

DEPTH SENSOR TEMPERATURE PERFORMANCE IN BOREHOLE APPLICATIONS



This document examines the temperature performance characteristics of two typical depth sensors when used in borehole monitoring applications.

ERROR COMPONENTS

Two components contribute to the overall error specified by the sensor manufacturer:

- 1) Accuracy Error is typically expressed as a percentage of full-scale value. This represents the deviation in the pressure response of the sensor from an ideal curve, as the pressure (water depth) is varied and applies over the specified compensated temperature range.
- 2) Thermal Effect Error, typically expressed as a percentage of full-scale value, per deg C or F. This represents the deviation in the sensor's response from an ideal curve and applies when the water temperature is outside the specified compensated temperature range. This is an additional error that adds to the Accuracy Error.

ERROR EXAMPLES

We have listed two typical sensors, one made in the USA and one of the many manufactured in China.

PROBE #1 DWYER / MERCOID SBLT2 (MANUFACTURED IN THE USA)

Note that the thermal effect error is quoted in Fahrenheit rather than centigrade.

Accuracy = +/-0.25% FS

Thermal Effect Error = +/-0.02% FS per °F

Temperature Compensated Range -18 to +60 °C

Temperature Limit -18 to +66 °C

The accuracy is +/- 0.25% FS when the water temperature is between -18 to +60 °C.

The accuracy is +/- 0.25% + (+/- 0.22%) FS when the water temperature is 66 °C.

PROBE #2 A SAMPLE FROM MANY MANUFACTURERS, FOR EXAMPLE, CHINA STAR- (MANUFACTURED IN CHINA)

Note that the thermal effect error is quoted in centigrade rather than Fahrenheit.

Accuracy = +/-0.25% FS

Thermal Effect Error = +/- 0.032%FS (typically), +/- 0.2%FS (maximum) per °F

Temperature Compensated Range -10 to +60 °C

Temperature Limit -30 to +80 °C

The accuracy is +/- 0.25% FS when the water temperature is between -10 to +60 °C.

The accuracy is +/- 0.25% + (+/- 1.2% typically) FS when the water temperature is +66 °C.

CONCLUSION

The Dwyer Mercoïd sensor is comparable to the Chinese sensor typical error over the temperature range -10 to 60 °C.

The Dwyer/ Mercoïd sensor has a better error specification when operating outside the temperature range of -10 to 60 °C.

In Borehole Applications, it is unlikely the water temperature will be outside the temperature compensated range.