Anville Instruments Ltd
Data Logging & Process Monitoring

Anville measurement uncertainty

Anville systems differ from the majority of data loggers by the technology used to switch the analogue inputs and in the design of the thermocouple cold junction compensation in the series 825 system. The Anville series 825 system minimises the cold junction compensation error by using correctly compensated miniature type T thermocouple connectors with matching class 1 type T thermocouple wiring to the cold junction temperature sensor connection.

The temperature of the thermocouple cold junction is measured with a 1/3 DIN Pt100 sensor which has an accuracy of ±0.1°C at 0°C. Design of the physical layout of the cold junction compensation reduces any thermal scatter to a typical deviation of ±0.05°C. A 20 bit sigma-delta A/D converter with a programmable gain instrumentation amplifier on each input minimises noise, time and temperature drift errors. Acquisition of all inputs is in parallel ensuring that all measurements are taken simultaneously. Digital linearization for thermocouple and Pt100 sensors is employed for signal conversion to °C.

For type T thermocouples the resolution is 0.01°C. The system measurement accuracy is ±0.25°C over the range from -50°C to 300°C. This accuracy figure includes all the sources of instrument error including the digital linearization of the type T thermocouple voltage output into °C, cold junction compensation measurement, A/D converter errors and instrumentation amplifier errors. The system accuracy figure of ±0.25°C also includes the errors due to instrument ambient temperature changes over an operating range from 0°C to 50°C.

Using an Anville system will allow you to comply with the requirements of HTM2010 that the repeatability of measurement should be ±0.25°C or better and that the limit of error of the complete measurement system (including sensors) should be no more that ±0.5°C.

The table below shows the calculation of measurement uncertainty of the Anville Series 825 thermal validation interface and that this measurement uncertainty of ±0.33°C cannot be removed by calibration and qualifies all measurements taken with the system.

SOURCE OF UNCERTAINTY	Value °C	Probability Distribution	Divisor SQRT(3)	Total Value /SQRT(3)	Total ^2
Resolution	0.01	Rectangular	1.73205081	0.00577350	0.00003333
Drift of Unit + Thermocouples	0.10	Rectangular	1.73205081	0.05773503	0.00003333
Range Accuracy	0.25	Rectangular	1.73205081	0.14433757	0.02083333
Stability vs Ambient Temp	0.10	Rectangular	1.73205081	0.05773503	0.00003333
Drift with Use	0.10	Rectangular	1.73205081	0.05773503	0.00003333
Cold Junction Error	0.15	Rectangular	1.73205081	0.08660254	0.00750000

Combined [sum of all components]	0.02849998°C
66% Combined un-certainty [sqrt of sum]	0.16881937°C
UKAS 95% confidence [66% value*2]	**0.33763874°C**

NB. All values are in °C and at an operating ambient temperature from 0°C to +50°C

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