

# F700

## Thermometry Bridge



### TYPICAL APPLICATIONS

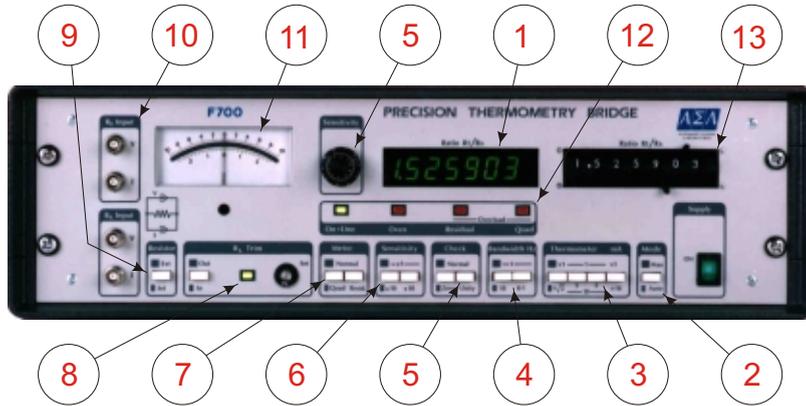
- Site Thermometer Calibration
- Mass and density
- Flow and viscosity
- Oceanography
- Pump & turbine efficiency
- Calorimetry
- Thermodynamic research

# F700 PRECISION THERMOMETRY BRIDGE

In calibration laboratories, the most important consideration is the quality of the fundamental measurement. ASL's F700 AC bridge technology represents the peak of performance in its class for resistance thermometry measurement and exploits the inherent advantages of AC bridge technology to maintain repeatable measurements of the highest precision under practical operating conditions.

## PC SOFTWARE

You can use U-LOG software for control, data logging and for graphical data presentation of measurement data. Optionally you can choose U-CAL software for calibration applications with liquid baths or block calibrators and for generating calibration certificates



## MAIN FEATURES

- Accuracy  $<\pm 0.5\text{ppm}$  ( $\pm 0.5\text{mK}$  over full range)
- Resolution  $0.25\text{ppm}$  ( $0.25\text{mK}$  over full range)
- Linearity  $<\pm 1$  LSD ( $\pm 0.25\text{mK}$  over full range)
- Differential & absolute measurement
- Warm up time  $<30$  seconds
- Expandable up to 60 channels

Like to know more about AC and why AC measurement then see the data sheet "Why is AC better than DC ?"

## A FEW FACTS

The Model F700 is a high accuracy resistance bridge designed specifically for use in resistance thermometry. Its unique AC bridge circuitry eliminates thermal EMF effects to provide you with fast, reliable measurements under a wide range of real operating conditions. A special input guard circuit maintains accuracy by minimising the effect of probe or cable leakage to ground. The effect of cable and probe reactance is eliminated by an on-board quadrature servo allowing you typically to make measurements up to 100 metres from the PRT. The differential capability allows the resistance of one PRT to be measured against another directly and provides the most accurate comparison calibration technique.

## RESOLUTION

$R_s$	Typical Probe	Current	Typical probe range	Typical Resolution	Remarks
$1\Omega$	$0.25\Omega$	10mA	$-200^\circ\text{C}$ to $+1064^\circ\text{C}$	$1\mu\Omega / 0.001^\circ\text{C}$	Low Ohm SPRT's
$10\Omega$	$2.5\Omega$	5mA	$-200^\circ\text{C}$ to $+1064^\circ\text{C}$	$10\mu\Omega / 0.001^\circ\text{C}$	962°C limit for ITS-90
$10\Omega$	$25\Omega$	1mA	$-200^\circ\text{C}$ to $+150^\circ\text{C}$	$10\mu\Omega / 0.0001^\circ\text{C}$	Enhanced resolution
$25\Omega$	$25\Omega$	1mA	$-200^\circ\text{C}$ to $+660^\circ\text{C}$	$25\mu\Omega / 0.00025^\circ\text{C}$	SPRT's
$100\Omega$	$100\Omega$	0.5 or 1mA	$-200^\circ\text{C}$ to $+800^\circ\text{C}$	$100\mu\Omega / 0.00025^\circ\text{C}$	Industrial PRT's
$1000\Omega$	$1000\Omega$	0.1mA	$-100^\circ\text{C}$ to $+100^\circ\text{C}$	$1\mu\Omega / 0.00025^\circ\text{C}$	Aerospace/averaging PRT's

## A TRUE PEDIGREE

National standards laboratories around the world require the best instrumentation for their work. The majority of these organisations use ASL's top of the range Models F900 or F18 to set the temperature standard in their country, these include 22 out of the 22 members of the international C.C.T. (Consultative Committee of Thermometry).

## FEATURES

Digital display (1)	R <sub>t</sub> /R <sub>s</sub> digital display; 0.000 000 to 3.999 999	
Auto (2)	Selects automatic or manual balance.	
Thermometer mA (3)	Selectable: 0.1, 0.2, 0.5, 1, 2, 5, 10mA, plus $\sqrt{2}$ for all values.	
Bandwidth Hz (4)	Selectable: 0.1, 1 or 10 Hz for the analogue meter.	
Check (5)	Unity & zero self test confirms accuracy of the 1:1.000 000 ratio & 0.000 000 settings.	
Sensitivity (6)	Selects gain for manual bridge balance.	
Meter (7)	<u>Normal</u> : Indicates the balance status of the bridge. <u>Quadrature</u> : Shows the reactive component of PRT, leads and R <sub>s</sub> resistor, if present. (Automatically cancelled with on board servo). <u>Residual</u> : Indicates noise and interference from external sources.	
R <sub>s</sub> trim (8)	Allows the internal R <sub>s</sub> to be trimmed to precisely 100Ω against an external standard.	
Ext/Int R <sub>s</sub> (9)	Selects either internal 100Ω reference resistor in a temperature controlled oven at 36°C, or any external reference between 1Ω and 1000Ω.	
Lead connections (10)	True 4 wire connections for resistance thermometer (R <sub>t</sub> ) and standard resistor (R <sub>s</sub> ).	
Balance meter (11)	Shows bridge balance, quadrature or residual noise, as selected by (7).	
LED indicators (12)	<u>On-Line</u> : Indicates when F700 is active, or "On-line" with computer. <u>Oven</u> : illuminates if the internal R <sub>s</sub> resistor oven is not at the preset temperature. <u>Residual</u> : (overload); Indicates very high levels of noise or interference are present. <u>Quad</u> : Indicates very high levels of quadrature, or reactance, from cables.	
Ratio R <sub>t</sub> /R <sub>s</sub> (13)	R <sub>t</sub> /R <sub>s</sub> decade switches; 7 decades of switches to balance F700 manually.	

## ACCESSORIES

SB148	10 channel auto/manual multiplexer, with individual preset "keep warm" current.	
SB148/01	As SB148, with 4 individual "keep warm" currents per channel.	
SB158	Driver/interface for up to 2 x SB148 or SB148/01 multiplexers (Specify RS232 or IEEE).	
SB158/01	Driver/interface for up to 6 x SB148 or SB148/01 multiplexers (Specify RS232 or IEEE).	
AS1 System	F700 complete with SB148 & SB158 multiplexer in cabinet. (Specify F700A or F700B).	
AS2 System	As AS1 system, but with SB148/01 multiplexer. (Specify F700A or F700B).	
RW1, 10, 25, 100, 1000	"Wilkins" AC/DC standard resistor. Values: 1, 10, 25, 100 and 1000Ω.	
RR1, 10, 25, 100, 1000	Laboratory AC/DC standard resistor. Values: 1, 10, 25, 100 and 1000Ω.	
RWTE1, RWTE2	Thermal enclosure for 1 off or 2 off RW & RR resistors.	
FR4	Four oven controlled reference resistors in cabinet. Choose 1, 10, 25, 100 or 1000Ω.	
F/ACC	FA-1, FA-2 and FA-3 cable set.	
U-LOG	Control and data logging acquisition software. U-CAL software for calibration applications is an option.	

# F700

°C °F Ω K mV 0.01 °C

## SPECIFICATION

Accuracy	<p><b>F700A:</b> ±1ppm of reading or 1 digit, whichever is the greater. Equivalent to 0.25mK @ unity ratio (0.01°C) or 1mK over the full range.</p> <p><b>F700B:</b> ±0.5ppm of reading or 1 digit, whichever is the greater. Equivalent to 0.25mK @ unity ratio (0.01°C) or 0.5mK over the full range. <i>Temperature equivalents for 25.5Ω SPRT against a 25Ω standard @ 1mA.</i></p> <p><b>F700A:</b> ±5ppm @ unity ratio, equivalent to 6mK up to 1064°C. <b>F700B:</b> ±2.5ppm @ unity ratio, equivalent to 3mK up to 1064°C. <i>Temperature equivalents for 0.25Ω HTSPRT against a 1Ω standard @ 10mA.</i></p>
Resolution	1 least significant digit.
Linearity	<±1 least significant digit.
Measurement time	10 seconds for full balance.
Warm up time	<30 seconds with external standard, <5 minutes with internal standard.
Thermometers	R <sub>0.01</sub> of 1000Ω, 100Ω, 25Ω, 10Ω, 1Ω or 0.25Ω and any intermediate value.
External standard resistor range	1Ω to 1000Ω AC/DC resistance.
Internal standard resistor	100Ω ±50ppm, with t/c of <0.3ppm/°C, in a temperature controlled oven at 36°C. A trim control allows calibration against an external standard.
Measurement range	0 - 3.999 999 ratio of two resistors; 0 - 3.999 999Ω where R <sub>s</sub> = 1Ω 0 - 399.999 9Ω where R <sub>s</sub> = 100Ω; 0 - 1500.000Ω where R <sub>s</sub> = 1000Ω
Sensor current	0.1, 0.2, 0.5, 1, 2, 5 or 10mA plus √2 multiplier. Constant current, stabilised to ±1% of nominal value.
Communications	<p><b>RS232C:</b> 300 baud, 8 bits, no parity and 2 stop bits.</p> <p><b>IEEE-488:</b> Address selectable from 0 to 15 (factory default = 9)</p> <p><b>Analogue outputs:</b> ±10V null balance signal, unfiltered P.S.D. output. ±10V null balance signal, filtered output (1 Hz bandwidth).</p>
Operating conditions	0°C to 30°C (32°F to 86°F), 10 to 90% RH.
Power requirements	240, 220, 120, 100 VAC (±10%) selectable on rear panel, 50 or 60 Hz, 70VA max.
Dimensions/weight	520mm (W) x 155mm (H) x 466mm (D). 3U x 19" front panel. 15kg.

Standard test conditions: 25.5Ω SPRT @ 0.01°C, 25Ω standard resistor and 1mA sensor current unless otherwise stated.

Specifications are subject to change without prior notice.



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