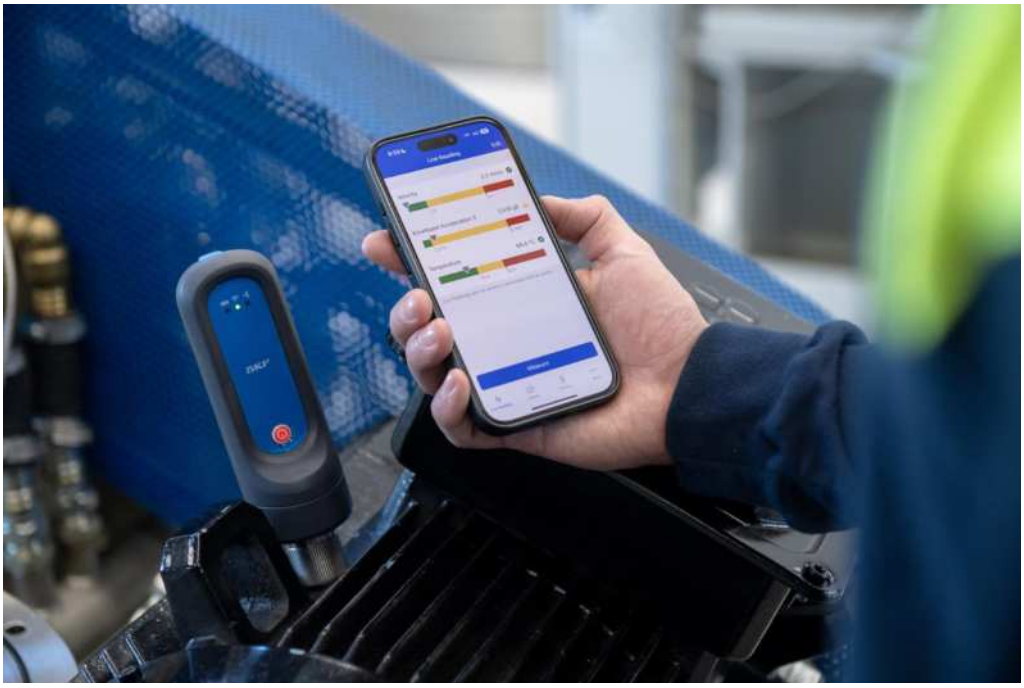

Figure 1 SKF QuickCollect system in working environment

In brief, a typical operation would include the following steps:

- Take the QuickCollect sensor and smart phone or tablet out to the rotating machinery to be monitored (such as a pump or motor).
- Mount the sensor on the bearing housing using the magnetic mount.
- Initiate the sensor measurement wirelessly using **Bluetooth**® Low Energy from an SKF app running on a smart device.
- After taking the measurement, remove the sensor and proceed to the next machine or measurement location and continue taking measurements.
- When complete, return the sensor to its charger.

Figure 2 SKF QuickCollect System

1. QuickCollect portable wireless sensor
2. QuickCollect App on mobile phone

The QuickCollect sensor uses **Bluetooth**® low-energy version 4.2 wireless technology to communicate with off-the-shelf iOS and Android devices using an SKF app for capturing overall machine vibration (velocity and enveloped acceleration), time waveform and temperature data.

The QuickCollect sensor features wireless data transfer, a rugged design, and a rechargeable battery. The sensor increases operator safety by eliminating the hazards and inconvenience of cumbersome cables to provide a safe, fast, and easy-to-use system for performing front-line machinery condition monitoring. The data collected and transferred to an SKF app is displayed on the screen with easy-to-identify colour-coded bars that indicate alarm status: green for acceptable, yellow for alert and red for danger.
Full specifications for the sensor are listed in its product datasheet.

Figure 3 SKF QuickCollect sensors CMDT 391 and CMDT 391-Ex

Figure 4 SKF QuickCollect app on a mobile device – Example

2.2 Sensor controls and indicators

Figure 5 SKF QuickCollect sensor – Controls and LEDs

1. Power button
2. Battery LED
3. Communication LED
4. All-purpose check LED

- **Power button** – Powers the sensor on and off. When the sensor is off, pressing the power button will immediately turn on the sensor. When powered on, a 15-minute inactivity timer will start. If no communication is detected between the sensor and an SKF app within 15 minutes, the sensor will automatically power off.

  When powered on, a button press of less than 3 seconds will reset the inactivity timer.

  When powered on, a press and hold of greater than 3 seconds will power off the sensor.

- **Battery LED** – (Green, Red)

  When connected to a (powered) charger:

  - Green – Indicates battery had reached full charge, charging has stopped.
  - Red, solid – Indicates battery is being charged.

  Otherwise, the battery LED is normally off but:

  - Red, slow blinking – Indicates low battery. Remaining life is about 15% of fully charged level.
  - Red, fast blinking – Indicates battery charge is too low to keep the sensor powered on; the device will power itself off.

- **Communication LED** – (Green, Red)
  - Off – Indicates the sensor is powered off.
  - Green, blinking – Indicates the sensor is powered on and not connected to the app.
  - Toggling between green and red – Firmware update in progress.
  - Green, solid – Indicates the sensor is connected to an SKF app.
- **All-purpose check LED** – (Green, Red, Amber)
  - Green – No errors
  - Red, solid – Indicates an error condition: factory state, no serial number, uncalibrated.
  - Red, fast blinking – Indicates a critical error.
  - Toggling between red and amber – Indicates an external sensor error.

2.3 Vibration and temperature measurements

When used directly on a machine, the QuickCollect sensor can collect simultaneous vibration and temperature measurements. Note that when an external sensor is being used (external sensor cable connected), a temperature measurement cannot be made.

2.3.1 Vibration

Most machinery problems result in excessive vibration. Mechanical looseness, imbalance, soft foot (foundation), misalignment, shaft bow, bearing wear, gear defects, or rotor damage can all be detected using vibration measurements.

When performing measurements, the sensor’s vibration output is processed to produce two very meaningful vibration measurements for each measurement point.

- **Velocity** – Vibration velocity is considered the “general purpose” vibration measurement for detecting machinery problems. This is because most machinery problems generate low to mid-frequency sinusoidal-type vibration signals (problems such as imbalance, misalignment, bent shaft and looseness), and velocity measurements focus on detecting vibration signals occurring in this frequency range. ISO standards provide general guidelines for vibration severity using velocity criteria.

- **Enveloped Acceleration Band 3** – Rolling element bearing faults cause low-amplitude impulsive type vibration signals at a regular rate of repetition. When monitored using velocity measurements, these low-energy impulsive signals are typically lost in surrounding machinery vibration noise caused by imbalance, misalignment, looseness, etc. Enveloped acceleration measurements filter out surrounding machine vibration noise and enhance the impulsive nature of repetitive rolling element bearing or gear fault vibration signals, allowing much earlier and accurate bearing fault detection. Not used for overall machine vibration monitoring, enveloped acceleration measurements ensure consistent early detection of bearing and gear-type defects

- **Measurement and analysis capabilities** – When the sensor is used in conjunction with the SKF Enlight ProCollect app the available sample rates (bandwidth) and FFT resolution are extended and adjustable.

2.3.2 Temperature

Temperature measurement is a useful indicator of mechanical condition or the load applied to a specific component. As a bearing or its lubrication fails, friction causes its temperature to rise. Measuring temperature changes at the bearing helps the early recognition of problems and the scheduling of corrective maintenance before a serious and expensive failure occurs.

The sensor’s opening for taking temperature measurements is located next to the magnet mounting. The infrared (IR) sensor has a range of 4 cm and quickly determines the temperature of the equipment to which the QuickCollect sensor has been attached. Note that the temperature measurement is unavailable when the external sensor cable is in use.

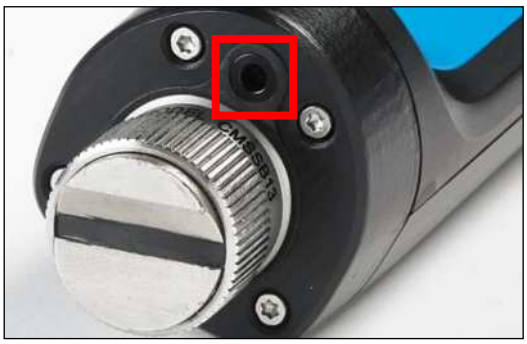

Figure 6 IR sensor location

2.3.3 External sensor setup

Note: Not compatible with the CMDT 390 sensor.

The CMDT 391 has been engineered to support any two-wire, constant current powered, external accelerometer that provides an output of 100 mV/g and a bias voltage to indicate sensor OK.

For the connection to the CMDT 391, the correct SKF cable (part no. CMAC 8010) must be used. This cable has a 6-pin connector that mates with the unit's external sensor/charging connector

Figure 7 CMAC 8010 – External sensor cable for the CMDT 391

Important! *Note that the CMDT 391-Ex uses cable part number CMAC 8010-Ex. Refer to the safety instructions for specific conditions of use and the entity/connector parameters to be considered when selecting a suitable Ex approved external accelerometer.*

The SKF recommended external accelerometer for use with the CMDT 391 is the CMSS 2100 and for the CMDT 391-Ex it is the CMSS 786A-IS.

Ensure the external sensor cable is securely attached by following these steps:

1. Locate the small notch on the QuickCollect connector.

2. Align the cable connector's keyway to that notch and press gently to join the two connectors.

3. Tighten the screw lock on the cable mounted connector to secure it (do not over tighten).

Or alternatively:

4. Press the two connectors gently together and slowly rotate one connector until the keyway slides into the notch, and then tighten the screw lock to secure.

The maximum total external cable length the CMDT 391 can drive is 10 metres. The CMAC 8010 cable is 2-metres long, so the maximum length of additional external cable is 8 metres.
The other end of the external sensor cable has a 2-pin (MIL-C-5015) connector suitable for direct connection to standard SKF accelerometers. If the cable is to be attached to another type of connector, then a suitable adapter must be sourced.

Note the following:

- It is not possible to take a measurement using the internal sensor whilst a cable is attached to this connector, as the internal sensor is disconnected and therefore inoperable. This applies even if no external sensor is attached to that cable.
- When using an external sensor cable the temperature measurement is similarly unavailable.
- Battery life will be reduced as the QuickCollect sensor is powering the external sensor.
- Never carry the QuickCollect sensor by the attached cable.

The following status conditions may apply when using an external sensor/cable combination:

1. No cable plugged in – This is the expected status when using the internal sensor to acquire data and not having any sort of cable attached.
2. Cable plugged in and no error detected – This is the expected status when using an external sensor to acquire data. It indicates the external sensor cable is attached and no error condition detected.
3. Cable plugged in and a short circuit error detected.
4. Cable plugged in and an open circuit error detected.
5. Cable plugged in, but no sensor attached.

Notes:

Status conditions 3, 4 and 5 are considered error conditions and are signalled by the All-purpose check LED flashing alternate amber and red, approximately two times per second.

It is not possible to take a measurement when an error condition is detected.

It is not possible to distinguish between the open circuit error condition 4 and the no sensor attached condition 5.

2.4 Calibration and repair

It is recommended that the QuickCollect sensor is checked that it's within calibration every **24 months**, with the first calibration check due 24 months from the first date of in-service, use.

SKF can provide calibration check and if needed replacement of QuickCollect sensors.

Contact your nearest SKF Technical Support Group TSG representative for more details.

2.5 Electrical waste

Electrical waste and electrical equipment should be recycled as specified by the WEEE-directive and not be placed in the general refuse. Product should be sent to an approved recycling centre for safe recycling, recovery, reuse or returned to SKF for proper recycling.

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3 Using the QuickCollect sensor

3.1 Charging the battery

The battery should only be charged in an office environment. Always use the correct charger: for the CMDT 391 this is the CMAC 8004 and for the CMDT 391-Ex this is the CMAC 8007.

The sensor is equipped with an internal lithium-ion battery. Prior to using the sensor for the first time, use the provided power supply to fully charge the sensor battery.

The sensor's only external connector is the 6-pin connector located on the back. It has dual use: for charging the sensor (when not collecting data) and for using an external accelerometer to take vibration measurements.

***Important**! SKF QuickCollect connector uses a 6-pin for secure connection. To prevent damage to connector, on connecting and disconnecting charger, make sure that the connector alignment matches QuickCollect sensor as illustrated below.*

Figure 8 External sensor and charging connector

To charge the battery:

1. Connect the charger to an AC outlet (if necessary, use regional AC outlet adapters).
2. Align, connect, and tighten the charger's cable to the sensor's external 6-pin connector.
3. The battery LED lights red while charging and green when fully charged. The battery will be fully charged after approximately four hours.

Once the battery is fully charged, the sensor is ready for operation. The battery LED will blink red when the power level is low. If the battery level becomes too low, the sensor will automatically power itself off to prevent battery damage.

When not being used for data collection, connect the sensor to its charger.

3.2 Measurement guidelines

Vibrations measurements are typically performed with the machine operating under normal conditions. For example, when the machinery has reached its normal operating temperature and is running under its normal rated condition (at rated voltage, flow, pressure and load). For machines with varying speeds or loads, perform measurements at all extreme rating conditions, as well as at selected conditions within these limits.

Place the sensor's magnet on the machine's measurement point. When placing the sensor on the machine, generally avoid greasy, oily or wet surfaces, housing joints, panels and non-structural parts. Select the best measurement point (specifically avoid unloaded bearing zones) and be consistent in terms of sensor position, sensor angle/alignment and contact pressure.

If possible, choose a flat surface in the bearing's load zone. Measurements should be taken at the same precise location (as moving the probe only a few inches can produce drastically different vibration readings). To ensure measurements are taken repeatably, mark the measurement point with a permanent marker.

Proper hand-held sensor technique is vital to the accuracy of measurements. It is critical that consistent measurements are made.

When taking measurements using an external cable and sensor, care must be taken not to move the cable during data collection.

Using the cable in conjunction with different external accelerometers may give different readings due to the variation in the accelerometers used. Measurements will also vary between the internal sensor and an external sensor. Be consistent by always using the same sensor for a particular measurement point, i.e. internal sensor or same external sensor.

3.2.1 Performing infrared temperature measurements

To perform accurate non-contact infrared temperature measurements, bear in mind infrared sensor cleanliness. The infrared sensor has a small opening. Dirt, grease or oil may enter the opening and cause inaccurate temperature measurements. If necessary, clean the opening using alcohol and cotton buds.

4 Using the QuickCollect app

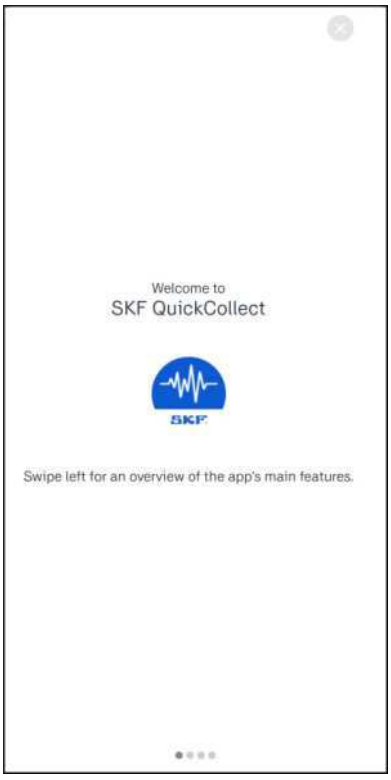
The QuickCollect sensor can be used with the SKF QuickCollect or Enlight ProCollect apps. The operation of the QuickCollect app is described below, for details and guidance regarding the use of the Enlight ProCollect app refer to www.skf.com.

4.1 Download, install and launch the QuickCollect app

The QuickCollect app is compatible with iOS and Android and can be downloaded from the App Store or Google Play. Check the respective store for iOS and Android version compatibility.

To launch QuickCollect for the first time:

1. Tap the **QuickCollect** icon on the device. The welcome screen will appear.

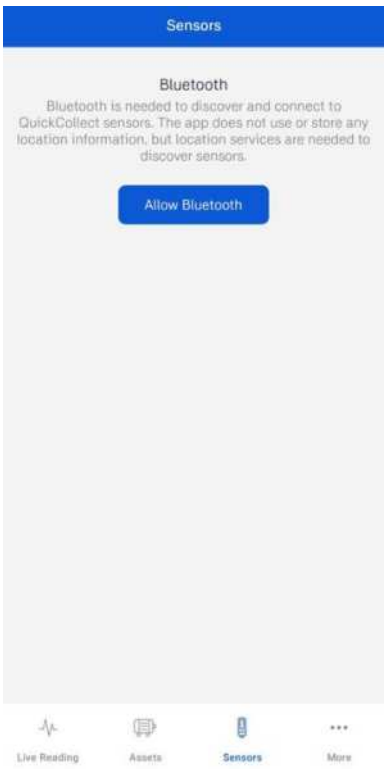


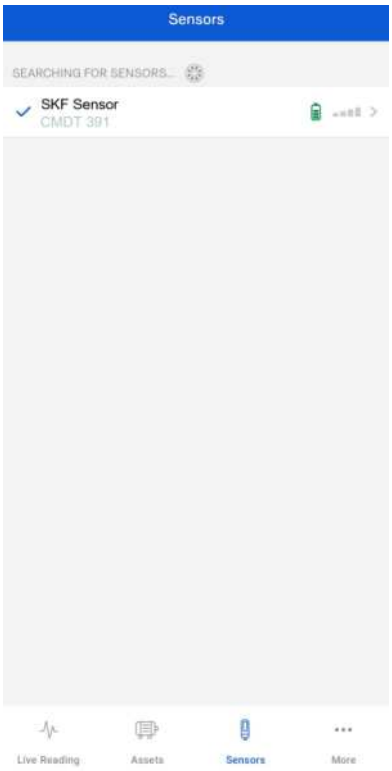
2. Swipe left to read information about the key app features or tap the symbol to skip the welcome information and continue using the app.

The app has three main views: **Live Reading**, **Assets** and **Sensors**. To access them, tap on the respective icon at the bottom of the screen.

4.2 Connect sensor

1. Power on the QuickCollect sensor.
2. Enable the Bluetooth on your mobile device.
3. Go to the **Sensors** view and tap the sensor you wish to connect to the app.





4. Once the app has successfully connected to the sensor, a checkmark, battery icon, and signal strength indicator will be displayed next to that sensor.
5. To view sensor details, tap on the sensor field.

4.3 Live reading

When the sensor is connected, live readings are sent to the app. These readings are not saved or associated with an asset.

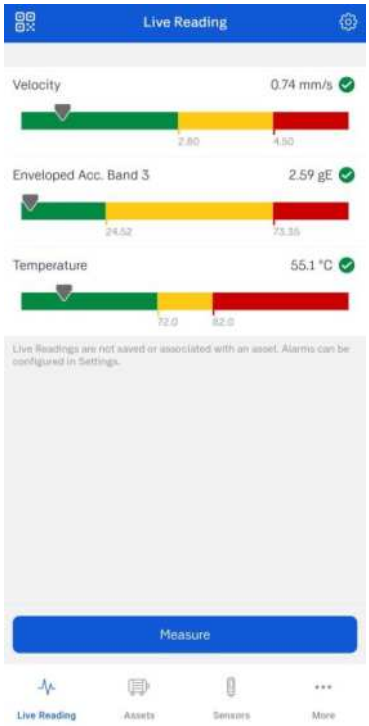


Figure 9 Live Reading view - Example

To edit the measurement configuration, tap the gear symbol to enter the **Alarm levels** view.

4.4 Add asset

1. Tap **Assets** > **New Asset**.

2. In the **General** section

    a. Type a meaningful **Name**.
    b. Select **Asset type** from the available options.
    c. You can also **Add photo** either by taking one with the phone's camera or by adding them from the photo library.

3. In the **Measurement schedule** section, select an **Interval**. After this interval has passed, the app will remind you to take a new measurement.

4. In the **Measurement locations** section, toggle off the locations that cannot be measured, if any.

5. Tap **Continue** to enter the next view.

6. Use the **ISO configuration** levels for velocity and enveloped acceleration, or toggle off the **ISO Alarm Levels** button and enter the values manually.

7. Tap **Save** to save the asset.

- **Edit** – In the **Assets** view, several options to edit an existing asset are available.
    - **Edit Asset** – Tap to edit the asset parameters and information.
    - **Duplicate** – Tap to duplicate the asset information and use it to create a new asset of the same type.
    - **Remove** – Tap to remove the asset from the app.
    - **Create QR Code** – Create a QR Code for an existing asset and use it to quickly find the asset in the app.

To create a QR-code:

1. From the **Assets** view, tap on an existing asset containing all necessary parameters to perform a measurement.

2. Tap **Edit** > **Create QR Code**.
3. Select an application on your mobile device to send the QR Code.
4. Print the QR Code and attach it to the asset.

Use the assets QR Code:

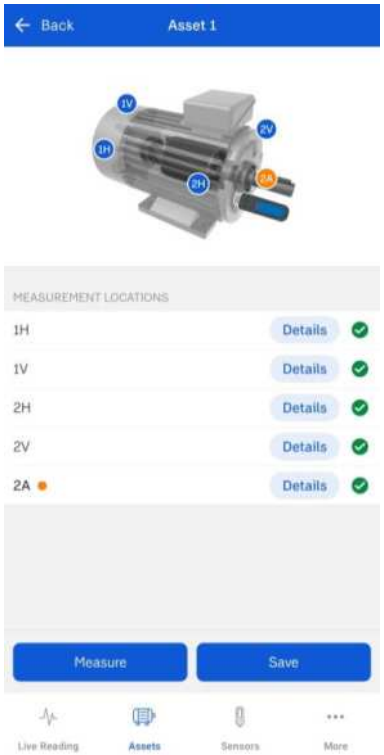
1. In the **Asset** or **Live Readings** view, tap the QR code symbol in the top right corner to start the device's camera.
2. Scan the QR code.
3. Tap **Go to** *Asset name*.
4. You can now perform measurements on this asset.

4.5 Taking measurements

Important! *The phone's Bluetooth function must be on to communicate with a QuickCollect sensor.*

1. Ensure an asset has been added and selected and the sensor is connected to the app. See sections 4.2 and 4.4.
2. When the sensor is connected, live readings are sent to the app visible in the **Live readings** view.
3. Tap **Asset** and select an asset or use the QR Code scanner to scan the asset's QR Code. See section 4.2.
4. Tap **Measure**.
5. Tap **Current Speed** and enter value. Optional input.
6. Tap **Continue**.
7. Place the sensor on a measurement location.
8. Tap **Measure**.
9. Repeat the process for all measurement locations.

10. In the illustration, you can select a specific location by tapping on it. Place the sensor on the location, and then tap **Measure** to take the measurement.



11. To view measurement details, tap **Details**.

12. Tap **Save** to save the measurements.

4.6 Reading the measurements

From the Live Readings tab:

1. Tap **Start Live Measure** > **Measure**.

2. Readings for **Velocity**, **Enveloped Acceleration Band 3** and **Temperature** are visible on the screen.

3. To view the spectrum plots for **Velocity** and **Enveloped Acceleration Band 3**, tap **View Spectrum**.

Each reading displays a current overall measurement, including alarm status and alert and danger thresholds.

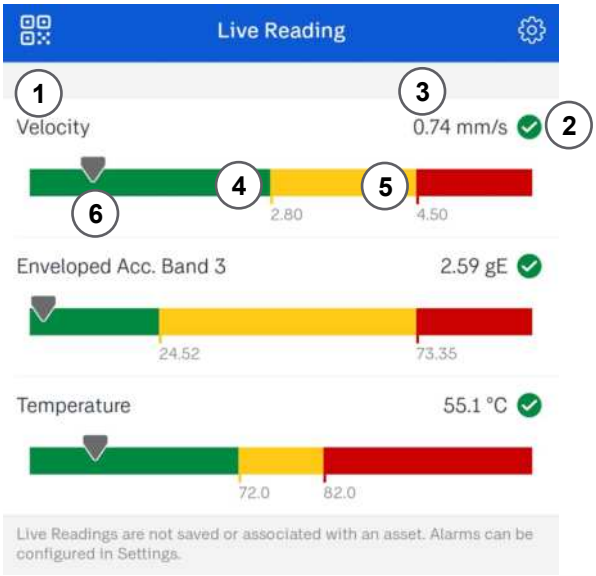


Figure 10 Live Reading measurement - Example

1. Reading category
2. Alarm status
3. Overall value
4. Alert threshold
5. Danger threshold
6. Current reading

From the Assets tab:

1. Tap asset name.

2. Tap **Measurements**.

3. Tap a measurement location to view graphical plots about the recent measurements.

4. Tap **Trend** to view the trend plots. The last five measurements are always displayed.

5. Tap **Spectrum**, to view the spectrum plots. The last five measurements are always displayed.

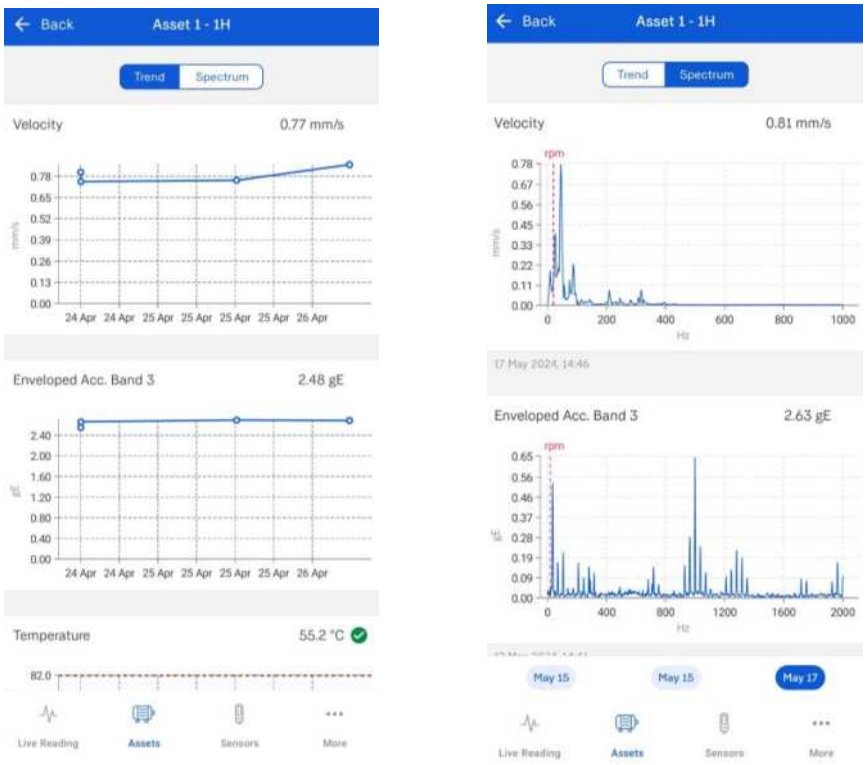


Figure 11 Trend and Spectrum plots - Example

In the spectrum plot, the operating current speed in rpm entered for the asset is displayed as a dashed red reference line.

Review the plot data and tap **Back** to return to the **Measurement Results** screen.

To send an email report of the measurement results:

1. In the **Assets** view, tap **Send Report** and select the e-mail app you wish to use.

2. QuickCollect will generate and populate an e-mail with the current measurement results via the device's email application.

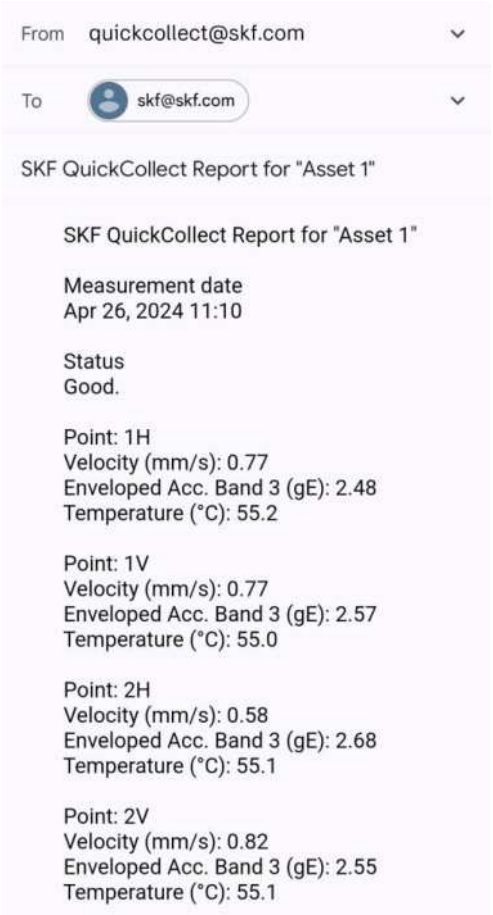


Figure 12 SKF QuickCollect report - Example

4.7 App settings

At the bottom of the screen, tap **More** to enter the settings view where several settings and information are available.

- Select **Unit System** as **Metric** or **Imperial**.
- **Support** information and view the introduction presentation.
- **Legal information**.
- **Version** of the application.
- **Demo Mode** uses realistic data to demonstrate QuickCollect measurement functionality without connecting a QuickCollect sensor.

Appendix A Limited Warranty

SKF – Limited Warranty

Download the latest version from www.skf.com