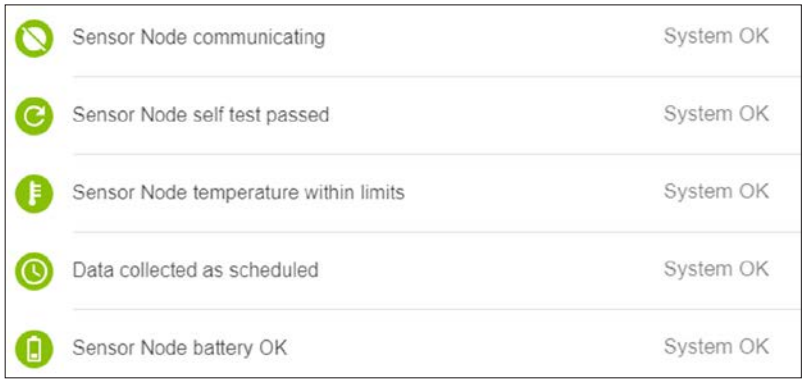
SKF Insight Rail

Web portal / reporting interface guide

Sensor Node Status

The web-portal opening display, **Sensor Node Status** shown below, is used to provide a summary of the monitoring system itself.

It shows the current integrity of individual sensors and is not intended as a means of monitoring the train; that uses spectral and vibration analysis tools to provide assessments and recommendations via Event Reports, described later.

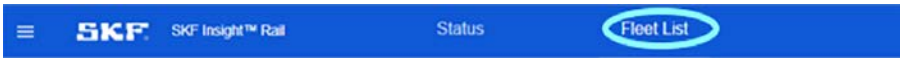


It is also possible to return to this display by clicking on the **Status** tab at the top of the screen.

The icons displayed will change between **green**, **yellow** or **red**, depending on the system status.

It is possible to click on a **yellow** or **red** alarm icon on the **Sensor Node Status** display to then display a list of trains that have that specific alarm. When this list of trains is displayed, it is important to remember that this is a subset of 'all' the trains in the fleet.

To see a list of all trains in the fleet, the **Fleet List** tab should be used:



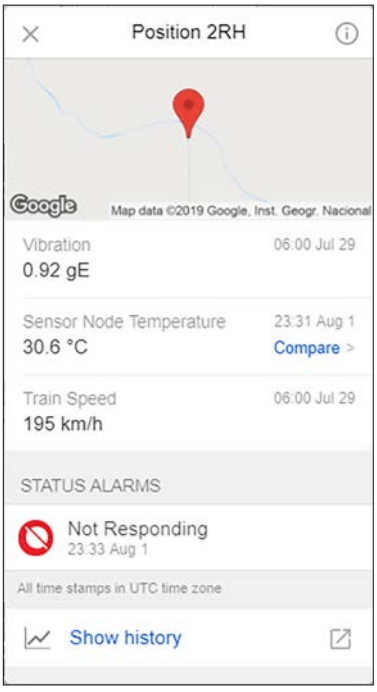
Sensor Node Communicating:

or

This indicator will show if, and how many, sensors have not communicated over the mobile network.

Trigger:
No communication received for more than 2 days

Display:
Green Communication received in the last 2 days
Yellow Not applicable
Red Not Responding (no communication received for more than 2 days)



Action:
It is important to be aware that this alarm does not necessarily indicate a fault with the sensor node.

Network coverage for mobile communication is dependent on the location of the train. For example; the train could be parked inside a depot or located in an area where there is no cellular coverage.

If it is known that a train is in operation, in an area of cellular coverage, and other sensors on that train 'are communicating', then:

- Inspect the sensor node for physical damage.
- Check the self-test icon to see if the sensor had identified any problems.
- Contact SKF for assistance.

Sensor Node self-test passed

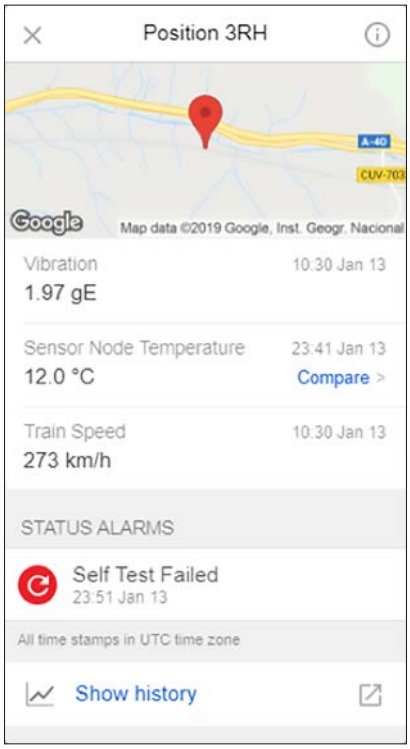
or

Each sensor performs a series of operational self-checks at every wake up and reports any functional anomaly to SKF.

Trigger:
Sensor node self-check

Display:

Green	Sensor passed self-check
Yellow	Not applicable
Red	Self Test Failed (sensor fails self-check)



Action:
- Inspect the sensor node for physical damage.
- Contact SKF for assistance.

Sensor Node temperature within limits

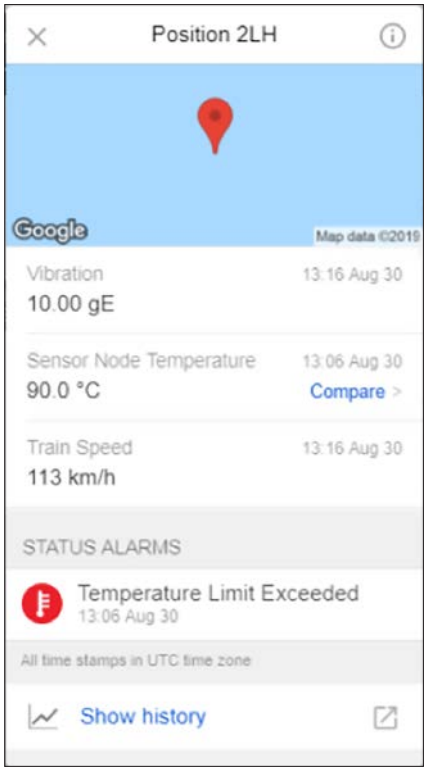
or

If the measured temperature approaches the physical operating condition limits of the sensor (–40 to +85 °C) then there is a high probability of irreparable sensor damage being caused. In such circumstances subsequent measurements and performance will be unreliable and the sensor should be replaced.

Trigger:
Measured temperature below –35 or above +80 °C

Display:

Green	Sensor Node temperature has remained inside the trigger limits
Yellow	Not applicable
Red	Temperature Limit Exceeded (temperature has exceeded its trigger limits)



Action:
- Replace the sensor node(s) at the next service opportunity.

Data collected as scheduled

or

This indicator will show if, and how many, sensors have not captured temperature or gated vibration data for more than 2 days.

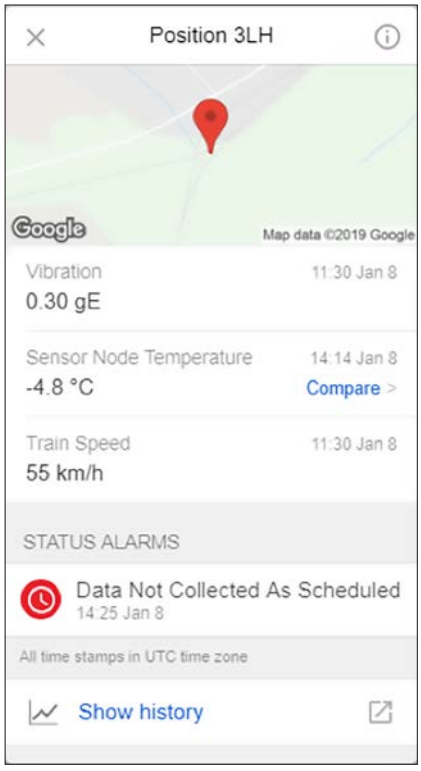
Trigger:
No temperature or gated vibration data recorded for over 2 days.

Display:

Green Temperature and/or gated vibration measurement data has been recorded within the last 2 days.

Yellow Not applicable

Red Data Not Collected As Scheduled (no temperature or gated data for more than 2 days).



Action:

- Verify whether train operation has been within the gated parameters (i.e. minimum and constant speeds have been met).
- Check sensor communication to ensure that another problem is not preventing measurement data from being transmitted. e.g. battery totally depleted (history of Battery Low alarms will have been generated/logged).
- Check the self-test icon to see if the sensor had identified any problems.
- Contact SKF for assistance.

Sensor Node battery OK

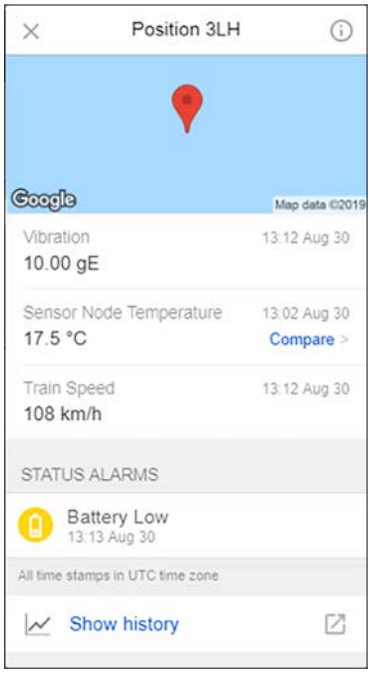
or

When the remaining battery energy drops below 20% this warning will be triggered. The node may still provide up to 3 months of useful operation, but it is recommended to replace the sensor node at the next service opportunity.

Trigger:
≤ 20% Battery energy remaining.

Display:
Green Battery energy is above 20%.
Yellow Battery Low (battery energy is ≤ 20% remaining).
Red Not applicable

NOTE: The display will remain yellow even if the battery becomes completely discharged. Other alarms may then trigger such as 'Data Not Collected As Scheduled'

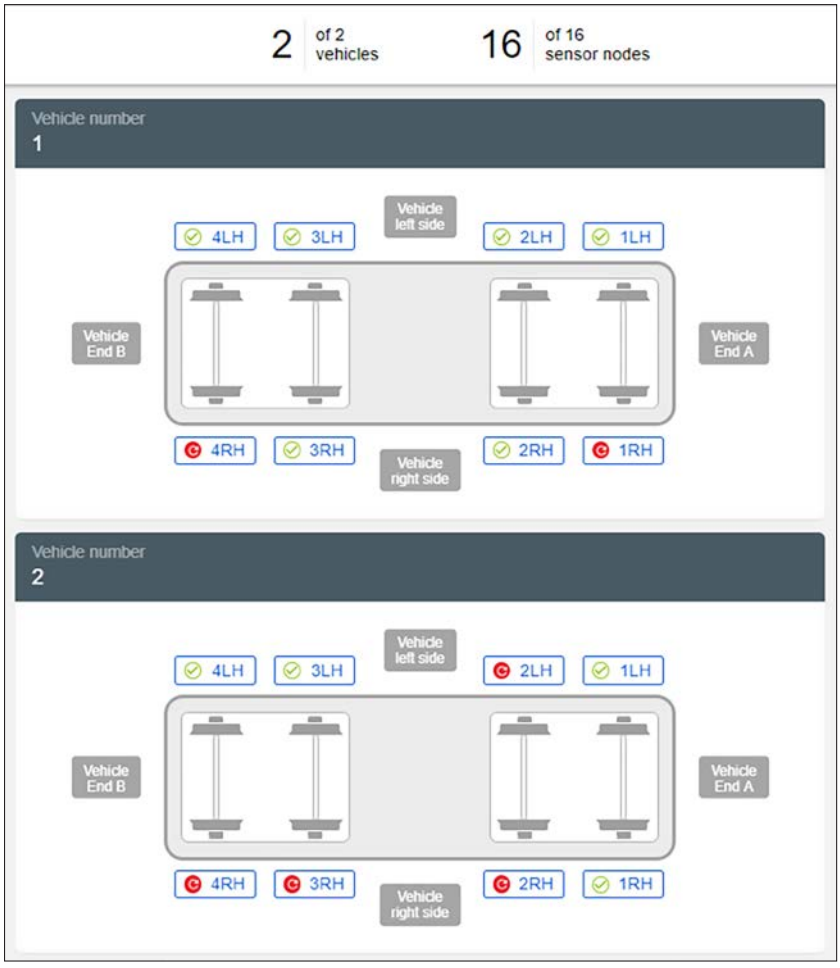


Action:
- Replace the sensor node(s) at the next service opportunity.

Web Portal (Reporting App) Graphic Displays

Selecting the **Fleet List** tab at the top of the screen, will display all trains that have been configured for the customer / train operator account.

The above example is a simple pilot installation, with only one train having 2 vehicles. Clicking on the train icon will display the vehicles/coaches, as shown below.

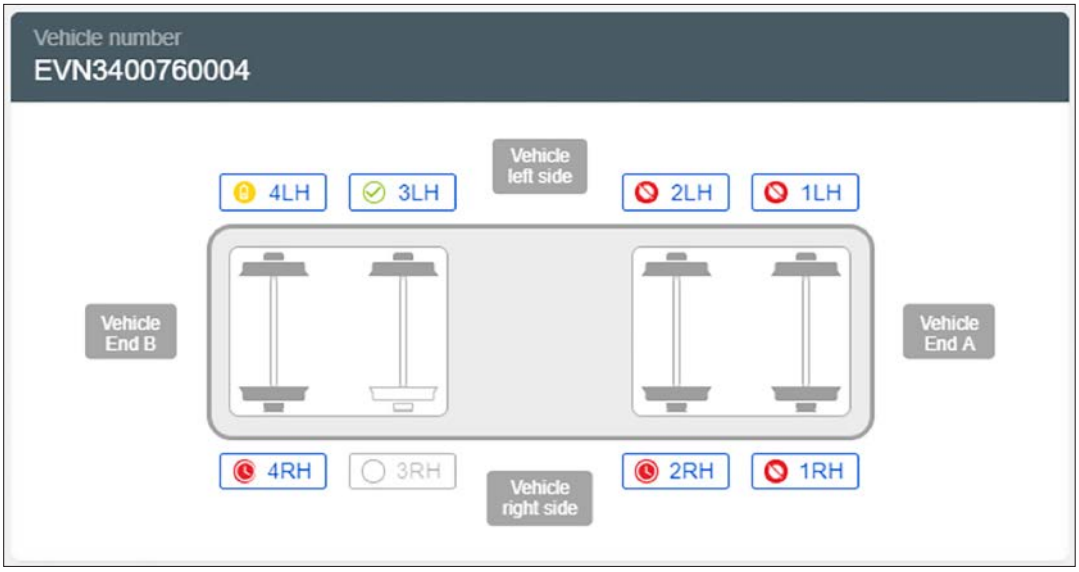


From the above example, there are 6 **STATUS ALARMS** present; these are identified by the red icons shown around the vehicle/coach. A green (tick) icon indicates that there are no **STATUS ALARMS** for the respective node.

Status Alarms

The STATUS ALARM icons are located around the outside of the vehicle graphic and show the node's designation; e.g. **4LH**, being wheel 4 on the **left-hand-side**. These icons can be **white/clear**, **green**, **yellow** or **red**; depending on the actual state of the node.

The STATUS ALARM **state** is automatic; if any recorded measurement is outside its specified tolerance, then the **status** of the node will be changed at the next scheduled data upload, typically daily.

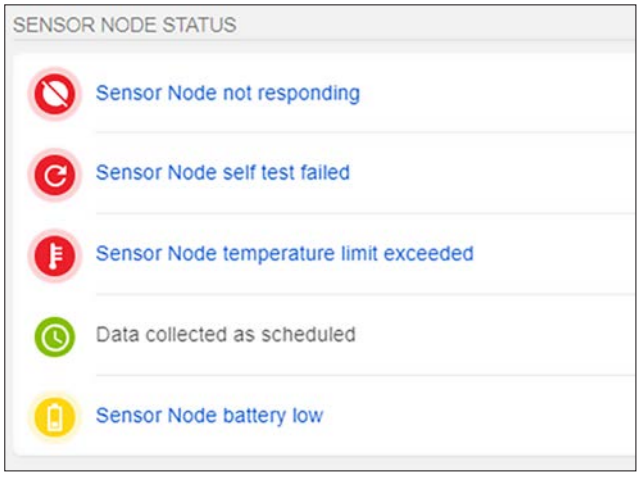


Any location where the STATUS ALARM icon is **white/clear**, indicates that no sensor node has been installed at that location (e.g. 3RH in the above).

The **red** and **yellow** icons that are used on the outside of the vehicle display are the same as those used on the **Status** tab display (below).

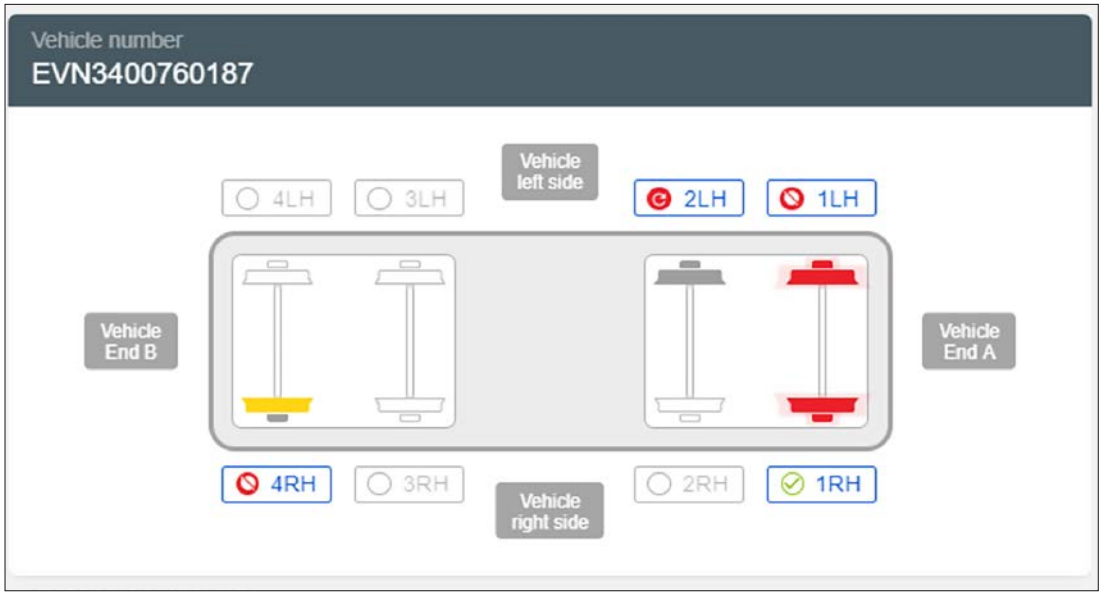
When the icons on the **SENSOR NODE STATUS** display show an **alarm** condition (yellow or red) they also display a pulse/flash effect; while the **non-alarm** condition (green) is steady. These icons do not pulse/flash when used on the Vehicle display.

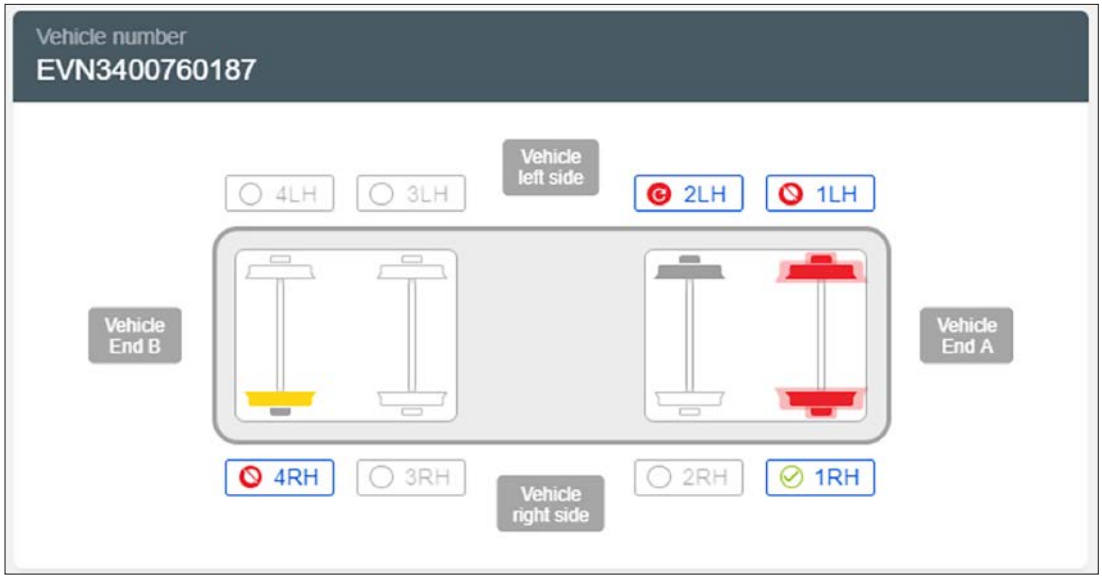
NOTE: When the Status tab is selected, showing the STATUS ALARM display, clicking on a **yellow** or **red** alarm will link to a display of trains from the **Fleet List** where these alarms are – this will not, however, include any trains with no alarm or different alarms.



Event Reports

The EVENT REPORT icons are located around the inside of the vehicle graphic and consist of the 'wheel' and the 'axle-hub'. These icons can be 'white/clear', 'grey', 'yellow' and 'red'; depending on whether or not an EVENT REPORT has been created. An EVENT REPORT is generated by an RDC Analyst in direct response to observed measurement data and can be viewed on the summary screen.

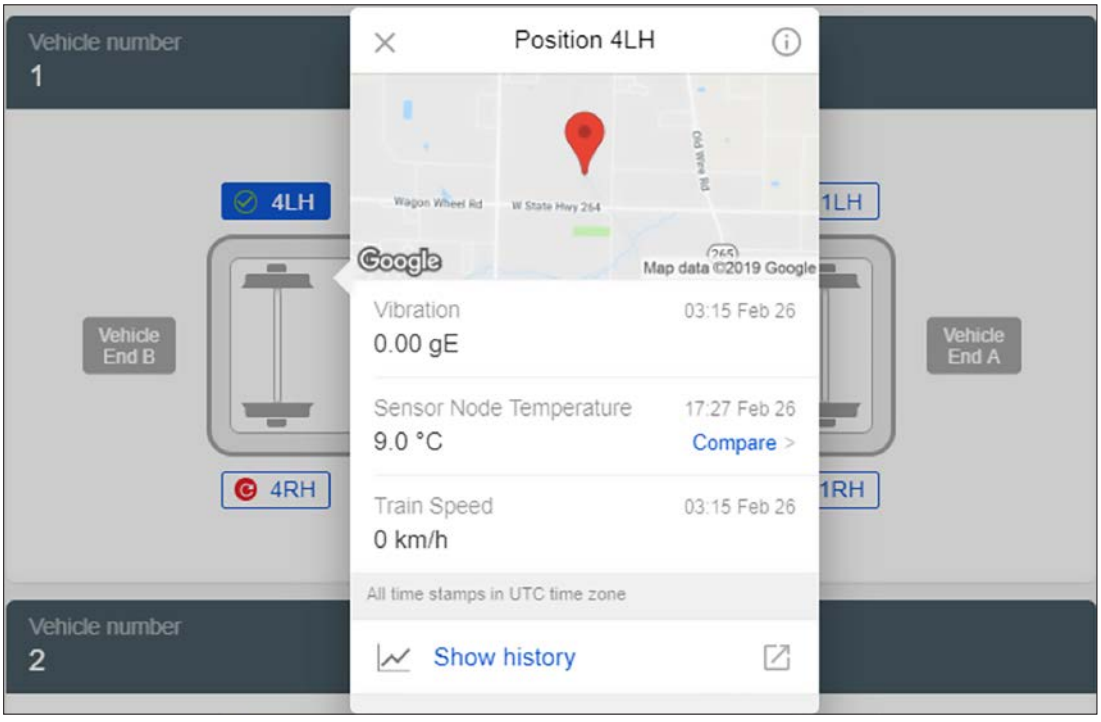




When the EVENT REPORT icons are **red** they display a pulse/flash effect; when they are **yellow**, **grey** or **white** they are steady (no pulse/flash effect).

Position pop-up

When a STATUS ALARM or EVENT REPORT icon is clicked, a Position pop-up **status** window is displayed. If no **alarm** or **report** has been generated, the respective icon will be green or grey and the pop-up will be as shown in the example below:



The measurement values that are used on the Position pop-up, for **vibration**, **speed** and **temperature** are the latest measurements received in the latest data upload from the sensor. So, if multiple vibration/speed measurements have been recorded on a given day, the value displayed here will be the last one recorded.

NOTE: These can be different values from the values used on the **point** pop-up that is described later under **Show history**. The **point** pop-up uses the first value recorded, while the **Position** pop-up uses the last value recorded. When only one vibration/speed measurement has been recorded, the values will be the same.

From the **Position** pop-up, two additional features can be accessed:

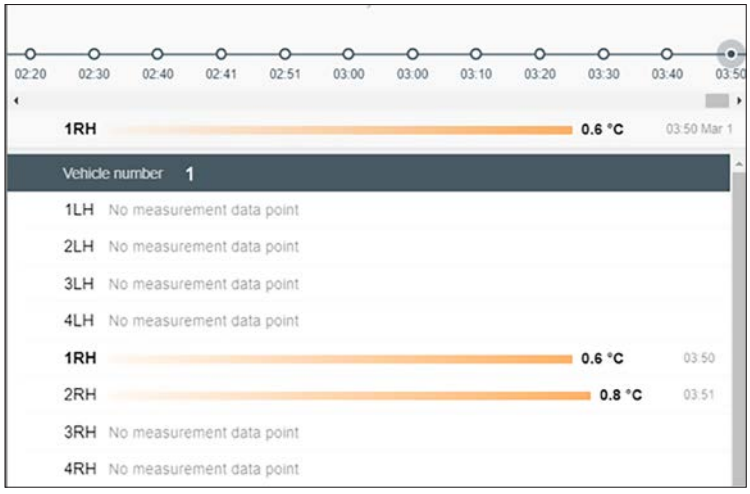
Compare and **Show history**.

When either a STATUS ALARM or EVENT REPORT exist (shown by the presence of a **yellow** or **red** icon) additional sections will be included on the **Position** pop-up. This is described later.

Compare

The upper section of the **Compare** pop-up shows the latest temperature measurement for the selected node – it is possible to select earlier measurements from the timeline along the top.

The lower section of the **Compare** pop-up displays temperatures of other nodes, centred on the currently selected node (in this example 1RH, highlighted in bold text)

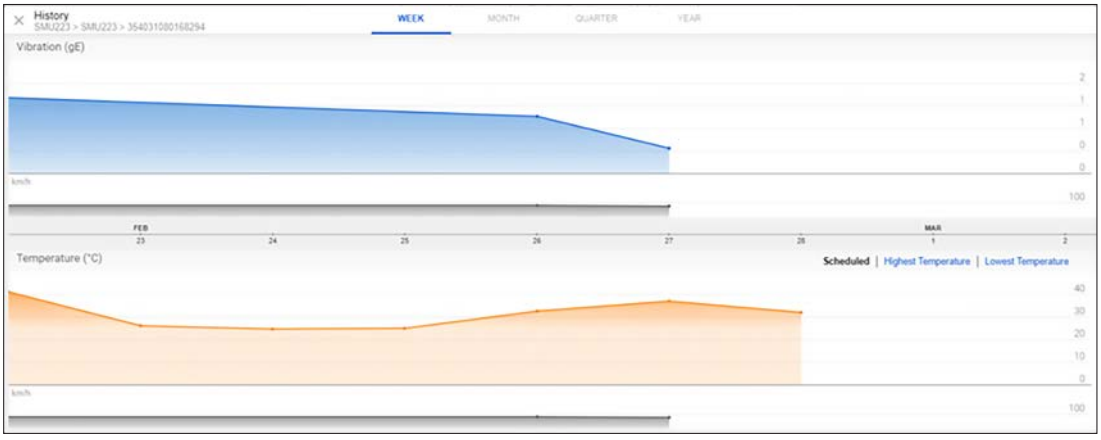


No measurement data point indicates that these nodes have not yet uploaded their temperature measurements for the selected **time** (03:50, in the example above.); selecting earlier times on the upper section timeline will reduce the number of **No measurement data point** node entries that occur on the **Compare** display.

The graph compares adjacent nodes and to effectively highlight differences has an **exaggerated scale**. It is provided to enable identification of significant temperature variances between co-located nodes.

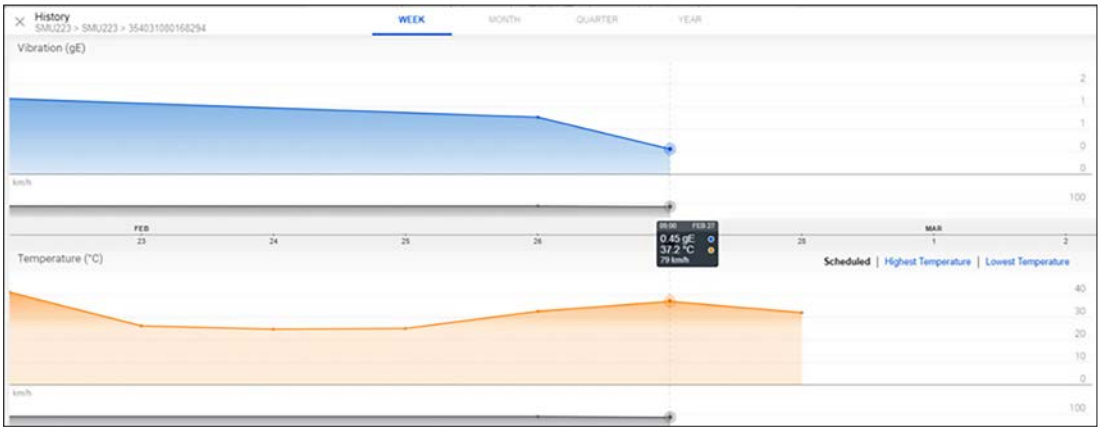
Show history

Clicking on the **Show history** link will open a new window which will show the selected nodes' most recent vibration (blue), speed (grey) and temperature (orange) measurements.



This top-level graph displays the most recent values that have been uploaded. Points on the graphs show where measurement values are recorded (temperature measurements will be made every day, but vibration and speed measurements may not).

Moving the cursor over the graph will provide a pop-up that provides details of measurements associated with each 'point'.



The data that is included in the pop-up can vary, depending on whether vibration and speed data exists at the 'point' and on which of the temperature options are selected (**Scheduled**, **Highest Temperature** or **Lowest Temperature**).

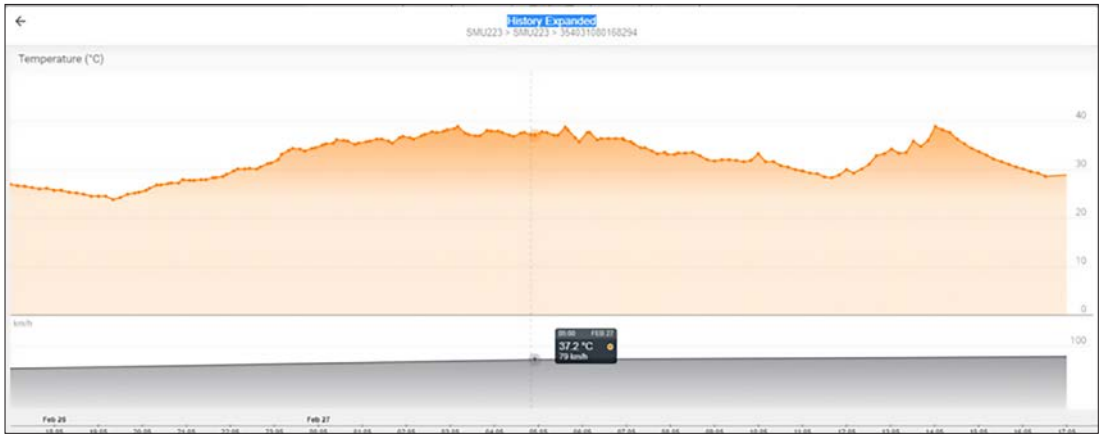
If no vibration/speed data is associated with the **point**, then no values will appear in those fields; the temperature value, however, will be the first value acquired on the **day** associated with the **point**. If there is vibration/speed data, then the temperature value will be the one linked with the vibration/speed measurement. If there are multiple vibration/speed measurements recorded on the **day**, it is the first measurement values that are displayed on the **point** pop-up.

Clicking on a **point** will drill-down to provide more detailed data:

This will show all the temperature measurements available over the 24-hours of the selected day (UTC time). Speed measurements (if any) are also displayed on the lower section. No vibration data is displayed on this detailed graph.

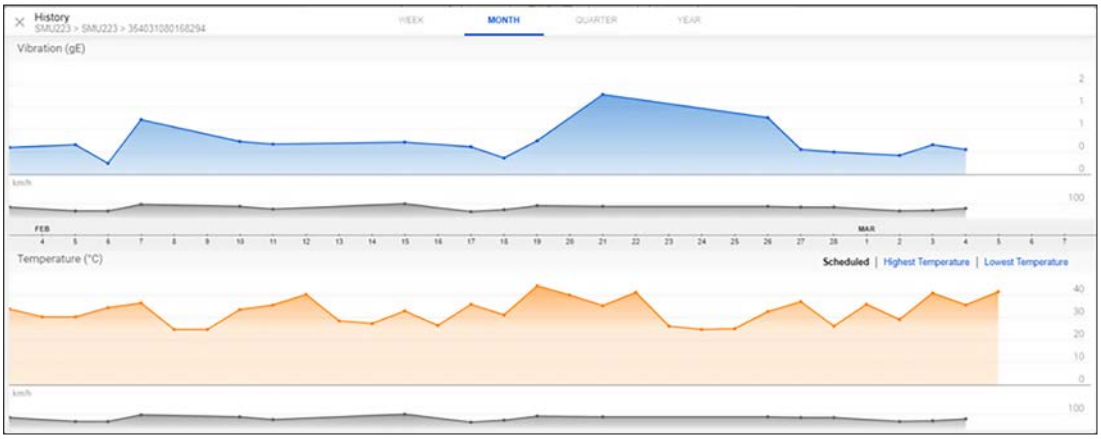
Again, moving the cursor over the graph will provide a pop-up that provides details of measurements associated with that **point**.

Clicking on the graph/point at this level will move the point **clicked** to the centre.

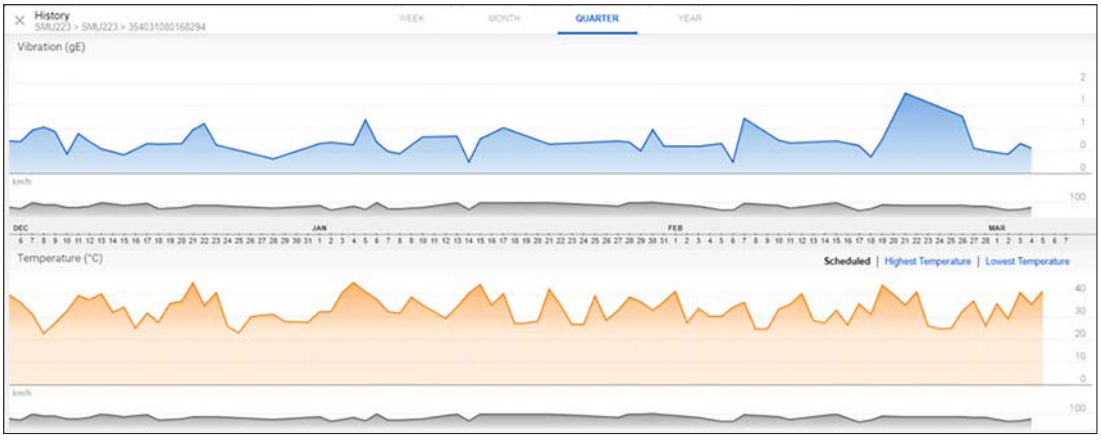


The graph is still showing 24 hours of measurements, but now the 12 hours before and after the selected point **time** (Note: all times displayed are UTC).

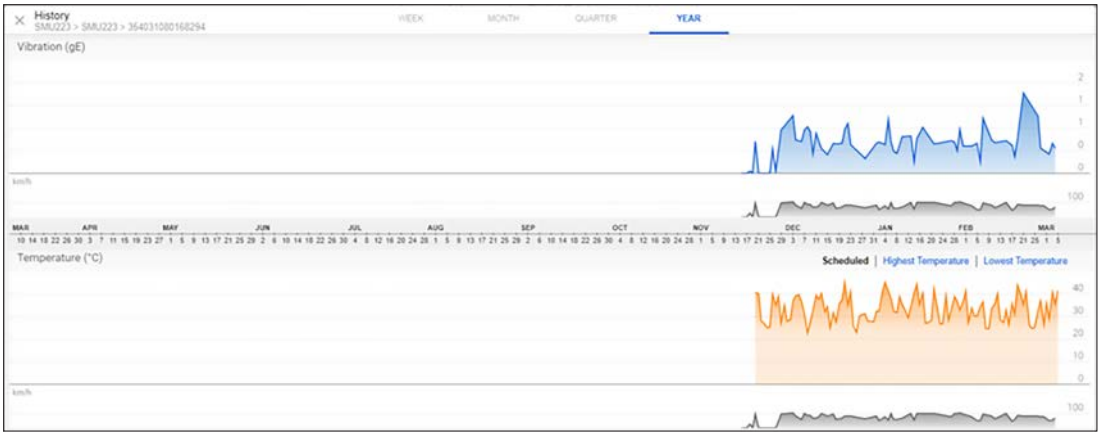
The graph below shows data for a month, obtained by clicking the **MONTH** tab



The graph below shows data for a quarter, obtained by clicking the **QUARTER** tab.

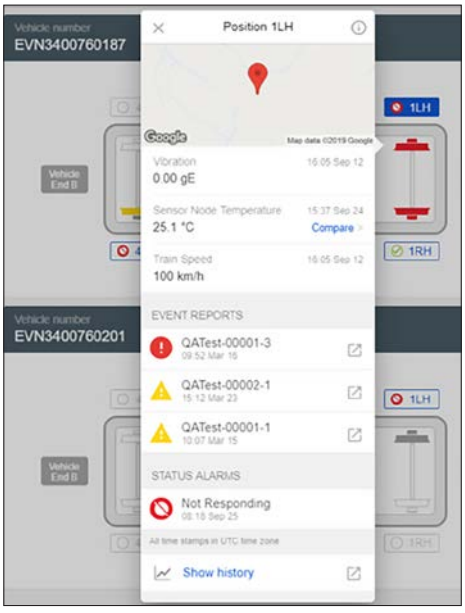


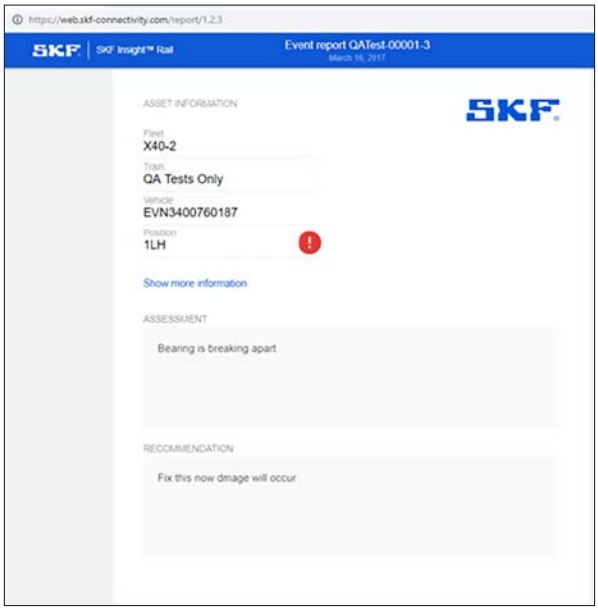
The graph below shows data for a year, obtained by clicking the **YEAR** tab.



Detail data cannot be drilled down from the **QUARTER** and **YEAR** displays.

As mentioned earlier, if EVENT REPORTS or STATUS ALARMS exist, then when an icon associated with such a wheel/node is clicked the pop-up for that position will include additional sections – as shown below (left).





By clicking on the EVENT REPORT entry on the pop-up, this will display the appropriate document; see above (right).

It is possible that one location on the vehicle display may contain more than one **alarm**. In this situation, the most serious **alarm** is the one that will be displayed. Basically, a **yellow** alarm or report icon will be superseded by a **red** alarm or report. Clicking on an icon will show the **Position** pop-up, as above (left), this will list all the **alarms** associated with the node. In the above example there are 3 EVENT REPORTS, two **yellow** and one **red** plus a **red** STATUS ALARM.

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