



सूक्ष्म, लघु एवं मध्यम उद्यम
MICRO, SMALL & MEDIUM ENTERPRISES
MSME - TECHNOLOGY DEVELOPMENT CENTRE,
MUMBAI

वैद्युतिक मापन उपयंत्र अभिकल्प संस्थान, मुंबई - ४०० ०२२.

INSTITUTE FOR DESIGN OF ELECTRICAL
MEASURING INSTRUMENTS, MUMBAI - 400 022.



ELECTRICAL CALIBRATION LABORATORY

Instrument Sr. No. : 1372004
Date of Calibration : 12/12 to 23/12/2016

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Certificate No. : CC/ECL/1953/16-17

RESISTANCE CALIBRATION

Calibration Standard		Unit Under Calibration		Error		Exp. Uncert in %
Range	Reading	Range	Reading	Units	% of Rdg	
Auto Ohms	kΩ		kΩ	kΩ		
	5.000002	3.3 to	5.00000	-0.000002	-0.00004	0.002
	10.900009	10.99999k Ω , 4Wire	10.90000	-0.000009	-0.0001	0.001
	20.000024	11 to	20.00000	-0.000024	-0.0001	0.001
	32.900011	32.99999k Ω , 4Wire	32.90000	-0.000011	-0.00003	0.002
	49.99992	33 to	50.0000	0.00008	0.0002	0.002
	109.90001	109.9999k Ω , 4Wire	109.9000	-0.00001	-0.00001	0.001
	199.99894	110 to	200.0000	0.00106	0.0005	0.001
	329.89863	329.9999k Ω , 2Wire	329.9000	0.0014	0.0004	0.002
	MΩ		MΩ	MΩ		
	0.4999980	330 k Ω to	0.500000	0.0000020	0.0004	0.002
	1.0899992	1.099999 M Ω , 2Wire	1.090000	0.0000008	0.0001	0.002
	1.9999703	1.1 to	2.000000	0.0000297	0.001	0.002
	3.2899949	3.299999 M Ω , 2Wire	3.290000	0.0000051	0.0002	0.006
	4.999945	3.3 M Ω to	5.00000	0.000055	0.001	0.005
	10.899989	10.99999M Ω , 2Wire	10.90000	0.000011	0.0001	0.004
	19.998212	11 to	20.00000	0.001788	0.009	0.003
	32.899515	32.9999 M Ω , 2Wire	32.90000	0.00048	0.001	0.05
	49.99762	33 to	50.0000	0.0024	0.005	0.04
	109.88872	109.9999 M Ω , 2Wire	109.9000	0.0113	0.01	0.02
	199.9267	110 M Ω to	200.000	0.0733	0.04	0.08
	330.0425	329.9999 M Ω , 2Wire	329.900	-0.1425	-0.04	0.05
	499.699	330 to	500.00	0.301	0.06	0.3
	1000.568	1100.00 M Ω , 2Wire	1000.00	-0.568	-0.06	0.2

Note : Value mentioned above is the mean of 5 readings.

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ELECTRICAL CALIBRATION LABORATORY

Instrument Sr. No. : 1372004
Date of Calibration : 12/12 to 23/12/2016

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Certificate No. : CC/ECL/1953/16-17

Calibration Results :

CAPACITANCE CALIBRATION

Calibration Standard		Unit Under Calibration		Error		Exp. Uncert in %
Range	Reading	Range	Reading	Units	% of Rdg	
Standard DMM with Standard Capacitors	nF 0.99338	0.4 nF to 1.0999 nF	nF 1.0000	nF 0.0066	0.67	0.6
	9.98468	3.3 nF to 10.9999 nF	10.0000	0.0153	0.15	0.5
	100.0327	33 nF to 109.999 nF	100.000	-0.0327	-1.03	0.3
	μF 0.998383	0.33 μF to 1.09999 μF	μF 1.00000	μF 0.0016	0.16	0.2
	9.99600	3.3 μF to 10.9999 μF	10.0000	0.0040	0.04	0.1
	100.1200	33 μF to 109.999 μF	100.000	-0.12	-0.12	0.1
	mF 1.00360	0.33 μF to 1.0999 mF	mF 1.0000	mF -0.0036	-0.36	0.4

Note : 1) Value mentioned above is the mean of 5 readings.
2) Standard Capacitors value are traceable at 1kHz.

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ELECTRICAL CALIBRATION LABORATORY

Instrument Sr. No. : 1372004
Date of Calibration : 12/12 to 23/12/2016

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Calibration Results :

FREQUENCY CALIBRATION

Calibration Standard		Unit Under Calibration		Error		Exp.Uncert in %
Range	Reading	Range	Reading	Units	% of Rdg	
Auto Hz @ 3 VAC	Hz		Hz	Hz		
	44.99997	0.01 to 119.99 Hz	45.00	0.00003	0.0001	0.0002
	49.99996		50.00	0.00004	0.0001	0.0002
	99.9999		100.00	0.0001	0.0001	0.0002
	499.9997	120.0 to 1199.9 Hz	500.0	0.0003	0.0001	0.0002
	1099.999		1100.0	0.001	0.0001	0.0002
	kHz		kHz	kHz		
	1.199999	1.2 to 11.999 kHz	1.200	0.000001	0.0001	0.0002
	11.899990		11.900	0.000010	0.0001	0.0002
	49.99997	12 to 119.99 kHz	50.00	0.00003	0.0001	0.0002
	118.9999		119.00	0.0001	0.0001	0.0002
	499.9997	120.0 to 1199.9 kHz	500.0	0.0003	0.0001	0.0002
	MHz		MHz	MHz		
	0.9999995		1.0000	0.0000005	0.0001	0.0002
	1.198999		1.1990	0.000001	0.0001	0.0002
	1.199999	1.2 to 2MHz	1.200	0.000001	0.0001	0.0002
	2.000001		2.000	-0.000001	-0.00005	0.0002

Note : Value mentioned above is the mean of 5 readings.

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ELECTRICAL CALIBRATION LABORATORY

Instrument Sr. No:1372004

Date of Calibration :12/12to 23/12/2016

Page No. : 15 of 22

Certificate No. : CC/ECL/1953/16-17

Calibration Results :

THERMOCOUPLE CALIBRATION Source Mode

Calibration Standard		Unit Under Calibration		Error		Exp.Uncert in °C
Range	Reading	Range	Reading	Units	% of Rdg	
Auto mV DC	Calculated °C		°C	°C		
	600.050	B-T/C (600°C TO 1820°C)	600.00	-0.050	-0.008	0.1
	800.000		800.00	0.000	0.00	0.07
	1000.044		1000.00	-0.044	-0.004	0.07
	1200.045		1200.00	-0.045	-0.004	0.06
	1400.036		1400.00	-0.036	-0.003	0.06
	1800.017		1800.00	-0.017	-0.001	0.05
	-250.043	T-T/C (-250°C TO 400°C)	-250.00	0.043	-0.017	0.1
	0.003		0.00	-0.003	-	0.07
	99.996		100.00	0.004	0.004	0.05
	200.013		200.00	-0.013	-0.01	0.05
	299.997		300.00	0.003	0.001	0.05
	399.010		399.00	-0.010	-0.003	0.03
	0.040	R-T/C (0°C TO 1767°C)	0.00	-0.040	-	0.2
	299.970		300.00	0.030	0.01	0.16
	600.058		600.00	-0.058	-0.01	0.14
	900.000		900.00	0.000	0.00	0.14
	1200.007		1200.00	-0.007	-0.001	0.08
	1499.964		1500.00	0.036	0.002	0.05
	1759.954		1760.00	0.046	0.003	0.05
	-199.990	N-T/C (-200°C TO 1300°C)	-200.00	-0.010	0.01	0.06
	0.008		0.00	-0.008	-	0.06
	100.037		100.00	-0.037	-0.04	0.05
	499.992		500.00	0.008	0.002	0.05
	999.972		1000.00	0.028	0.003	0.04
	1298.997		1299.00	0.003	0.0002	0.03
	-248.918	E-T/C (-250°C TO 1000°C)	-249.00	-0.082	0.03	0.3
	0.003		0.00	-0.003	-	0.22
	200.015		200.00	-0.015	-0.01	0.14
	400.004		400.00	-0.004	-0.001	0.14
	599.969		600.00	0.031	0.005	0.07
	799.978		800.00	0.022	0.003	0.05
	999.939		1000.00	0.061	0.006	0.02

Note : 1) Above mentioned values are mean of 5 readings.

2) Above Calibration is done by simulation method.

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ELECTRICAL CALIBRATION LABORATORY

Instrument Sr. No:1372004
Date of Calibration :12/12to 23/12/2016

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Certificate No. : CC/ECL/1953/16-17

Calibration Results :

THERMOCOUPLE/RTD CALIBRATION Source Mode

Calibration Standard		Unit Under Calibration		Error		Exp. Uncert in °C
Range	Reading	Range	Reading	Units	% of Rdg	
Auto mV DC	Calculated °C		°C	°C		
	0.040		0.00	-0.040	-	0.2
	300.000	S-T/C (0°C TO 1767°C)	300.00	0.000	0.000	0.16
	599.982		600.00	0.018	0.003	0.12
	900.018		900.00	-0.018	-0.002	0.12
	1199.942		1200.00	0.058	0.005	0.06
	1499.958		1500.00	0.042	0.003	0.03
	1759.980		1760.00	0.020	0.001	0.03
	-200.005	J-T/C (-210°C TO 1200°C)	-200.00	0.005	-0.002	0.03
	0.004		0.00	-0.004	-	0.03
	199.996		200.00	0.004	0.002	0.03
	399.989		400.00	0.011	0.003	0.03
	600.010		600.00	-0.010	-0.002	0.03
	800.014		800.00	-0.014	-0.002	0.03
	999.981		1000.00	0.019	0.002	0.03
	1198.996		1199.00	0.004	0.0003	0.03
	-199.993	K-T/C (-200°C TO 1372°C)	-200.00	-0.007	0.004	0.04
	0.005		0.00	-0.005	-	0.04
	200.005		200.00	-0.005	-0.002	0.04
	499.995		500.00	0.005	0.001	0.03
	999.972		1000.00	0.028	0.003	0.03
	1349.959		1350.00	0.041	0.003	0.02
Auto Ohms	-198.997	Pt- 385 (-200°C to 800°C)	-199.000	-0.003	0.002	0.01
	-50.023		-50.000	0.023	-0.05	0.01
	-0.019		0.000	0.019	-	0.01
	49.973		50.000	0.027	0.05	0.01
	199.951		200.000	0.049	0.02	0.01
	399.959		400.000	0.041	0.01	0.02
	799.921		800.000	0.079	0.01	0.02

Note : 1) Above mentioned values are mean of 5 readings.

2) Above Calibration is done by simulation method.

Amalashin
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Shadhekar
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ELECTRICAL CALIBRATION LABORATORY

Instrument Sr. No:1372004
Current Coil Sr. No. : 0025678
Date of Calibration :12/12to 23/12/2016

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Certificate No. : CC/ECL/1953/16-17

Calibration Results :

CUEERNT COIL CALIBRATION

Calibration Standard		Unit Under Calibration		Error		Expanded Uncert. in %
Range	Reading	Range	Reading	Units	% of Rdg.	
	Calculated A		Calculated A	A		
Auto	20.041	1000 AAC	20.00	-0.041	-0.20	0.7
Volts	100.061	@ 50 Hz	100.00	-0.061	-0.06	0.7
AC	200.304	(Calibrator with	200.00	-0.304	-0.15	0.7
with Current	500.652	Current Coil)	500.00	-0.652	-0.13	0.7
Clamp	1001.987		1000.00	-1.987	-0.20	0.7
Auto	19.682	1000 A	20.00	0.318	1.62	0.8
Volts	100.404	DC	100.00	-0.404	-0.40	0.8
DC	198.389	(Calibrator with	200.00	1.611	0.81	0.8
with Current	497.890	Current Coil)	500.00	2.110	0.42	0.8
Clamp	991.644		995.00	3.356	0.34	0.8

Note : Above mentioned values are mean of 5 readings.

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ELECTRICAL CALIBRATION LABORATORY

Instrument Sr. No. : 1372004
Date of Calibration : 12/12 to 23/12/2016

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Certificate No. : CC/ECL/1953/16-17

Calibration Results :

AC POWER CALIBRATION AT 50Hz, UPF

Calibration Standard		Unit Under Calibration			Error		Exp. Uncert in %
Range	Reading	Voltage	Current	Wattage	Units	% of Rdg	
Auto AC Voltage & Current 0-1-0 Lead / Lag PF	mW	V	A	mW	mW		
	**30.026	1	0.03	30.00	-0.026	-0.09	0.06
	W			W	W		
	**1.0006	1	1	1.000	-0.0006	-0.06	0.06
	**5.0044	1	5	5.000	-0.0044	-0.09	0.06
	**10.007	1	10	10.00	-0.007	-0.07	0.06
	**20.022	1	20	20.00	-0.022	-0.11	0.06
	mW			mW	mW		
	**300.05	10	0.03	300.0	-0.05	-0.02	0.06
	W			W	W		
	**10.0012	10	1	10.00	-0.0012	-0.01	0.06
	**50.003	10	5	50.00	-0.003	-0.01	0.06
	**100.009	10	10	100.0	-0.009	-0.01	0.06
	**199.89	10	20	200.0	-0.09	-0.04	0.06
	W			W	W		
	4.5005	150	0.03	4.500	-0.0005	-0.01	0.04
	150.01	150	1	150.0	-0.01	-0.01	0.04
	750.06	150	5	750.0	-0.06	-0.01	0.04
	1500.1	150	10	1500	-0.1	-0.01	0.04
	3001.7	150	20	3000	-1.7	-0.06	0.04
	W			W	W		
	9.0008	300	0.03	9.000	-0.0008	-0.01	0.04
	300.03	300	1	300.0	-0.03	-0.01	0.04
	1500.09	300	5	1500.0	-0.09	-0.01	0.04
	3000.4	300	10	3000	-0.4	-0.01	0.04
	6002.5	300	20	6000	-2.5	-0.04	0.04
	W			W	W		
	15.0012	500	0.03	15.000	-0.0012	-0.01	0.04
	500.05	500	1	500.0	-0.05	-0.01	0.04
	2500.19	500	5	2500.0	-0.19	-0.01	0.04
	5000.17	500	10	5000	-0.17	-0.003	0.04
	10004.0	500	20	10000	-4.0	-0.04	0.04

Note : 1) Value mentioned above is the mean of 5 readings.

2) Above " ** " Mark Readings are not covered under the scope of NABL Accreditation.

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ELECTRICAL CALIBRATION LABORATORY

Instrument Sr. No. : 1372004
Date of Calibration : 12/12 to 23/12/2016

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Calibration Results :

AC POWER CALIBRATION AT 50Hz, 0.5 Lag

Calibration Standard		Unit Under Calibration			Error		Exp. Uncert in %
Range	Reading	Voltage	Current	Wattage	Units	% of Rdg	
Auto AC Voltage & Current 0-1-0 Lead / Lag PF	mW	V	A	mW	mW		
	**15.032	1	0.03	15.00	-0.032	-0.21	0.12
	**522.61	1	1	500	-7.53	-1.48	0.12
	W			W	W		
	**2.5290	1	5	2.500	-0.0290	-1.15	0.12
	**5.143	1	10	5.00	-0.143	-2.78	0.12
	**10.232	1	20	10.00	-0.232	-2.27	0.12
	mW			mW	mW		
	**150.15	10	0.03	150.0	-0.15	-0.10	0.12
	W			W	W		
	**4.998	10	1	5.00	0.0020	0.04	0.12
	**24.992	10	5	25.00	0.008	0.03	0.12
	**43.975	10	10	50.0	0.025	0.05	0.12
	**99.96	10	20	100.0	0.04	0.04	0.12
	W			W	W		
	2.2508	150	0.03	2.250	-0.0008	-0.04	0.08
	75.00	150	1	75.0	0.00	0.00	0.08
	374.91	150	5	375.0	0.09	0.02	0.08
	749.7	150	10	750	0.3	0.04	0.08
	1499.7	150	20	1500	0.3	0.02	0.08
	W			W	W		
	4.5019	300	0.03	4.500	-0.0019	-0.04	0.08
	150.00	300	1	150.0	0.00	0.00	0.08
	749.78	300	5	750.0	0.22	0.03	0.08
	1499.6	300	10	1500.0	0.4	0.03	0.08
	3000.6	300	20	3000	-0.6	-0.02	0.08
	W			W	W		
	7.5020	500	0.03	7.500	-0.0020	-0.03	0.08
	249.98	500	1	250.0	0.02	0.01	0.08
	1249.50	500	5	1250.0	0.50	0.04	0.08
	2499.7	500	10	2500	0.3	0.01	0.08
	5001.4	500	20	5000	-1.4	-0.03	0.08

Note : 1) Value mentioned above is the mean of 5 readings.

2) Above " " Mark Readings are not covered under the scope of NABL Accreditation.

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ELECTRICAL CALIBRATION LABORATORY

Instrument Sr. No. : 1372004
Date of Calibration : 12/12 to 23/12/2016

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Certificate No. : CC/ECL/1953/16-17

Calibration Results :

AC POWER CALIBRATION AT 50Hz ,0.2 Lag

Calibration Standard		Unit Under Calibration			Error		Exp.Uncert in %
Range	Reading	Voltage	Current	Wattage	Units	% of Rdg	
Auto AC Voltage & Current 0-1-0 Lead / Lag PF	mW	V	A	mW	mW		
	**6.025	1	0.03	6.00	-0.025	-0.41	0.3
	**206.5	1	1	200	-6.5	-3.15	0.3
	W			W	W		
	**1.0739	1	5	1.000	-0.0739	-6.88	0.3
	**2.188	1	10	2.00	-0.188	-8.59	0.3
	**4.469	1	20	4.00	-0.469	-10.49	0.3
	mW			mW	mW		
	**60.19	10	0.03	60.0	-0.19	-0.32	0.3
	W			W	W		
	**2.001	10	1	2.00	-0.001	-0.05	0.3
	**9.999	10	5	10.00	0.001	0.01	0.3
	**19.998	10	10	20.0	0.002	0.01	0.3
	**40.03	10	20	40.0	-0.03	-0.07	0.3
	mW			mW	mW		
	901.4	150	0.03	900	-1.4	-0.16	0.2
	W			W	W		
	29.99	150	1	30.0	0.01	0.03	0.2
	149.97	150	5	150.0	0.03	0.02	0.2
	300.0	150	10	300	0.0	0.00	0.2
	600.1	150	20	600	-0.1	-0.02	0.2
	W			W	W		
	1.8028	300	0.03	1.800	-0.0028	-0.16	0.2
	60.04	300	1	60.0	-0.04	-0.07	0.2
	300.06	300	5	300.0	-0.06	-0.02	0.2
	600.0	300	10	600	0.0	0.00	0.2
	1200.5	300	20	1200	-0.5	-0.04	0.2
	W			W	W		
	3.0035	500	0.03	3.000	-0.0035	-0.12	0.2
	100.06	500	1	100.0	-0.06	-0.06	0.2
	500.26	500	5	500.0	-0.26	-0.05	0.2
	1000.6	500	10	1000	-0.6	-0.06	0.2
	2002.5	500	20	2000	-2.5	-0.12	0.2

Note : 1) Value mentioned above is the mean of 5 readings.

2) Above " " Mark Readings are not covered the under the scope of NABL Accreditation.

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ELECTRICAL CALIBRATION LABORATORY

Instrument Sr. No. : 1372004
Date of Calibration : 12/12 to 23/12/2016

Page No. : 21 of 22
Certificate No. : CC/ECL/1953/16-17

Calibration Results :

AC POWER CALIBRATION AT 50Hz, 0.8 Lead

Calibration Standard		Unit Under Calibration			Error		Exp. Uncert in %
Range	Reading	Voltage	Current	Wattage	Units	% of Rdg	
Auto AC Voltage & Current 0-1-0 Lead / Lag PF	mW	V	A	mW	mW		
	**24.014	1	0.03	24.00	-0.014	-0.06	0.08
	**792.4	1	1	800	7.6	0.96	0.08
	W			W	W		
	**3.9523	1	5	4.000	0.0477	1.21	0.08
	**7.905	1	10	8.00	0.095	1.20	0.08
	**15.966	1	20	16.00	0.034	0.21	0.08
	mW			mW	mW		
	**239.96	10	0.03	240.0	0.04	0.02	0.08
	W			W	W		
	**8.003	10	1	8.00	-0.003	-0.04	0.08
	**40.015	10	5	40.00	-0.015	-0.04	0.08
	**80.03	10	10	80.0	-0.03	-0.04	0.08
	**160.07	10	20	160.0	-0.07	-0.04	0.08
	W			W	W		
	3.5999	150	0.03	3.600	0.0001	0.003	0.05
	120.03	150	1	120.0	-0.03	-0.02	0.05
	600.25	150	5	600.0	-0.25	-0.04	0.05
	1200.4	150	10	1200	-0.4	-0.03	0.05
	2400.8	150	20	2400	-0.8	-0.03	0.05
	W			W	W		
	7.2001	300	0.03	7.200	-0.0001	-0.001	0.05
	240.08	300	1	240.0	-0.08	-0.03	0.05
	1200.67	300	5	1200.0	-0.67	-0.06	0.05
	2400.9	300	10	2400	-0.9	-0.04	0.05
	4802.3	300	20	4800	-2.2	-0.05	0.05
	W			W	W		
	12.0010	500	0.03	12.000	-0.0010	-0.01	0.05
	400.16	500	1	400.0	-0.16	-0.04	0.05
	2001.09	500	5	2000.0	-1.09	-0.05	0.05
	4001.5	500	10	4000	-1.5	-0.04	0.05
	8003.6	500	20	8000	-3.4	-0.04	0.05

Note : 1) Value mentioned above is the mean of 5 readings.

2) Above " " Mark Readings are not covered the under the scope of NABL Accreditation.

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ELECTRICAL CALIBRATION LABORATORY

Instrument Sr. No. : 1372004

Date of Calibration : 12/12 to 23/12/2016

PageNo. : 22 of 22

Certificate No. : CC/ECL/1953/16-17

Calibration Results :

POWER FACTOR

Calibration Standard		Unit Under Calibration		Error		Exp.Uncert
Range	Reading	Range	Reading	Units	% of Rdg	in PF
Auto	PF	300 V & 10 A @ 50 Hz	PF	PF		
AC	1.0000		1.000	0.0000	-	0.001
Voltage	Lag		Lag	Lag		
&	0.2001		0.200	-0.0001	-	0.001
Current	0.5001		0.500	-0.0001	-	0.001
0-1-0	0.7999		0.800	0.0001	-	0.001
Lead / Lag	Lead		Lead	Lead		
PF	0.2002		0.200	-0.0002	-	0.001
	0.5000		0.500	0.0000	-	0.001
	0.8000		0.800	0.0000	-	0.001

Note : Value mentioned above is the mean of 5 readings.

*** End of Calibration Certificate ***

Guha

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