

Schedule

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Certificate No. : LA-2003-0278-C
Issue No. : 21
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Field of Testing: Calibration and Measurement

MEASURED QUANTITIES/ INSTRUMENTS/RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
A Temperature Calibration		
A1. Resistance temperature Devices Indicators	STCP-001 (Rev. 4)	
-200 °C to 200 °C		0.01 °C
200 °C to 850 °C		0.01 °C
A2. Resistance temperature Devices Simulators	STCP-001 (Rev. 4)	
-200 °C to 850 °C		0.01 °C
A3. Thermocouple Simulators	STCP-002 (Rev. 4)	
Type E		
-270 °C to -150 °C		0.35 °C
-150 °C to -100 °C		0.3 °C
-100 °C to 0 °C		0.25 °C
0 °C to 200 °C		0.2 °C
200 °C to 1000 °C		0.16 °C
Type J		
-210 °C to -150 °C		0.35 °C
-150 °C to -100 °C		0.25 °C
-100 °C to 0 °C		0.2 °C
0 °C to 1200 °C		0.2 °C

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Type K -270 °C to -150 °C -150 °C to -100 °C -100 °C to 0 °C 0 °C to 900 °C 900 °C to 1372 °C		0.3 °C 0.25°C 0.2 °C 0.2 °C 0.25 °C
Type N -270 °C to -150 °C -150 °C to -100 °C -100 °C to 100 °C 100 °C to 200 °C 200 °C to 1300 °C		0.4 °C 0.3°C 0.25 °C 0.2 °C 0.22 °C
Type R -50 °C to 100 °C 100 °C to 400 °C 400 °C to 600 °C 600 °C to 900 °C 900 °C to 1768 °C		0.5 °C 0.4°C 0.4 °C 0.33 °C 0.3 °C
Type S -50 °C to 100 °C 100 °C to 200 °C 200 °C to 400 °C 400 °C to 700 °C 700 °C to 1768 °C		0.5 °C 0.4°C 0.4 °C 0.33 °C 0.3 °C
Type T -270 °C to -150 °C -150 °C to -100 °C -100 °C to 0 °C 0 °C to 200 °C 200 °C to 400 °C		0.3 °C 0.28°C 0.25 °C 0.2 °C 0.17 °C

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<p>A4 Thermocouple Indicators</p> <p>Type E -200 °C to -150 °C -150 °C to -100 °C -100 °C to 0 °C 0 °C to 200 °C 200 °C to 1000 °C</p> <p>Type J -210 °C to -150 °C -150 °C to -100 °C -100 °C to 100 °C 100 °C to 1200 °C</p> <p>Type K -200 °C to -150 °C -150 °C to -100 °C -100 °C to 0 °C 0 °C to 1000 °C 1000 °C to 1372 °C</p> <p>Type N -270 °C to -150 °C -150 °C to -100 °C -100 °C to -50 °C -50 °C to 300 °C 300 °C to 1300 °C</p> <p>Type R -50 °C to 100 °C 100 °C to 400 °C 400 °C to 600 °C 600 °C to 900 °C 900 °C to 1768 °C</p>	<p>STCP-002 (Rev. 4)</p>	<p>0.35 °C 0.3 °C 0.25 °C 0.2 °C 0.16 °C</p> <p>0.35 °C 0.25 °C 0.2 °C 0.2 °C</p> <p>0.3 °C 0.25 °C 0.2 °C 0.2 °C 0.25 °C</p> <p>0.4 °C 0.3 °C 0.25 °C 0.2 °C 0.22 °C</p> <p>0.5 °C 0.4 °C 0.4 °C 0.33 °C 0.3 °C</p>

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<p>Type S -50 °C to 100 °C 100 °C to 200 °C 200 °C to 400 °C 400 °C to 700 °C 700 °C to 1100 °C 1100 °C to 1768 °C</p>		<p>0.5 °C 0.4 °C 0.4 °C 0.33 °C 0.3 °C 0.3 °C</p>
<p>Type T -200 °C to -150 °C -150 °C to -100 °C -100 °C to 0 °C 0 °C to 200 °C 200 °C to 400 °C</p>		<p>0.3 °C 0.28 °C 0.25 °C 0.2 °C 0.17 °C</p>
<p>A5 Resistance Temperature Detectors without Display -80 °C to 0 °C 0 °C to 30 °C 30 °C to 250 °C 250 °C to 500 °C</p>	<p>STCP-003 (Rev.4)</p>	<p>17 mK 11 mK 17 mK 0.41 °C</p>
<p>A6 Thermocouple Sensor without Display Type E -80 °C to 250 °C Type J -80 °C to 0 °C 0 °C to 250 °C 250 °C to 500 °C 500 °C to 1000 °C</p>	<p>STCP-004 (Rev.6)</p>	<p>0.4 °C 0.6 °C 0.5 °C 0.6 °C 0.7 °C</p>

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Type K -80 °C to 0 °C 0 °C to 250 °C 250 °C to 500 °C 500 °C to 1000 °C 1000 °C to 1290 °C Type N -80 °C to 0 °C 0 °C to 200 °C 200 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1290 °C Type R 0 °C to 500 °C 500 °C to 1000 °C 1000 °C to 1290 °C Type S 0 °C to 350 °C 350 °C to 1100 °C 1100 °C to 1290 °C Type T -80 °C to 0 °C 0 °C to 250 °C		0.3 °C 0.3 °C 0.5 °C 1.0 °C 2.0 °C 0.3 °C 0.3 °C 0.5 °C 1.0 °C 2.0 °C 0.5 °C 1.0 °C 2.0 °C 0.9 °C 1.0 °C 2.0 °C 0.3 °C 0.2 °C
A7 Digital Indicator with RTD Sensor -80 °C to -40 °C -40 °C to 0 °C 0 °C to 250 °C 250 °C to 550 °C	STCP-005 (Rev.5)	15 mK 15 mK 15 mK 0.41 °C

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A8 Digital Indicator with Base Metal Thermocouple -80 °C to 20 °C 20 °C to 250 °C 250 °C to 500 °C 500 °C to 700 °C 700 °C to 900 °C 900 °C to 1290 °C	STCP-005 (Rev.5)	0.3 °C 0.2 °C 0.7 °C 1.2 °C 1.5 °C 1.7 °C
A9 Digital Indicator with Noble Metal Thermocouple 0 °C to 250 °C 250 °C to 500 °C 500 °C to 1000 °C 1000 °C to 1100 °C 1100 °C to 1290 °C	STCP-005 (Rev.5)	0.4 °C 0.6 °C 1.5 °C 2.2 °C 2.8 °C
A10 Humidity Instruments -20 °C to 60 °C (10 to 95) % relative humidity at 23 °C -20 °C to 60 °C (i) (10 to 95) % relative humidity (ii) (95 and above) % relative humidity Dew Point (-20 °C to 60 °C)	STCP-006 (Rev.5)	0.2 °C (2.0 to 2.2) % relative humidity 0.12 °C (2.0 to 2.2) % relative humidity (2.7 to 2.8) % relative humidity 0.3 °C
A11 Temperature Enclosures (In-house and On-site) -80 °C to -40 °C -40 °C to 100 °C 100 °C to 350 °C 350 °C to 1290 °C 121 °C Autoclaves and Pressurized Enclosures	STCP-007 (Rev.5)	0.9 °C 0.6 °C 1.7 °C 3.9 °C 0.3 °C

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A12 Digital Indicator with RTD Sensor (On-site) -40 °C to 0 °C 0 °C to 100 °C 100 °C to 200 °C 200 °C to 300 °C 300 °C to 500 °C	STCP-008 (Rev.4)	0.3 °C 0.15 °C 0.2 °C 0.3 °C 0.5 °C
A13 Digital Indicator with Base Metal Thermocouple Sensor (On-Site) Digital Display (On-Site) -40 °C to 0 °C 0 °C to 100 °C 100 °C to 200 °C 200 °C to 300 °C 300 °C to 500 °C	STCP-008 (Rev.4)	0.5 °C 0.3 °C 0.5 °C 0.6 °C 0.8 °C
A14 Digital RTD Indicators (On-Site) -200 °C to 500 °C	STCP-009 (Rev.4)	0.15 °C
A15 Thermocouple Display Device (On-Site) Type E -200 °C to 0 °C 0 °C to 1000 °C Type J -200 °C to 800 °C Type K -200 °C to 1200 °C Type N -200 °C to 1200 °C Type T -200 °C to 0 °C 0 °C to 400 °C	STCP-010 (Rev.4)	0.3 °C 0.5 °C 0.5 °C 0.4 °C 0.5 °C 0.3 °C 0.2 °C

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A16 Temperature Transmitter with RTD Sensor -80 °C to 250 °C 250 °C to 500 °C	STCP-011 (Rev.5)	17 mK 0.41 °C
A17 Temperature Transmitter with Base Metal Thermocouple Sensor 0 °C to 200 °C 200 °C to 1000 °C 1000 °C to 1200 °C	STCP-011 (Rev.5)	0.4 °C 0.5 °C 1.0 °C
A18 Radiation Thermometers -10 °C to 50 °C 50 °C to 100 °C 100 °C to 350 °C 350 °C to 700 °C -10 °C to 50 °C 50 °C to 350 °C 350 °C to 700 °C	STCP-012 (Rev.4) € = 1.00 € = 1.00 € = 1.00 € = 1.00 € = 0.90 to 0.99 € = 0.90 to 0.99 € = 0.90 to 0.99	0.3 °C 0.25 °C 1.5 °C to 2.5 °C 2.0 °C to 3.0 °C 0.5 °C 0.8 °C 3.0 °C to 4.0 °C

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MEASURED QUANTITIES/ INSTRUMENTS/RANGE TO BE CALIBRATED				METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
A19	Liquid-In-Glass (LIG) Thermometer			STCP-013 (Rev. 5)	
	Type of Immersion	Min. LIG Graduation (°C)	Max. LIG Graduation (°C)	Temperature Range (°C)	
(i)	Total Immersion	0.01	1.0	-80 to -40	0.2 °C
(ii)	Total Immersion	0.01	1.0	-40 to 0	0.1 °C
(iii)	Total Immersion	0.01	1.0	0 to 200	0.1 °C
(iv)	Total Immersion	0.01	1.0	200 to 250	0.3 °C
(v)	Partial Immersion	0.01	1.0	-80 to -40	0.4 °C
(vi)	Partial Immersion	0.01	1.0	-40 to 0	0.3 °C
(vii)	Partial Immersion	0.01	1.0	0 to 150	0.5 °C
(viii)	Partial Immersion	0.01	1.0	150 to 200	0.6 °C
(ix)	Partial Immersion	0.01	1.0	200 to 250	0.8 °C
A20	Temperature and Humidity Chamber			STCP-014 (Rev. 2)	
	-20 °C to 60 °C (10 to 95) % relative humidity				0.6 °C to 0.8 °C (2.3 to 7.8) % relative humidity
A21	Sensor Calibration Using Fixed Point				
	(a) Triple Point of Water (0.01 °C)			STCP-015 (Rev. 3)	3 mK
	(b) Gallium Melting Point (29.7646 °C)			STCP-016 (Rev. 3)	3 mK

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<p>A22 Multi-Holed Temperature Block Bath Calibration</p> <p>Radial and Axial Test -40 °C to 250 °C 250 °C to 1100 °C 1100 °C to 1295 °C</p> <p>Loading, Stability and Deviation Test -40 °C to 250 °C 250 °C to 1100 °C 1100 °C to 1295 °C</p>	<p>STCP-017 (Rev. 2)</p>	<p>0.1 °C to 0.4 °C 2.6 °C to 3.8 °C 4.7 °C</p> <p>0.1 °C 1.8 °C to 3.4 °C 4.0 °C</p>
<p>B Mechanical calibration (Pressure)</p>		
<p>B1 Analogue Pressure Gauges (In-house) (-0.9 to 1100) bar</p> <p>(a) Analogue Pressure Gauges -0.9 bar to 0 bar 0 mbar to 1000 mbar 1000 mbar to 35 bar 35 bar to 70 bar 70 bar to 1100 bar</p> <p>(b) Manometers / Differential Manometers / Magnehelic Pressure Gauges</p> <p>-500 pascal to 0 pascal 0 pascal to 250 pascal 250 pascal to 500 pascal 500 pascal to 1000 pascal 1 kilo-pascal to 2.5 kilo-pascal</p>	<p>SPCP-001 (Rev. 6)</p> <p>SPCP-001 (Rev. 6)</p> <p>SPCP-001 (Rev. 6)</p>	<p>3.0 mbar 3.0 mbar 0.06 bar 0.5 bar 1.2 bar</p> <p>5 pascal 5 pascal 8 pascal 8 pascal 0.025 kilo-pascal</p>

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B2 Digital Pressure Indicators (-0.9 to 1100) bar (In-house)	SPCP-002 (Rev. 6)	
(a) Digital Pressure Indicators -0.9 bar to 0 bar 0 mbar to 1000 mbar 1000 mbar to 35 bar 35 bar to 70 bar 70 bar to 350 bar 350 bar to 700 bar 700 bar to 1100 bar	SPCP-002 (Rev. 6)	0.18 mbar 0.2 mbar 0.018% of Applied Reading +0.1 mbar 0.02 bar 0.05 bar 0.1 bar 0.2 bar
(b) Digital Manometers / Differential Digital Manometers and Low pressure Digital Indicators (in-house / On-site) -500 pascal to 0 pascal 0 pascal to 250 pascal 250 pascal to 500 pascal 500 pascal to 1000 pascal 1 kilo-pascal to 2.5 kilo-pascal	SPCP-001 (Rev. 6)	5 pascal 5 pascal 8 pascal 8 pascal 0.025 kilo-pascal
B3 Pressure Transmitters	SPCP-003 (Rev.6)	
(a) (-0.9 bar to 1100 bar) (In-house) -0.9 bar to 0 bar 0 mbar to 1000 mbar 1 bar to 1100 bar	SPCP-003 (Rev.6)	1 mbar 0.2 mbar 0.018% of Applied Reading
(b) (-0.9 bar to 27.5 bar) (On-site) -0.9 bar to 0 bar 0 mbar to 27.5 bar	SPCP-003 (Rev.6)	2 mbar 0.07 bar

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B4 Analogue Pressure Gauges (On-site) (-0.9 to 1100) bar	SPCP-004 (Rev. 6)	
(a) Analogue Pressure Gauges (On-site) -0.9 bar to 0 bar 0 bar to 20 bar 20 bar to 350 bar 350 bar to 700 bar	SPCP-004 (Rev. 6)	0.0095 bar 0.1 bar 2.1 bar 2.4 bar
(b) Manometers / Differential Manometers / Magnehelic Pressure Gauges (On-site)	SPCP-004 (Rev. 6)	
-500 pascal to 0 pascal 0 pascal to 250 pascal 250 pascal to 500 pascal 500 pascal to 1000 pascal 1 kilo-pascal to 2.5 kilo-pascal		5 pascal 5 pascal 8 pascal 8 pascal 0.025 kilo-pascal
B5 Absolute Pressure Instruments (In-house)	SPCP-005 (Rev. 6)	
a. Liquid Media (1.0 to 1100) bar absolute		0.018% of Applied Reading +0.1 mbar
b. Gas Media		
i. (0.1 to 1.2) bar absolute		0.0011 bar absolute
ii. (1.2 to 35) bar absolute		0.018% of Applied Reading +0.1 mbar
iii. (35 to 70) bar absolute		0.0071 bar

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C Electrical Calibration (Stopwatches and Timers)	LDCP-005 (Rev. 3)	
C1 Stopwatches (In-house)		
a. Analogue Stopwatches 5 s to 18000 s	Ref: Universal Counter or Stopwatch	1.2 s
b. Digital Stopwatches 1 s to 5 s 5 s to 18000 s	Ref: Universal Counter	0.001 s 0.03 s
c. Digital Stopwatches 1 s to 5 s 5 s to 18000 s	Ref: Stopwatch	0.001 s 0.03 s
C2 Stopwatches (On-site)		
a. Analogue Stopwatches 5 s to 18000 s	Ref: Universal Counter or Stopwatch	1.2 s
b. Digital Stopwatches 1 s to 5 s 5 s to 18000 s	Ref: Universal Counter	0.001 s 0.06 s
c. Digital Stopwatches 1 s to 5 s 5 s to 18000 s	Ref: Stopwatch	0.03 s 0.07 s
C3 Timers (In-house)		
a. Analogue Timers 5 s to 28800 s	Ref: Universal Counter or Stopwatch	1.2 s
b. Digital Timers 1 s to 5 s 5 s to 28800 s	Ref: Universal Counter	0.006 s 0.03 s

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C4 Timers (On-site) a. Analogue Timers 5 s to 28800 s b. Digital Timers 1 s to 5 s 5 s to 28800 s	Ref: Universal Counter or Stopwatch Ref: Stopwatch	1.7 s 0.03 s 0.07 s

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

Approved Signatories:

Mr. Simon Montero Jr. - For all items
Mr. Gerald Quek Teck Thye - A5 - A9, A16, A17, A19, A21(a) and A21(b) only.
Mr. Shetty A. Jagadeesh - For A1, A2, B and C only.
Mr. Thanish Nagappan - For A1 - A9, A11 – A17 and A20 only.

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 test 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.