GUILDLINE INSTRUMENTS

MODEL 5150

PRECISION DUAL – CHANNEL THERMOMETER

"TOTAL FLEXIBILITY FOR PROCESS/STATUS CONTROL MONITORING OF TEMPERATURE"

Guildline Model 5150 Precision Dual Channel Thermometer represents the most cost effective "smart thermometer" available. It has the functionality of thermometers marketed at two and three times the price and challenges the most sophisticated bridge type instruments for a fraction of their cost.

The 5150 provides the best solution for process and status control based on the monitoring of temperatures. In addition to the basic function of extremely accurate temperature measurement, two 'Form C' relays provide the means to accomplish process control and monitoring, using programmable contact closure conditions.

Measurements can be made on two independent channels of SPRT's, PRTs or RTD's in the ohmic range of 0.25 Ω to 100 Ω. In addition, 2.25 k Ω and 10 k Ω thermistors can be used as sensors for the 5150. The independent channels allow direct measurement with a relative uncertainty of better than 5 ppm to a resolution in temperature to 0.001 ^{0}C. The temperature measurement range is -200 ^{0}C to 1000 ^{0}C. The results can be displayed in ^{0}C, ^{0}F, Kelvin or Ω. Calculated results for max/min, ΔT and drift rate can also be displayed.

5150 FEATURES

- *2 Channel Measurement for SPRTs, PRTs/RTDs from 0.25 Ω to 100 Ω & Thermistors 1 to 10 kΩ*
- *Process & Status Control by two 'Form C' Relays*
- *Measurements Displayed in ^{0}C, ^{0}F, Kelvin or Ω*
- *Measurement Range: -200 ^{0}C to +1000 ^{0}C*
- *1 ppm A/D Converter Resolution*
- *Resolution: 0.001 ^{0}C*
- *Analog Output*
- *User Defined Probe Coefficients, ITS-90, IPTS-68, IEC751, logarithmic, or 5th Order Polynomial*
- *Functions: Max & Min; ΔT; STD-DEV; Drift Rate*
- *IEEE 488.2 & RS- 232C Interface Standards*
- *Temperature Difference (ΔT) Measurement*
- *Relative Uncertainty: < 5 ppm*
- *Graphical Display*
- *Data Logging*

The 5150 is the cost effective solution for accurate temperature calibration, monitoring or control in a wide range highly functional instrument.

The user can define the probe coefficients to conform to the ITS-90, IPTS-68, or IEC751 (Calendar – Van Dusen) temperature curves or define up to a 5th order polynomial, or a logarithmic temperature algorithm. Sixteen different probe configurations including calibration coefficients can be set up and stored in memory.

The 5150 will store 500 pairs of readings which are individually identified by date and time and can be transferred to a remote output device via the RS-232C or IEEE 488.2 communication interfaces built into the instrument.

A vacuum fluorescent display provides a graphical representation of real time data and calculated variables, while the information along with probe characteristics can be output via the communication interfaces. In addition to the main display, both channels have an independent real time LED display for continuous monitoring of temperature.

An analog output is provided for continuous temperature monitoring using a chart recorder.

5150 Precision Dual – Channel Thermometer

The 5150 Precision Dual Channel Thermometer satisfies the need for a "smart thermometer" for many applications. It is at home in pharmaceutical, biological, oceanographic, thermodynamic or chemical research facilities as well as traditional calibration laboratories. In industry its application extends to temperature process monitoring, distillation processes, calorimetry, fermentation monitoring, process control and alarm triggering.

TEMPERATURE SENSORS

A variety of plug-in probes are available for use with the 5150. The plug-in probes are terminated with a circular standard DIN connector. A DIN to spade lugs adaptor is available. This adaptor enables the use of user owned temperature sensors with the 5150.

For process applications a production grade sensor (51501) provides a rugged PRT mounted in a stainless steel sheath. This sensor achieves a measurement accuracy of typically 0.05 ^{0}C.

For more discerning applications an industrial grade sensor (51502) offers accuracies in the order of 0.015 ^{0}C. This sensor is less resilient to mechanical shock but has a faster time constant and better uncertainty than a production grade sensor.

Where standards accuracy is required a precision standard platinum resistance thermometer (51503) is available.

Other standard platinum resistance thermometers and thermistor sensors are available on special request for special applications.

5150 Specifications

Temperature Specifications

Note 1: Total instrument uncertainty includes 5150 measurement uncertainty and calibration uncertainty of the probe to ITS90 Temperature Scale.

Note 2: a. After 10 temperature shock cycles – 180 °C to +500 °C
b. After 10 temperature shock cycles +20 °C to +650 °C

Note 3: Contributing errors include calibration uncertainty which is referred to flowing liquid at the rate of 1 m/s, sensor stability and linearization plus electronics drift and temperature coefficient.

Note 4: Temperature and resistance calibrations traceable to National Standards (NRCC/NIST)

Note A: Total instrument uncertainty includes 5150 measurement uncertainty and calibration uncertainty of the probe to IEC 751 Temperature Scale. ITS90 calibration is available.

Note B: After 10 temperature shock cycles +20 °C to +600 °C

Accuracy – Temperature, using a process/production grade temperature probe, Option 51501

Temperature Range ^{0}C	Resolution ^{0}C	UNCERTAINTY ± °C (see note A) 24 hrs 23 ^{0}C ± 1 ^{0}C	90 days 23 ^{0}C ± 5 ^{0}C	1 year 23 ^{0}C ± 5 ^{0}C
-200 ^{0}C to -80 ^{0}C	0.001	0.1	0.15	0.2
-80 ^{0}C to -40 ^{0}C	0.001	0.05	0.1	0.15
-40 ^{0}C to 240 ^{0}C	0.001	0.05	0.1	0.15
240 ^{0}C to +420 ^{0}C	0.001	0.05	0.1	0.15
420 ^{0}C to + 600 ^{0}C	0.001	0.1	0.15	0.2

Measurement Range: -200 ^{0}C (-328 ^{0}F) to +600 ^{0}C (1112 ^{0}F)
Probe Self Heating: 60 mW/^{0}C in flowing water at 1 m/sec
Probe Temperature Coefficient: 0.00385 Ω/Ω/^{0}C minimum
Resistance Element: platinum, 100 Ω ±0.1% at 0 ^{0}C
Repeatability: ± 0.1 ^{0}C at 0 ^{0}C (see note B)
Stability: ± 0.1 ^{0}C/year at 0 ^{0}C
Time Constant: < 10 seconds in flowing water at 1m/s
Probe length: 356 mm (14 inches)
Probe diameter: 4.8 mm (0.19 inches)
Probe lead length: 1.8m (6 feet)
Probe immersion depth: 152 mm (6 inches)

> See Temperature Specification Notes 1-4

Accuracy – Temperature, using an industrial grade PRT, Option 51502

Temperature Range °C	Resolution °C	UNCERTAINTY ± °C (see note 1)		
		24 hrs 23 °C ± 1 °C	90 days 23 °C ± 5 °C	1 year 23 °C ± 5 °C
-200 °C to -80 °C	0.001	0.1	0.115	0.13
-80 °C to -40 °C	0.001	0.03	0.045	0.06
-40 °C to 0 °C	0.001	0.015	0.03	0.045
0 °C to +240 °C	0.001	0.015	0.03	0.045
240 °C to + 420 °C	0.001	0.05	0.065	0.08
420 °C to + 650 °C	0.001	0.1	0.115	0.13

Measurement Range: -200 °C (-328 °F) to +650 °C (1202 °F)
Probe Self Heating: 17 mW/°C in moving air at 60 m/sec
Probe Temperature Coefficient: 0.00392 Ω/Ω°C minimum
Resistance Element: platinum, 100 Ω ± 0.1% at 0 °C
Repeatability: ± 0.01 °C at 0 °C (see note 2b)
Stability: ± 0.02 °C/year at 0 °C
Time Constant: < 8 seconds in flowing water at 1m/s
Probe length: 356 mm (14 inches)
Probe diameter: 6.3 mm (0.25 inches)
Probe lead length: 1.8m (6 feet)
Probe immersion depth: 152 mm (6 inches)

> See Temperature Specification Notes 1-4

Accuracy – Temperature, using a precision secondary Standard PRT (Minco Type S7929A), Option 51503

Temperature Range °C	Resolution °C	UNCERTAINTY ± °C (see note 1)		
		24 hrs 23 °C ± 1 °C	90 days 23°C ± 5 °C	1 year 23 °C ± 5 °C
-180 °C to –40 °C	0.001	0.015	0.025	0.03
-40 °C to 0 °C	0.001	0.01	0.02	0.025
0 °C to +240 °C	0.001	0.01	0.02	0.025
240 °C to + 420 °C	0.001	0.03	0.04	0.045
420 °C to +500 °C	0.001	0.04	0.05	0.055

Measurement Range: -180 °C (-292 °F) to +500 °C (923 °F)
Probe Self Heating: 12.5 mW/°C in still water at 0 °C
Probe Temperature Coefficient: 0.003925 Ω/Ω/°C minimum
Resistance Element: platinum, 100 Ω ±0.1% at 0 °C
Repeatability: ± 0.005 °C at 0 °C (see note 2a)
Stability: ± 0.005 °C/year at 0 °C
Time Constant: < 10 seconds in flowing water at 1 m/s
Probe length: 305 mm (12 inches)
Probe diameter: 4 mm (0.156 inches)
Probe lead length: 1.8 m (6 feet)
Probe immersion depth: 76 mm (3 inches)

5150 Precision Dual – Channel Thermometer

Accuracy – Resistance, basic instrument

Probe Type	Resistance Range (Ω)	Temperature Range (°C)	Probe Current mA	Resolution mΩ		Uncertainty 23 °C ± 5 °C mΩ(equivalent °C)		
				Display	Measure	24 hr	90 dy	1 yr
0.25 Ω PRT	0.04 to 1.0	0 to 1070	10.0	0.001	0.001	0.05 (.050)	0.056 (0.056)	0.061 (0.061)
2.5 Ω PRT	0.4 to 10.0	0 to 1070	3.0	0.01	0.01	0.25 (.025)	0.31 (0.031)	0.36 (0.036)
25 Ω PRT	4 to 100	-200 to 660	1.0	0.1	0.1	1 (.010)	1.6 (0.016)	2.1 (0.021)
100 Ω PRT	17 to 340	-200 to 600	0.5	0.1	0.3	3 (.007)	5 (.013)	7 (.018)
2252Ω thermistor	300 to 7400	0 to 100	0.10	1	7	74	120	155
10k Ω thermistor	2600 to 30k	0 to 100	0.03	10	30	300	480	630

Traceable to National Standards NRCC/NIST. Assumes 5 ppm (relative) uncertainty plus 1 ppm calibration uncertainty to NRCC/NIST plus 2 ppm transfer uncertainty. Total guaranteed performance is worst case. All contributing errors are assumed maximum and occur at the same time and in the same direction.

Warm-up time to full rated accuracy: 30 minutes
Display update rate: 1.2 seconds
Filter time constant: 4 to 60 seconds
Analog Output: ± 5 V
Standard Interfaces: IEEE 488.2 & RS-232C
Digital Control Relay: 2 independent 'Form C' contact closure relays

5150 Ordering Information

5150	Precision Dual Channel Thermometer
TM5150	Technical Manual (included)
	Certificate of Calibration (included)
	Report of Calibration (included if sold with PRT)

Accessories:

51501	Production Grade PRT
51502	Industrial Grade PRT
51503	Secondary Standard PRT
51507	Adaptor DIN to 4mm terminals/binding posts

General Specifications

Power Supply	Voltage	95 to 130V, 190 to 260V.
	Frequency	50/60 Hz;
	Consumption	10 VA
Environment	Operating:	18 °C to +28 °C, 15 to 80% RH
	Non Operating:	-20 °C to +70 °C, 15 to 80% RH
Dimensions		H 118 mm (4.7 in) W 391 mm (15.4 in) D 257 mm (10.1 in) excluding sensors
Weight		4.4 KG (9.6 lbs)

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