

# Schedule

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Blk 71 Bukit Batok Crescent  
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Singapore 658071

Certificate No. : LA-2007-0373-C

Issue No. : 15

Date : 15 February 2021

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FIELD OF TESTING : Calibration and Measurement

MEASURED QUANTITIES / RANGE / INSTRUMENT TO BE CALIBRATED	METHOD	CALIBRATION & MEASUREMENT CAPABILITIES (CMC *)
<b>A. VOLUMETRIC</b>		
<b>1. Piston Pipettes (EX)</b>		
a. Single & Multi-Channel, Air Displacement Calibration Volume: 0.1 to 10 µL >10 to 20 µL >20 to 30 µL >30 to 50 µL >50 to 100 µL >100 to 200 µL >200 to 300 µL >300 to 1000 µL >1000 to 1250 µL >1250 to 5000 µL >5 to 10 mL	In-House Procedure (BioCal™) BF-SOP-01 (R18)	0.013 µL 0.014 µL 0.017 µL 0.019 µL 0.07 µL 0.09 µL 0.10 µL 0.14 µL 0.24 µL 1.0 µL 2.1 µL
b. Single Channel, Positive Displacement Calibration Volume: 1 to 10 µL >10 to 25 µL >25 to 50 µL >50 to 100 µL >100 to 1000 µL	In-House Procedure (BioCal™) BF-SOP-01 (R18)	0.015 µL 0.031 µL 0.028 µL 0.06 µL 0.09 µL

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<p>c. Single Channel, Repetitive Calibration Volume: 1 to 20 µL &gt;20 to 100 µL &gt;100 to 500 µL &gt;500 to 1000 µL &gt;1000 to 5000 µL &gt;5 to 10 mL &gt;10 to 25 mL &gt;25 to 50 mL</p>	In-House Procedure (BioCal™) BF-SOP-01 (R18)	0.017 µL 0.031 µL 0.07 µL 0.13 µL 0.38 µL 0.9 µL 1.8 µL 3.3 µL
<p><b>2. Bottle-Top Dispensers (Piston Operated, EX)</b> Calibration Volume : 0.05 to 0.5 mL &gt;0.5 to 2 mL &gt;2 to 10 mL &gt;10 to 25 mL &gt;25 to 100 mL</p>	In-House Procedure (BioCal™) BF-SOP-01 (R18)	0.16 µL 0.24 µL 1.3 µL 5.8 µL 6.4 µL
<p><b>3. Bottle-Top Burettes (Piston Operated, EX)</b> Calibration Volume: 1 to 25 mL &gt;25 to 50 mL</p>	In-House Procedure (BioCal™) BF-SOP-01 (R18)	1.7 µL 2.7 µL
<p><b>4. Dilutors (Piston Operated)</b> Sample Volume (IN) or Diluent Volume (EX) 2.5 to 25 mL &gt;25 to 50 mL</p>	In-House Procedure (BioCal™) BF-SOP-01 (R18)	0.0023 mL 0.0043 mL
<p><b>5. Syringes (Digital with Reusable Plungers, EX)</b> Calibration Volume: 0.2 to 25 µL &gt;25 to 50 µL &gt;50 to 100 µL &gt;100 to 1000 µL &gt;1000 to 5000 µL</p>	In-House Procedure (BioCal™) BF-SOP-01 (R18)	0.013 µL 0.014 µL 0.021 µL 0.08 µL 0.46 µL

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<p><b>6. Peristaltic Pump (EX)</b> Calibration Flow Rate: 2 µL/min &gt;2 to 90 µL/min &gt;90 to 840 µL/min &gt;840 to 5000 µL/min &gt;5 to 24 mL/min &gt;24 to 100 mL/min &gt;100 to 1000 mL/min &gt;1000 to 5000 mL/min</p>	In-House Procedure (BioCal™) BF-SOP-01 (R18)	0.024 µL/min 0.037 µL/min 3.6 µL/min 24 µL/min 0.15 mL/min 0.41 mL/min 4.7 mL/min 24 mL/min
<p><b>7. Volumetric Flasks (IN)</b> Calibration Volume: 5 to 10 mL &gt;10 to 20 mL &gt;20 to 25 mL &gt;25 to 50 mL &gt;50 to 100 mL &gt;100 to 250 mL &gt;250 to 500 mL &gt;500 to 1000 mL &gt;1000 to 2000 mL</p>	In-House Procedure (BioCal™) BF-SOP-05 (R05)	0.0045 mL 0.0074 mL 0.011 mL 0.014 mL 0.018 mL 0.020 mL 0.038 mL 0.073 mL 0.12 mL
<p><b>8. Graduated Cylinders (IN)</b> Calibration Volume: 1 to 10 mL &gt;10 to 25 mL &gt;25 to 50 mL &gt;50 to 100 mL &gt;100 to 250 mL &gt;250 to 500 mL &gt;500 to 1000 mL &gt;1000 to 2000 mL &gt;2000 to 5000 mL</p>	In-House Procedure (BioCal™) BF-SOP-05 (R05)	0.013 mL 0.027 mL 0.049 mL 0.069 mL 0.12 mL 0.23 mL 0.39 mL 0.62 mL 3.0 mL
<p><b>9. Glass Burettes (EX)</b> Calibration Volume: 1 to 10 mL &gt;10 to 25 mL &gt;25 to 50 mL</p>	In-House Procedure (BioCal™) BF-SOP-05 (R05)	0.0033 mL 0.0059 mL 0.0093 mL

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<p><b>B. MECHANICAL</b></p> <p><b>1. Weighing Balances</b>            In-House Calibration using            OIML Class E<sub>1</sub> weights :</p> <table border="0"> <thead> <tr> <th><u>Range</u></th> <th><u>Resolution</u></th> </tr> </thead> <tbody> <tr><td>0 g to 5 g</td><td>0.001 mg</td></tr> <tr><td>0 g to 22 g</td><td>0.001 mg</td></tr> <tr><td>0 g to 50 g</td><td>0.01mg</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 E<sub>2</sub> weights :</p> <table border="0"> <thead> <tr> <th><u>Range</u></th> <th><u>Resolution</u></th> </tr> </thead> <tbody> <tr><td>0 g to 2 g</td><td>0.1 µg</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 12,000 g</td><td>0.01 g</td></tr> <tr><td>0 g to 15,000 g</td><td>0.1 g</td></tr> </tbody> </table> <p><b>2. Rotational Speed Measurement</b>            In-House/On-Site:            0 to 20,000 rpm</p> <p><b>3. Time Measurement</b>            In-House/On-Site:            1 to 180 min</p>	<u>Range</u>	<u>Resolution</u>	0 g to 5 g	0.001 mg	0 g to 22 g	0.001 mg	0 g to 50 g	0.01mg	0 g to 100 g	0.01 mg	<u>Range</u>	<u>Resolution</u>	0 g to 2 g	0.1 µg	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 12,000 g	0.01 g	0 g to 15,000 g	0.1 g	<p>In-House Procedure (BioCal™)            BF-SOP-03 (R10)</p> <p>In-House Procedure (BioCal™)            BF-SOP-09 (R04)</p> <p>In-House Procedure (BioCal™)            BF-SOP-09 (R04)</p>	<p>0.012 mg            0.023 mg            0.05 mg            0.10 mg</p> <p>0.024 mg            0.032 mg            0.048 mg            0.067 mg            0.09 mg            0.13 mg            0.24 mg            0.3 mg            0.4 mg            0.6 mg            0.003 g            0.02 g            0.03 g            0.2 g</p> <p>5.7 rpm</p> <p>0.15 sec</p>
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<b>C. TEMPERATURE</b>		
<b>1. Centrifuges</b>		
In-House/On-Site:		
a) Sample Temperature 4 to 25 °C	In-House Procedure (BioCal™) BF-SOP-09 (R04)	0.64 °C
b) Chamber Temperature 4 to 25 °C		0.62 °C
<b>2. Thermocyclers (PCR Systems)</b>		
In-House/On-Site:		
Using MTAS™ System with Up to 15 Temperature Sensors		
In-House Procedure (BioCal™) BF-SOP-04 (R04)		
Values in order of cycling temperatures :		
95 °C		0.29 °C
30 °C		0.29 °C
90 °C		0.29 °C
50 °C		0.28 °C
70 °C		0.29 °C
60 °C		0.29 °C
<b>3. Temperature Enclosures</b> (Fridge, Freezers, Incubators, Ovens, Furnaces & Liquid Baths)		
On-Site Calibration:		
-86 to -81 °C	In-House Procedure (BioCal™) BF-SOP-06 (R05)	0.80 °C
-80 to -21 °C		0.59 °C
-20 to 100 °C		0.49 °C
101 to 200 °C		0.65 °C
<b>4. Heating Block / Dry Bath</b>		
In-House/On-Site:		
4 to 100 °C	In-House Procedure (BioCal™) BF-SOP-07 (R01)	0.66 °C
101 to 150 °C		0.79 °C

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<p><b>5. Temperature Sensors</b> (with or without Indicator)</p> <p><b>a. Thermocouples</b> (Type T) -80 °C to 250 °C (Type K) -80 °C to 400 °C</p> <p><b>b. PRT / RTD</b> -80 to -20 °C -19 to 100 °C 101 to 200 °C 201 to 300 °C 301 to 400 °C</p> <p><b>D OPTICAL</b></p> <p><b>1. UV-Vis Spectrophotometers</b> with Spectral Bandwidth 1-5 nm</p> <p>In-House/On-Site:</p> <p>a) Wavelength Accuracy 241 to 641 nm</p> <p>b) Photometric Accuracy 235, 257, 313 &amp; 350 nm</p>	<p>In-House Procedure (BioCal™) BF-SOP-11 (R02)</p> <p>In-House Procedure (BioCal™) BF-SOP-10 (R03)</p>	<p>0.25 °C 0.59 °C</p> <p>0.081 °C 0.072 °C 0.088 °C 0.093 °C 0.12 °C</p> <p>0.18 nm</p> <p>20 mg/L – 0.013 A 60 mg/L – 0.014 A 100 mg/L – 0.016 A</p>

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

## Approved signatories

Mr Sim Koon Meng For all calibration except items B2, C1, C4 and C5.  
Ms Quek Wang Sim For all calibration.  
Ms Lim Pei San For all calibration except item A.  
Ms Veronica For item 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.