

Laboratory Toshniwal Enterprises Controls Pvt. Ltd. (TECPL)- Cal Express, 1A,  
Akrur Dutta Lane, 3rd Floor, Kolkata, West Bengal

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number CC-2682

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Validity 23.04.2018 to 22.04.2020

Last Amended on -

Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
<b><u>ELECTRO TECHNICAL CALIBRATION</u></b>				
<b>I.</b>	<b>SOURCE</b>			
1.	DC Voltage <sup>#</sup>	1 mV to 300 mV 300 mV to 300 V 300 V to 1000 V	0.36% to 0.008% 0.008% to 0.007% 0.007% to 0.007%	Using Multi Product Calibrator Fluke-5502A by Direct Method
2.	DC Current <sup>#</sup>	10 $\mu$ A to 300 $\mu$ A 300 $\mu$ A to 300 mA 300 mA to 1 A 1 A to 10 A 10 A to 20 A 20 A to 500 A 500 A to 1000 A	2.9% to 0.03% 0.03% to 0.06% 0.06% to 0.05% 0.05% to 0.14% 0.14% to 0.52% 0.52% to 0.3% 0.3% to 0.3%	Using Multi Product Calibrator Fluke-5502A with Turn coil by Direct Method
3.	Resistance <sup>#</sup>	0.1 $\Omega$ to 1 $\Omega$ 1 $\Omega$ to 300 $\Omega$ 300 $\Omega$ to 1 k $\Omega$ 1 k $\Omega$ to 300 k $\Omega$ 300 k $\Omega$ to 1 M $\Omega$ 1 M $\Omega$ to 100 M $\Omega$ 100 M $\Omega$ to 1G $\Omega$ 1G $\Omega$ to 10 G $\Omega$	1.6% to 0.2% 0.2% to 0.1% 0.1% to 0.09% 0.09% to 0.03% 0.03% to 0.03% 0.03% to 0.6% 0.6% to 3.5% 3.5%	Using Multi Product Calibrator Fluke-5502 & AVO MEGGER CB101 by Direct Method
4.	Frequency <sup>#</sup>	1Hz to 10 Hz 10 Hz to 1000 Hz 1000 Hz to 1 MHz 1 MHz to 2 MHz 2 MHz to 10 MHz 10 MHz to 3 GHz	0.8% to 0.1% 0.1% to 0.015% 0.015% to 0.014% 0.014% to 0.013% 0.013% to 0.00011% 0.00011%	Using Multi Product Calibrator Fluke-5502A, Signal Generator R&S-SME 03 by Direct Method

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Convenor

Avijit Das  
Program Manager

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5.	AC Voltage <sup>#</sup>	<b>45 Hz to 10 kHz</b> 10 mV to 300 mV 300 mV to 30 V 30 V to 300 V 300 V to 750 V 750 V to 1000 V  <b>45 Hz</b> 1000 V	0.1% to 0.3% 0.3% to 0.1% 0.1% to 0.1% 0.1% to 0.07% 0.07% to 0.1%  0.1%	Using Multi Product Calibrator Fluke-5502A by Direct Method
6.	AC Current <sup>#</sup>	<b>50 Hz to 5 kHz</b> 1mA to 300 mA 300 mA to 1A 1A to 10 A 10 A to 19.9 A  <b>50 Hz</b> 19.9 A to 20 A 20 A to 100 A 100 A to 500 A 500 A to 1000 A	9.54% to 0.20% 0.20% to 0.81% 0.81% to 0.33% 0.33%  2.04% to 2.04% 2.04% to 2% 2% to 2.96% 2.96%	Using Multi Product Calibrator Fluke-5502A with Turn coil by Direct Method
7.	Capacitance <sup>#</sup>	<b>1 kHz</b> 1nF to 300 nF 300 nF to 1 $\mu$ F 1 $\mu$ F to 10 $\mu$ F 10 $\mu$ F to 300 $\mu$ F 300 $\mu$ F to 1mF	1.7% to 0.5% 0.5% to 0.5% 0.5% 0.5% to 0.7% 0.7% to 0.64%	Using Multi Product Calibrator Fluke-5502A by Direct Method
8.	Inductance <sup>#</sup>	<b>1 kHz</b> 0.1mH to 1mH 1mH to 10 mH 10 mH to 100 mH	2.3% 2.3% 2.3%	Using Decade Inductance Box ME323 by Direct Method

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9.	Temperature Simulation <sup>#</sup> RTD	(-)200°C to 0°C 0°C to 660°C	0.5°C	Using Multi Product Calibrator Fluke-5502A by Direct Method
	J Type Thermocouple	(-)200°C to 0°C 0°C to 1200°C	0.45°C	
	K Type Thermocouple	(-)200°C to 0°C 0°C to 1350°C	0.66°C	
	R Type Thermocouple	0°C to 1700°C	0.95°C	
	S Type Thermocouple	0°C to 1700°C	0.8°C	
11.	Phase Angle/ Power Factor <sup>#</sup>	<b>50 Hz</b> <b>Lead</b> 0.2 PF to 0.5 PF 0.5 PF to 0.8 PF	0.01PF 0.01PF 0.01PF	Using Multi Product Calibrator Fluke-5502A by Direct Method
		UPF <b>Lag</b> 0.2 PF to 0.5 PF 0.5 PF to 0.8 PF	0.01PF 0.01PF	
12.	DC Power <sup>#</sup>	<b>15 V to 600 V</b> <b>0.5 A to 20 A</b> 7.5 W to 12 kW	1.2% to 0.3%	Using Multi Product Calibrator Fluke-5502A by Direct Method

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Sl.	Quantity Measured / Instrument	Range/Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
13.	AC Power <sup>#</sup> 1 $\emptyset$	<b>UPF</b> 100V to 600V, 0.5A to 19A 50W to 11.4kW  <b>At 0.5 PF Lead</b> 100V to 600V, 0.5A to 19A 25W to 5.7kW  <b>At 0.5 PF Lag</b> 100V to 600V, 0.5A to 19A 25W to 5.7kW	0.7% to 0.5%  4% to 0.5%  4% to 0.5%	Using Multi Product Calibrator Fluke-5502A by Direct Method
14.	RF Power <sup>#</sup>	<b>10MHz</b> 13dBm to (-)70dBm <b>1GHz</b> 13dBm to (-)70dBm <b>3GHz</b> 13dBm to (-)70dBm	1.2dB  1.2dB  2.29dB	Using Signal Generator R&S-SME 03 by Direct Method
II.	<b>MEASURE</b>			
1.	DC Voltage <sup>#</sup>	1mV to 100mV 100mV to 1V 1V to 10V 10V to 100V 100V to 1000V	0.14% 0.14% to 0.01 % 0.01 % to 0.012 % 0.012 % to 0.006 % 0.006 % to 0.007 %	Using 6 <sup>1</sup> / <sub>2</sub> Digital Multimeter Agilent-34401A by Direct Method
2.	DC Current <sup>#</sup>	1mA to 10mA 10mA to 100mA 100mA to 1A 1A to 3A	0.3 % to 0.12 % 0.12 % 0.12 % to 2 % 2 % to 1%	Using 6 <sup>1</sup> / <sub>2</sub> Digital Multimeter Agilent-34401A by Direct Method

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3.	Resistance <sup>#</sup>	0.1 $\Omega$ to 1 $\Omega$ 1 $\Omega$ to 100 $\Omega$ 100 $\Omega$ to 1k $\Omega$ 1k $\Omega$ to 100k $\Omega$ 100k $\Omega$ to 1M $\Omega$ 1M $\Omega$ to 100M $\Omega$ 100M $\Omega$ to 1G $\Omega$ 1G $\Omega$ to 10G $\Omega$	5 % to 0.5 % 0.5 % to 0.02 % 0.02 % to 0.03 % 0.03 % to 0.02 % 0.02 % to 0.08 % 0.08 % to 1 % 1 % to 2.7 % 2.7 % to 14.7 %	Using 6 <sup>1</sup> / <sub>2</sub> Digital Multimeter Agilent-34401A, Insulation Tester Fluke-1507 by Direct Method
4.	Frequency <sup>#</sup>	10Hz to 40Hz 40Hz to 50Hz 50Hz to 500Hz 500Hz to 1kHz 1kHz to 300kHz 300kHz to 1MHz 1MHz to 3GHz	0.09 % to 0.04 % 0.04 % to 0.02 % 0.02 % 0.02 % 0.02 % to 0.07 % 0.07 % to 0.006 % 0.006 % to 0.002 %	Using 6 <sup>1</sup> / <sub>2</sub> Digital Multimeter Agilent-34401A, Fieldfox RF Analyzer Agilent-N9912A by Direct Method
5.	AC Voltage <sup>#</sup>	<b>45Hz to 1kHz</b> 1mV to 10mV 10mV to 100mV 100mV to 1V 1V to 100V 100V to 750V	5 % to 0.53 % 0.53 % to 0.12 % 0.12 % 0.12 % 0.12 %	Using 6 <sup>1</sup> / <sub>2</sub> Digital Multimeter Agilent-34401A by Direct Method
6.	AC Current <sup>#</sup>	<b>45Hz to 1kHz</b> 4mA to 10mA 10mA to 100mA 100mA to 1A 1A to 3A	0.12 % to 5 % 5 % to 0.6 % 0.6 % to 0.2 % 0.2 % to 0.3 %	Using 6 <sup>1</sup> / <sub>2</sub> Digital Multimeter Agilent-34401A by Direct Method
7.	Temperature Simulation <sup>#</sup> RTD J Type Thermocouple K Type Thermocouple R Type Thermocouple	(-)20 $^{\circ}$ C to 600 $^{\circ}$ C (-)195 $^{\circ}$ C to 1000 $^{\circ}$ C (-)195 $^{\circ}$ C to 1000 $^{\circ}$ C 0 $^{\circ}$ C to 1600 $^{\circ}$ C	0.34 $^{\circ}$ C 0.35 $^{\circ}$ C 0.50 $^{\circ}$ C 0.84 $^{\circ}$ C	Using Data Acquisition Unit Fluke-3628A by Direct Method

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	S Type Thermocouple	0°C to 1200°C	0.77°C	
8.	RF Power <sup>#</sup>	<b>10MHz</b> 13dBm to (-)70dBm <b>1GHz</b> 13dBm to (-)70dBm <b>3GHz</b> 13dBm to (-)70dBm	0.64dB 0.64dB 0.64dB	Using Fieldfox RF Analyzer Agilent-N9912A by Direct Method

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<b><u>MECHANICAL CALIBRATION</u></b>				
<b>I.</b>	<b>PRESSURE INDICATING DEVICES</b>			
<b>1.</b>	Pressure-Hydraulic Dial and Digital Pressure Gauges, Pressure Transmitters <sup>§</sup>	1bar to 35 bar >35 bar to 1100 bar	0.28% of rdg 0.21% of rdg	Using Hydraulic Dead Weight Tester Fluke-P3125 based on DKD-R 6-1
<b>2.</b>	Pressure-Pneumatic Dial and Digital Pressure Gauges, Pressure Transmitters <sup>#</sup>	0 bar to 20 bar	0.06 bar	Using Portable Pressure Calibrator Fluke-3130 with pneumatic Pump based on DKD-R 6-1
<b>3.</b>	Vacuum Dial and Digital Pressure Gauges, Pressure Transmitters <sup>#</sup>	(-)0.8 bar to 0 bar	0.006 bar	Using Portable Vacuum Calibrator Fluke-3130 with vacuum Pump based on DKD-R 6-1
<b>4.</b>	Pressure-Hydraulic Dial and Digital Pressure Gauges, Pressure Transmitters <sup>*</sup>	20 bar to 1100 bar	2.18 bar	Using Portable Pressure Calibrator Fluke with hydraulic Pump based on DKD-R 6-1

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<b><u>THERMAL CALIBRATION</u></b>				
<b>I.</b>	<b>TEMPERATURE</b>			
<b>1.</b>	RTD & Thermocouple sensors- with and without indicators, Temperature controllers, Digital & Dial Thermometers#	(-) 20°C to 100°C 100°C to 300°C 300°C to 600°C 600°C to 1200°C	0.45°C 0.90°C 2.3°C 3.9°C	Using RTD sensor and DAU with liquid bath by Comparison Method  Using R type T/C sensor and DAU with Dry well bath by Comparison Method
<b>2.</b>	RTD & Thermocouple indicators only for Baths, Ovens, Freezers, Furnace* (Single position Calibration)	(-)20°C to 100°C 100°C to 300°C 300°C to 600°C 600°C to 1200°C	0.45°C 0.90°C 2.3°C 3.9°C	Using RTD sensor and DAU by Comparison Method  Using R type T/C sensor and DAU by Comparison Method

\* Measurement Capability is expressed as an uncertainty ( $\pm$ ) at a confidence probability of 95%

§ Only in Permanent Laboratory

\* Only for Site Calibration

# The laboratory is also capable for site calibration however, the uncertainty at site depends on the prevailing actual environmental conditions and master equipment used.

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