

Specifications and Total Error Band

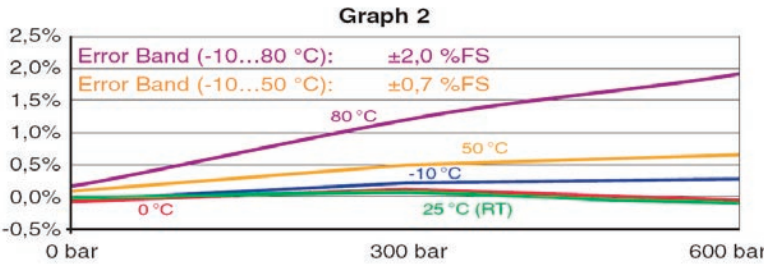
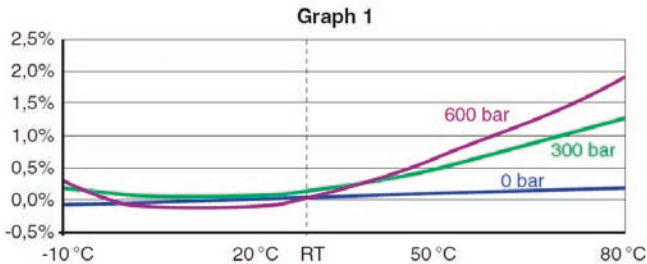
A typical specification sheet for a pressure transmitter may contain a dozen possible error sources, which may make it difficult for the user to decide whether a certain transmitter is sufficient in accuracy for a particular application.

A minimum of four parameters have to be taken into account for the error calculation on the specification sheet:

1. Linearity
2. Temperature Coefficient of Zero
3. Temperature Coefficient of Gain
4. Long Term Stability

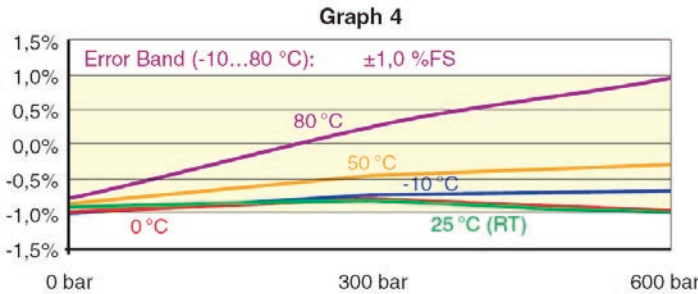
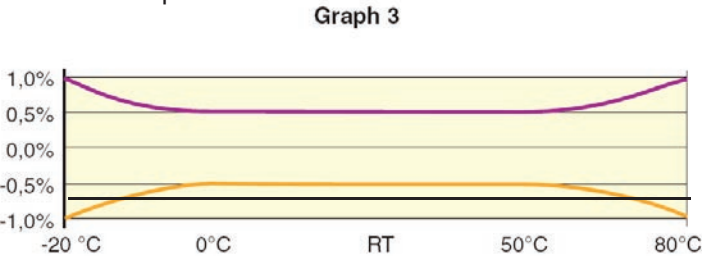
In laboratory applications at constant temperature, linearity alone defines the accuracy. In the days of glued strain-gages, hysteresis and repeatability had to be taken into account. With modern sensor technologies such as piezoresistive, these errors are negligible, and advanced packaging techniques have greatly improved long term stability as well. Therefore what remains as the most significant error source are the temperature dependencies.

The wider the temperature range of a transmitter, the greater the influence of the temperature errors. How this influence can affect the output (i.e. accuracy) is shown in the following graphs.



The lines in Graph 1 show the error increase as a function of temperature for constant pressure lines, while Graph 2 shows the error at constant temperatures as a function of pressure.

In military or avionic applications the accuracy requirements are typically indicated in “error bands” over a range of temperature. No individual specifications, such as TC zero or linearity, are listed in such a spec. This type of error band requirement looks like Graph 3.



The transmitter of Graph 2 could meet this requirement if the zero is offset intentionally to -1%, as shown in Graph 4. In automotive and other high volume applications, this method of intentionally displacing zero and gain at room temperature is frequently used to meet the error band requirement. This may have the effect that the transmitter is less accurate at room temperature, but can make sense for applications like automotive, where the transmitter is rarely maintained at room temperature. However, most “real-world” applications require accuracy to be maintained over a wide range of temperature, including room temperature.

“Total Error Band” is defined as the smallest band which covers all the values within the pressure and temperature range. Keller America’s Preciseline and Acculevel “new generation” transmitters are based upon the Xemics µP-circuit, programmed with the pressure-temperature lines. The transmitter output is therefore automatically corrected to minimize pressure / temperature errors. As well, the customer is able to read out the deviations for his specific pressure / temperature point and pressure / temperature range. Thus is given much more information than any official calibration certificate, which usually shows the pressure / output curve at room temperature only.

See reverse for a typical calibration certificate delivered with Keller µP-based transmitters.

Calibration Certificate

Type: PAA-33X / 10bar / 80794

Serial number: 47328

Measurement range: 0.05 – 10 bar abs

Compensated temperature range: -10 – 80°C

Supply: 13 – 28 VDC

Output signal: 0 – 10 bar @ 0 – 10 VDC

Connector: Binder 723

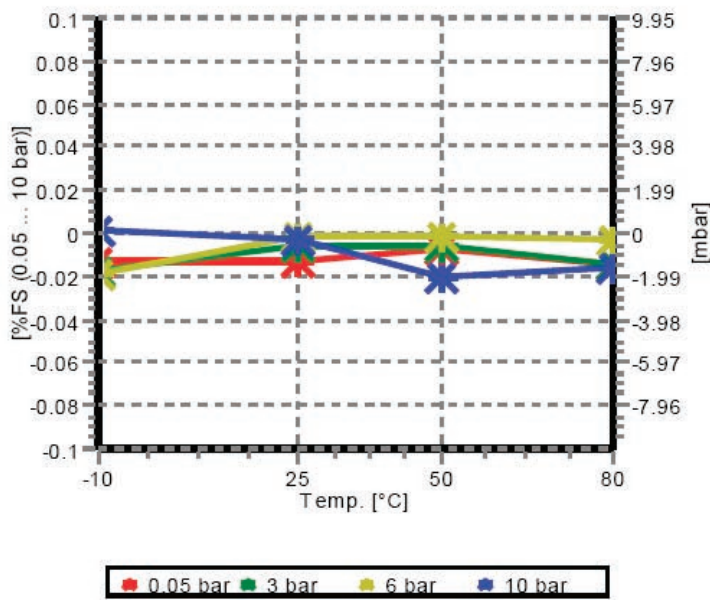
1: GND 4: RS485A

2: +OUT 5: RS485B

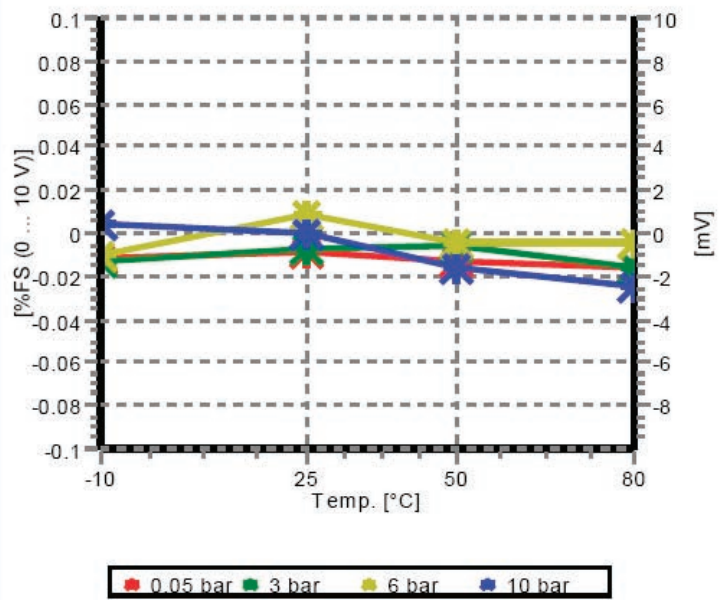
3: +Vcc

Remark: KELLER Pressure Transmitter Series 33X

Deviation % measurement range



Deviation analog output signal



Linearity error:

±0.003 %FS @ 25°C

Accuracy (TEB):

-0.020 +0.002 @ -10 – 80°C

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