

## Calibration Certificate

# PC10709

### Confidence Interval

$$\bar{x} - \left( \frac{t_{0.95}}{\sqrt{n}} \right) s < \mu < \bar{x} + \left( \frac{t_{0.95}}{\sqrt{n}} \right) s$$

### Actual Measurements

Measurement	Calibration Data	
	1 $\mu$ L	10 $\mu$ L
1	1.01	10.02
2	0.99	10.00
3	1.00	10.00
4	1.01	9.99
5	0.99	10.02
6	1.01	10.02
	1.01	10.02
	1.00	10.03
	1.01	10.01
10	1.00	10.02

### Systematic Error

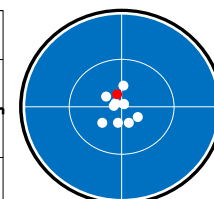
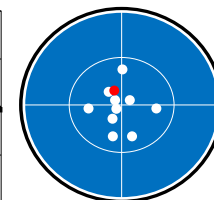
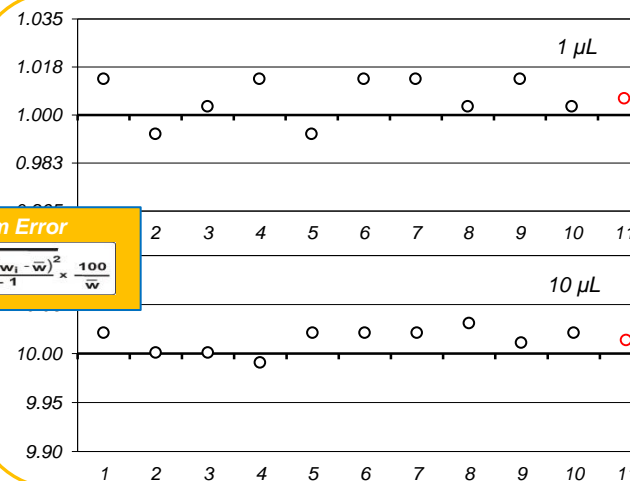
$$e = \frac{(\bar{w} - w_{\text{nominal}}) \times 100}{w_{\text{nominal}}}$$

11 Mean Volume ( $\mu$ L)	<b>1.01</b>	<b>10.01</b>
Inaccuracy (%)	0.61	0.14
Specification ( $\pm$ %)	3.50	1.00
Status	<b>PASS</b>	<b>PASS</b>
Imprecision CV (%)	0.82	0.13
Specification ( $\leq$ %)	3.00	0.50
Status	<b>PASS</b>	<b>PASS</b>
Uncertainty ( $\pm$ $\mu$ L)	<b>0.04</b>	<b>0.05</b>

### Random Error

$$CV = \sqrt{\frac{\sum_{i=1}^n (w_i - \bar{w})^2}{n-1}} \times \frac{100}{\bar{w}}$$

Confidence Interval -1 $\mu$ L	95%	1.00 $\mu$ L	-	1.01 $\mu$ L
	99%	1.00 $\mu$ L	-	1.01 $\mu$ L
Confidence Interval -10 $\mu$ L	95%	10.00 $\mu$ L	-	10.02 $\mu$ L
	99%	10.00 $\mu$ L	-	10.03 $\mu$ L



### Measurement Uncertainty

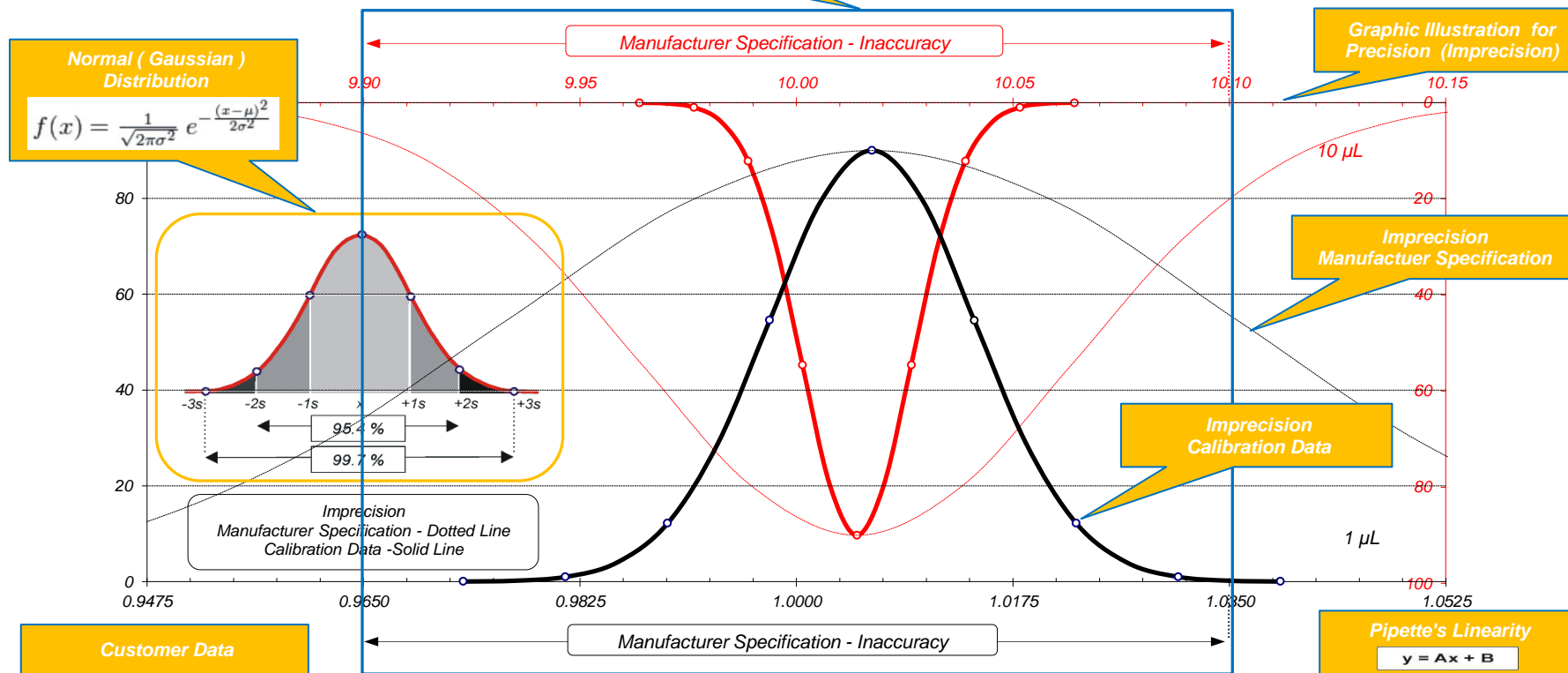
Pipette Data		Laboratory Conditions	
Pipette Manufacturer :	Thermo Electron Corporation	Water Temperature (°C)	21.1
Pipette Type :	Finnpipette Focus 4600	Air Pressure (hPa)	998
Volume Range :	1-10 $\mu$ L	Relative Humidity (%)	48
Serial Number :	AA86527	Density Correction ( $\mu$ L/mg)	1.0031
Customer ID:	BAL223	Calibrated with :	Sartorius ME235P auto door
Calibrated on :	1-Sep-2018	Calibrated by :	Mike Balac BSc (Hons) Chem

Graphic Illustration for Accuracy (Inaccuracy)

# Calibration Certificate

Inaccuracy  
Manufacturer Specification

# PC10709



## Customer Data

In Use At: Pipette Clinic Pty Ltd  
48-50 George Street  
Parramatta NSW 2150

Test Method: AS 2162.2-1998, ISO-8655

## Uncertainty of Measurement

Coverage factor at confidence level 95 %  $k=2$

(Selected volume x) Linearity (  $\mu\text{L}$  )

Accuracy (  $\mu\text{L}$  )  $y = 1.0009x + 0.0052$

Accuracy + Uncertainty (  $\mu\text{L}$  )  $y1 = 1.0020x + 0.0407$

Uncertainty (  $\mu\text{L}$  )  $Ux = y1 - y$

As required by AS ISO/IEC 17025-2005, all measurements in this report are traceable to the International System of Units (Système international d'unités).