

Schedule

Biofrontier Technology Pte Ltd
Blk 71 Bukit Batok Crescent
#07-11 Prestige Centre
Singapore 658071

Certificate No. : LA-2007-0373-C

Issue No. : 13

Date : 23 April 2019

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FIELD OF TESTING : Calibration and Measurement

MEASURED QUANTITIES / RANGE / INSTRUMENT TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITIES (CMC *)
A. VOLUMETRIC		
1. Piston Pipettes (EX)		
a. Single & Multi-Channel, Air Displacement Calibration Volume:		
0.1-1 µL		0.010 - 0.010 µL
0.2 - 2 µL	Biocal™ Compliance Method	0.010 - 0.010 µL
1 - 10 µL	BF-SOP-01 (R15)	0.009 - 0.010 µL
2 - 20 µL		0.010 - 0.012 µL
3 - 30 µL	Accuracy & Precision Tests	0.010 - 0.016 µL
5 - 50 µL	with Analytical Balances	0.013 - 0.019 µL
10 - 100 µL		0.07 - 0.07 µL
20 - 200 µL		0.07 - 0.09 µL
30 - 300 µL		0.07 - 0.12 µL
100 - 1000 µL		0.10 - 0.22 µL
125 - 1250 µL		0.15 - 0.33 µL
500 - 5000 µL		0.5 - 1.3 µL
1 - 10 mL		1.0 - 2.7 µL
b. Single Channel, Positive Displacement Calibration Volume:		
1 - 10 µL	Biocal™ Compliance Method	0.012 - 0.012 µL
3 - 25 µL	BF-SOP-01 (R15)	0.012 - 0.030 µL
20 - 50 µL	Accuracy & Precision Tests with	0.027 - 0.028 µL
10 - 100 µL	Analytical Balances	0.07 - 0.08 µL
50 - 250 µL		0.09 - 0.11 µL
100 - 1000 µL		0.11 - 0.22 µL

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<p>c. Single Channel, Repetitive Calibration Volume:</p> <p>2 - 20 µL 4 - 40 µL 10 - 100 µL 20 - 200 µL 50 - 500 µL 100 - 1000 µL 250 - 2500 µL 500 - 5000 µL 1 - 10 mL 2.5 - 25 mL 5 - 50 mL</p>	<p>Biocal™ Compliance Method BF-SOP-01 (R15)</p> <p>Accuracy & Precision Tests with Analytical Balances</p>	<p>0.014 - 0.032 µL 0.015 - 0.029 µL 0.014 - 0.035 µL 0.07 - 0.09 µL 0.08 - 0.13 µL 0.13 - 0.22 µL 0.12 - 0.62 µL 0.23 - 0.23 µL 0.6 - 2.1 µL 1.9 - 5.1 µL 2.0 - 10 µL</p>
<p>2. Bottle-Top Dispensers (Piston Operated, EX)</p> <p>Calibration Volume :</p> <p>0.05 mL – 0.5 mL 0.20 mL – 2 mL 0.5 mL – 5 mL 1 mL – 10 mL 2.5 mL – 25 mL 5 mL – 50 mL 10 mL – 100 mL</p>	<p>Biocal™ Compliance Method BF-SOP-01 (R15)</p> <p>Accuracy & Precision Tests with Analytical Balances</p>	<p>0.14 µL – 0.16 µL 0.25 µL – 0.25 µL 1.0 µL – 1.3 µL 1.0 µL – 1.3 µL 2.2 µL – 5.9 µL 3.7 µL – 6.9 µL 4.1 µL – 6.6 µL</p>
<p>3. Bottle-Top Burettes (Piston Operated, EX)</p> <p>Calibration Volume:</p> <p>2.5 mL – 25 mL 5 mL – 50 mL</p>	<p>Biocal™ Compliance Method BF-SOP-01 (R15)</p> <p>Accuracy & Precision Tests with Analytical Balances</p>	<p>3.4 µL – 6.6 µL 2.1 µL – 2.9 µL</p>
<p>4. Dilutors (Piston Operated)</p> <p>Sample Volume (IN) :</p> <p>2.5 - 25 mL 5 - 50 mL</p> <p>Diluent Volume (EX) :</p> <p>2.5 - 25 mL 5 - 50 mL</p>	<p>BioCal™ Compliance Method BF-SOP-01 (R15)</p> <p>Accuracy & Precision Tests with Analytical Balances</p>	<p>0.003 mL - 0.003 mL 0.003 mL - 0.005 mL</p> <p>0.0040 mL - 0.0020 mL 0.0031 mL - 0.0049 mL</p>

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<p>5. Syringes (Digital with Reusable Plungers, EX) Calibration Volume: 0.2 - 1 µL 0.5 - 5 µL 5 - 50 µL 10 - 100 µL 50 - 500 µL 100 - 1000 µL 250 - 2500 µL 500 - 5000 µL</p>	<p>Biocal™ Compliance Method BF-SOP-01 (R15)</p> <p>Accuracy & Precision Tests with Analytical Balances</p>	<p>0.009 - 0.010 µL 0.009 - 0.010 µL 0.010 - 0.010 µL 0.013 - 0.019 µL 0.07 - 0.11 µL 0.09 - 0.10 µL 0.32 - 0.53 µL 0.31 - 0.46 µL</p>
<p>6. Peristaltic Pump (EX) Calibration Flow Rate: 2 - 840 µL/min 5 - 24 mL/min 100 - 5000 mL/min</p>	<p>Biocal™ Compliance Method BF-SOP-01 (R15)</p> <p>Accuracy & Precision Tests with Analytical Balances</p>	<p>0.022 - 3.6 µL/min 0.023 - 0.15 mL/min 1.7 - 24 mL/min</p>
<p>7. Volumetric Flasks (IN) Calibration Volume: 5 mL 10 mL 20 mL 25 mL 50 mL 100 mL 250 mL 500 mL 1000 mL 2000 mL</p>	<p>Biocal™ Compliance Method BF-SOP-05 (R03)</p> <p>Accuracy Tests with Analytical Balances</p>	<p>0.0045 mL 0.0045 mL 0.0074 mL 0.011 mL 0.014 mL 0.018 mL 0.020 mL 0.05 mL 0.11 mL 0.16 mL</p>
<p>8. Graduated Cylinders (IN) Calibration Volume: 1 mL – 10 mL 2.5 mL – 25 mL 5 mL – 50 mL 10 mL – 100 mL 10 mL – 250 mL 50 mL – 500 mL 100 mL – 1000 mL 200 mL – 2000 mL 250 mL – 5000 mL (Measuring Jug)</p>	<p>Biocal™ Compliance Method BF-SOP-05 (R03)</p> <p>Accuracy Tests with Analytical Balances</p>	<p>0.014 mL / 0.014 mL 0.027 mL / 0.027 mL 0.048 mL - 0.049 mL 0.068 mL - 0.076 mL 0.15 mL - 0.12 mL 0.22 mL - 0.27 mL 0.38 mL - 0.48 mL 0.62 mL - 0.63 mL 3.2 mL - 4.1 mL</p>

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<p>9. Glass Burettes (EX) Calibration Volume: 1.0 mL – 10 mL 2.5 mL – 25 mL 5 mL – 50 mL</p>	<p>Biocal™ Compliance Method BF-SOP-05 (R03) Accuracy Tests with Analytical Balances</p>	<p>0.0033 mL 0.0059 mL 0.0094 – 0.0093 mL</p>																																								
<p>B. MECHANICAL</p> <p>1. Weighing Balances In-House Calibration using OIML Class E₁ / E₂ weights :</p> <table border="1"> <thead> <tr> <th>Range</th> <th>Resolution</th> </tr> </thead> <tbody> <tr> <td>0 g to 5 g</td> <td>0.001 mg</td> </tr> <tr> <td>0 g to 40 g</td> <td>0.01 mg</td> </tr> <tr> <td>0 g to 100 g</td> <td>0.01 mg</td> </tr> </tbody> </table> <p>On-Site Calibration using OIML Class E₂ weights :</p> <table border="1"> <thead> <tr> <th>Range</th> <th>Resolution</th> </tr> </thead> <tbody> <tr> <td>0 g to 2 g</td> <td>0.000 1 mg</td> </tr> <tr> <td>0 g to 5 g</td> <td>0.001 mg</td> </tr> <tr> <td>0 g to 6 g</td> <td>0.001 mg</td> </tr> <tr> <td>0 g to 52 g</td> <td>0.001 mg</td> </tr> <tr> <td>0 g to 40 g</td> <td>0.01 mg</td> </tr> <tr> <td>0 g to 100 g</td> <td>0.01 mg</td> </tr> <tr> <td>0 g to 230g</td> <td>0.01 mg</td> </tr> <tr> <td>0 g to 220 g</td> <td>0.1 mg</td> </tr> <tr> <td>0 g to 230 g</td> <td>0.1 mg</td> </tr> <tr> <td>0 g to 520 g</td> <td>0.1 mg</td> </tr> <tr> <td>0 g to 2300 g</td> <td>0.001 g</td> </tr> <tr> <td>0 g to 6100 g</td> <td>0.01 g</td> </tr> <tr> <td>0 g to 10100 g</td> <td>0.01 g</td> </tr> <tr> <td>0 g to 15000 g</td> <td>1 g</td> </tr> <tr> <td>0 g to 15000 g</td> <td>2 g</td> </tr> </tbody> </table>	Range	Resolution	0 g to 5 g	0.001 mg	0 g to 40 g	0.01 mg	0 g to 100 g	0.01 mg	Range	Resolution	0 g to 2 g	0.000 1 mg	0 g to 5 g	0.001 mg	0 g to 6 g	0.001 mg	0 g to 52 g	0.001 mg	0 g to 40 g	0.01 mg	0 g to 100 g	0.01 mg	0 g to 230g	0.01 mg	0 g to 220 g	0.1 mg	0 g to 230 g	0.1 mg	0 g to 520 g	0.1 mg	0 g to 2300 g	0.001 g	0 g to 6100 g	0.01 g	0 g to 10100 g	0.01 g	0 g to 15000 g	1 g	0 g to 15000 g	2 g	<p>Biocal™ Compliance Method BF-SOP-03 (R09)</p> <p>i. Linearity ii. Off-Center Load Error iii. Repeatability iv. Hysteresis v. Linearity</p> <p><u>Environment Conditions :</u> Temperature : 18 °C to 27 °C Relative Humidity : 40 % to 75 % Air Pressure : (1005 to 1030) hPa</p>	<p>0.009 mg 0.05 mg 0.11 mg</p> <p>0.017 mg 0.023 mg 0.027 mg 0.059 mg 0.07 mg 0.11 mg 0.22 mg 0.2 mg 0.3 mg 0.5 mg 0.002 g 0.02 g 0.03 g 4 g 3 g</p>
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<p>2. Centrifuge <u>On-Site Calibration :</u></p> <p>a) Speed 0 to 14,999 rpm 15,000 to 20,000 rpm</p> <p>b) Timing 1 to 99 min</p>	<p>Biocal™ Compliance Method BF-SOP-09 (R03)</p> <p>i. Rotation Speed Accuracy ii. Max Rotation Speed iii. Min Rotation Speed</p> <p>i. Timing Accuracy</p> <p><u>Environment Conditions:</u> Temperature: 18 °C to 28 °C Relative Humidity: < 90 %</p>	<p>5.0 rpm 6.2 rpm</p> <p>0.75 sec</p>																																								

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C. TEMPERATURE		
1. Centrifuges		
<u>On-Site Calibration :</u>		
a) Sample Temperature (4 to 25) °C	Biocal™ Compliance Method BF-SOP-09 (R03) i. Temperature Accuracy	0.66 °C
b) Chamber Temperature (4 to 25) °C	<u>Environment Conditions:</u> Temperature: 18 °C to 28 °C Relative Humidity: < 90 %	0.98 °C
2. Thermocyclers (PCR Systems)		
<u>On-Site Calibration :</u> Using MTAS™ System with Up to 15 Temperature Sensors: Values in order of cycling temperatures :		
95 °C	Biocal™ Compliance Method BF-SOP-04 (R03) i. Temperature Accuracy	0.39 °C
30 °C	<u>Environment Conditions :</u>	0.30 °C
90 °C	Temperature : 18 °C to 28 °C	0.36 °C
50 °C	Relative Humidity : < 90 %	0.29 °C
70 °C		0.30 °C
60 °C		0.30 °C
3. Freezers, Incubators, Ovens, Furnaces & Liquid Baths		
<u>On-Site Calibration :</u>		
a) Empty Load Condition	Biocal™ Compliance Method BF-SOP-06 (R04)	
-80 to -21 °C	Nine-Point Temperature Survey on	2.5 °C
-20 to 20 °C	i. Temperature Accuracy	0.77 °C
21 to 50 °C	<u>Environment Conditions :</u>	0.50 °C
51 to 100 °C	Temperature : 18 °C to 28 °C	0.56 °C
101 to 200 °C	Relatively Humidity: < 90 %	2.7 °C

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<p>4. Heating Block / Dry Bath <u>On-Site Calibration:</u></p> <p>Empty Load Condition</p> <p>(30 to 65) °C (66 to 100) °C (101 to 150) °C</p>	<p>Biocal™ Compliance Method BF-SOP-07 (R00)</p> <p>Up to Eight Point Temperature Survey on</p> <p>i. Temperature Accuracy</p> <p><u>Environment Conditions:</u> Temperature: 18 °C to 28 °C Relative Humidity: < 90 %</p>	<p>0.68 °C 0.84 °C 1.47 °C</p>
<p>D OPTICAL</p> <p>1. UV-Vis Spectrophotometers with a Spectral bandwidth of 1 nm to 5 nm</p> <p><u>On-Site Calibration :</u></p> <p>a) Wavelength Accuracy</p> <p>241 to 641 nm</p> <p>b) Photometric Accuracy 235, 257, 313 & 350 nm</p>	<p>Biocal™ Compliance Method BF-SOP-10 (R02)</p> <p>i. Wavelength Accuracy & Precision</p> <p>ii. Photometric Accuracy & Precision</p> <p><u>Environment Conditions:</u> Temperature: 20 °C to 30 °C Relative Humidity: < 80 %</p>	<p>0.17 nm</p> <p>20mg/L – 0.007 A 60mg/L – 0.009 A 100mg/L – 0.011 A</p>
<p>E. RELATIVE HUMIDITY</p> <p><u>On-Site Measurement</u></p> <p>65% (at 28 °C) 48% (at 5 °C) 24% (at 30 °C) 19% (at 5 °C)</p>	<p>Biocal™ Compliance Method BF-SOP-06 (R04)</p> <p>One-Point measurement on</p> <p>i. Temperature Accuracy ii. Relative Humidity</p> <p><u>Environment Conditions :</u> Temperature : 18 °C to 28 °C Relatively Humidity: < 90 %</p>	<p>2.12% relative humidity 5.76% relative humidity 1.37% relative humidity 3.00% relative humidity</p>

* CMC is expressed as an expanded uncertainty estimated at a level of confidence of approximately 95%.

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Approved signatories

Mr Sim Koon Meng For all calibration except B2, C1 and C4.

Ms Quek Wang Sim For all calibration.

Ms Lim Pei San For all calibration except A.

Note :

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. A laboratory's fulfilment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and **management system requirements** that are necessary for it to consistently deliver technically valid calibration results. The **management system requirements** in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001.