

NO: SAMM 596(Issue 2, 18 May 2018 replacement
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LABORATORY LOCATION:
(PERMANENT LABORATORY)

NORTHLAB SEAMS (M) SDN. BHD.
LOT 5 BLOCK B
SHERMADEF COMMERCIAL CENTRE
JALAN PATAU-PATAU
87000 LABUAN
MALAYSIA

FIELDS OF CALIBRATION: **PRESSURE, TORQUE, TEMPERATURE, ELECTRICAL & DIMENSIONAL**

FIELD OF TESTING: **MECHANICAL**

This laboratory has demonstrated its technical competence to operate in accordance with MS ISO/IEC 17025:2005 (ISO/IEC 17025:2005).

This laboratory's fulfillment 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 and calibrations. 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 (see Joint ISO-ILAC-IAF Communiqué dated April 2017).

* The expanded uncertainties are based on an estimated confidence probability of approximately 95% and have a coverage factor of $k=2$ unless stated otherwise.

SCOPE OF CALIBRATION: PRESSURE

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Pneumatic Pressure Instruments	0 psi to 100 psi	0.22 psi	Calibrated using Digital Pressure Indicator
Hydraulic Pressure Instruments	1 bar to 1200 bar	0.018% of Reading + 0.0096 bar	Calibrated using Hydraulic Dead Weight Tester
Hydraulic Pressure Instruments	0 psi to 20,000 psi	13 psi	Calibrated using Digital Pressure Indicator
	0 psi to 60,000 psi	200 psi	Calibrated using High Pressure Transducer

Signatories:

1. **Mahesh Radhakrishna Pillai**
2. **Pakkanar Vishnu**
3. ****Mohanakrishnan Sreesankar**
4. ****Biji Nalinakshan Nair**
5. ****Tamilselvam A/L Chinayah**

Note: **Non-resident signatory

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SCOPE OF CALIBRATION: PRESSURE**SITE: CATEGORY I**

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Pneumatic Pressure Instruments	0 psi to 100 psi	0.22 psi	Calibrated using Digital Pressure Indicator
Water or Hydraulic Pressure Instrument	0 to 1000 psi	0.78 psi	Calibrated using Digital Pressure Indicator
	1000 psi to 5000 psi 5000 psi to 10,000 psi	3.6 psi 7.0 psi	
Hydraulic Pressure Instruments	0 psi to 20,000 psi	16 psi	Calibrated using Digital Pressure Indicator
	0 psi to 60,000 psi	220 psi	Calibrated using High Pressure Transducer

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Hand Torque Tools	Up to 10 N.m Above 10 N.m to 20 N.m Above 20 N.m to 80 N.m Above 80 N.m to 240 N.m Above 240 N.m to 400 N.m Above 400 N.m to 900 N.m Above 900 N.m to 1500 N.m	0.05 N.m 0.09 N.m 0.30 N.m 0.80 N.m 1.0 N.m 2.2 N.m 4.0 N.m	Calibrated with general reference to ISO 6789 : 2003

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3. ****Mohanakrishnan Sreesankar**
4. ****Sreejith Radhakrishnan**

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NO: SAMM 596(Issue 2, 18 May 2018 replacement
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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Temperature Sensors with Indicators	-20 °C to 5 °C 5 °C to 100 °C 100 °C to 420 °C 420 °C to 600 °C	0.27 °C 0.38 °C 0.75 °C 2.2 °C	By Comparison Method Using PRT / Type S Thermocouple and Temperature Bath / Dry Block
PT100 & Thermocouple Sensors without Indicators	-20 °C to 100 °C 100 °C to 420 °C 420 °C to 600 °C	1.0 °C 1.5 °C 3.2 °C	By Comparison Method Using PRT / Type S Thermocouple and Temperature Bath / Dry Block
Temperature Indicators			By Electrical Simulation Using Temperature Calibrator and ITS 90 Tables
PT 100 (3926)	-200 °C to 100 °C 100 °C to 600 °C	0.27 °C 0.35 °C	
PT 100 (385)	-200 °C to 100 °C 100 °C to 790 °C	0.27 °C 0.35 °C	
Type E	-250 °C to 1000 °C	0.74 °C	
Type J	-210 °C to 1200 °C	0.47 °C	
Type K	-200 °C to 1370°C	0.67 °C	
Type N	-200 °C to 1200 °C	0.84 °C	
Type R	0 °C to 1750 °C	1.5 °C	
Type S	0 °C to 1750 °C	1.5 °C	
Type T	-250 °C to 400 °C	1.1 °C	
Temperature Calibrators			By Electrical Measurement Using Temperature Calibrator and ITS 90 Tables
PT 100 (3926)	-200 °C to 100 °C 100 °C to 600 °C	0.27 °C 0.35 °C	
PT 100 (385)	-200 °C to 100 °C 100 °C to 790 °C	0.27 °C 0.37 °C	

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Temperature Calibrators (continue)			By Electrical Measurement Using Temperature Calibrator and ITS 90 Tables
Type E	-250 °C to 1000 °C	1.5 °C	
Type J	-210 °C to 1200 °C	0.77 °C	
Type K	-200 °C to 1370°C	0.93 °C	
Type N	-200 °C to 1200 °C	1.2 °C	
Type R	0 °C to 1750 °C	2.8 °C	
Type S	0 °C to 1750 °C	2.8 °C	
Type T	-250 °C to 400 °C	2.0 °C	
Dry Block Calibrators	-20 °C to 420 °C 420 °C to 600 °C	0.16 °C 2.0 °C	Calibrate using PRT and Type N Thermocouple Based on EA-10/13 (February 2000)
Liquid-in-Glass Thermometer (partial immersion)	-20 °C to 5 °C 5 °C to 100 °C	0.45 °C 0.52 °C	By Comparison Method Using PRT and Temperature Bath

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Temperature Sensors with Indicators	-15 °C to 420 °C 420 °C to 600 °C	0.76 °C 2.2 °C	By Comparison Method Using PRT / Type S Thermocouple and Dry Block
PT100 & Thermocouple Sensors without Indicators	-15 °C to 420 °C 420 °C to 600 °C	1.5 °C 3.2 °C	By Comparison Method Using PRT / Type S Thermocouple and Dry Block
Temperature Indicators			
PT 100 (3926)	-200 °C to 100 °C 100 °C to 600 °C	0.74 °C 0.77 °C	By Electrical Simulation Using Temperature Calibrator and ITS 90 Tables
PT 100 (385)	-200 °C to 100 °C 100 °C to 790 °C	0.74 °C 0.79 °C	
Type E	-250 °C to 1000 °C	1.0 °C	
Type J	-210 °C to 1200 °C	0.84 °C	
Type K	-200 °C to 1370°C	0.96 °C	
Type N	-200 °C to 1200 °C	1.1 °C	
Type R	0 °C to 1750 °C	1.7 °C	
Type S	0 °C to 1750 °C	1.6 °C	
Type T	-250 °C to 400 °C	1.3 °C	
Temperature Controlled Enclosures	-20 °C to 200 °C 200 °C to 400 °C 400 °C to 1200 °C	1.6 °C 2.3 °C 6.5 °C	Using Thermocouple and Temperature Data Logger Based on AS2853-1986

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Humidity controlled enclosure	5 °C to 60 °C	1.1 °C	Using Thermocouple and Temperature Data Logger Based on AS2853-1986
	<u>5 °C to 20 °C</u>		
	20 %R.H to 50 %R.H	7.1 %R.H	
	50 %R.H to 80 %R.H	8.9 %R.H	
	80 %R.H to 95 %R.H	9.8 %R.H	
	<u>20 °C to 40 °C</u>		
	20 %R.H to 50 %R.H	5.0 %R.H	
	50 %R.H to 80 %R.H	6.4 %R.H	
	80 %R.H to 95 %R.H	7.2 %R.H	
	<u>40 °C to 60 °C</u>		
	20 %R.H to 50 %R.H	4.3 %R.H	
	50 %R.H to 80 %R.H	5.4 %R.H	
80 %R.H to 95 %R.H	6.1 %R.H		

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Measuring Instruments			
DC Voltage	0 mV to 329 mV	0.08 mV / V	Calibrated according to procedure E18, Rev 01 using Direct Method
	0.33 V to 3.29 V	0.06 mV / V	
	3.29 V to 32.9 V	0.06 mV / V	
	30 V to 329 V	0.066 mV / V	
	329 V to 1020 V	0.066 mV / V	
AC Voltage	1 mV to 33 V	See Matrix A	Calibrated according to procedure E18, Rev 01 using Direct Method
	33 V to 330 V		
	45 Hz to 1 kHz	0.6 mV / V	
	1 kHz to 10 kHz	0.92 mV / V	
	10 kHz to 20 kHz	1.0 mV / V	
	330 V to 1020 V		
	45 Hz to 1 kHz	0.67 mV / V	
	1 kHz to 5 kHz	2.3 mV / V	
	5 kHz to 10 kHz	2.3 mV / V	

MATRIX A
AC VOLTAGE MEASUREMENT

	Frequency					
	Hz	kHz	kHz	kHz	kHz	KHz
	10 to 45	0.045 to 10	10 to 20	20 to 50	50 to 100	100 to 500
1 mV to 32.9 mV	4.7	2.4	3.0	3.6	5.2	14
33 mV to 330 mV	3.1	0.65	1.2	2	3.4	9.2
0.33 V to 3.3 V	1.8	0.37	0.94	1.7	3.4	6.9
3.3 V to 33 V	1.8	0.48	1.0	2.4	3.4	-

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Measuring Instruments (Continued)			
DC Current	0 mA to 3.3 mA 3.3 mA to 33 mA 33 mA to 0.330 A 0.330 A to 2.2 A 2.2 A to 11 A	0.17 mA / A 0.13 mA / A 0.15 mA / A 0.37 mA / A 0.71 mA / A	Calibrated according to procedure E18, Rev 01 using Direct Method
	11 A to 550A (current coil)	3.1 mA / A	Calibrated according to procedure E11, Rev 01 using Direct Method
AC Current	0.029 mA to 330 mA	See Matrix B	Calibrated according to procedure E18, Rev 01 using Direct Method
	<u>0.33 A to 2.2 A</u> 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz	2.5 mA / A 1.4 mA / A 8.8 mA / A	
	<u>2.2 A to 11 A</u> 45 Hz to 65 Hz 65 Hz to 500 Hz 500 Hz to 1 kHz	1.0 mA / A 1.4 mA / A 4.0 mA / A	
	<u>11 A to 550 A (current coil)</u> 45 Hz to 65 Hz 65 Hz to 440 Hz	3.4 mA / A 3.2 mA / A	Calibrated according to procedure E11, Rev 01 using Direct Method

**MATRIX B
AC CURRENT MEASUREMENT**

Range	Frequency				
	Hz	Hz	kHz	kHz	kHz
	10 to 20	20 to 45	0.045 to 1	1 to 5	5 to 10
0.029 mA to 0.33mA	3.4	2	2.3	5.1	15
0.33 mA to 3.3 mA	2.4	1.3	1.3	2.4	7
3.3 mA to 33 mA	2.4	1.3	1.1	2.4	7
33 mA to 330 mA	-	1.3	1.2	2.4	7

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Measuring Instruments (Continued)			
Resistance (DMM)	0 Ω to 11 Ω	1.1 m Ω / Ω	Calibrated according to procedure E18, Rev 01 using Direct Method
	11 Ω to 33 Ω	0.66 m Ω / Ω	
	33 Ω to 110 Ω	0.26 m Ω / Ω	
	110 Ω to 330 Ω	0.16 m Ω / Ω	
	330 Ω to 1.1 k Ω	0.17 m Ω / Ω	
	1.1 k Ω to 3.3 k Ω	0.13 m Ω / Ω	
	3.3 k Ω to 11 k Ω	0.19 m Ω / Ω	
	11 k Ω to 33 k Ω	0.13 m Ω / Ω	
	33 k Ω to 110 k Ω	0.19 m Ω / Ω	
	110 k Ω to 330 k Ω	0.16 m Ω / Ω	
	330 k Ω to 1.1 M Ω	0.23 m Ω / Ω	
	1.1 M Ω to 3.3 M Ω	0.20 m Ω / Ω	
	3.3 M Ω to 11 M Ω	0.75 m Ω / Ω	
	11 M Ω to 33 M Ω	1.2 m Ω / Ω	
	33 M Ω to 110 M Ω	5.8 m Ω / Ω	
110 M Ω to 330 M Ω	6.5 m Ω / Ω		
Capacitance	0.33 nF to 0.5 nF	29 mF / F	Calibrated according to procedure E15, Rev 01 using Direct Method
	0.5 nF to 1.1 nF	16 mF / F	
	1.1 nF to 3.3 nF	9.3 mF / F	
	3.3 nF to 11 nF	6.8 mF / F	
	11 nF to 33 nF	6.4 mF / F	
	33 nF to 110 nF	4.0 mF / F	
	110 nF to 0.330 μ F	4.0 mF / F	
	0.330 μ F to 1.1 μ F	4.0 mF / F	
	1.1 μ F to 3.3 μ F	5.1 mF / F	
	3.3 μ F to 11 μ F	5.1 mF / F	
	11 μ F to 33 μ F	5.7 mF / F	
	33 μ F to 110 μ F	6.8 mF / F	
	110 μ F to 330 μ F	9.1 mF / F	
330 μ F to 1.1 mF	12 mF / F		
Frequency	0.01 Hz to 12 kHz	0.062 mHz / Hz	Calibrated according to procedure E18, Rev 01 using Direct Method
	12 kHz to 100 kHz	0.057 mHz / Hz	

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SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Measuring Instruments			
Resistance (Insulation Resistance)	1 Ω to 10 Ω	12 m Ω / Ω	Calibrated According to Procedure E-12, Rev.01 Using Direct Method
	10 Ω to 100 Ω	5.8 m Ω / Ω	
	100 Ω to 1000 Ω	1.2 m Ω / Ω	
	1 k Ω to 10 k Ω	1.2 m Ω / Ω	
	10 k Ω to 100 k Ω	1.2 m Ω / Ω	
	0.1 M Ω to 1 M Ω	23 m Ω / Ω	
	1 M Ω to 10 M Ω	23 m Ω / Ω	
	10 M Ω to 25 G Ω	58 m Ω / Ω	
Sourcing Instruments			
DC Voltage	1 mV to 100 mV	0.098 mV / V	Calibrated according to procedure E17, Rev 01 using Direct Method
	100 mV to 1V	0.054 mV / V	
	1 V to 10 V	0.046 mV / V	
	10 V to 100 V	0.059 mV / V	
	100 V to 1000 V	0.064 mV / V	
	1 kV to 40 kV	23 mV / V	Calibrated according to procedure E03, Rev 01 using Direct Method
AC Voltage	1 mV to 750 V	See Matrix C	Calibrated according to procedure E17, Rev 01 using Direct Method
	750 V to 1000 V 45 Hz to 1 kHz 1 kHz to 10 kHz	9.2 mV / V 9.2 mV / V	

MATRIX C**AC VOLTAGE SOURCING**

Range	Frequency					
	Hz	Hz	kHz	kHz	kHz	KHz
	3 to 5	5 to 10	0.01 to 20	20 to 50	50 to 100	100 to 300
1 mV to 100 mV	12	4.5	1.2	2.0	7.9	52
0.1 V to 1 V	12	4.4	1.0	2.0	7.9	52
1 V to 10 V	12	4.4	1.0	2.0	7.9	52
10 V to 100 V	12	4.4	1.0	2.0	7.9	52
100 V to 750 V	12	4.4	1.0	2.0	7.9	52

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Sourcing Instruments (Continued)			
AC Voltage	1 kV to 40 kV 45 Hz to 65 Hz	35 mV / V	Calibrated according to procedure E03, Rev 01 using Direct Method
DC Current	1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 3 A	0.90 mA / A 0.77 mA / A 1.3 mA / A 1.6 mA / A	Calibrated according to procedure E17, Rev 01 using Direct Method
	3 A to 100 A	2.3 mA / A	Calibrated according to procedure E04, Rev 02 using V/I Method
AC Current	1 mA to 3A	See Matrix D	Calibrated according to procedure E17, Rev 01 using Direct Method
	3 A to 100 A 45 Hz to 65 Hz	2.4 mA / A	Calibrated according to procedure E04, Rev 02 using V/I Method

MATRIX D
AC CURRENT SOURCING

Range	Frequency		
	Hz	Hz	kHz
	3 to 5	5 to 10	0.01 to 5
1 to 100 mA	12	4.3	2.4
0.1 A to 1 A	12	4.0	1.8
1 A to 3 A	13	4.8	2.5

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SCOPE OF CALIBRATION: ELECTRICAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Sourcing Instruments (Continued)			
Resistance	0.1 Ω to 100 Ω	0.17 m Ω / Ω	Calibrated according to procedure E17, Rev 01 using Direct Method
	100 Ω to 1 k Ω	0.13 m Ω / Ω	
	1 k Ω to 10 k Ω	0.13 m Ω / Ω	
	10 k Ω to 100 k Ω	0.13 m Ω / Ω	
	100 k Ω to 1 M Ω	0.13 m Ω / Ω	
	1 M Ω to 10 M Ω	0.51 m Ω / Ω	
Frequency (100 mV to 750 V)	1 Hz to 40 Hz	0.62 mHz / Hz	Calibrated according to procedure E17, Rev 01 using Direct Method
	40 Hz to 300 kHz	0.12 mHz / Hz	

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SCOPE OF CALIBRATION: ELECTRICAL**SITE: CATEGORY I**

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Measuring Instruments			
DC Voltage	0 V to 20 V	0.58 mV / V	Calibrated according to procedure SE01, Rev 01 using Direct Method
DC Current	0 mA to 24 mA	0.95 mA / A	Calibrated according to procedure SE01, Rev 01 using Direct Method
Resistance (Insulation Resistance)	1 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1000 Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 0.1 M Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 25 G Ω	12 m Ω / Ω 5.8 m Ω / Ω 1.2 m Ω / Ω 1.2 m Ω / Ω 1.2 m Ω / Ω 23 m Ω / Ω 23 m Ω / Ω 58 m Ω / Ω	Calibrated according to Procedure SE01, Rev.01 Using Direct Method
Frequency	1 Hz to 1000 Hz 1 kHz to 10 kHz	0.58 mHz / Hz 1.4 mHz / Hz	Calibrated according to procedure SE01, Rev 01 using Direct Method
Sourcing Instruments			
DC Voltage	1 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V 1 kV to 40 kV	0.17 mV / V 0.10 mV / V 0.096 mV / V 0.10 mV / V 0.11 mV / V 23 mV / V	Calibrated according to procedure SE02, Rev 01 using Direct Method
AC Voltage	<u>10 mV to 750 V</u> <u>750 V to 1000 V</u> 0.045 kHz to 1 kHz 1 kHz to 10 kHz	See Matrix E 9.2 mV / V 9.2 mV / V	Calibrated according to procedure SE02, Rev 01 using Direct Method
	<u>1 kV to 40 kV</u> 45 Hz to 65 Hz	62 mV / V	Calibrated according to procedure SE03, Rev 01 using Direct Method

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SCOPE OF CALIBRATION: ELECTRICAL**SITE : CATEGORY I**MATRIX E
AC VOLTAGE SOURCING

Range	Frequency					
	Hz	Hz	kHz	kHz	kHz	KHz
	3 to 5	5 to 10	0.01 to 20	20 to 50	50 to 100	100 to 300
10 mV to 100 mV	12	4.5	1.2	2.0	7.9	52
0.1 V to 1 V	12	4.4	1.0	2.0	7.9	52
1 V to 10 V	12	4.4	1.0	2.0	7.9	52
10 V to 100 V	12	4.4	1.0	2.0	7.9	52
100 V to 750 V	12	4.4	1.0	2.0	7.9	52

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Sourcing Instruments (Continued)			
DC Current	50 μ A to 500 μ A 500 μ A to 1000 μ A 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 3 A	3.3 mA / A 3.1 mA / A 0.81 mA / A 0.64 mA / A 1.3 mA / A 1.6 mA / A	Calibrated according to procedure SE02, Rev 01 using Direct Method
	3 A to 100 A	2.5 mA / A	Calibrated according to procedure SE04, Rev 04 using Direct Method
AC Current	50 μ A to 3 A	See Matrix F	Calibrated according to procedure SE02, Rev 01 using Direct Method
	<u>3 A to 100 A</u> 45 Hz to 65 Hz	2.5 mA / A	Calibrated according to procedure SE04, Rev 04 using Direct Method

**MATRIX F
AC CURRENT MEASUREMENT**

Range	Frequency				
	Hz	Hz	kHz	kHz	kHz
	3 to 5	5 to 10	0.01 to 5	0.045 to 1	1 to 20
50 μ A to 500 μ A	-		-	9.1	9.1
500 μ A to 1000 μ A	-	-	-	9.2	9.8
1 mA to 100 mA	12	3.9	1.6	-	-
100 mA to 1 A	12	3.9	1.6	-	-
1 A to 3 A	13	4.7	2.4	-	-

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Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Resistance	10 Ω to 100 Ω 100 Ω to 1 k Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω	0.16 m Ω / Ω 0.1 m Ω / Ω 0.13 m Ω / Ω 0.13 m Ω / Ω 0.13 m Ω / Ω 0.47 m Ω / Ω 9.4 m Ω / Ω	Calibrated according to procedure SE02, Rev 01 using Direct Method
Frequency (100 mv to 750 v)	3 Hz to 5 Hz 5 Hz to 10Hz 10 Hz to 40 Hz 40 Hz to 300 kHz	1.2 mHz / Hz 0.58 mHz / Hz 0.35 mHz / Hz 0.12 mHz / Hz	Calibrated according to procedure SE02, Rev 01 using Direct Method

Signatories:

1. **Mahesh Radhakrishna Pillai**
2. **Pakkanar Vishnu**
3. ****Mohanakrishnan Sreesankar**
4. **** Neela Lohit Pavani**

Note: **Non-resident signatory

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SCOPE OF CALIBRATION: DIMENSIONAL

Instrument Calibrated/ Measurement Parameter	Range	Calibration and Measurement Capability Expressed as an Uncertainty (\pm)*	Remarks
Vernier, Dial and Digital Caliper (external accuracy)	0 mm to 300 mm	14 μ m	Calibrated using Caliper Checker & Gauge Block according to BS EN ISO 13385-1:2011 or JIS B 7507:2016
Vernier, Dial and Digital Depth Caliper	0 mm to 150 mm	14 μ m	Calibrated using Gauge Block according to BS EN ISO 13385-2:2011
Vernier, Dial and Digital Height Gauge	0 mm to 300 mm	14 μ m	Calibrated using Gauge Block & Caliper Checker according to BS EN ISO 13225:2012
External Micrometer	25 mm traverse	2 μ m	Calibrated using Gauge Block according to ISO 3611:2010
	Setting Rod for length up to 150 mm	3 μ m	
Internal Micrometer including Stick Micrometer	25 mm traverse and setting rod for length up to 150 mm	4 μ m	Calibrated using Gauge Block according to BS 959:2008
Depth Micrometer	25 mm traverse with extension rod up to 150 mm	3 μ m	Calibrated using Gauge Block according to BS 6468:2008
Digital Indicator	0 mm to 50 mm	1.5 μ m	Calibrated using Gauge Block according to in house calibration procedure SEAMS-0017

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SCOPE OF TESTING: MECHANICAL (VALVE TESTING)**SITE: CATEGORY I**

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Method/ Equipment/Techniques
A. Pressure Relief Valves	1. "As Received" Pop Pressure Test 2. Seat Leakage Test	1. API 576 Clause 6.2.9: 2009 2. API 527 Section 2,4 & 5: 2014
B. Control Valves	1. Shell Test 2. Pressure Closure Test (Seat Leakage Test) 3. Packing Test 4. Rated Valve Travel Test 5. Dead Band Test	1. API 598 : 2016 Clause 6.3, ASME B 16.34 Section 7.1 & IEC 60534-4: 2006 Section 5.4 2. API 598 : 2016 Clause 6.4, ASME B 16.34 Section 7.2 & IEC 60534-4: 2006 Section 5.5 3. IEC 60534-4: 2006 Section 5.6 4. IEC 60534-4: 2006 Section 5.7 5. IEC 60534-4: 2006 Section 5.8
C. Isolation Valves 1. Parallel Slide Valve 2. Gate Valve 3. Globe Valve 4. Check Valve 5. Plug Valve 6. Butterfly Valve 7. Ball Valve	1. Shell Test 2. Pressure Closure Test (Seat Leakage Test) 3. Back Seat Test	1. API 598: 2016 Clause 6.3 & ASME B 16.34 Section 7.1 2. API 598: 2016 Clause 6.4 & ASME B 16.34 Section 7.2 3. API 598: 2016 Clause 6.2

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SCOPE OF TESTING: MECHANICAL (VALVE TESTING)**SITE: CATEGORY I**

Materials/ Products Tested	Type of Test/ Properties Measured/ Range of Measurement	Standard Test Method/ Equipment/Techniques
A. Pressure Relief Valves	<ol style="list-style-type: none"> 1. "As Received" Pop Pressure Test 2. Seat Leakage Test 	<ol style="list-style-type: none"> 1. API 576 Clause 6.2.9: 2009 2. API 527 Section 2,4 & 5: 2014
B. Control Valves	<ol style="list-style-type: none"> 1. Shell Test 2. Pressure Closure Test (Seat Leakage Test) 3. Packing Test 4. Rated Valve Travel Test 5. Dead Band Test 	<ol style="list-style-type: none"> 1. API 598 : 2016 Clause 6.3, ASME B 16.34 Section 7.1 & IEC 60534-4: 2006 Section 5.4 2. API 598 : 2016 Clause 6.4, ASME B 16.34 Section 7.2 & IEC 60534-4: 2006 Section 5.5 3. IEC 60534-4: 2006 Section 5.6 4. IEC 60534-4: 2006 Section 5.7 5. IEC 60534-4: 2006 Section 5.8
C. Isolation Valves <ol style="list-style-type: none"> 1. Parallel Slide Valve 2. Gate Valve 3. Globe Valve 4. Check Valve 5. Plug Valve 6. Butterfly Valve 7. Ball Valve 	<ol style="list-style-type: none"> 1. Shell Test 2. Pressure Closure Test (Seat Leakage Test) 3. Back Seat Test 	<ol style="list-style-type: none"> 1. API 598: 2016 Clause 6.3 & ASME B 16.34 Section 7.1 2. API 598: 2016 Clause 6.4 & ASME B 16.34 Section 7.2 3. API 598: 2016 Clause 6.2

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