

# Schedule

Mirai Calibration Laboratory Pte Ltd  
No. 53, Tuas South Ave 1  
Tuas Cove Industrial Centre  
Singapore 637606

Certificate No. : LA-2012-0511-C

Issue No. : 5

Date : 3 Oct 2016

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FIELD OF TESTING : Calibration and Measurement

MEASURED QUANTITIES/INSTRUMENTS/ RANGE TO BE CALIBRATED	METHOD/ FREQUENCY	CALIBRATION & MEASUREMENT CAPABILITY (CMC *)
<b>A Electrical</b>		
A1. <b>DC Voltage Source (Lab &amp; Site)</b> 0.1 V 0.1 V to 20 V 20 V to 70 V	In-house procedure : MCL/WI/E-02 Issue 02 Amd 02 6½ DMM	1 mV 6.1 mV 58 mV
A2. <b>DC Current Source (Lab &amp; Site)</b>  0.1 mA to 10 mA 10 mA to 22 mA	In-house procedure : MCL/WI/E-02 Issue 02 Amd 02 6½ DMM	8 µA 20 µA
A3. <b>Sourcing Instruments Resistance 2 Wire (Lab &amp; Site)</b>  0 Ω to 100 Ω 100 Ω to 2 kΩ 2 kΩ to 4 kΩ	In-house procedure : MCL/WI/E-02 Issue 02 Amd 02 6½ DMM	0.03 Ω 0.4 Ω 0.7 Ω
A4. <b>Sourcing Instruments Frequency (Lab &amp; Site)</b>  10 Hz to 1 kHz 1 kHz to 10 kHz	In-house procedure : MCL/WI/E-02 Issue 02 Amd 02 6½ DMM	0.6 Hz 58 Hz

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<p>A5. <b>DC Voltage Measuring Instruments (Lab &amp; Site)</b></p> <p>0 mV - 50 mV                      50 mV - 200 mV                      0.2 V - 1 V                      1 V - 2 V                      2 V - 10 V                      10 V - 20 V                      20 V - 100 V                      100 V - 200 V                      200 V - 500 V                      500 V - 1000 V</p>	<p>In-house procedure :                      MCL/WI/E-03 Issue 01 Amd 02                      Transmille 3041A Using                      Direct Method with                      4½ DMM</p>	<p>6.1 µV                      13 µV                      71 µV                      96 µV                      0.7 mV                      0.9 mV                      7.1 mV                      10 mV                      31 mV                      73 mV</p>
<p>A6. <b>AC Voltage Measuring Instrument (Lab &amp; Site)</b></p> <p>1 mV - 20 mV</p> <p>20 mV - 100 mV</p> <p>100 mV - 200 mV</p> <p>0.2 V - 1 V</p>	<p>In-house procedure :                      MCL/WI/E-03 Issue 01 Amd 02                      Transmille 3041A Using                      Direct Method with                      4½ DMM</p> <p>50 Hz                      50 Hz - 1 kHz                      1 kHz - 10 kHz                      10 kHz - 20 kHz</p> <p>50 Hz                      50 Hz - 1 kHz                      1 kHz - 10 kHz                      10 kHz - 20 kHz</p> <p>50 Hz                      50 Hz - 1 kHz                      1 kHz - 10 kHz                      10 kHz - 20 kHz</p> <p>50 Hz                      50 Hz - 1 kHz                      1 kHz - 10 kHz                      10 kHz - 20 kHz</p>	<p>0.04 mV                      0.08 mV                      0.07 mV                      0.2 mV</p> <p>0.08 mV                      0.15 mV                      0.2 mV                      0.2 mV</p> <p>0.2 mV                      0.3 mV                      0.3 mV                      0.8 mV</p> <p>0.6 mV                      1.3 mV                      1.2 mV                      5.2 mV</p>

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1 V - 2 V	50 Hz 50 Hz - 1 kHz 1 kHz - 10 kHz 10 kHz - 20 kHz	1.1 mV 2.3 mV 2.3 mV 8.1 mV
2 V - 10 V	50 Hz 50 Hz - 1 kHz 1 kHz - 10 kHz 10 kHz - 20 kHz	5.4 mV 9.7 mV 10 mV 64 mV
10 V - 20 V	50 Hz 50 Hz - 1 kHz 1 kHz - 10 kHz 10 kHz - 20 kHz	9.3 mV 18 mV 18 mV 89 mV
20 V - 100 V	50 Hz 50 Hz - 1 kHz 1 kHz - 10 kHz 10 kHz - 20 kHz	56 mV 0.16 V 0.2 V 0.2 V
100 V - 200 V	50 Hz - 1 kHz 1 kHz - 20 kHz	0.3 V 0.3 V
200 V - 600 V	50 Hz - 10 kHz	1.6 V
600 V - 1000 V	50 Hz - 10 kHz	2.2 V
<b>A7. DC Current Measuring Instruments (Lab &amp; Site)</b>	In-house procedure : MCL/WI/E-03 Issue 01 Amd 02 Transmille 3041A Using Direct Method with 4½ DMM	
0.2 µA - 100 µA		47 nA
100 µA - 200 µA		59 nA
0.2 mA - 1 mA		0.6 µA
1 mA - 2 mA		0.8 µA
2 mA - 10 mA		1.2 µA
10 mA - 20 mA		1.7 µA
20 mA - 50 mA		8.4 µA
50 mA - 100 mA		14.1 µA
100 mA - 200 mA		24 µA

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0.2 A - 1 A 1 A - 2 A 2 A - 5 A 5 A - 7.5 A 7.5 A - 10 A		0.3 mA 0.4 mA 2.8 mA 4 mA 5.1 mA
<b>A8. Current Clamp Meter DC current (Lab &amp; Site)</b>	In-house procedure : MCL/WI/E-07 Issue 01 Amd 01 Transmille 3041A Current Clamp EA002	1.4 A 2.9 A 5.3 A
10 A - 200 A 200 A - 500 A 500 A - 1000 A		
<b>A9. AC Current Measuring Instruments (Lab &amp; Site)</b>	In-house procedure : MCL/WI/E-03 Issue 01 Amd 02 Transmille 3041A Using Direct Method with 4½ DMM @ 50 Hz	0.4 µA 0.7 µA 1.7 µA 2.6 µA 16 µA 26 µA 0.4 mA 2 mA 3 mA 10 mA 13 mA
20 µA - 50 µA 50 µA - 200 µA 0.2 mA - 1 mA 1 mA - 2 mA 2mA - 10 mA 10 mA - 20 mA 20 mA - 200 mA 0.2 A - 1 A 1 A - 2 A 2 A - 5 A 5 A - 10 A		
20 µA - 50 µA 50 µA - 200 µA 0.2 mA - 1 mA 1 mA - 2 mA 2mA - 10 mA 10 mA - 20 mA 20 mA - 200 mA 0.2 A - 1 A 1 A - 2 A 2 A - 5 A 5 A - 10 A	In-house procedure : MCL/WI/E-03 Issue 01 Amd 02 Direct Method with 4½ DMM @ 1 KHz	0.9 µA 2.2 µA 8.9 µA 17 µA 66 µA 124 µA 1.5 mA 8 mA 12 mA 23 mA 41 mA

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<b>A10. Current Clamp Meter – AC Current (Lab &amp; Site)</b>  10 A - 200 A 200 A - 500 A 500 A - 1000 A	In-house procedure : MCL/WI/E-07 Issue 01 Amd 01 Transmille 3041A Current Clamp EA002 @50 Hz	0.9 A 2.3 A 5.0 A
<b>A11. Measuring Instrument Resistance 2 Wire (Lab &amp; Site)</b>  1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ	In-house procedure : MCL/WI/E-03 Issue 01 Amd 02 Transmille 3041A Using Direct Method with 4½ DMM	9 mΩ 10 mΩ 14 mΩ 0.2 Ω 1.1 Ω 12 Ω 0.2 kΩ 4.7 kΩ 0.6 MΩ
<b>A12. Measuring Instrument Resistance 4 Wire (Lab &amp; Site)</b>  1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ	In-house procedure : MCL/WI/E-03 Issue 01 Amd 02 Transmille 3041A Using Direct Method with 4½ DMM	8.3 mΩ 9.1 mΩ 13 mΩ 0.2 Ω 1.1 Ω 12 Ω
<b>A13. Frequency Measuring Instruments (Lab &amp; Site)</b>  100 Hz - 500 Hz 0.5 kHz - 2 kHz 2 kHz - 5 kHz 5 kHz - 20 kHz 20 kHz - 75 kHz 75 kHz - 100 kHz 100 kHz - 500 kHz	In-house procedure : MCL/WI/E-03 Issue 01 Amd 02 Transmille 3041A Using Direct Method with 4½ DMM	13 mHz 0.1 Hz 0.2 Hz 0.8 Hz 1.9 Hz 6.3 Hz 13 Hz

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<p><b>A14. Insulation Tester / Earth Tester Megger / Megohm Hi-Tester (Lab &amp; Site)</b></p> <p>Insulation Test</p> <p>1 MΩ to 2.5 GΩ &gt;2.5 GΩ to 3.5 GΩ &gt;3.5 GΩ to 11 GΩ</p> <p>Earth bond Resistance</p> <p>0.1 Ω to 21 Ω &gt;21 Ω to 200 Ω &gt;200 Ω to 20 kΩ</p> <p>AC Voltage</p> <p>1V to 80 V &gt; 80V to 600V</p> <p>DC Voltage</p> <p>1V to 600 V</p>	<p>In-house procedure MCL/WI/E-08 Issue 1 Amd 02 Direct Method</p>	<p>2.7 % reading 3.3 % reading 6.2 % reading</p> <p>0.03 Ω 0.15 % reading 0.03 kΩ</p> <p>0.08 V 0.1% reading</p> <p>0.07 V</p>
<p><b>B Mechanical</b></p>		
<p><b>B1. Tachometer (Non-contact) (Lab)</b></p> <p>240 rpm – 900 rpm 900 rpm – 3000 rpm 3000 rpm – 20000 rpm 20000 rpm – 40000 rpm 40000 rpm – 60000 rpm</p>	<p>In-house procedure MCL/WI/M-04 Issue 01 Amd 02 Multifunction Calibrator and Optical Tachometer Adaptor MCL/WI/M-04 Issue 01 Amd 02</p>	<p>0.1 rpm 0.4 rpm 1.3 rpm 2.4 rpm 3.6 rpm</p>
<p><b>B2. Indicating &amp; Setting Torque Tools (Lab)</b></p> <p>0.5 N•m to 10 N•m 10 N•m to 150 N•m 150 N•m to 1000 N•m 1000 N•m to 1500 N•m</p>	<p>In-house procedure MCL/WI/M-08 Issue 01 Amd 0 Direct Method In-house procedure MCL/WI/M-08 Issue 01 Amd 0</p>	<p>0.12 N•m 2.9 N•m 6.0 N•m 12 N•m</p>

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<p><b>C Pressure / Vacuum Calibration</b></p> <p><b>C1 Vacuum Instruments (Lab/Site)</b> Analog gauge, Digital gauge/ Calibrators, Manometer , Transmitter, Switch, Recorder</p> <p style="padding-left: 40px;">-0.85 to 0 bar</p> <p><b>C2 Pressure Instruments using Indicator (Lab/Site)</b> Analog gauge, Digital gauge/ Calibrator, Manometer, Transmitter, Switch, Recorder.</p> <p style="padding-left: 40px;">0 to 100 psi &gt;100 to 300 psi &gt;300 to 1000 psi &gt;1000 to 3000 psi &gt; 3000 to 10,000 psi &gt; 10,000 to 35000 psi</p> <p><b>C3 Pressure Instruments using Dead Weight Tester (Lab)</b> Analog gauge, Digital gauge/ Calibrators, Manometer, Transmitter, Switch, Recorder</p> <p style="padding-left: 40px;">260 to 650 psi &gt;650 to 3000 psi &gt;3000 to 10000 psi &gt;1000 to 14500 psi</p>	<p>MCL/WI/M-05, Issue 02 Amd 03 MCL/WI/M-06, Issue 02 Amd 04 MCL/WI/M-07, Issue 01 Amd 02 MCL/WI/M-08, Issue 01 Amd 02</p> <p>MCL/WI/M-05, Issue 02 Amd 03 MCL/WI/M-06, Issue 02 Amd 04 MCL/WI/M-07, Issue 01 Amd 02 MCL/WI/M-08, Issue 01 Amd 02</p> <p>MCL/WI/M-05, Issue 02 Amd 03 MCL/WI/M-06, Issue 02 Amd 04 MCL/WI/M-07, Issue 01 Amd 02 MCL/WI/M-08, Issue 01 Amd 02</p>	<p>4.7 mbar</p> <p>0.07 psi 0.21 psi 0.6 psi 2.1 psi 7.5 psi 1.7 % full scale</p> <p>0.05 % reading 0.04 % reading 0.05 % reading 0.04 % reading</p>

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<b>D Balance</b>		
<b>D1 Weighing Balance (Lab)</b> 22 g to 220 g >220g to 8200 g >8200 g to 300,000 g	MCL/WI/M-02 Issue 01 Amd 03	0.5 mg 0.2 g 36 g
<b>D2 Weighing Balance (Site)</b> 22 g to 220 g >220g to 8200 g >8200 g to 300,000 g		0.3 g 0.4 g 36 g
<b>D3 Standard Weights (M1 and Lower class)</b> 1 mg to 5 mg 10 mg to 20 mg 50 mg to 500 mg 1 g to 10 g 20 g to 50 g 100 g to 200 g	MCL/WI/M-03 Issue 02 Amd 00	0.06 mg 0.08 mg 0.12 mg 0.3 mg 0.6 mg 1.6 mg
<b>E. Temperature Calibration</b>		
<b>E1 Resistance Temperature Detector</b> -40°C to 50°C (Lab) 50°C to 350°C (Lab/Site) >350°C to 660°C (Lab/Site)	MCL/WI/T-01, Issue 02 Amd 02	0.35 °C 0.40 °C 0.54 °C
<b>E2 Temperature gauge, Temperature Indicator/Transmitter with Sensor</b> -40°C to 50°C (Lab) 50°C to 350°C (Lab/Site) >350°C to 660°C (Lab/Site)	MCL/WI/T-02, Issue 02 Amd 02 MCL/WI/T-03, Issue 02 Amd 02	0.35 °C 0.40 °C 0.54 °C
<b>E3 Temperature Calibrator (Dry Block &amp; Liquid bath) (Lab/Site)</b> -45°C to 350°C >350°C to 660°C	MCL/WI/T-04, Issue 03 Amd 03	0.35 °C 0.53 °C



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<b>E4 RTD Indicator &amp; Simulator (Lab/Site)</b> Type : Pt-100 -200 °C to 800 °C	MCL/WI/T-05, Issue 02 Amd 02 MCL/WI/T-03, Issue 02 Amd 02	1.0 °C
<b>E5 Thermocouple Indicator (Lab/Site)</b> Type J -190 °C to 1200 °C Type K -160 °C to 1260 °C Type T -130 °C to 400 °C Type S 0 °C to 1760 °C	MCL/WI/T-05, Issue 02 Amd 02	1.2 °C 1.6 °C 1.4 °C 1.9 °C
<b>E6 Thermocouple Simulator (Lab/Site)</b> Type J -60 °C to 1120 °C Type K -100 °C to 1370 °C Type T -100 °C to 400 °C Type S 0 °C to 1760 °C	MCL/WI/T-05, Issue 02 Amd 02 MCL/WI/T03, Issue 02 Amd 02	1.5 °C 1.8 °C 1.6 °C 2.5 °C
<b>F DIMENSIONAL (Lab)</b>		
<b>F1 External Micrometer (Fixed Anvil)</b> Resolution: 0.001 mm 0 to 25 mm	MCL/WI/D-02 Issue 01 Amd 02 Set of Slip Gauges	0.8 µm
<b>F2 Vernier Calliper (Outside Measurement &amp; Inside Measurement)</b> 20 mm - 100 mm 100 mm - 350 mm 350 mm - 400 mm	MCL/WI/D-02, Issue 02 Amd 03 Calliper Checker	14 µm 15 µm 16 µm

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F3 <b>Digital Calliper</b> (Outside Measurement & Inside Measurement) 20 mm – 250 mm 250 mm – 450 mm	MCL/WI/D-02 Issue 02 Amd 03 Calliper Checker	11 µm 12 µm
F4 <b>Dial Calliper</b> (Outside Measurement & Inside Measurement) 20 mm – 300 mm 300 mm – 400 mm	MCL/WI/D-02 Issue 02 Amd 03 Calliper Checker	11 µm 12 µm
F5 <b>Limit Gauges</b> i. Pin Gauge or Plain Plug Gauge Up to 50 mm ii. Plain Ring Gauge Up to 50 mm	MCL/WI/D-07 Issue 02 Amd 00  MCL/WI/D-08 Issue 02 Amd 00	1 µm  1.5 µm
F6 <b>Parallel Screw Gauge</b> Thread Plug Gauge (Up to 36 mm) Pitch Diameter Major Diameter Pitch Distance Flank Angle	MCL/WI/D-03 Issue 02 Amd 00	2 µm 2 µm 5 µm 6 min
F7 <b>Standard Rods, Setting Rods, Setting Gauges</b> Up to 25 mm 25 mm to 275 mm 275 mm to 575 mm	MCL/WI/D-12 Issue 02 Amd 00	0.8 µm 3.1 µm 4.8 µm

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

Approved signatories

Mr Robert Kee Kim Hook

All items (except A14)

Mr V. Mohan

All items (except B2, F5, F6, F7)

Mr. Karnan Raghupathy

Items C & E only

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## Note :

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025:2005. A laboratory's fulfilment of the requirements of ISO/IEC 17025:2005 means the laboratory meets both the technical competence requirements and **management system requirements** that are necessary for it to consistently deliver technically valid test results and calibrations. The **management system requirements** in ISO/IEC 17025:2005 (Section 4) are written in language relevant to laboratory operations and meet the principles of ISO 9001:2008 **Quality Management Systems — Requirements** and are aligned with its pertinent requirements.