Connections and Set up for Combined Accelerometers (Vibration and Temperature), Three-Wire Accelerometer

Introduction

Usually there are problems during connection and set up of combined sensors in SKF Multilog IMx on-line monitoring and protection systems due to bad readings on the temperature side. This document explains in detail how to connect these sensors to SKF Multilog On-line System IMx-S, –T, –W and –M and how to set them up in SKF @ptitude Observer and SKF @ptitude Analyst.

The sensors commonly used for this purpose and described here are CMSS 2100T, CMSS 2200T, CMSS 797T-1, CMSS 797T-3, CMPT 2323T and CMPT 2310T. These sensors have three pins/cables: one for accelerometer signal/power, one for temperature sensor signal and one for temperature and accelerometer signal common.

Differential versus referential inputs

Modern on-line monitoring systems like the SKF Multilog IMx have the capacity to measure differential inputs in their channels. This means that both terminals in each channel are connected to an analog/digital (A/D) converter and the measured value is always the difference between these two terminals. This measurement ignores any external reference and makes it efficient with noise reduction once an interference appears normally in both terminals in a similar way.

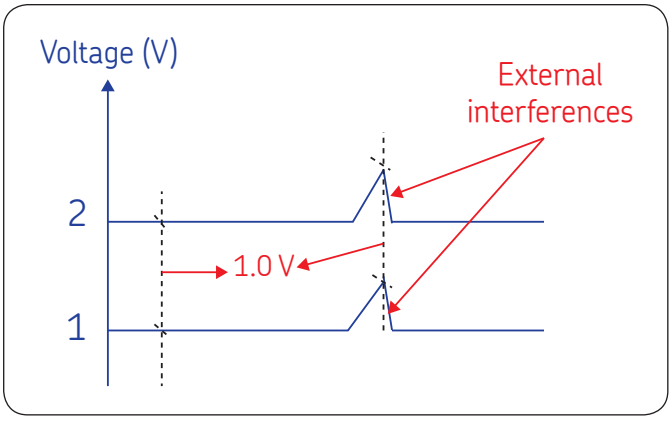

Fig. 1. External interferences in a channel with differential measurement.

This type of measurement is important, especially in low intensity signal monitoring (> 1 V) and in areas with electric noise, which leads this option as the first one when measuring with ICP accelerometers.

With connected sensors with multiple signal outputs to a differential input, the signal of one of the outputs could interfere with the reference from other signals, carrying it to erroneous measurements or with a high offset.

In order to eliminate these deviations, it is advisable that multiple output sensors always be connected to referential inputs (single-end). In a referential input, only one terminal is connected to the A/D converter and the other one to earth. With this, measurements will always have earth as a reference that is supposed to be 0 V, although in practice it can vary according to installation place. This kind of input is obviously more susceptible to an external interference, because it affects the sensor cable in a different way than earth, where it tends to be null.

When needed, a differential input can be easily converted to a referential input just by grounding one of the terminals. It is important that grounding be done with an on-line monitoring ground and not with a sensor in order to prevent ground loops. The opposite conversion from a referential input to a differential one requires complex modifications and it is not possible to do it in the field. This makes a system with differential inputs more flexible, in which it is possible to connect more kinds of sensors.

To consider

Temperature measurement with dual sensors (vibration and temperature sensors) is intended to trend temperature behavior in rotary machinery as an indication of a bearing's or other internal component's state, e.g., a change in temperature trend can be related to a change in the machine state and needs to be compared with vibration and other process values. It is not recommended to use this value as a control parameter, due to the internal electronics in the sensor generate additional heat that is transferred to the environment with different rates depending on the kind of sensor. This leads to having differences in temperature values between control systems or thermograms and the dual sensor. For example, when comparing values between a CMSS 2100T or CMSS 2200T sensor with a CMPT 2310T or CMPT 2323T sensor, a 3 to 5 °C difference (higher) is obtained because of the bigger heat transfer area in CMPT sensors compared with CMSS sensors. Also, there will be a higher difference in the temperature measured in CMSS 797T-1 and CMSS 797T-3 sensors because the electronics inside are different (temperature and vibration have individual powering).

Connecting different types of sensors to SKF Multilog IMx systems

CMSS 2100T and CMSS 2200T

With these sensors, it is recommended to use cable CMSS R6GSL-0-J9T3A-16 and take care of this convention when installing:

- Pin A = Red
- Pin B = Black
- Pin C = White

In the SKF Multilog IMx side, it is important to power the channel where the acceleration signal is connected by setting dip switches as shown in **fig. 2** (SKF Multilog IMx-S, –T, –M). With SKF Multilog IMx-W, it is not necessary to set any dip switch. As any power is not necessary in the temperature side, set dip switches as shown in **fig. 3**. Finally, jump B terminals between the two channels used and ground it (→ **fig. 4**).

Terminal		DIP Settings position: 123456
+ –	A B	100110

Fig. 2a. Dip switch positions for vibration part in SKF Multilog IMx-S, –T and –M channels 1 through 8.

Terminal		DIP A settings	DIP B settings
N.C. + – Shield	P A B S	100110	0010

Fig. 2b. Dip switch positions for vibration part in SKF Multilog IMx-M channels 9 through 16.

Terminal		DIP Settings position: 123456
+	A	000000
–	B	

Fig. 3a. Dip switch positions for temperature part in SKF Multilog IMx-S, –T and –M channels 1 through 8.

Terminal		DIP A settings	DIP B settings
N.C.	P	000000	0010
+	A		
–	B		
Shield	S		

Fig. 3b. Dip switch positions for temperature part in SKF Multilog IMx-M channels 9 through 16.

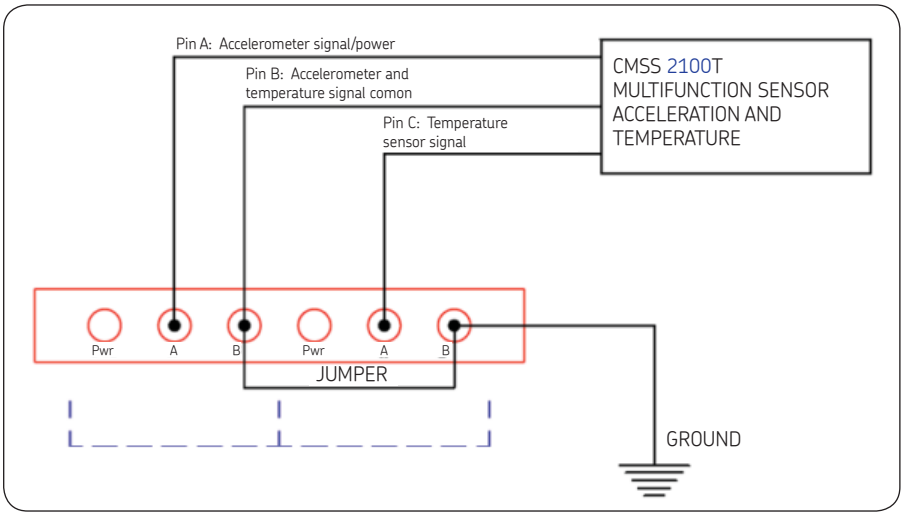

Fig. 4. Wiring for sensors CMSS 2100T, CMSS 2200T and SKF Multilog IMx units.

CMSS 797T-1 and CMSS 793T-3

Using these sensors, it is not necessary to convert the channel from differential input to a referential input, since the temperature side does not use the same power as the vibration part. With this, there is no potential problem for the temperature part and it will not affect the vibration signal. According to the above, the **temperature side needs to be powered** and for these two signals (vibration and temperature) the same dip switch configuration is needed according to **fig. 2**. **Fig. 5** shows the new drawing for these two sensors.

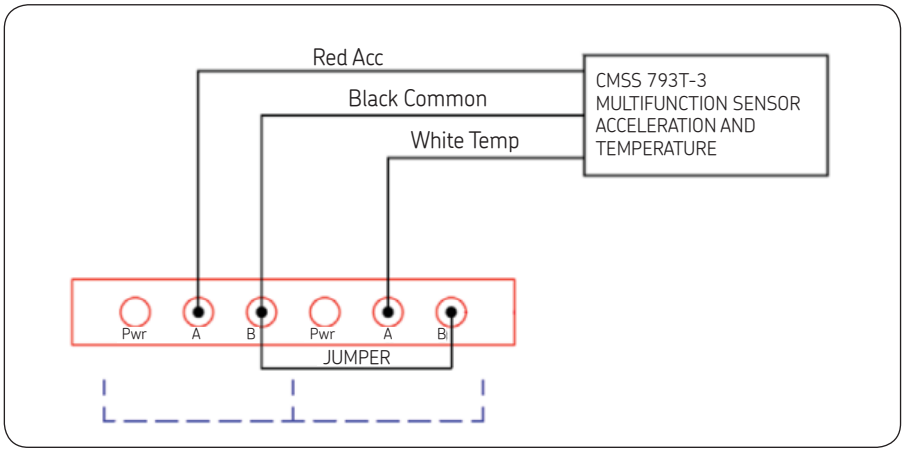

Fig. 5. Wiring for sensors CMSS 797T, CMSS 793T-3 and SKF Multilog IMx units.

CMSS 2310T and CMSS 2323T

These CMPT 2310T and CMPT 2323T sensors should be connected as shown in **fig. 6**, grounding in order to obtain referential inputs. Remember to set dip switches for SKF Multilog IMx-S, –T and –M as described in **figs. 2** and **3**.

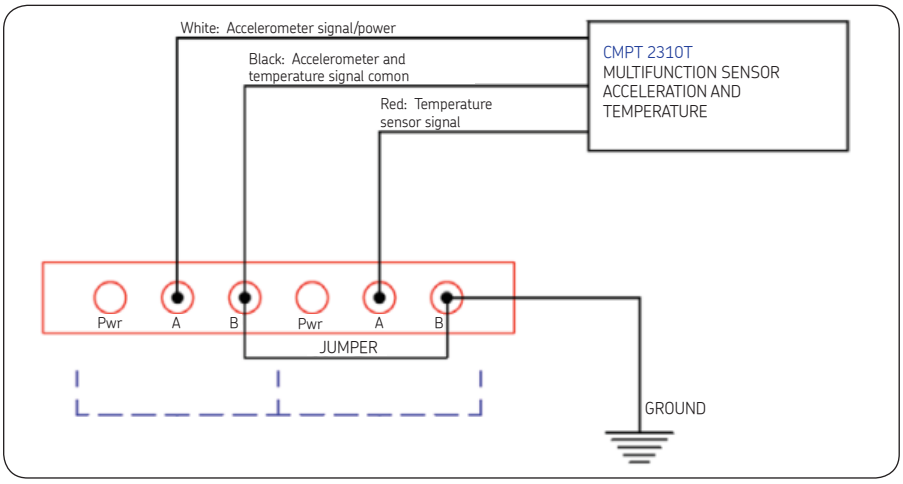

Fig. 6. Wiring for sensors CMPT 2310T, CMPT 2323T-3 and SKF Multilog IMx units.

Configuring SKF @ptitude Observer to read combined vibration–temperature sensors

In SKF @ptitude Observer, go to the **On-Line** menu and select **MasCon/ IMx unit**, then select the channel connected to the accelerometer and use settings as shown in **fig. 7**. **Sensitivity** should be "100 mV/g" for CMSS 2100T, CMSS 793T-3, CMSS 797T-1, CMPT 2310T, and "230 mV/g" for CMPT 2323T.

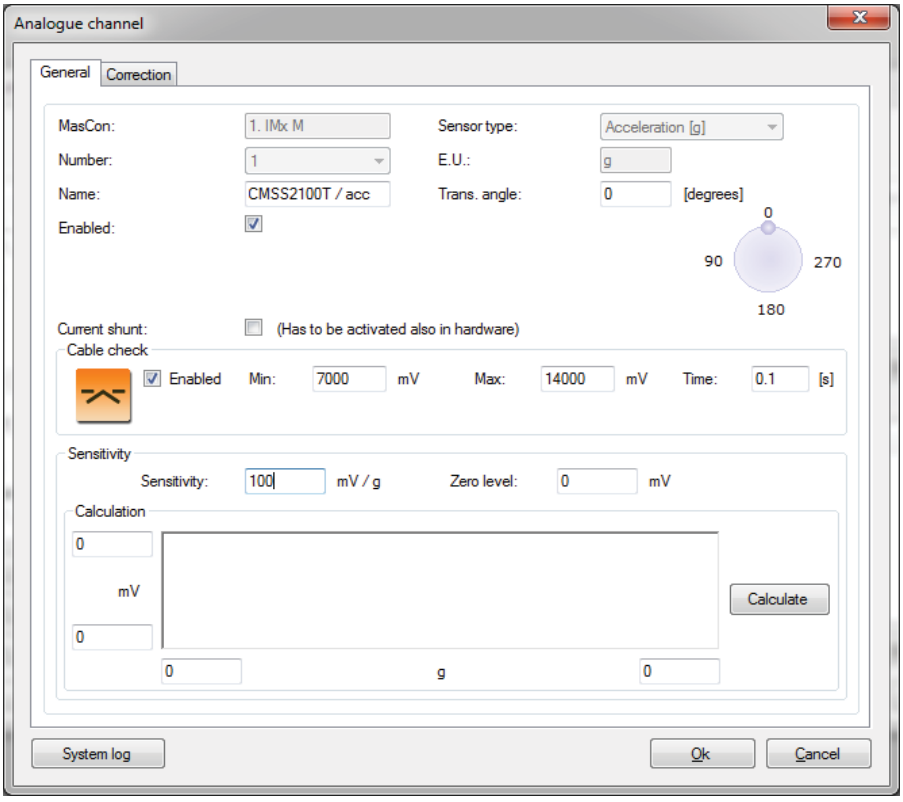

Fig. 7. Standard channel set up for the acceleration part in a combined sensor in SKF @ptitude Observer.

Then select the channel connected to the temperature part (it should be paired with the vibration part) and use the settings as described in **fig. 8** when using the Celsius scale. Make sure to:

- Select "Other" as the **Sensor type** (TBU. Temp is a railway sensor).
- **E.U.** should be "C".
- Uncheck **Cable check**.
- For CMSS 2100T and CMSS 2200T, **Sensitivity** should be "10 mV/C" and **Zero level** should be "0 mV".
- For CMSS 797T-1 and CMSS 793T-3, **Sensitivity** should be "10 mV/C" and **Zero level** should be "2727.8 mV".
- For CMPT 2310T and CMPT 2323T, **Sensitivity** should be "10 mV/C" and **Zero level** should be "0 mV".

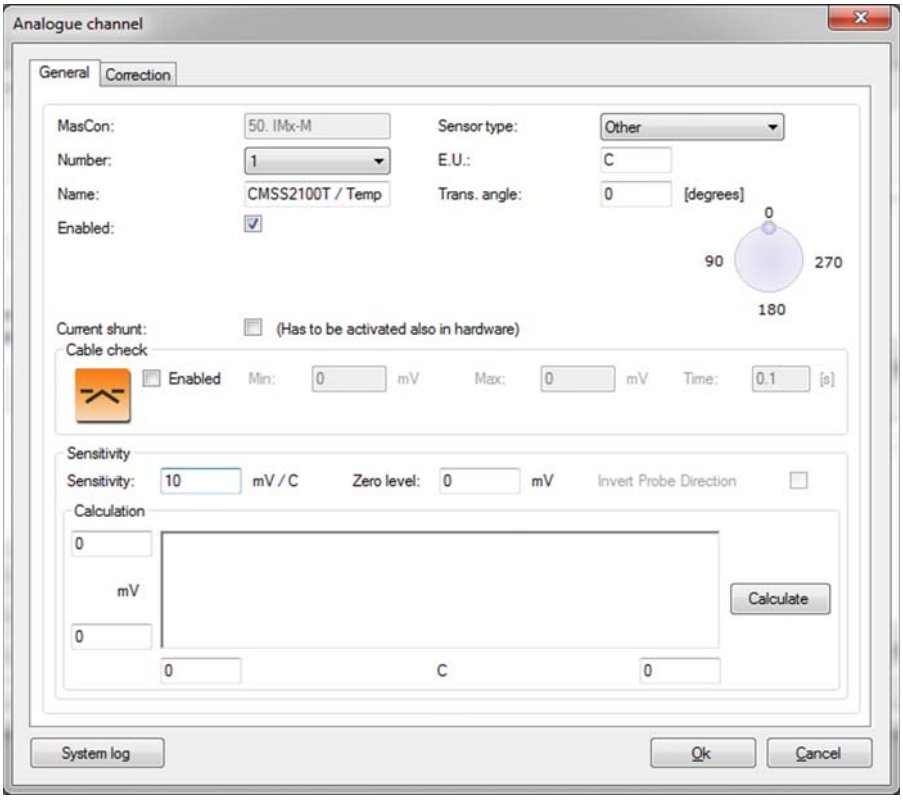

Fig. 8. Standard channel set up for the temperature part in a combined sensor, Celsius scale in SKF @ptitude Observer.

When using the Fahrenheit scale, use the settings described in **fig. 9** and make sure to:

- Select "Other" as the **Sensor type** (TBU. Temp is a railway sensor).
- **E.U.** should be "F".
- Uncheck **Cable check**.
- For sensors CMSS 2100T and CMSS 2200T, **Sensitivity** should be "5.56 mV/F" and **Zero level** should be "–177.8 mV".
- For sensors CMPT 2323T and CMPT 2310T, **Sensitivity** should be "5.56 mV/F" and **Zero level** should be "–177.8 mV".
- For sensors CMSS 797T-1 and CMSS 793T-3, **Sensitivity** should be "5.56 mV/F" and **Zero level** should be "2556 mV".

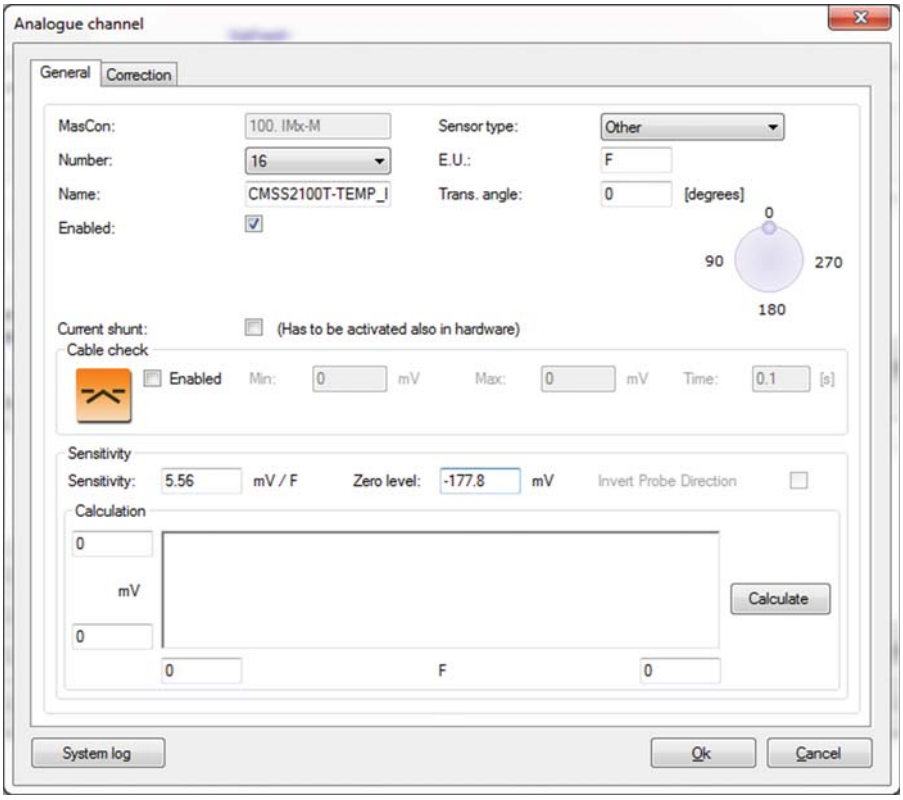

Fig. 9. Standard channel set up for the temperature part in a combined sensor, Fahrenheit scale in SKF @ptitude Observer.

Proceed with measurement point set up according to your needs.

Configuring SKF @ptitude Analyst to read combined vibration–temperature sensors

In SKF @ptitude Analyst, go to the **Customize** menu and select **On line settings**, then select **Config** and proceed selecting the channel connected to the accelerometer and use settings as in **fig. 10**. **Sensitivity** should be "100 mV/g" for CMSS 2100T, CMSS 2200T, CMSS 793T-3, CMSS 797T-1, CMPT 2310T, and "230 mV/g" for CMPT 2323T.

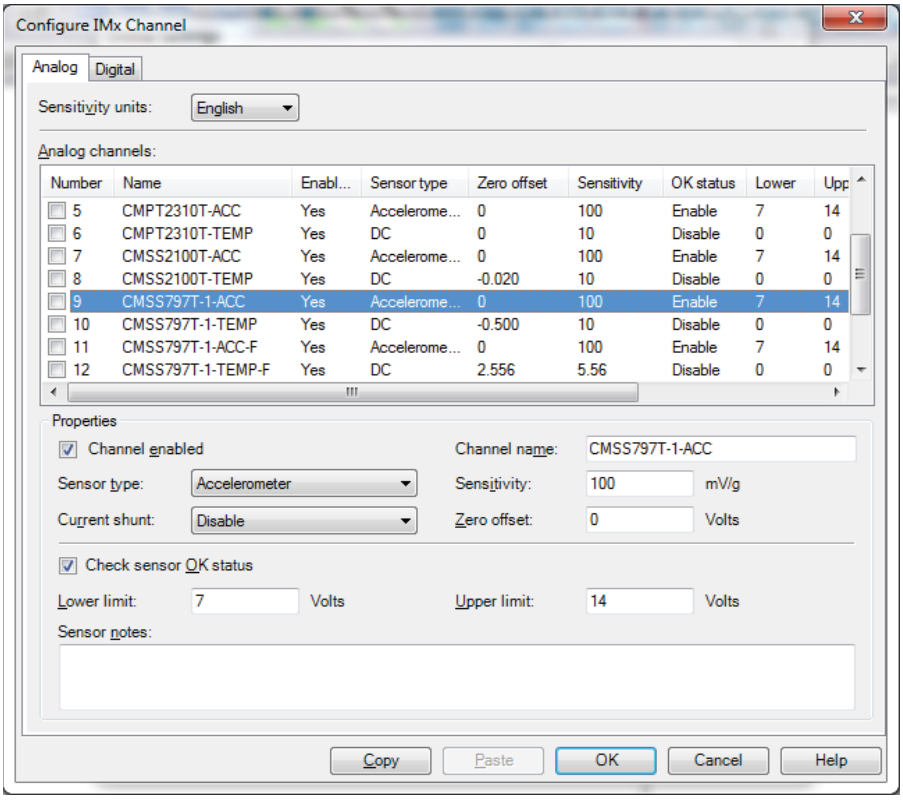

Fig. 10. Standard channel set up for the acceleration part in a combined sensor in SKF @ptitude Analyst.

Then select the channel connected to the temperature part (it should be paired with the vibration part) and use the settings as described in **fig. 11** when using the Celsius scale. Make sure to:

- Select "DC" as the **Sensor type**.
- "Disable" **Current shunt** and uncheck **Check sensor OK status**.
- For CMSS 2100T and CMSS 2200T, **Sensitivity** should be "10 mV/EU" and **Zero offset** should be "0 V".
- For CMSS 797T-1 and CMSS 793T-3, **Sensitivity** should be "10 mV/EU" and **Zero offset** should be "2.728 V".
- For CMPT 2310T and CMPT 2323T, **Sensitivity** should be "10 mV/EU" and **Zero offset** should be "0 V".

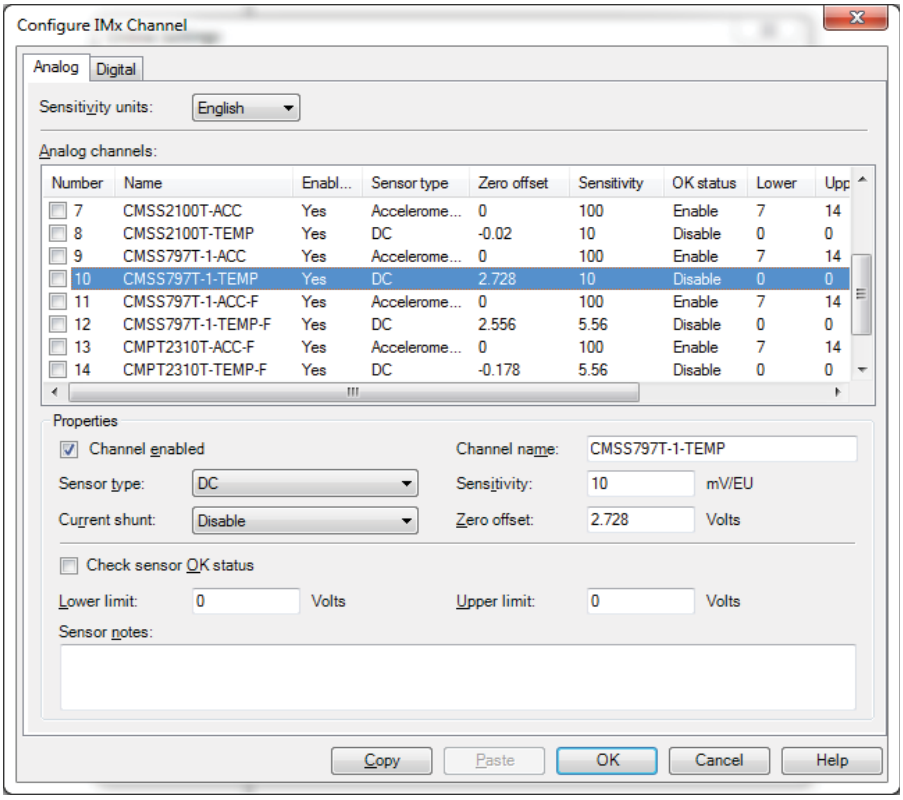

Fig. 11. Standard channel set up for the temperature part in a combined sensor, Celsius scale in SKF @ptitude Analyst.

When using the Fahrenheit scale, use the settings described in **fig. 12** and make sure to:

- Select "DC" as the **Sensor type**.
- "Disable" **Current shunt** and uncheck **Check sensor OK status**.
- For sensors CMSS 2100T and CMSS 2200T, **Sensitivity** should be "5.56 mv/EU" and **Zero offset** should be "–0.178 V".
- For sensors CMPT 2323T and CMPT 2310T, **Sensitivity** should be "5.56 mv/EU" and **Zero offset** should be "–0.178 V".
- For sensors CMSS 797T-1 CMSS 793T-3, **Sensitivity** should be "5.56 mv/EU" and **Zero offset** should be "2.556 V".

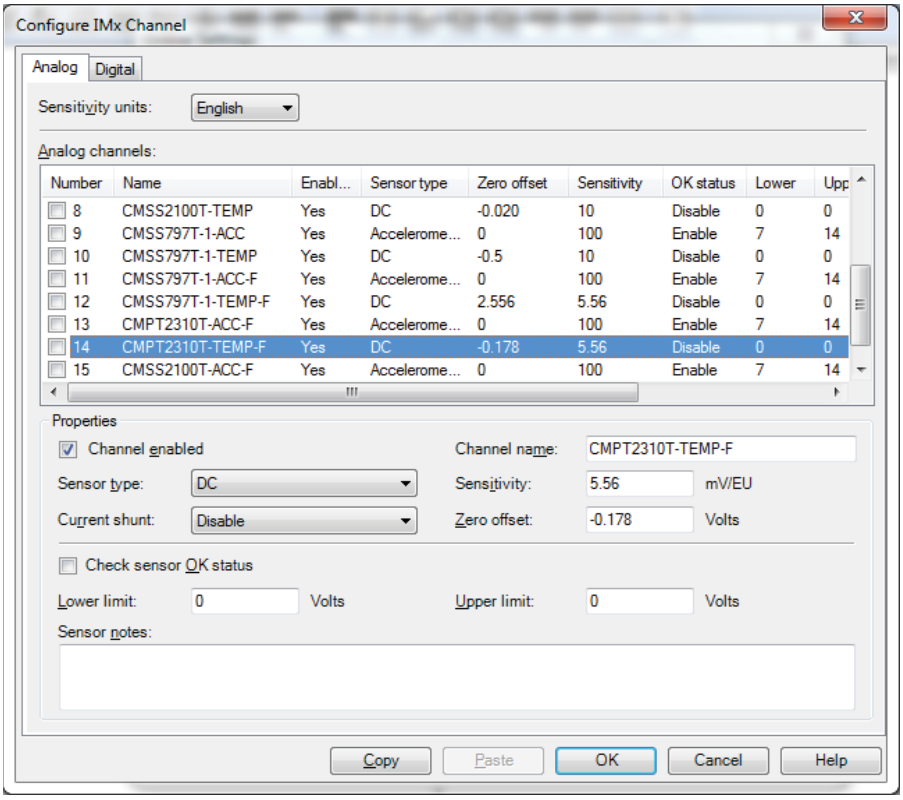

Fig. 12. Standard channel set up for the temperature part in a combined sensor, Fahrenheit scale in SKF @ptitude Analyst.

Proceed with measurement point set up and be careful to set the scale units in C or F according to your needs.

Please contact:

SKF Condition Monitoring Center – Luleå
Aurorum 30 · SE-977 75 Luleå · Sweden
Tel: +46 (0)31 337 1000 · Fax: +46 (0)920 134 40

Web: www.skf.com

PUB CM3165 EN · February 2013