FEDERATION FOR DEVELOPMENT OF ACCREDITATION SERVICES

118-119, First Floor, Sushant Tower, Sector – 56, Gurugram – 122011, Haryana, India.

CERTIFICATE OF ACCREDITATION

(AS PER ISO/IEC 17025:2017)

This is to attest that

M/s EMM TECH CALIBRATION,

Plot No. D1/90, Sanjay Colony, Sector-23,
Faridabad (Haryana) -121005, India

Calibration Laboratory

has demonstrated compliance with ISO/IEC Standard 17025:2017, General requirements for the competence of testing and calibration laboratories and supplementary criteria for calibration laboratories.

Certificate Number: CL-111

Issue Date: 30.09.2023 **Valid Until:** 29.09.2025

The certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard and the relevant requirements of FDAS. (for scope of accreditation visit website www. fdasindia.org).

DEVI SARAN TEWARI
Director

FEDERATION FOR DEVELOPMENT OF ACCREDITATION SERVICES

118-119, First Floor, Sushant Tower, Sector – 56, Gurugram – 122011, Haryana, India.

SCOPE OF ACCREDITATION

(**Annexure to Certificate of CL - 111**)

Validity 30.09.2023 to 29.09.2025 Last Amended on .....

Electro-Technical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Direct Current Measure Mode				
1	DC Current	Using Digital Multimeter 6½ by Direct Method	1 µA to 10µA	1 % to 0.20 %
			10 µA to100 µA	0.20 % to 0.09 %
			100 µA to 1mA	0.09 % to 0.064 %
			1 mA to 1 A	0.064 % to 0.08 %
			1 A to 3 A	0.08 % to 0.16 %
			3 A to 10 A	0.16 % to 0.20 %
			10 A to 100A	0.30 %
			100 A to 1000A	0.50 %
2	Resistance(4 Wire)	Using Micro Ohm Meter & Digital Multimeter 6½ by Direct Method	0.10 m Ohm to1 m Ohm	0.66 % to 0.12 %
			1 m ohm to 1000 m ohm	0.12 %
			1000 m ohm to 100 Ohm	0.12 % to 0.02 %
			100 ohm to 100 k ohm	0.02 %
3	Resistance(2 Wire)	Using Digital Multimeter 6½ by Direct Method	100 k Ohm to 500 k Ohm	0.014 % to 0.03 %
			500 k Ohm to10 M ohm	0.03 % to 0.05 %
			10 M Ohm to 100 M Ohm	0.05 % to 0.94 %
			100 M ohm to 1 G Ohm	0.94 % to 2.40 %
4	DC Voltage	Using Digital Multi meter 6½ by Direct Method	1 mV to 10mV	0.42 % to 0.045 %
			10 mV to 100mV	0.045 % to 0.0086 %
			100 mV to1000 V	0.0086 %
5	DC High Voltage	Using HV Probe with DMM by Direct Method	1 KV to 35KV	3.10 %

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Electro-Technical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Direct Current Source Mode				
1	DC Current	Using Multi Product Calibrator by Direct Method	1 µA to 10µA	0.65 % to 0.25 %
			10 µA to 330 µA	0.25 % to 0.025 %
			330 µA to 330 mA	0.025 %
			330 mA to 3 A	0.025 % to 0.05 %
			3 A to 10 A	0.05 % to 0.08 %
			10 A to 20 A	0.08 % to 0.25 %
		Using Multi Product Calibrator with Current Coil by Direct Method	20 A to 50 A	0.25 %
			50 A to 200A	0.30 %
			200 A to 1000 A	0.40 %
2	DC Voltage	Using Multi Product Calibrator by Direct Method	1 mV to 330 mV	0.20 % to 0.0085 %
			330 mV to 1000 V	0.009 %
3	DC Power Single phase (10V to 1000V ,0.1A to 20 A)	Using Multi Product Calibrator by Direct Method	1 W to 20 KW	0.94 % to 0.25 %
4	Resistance	Using Multi Product Calibrator by Direct Method	1 ohm to 10 ohm	0.08 % to 0.017 %
			10 ohm to 330 k ohm	0.017 % to 0.014 %
			330 k ohm to 10 M ohm	0.014 % to 0.07 %
			10 M ohm to 330 M ohm	0.07 % to 0.57 %
			330 M ohm to 1000 M ohm	0.57 % to 1.90 %
5	Resistance(4-wire)	Using Multi Product Calibrator, Std. Resistance Box, DC Shunt Resistance Micro Ohm Meter & Digital Multimeter 6½ by Direct Method/ Comparison Method	0.10 m ohm to 1 m ohm	0.66 % to 0.12 %
			1 m ohm to 1000 m ohm	0.12 %
			1000 m ohm to 100 ohm	0.12 % to 0.02 %
			100 ohm to 100 k ohm	0.02 %

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Electro-Technical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
6	Insulation Resistance	Using HV Mega Ohm Box by Direct Method	2 M Ohm	3.45 %
			20 M Ohm	3.45 %
			100 M Ohm	3.45 %
			200 M Ohm	4.18 %
			1000 M Ohm	4.21 %
Alternating Current Measure Mode				
1	AC Current @ 50Hz	Three Phase reference Energy Calibrator by Direct Method	5 mA to 500mA	0.03 %%
			0.50 A to 120A	0.025 %
2	AC Current@ 50 Hz to 1kHz	Using Digital Multimeter 6½ by Direct Method	33 µA to 1A	0.66 % to 0.17 %
			1 A to 10 A	0.17 % to 0.26 %
3	AC Current @ 50Hz	Current Transformer & Digital Multi meter 6½ & Direct Method	50 A to 1000 A	0.60 %
4	AC Power/ energy Single/ three phase Active /reactive/ Apparent P.F 1 to 0.25(lag/lead) 45to 60Hz, 30 V to 300 V, 10A to 120A	Using Three Phase Reference Energy Calibrator Songyang SY3102 by Direct Method / Comparison Method	60 W/Var to 108 KW/KVar	0.025 %
	AC Power/ energy Single/ three phase Active /reactive/ Apparent P.F 1 to 0.2(lag/lead) 45to 60Hz, 30 V to 300 V, 0.5A to 10A		3 W/Var to 9000 W/Var	0.034 % to 0.028 %
	AC Power/ energy Single/ three phase Active /reactive/ Apparent P.F 1 to 0.2(lag/lead) 45to 60Hz, 30 V to 300 V, 5mA to 500mA		0.03 W/Var to 450 W/Var	0.667 % to 0.025 %
5	Inductance@1kHz	Using LCR Meter by Direct Method	100 µH to 1H	0.50 %
6	Capacitance@1kHz	Using LCR Meter by Direct Method	1 nF to 1 µF	0.40 %

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Electro-Technical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
7	Power Factor@50 to 60 Hz	Using Three Phase Reference Energy Calibrator by Direct Method/ Comparison Method	1 lag/lead to 0.10 lag/lead	0.0006 P.F
8	AC Voltage @ 50Hz to 1 KHz	Digital Multi meter 6½ by Direct Method	1 mV to 10 mV	2.76 % to 0.54 %
			10 mV to 100 mV	0.54 % to 0.12 %
			100 mV to 1V	0.12 %
			1 V to 1000 V	0.11 %
9	AC Voltage @ 50Hz	Three Phase reference Energy Calibrator by Direct Method	30 V to 480V	0.025 %
10	AC High Voltage @ 50Hz	HV Probe with DMM by Direct Method	1 KV to 28KV	3.50 %
Alternate Current Source Mode				
1	AC Current @ 50Hz to 1 kHz	Using Multi product Calibrator by Direct Method	30 µA to 330 µA	0.58 % to 0.02 %
			330 µA to 330 mA	0.02 % to 0.05 %
			330 mA to 3A	0.05 % to 0.07 %
			3 A to 10 A	0.07 %
			10 A to 20 A	0.17 %
2	AC Current @ 50Hz	Using Multi product Calibrator with CurrentCoil by Direct Method	20 A to 200A	0.46 %
			200 A to 1000 A	0.50 %
3	AC Power/ energy Single/ three phase Active /reactive/ Apparent P.F 1 to 0.25(lag/lead) 45to 60Hz, 30 V to 300 V, 10A to 120A	Using Three Phase Reference Energy Calibrator by Direct Method / Comparison Method	60 W/Var to108 KW/KVar	0.025 %
	AC Power/ energy Single/ three phase Active /reactive/ Apparent P.F 1 to 0.2(lag/lead) 45to 60Hz, 30 V to 300 V, 0.5A to 10A		3 W/Var to 9000 W/Var	0.034 % to 0.028 %
	AC Power/ energy Single/ three phase Active /reactive/ Apparent		0.03 W/Var to 450 W/Var	0.667 % to 0.025 %

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Electro-Technical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
	P.F 1 to 0.2(lag/lead) 45to 60Hz, 30 V to 300 V, 5mA to 500mA			
4	AC Voltage @50Hz to 1kHz	Using Multi Product Calibrator by Direct Method	3 mV to 330 mV	0.91 % to 0.06 %
			330 mV to 1000 V	0.06 %
5	AC Voltage @ 45 to 60 Hz,	Using Three Phase Reference Energy Calibrator by Direct Method	30 V to 300V	0.025 %
6	Inductance@1kHz	Using Std. Inductance Box &LCR Meter by Compression Method	100 µH to 1H	0.50 %
7	Capacitance@1kHz	Using Std. Capacitance Box &LCR Meter by Compression Method	1 nF to 1 µF	0.50 %
8	AC Resistance@1kHz	Using Std. Resistance Box &LCR Meter by Compression Method	1 Ohm to 100 k Ohm	0.50 %
9	DC Capacitance	Using Multi Product Calibrator by Direct Method	1 nF to 10 nF	1.73 % to 0.48 %
			10 nF to 100 µF	0.48 % to 0.6 %
10	Power factor 45 to 60 Hz	Using Three Phase Reference Energy Calibrator By Comparison Method	1 lag/lead to 0.1 lag/lead	0.0008 PF
Electrical Equipment Source Mode				
1	Oscilloscope Amplitude (Vertical axis Deflection factor) 1 kHz , 1 M ohm	Using Multi Product Calibrator by Direct Method	5 mV to 105V	1 %
2	Oscilloscope Time base (Horizontal Axis Deflection factor)		2 ns to 5 s	0.67 % to 0.68%
3	Oscilloscope Amplitude Bandwidth		1 kHz to 300MHz	2.40 %
Low Frequency Measure Mode				
1	Ultra-Sonic Pulse velocity Tester (parameter-time)	Using Reference Acrylic Blocks & IS 516(P5/ Sec-1):2018	34.30 µS to 99.50 µS	0.20 µS
2	Time	Digital Timer & Direct Method	0.1 s to 10 s	0.0091 s

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Electro-Technical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
			10 s to 1000 s	0.014 s
			1000 s to 9900 s	0.17 s
			9900 s to 86400 s	1.30 s to 2.77 s
3	Frequency	Digital Multi meter 6½ by Direct Method	10 Hz to 50 Hz	0.082 % to 0.016 %
			50 Hz to 1000 KHz	0.016 % to 0.012 %
Low Frequency Source Mode				
1	Frequency	Multi Product Calibrator by Direct Method	10 Hz to 2MHz	0.07 % to 0.007 %
Simulation Source Mode				
1	pH Indicator -	Using Universal/Process /Multiproduct Calibrator by Simulation method	1 pH to 14 pH	0.01pH
2	Temperature Simulation (Indicator/Controller, PID, Data logger,Scanner, Calibrator, Process meter & Recorder) RTD (PT-100)	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to 600 °C	0.16 °C
3	Temperature Simulation (Indicator /Controller, PID, Data logger, Scanner, Calibrator, Process meter & Recorder) E-Type Thermocouple	Using Precision Multi Product Calibrator/ Universal Calibrator by Direct Method	-200 °C to1000 °C	0.50 °C
4	Temperature Simulation (Indicator / Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder B-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	600 °C to1800 °C	0.56 °C

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Electro-Technical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
5	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder J-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to 700 °C	0.27 °C
6	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder K-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to1300 °C	0.50 °C
7	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder T-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to400 °C	0.30 °C
8	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder R-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	200 °C to 1700 °C	0.57 °C
9	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder S-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	200 °C to 1700 °C	0.47 °C
10	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder N-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to1300 °C	0.40 °C

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Electro-Technical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Simulation Measure Mode				
1	Temperature Simulation Universal Calibrator, Process meter RTD (PT-100)	Using Multi Product Calibrator / Universal Calibrator/ Digital Multi meter 6½ by Direct Method	-200 °C to 630 °C	0.14 °C
2	Temperature Simulation Universal Calibrator, Process meter K-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to1300 °C	0.50 °C
3	Temperature Simulation Universal Calibrator, Process meter N-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to 1300 °C	0.40 °C
4	Temperature Simulation Universal Calibrator, Process meter J-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to 1000 °C	0.27 °C
5	Temperature Simulation Universal Calibrator, Process meter T-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to 400 °C	0.30 °C
6	Temperature Simulation Universal Calibrator, Process meter R-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	0 °C to 1700°C	0.57 °C
7	Temperature Simulation Universal Calibrator, Process meter S-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	0 °C to 1700°C	0.53 °C

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Electro-Technical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
8	Temperature Simulation Universal Calibrator, Process meter B-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	0 °C to 1800°C	0.44 °C
9	Temperature Simulation Universal Calibrator, Process meter E-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to 1000 °C	0.50 °C

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Electro-Technical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Direct Current Measure Mode				
1	DC Current	Using Digital Mustimeter 6½ by Direct Method	1 µA to 10µA	1 % to 0.20 %
			10 µA to100 µA	0.20 % to 0.09 %
			100 µA to 1mA	0.09 % to 0.06 %
			1 mA to 1 A	0.064 % to 0.08 %
			1 A to 3 A	0.08 % to 0.16 %
			3 A to 10 A	0.16 % to 0.20 %
			10 A to 100A	0.30 %
			100 A to 1000A	0.50 %
2	Resistance(4 Wire)	Using Micro Ohm Meter & Digital Multimeter 6½ by Direct Method	0.10 m ohm to1 m ohm	0.66 % to 0.12 %
			1 m ohm to 1000 m ohm	0.12 %
			1000 m ohm to 100 ohm	0.12 % to 0.02 %
			100 ohm to 100 k ohm	0.02 %
3	Resistance(2 Wire)	Using Digital Multimeter 6½ by Direct Method	100 k Ohm to 500 k ohm	0.014 % to 0.03 %
			500 k ohm to 10 M ohm	0.03 % to 0.05 %
			10 M ohm to 100 M ohm	0.05 % to 0.94 %
			100 M ohm to 1 G ohm	0.94 % to 2.40 %
4	DC Voltage	Digital Multi meter 6½ by Direct Method	1 mV to 10 mV	0.42 % to 0.045 %
			10 mV to 100 mV	0.045 % to 0.0086 %
			100 mV to1000 V	0.0086 %
5	DC High Voltage	HV Probe with DMM & Direct Method	1 KV to 35 KV	3.10 %
Direct Current Source Mode				
1	DC Current	Using Multi Product Calibrator(by Direct Method	1 µA to 10µA	0.65 % to 0.25 %
			10 µA to 330 µA	0.25 % to 0.025 %
			330 µA to330 mA	0.025 %

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Electro-Technical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
			330 mA to 3 A	0.025 % to 0.05 %
			3 A to 10 A	0.05 % to 0.08 %
			10 A to 20 A	0.08 % to 0.25 %
		Using Multi Product Calibrator with Current Coil by Direct Method	20 A to 50 A	0.25 %
			50 A to 200A	0.30 %
			200 A to 1000 A	0.40 %
2	DC Voltage	Using Multi Product Calibrator by Direct Method	1 mV to 330 mV	0.20 % to 0.0085 %
			330 mV to 1000 V	0.0085 %
3	DC Power Single phase (10V to 1000V ,0.1A to 20 A)	Using Multi Product Calibrator by Direct Method	1 W to 20 KW	0.10 % to 0.25 %
4	Resistance	Using Multi Product Calibrator by Direct Method	1 ohm to 10 ohm	0.08 % to 0.017 %
			10 ohm to 330 k ohm	0.017 % to 0.014 %
			330 k ohm to 10 M ohm	0.014 % to 0.07 %
			10 M ohm to 330 M ohm	0.07 % to 0.57 %
			330 M ohm to 1000 M ohm	0.57 % to 1.90 %
5	Resistance(4-wire)	Using Multi Product Calibrator, Std. Resistance Box, DC Shunt Resistance Micro Ohm Meter & Digital Multimeter 6½ by Direct Method/ Comparison Method	0.10 m ohm to 1 m ohm	0.66 % to 0.12 %
			1 m ohm to 1000 m ohm	0.12 %
			1000 m ohm to 100 ohm	0.12 % to 0.02 %
			100 ohm to 100 k ohm	0.02 %
6	Insulation Resistance	Using HV Mega Ohm Box by Direct Method	2 M Ohm	3.45 %
			20 M Ohm	3.45 %
			100 M Ohm	3.45 %
			200 M Ohm	4.18 %
			1000 M Ohm	4.21 %

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Electro-Technical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Alternating Current Measure Mode				
1	AC Current @ 50Hz	Three Phase Reference Energy Calibrator by Direct Method	5 mA to 500 mA	0.03 %%
			0.50 A to 120 A	0.025 %
2	AC Current@ 50 Hz to 1kHz	Using Digital Multimeter 6½ by Direct Method	33 µA to 1A	0.66 % to 0.17 %
			1 A to 10 A	0.17 % to 0.26 %
3	AC Current @ 50Hz	Current Transformer & Digital Multimeter 6½ by Direct Method	50 A to 1000A	0.60 %
4	AC Power/ energy Single/ three phase Active /reactive/ Apparent P.F 1 to 0.25(lag/lead) 45to 60Hz, 30 V to 300 V, 10A to 120A	Using Three Phase Reference Energy Calibrator by Direct Method / Comparison Method	60 W/Var to 108 KW/KVar	0.025 %
	AC Power/ energy Single/ three phase Active /reactive/ Apparent P.F 1 to 0.2(lag/lead) 45to 60Hz, 30 V to 300 V, 0.5A to 10A		3 W/Var to 9000 W/Var	0.034 % to 0.028 %
	AC Power/ energy Single/ three phase Active /reactive/ Apparent P.F 1 to 0.2(lag/lead) 45to 60Hz, 30 V to 300 V, 5mA to 500mA		0.03 W/Var to 450 W/Var	0.667 % to 0.025 %
5	Inductance@1kHz	Using LCR Meter by Direct Method	100 µH to 1H	0.50 %
6	Capacitance@1kHz	Using LCR Meter by Direct Method	1 nF to 1 µF	0.40 %
7	Power Factor@50 to 60 Hz	Using Three Phase Reference Energy Calibrator by Direct Method / Comparison Method	1 lag/lead to 0.1 lag/lead	0.0006 P.F
8	AC Voltage @ 50Hz to 1 KHz	Digital Multi meter 6½ by Direct Method	1 mV to 10 mV	2.76 % to 0.54 %
			10 mV to 100mV	0.54 % to 0.12 %
			100 mV to 1V	0.12 %
			1 V to 1000V	0.11 %

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Electro-Technical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
9	AC Voltage @ 50Hz	Three Phase reference Energy Calibrator by DirectMethod	30 V to 480 V	0.025 %
10	AC High Voltage @ 50Hz	HV Probe with DMM by Direct Method	1 KV to 28 KV	3.50 %
Alternate Current Source Mode				
1	AC Current @ 50Hz to 1 kHz	Using Multi product Calibrator by DirectMethod	30 µA to 330 µA	0.59 % to 0.02 %
			330 µA to 330 mA	0.02 % to 0.05 %
			330 mA to 3A	0.05 % to 0.07 %
			3 A to 10 A	0.07 %
			10 A to 20 A	0.17 %
2	AC Current @ 50Hz	Using Multi Product Calibrator with Current Coil By Direct Method	20 A to 200A	0.46 %
			200 A to 1000 A	0.50 %
3	AC Power/ energy Single/ three phase Active /reactive/ Apparent P.F 1 to 0.25(lag/lead) 45to 60Hz, 30 V to 300 V, 10A to 120A	Using Three Phase Reference Energy Calibrator by Direct Method / Comparison Method	60 W/Var to 108 KW/KVar	0.025 %
	AC Power/ energy Single/ three phase Active /reactive/ Apparent P.F 1 to 0.2(lag/lead) 45to 60Hz, 30 V to 300 V, 0.5A to 10A		3 W/Var to9000 W/Var	0.034 % to 0.028 %
	AC Power/ energy Single/ three phase Active /reactive/ Apparent P.F 1 to 0.2(lag/lead) 45to 60Hz, 30 V to 300 V, 5mA to 500mA		0.03 W/Var to 450 W/Var	0.667 % to 0.025 %
4	AC Voltage @50Hz to 1kHz	Using Multi Product Calibrator by Direct Method	3 mV to 330 mV	0.91 % to 0.06 %
			330 mV to1000 V	0.06 %

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Electro-Technical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
5	AC Voltage @ 45 to 60 Hz,	Using Three Phase Reference Energy Calibrator by Direct Method	30 V to 300V	0.025 %
6	Inductance@1kHz	Using Std. Inductance Box &LCR Meter by Compression Method	100 µH to 1H	0.50 %
7	Capacitance@1kHz	Using Std. Capacitance Box &LCR Meter by Compression Method	1 nF to 1 µF	0.50 %
8	AC Resistance@1kHz	Using Std. Resistance Box&LCR Meter by Compression Method	1 Ohm to 100 k Ohm	0.50 %
9	DC Capacitance	Using Multi Product Calibrator by Direct Method	1 nF to 10 nF	1.73 % to 0.48 %
			10 nF to 100 µF	0.48 % to 0.60 %
10	Power factor 45 to 60Hz	Using Three Phase Reference Energy Calibrator by Comparison Method	1 lag/lead to 0.1 lag/lead	0.0008 PF
Low Frequency Measure Mode				
1	Ultra-Sonic Pulse velocity Tester (Parameter-time)	Using Reference acrylic Blocks & IS 516(P5/ Sec-1):2018	34.30 µS to 99.50 µS	0.20 µS
2	Time	Digital Timer by Direct Method	0.1 s to 10 s	0.0013 s
			10 s to 1000 s	0.014 s
			1000 s to 9900 s	0.17 s
			9900 s to 86400 s	1.3 s to 2.77 s
3	Frequency	Digital Multi meter 6½ by Direct Method	10 Hz to 50 Hz	0.082 % to 0.016 %
			50 Hz to 1000 KHz	0.016 % to 0.012 %
Low Frequency Source Mode				
1	Frequency	Multi Product Calibrator by Direct Method	10 Hz to 2 MHz	0.07 % to 0.007 %

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Electro-Technical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Simulation Source Mode				
1	pH Indicator	Using Universal/Process /Multiproduct Calibrator by Simulation method	1 pH to 14 pH	0.01 pH
2	Temperature Simulation (Indicator/Controller, PID, Data logger,Scanner, Calibrator, Process meter & Recorder) RTD (PT-100)	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to 600 °C	0.16 °C
3	Temperature Simulation (Indicator /Controller, PID, Data logger, Scanner, Calibrator, Process meter & Recorder) E-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to1000 °C	0.50 °C
4	Temperature Simulation (Indicator / Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder B-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	600 °C to1800 °C	0.56 °C
5	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder J-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to 700 °C	0.27 °C
6	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder K-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to1300 °C	0.50 °C

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Electro-Technical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
7	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder T-Type Thermocouple	Using Precision Multi Product Calibrator/ Universal Calibrator by Direct Method	-200 °C to400 °C	0.30 °C
8	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder R-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	200 °C to 1700 °C	0.57 °C
9	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder S-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	200 °C to 1700 °C	0.47 °C
10	Temperature Simulation (Indicator/Controller,PID, Data logger, Scanner, Calibrator, Process meter & Recorder N-Type Thermocouple	Using Precision Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to1300 °C	0.40 °C
Simulation Measure Mode				
1	Temperature Simulation Universal Calibrator, Process meter RTD (PT-100)	Using Multi Product Calibrator / Universal Calibrator/ Digital Multi meter 6½ by DirectMethod	-200 °C to 630 °C	0.14 °C
2	Temperature Simulation Universal Calibrator, Process meter K-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to 1300 °C	0.38 °C
3	Temperature Simulation Universal Calibrator, Process meter N-Type Thermocouple	Using Multi Product Calibrator/ Universal Calibrator by Direct Method	-200 °C to 1300 °C	0.40 °C

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Electro-Technical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
4	Temperature Simulation Universal Calibrator, Process meter J-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to 1000 °C	0.27 °C
5	Temperature Simulation Universal Calibrator, Process meter T-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	-200 °C to 400 °C	0.24 °C
6	Temperature Simulation Universal Calibrator, Process meter R-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	0 °C to 1700°C	0.57 °C
7	Temperature Simulation Universal Calibrator, Process meter S-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	0 °C to 1700°C	0.53 °C
8	Temperature Simulation Universal Calibrator, Process meter B-Type Thermocouple	Using Multi Product Calibrator / Universal Calibrator by Direct Method	0 °C to 1800°C	0.44 °C
9	Temperature Simulation Universal Calibrator, Process meter E-Type Thermocouple	Using Multi Product Calibrator/ Universal Calibrator by Direct Method	-200 °C to 1000 °C	0.50 °C

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Dimension				
1	Gauge Block Calibrator L.C.: 0.01 µm or coarser	Using Slip Gauge Set (11 PC's) & E AL G-21: 1996	0.50 mm to 100 mm	0.12 µm
2	Length Measuring Machine (Single Axis) L.C.: 0.0001 mm or coarser	Using Slip Gauge Set ˜K Grade & IS 2984: 2003 RA 2019 & ISO 3650:1998	0.50 mm to 100 mm	0.20 µm
		Using Slip Gauge Set ˜K Grade, Long Slip Gauge 200 mm & IS 2984 :2003 RA 2019 & ISO 3650:1998 & IS 7014:1973 RA 2020	>100 mm to 300 mm	2.5 µm
3	Slip gauge set	Gauge Block Calibrator & Slip Gauge Set ˜K Grade & IS 2984 : 2003 RA 2019 & ISO 3650:1998	>0.50 mm to 10 mm	0.09 µm
			>10 mm to 50 mm	0.13 µm
			>50 mm to 75 mm	0.14 µm
			>75 mm to 100 mm	0.15 µm
4	Length Bar / Setting Rod / Long Slip Gauge	Length Measuring Machine & IS 7014: 1973 RA-2020, IS 2984 : 2003 RA 2019	0.50 mm to 100 mm	0.35 µm
			>100 mm to 200 mm	0.60 µm
		Length Measuring Machine, Master Ring Gauge & IS 7014: 1973 RA-2020, IS 2984 : 2003 RA 2019	>200 mm to 400 mm	1.5 µm
		Using 2D Height Gauge IS 7014: 1973 RA-2020, IS 2984 : 2003 RA 2019.	>400 mm to 600 mm	2.5 µm
5	Cylindrical Setting Master (Diameter)	Length Measuring Machine & IS- 4349 : 1987 RA -2019	1 mm to 50 mm	0.30 µm
6	Caliper Checker / Height Master	Using 2D Height Gauge by comparison method & IS 13907: 1994 RA 2020.	5 mm to 600 mm	3 µm

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
7	2D / Linear Height Gauge L.C.0.0001mm or courser	Slip Gauge Set, Caliper Checker & IS 13907: 1994 RA 2020.	5 mm to 600 mm	4.50 µm
8	Profile Projector/Video Measuring Machine (Parameter-Linear) L.C: 0.0001 µm or coarser	Glass Scale/Slip Gauge set & JIS B 7184:2021	0.001 mm to 200 mm	6 µm
9	Profile Projector/Video Measuring Machine (Parameter-Angular)	Angle Gauge Set & JIS B 7184:2021	15 to 90°	10 second of arc
10	Profile Projector/ Microscope (Parameter -Magnification).	Glass Scale & Digimatic Caliper & JIS B 7184:2021	10X mm to 100X mm	0.06 %
11	Dial Calibration Tester / Micrometer Head- : L.C 0.0001 mm or coarser	Slip Gauge Set, Dial Indicator & IS – 9483: 1993 RA 2020	0.5mm to 50 mm	2 µm
12	Extensometers calibrator	Using Slip Gauge set & Dial Gauge (LC-0.0001mm) & IS 12872: 2021 Indirect Method	Up to 5 mm	0.50 µm
13	Caliper(Vernier/Dial/Digital, Error external jaw, internal jaw and depth, parallelism of external and internal jaws) L.C. 0.01mm or coarser	Slip Gauge Set, Caliper Checker & Long Slip Gauges & IS 16491(part-1) -2021	0.5mm to 1000 mm	8 µm
			>1000 mm to 1500 mm	14.50 µm
14	Depth Caliper (Vernier/Dial/Digital) L.C 0.01mm or coarser	Using Slip Gauge Set Grade-0 & Slip Gauge Set Grade-K, Long slip & IS 16491-2:2016, ISO 13385-2:2011	2 mm to 300 mm	15 µm
15	External Micrometer (analog/ digital/ pin /disc/screw thread/caliper/gear tooth/ tube/crimp height type)	Using Slip Gauge Set & IS 2967: 1983 RA 2019 & JIS B 7502:2016	0.5mm to 100 mm	1 µm

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
	(Screw error & Error in length of each extension)-L.C 0.001 mm or coarser			
16	External Micrometer (analog/ digital/ pin /disc/screw thread/caliper/gear tooth/tube/crimp height type)- (Screw error & Error in length of each extension)- L.C 0.01mm or coarser	Using Slip Gauge Set & Long Slip Gauges & IS 2967: 1983 RA 2019 & JIS B 7502:2016	>100 mm to 150 mm	1.50 µm
		Using Slip Gauge Set & Long Slip Gauges & IS 2967: 1983 RA 2019 & JIS B 7502:2016	>150 mm to 300 mm	4.20 µm
			>300 mm to 600 mm	9.50 µm
			>600 mm to 1000 mm	18 µm
17	Internal Micrometer (Screw Error & Error in length of each extension) L.C 0.001mm or coarser	Length Measuring Machine & IS 2966: 1964 RA 2019	upto 200 mm	2 µm
		Length Measuring Machine, Master Ring Gauge & IS 2966: 1964 RA 2019	>200 mm to 400 mm	4.30 µm
18	Internal Micrometer (Screw Error & Error in length of each extension) L.C 0.01mm or coarser	2D Height Gauge & Long Slip Gauge & IS 2966: 1964 RA 2019	>400 mm to 600 mm	6.20 µm
19	Depth Micrometer (Mech/Digital) (Screw Error & Error in length of each extension)L.C 0.001mm or coarser	Using Slip Gauge Set Grade-0, Slip Gauge Set Grade-K & Long Slip JIS B7544:1994 & BS 6468:2008	5 mm to 300 mm	3 µm
20	Height Gauge (Vernier/Dial/Digital) (Parallelism of scriber to base)L.C. 0.01mm or coarser	Slip Gauge Set, Caliper Checker, Dial test Indicator & Long Slip Gauges & IS 2921:2016 & JIS B7517:1982	5 mm to 1000 mm	7 µm

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
21	Dial Indicator(Dial / Digital) (Hysteresis repeatability accuracy) L.C 0.0001mm or coarser	Using Length Measuring Machine & IS 2092:1985 RA 2019 & JIS B7503:2017	Up to 25 mm	0.70 µm
			25 to 50 mm	1 µm
22	Dial Indicator(Dial / Digital) (Hysteresis repeatability accuracy) L.C 0.001mm or coarser	Using Length Measuring Machine & IS 2092:1985 RA 2019 & JIS B7503:2017	>50 mm to 100 mm	1.20 µm
23	Dial Test Indicator (Hysteresis repeatability accuracy) L.C 0.001mm or coarser	Using Length Measuring Machine & IS 11498:1985 RA 2000 & JIS B7533:2017	Up to 2 mm	2 µm
24	Dial Bore Gauge : L.C 0.001mm	Using Length Measuring Machine	up to 1 mm	0.60 µm
25	Dial Thickness Gauge/ OD Caliper ,L.C.0.001mm	Using Slip Gauge Set & IS 2092 & JIS B7503:2017	Up to 5 mm	3 µm
	Dial Thickness Gauge/ OD Caliper, L.C.0.01mm		5.0 mm to 100 mm	6 µm
26	Coating Thickness Gauge	Using Master Foil	0.01 mm to 1 mm	3.50 µm
27	Ultrasonic Thickness gauge.	Using Setting round master/slip gauges by Comparison method	0 to 100 mm	10 µm
28	Laser Distance Meter	Using Scale & Tape Calibrator by Comparison method	0 mm to 1000 mm	5 µm
29	Electronic Probe with DRO L.C.: 0.0001 mm or coarser	Slip Gauge Set	0 mm to 50 mm	0.50 µm
30	Travel of Extensometer Gauge Length	Dial Gauge of 0.0001 mm least count with Extensoeter	0.0001 mm to 50 mm	7 µm

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
		Calibrator & IS 12872:2021/ ISO 9513:2021		
31	Steel Scale ,L.C.:0.5mm or coarser	Using Scale & Tape Calibrator & IS 1481: 1970 RA 2014	0.50 mm to 1000 mm	27 µm
32	Measuring Tape /Pie Tape L.C.: 1mm or coarser	Using Scale & Tape Calibrator & IS 1269 (Part-1,11) :1997 RA 2018	1 mm to 50 meter	22*L, where L is in meter µm/mtr
33	Calibration Slide/Glass Scale/ Graticule and glass grid (Parameter-linear measurement)	Using Profile Projector by comparison method & JIS B 7541:2001	0.005 mm to 100 mm	4 µm
34	Metallurgical /Stereo Microscope- (parameter-Magnification)	Using Glass Scale/Calibration Slide & Eye Piece by comparison method & ISO 10936:2017/ ASTME 1951:2014(RA 2019)	1 X to 1000 X	1.50 %
35	Bevel / Angle Protector/Combination Set(Angle) L.C. 1 (min)	Using Angle Gauge Set & IS 4239: 1970 RA 2011, IS 5812:1970	Up to 180 °	1 '
36	Bevel / Angle Protector/Combination Set(Angle) L.C. 5 (min)		Up to 180 °	3.20’
37	Sine Center-(Angle, Parallelism)	Using Slip Gauge Set, Angle Gauge set, Dial Test Indicator, 2D Height Gauge & IS 5979: 1981 RA 2017	Up to 300 mm	6 "
38	Sin Bar-(Angle, Centre distance between rollers, Parallelism)	By using Slip Gauge, angle gauge, Dial test Indicator by comparison method & IS 5359: 1987 RA 2019	Up to 300 mm	6 "

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
39	Angle Gauge	Using Sine Bar & Slip Gauge & IS – 6231:1971 RA 2019	Up to 90 °	2.50 "
40	Precision Level /Sprit Level Sensitivity 10 µm/m	Electronic Level & IS -5706:1993-RA-2022 & JIS B7510:1993	Up mm to 300 mm	8.50 µm/m
41	Angular scale, Angle Measurement, Angle Gauge	Profile Projector & IS 6231:1971 RA 2019	Up to 360 °	16 "
42	Inclinometer L.C.: 0.1° or coarser	Slip Gauge Set & Sine Bar	-90 ° to + 90 °	4.5 '
43	Angle Plate/ Box Angle Plate/ Right Angle (Parallelism, Flatness & Squareness)	Slip Gauge Set, Dial Indicator &Granite Square & IS – 6232 :1971 RA 2019, IS-2554: 1971 RA 2020, IS-6973: 1973 RA 2020, IS-6985: 1973 RA 2020, IS-2103:1980 RA 2017	Up to 400 mm	6.9 µm
44	Plain Plug Gauge / Setting Plug Gauge (Diameter)	Length Measuring Machine / Dial Indicator with comparator (LC - 0.0001mm) & IS-3455:1971,IS 3485: 1983 RA 2019 & IS 919(part-1):2014 RA 2019, IS -6137: 1983 RA 2019, IS-6244 : 1980 RA 2017 & IS 6246:1980 RA 2017	2 mm to 200 mm	0.85 µm
45	Plain Ring Gauge / Setting Ring Gauge (Diameter at 4 positions)	Using Length Measuring Machine, Master Ring Gauges & IS 3485: 1983 RA 2019, IS-3455:1971 RA 2020, IS-919(part-1):2014 RA 2019, IS-7876: 1975 RA 2020.	3 mm to 150 mm	1 µm

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
		Using Length Measuring Machine, Master Ring Gauges & IS 3485: 1983 RA 2019, IS-3455:1971 RA 2020, IS-919(part-1):2014 RA 2019, IS-7876: 1975 RA 2020.	>150 mm to 200 mm	1.50 µm
46	Flush Pin Gauge/Width Gauge	Using Length Measuring Machine & IS 3455:1971 RA 2020,IS 919(part-1):2014 RA 2019,	0.10 mm to 200 mm	2.90 µm
47	Snap Gauge	Slip Gauge Set & IS 3477,7876: 1975 RA 2020. & IS 919(part-1):2014 RA 2019,	3 mm to 150 mm	3 µm
		Using Slip Gauge Set ,Linear height gauge & IS 3477,7876: 1975 RA 2020 & IS 919(part-1):2014 RA 2019,	>150 mm to 300 mm	5 µm
48	Dial Snap Gauge / Indicating Miicrometer , L.C. 0.001mm or coarser	Using Slip Gauge Set & IS 14271:1995 RA 2020 & JIS B7520:1981	Up to 100 mm	1.30 µm
49	Thread Plug Gauge / W.C.P (Effective Diameter, Major Diameter)	Using Length Measuring Machine & Three Wire Unit & IS 10685: 1983 RA 2019, IS-2334:2001 RA 2019, IS 4218(P-1):2001 RA 2018, IS 6311:1978 RA 2020	1 mm to 100 mm	1 µm
50	Thread Ring Gauge / W.C.R (Effective Diameter, Minor Diameter)	Using Length Measuring Machine, Master Ring Gauge & IS 2334:2001 RA 2019, IS 4218(P-1):2001 RA 2018, IS 6311:1978 RA 2020	3.50 mm to 100 mm	2.50 µm

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
51	Measuring Pin Set	Length Measuring Machine/ Dial Indicator with Comparator (LC. 0001mm) & IS –11103:1984 RA 2020, IS 6311:1978 RA2020, IS 4359:2021	0.10 mm to 50 mm	0.50 µm
52	Three wire Unit (Diameter)	Length Measuring Machine & IS- 11103:1984 RA 2020, IS 6311:1978 RA 2020, IS 4359:2021	0.17 mm to 6.50 mm	0.50 µm
53	Test Mandrel (Variation in Diameter)	Length Measuring Machine IS 2063:2016 & ISO 230-1:2012	40x150 mm to 12X400mm	0.70 µm
54	Spline Plug Gauge (Dimension over Two Pins)	Using Length Measuring Machine & IS 4966 (PART-2):1969 RA 2019	5 mm to 100 mm	4 µm
	Spline Ring Gauge (Dimension between two pins)		10 mm to 100 mm	2.50 µm
55	Chamfer Gauge Diameter	Length Measuring Machine	2.50 mm to 50 mm	1 µm
56	Chamfer Gauge Angle	Profile Projector	Up to 360 °	6 "
57	Chamfer Gauge Length		0.10 mm to 100 mm	5.50 µm
58	Filler Gauge	Using Length Measuring Machine & IS – 3179:1990 RA 2020	Up to 1 mm	0.60 µm
59	Standard Foil	Using Length Measuring Machine & IS -3179:1990 RA 2020	0.01 mm to 2 mm	0.60 µm
60	Radius Gauge	Using Profile Projector & IS – 5273:1969 RA 2019	0.5 mm to 25 mm	7.50 µm

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
61	Thread Pitch Gauge	Using Profile Projector & IS – 4211:1993 RA 2019	0.1 mm to 6 mm	7.50 µm
62	V-Block, Squareness	Granite Square,, 2D height Gauge with squareness probe , & IS – 2949: 1992,RA 2017	Up mm to 200 mm	4.50 µm
63	V-Block, Symmetricity	Granite Square, Test Mandrel & Dial Indicator, & IS 2949:1992 RA 2017	Up mm to 200 mm	2.60 µm
64	V-Block, Parallelism of V-Block	Test Mandrel & Dial Indicator, & IS - 2949: 1992,RA 2017	Up mm to 200 mm	2.60 µm
65	Straight Edge(Straightness Measurement)	Using Electronic Level & IS – 2220: 1990 RA 2020, IS-5268:1991 RA 2017, IS-12937:1990 RA 2020	Up mm to 2000.0 mm	8 µm/m
66	Surface plate/Comparator base (Flatness Measurement)	Electronic Level, IS 12937:1990 RA 2020 ,IS-2285:2003 RA 2020 ,IS-7327:2003 RA 2019	150x150 mm to 6000x4000 mm	3.12* Sqrt. (L+W) /125 µm/mtr
67	Comparator base (Flatness Measurement)	Using Height Gauge and Dial Indicator & IS 12937:1990 RA 2020 ,IS- 2285:2003 RA 2020 , IS-7327:2003 RA 2019	Up to 300 mm	1 µm
68	Test Sieve (Aperture Size, Wire dia & Aperture pitch size)	Using Profile Projector / Digimatic Caliper & IS - 460 (PART-1,2&3):2020	32 µm to 10 mm	3.10 µm
69	Test Sieve (Aperture Size, Wire dia & Aperture pitch size)	Digimatic Caliper & IS 460 P-1,2020, IS 460 P-2:2020, IS 460 P-3:2020	10 mm to 150 mm	25 µm
70	Crushing Value Apparatus-Cylinders-	Using height gauge, Digimatic Caliper, Micrometer	5 mm to 250 mm	0.15 mm

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
	(parameters- Internal dia, height, Wall Thickness) Plunger-(parameters- Diameter of piston, Stem, Height, Depth of piston, Diameter of hole)Base Plate-(parameters-	& IS 2386 (part-IV):1963 RA 2021 by direct method		
71	Cube mould (parameter-Distance between opposite faces, Height of mould, Thickness of wall plate, Length/width/thickness of base plate, Deviation from perpendicularity between interior faces and top	Using height gauge, Digimatic Calliper by Direct method & IS 10086:2021	50*50*50 mm to 300*300*300 mm	0.12 mm
72	Aggregate Impact Value Apparatus: Steel Cup-Diameter, Depth, Thickness. Steel Hammer-Diameter, length of cylindrical lower end, Diameter of shank, Height of fall. Cylindrical Measure-Diameter, Depth,	Using Digimatic Caliper, Mmeasuring tape, Digimatic Micrometer & IS 9377-1979 by Direct method	2 mm to 400 mm	1.56 mm
73	Cylindrical mould (parameter-Mean Internal Dia, Actual Internal Dia. in any direction, Height, Thickness of wall plate, Dia.Thickness of base plate, Dia. of capping plate	Using height gauge, Digimatic Calliper, Dgital Micrometer by Direct method & IS 10086:2021	upto 150*300 mm	0.50 mm

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
74	Beam Mould- (Parameter- Length, Width between internal faces, Height, Length, Width, Thickness of base plate, Deviation fromperpandularity between interior faces and top and bottomplanes of Mould)	Using height gauge, Digimatic Calliper,Digital Measuring tape, Digital micrometerby Direct method & IS 10086:2021	100*100*500 mm to 150*150*700 mm	1.61 mm
75	Metal Bar Mould- (Parameter- Distances between inner ends of reference points, width between inner surfaces, height.	Using height gauge, Digimatic Calliper, Digital micrometer by Direct method & IS 10086:2021	upto 250*25*25 mm	0.06 mm
76	Slump Cone with Rod- (parameter- Bottom and top Diameter, Height)Rod- (Diameter, height)	Using Digimatic Caliper, measuring tape & IS 7320:1974 by Direct method	10 mm to 620 mm	0.16 mm
77	Elongation Gauge- (parameter -Length)	Using electronic Height Gauge, Digimatic Caliper & IS 2386 (part 1):1963 RA 2021 by comparison method	4.70 mm to 81.50 mm	0.03 mm
78	Cylindrical Calibrating Container for sand pouring- (parameters- Dia, Depth, Flange width, thickness)Metal trey with Hole(Size, depth, hole size in center).	Using height gauge, Digimatic Caliper, measuring tape, Micrometer & IS 2720 (part 28):1974 RA 2020 by direct method	1 mm to 500 mm	0.70 mm

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
79	Vicat Apparatus: (Parameters-Needle C & F, Dia, effective length excluding hilt,Circular cutting edge dia, depth holdout. Plunger G dia, Length. Graduated scale- Total scale length, L.C. of scale. I	Using Profile Projector, Height Gauge, Digimatic Caliper, Micrometer & IS 5513:1996 RA 2021 By direct method	0.02 mm to 100 mm	0.30 mm
80	LOS Angles-(Parameters-Circumference of cylinder, Diameter of each weights(Abrasion charge).	Using Measuring Tape, Digimatic Caliper & IS 10070:1982 RA 2018 by direct method	40 mm to 1300 mm	1.21 mm
81	Ball /Diamond cone Indenter (diameter)	Using LMM & Profile projector by Comparison method & IS 1500(P- 2):2021 & IS 1586(P-2):2018	Up to 15 mm	3.20 µm
82	Ball /Diamond cone Indenter (angle)		Up to 150 °	3.30 °
83	Template/ Test finger-Nail probe/Articulate test finger probe/ wedge probe finger/small child finger (Diameter, length, radius).	Using Profile Projector, Digital Caliper, Height Gauge by Direct Method & IEC 61032:1997, IS 61010:2010,IS 60950:2020	Up to 500 mm	26 µm
84	Template/ Test finger-Nail probe/Articulate test finger probe/ wedge probe finger/small child finger (angle)	Using Profile Projector by Direct Method & IEC 61032:1997, IEC 61010:2010,IEC 60950:2020	Up to 90 °	20 "
85	Inspection fixture/ Relation gauge/CD/PCD Gauge (Diameter, length, radius, height, CD).	Using 2D Height Gauge, Profile Projector, Caliper & as per relevant drawing/ specifications	Up to 300 mm	20 µm

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S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
86	Metal Gauge for Flakiness Index (parameter- Length)	Using Profile Projector, Digimatic Caliper & IS 2386 (part 1):1963 RA 2021 Direct Method	4.70 mm to 100.50 mm	39 µm
Acoustics				
1	Sound Level Meter	Using Sound level Calibrator By Comparison method	94 dB to 114 dB	2 dB
Density				
1	Density/ Hydrometer/ Lactometer	Hydrostatic weighing Cukow's method	0.6 g/ml to 2.0 g/ml	0.003 g/ml
Force				
1	Push Pull Gauge	Fixture, Frame, Hangers and Newtonian weights Based on VDI/VDE 2624-2.1:2018	10 N to 100 N	1.29 N
			100 N to 500 N	1.29 N
2	Rubber Hardness Tester for Spring Force (A&D)	Digital Balance and fixture & ASTM D 2240:2017/ ISO 18898:2016	0 Shore to 100 Shore	0.90 Shore
3	Rubber Hardness Tester for Indention depth(A&D)	Micrometer Head & ASTM D 2240:2017/ ISO 18898:2016	0 to 2.50 mm	0.007 mm
Pressure & Vacuum				
1	Digital/Analogue Pressure Gauges ,Differential Pressure Gauges, Transducers/ Transmitters ,Switches	Using Digital Pressure gauges Universal Calibrator DKD-R6-1:2003By Comparison method	0.001 bar to 700 bar	0.23 % of rdg
2	Differential Pressure Gauges, Manometer,	Using Digital Pressure Calibrator DKD-R6-	0.025 Pa to 250 Pa	1.78 % of rdg

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
	Transducers/Transmitters ,Switches	1:2003 By Comparison method	>250.0 Pa to 2000 Pa	0.30 % of rdg
3	Absolute Pressure (Barometer/manometer)	Using Barometric Pressure Indicator DKD-R6-1:2003 By Comparison method	600 mbar to 1050 mbar	3 mbar
4	Digital/Analogue Vacuum Gauges, Transducers/ Transmitters, Switches	Using Digital Vacuum gauge, Universal Calibrator & DKD-R6-2:2002 By Comparison method	0.0 bar to -0.95 bar	0.80 %
Torque				
1	Torque Wrench (Type I/Class B,C,D,E) (Type II/class A,B,D,E)	Torque Transducer & indicator with Torque wrench Calibrator,& IS 16906:2018	0.5 Nm to 500 Nm	0.75 % rdg
Volume				
1	Micro Pipette	Distilled Water and balances (suitable at 27oC) Gravimetric Method & ISO 8655-6: 2022	20 µl to 1000 µl	0.09 µl
2	Pycnometer	Distilled Water and balances Gravimetric Method & ISO 4787:2021 & ISO TR 20461:2000 specification as per OIML G14:2011, IS 1448 (part-76):2019.	50ml to 100 ml	0.19 ml
3	Volumetric Measures	E1 class weights, Distilled Water and balances Gravimetric Method & ISO 4787:2021 & ISO TR 20461:2000	1 ml to 10 ml	0.09 µl
			10 ml to 1000 ml	0.20 ml
			1000 ml to 10000 ml	3.30 ml

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Mass				
1	Electronic weighing Balances - Readability 0.001mg & Coarser	E1 class weights. Calibration of weighing balance & OIML R 76-1: 2006	1 mg to 5g	0.01mg
2	Electronic weighing Balances - Readability 0.01mg & Coarser		>5g to 80 g	0.02mg
3	Electronic weighing Balances - Readability 1.0 mg & Coarser		>80 g to 200 g	0.06mg
4	Electronic weighing Balances - Readability :1.0mg & Coarser		>200g to 2000 g	0.50 mg
5	Electronic weighing Balances - Readability 1.0 mg & Coarser	F1 class weights. Calibration of weighing balance & OIML R 76-1: 2006	>2 k g to 10 kg	0.02g
6	Electronic weighing Balances- Readability 0. 1 g or Coarser		>10 kg to 20 kg	0.06 g
7	Electronic weighing Balances- Readability 1 g or Coarser		>20kg to 50 kg	1 g
8	Electronic weighing Balances- Readability: 10g or Coarser		> 50 kg to 100 kg	5 g
9	Electronic weighing Balances- Readability: 10g or coarser		>100kg to 300 kg	10 g
11	Weight (F2 class and coarser)	E1 class weights & Precision Balances (80g readability 0.01mg) & OIML R 111-1: 2004	1mg	0.04 mg
			2mg	0.04 mg

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
			5mg	0.04 mg
			10mg	0.04 mg
			20mg	0.04 mg
			50mg	0.04 mg
			100mg	0.017 mg
			200mg	0.017 mg
			500mg	0.015 mg
			1g	0.015 mg
			2g	0.015 mg
			5g	0.015 mg
			10g	0.015 mg
			20g	0.015 mg
			50 g	0.05 mg

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
		E1 class weights & Precision Balances (200g readability 0.1mg) & OIML R 111-1: 2004	100 g	0.104 mg
			200 g	0.112 mg
		E1 class weights & Precision Balances (1200g readability 0.01g, & OIMLR 111-1 R :2004	500 g	0.112 g
			1 kg	0.01 g
12	Weight (MI class and coarser)	F1 class weights & Precision Balances (3Kg readability 0.01g) & OIML R 111-1: 2004	2 kg	0.10 g
		F1 class weights & Precision Balances (6Kg readability 0.1g) & OIML R 111-1: 2004	5 kg	0.10 g
		F1 class weights & Precision Balances (21 Kg readability 0.1g) & OIML R 111-1: 2004	10 kg	0.10 g
		F1 class weights & Precision Balances (21Kg readability 0.1g) & OIML R 111-1: 2004	20 kg	0.10 g
		M1 class weights & Precision Balances (50Kg readability 1g) & OIML R 111- 1: 2004	50 kg	1.60 g
13	Non Standard Weight	E1 class weights & Precision Balances (220g- Readability- 0.1mg) by ABBA Substitution method	1g to 200 g	0.70 mg
		E1 class weights & Precision Balances (1220g- Readability- 0.1g) by ABBA Substitution method	>200 g to 1000 g	0.02g

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
		F1 class weights & Precision Balances (6Kg readability 0.1g)) by ABBA Substitution method	>1 kg to 5 kg	0.12 g
		F1 class weights & Precision Balances (21Kg-Readability-0.1g) by ABBA Substitution method	>5 kg to 20 kg	1.60 g
		F1 class weights & Precision Balances (51Kg-Readability-1g) by ABBA Substitution method.	>20 kg to 50 kg	3 g
14	Newton Weight	E1 class weights & Precision Balances (220g-Readability- 0.1mg) by ABBA Substitution method	1N to 2N	0.70 mg
		E1 class weights & Precision Balances (1220g-Readability- 0.1g) by ABBA Substitution method	>2N to 11N	0.02g
		F1 class weights & Precision Balances (6Kg readability 0.1g)) by ABBA Substitution method	>11 N to 58 N	0.12 g
		F1 class weights & Precision Balances (21Kg-Readability-0.1g) by ABBA Substitution method	>58 N to 200 N	1.60g

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Mechanical Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
		F1 class weights & Precision Balances (51Kg-Readability-1g) by ABBA Substitution method	>200 N to 500 N	3 g
15	Aggregate Impact Value Apparatus: Mass of hammer.	Using weighing balance & & Standard weights, IS 9377-1979 by Direct method	13 kg to 15 kg	1.60 g
16	LOS Angles-(Parameters-Mass of each weight(Abrasion charge), Total weight of (12 nos)of abrasion charge.	Using Weighing Balance & Standard weight s IS 10070-1982 by direct method	380 g to 5050 g	0.06 g
Speed & Acceleration				
1	Non-contact type rpm measurement (stroboscope /tacho calibrator/rpm source/ digital tachometer)	Digital Tachometer & Source By Comparison method with using motorized source with strip & SANASTR45-II-2017	10 rpm to 100 rpm	4 % rdg to 0.40 % rdg
			100 rpm to 1000 rpm	0.40 % rdg to 0.07 % rdg
			1000 rpm to 99000 rpm	0.07 % of rdg
2	Contact type rpm measurement (Tacho calibrator/rpm source/ digital tachometer)	Using Digital Tachometer & Source By Comparison method & SANASTR45-II-2017	40 rpm to 500 rpm	3.14 % of rdg to 1.71 % of rdg
			>500 rpm to 3000 rpm	1.71 % of rdg to 0.35 % of rdg

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Mechanical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Dimension				
1	Gauge Block Calibrator L.C.: 0.01 µm or coarser	Using Slip Gauge Set (11 PC's) & E AL G-21: 1996	0.50 mm to 100 mm	0.08 µm
2	Length Measuring Machine (Single Axis)L.C.: 0.0001 mm or coarser	Using Slip Gauge Set ˜K Grade & IS 2984 : 2003 RA 2019 & ISO 3650:1998	0.50 mm to 100 mm	0.20 µm
		Using Slip Gauge Set ˜K Grade, Long Slip Gauge 200 mm & IS 2984 :2003 RA 2019 & ISO 3650:1998 & IS 7014:1973 RA 2020	>100 mm to 300 mm	2.50 µm
3	Caliper Checker / Height Master	Using 2D Height Gauge by comparison method & IS 13907: 1994 RA 2020.	5 to 600 mm	3 µm
5	2D / Linear Height Gauge L.C.0.0001mm or courser	Slip Gauge Set,Caliper Checker & IS 13907: 1994 RA 2020.	5.0 mm to 600 mm	4.50 µm
6	Profile Projector/Video Measuring Machine (Parameter-Linear) L.C: 0.0001 µm or coarser	Glass Scale/Slip Gauge set & JIS B 7184:2021	0.001 mm to 200 mm	6 µm
7	Profile Projector/Video Measuring Machine (Parameter-Angular)	Angle Gauge Set & JIS B 7184:2021	15 to 90˚	10 second of arc
8	Profile Projector/ Microscope (Parameter -Magnification).	Glass Scale & Digimatic Caliper & JIS B 7184:2021	10X mm to 100X mm	0.06 %
9	Dial Calibration Tester / Micrometer Head- : L.C	Slip Gauge Set, Dial Indicator & IS – 9483: 1993 RA 2020	0.5mm to 50 mm	2 µm

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Mechanical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
	0.0001 mm or coarser			
10	Height Gauge(Vernier/Dial /Digital) (Parallelism of scriber to base)L.C. 0.01mm or coarser	Slip Gauge Set, Caliper Checker, Dial test Indicator & Long Slip Gauges & IS 2921:2016 & JIS B7517:1982	5 mm to 1000 mm	7 µm
11	Travel of Extensometer Gauge Length	Dial Gauge of 0.0001 mm least count with Extenso Meter Calibrator & IS 12872/ISO 9513: 2021	0.0001 mm to 50 mm	7 µm
12	Metallurgical /Stereo Microscope- (parameter-Magnification)	Using Glass Scale/Calibration Slide & Eye Piece by comparison method & ISO 10936:2017/ ASTME 1951:2014(RA 2019)	1 X to 1000 X	1.50 %
13	Sine Center-(Angle, Parallelism)	Using Slip Gauge Set, Angle Gauge set, Dial Test Indicator, 2D Height Gauge & IS 5979: 1981 RA 2017	Up to 300 mm	6 "
14	Straight Edge(Straightness Measurement)	Using Electronic Level & IS – 2220 : 1990 RA 2020, IS 5268:1991 RA 2017, IS 12937:1990 RA 2020	Up mm to 2000 mm	8 µm/m
15	Surface plate/Comparator base (Flatness Measurement)	Electronic Level, IS 12937:1990 RA 2020 ,IS 2285:2003 RA 2020 ,IS 7327:2003 RA 2019	150x150 mm to 6000x4000 mm	1.0* Sqrt. (L+W) /125 µm/mtr
16	Comparator base (Flatness Measurement)	Using Height Gauge and Dial Indicator & IS 12937:1990 RA 2020 ,IS 2285:2003 RA 2020 , IS 7327:2003 RA 2019	Up to 300 mm	1 µm

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Mechanical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
17	Crushing Value Apparatus-Cylinders-(parameters-Internal dia, height, Wall Thickness)Plunger-(parameters- Diameter of piston, Stem, Height, Depth of piston, Diameter of hole)Base Plate-(parameters-	Using height gauge, Digimatic Caliper, Micrometer & IS 2386 (part-IV):1963 RA 2021 by direct method	5 mm to 250 mm	0.15 mm
18	Cube mould (parameter-Distance between opposite faces, Height of mould, Thickness of wall plate, Length/width/ thickness of base plate, Deviation from perpendicularity between interior faces and top	Using height gauge, Digimatic Calliperby Direct method & IS 10086:2021	50*50*50 mm to 300*300*300 mm	0.12 mm
19	Aggregate Impact Value Apparatus: Steel Cup-Diameter, Depth, Thickness. Steel Hammer-Diameter, length of cylindrical lower end, Diameter of shank, Height of fall. Cylinderical Measure-Diameter, Depth,	Using Digimatic Caliper, measuring tape, Digimatic micrometer & IS 9377-1979 by Direct method	2 mm to 400 mm	1.56 mm
20	Cylindrical mould (parameter- Mean Internal Dia, Actual Internal Dia. in any direction, Height,	Using height gauge, Digimatic Calliper, Dgital micrometerby Direct method & IS 10086:2021	Up to 150*300 mm	0.50 mm

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Mechanical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
	Thickness of wall plate, Dia. Thickness of base plate, Dia. of capping plate			
21	Beam Mould- (Parameter- Length, Width between internal faces, Height, Length, Width, Thickness of base plate, Deviation fromperpandularity between interior faces and top and bottomplanes of Mould)	Using height gauge, Digimatic Calliper,Digital Measuring tape, Digital micrometerby Direct method & IS 10086:2021	100*100*500 mm to 150*150*700 mm	1.61 mm
22	Metal Bar Mould- (Parameter- Distances between inner ends of reference points, width between inner surfaces, height.	Using height gauge, Digimatic Calliper, Digital micrometerby Direct method & IS 10086:2021	Up to 250*25*25 mm	0.06 mm
23	Slump Cone with Rod- (parameter- Bottom and top Diameter, Height)Rod- (Diameter, height)	Using Digimatic Caliper, measuring tape &IS 7320:1974 by Direct method	10 mm to 620 mm	0.16 mm
24	Elongation Gauge- (parameter -Length)	Using electronic height gauge, Digimatic Caliper & IS 2386 (part 1):1963 RA 2021 by comparison method	4.70 mm to 81.50 mm	0.03 mm
25	Cylindrical Calibrating Container for sand pouring- (parameters- Dia, Depth, Flange width, thickness) Metal trey with Hole(Size,	Using height gauge, Digimatic Caliper, measuring tape, Micrometer & IS 2720 (part 28):1974 RA 2020 by direct method	1 mm to 500 mm	0.70 mm

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Mechanical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
	depth, hole size in center).			
26	LoS Angles-(Parameters-Circumference of cylinder, Diameter of each weights(Abrasion charge).	Using Measuring tape, Digimatic Caliper &IS 10070:1982 RA 2018 by direct method	40 mm to 1300 mm	0.55 mm
27	Bench Center (Parallelism & Coaxiality Measurement)	Using Test Mandrel & Dial Indicator & IS 5980:1978 RA 2020.	Up to 500 mm	6 µm
Force				
1	Uniaxial Testing Machine Compression	Force proving Instrument of Class 1 or better, IS 1828:2022 (Part-1) for class 1 or coarser testing machine	0.5 N to 5 N	0.55 %
			5 N to 2000 KN	0.55 %
		ASTM E4 -21:2021	200 N to 50 KN	0.55 %
2	Uniaxial Testing Machine Tension	Force proving Instrument of Class 1 or better, IS 1828:2022 (Part-1) for class 1 or coarser testing machine	2 N to 50 KN	0.67 %
Hardness				
1	Rockwell/Leeb/Portable Hardness Tester	Standard Hardness Block, & IS 1586-2:2018/ ISO 6508-2:2015 Indirect Method	20 HRA to 95 HRA	0.72 HRA
			10 HRBW to 100 HRBW	1.64 HRBW
			10 HRC to 70 HRC	0.72 HRC

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Mechanical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
2	Brinell Hardness Testing Machine (5/750)	Standard Hardness Block, & IS 1500-2:2021/ ISO 6506-2:2017 Indirect Method	UPTO 650 HBW	2.50 %
	Brinell Hardness Testing Machine (2.5/187.5)	Standard Hardness Block, & IS 1500-2:2021/ ISO 6506-2:2017 Indirect Method	UPTO 600 HBW	2.20 %
	Brinell Hardness Testing Machine (10/3000)	Standard Hardness Block, & IS 1500-2:2021/ ISO 6506-2:2017 Indirect Method	UPTO 650 HBW	1.75 %
3	Vickers Hardness Testing Machine (HV1)	Standard Hardness Block, IS 1501-2:2020/ ISO 6507-2:2018 Indirect Method	UPTO 800 HV1	2.60 %
	Vickers Hardness Testing Machine (HV5)	Standard Hardness Block, IS 1501-2:2020/ ISO 6507-2:2018 Indirect Method	UPTO 800 HV5	3.50 %
	Vickers Hardness Testing Machine (HV10)	Standard Hardness Block, IS 1501-2:2020/ ISO 6507-2:2018 Indirect Method	UPTO 800 HV10	1.85 %
	Vickers Hardness Testing Machine (HV30)	Standard Hardness Block, IS 1501-2:2020/ ISO 6507-2:2018 Indirect Method	UPTO 800 HV30	1.95 %

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Mechanical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Torque				
1	Pneumatic/electrical operated Torque screw driver	Torque Calibrator,& IS 16906:2018	0.50 Nm to 5 Nm	1 % rdg
Pressure & Vacuum				
1	Digital/Analogue Pressure Gauges , Differential Pressure Gauges, Transducers/ Transmitters ,Switches	Using Digital Pressure gauges Universal Calibrator DKD-R6-1:2003 by Comparison method	0.001 bar to 700 bar	0.23 % of rdg
2	Differential Pressure Gauges, Manometer, Transducers/ Transmitters , Switches	Using Digital Pressure Calibrator DKD-R6-1:2003 by Comparison method	0.025 Pa to 250 Pa	1.78 % of rdg
		Using Digital Pressure Calibrator DKD-R6-1:2003 by Comparison Method	>250.0 Pa to 2000 Pa	0.30 % of rdg
3	Digital/Analogue Vacuum Gauges, Transducers/ Transmitters, Switches	Using Digital Vacuum gauge, Universal Calibrator & DKD-R6-2:2002 By Comparison method	0 bar to -0.95 bar	0.80 %
Mass				
1	Electronic weighing Balances - Readability 0.001mg & Coarser	E1 class weights. Calibration of weighing balance & OIML R 76-1: 2006	1 mg to 5 g	0.01mg

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Mechanical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
2	Electronic weighing Balances - Readability 0.01mg & Coarser		>5g to 80 g	0.02mg
3	Electronic weighing Balances - Readability 1.0 mg & Coarser		>80 g to 200 g	0.06mg
4	Electronic weighing Balances - Readability :1.0mg & Coarser		>200g to 2000 g	0.50 mg
5	Electronic weighing Balances - Readability 1.0 mg & Coarser	F1 class weights.Calibration of weighing balance & OIML R 76-1: 2006	>2 kg to 10 kg	0.02g
6	Electronic weighing Balances- Readability 0. 1 g or Coarser	F1 class weights.Calibration of weighing balance & OIML R 76-1: 2006	>10 kg to 20 kg	0.06 g
7	Electronic weighing Balances- Readability 1 g or Coarser		>20 kg to 50 kg	1 g
8	Electronic weighing Balances- Readability: 10g or Coarser	F1 & M1 class weights Calibration of weighing balance& OIML R76-1: 2006	>50 kg to 100 kg	5 g
9	Electronic weighing Balances- Readability: 10g or coarser		>100 kg to 300 kg	10 g
Speed & Acceleration				
1	Rpm Measurement (centrifuge / rpm Indicator/Vibrating M/c	Using Digital Tachometer By direct method with strip & SANASTR45-II-2017	10 rpm to 100 rpm	4.0 % rdg to 0.4 % rdg

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Mechanical Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
	/Los Angles m/c /high speed starrier, Abrasion Testing M/C/ rotating shaker/Washing & Drying M/c / & rpm measurement of equipment's)			
2	Rpm Measurement (centrifuge / rpm Indicator/Vibrating M/c /Los Angles m/c /high speed starrier, Abrasion Testing M/C/ rotating Shaker/Washing & Drying M/c / & rpm measurement of equipment's)	Using Digital Tachometer By direct method with strip & SANASTR45-II-2017	100 rpm to 1000 rpm	0.4 % rdg to 0.07 % rdg
3	Rpm Measurement (centrifuge / rpm Indicator/Vibrating M/c /Los Angles m/c /high speed starrier, Abrasion Testing M/C/ rotating shaker/ Washing & Drying M/c / & rpm measurement of equipment's)	Using Digital Tachometer By direct method with strip & SANASTR45-II-2017	1000 rpm to 99000 rpm	0.07 % of rdg

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Thermal Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Temperature & Humidity				
1	RTD, Thermocouples, With or Without Controller/ Indicator/Data logger /Recorder, Temperature Transmitter, Temperature Gauge, Temperature Switch, Glass Thermometer Digital Thermometer	6½ Digital Mustimeter /Precision Temperature scanner with SSPRT / Liquid Bath, by Comparison Method	-80 °C to 50 °C	0.12 °C
			50 °C to 250 °C	0.19 °C
2	RTD/Thermocouples, With or without Controller/ Indicator/Data logger /Recorder, Temperature Transmitter, Temperature Switch, Digital Thermometer	6½ Digital Mustimeter/, Precision Temperature scanner with SSPRT / Digital Temperature Indicator with S-Type TC & Dry Block Furnaces by Comparison Method	250 °C to 600 °C	0.25 °C
3	Thermocouples, With or without Controller/ Indicator/Data logger /Recorder, Temperature Transmitter, Digital Thermometer	6½ Digital Multimeter/Digital Temperature Indicator with S-Type TC & Dry Block Furnaces by Comparison Method	600 °C to 800 °C	1.95 °C
			800 °C to 1200 °C	2.44 °C
4	RTD, Thermocouples, With or Without Controller/ Indicator/Data logger /Recorder, Temperature Transmitter, Temperature Gauge, Digital Thermometer	6½ Digital Multimeter/ Precision Temperature scanner with SSPRT & Liquid Nitrogen at by Comparison Method	-196 °C	0.21 °C

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Thermal Calibration (Laboratory Based)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
5	Temperature Indicator with sensor of Liquid Bath, Oven, GC Oven, Dry Block furnace, Refrigerator, Auto clave, Incubator, BOD, COD, Environmental Chamber (Single Position Calibration)- Temperature Measurement	Precision Temperature scanner with SSPRT/Simplex-4 wire, RTD with Indicator By Comparison Method	-80 °C to 600 °C	0.15 °C
6	Temperature Indicator with sensor of Dry Block Furnace/ Muffle Furnace (Single Position calibration)	Digital Temperature Indicator with S- Type TC by Comparison Method	600 °C to 800 °C	1.95 °C
			800 °C to 1200 °C	2.50 °C
7.	Non-Contact Type Thermometer (Infrared Thermometer / Digital Pyrometer)	Digital Pyrometer Black Body Furnace by Comparison Method	50 °C to 600 °C	3.50 °C
			600 °C to 1200 °C	5.40 °C
8.	Thermo-hygrometer /Data logger /Recorder @ 50% RH	Temperature scanner with SSPRT, Humidity Chamber by Comparison method	10 °C to 50°C	0.19 °C
9.	Digital /Analog Hygrometer, RH sensor with Indicator/ Controller / Data logger / Recorder@25 °C.	Digital RH Indicator with Sensor, Humidity Generator & Chamber By Comparison Method	10 %RH to 95 %RH	1 %RH

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Thermal Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
Temperature & Humidity				
1	RTD, Thermocouples, With or Without Controller/ Indicator/Data logger /Recorder, Temperature Transmitter, Temperature Gauge, Temperature Switch, Glass Thermometer Digital Thermometer	6½ Digital Mustimeter /Precision Temperature scanner with SSPRT / Liquid Bath, by Comparison Method	-80 °C to 50 °C	0.12 °C
			50 °C to 250 °C	0.19 °C
2	RTD/Thermocouples, With or without Controller/ Indicator/Data logger /Recorder, Temperature Transmitter, Temperature Switch, Digital Thermometer	6½ Digital Mustimeter/, Precision Temperature scanner with SSPRT / Digital Temperature Indicator with S-Type TC & Dry Block Furnaces by Comparison Method	250 °C to 600 °C	0.25 °C
3	Thermocouples, With or without Controller/ Indicator/Data logger /Recorder, Temperature Transmitter, Digital Thermometer	6½ Digital Multimeter/Digital Temperature Indicator with S-Type TC & Dry Block Furnaces by Comparison Method	600 °C to 800 °C	1.95 °C
			800 °C to 1200 °C	2.44 °C
4	RTD, Thermocouples, With or Without Controller/ Indicator/Data logger /Recorder, Temperature Transmitter, Temperature	6½ Digital Multimeter/ Precision Temperature scanner with SSPRT & Liquid Nitrogen at by Comparison Method	-196 °C	0.21 °C

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Thermal Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
	Gauge, Digital Thermometer			
5	Temperature Indicator with sensor of Liquid Bath, Oven, GC Oven, Dry Block furnace, Refrigerator, Auto clave, Incubator, BOD, COD, Environmental Chamber(Single Position Calibration)- Temperature Measurement	Precision Temperature scanner with SSPRT/Simplex-4 wire, RTD with Indicator by Comparison Method	-80 °C to 600 °C	0.15 °C
6	Temperature Indicator with sensor of Dry Block Furnace/ Muffle Furnace (Single Position calibration)	Digital Temperature Indicator with S- Type TC by Comparison Method	600 °C to 800 °C	1.95 °C
			800 °C to 1200 °C	2.50 °C
7	Environment Chamber, Furnaces,Freezers/refrigerator, Oven, Vacuum Oven, Dry Block furnace, Auto Clave, Incubator, BOD, COD, Carbon Sulphur furnace Centrifuge,. Cold/ Hot Room, , Aging Oven(Multi position Calibration	Precision Temperature scanner with RTDs By comparison Method	-80 °C to 50 °C	1.10 °C
			50 °C to 300 °C	1.10 °C

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Dealing Officer

SCOPE OF ACCREDITATION

(Annexure to Certificate of CL – 111)

Thermal Calibration (At Site)

S. No.	Parameter	Calibration Method/ Procedure & Equipment used as Reference Standard	Range	Uncertainty in Measurement (±) *
8	Dry Block Furnace/ Muffle Furnace(Multi Position Calibration)	Data Logger with Thermocouple By Comparison Method	600 °C to 1200 °C	5.50 °C
9	Industrial Furnace (Multi position Calibration)	Data Logger with Thermocouple by Comparison method	300 °C to 600 °C	3.60 °C
			600 °C to 1200 °C	5.50 °C
10	Temperature indicator with sensor of Black Body Furnace (Single Position calibration	Using Digital Pyrometer	0 °C to 600 °C	3.35 °C
			600 °C to 1200 °C	5.40 °C
11	Environment Chamber / Humidity Chamber/ Humidity Source, Humidity Calibrator /Generator (single position, Humidity measurement) @(25 +/- 2°C) °C	Digital RH Indicator with Sensor	10 %RH to 95 %RH	0.90 %RH
12	Environment Chamber / Humidity Chamber/Humidity Source, Humidity Calibrator/Generator (Multiplications, Multiple Sensors, Humidity measurement/ Mapping)@25 °C	Using Wireless Data Loggers by Comparison Method	15 %RH to 95 %RH	2.10 %RH

***Expanded uncertainty expressed in coverage probability of approximately 95 % (coverage factor K=2)**

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