

# Sales Guide

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## 6109A/7109A Portable Calibration Baths

**Four times more calibration throughput with twice the accuracy of Micro-Baths and dry-block calibrators**



### Table of Contents

Introduction

Value proposition

Typical application

Key features and benefits

Competitive comparison

Common sales scenarios

Ordering information

Demo guide

Specifications

Sales and Marketing documents

## Introduction

Process manufacturing plants for pharmaceuticals and biotechnology utilize many sanitary temperature sensors that require regular calibration. Production must stop while the calibrations are taking place. Therefore, more calibration throughput means less plant downtime. And in businesses where even a few tenths of a degree Celsius can cost thousands of dollars in ruined product, temperature accuracy is crucial to maintaining quality.

The **6109A and 7109A Portable Calibration Baths** let process industry professionals calibrate four times more sanitary sensors per batch in less time and with twice the accuracy of other baths in this class. Up to four tri-clamp sanitary sensors fit easily into these baths for calibration at  $\pm 0.1$  °C display accuracy. Throughput is even higher for sanitary RTDs with small or no flanges.

Two bath models cover a wide temperature range:

6109A: 35 °C to 250 °C

7109A: -25 °C to 140 °C



Each model offers a “-P” version that includes process electronics for connecting an external reference probe.

## Value Proposition

### What value do the 6109A/7109A Portable Calibration Baths offer?

- Four times more calibration throughput with twice the accuracy of Micro-Baths and dry-block calibrators.

### What customer problems do they solve?

- Higher sanitary sensor calibration throughput
- Temperature range to cover most life sciences applications
- Compatibility with clean room environments

### Who uses this product?

- Calibration Technicians
- Instrument Technicians,
- Test Engineers

### Which industries does this product serve?

- Pharmaceutical
- Biomedical

- Food Processing

**What specific benefits does the product provide the customer?**

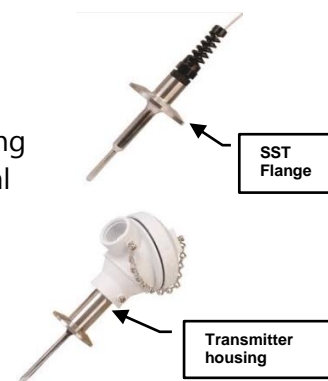
- Increases calibration throughput and technician productivity
- Decreases expensive production downtime
- Reduces risk of non-conformance to corporate and government agency standards
- Lowers risk of process measurement errors can cost tens of thousands of dollars in lost product

**Why will the customer buy from us and not the competition (key differentiators)?**

- Large working area (calibrate more sensors in less time)
- System accuracy (twice the accuracy of Micro-Baths and dry-block solutions)
- Clean room compatible features (stainless steel casing is easy to sanitize, withstands harsh sterilizing chemicals, and is rust proof)
- Ease-of-use/maintenance features (portability, large color display, stability indicator with 360° visibility, probe holding fixtures, drain tube)

**What is a Tri-Clamp Sensor?**

- “Tri-clamp” refers to the mechanical housing of a temperature sensor used in process manufacturing where a liquid seal is required
- A tri-clamp sensor includes a stainless steel (SST) flange ranging from ½-in to 3-in dia. – clamps to a pipe ferrule creating a seal
- Immersing the entire flange in a fluid during calibration produces a more accurate calibration
- The tank diameter of Fluke Micro-Baths (6102/7102/7103) is not large enough to accommodate 2-in dia. tri-clamp flanges and a reference thermometer





Tri-clamp sensor (side view)



Tri-clamp sensor (bottom view)

## Typical Application for 6109A/7109A Portable Calibration Baths

Step	Process	Pain Points	6109A/7109A Solution
1. Define - plan, select, determine	21 CFR part 11 compliant asset management software indicates which sensors are due for cal and where they are located. Production must cease during calibration. Up to 60 sensors in a production suite (clean room environment where everything is SST). Sensors on a 6-mo. cal interval.	<ul style="list-style-type: none"> <li>Production down time.</li> <li>Must complete cals as efficiently &amp; accurately as possible.</li> </ul>	<ul style="list-style-type: none"> <li>These portable baths can calibrate up to four tri-clamp sensors at a time. Faster calibration reduces downtime.</li> </ul>
2. Locate - gather, access, receive	Load 6109A/7109A Portable Calibration Baths, reference thermometers, and documenting process calibrator (DPC) onto a 60 cm (2-ft) wide cart. Tech wears gown, cap, gloves (aka "bunny suit"). Once tech enters the clean room, cannot exit w/out decontaminating. Must have all instruments & tools to complete the job.	<ul style="list-style-type: none"> <li>Only one sanitary sensor at a time fits into competing solutions from Jofra, Isotech, Presys, Wika, etc.</li> <li>Only one sanitary sensor at a time fits in a Fluke 6102/7102/7103 Micro-Bath</li> </ul>	<ul style="list-style-type: none"> <li>Can calibrate up to four tri-clamp sensors at a time. Faster calibration throughput.</li> </ul>



Sanitary Sensor



Competitor's baths on bench; cal cart in foreground



Bunny Suit



Micro-Bath smaller tank diameter



6109A/7109A calibrates up to four sanitary sensors at a time!

Step	Process	Pain Point	6109A/7109A Solution
3. Prepare - setup, organize, examine	All test equipment must be sanitized before entering clean room (Spor Klenz, alcohol, hydrogen peroxide). Tech positions microbath next to location where sensor is installed. Sometimes may have to climb stairs to reach sensors. Sensors remain connected to their indicator at the central Process Control Station (PCS).	<ul style="list-style-type: none"> <li>Harsh cleaning agents can damage materials</li> <li>Product can be difficult to sanitize</li> <li>Must be able to carry bath with one hand.</li> <li>No probe holder on baths</li> </ul>	<ul style="list-style-type: none"> <li>Built to withstand harsh sterilizing chemicals</li> <li>Use synthetic materials that don't harbor bacteria</li> <li>Handles for either single or two-handed transport</li> <li>Optional Probe Clamp Accessory available</li> </ul>
4. Confirm - validate, prioritize, decide	Critical processes require calibration accuracy of $\pm 0.1$ °C. More common processes require $\pm 0.25$ °C. Three cal points over span is typical.	<ul style="list-style-type: none"> <li>Drywell not good enough for short sensors &amp; large transmitter heads</li> <li>External reference thermometer required</li> </ul>	<ul style="list-style-type: none"> <li>Tank size accommodates sensors of various shapes/sizes and transmitter heads</li> <li>Best-in-class system accuracy of <math>\pm 0.1</math> °C</li> </ul>



Spor Klenz



Sanitize everything



Accessibility



6109A/7109A are clean room compatible



Competitor's keypad swells from silicone

Step	Process	Pain Point	6109A/7109A Solution
5. Execute - perform, transact, administer	Techs enter bath setpoint and wait to reach temperature. After the display is stable, will wait additional 15 minutes to allow for temperature stabilization. Will typically measure 3 set point temperatures over range.	<ul style="list-style-type: none"> <li>No clear indication that source is stable</li> <li>Stir magnets disengage or lost</li> </ul>	<ul style="list-style-type: none"> <li>Ready Indicator gives 360° visual indication when bath fluid temperature is at <u>setpoint</u> and ready for measurement</li> <li>Variable DC stir motor eliminates the hassle of stir bars and optimizes stir speed for best stability &amp; uniformity</li> </ul>
6. Monitor - verify, track, check	Two techs required to compare UUT to reference thermometer. One reads UUT at PCS and the other reads reference thermometer at the microbath. Techs shout measured values to each other across the suite.	<ul style="list-style-type: none"> <li>Requires two techs to adjust</li> </ul>	



Small scale bioreactor



High-temp sanitizing chamber



6109A/7109A Ready Indicator

Step	Process	Pain Point	6109A/7109A Solution
7. Modify - update, adjust, maintain	Tech at PCS will adjust indicator as needed (zero/span), and after waiting for stabilization, will verify UUT is in tolerance.	<ul style="list-style-type: none"> <li>Calibration process may take 2-3 hours</li> </ul>	<ul style="list-style-type: none"> <li>Reduce calibration time. Calibrate up to four tri-clamp sensors at a time instead of one at a time.</li> </ul>
8. Conclude - store, finish, close	Record as-found and as-left data in 21 CFR part 11 compliant asset management software. Clean UUTs with alcohol and reinstall. Remove all instruments and tools from clean room.	<ul style="list-style-type: none"> <li>Once calibration data is recorded, cannot change</li> </ul>	



Tech in background at PCS



Bioreactor most likely for R&amp;D



A single bio-reactor chain can have as many 60 tri-clamp temperature sensors

## Key Features and Benefits

6109A / 7109A Feature	Benefit
Large tank volume: 110 mm diameter x 150 mm depth (4.3" diameter x 5.9" deep)	Easily immerse up to four sanitary sensors into the tank at the same time. Calibrate odd-shaped sensors of varying lengths and diameters and still have room for a reference thermometer. Increase calibration throughput and decrease process downtime.
Wide temperature range between two models: 6109A: 35 °C to 250 °C 7109A: -25 °C to 140 °C	Calibrate most temperature sensors used in a wide variety of process manufacturing applications such as pharmaceutical bioreactors (-10 °C to 100 °C), chemical reactors (200 °C), steam-in-place process (121 °C to 140 °C), autoclaves (121 °C), food storage freezers (-25 °C)
Best-in-class system accuracy (i.e. display accuracy): $\pm 0.1$ °C. Accuracy covers all sources of error including calibration uncertainty, stability, uniformity, and repeatability. NVLAP-accredited calibration included standard. Conforms with EURAMET cg-13.	Fluke Calibration's high metrological standards instill customer confidence and save time and money—especially where measurement accuracy is critical to process quality. Measurement errors of several tenths of a degree Celsius can literally cost tens of thousands of dollars in lost product. This is especially true in pharmaceutical and biomedical processes.








Clean Room compatible	Process manufacturers pharmaceuticals, biomedical, and food production industries operate in clean-room environments and must comply with regulated standards for cleanliness. The materials of the 6109A and 7109A were selected and tested to withstand caustic chemicals such as Spor Klenz, which are used to sterilize products before entering a clean room. Synthetic materials for decals, keypads, and feet are used since they do not harbor micro-organisms. Stainless steel panels are easy to clean and aid in the perception of cleanliness, making it easier for process managers to accept new products and pass audits.
Designed for portability	The 6109A/7109A has a fixed bail handle (doesn't rotate) permitting single-handed carry, which makes it easier to transport the bath while climbing stairs or crossing catwalks. Two recessed handles on the bottom of the bath make it easy to move from a shelf to a cart or benchtop. A sealed lid protects against fluid spills.
Handy ease-of-use and maintenance features	<ul style="list-style-type: none"> <li>• Large color display (150 mm x 100 mm, 6.0 in x 4.0 in) gives date/time, bath fluid temperature, setpoint temperature, control indicator (when bath fluid is at setpoint), and heating status</li> <li>• Ready Indicator gives 360° visual indication when bath fluid temperature is at setpoint and ready for measurement.</li> <li>• Hot Warning Indicator lights up if fluid temperature is <math>\geq 60^{\circ}\text{C}</math> warning that bath fluid and tank area are hot and should not be touched.</li> <li>• Adjustable Probe Fixture holds up to four tri-clamp sensors inside the tank opening.</li> <li>• Probe Clamp Accessory holds probes in place while they are calibrated.</li> <li>• Overflow Tube directs excess bath fluid into an optional overflow container.</li> <li>• Drain Tube makes it easy to remove bath fluid for replacement or transport</li> </ul>

Variable speed, top down stirring impeller	No more stir magnets to lose, wear out, or disengage. Variable stir speed improves stability, minimizes fluid cavitation, and prevents fluid from splashing outside the tank if stirred too aggressively.
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## Competitive Comparison

### 6109A Competitive Summary (Hot baths)

	Fluke 6109A	Fluke 6102 Micro-Bath	Jofra RTC-250-A (1)	Isotech Drago 4934 (2)	Wika CTB9100.225
					
Temperature range	35 to 250 °C	35 to 200 °C	28 to 250 °C	30 to 250 °C	40 to 225 °C
Working volume (tank diameter x depth)	110 mm x 150 mm (4.3in x 5.9in)	48 mm x 140 mm	64 mm x 160 mm	65 mm x 160 mm	60 mm x 150 mm
Calibrate up to 4 tri-clamp sensors at a time	Yes	Only one	Only one	Only one	Only one
Calibrate batches of sensors with a variety of shapes & geometries	Yes, large batch	Yes, small batch	Yes, small batch	Yes, small batch	Yes, small batch
Display accuracy (with internal reference sensor)	± 0.1 °C	± 0.25 °C	No spec for liquid bath mode	No spec for liquid bath mode	± 0.3 °C
Dimensions and weight	382mm H x 242mm W x 400mm D (15in x 9.5in x 15.7in) 16kg (35lb)	260mm H x 140mm W x 200mm D (10.3in x 5.5in x 8in) 4.5kg (10lb)	363mm H x 171mm W x 366mm D (14.3in x 6.7in x 14.4in) 9.3kg (21.0lb)	384mm H x 212mm W x 312mm D (15.1in x 8.3in x 12.4in) 8kg (17.6lb)	400mm H x 160mm W x 270mm D (15.7in x 6.3in x 10.6in) 7.9kg (17.5lb)
(1) Using liquid bath kit					
(2) Liquid bath mode					

Legend
Best
Better
Good



## 7109A Competitive Summary (Cold baths)

	Fluke 7109A	Fluke 7102 Micro-Bath	Fluke 7103 Micro-Bath	Jofra RTC-158-A (1)	Isotech Hyperion 4036 (2)	Presys TA-25N (3)	Wika CTB9100-165
							
Temperature range	-25 to 140 °C	-5 to 125 °C	-30 to 125 °C	-22 to 155 °C	-25 to 140 °C	-25 to 140 °C	-35 to 165 °C
Working volume (bath diameter x depth)	110 mm x 150 mm (4.3 in x 5.9 in)	48 mm x 140 mm	48 mm x 140 mm	64 mm x 160 mm	65 mm x 160 mm	36 mm x 155 mm	60 mm x 150 mm
Calibrate up to 4 tri-clamp sensors at a time	Yes	Only one	Only one	Only one	Only one	Only one	Only one
Calibrate batches of sensors with a variety of shapes & geometries	Yes, large batch	Yes, small batch	Yes, small batch	Yes, small batch	Yes, small batch	No	Yes, small batch
Display accuracy (with internal reference sensor)	± 0.1 °C	± 0.25 °C	± 0.25 °C	No spec for liquid bath mode	No spec for liquid bath mode	No spec for sanitary sensor insert kit	± 0.2 °C
Dimensions and weight	362mm H x 242mm V x 400mm D (14.3 in x 9.5 in x 15.7 in) 20kg (45lb)	350mm H x 180mm V x 210mm D (13.8 in x 7.1 in x 8.3 in) 6.8kg (15lb)	340mm H x 230mm V x 260mm D (13.4 in x 9.1 in x 10.2 in) 9.0kg (20lb)	363mm H x 178mm V x 366mm D (14.3 in x 6.9 in x 14.4 in) 10kg (24.3lb)	304mm H x 232mm V x 312mm D (12.0 in x 9.1 in x 12.3 in) 12kg (26.5lb)	285mm H x 200mm V x 305mm D (11.2 in x 7.9 in x 12.0 in) 20kg (45lb)	425mm H x 215mm V x 305mm D (16.7 in x 8.5 in x 12.0 in) 12kg (26.5lb)
(1) Using liquid bath kit							
(2) Liquid bath mode							
(3) Using sanitary sensor insert kit							

Legend
Best
Better
Good

## Circulating Baths

- Leading providers: Polyscience, ThermoFisher, Julabo
- Designed primarily as recirculating chillers, not for calibrating sensors
- Used in process calibration because of their large working area (an entire tri-clamp flange fits in the bath)
- Normally for benchtop use: Oil easily spills during transport. Not designed to be portable.
- Stability and uniformity specs are typically not provided by utility bath providers or are not very good compared to the 6109A/7109A baths:

	6109A	7109A
Temperature Range	35 °C to 250 °C	-25 °C to 140 °C
Stability	0.015 °C	0.01 °C
Typical Uniformity	0.03 °C up to 200 °C 0.04 °C above 200 °C	0.02 °C

## Common Sales Scenarios

### 1. Customer considering or using a Fluke 6102/7102 Micro-Bath

"Currently I use a 7103 Micro-Bath to calibrate tri-clamp sensors. How can I justify buying a 7109A Portable Bath that costs more to do that job?"

Response:

- The 7109A bath has 4x the calibration throughput of a Micro-Bath. And has more than 2x the accuracy.
- Plus, the 7109A is "clean room compatible". Panels and tank are stainless steel which is easy to clean and rust resistant. It can withstand harsh sterilizing chemicals and uses materials that don't harbor bacteria.
- When considering the combined benefits of increased calibration efficiency, reduced production downtime, improved accuracy, and clean room compatibility, the 7109A can quickly pay for itself.

### 2. Customer considering or using a competitor dry-block/liquid bath solution

"I'm considering purchasing a Jofra RTC-250 dry-block with liquid bath kit for calibrating sanitary and odd size sensors."

Response:

- Jofra RTC-250 solution tank working volume is 64 mm diameter x 160 mm deep. Limited to one calibrating one tri-clamp sensor at a time. Or a small batch of odd size sensors.
- 6109A tank working volume is 110 mm diameter x 150 mm deep. Calibrate 4 tri-clamp sensors at a time. Or a large batch of odd size sensors. Much better throughput and less production downtime for calibration.
- 6109A accuracy with internal reference is almost 3x better than RTC-250 ( $\pm 0.1$  °C vs.  $\pm 0.28$  °C)



### 3. Customer considering or using a circulating bath

"I'm looking at Circulating Baths from Polyscience, ThermoFisher, and Julabo to calibrate tri-clamp sensors. They're in the \$2,000-\$5,000 range. Why would I want to spend more money to buy a 7109A Portable Bath from Fluke?"

Response:

- Circulating Baths have an adequate tank area to calibrate multiple sensors at a time.
- However, these baths are designed for laboratory sample preparation and regulating the temperature of external processes, not calibrating sensors, which is why they do not have a uniformity specification.
- The 7109A bath was designed for sensor calibration. It has much better stability and was mechanically designed for uniformity. Stability and uniformity are pre-requisites for a meaningful calibration.
- Temperature non-conformance in pharma/biotech process manufacturing can lead to expensive losses in fines, wasted product and bad publicity. With the stakes so high, using an appropriate calibration device is easily cost justified.

## Ordering Information

Item #	Model	Pricing Attribute	Description
<b>Mainframes</b>			
4757524	6109A-156		Portable Bath, 35 C to 250 C, 115 VAC
4757536	6109A-256		Portable Bath, 35 C to 250 C, 230 VAC
4757549	6109A-P-156		Portable Bath, 35 C to 250 C, with Process Electronics, 115 VAC
4757551	6109A-P-256		Portable Bath, 35 C to 250 C, with Process Electronics, 230 VAC
4757560	7109A-156		Portable Bath, -25 C to 140 C, 115 VAC
4757572	7109A-256		Portable Bath, -25 C to 140 C, 230 VAC
4757585	7109A-P-156		Portable Bath, -25 C to 140 C, with Process Electronics, 115 VAC
4757597	7109A-P-256		Portable Bath, -25 C to 140 C, with Process Electronics, 230 VAC
<b>Accessories</b>			
4810215	7109-2080		Fluid Expansion Overflow Kit
4810226	7109-2051		Single Probe Clamp Kit
4810232	7109-2027		Adjustable Probe Holding Fixture
4810244	7109-2013-1		Transport Cover
4810259	7109-2013-2		Probe Access Cover
4810267	7109-CASE		Carrying Case

## Demo Kit

Two demo kits (7109A-DKIT-156, 7109A-DKIT-256) are available for purchase by distributors. Distributors receive their standard distributor discount plus 10% off the price of the demo kit.

<b>7109A-DKIT-156</b>	
Model	Description
7109A-P-156	7109A Portable Calibration Bath, -25 °C to 140 °C, with Process Electronics, 115 VAC
7109-CASE	Carrying Case
5615-12-A	Secondary Standard PRT, 6.35 mm x 305 mm (0.250 x 12.0 in), -200 °C to 420 °C, lead wire (cable) 6 ft, style A termination
7109-2080	Fluid Expansion Overflow Kit
7109-2051	Single Probe Clamp Kit
7109-2027	Adjustable Probe Fixture
7109-2013-2	Probe Access Cover

<b>7109A-DKIT-256</b>	
Model	Description

7109A-P-256	7109A Portable Calibration Bath, -25 °C to 140 °C, with Process Electronics, 230 VAC
7109-CASE	Carrying Case
5615-12-A	Secondary Standard PRT, 6.35 mm x 305 mm (0.250 x 12.0 in), -200 °C to 420 °C, lead wire (cable) 6 ft, style A termination
7109-2080	Fluid Expansion Overflow Kit
7109-2051	Single Probe Clamp Kit
7109-2027	Adjustable Probe Fixture
7109-2013-2	Probe Access Cover

**7109A-P****7109-CASE****7109-2080****7109-2051****7109-2027****7109-2013-2**

## Demo Guide

Refer to the following sections in the 6109A/7109A Operators Manual for information on demonstrating these products:

- Product set-up: pages 12–15
- Attaching accessories: pages 16–18
- Connecting a reference probe and test sensor: pages 20–24
- Basic operations (immersing probes, setpoints, using a reference probe): pages 26–29

## Specifications

The product specifications describe the Absolute Instrumental Uncertainty of the Product at 95 % level of confidence (coverage factor  $k = 2$ ) within one year from calibration. The product specifications include environmental temperature effects from 13 °C to 33 °C.

### Temperature Source Specifications

	6109A	7109A
Range (at 25 °C ambient temperature)	35 °C to 250 °C	-25 °C to 140 °C (-15 °C cover off)
Accuracy: Maximum Permissible Error	0.1 °C	0.1 °C
Stability	0.015 °C	0.01 °C
Typical Uniformity	0.03 °C up to 200 °C 0.04 °C above 200 °C	0.02 °C
Repeatability	0.04 °C	0.04 °C
Typical Heating Time	35 °C to 100 °C: 25 minutes 100 °C to 250 °C: 45 minutes	25 °C to 140 °C: 55 minutes -25 °C to 25 °C: 35 minutes
Typical Cooling Time	250 °C to 100 °C: 35 minutes 100 °C to 35 °C: 55 minutes	25 °C to -25 °C: 75 minutes 140 °C to 25 °C: 45 minutes
Typical Settling Time	15 minutes	10 minutes
<b>Notes:</b> <ul style="list-style-type: none"> <li>The lower limit of the Temperature Range varies depending on the ambient temperature and whether the tank is covered. Operating time at negative temperatures may be limited by water condensation or ice build-up, especially if the tank is open.</li> <li>Accuracy covers all sources of error including calibration uncertainty, stability, uniformity, and repeatability.</li> <li>If the environment temperature is outside the Performance Environment Range but within the Operating Environment Range, multiply the specification by 1.25.</li> <li>Temperature Stability and Temperature Uniformity apply with the tank covered. If the Product is operated with the tank open, multiply the specifications by 1.25.</li> <li>Specifications are valid with fluid depth at least 130 mm and within the working volume defined as a 75 mm square centered in the tank opening from 15 mm above the bottom of the tank to 65 mm below the surface of the fluid. The specifications also apply with the recommended fluid in good condition. Results may vary if a different fluid is used.</li> <li>Temperature Stability is evaluated as two times the statistical standard deviation of the fluid temperature (2 sigma) during a 15-minute period after sufficient settling time is allowed.</li> <li>Temperature Uniformity is defined as half the difference between the maximum and minimum temperatures within the working volume.</li> <li>Repeatability includes hysteresis of the control sensor. It is defined as the difference between the maximum and minimum observed temperatures at a setpoint near the middle of the Product Temperature Range after that setpoint is alternately reached from both extremes of the Temperature Range.</li> <li>Cooling or heating time is measured from the time the setpoint is changed to when the fluid temperature reaches the setpoint within the Temperature Accuracy specification. Cooling and heating times vary depending on environment temperature, AC supply voltage, loading, and whether the tank is covered. At low ac supply voltages, heating time may be much longer.</li> <li>Settling time is measured from the end of the cooling or heating time to the time at which the fluid reaches its ultimate mean temperature within a tolerance equal to the Temperature Stability specification.</li> </ul>		



**Input Module Option Specifications**

The Product specifications describe the Absolute Instrumental Uncertainty of the Product at 95 % level of confidence (coverage factor  $k = 2$ ) within one year from calibration. The Input Module specifications include calibration uncertainty, linearity, repeatability, resolution, stability, and environmental temperature effects from 13 °C to 33 °C.

Function	Range	Accuracy: Maximum Permissible Error
Reference Input Resistance	0 $\Omega$ to 42 $\Omega$	0.0025 $\Omega$
	42 $\Omega$ to 400 $\Omega$	0.006 %
Reference Input Temperature	-25 °C to 250 °C	0.007 % + 0.015 °C
Resistance Sensing Current	1 mA	8 %
DUT 4-wire Resistance	0 $\Omega$ to 31 $\Omega$	0.0025 $\Omega$
	31 $\Omega$ to 400 $\Omega$	0.008 %
DUT 3-wire Resistance Accuracy	0 $\Omega$ to 400 $\Omega$	0.12 $\Omega$
Thermocouple mV	-10 mV to 100 mV	0.025 % + 0.01 mV
Reference Junction Temperature	0 °C to 40 °C	0.35 °C
Thermocouple Temperature	-25 °C to 250 °C	J: 0.44 °C K: 0.49 °C T: 0.53 °C E: 0.44 °C N: 0.57 °C M: 0.48 °C L: 0.42 °C U: 0.48 °C
	0 °C to 250 °C	R: 1.92 °C S: 1.88 °C C: 0.84 °C D: 1.12 °C G/W: 3.34 °C
mA	0 mA to 22 mA	0.02 % + 0.002 mA
<b>Notes</b> <ul style="list-style-type: none"> <li>Specifications stated in percent are percent of reading.</li> <li>If the environment temperature is outside the Performance Environment Range but within the Operating Environment Range, multiply the accuracy specifications by 1.5.</li> <li>Reference Input Temperature Accuracy assumes a 4-wire, 100 <math>\Omega</math>, <math>\alpha = 0.00392</math> PRT. The specification does not include accuracy of the thermometer (see Table 4 of this manual).</li> <li>DUT Input Resistance Accuracy specification for 2-wire sensors is 0.05 <math>\Omega</math> plus lead wire resistance.</li> <li>Thermocouple Input Temperature Accuracy specification includes Thermocouple Input mV and Reference Junction Temperature, combined using the root-sum-square method. The specification does not include the accuracy of the thermocouple.</li> </ul>		

**General Specifications**

Performance Environment Range.....	13 °C to 33 °C 5 % to 90 % (non-condensing)
Operating Environment Range .....	0 °C to 40 °C 5 % to 90 % (non-condensing)
Maximum Operating Altitude .....	2000 m (6600 ft)
Storage Range .....	-40 °C to 70 °C 5 % to 95 % (non-condensing)
Supply Voltage .....	115 V nominal: 100 V to 120 V ac (±10 %), 50 Hz or 60 Hz 230 V nominal: 200 V to 230 V ac (±10 %), 50 Hz or 60 Hz 1150 W
Fuses.....	115 V nominal: 10 A, 250 V 3AG slow 230 V nominal: 5 A, 250 V 5x20 slow
4-20 mA Input Loop Power Voltage.....	24 V dc ±6 V
4-20 mA Fuse .....	0.05 A, 250 V 5x20 fast
Size <sup>[1]</sup> .....	Height: 382 mm (15 in) Width: 242 mm (9.5 in) Depth: 400 mm (15.7 in)
Weight <sup>[2]</sup> .....	7109A: 20 kg (45 lb) 6109A: 16 kg (35 lb)
Fluid Volume.....	2.5 liters (0.66 gal)
Fluid Working Area .....	75 mm x 75 mm (3 in x 3 in)
Maximum Fluid Depth.....	154 mm
Remote Interface .....	RS-232 port, 1200 to 38400 baud USB 2.0 device port USB 2.0 host port (for data recording)
Compliance.....	EN 61010-1 (2010), category II, degree 2 IEC 61326-1, basic RoHS SCPI 1999.0

**Notes**

- [1] Size does not include the optional overflow kit or other attached accessories.  
 [2] Weight does not include bath fluid or accessories.

## Sales and Marketing Documents

The following sales and marketing documents will be available from the 6109A/7109A Portable Calibration Baths Launch Page at <http://eu.flukecal.com/6109A-7109A-Launch-EMEA>

- Press Release
- Advertisement
- Customer HTML email
- Introduction video
- Product page
- Web banners
- Product brochure/datasheet
- Sales guide
- Value selling sheet
- Product announcement
- Sales presentation
- TCAL Solutions for Pharma/Biotech Sales Note
- Customer presentation
- Rep email