

Laboratory **Arrow Instruments Calibration, 6/875, Lakshmi Nagar, Thoppampatti, Coimbatore, Tamil Nadu**

Accreditation Standard **ISO/IEC 17025: 2005**

Certificate Number **CC-2674**

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Validity **18.05.2018 to 17.05.2020**

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>MEASURE</b>			
<b>1.</b>	DC Voltage <sup>b</sup>	1mV to 10mV 10mV to 100mV 100mV to 1V 1V to 10V 10V to 100V 100V to 1000V	0.42% to 0.044% 0.044% to 0.0088% 0.0088% to 0.0038% 0.0038% to 0.0030% 0.0030% to 0.0046% 0.0046% to 0.0049%	Using Standard 6 ½ DMM by Direct Method
<b>2.</b>	AC Voltage <sup>b</sup>	<b>10 Hz to 20kHz</b> 10mV to 100mV 100mV to 10V  <b>10 Hz to 1kHz</b> 10V to 1000V	0.54% to 0.12% 0.12% to 0.10%  0.10%	Using Standard 6 ½ DMM by Direct Method
<b>3.</b>	DC Current <sup>b</sup>	100µA to 1mA 1mA to 10mA 10mA to 100mA 100mA to 1A 1A to 10A	0.087% to 0.064% 0.064% to 0.082% 0.082% to 0.064% 0.064% to 0.088% 0.088% to 0.19%	Using Standard 6 ½ DMM by Direct Method
<b>4.</b>	AC Current <sup>b</sup>	<b>40 Hz to 1kHz</b> 100µA to 1mA 1mA to 100mA 100mA to 1A 1A to 10A	0.20% to 0.18% 0.18% 0.18% to 0.22% 0.22% to 0.30%	Using Standard 6 ½ DMM by Direct Method

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5.	Resistance <sup>s</sup>	1 $\Omega$ to 10 $\Omega$ 10 $\Omega$ to 100 $\Omega$ 100 $\Omega$ to 1k $\Omega$ 1k $\Omega$ to 100k $\Omega$ 100k $\Omega$ to 1M $\Omega$ 1M $\Omega$ to 10M $\Omega$ 10M $\Omega$ to 100M $\Omega$	0.36% to 0.046% 0.046% to 0.016% 0.016% to 0.012% 0.012% to 0.014% 0.014% to 0.018% 0.018% to 0.05% 0.05% to 0.94%	Using Standard 6 ½ DMM by Direct Method
6.	Frequency <sup>s</sup>	1 Hz to 10Hz 10 Hz to 100Hz  100Hz to 1kHz 1kHz to 100kHz	0.084% to 0.064% 0.064% to 0.0064%  0.0064% to 0.012% 0.012%	Using Multifunction Calibrator by Direct Method  Using Standard 6 ½ DMM by Direct Method
7.	DC Voltage <sup>*</sup>	1mV to 100mV 100mV to 1V 1V to 10V 10V to 50V	1% to 0.053% 0.053% to 0.048% 0.048% to 0.022% 0.022% to 0.027%	Using Multifunction Calibrator by Direct Method
8.	DC Current <sup>*</sup>	1mA to 50mA	0.25% to 0.038%	Using Multifunction Calibrator by Direct Method
9.	Resistance <sup>*</sup>	1 $\Omega$ to 400 $\Omega$ 400 $\Omega$ to 4k $\Omega$	1.80% to 0.082% 0.082% to 0.072%	Using Multifunction Calibrator by Direct Method
10.	Frequency <sup>*</sup>	1Hz to 10Hz 10Hz to 100Hz 100Hz to 20kHz	0.086% to 0.009% 0.009% to 0.065% 0.065% to 0.014%	Using Multifunction Calibrator by Direct Method

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11.	Time <sup>#</sup>	1 sec to 10 sec 10 sec to 3600 sec 3600sec to 36000sec	0.10 sec 0.10 sec to 3.32 sec 3.32 sec to 29.98 sec	Using Digital Timer
12.	Temperature Simulation <sup>#</sup> J Type Thermocouple K Type Thermocouple T Type Thermocouple R Type Thermocouple S Type Thermocouple B Type Thermocouple RTD (PT100)	(-)100°C to 1200°C (-)100°C to 100°C 100°C to 1300°C (-)100°C to 100°C 100°C to 400°C 150°C to 1000°C 1000°C to 1700°C 150°C to 1000°C 1000°C to 1700°C 600°C to 1800°C (-)100°C to 0°C 0°C to 800°C	0.50°C 0.38°C 0.46°C 0.76°C 0.24°C 1.34°C 0.78°C 1.34°C 0.86°C 1.06°C 0.14°C 0.28°C	Using Multifunction Calibrator by Direct Method  (Make: AOIP model: CALYS50)
II.	<b>SOURCE</b>			
1.	DC Voltage <sup>#</sup>	1mV to 10mV 10mV to 100mV 100mV to 1V 1V to 1000V	1.20% to 0.14% 0.14% to 0.02% 0.02% to 0.014% 0.014%	Using Multifunction Calibrator by Direct Method
2.	DC Current <sup>#</sup>	100 $\mu$ A to 10mA 10mA to 100mA 100mA to 1A 1A to 10A  10A to 500A	0.07% to 0.063% 0.063% to 0.095% 0.095% to 0.18% 0.18% to 0.16%  0.94% to 0.33%	Using Multifunction Calibrator by Direct Method  Using Current Coil by Direct Method

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3.	AC Voltage <sup>#</sup>	<b>50Hz</b> 20mV to 100mV 100mV to 1000V	0.29% to 0.16% 0.16%	Using Multifunction Calibrator by Direct Method
4.	AC Current <sup>#</sup>	<b>50Hz</b> 100 $\mu$ A to 100mA 100mA to 1A 1A to 10A  10A to 500A	0.58% to 0.34% 0.34% to 0.44% 0.44%  1.10% to 0.49%	Using Multifunction Calibrator by Direct Method
5.	Resistance <sup>#</sup> 2 Wire – Variable Value	1 $\Omega$ to 10 $\Omega$ 10 $\Omega$ to 100 $\Omega$ 100 $\Omega$ to 1k $\Omega$ 1k $\Omega$ to 10k $\Omega$ 10k $\Omega$ to 100k $\Omega$ 100k $\Omega$ to 1M $\Omega$ 1M $\Omega$ to 10M $\Omega$	6.02% to 0.64% 0.64% to 0.082% 0.082% to 0.12% 0.12% 0.12% to 0.03% 0.03% to 0.094% 0.094% to 0.14%	Using Multifunction Calibrator by Direct Method
6.	Frequency <sup>#</sup>	10Hz to 100Hz 100Hz to 1kHz 1kHz to 10kHz  10kHz to 100kHz	0.12% to 0.061% 0.061% to 0.014% 0.014%  0.014% to 0.02%	Using Multifunction Calibrator by Direct Method  Using Multifunction Calibrator by Direct Method
7.	Capacitance <sup>#</sup>	<b>1kHz</b> 10nF 100nF 1 $\mu$ F	0.94% 0.92% 1.18%	Using Multifunction Calibrator by Direct Method

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8.	Temperature Simulation <sup>#</sup> RTD (PT-100)  J TYPE K TYPE  T TYPE R TYPE  S TYPE  B TYPE	(-)100°C to 0°C 0°C to 850°C -100°C to 1200°C -100°C to 100°C 100°C to 1300°C -100°C to 400°C 150°C to 1000°C 1000°C to 1700°C 150°C to 1000°C 1000°C to 1700°C 600°C to 1200°C 1200°C to 1800°C	0.22°C 0.40°C 0.58°C 0.80°C 0.50°C 0.82°C 1.48°C 1.44°C 1.42°C 1.38°C 1.52°C 1.44°C	Using Multifunction Calibrator by Direct Method

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<b><u>MECHANICAL CALIBRATION</u></b>				
<b>I. PRESSURE INDICATING DEVICES</b>				
1.	Hydraulic Pressure-Dial/Digital Pressure Gauges and Calibrators, Pressure Transmitters, Pressure Switches <sup>#</sup>	0 to 700 bar	0.12 bar	Using Calibrated Pressure Calibrator/DPG and Hydraulic pump
2.	Pneumatic Pressure-Dial/Digital Pressure Gauges and Calibrators, Pressure Transmitters, Pressure Switches <sup>#</sup>	0 to 20 bar	0.14 bar	Using Calibrated Pressure Calibrator/DPG and Hydraulic pump
3.	Vacuum-Dial/Digital Vacuum Gauges /indicators and calibrators <sup>#</sup>	(-).0.9 to 0 bar	0.0081 bar	Using Calibrated Pressure Calibrator/Digital Vacuum Gauge
<b>II. ACCELERATION &amp; SPEED</b>				
1.	RPM/ Centrifuge* ( Non Contact type)	60 rpm to 1000 rpm >1000 rpm to 90000 rpm	0.32% of rdg 0.28% of rdg	Using calibrated Digital Tachometer by comparison method and using Zeal Digital Tachometer calibrator as source.

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III.	<b>WEIGHTS</b>			
1.	Mass Weight <sup>b</sup>	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.02 mg 0.03 mg 0.03 mg 0.03 mg 0.03 mg 0.03 mg 0.03 mg 0.03 mg 0.03 mg 0.03 mg 0.1 mg 0.2 mg 0.3 mg 0.01 g 0.01 g 0.01 g 0.01 g 0.1 g 0.4 g	Using E2 class standard weights 1mg to 5 kg and 10 kg to 20 kg : F1 class  Weighing balances used are : 60 g/0.01mg 200 g/0.1mg 5 kg/ 10 mg 20 kg/0.1g

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<b>IV.</b>	<b>WEIGHING SCALE AND BALANCE</b>			
1.	Electronic Weighing Balance <sup>#</sup> d $\geq$ 0.01 mg d $\geq$ 0.1 mg  d $\geq$ 10 mg d $\geq$ 0.1 g d $\geq$ 5g	1 mg to 60 mg 10 mg to 200 g  0.5 g to 5 kg 20 g to 20 kg 100 g to 30 kg	0.15 mg 0.2 mg  20 mg 200 mg 20 g	Using E2 class standard weights 1 mg to 200 g  Using E2 class standard weights upto 5 kg & F1 class weights upto 20 kg
<b>V.</b>	<b>VOLUME</b>			
1.	Micro pipettes <sup>\$</sup>	10 $\mu$ l < V $\leq$ 100 $\mu$ l 100 $\mu$ l < V $\leq$ 1000 $\mu$ l	0.22 $\mu$ l 1.01 $\mu$ l	Using Weighing balance with d: 0.01 mg & 0.1mg and distilled water
2.	Volume Glassware <sup>\$</sup> (Pipettes, Volumetric flask, Burettes, Conical flask, Dispensette)	1 ml < V $\leq$ 100 ml 100 ml < V $\leq$ 2000 ml	0.18 ml 0.58 ml	Using Weighing balance with d: 0.01 mg & 10 mg and distilled water

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<b><u>THERMAL CALIBRATION</u></b>				
<b>I.</b>	<b>TEMPERATURE</b>			
<b>1.</b>	RTD's (with & without Indicator), Thermocouples (with & without Indicator), Data Logger with sensors, Probe Thermometers, Bi-metal Thermometers, Capillary Thermometers, Temperature Indicators with sensors, Recorders with sensors, Temperature Transmitter, Temperature Switches, Capillary thermometer, Temperature Gauges, Glass Thermometer, Thermometer <sup>s</sup>	-35 °C to 200° C 200 °C to 400° C 400 °C to 800° C  800 °C to 1200° C	0.66 ° C 0.76 ° C 3.15 ° C  2.77 ° C	Using Standard 61/2 DMM with RTD  Using Standard 61/2 DMM with S-Type Thermocouple (Make: FLUKE, Model:8846A)

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2.	Cytostatic bath, Oil bath, Temperature Baths, Furnance, Dry block calibrators <sup>§</sup>	(-)35 °C to 400° C 400 °C to 800° C  800 °C to 1200° C	0.66 ° C 0.76 ° C  2.77 ° C	Using Standard 61/2 DMM with RTD  Using Standard MFC with S-Type
3.	RTD's ( with & without Indicator), Thermocouples ( with & without Indicator), Data Logger with sensors, Probe Thermometers, Bi-metal Thermometers, Capillary Thermometers, Temperature Indicators with sensors, Recorders with sensor, Temperature Transmitter, Temperature Switches, Capillary thermometer, Temperature Gauges, Glass Thermometer, Thermometer <sup>*</sup>	(-)35 °C to 200° C 200 °C to 400° C 400 °C to 800° C  800 °C to 1200° C	0.68 ° C 0.80 ° C 3.35 ° C  2.9 ° C	Using Standard MFC with RTD  Using Standard MFC with S-Type Thermocouple

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4.	Incubators, Freezers, Refrigerators, Oven Furnance* (Single Point Method)	(-)35 °C to 400° C 400 °C to 800° C 800 °C to 1200° C	0.31 ° C 2.22 ° C 2.29 ° C	Using Standard MFC with RTD  Using Standard MFC with N-Type

\* 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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