# Order tracking measurements with the SKF Microlog Analyzer series and SKF @ptitude Analyst software

## Background to order tracking

In collecting vibration measurements on a variable speed machine that changes speed during data collection, it is probable that the spectra collected will not be usable. If a normal FFT is taken while speed variation occurs, the peaks in the spectrum will smear out; they will either be smaller and wider **(Figure 1)** or completely disappear **(Figure 2)**. This is because the frequency of the forcing frequencies changes with the change in speed. Therefore, it will be difficult to find peaks from bearing frequencies in the normal spectrum collected during a speed variation.

When measuring vibrations on a variable speed machine there is a need to constantly follow the speed and adjust the bandwidth of the spectrum relative to the speed of the machine. This is possible with order tracking in the SKF Microlog Analyzer series and SKF @ptitude Analyst.

*Order Tracking Measurements with the SKF Microlog Analyzer series and SKF @ptitude Analyst software.*

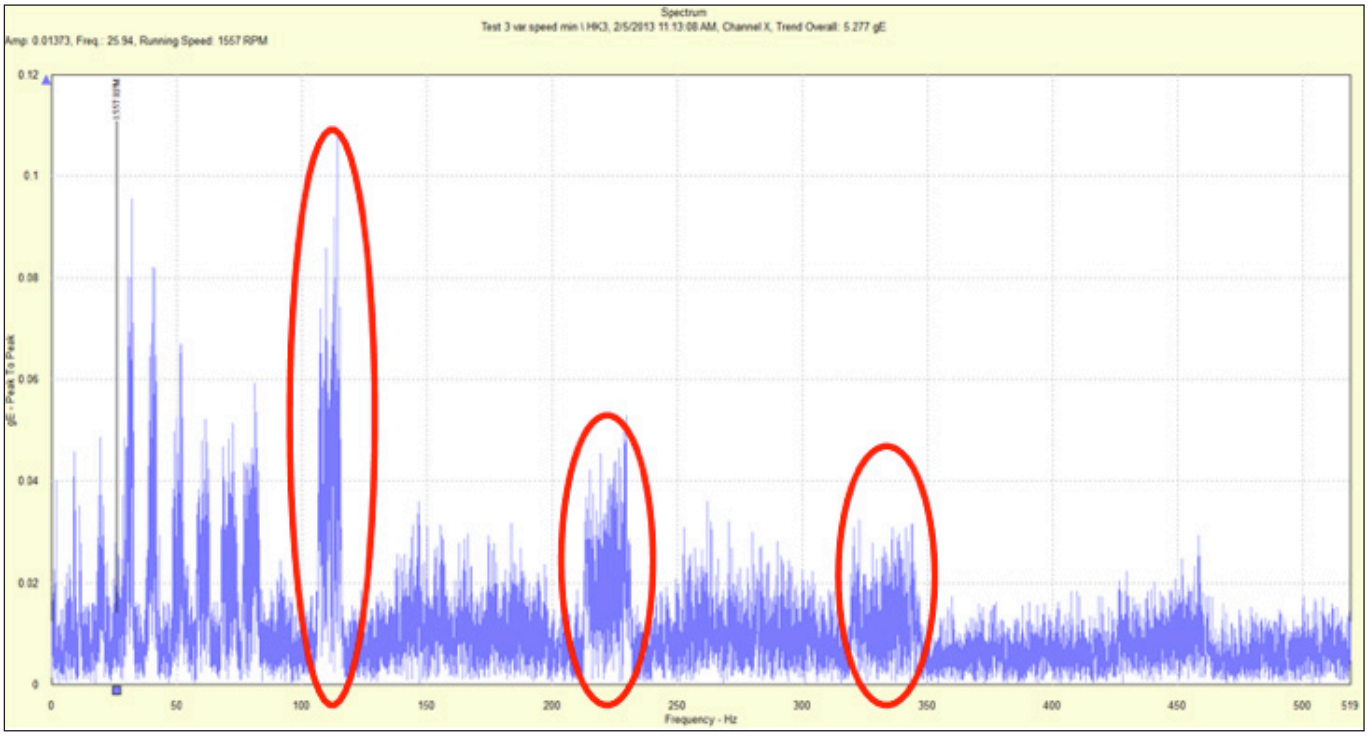



*Figure 1. FFT spectrum envelope 3 without an order tracking function.*

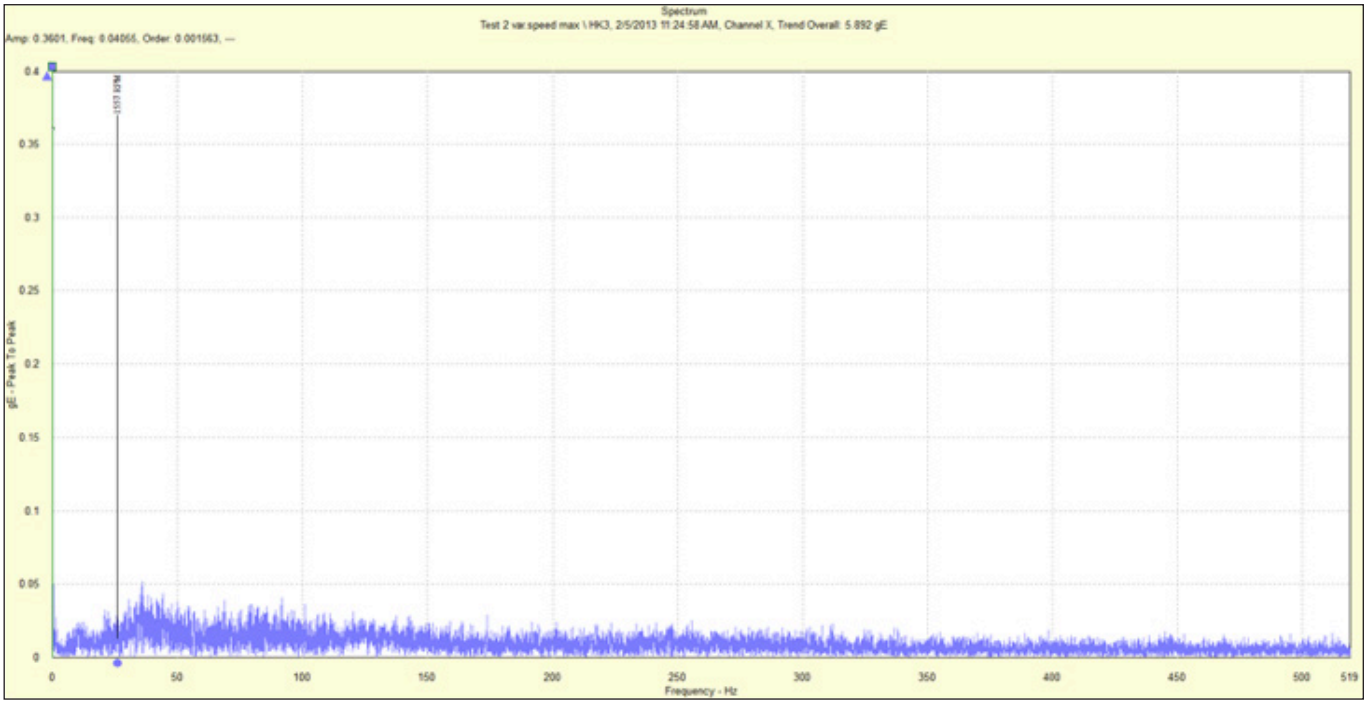



*Figure 2. FFT spectrum envelope 3 without an order tracking function.*

# The functions behind the order tracking in SKF Microlog Analyzer series

To be able to collect a good FFT, it is necessary to have the same number of samples collected for each revolution independent of the speed. The order tracking function in the SKF Microlog uses the speed measured on each revolution to adjust the number of samples for that revolution afterwards, which means the SKF Microlog takes the original time signal and "translates" the signal into a constant speed signal relative to the actual revolutions of the shaft. Finally, the FFT is calculated based on a time waveform that appears to be in stable speed.

The FFT is calculated based on a specific number of revolutions and not a specific time. For an order tracking point, the SKF Microlog will oversample the signal so that there is still room for a longer time signal if the speed is decreasing. For example if the first revolution of the measurement is at 1000 RPM and for the second revolution has the speed dropped to only 500 RPM, then the second revolution will be twice as long as the first one. The sampling rate is still the same but there will be twice as many samples for the second revolution **(Figure 3)**.

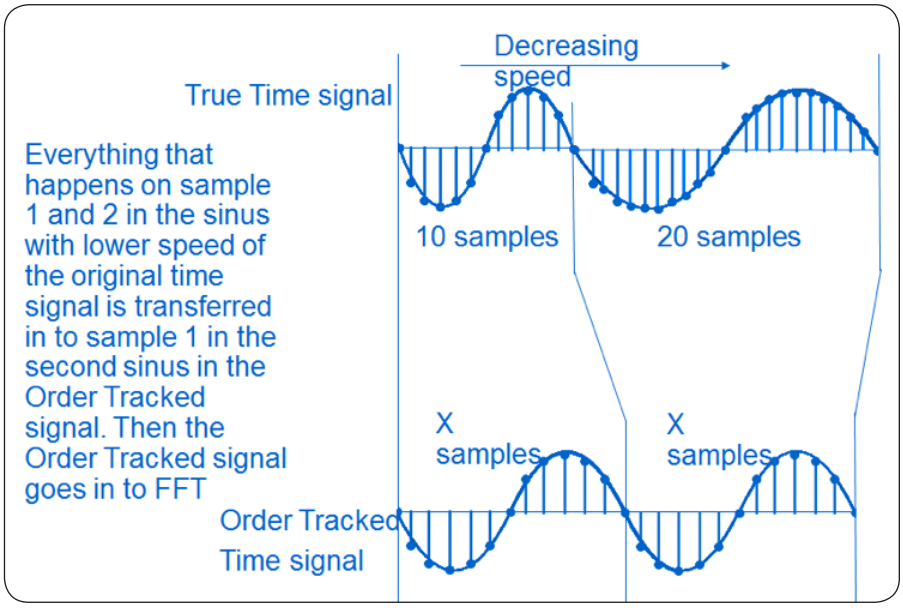



*Figure 3. Time signal sample rate normalized for every revolution.*

Therefore, the order tracking function has created a time signal which appears to be at stable speed. Then this time signal goes into normal FFT or into the Enveloping process. The result for the user is a spectrum based on orders of revolution with clear peaks, **(Figures 4 and 11)**.

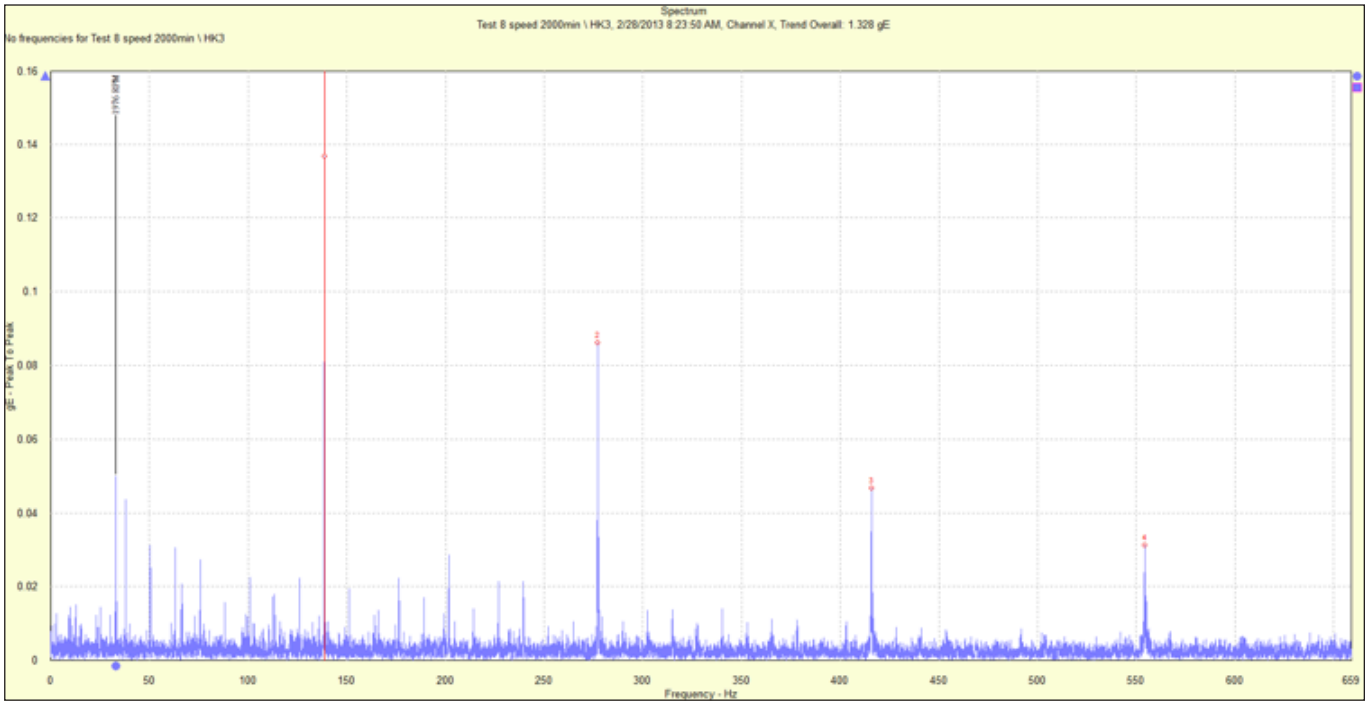



*Figure 4. FFT spectrum envelope 3 with order tracking function and a speed variation from 1800 and 2100 RPM.*

# How to setup up an order tracking point in the SKF @ptitude Software with SKF Microlog Analyzer

The procedure and suggestions described here are for ***SKF Microlog series firmware 4.0 or newer and @ptitude Analyst Version 8 or newer.***

- Start SKF @ptitude Analyst and check that the SKF @ptitude transaction service is running.
- Create SKF Microlog Analyzer units, channels and hierarchy according to the manual.
- Right-click on a machine and choose **Insert Item (Figure 5)**.
- Select "Microlog Analyzer" as the **DAD type** and "Vibration" as the **Application (Figure 6)**.
- In the **Point Properties Setup** tab **(Figure 7)**:
  - In **Freq type**, select "Order track".
  - The **Low freq cut off** is set in Hz.
  - Ensure that the **speed tag** is set to None. This is to ensure that the speed is measured at the time of collection of the data.

The most important settings for an order tracking point compared with a fixed span point are **End order** and number of **Lines**, where **End order** is equivalent to Fmax in a standard point.

The maximum frequency will change according to the speed.

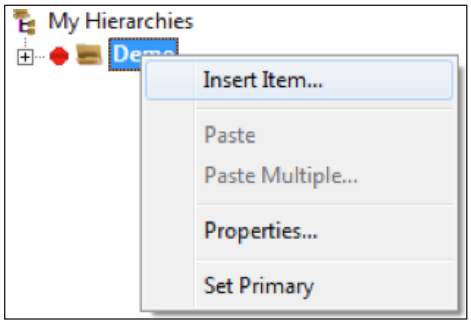



*Figure 5. Select* **Insert Item** *from a machine.*

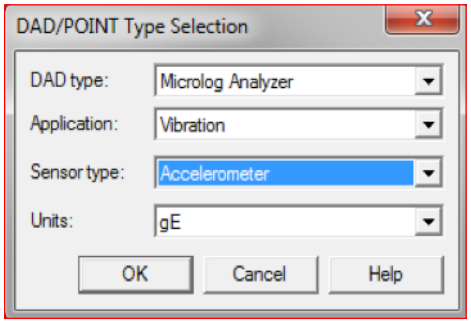



*Figure 6. Select the* **DAD type** *and* **application.**

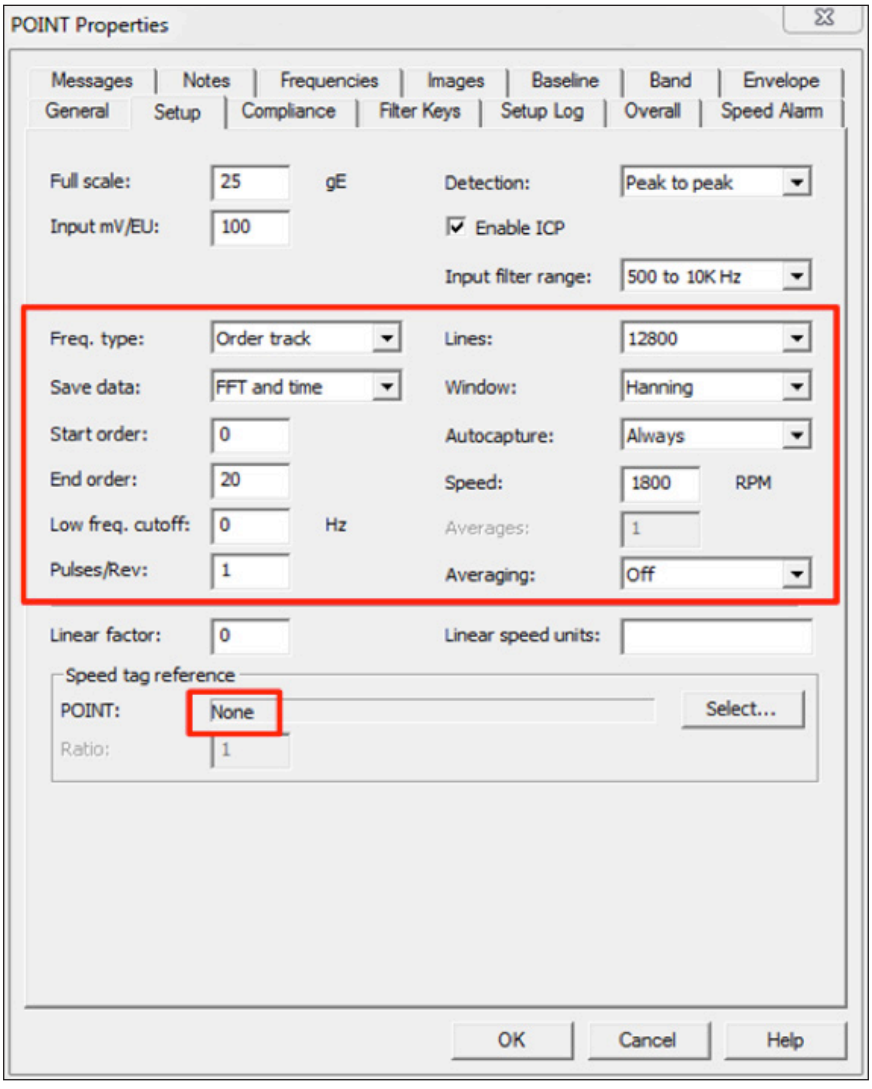



*Figure 7. Point Properties Setup for a gE measurement point.*

# How to setup up a order tracking point in the Analyzer module of SKF Microlog Analyzer

The procedure and suggestions described here are for SKF Microlog series firmware 4.0 or newer.

- Go to the Setup menu of the SKF Microlog Analyzer and ensure that the speed is not set to inactive **(Figure 8)**.

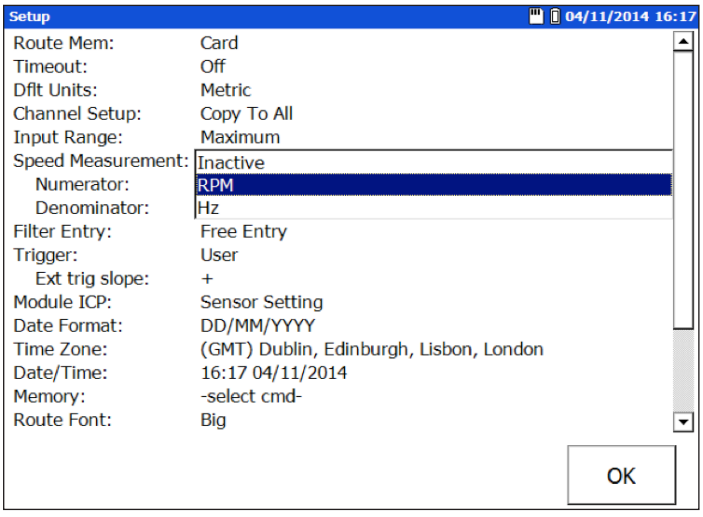



*Figure 8. SKF Microlog Analyzer Setup.*

- Next go to the Analyzer module and choose **New**.


- First choose **"Expand"** to open all of the existing settings **(Figure 9)**.

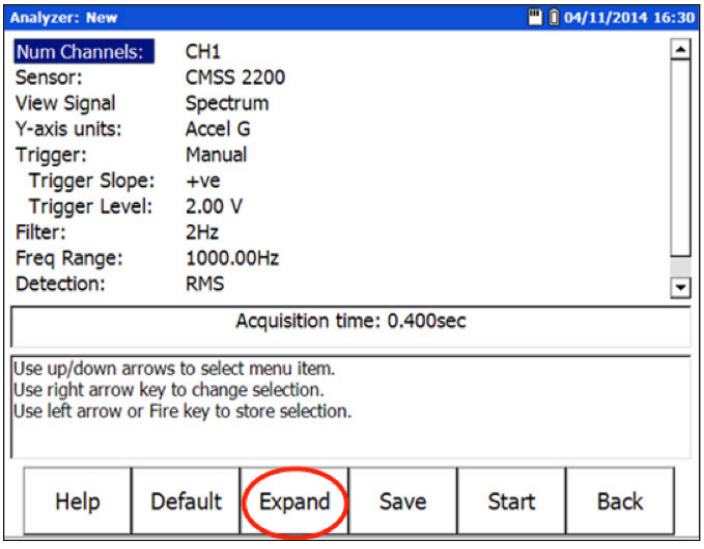



*Figure 9. Analyzer module function* **"Expand".**

- In the **Point Properties Setup** use the following settings **(Figure 10)**
  - In x-axis units select **“Orders”**
  - The selection **Filter** means the **Low freq. cut off** set in Hz or CPM
- Depending on what we choose in the Setup menu **(Figure 8)**
  - In the **Freq. Range** choose the number of orders

The most important settings for an order tracking point compared with a fixed span point are **End order** and number of **Lines**, where **End order** is equivalent to Fmax in a standard point. The maximum frequency will change according to the speed.

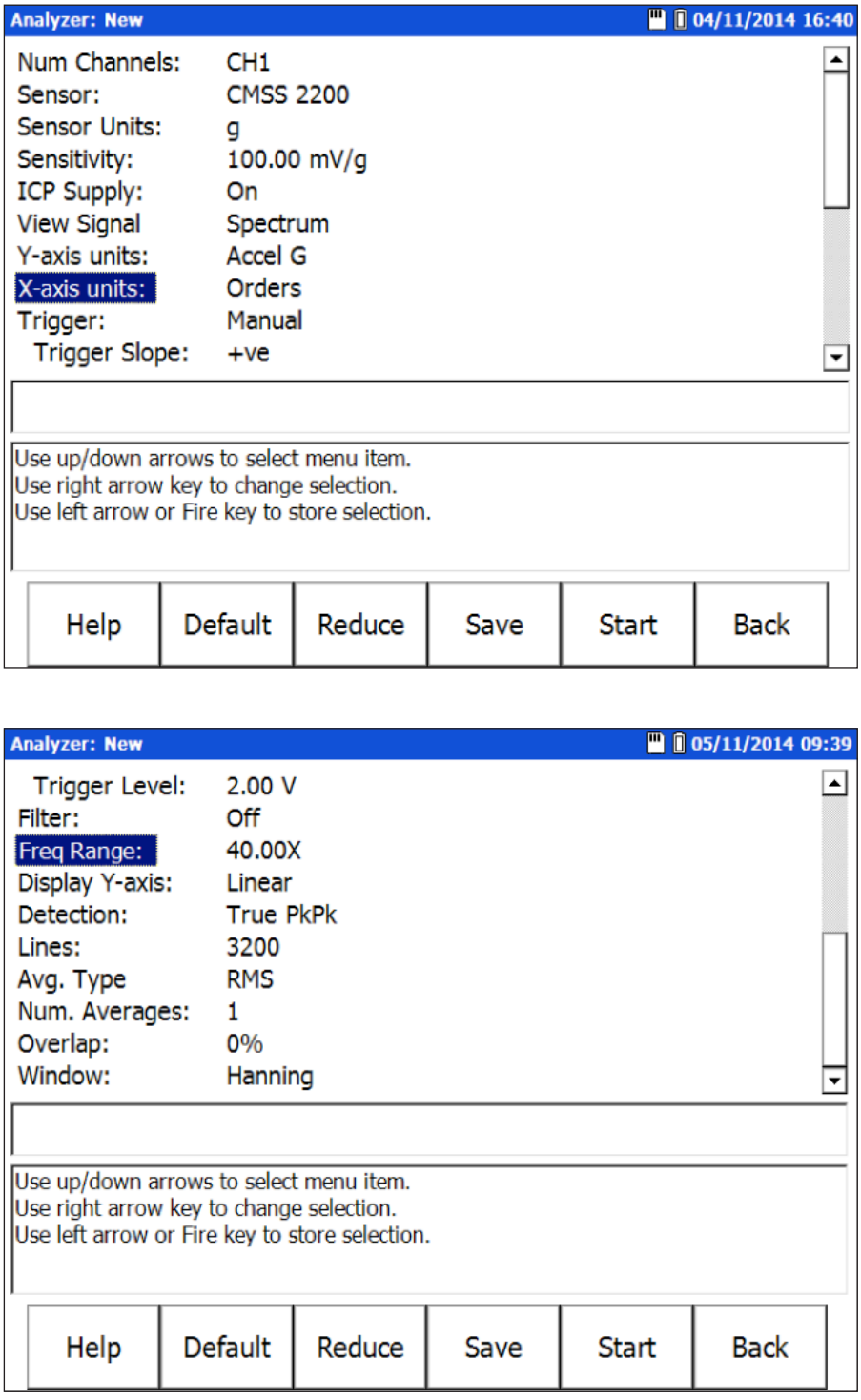



*Figure 10. Setup of a gE order tracking measurement point in the Analyzer module.*

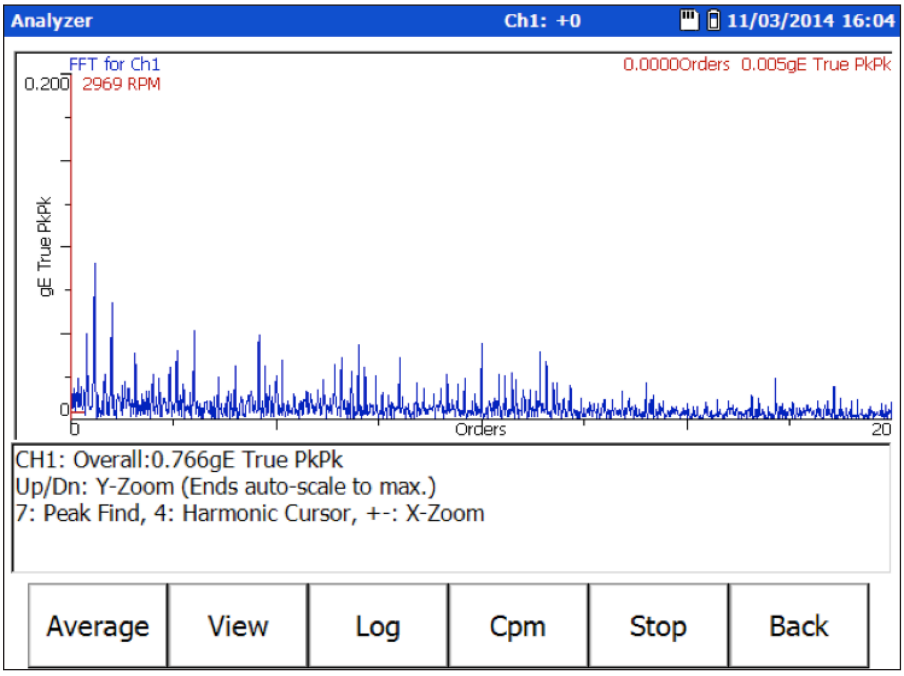
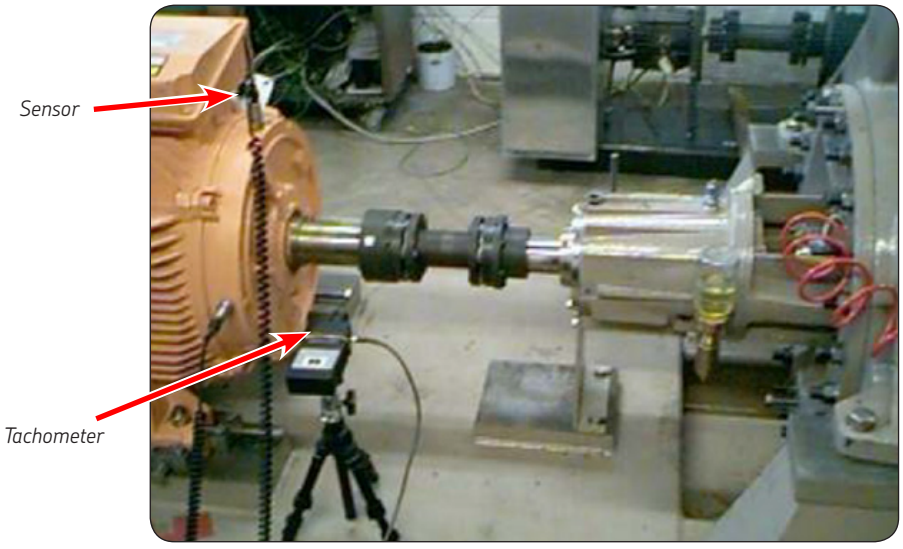
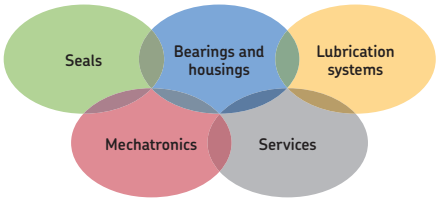



*Figure 11. gE order tracking measurement with the Analyzer module.*




*Order tracking measurement with sensor and tachometer.*

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