

**Laboratory** Fluid Control Research Institute, Kanjikode West, Palakkad, Kerala  
**Accreditation Standard** ISO/IEC 17025: 2005  
**Discipline** Electro-Technical Calibration **Issue Date** 01.07.2015  
**Certificate Number** C-0254 **Valid Until** 30.06.2017  
**Last Amended on** 11.09.2015 **Page** 1 of 7

Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
<b>I. SOURCE</b>			
<b>1. DC VOLTAGE</b> \$	100 $\mu$ V to 1 mV	0.61 % to 0.05 %	Using MFC Wavetek 4808 by Direct Method
	1 mV to 10 mV	0.05 % to 0.007 %	
	10 mV to 100 mV	0.007 % to 0.001 %	
	100 mV to 1000 V	0.001 %	
<b>2. DC CURRENT</b> \$	100 $\mu$ A to 1 mA	0.014 % to 0.006 %	Using MFC Wavetek 4808 by Direct Method
	1 mA to 100mA	0.006 %	
	100 mA to 10A	0.006 % to 0.054 %	Using MFC Wavetek 4808 with Amplifier Ballantine 1620 by Direct Method
	10 A to 100 A	0.21 %	
<b>3. RESISTANCE</b> \$ (4Wire)	10 $\mu\Omega$ , 100 $\mu\Omega$	0.58 %	Using Standard resisters Discrete values (Guildline & Fluke) by Direct Method
	10 m $\Omega$	0.01 %	
	100 m $\Omega$ , 1 m $\Omega$ , 10 m $\Omega$ , 25 m $\Omega$ ,	0.0005 %	
	100 $\Omega$		
	1 k $\Omega$ , 10 k $\Omega$ , 100 k $\Omega$	0.0007 %	
	1 M $\Omega$	0.0023 %	
	10 M $\Omega$	0.002 %	
	100 M $\Omega$	0.007 %	
	1 G $\Omega$	0.01 %	
	10 G $\Omega$	0.3 %	
<b>4. AC VOLTAGE</b> \$	<b>20 Hz to 1 kHz</b>		Using MFC Wavetek 4808 by Direct Method
	1 mV to 10 mV	0.4 % to 0.05 %	
	10 mV to 100 mV	0.05 % to 0.017 %	
	100 mV to 1 V	0.017 % to 0.005 %	
	1 V to 100 V	0.005 % to 0.01 %	
100 V to 1000 V	0.01 % to 0.014 %		

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AC VOLTAGE <sup>\$</sup>	<b>1 kHz to 100 kHz</b> 1 mV to 10 mV 10 mV to 10 V 10 V to 100 V	1.25 % to 0.27 % 0.27 % to 0.12 % 0.12 % to 0.011 %	Using MFC Wavetek 4808 by Direct Method
5. AC CURRENT <sup>\$</sup>	<b>20 Hz to 5 kHz</b> 1 mA to 1A 1A to 10A  <b>45 Hz to 5 kHz</b> 10 A to 20 A  <b>50 Hz</b> 20 A to 1000 A	0.02 % 0.02 % to 0.32 %  0.32 % to 0.17 %  0.53 %	Using MFC Wavetek 4808 by Direct Method  Using MFC Fluke 5520A by Direct Method  Using MFC Fluke 5520A with current coil by Direct Method
6. FREQUENCY <sup>#</sup>	1 Hz to 15 MHz  9 kHz to 1.0 GHz	0.0034 %  0.00012 %	Using Function Generator Agilent 33120A by Direct Method  Using RF Signal Generator Agilent N9310A by Direct Method
7. AC POWER <sup>#</sup> SINGLE PHASE	<b>50 Hz</b> 1 W to 4.8 kW (upf) 1 W to 3.8 kW (0.8pf) 1 W to 2.4 kW (0.5pf) 1 W to 1 kW (0.2pf)	0.49 % 0.19 % 0.33 % 1.2 %	Using MFC Fluke 5520A by Direct Method

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<b>8. OSCILLOSCOPE #</b>			
<b>Bandwidth/Flatness</b>	<b>(Relative to 50 kHz)</b> 50 kHz to 600 MHz	4.1 %	Using Oscilloscope Calibrator Wavetek 9500/600 by Direct Method
<b>Time Marker</b>	10 ns to 10 ms	0.1 % to 0.05 %	Using Oscilloscope Calibrator Wavetek 9500/600 by Direct Method
<b>Amplitude DC Voltage</b>	<b>@ 1M<math>\Omega</math> Load</b> 1 mV to 180 V	1.1 % to 0.3 %	Using Oscilloscope Calibrat Direct or Wavetek 9500/600 by Direct Method
<b>Amplitude AC Voltage (Sine Wave )</b>	<b>@ 50<math>\Omega</math> Load and 1kHz</b> 100 mV to 4.8 V <b>@ 1M<math>\Omega</math> Load and 1kHz</b> 1 V to 5.5 V	1.7 % 1.8 %	Using Oscilloscope Calibrator Wavetek 9500/600 by Direct Method
<b>Amplitude AC Voltage (Square Wave)</b>	<b>@ 1M<math>\Omega</math> Load and 1kHz</b> 6mV to 60V	0.41 % to 0.35 %	Using Oscilloscope Calibrator Wavetek 9500/600 by Direct Method
<b>9. TEMPERATURE SIMULATIONS #</b> (Temperature indicator)			
<b>Thermocouple</b>			
Type- B	600 °C to 1820 °C	0.44 °C	Using MFC Fluke 5520A by Direct Method
Type -C	0 to 2316 °C	0.84 °C	
Type -E	-250 °C to 1000 °C	0.5 °C	
Type- J	-210 °C to 1200 °C	0.44 °C	
Type- K	-200 °C to 1372 °C	0.45 °C	
Type-N	-200 °C to 1300 °C	0.40 °C	
Type-R	0 to 1767 °C	0.57 °C	
Type-S	0 to 1767 °C	0.47 °C	
Type-T	-250 °C to 400 °C	0.63 °C	
RTD Sensor- (PT-100)	-200 °C to 800 °C	0.058 °C to 0.27 °C	
RTD Sensor -(PT-1000)	-200 °C to 630 °C	0.04 °C to 0.27 °C	

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10. DC VOLTAGE *	0.1 mV to 100 mV 100 mV to 1000 V	2.3 % to 0.0041 % 0.0041 % to 0.002 %	Using MFC Fluke 5520A by Direct Method
11. DC CURRENT *	100 $\mu$ A to 3 A 3 A to 20 A 20A to 1000A	0.05 % 0.05 % to 0.31 % 0.36 %	Using MFC Fluke 5520A by Direct Method  Using MFC Fluke 5520A with current coil by Direct Method
12. RESISTANCE *	1 $\Omega$ to 10 M $\Omega$ 10 M $\Omega$ to 100 M $\Omega$ 100 M $\Omega$ to 300 M $\Omega$ 300 M $\Omega$ to 1000 M $\Omega$	0.13 % 0.13 % to 0.37 % 0.37 % to 0.45 % 0.45 % to 1.8 %	Using MFC Fluke 5520A by Direct Method
13 AC VOLTAGE *	45 Hz to 1 kHz 1 mV to 33 mV 33 mV to 330 V 330 V to 1000 V  1 kHz to 100 kHz 30 mV to 100 V	0.74 % to 0.05 % 0.05 % to 0.023 % 0.023 % to 0.04 %  0.45 % to 0.25 %	Using MFC Fluke 5520A by Direct Method  Using MFC Fluke 5520A with current coil by Direct Method
14. AC CURRENT *	45 Hz to 1 kHz 100 $\mu$ A to 1 A 1 A to 20 A  1 kHz to 5 kHz 20 mA to 1 A @ 50 Hz 1 A to 20 A 20 A to 1000 A	0.27 % to 0.1 % 0.1 % to 0.33 %  0.11 % 0.11 % to 3.5 % 0.53 %	Using MFC Fluke 5520 A by Direct Method

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Quantity Measured/ Instrument	Range / Frequency	*Calibration Measurement Capability ( $\pm$ )	Remarks
<b>II. MEASURE</b>			
<b>1. DC VOLTAGE</b> <sup>\$</sup>	0.1 mV to 100 mV 100 mV to 1000 V	0.55 % to 0.0006 % 0.0006 % to 0.0009 %	Using DMM Fluke 8508A by Direct Method
<b>2. DC CURRENT</b> <sup>\$</sup>	10 $\mu$ A to 100 $\mu$ A 100 $\mu$ A to 100 mA 100 mA to 1 A 1 A to 20 A	0.04 % to 0.002 % 0.002 % to 0.006 % 0.006 % to 0.02 % 0.02 % to 0.05 %	Using DMM Fluke 8508A by Direct Method
<b>3. RESISTANCE</b> <sup>\$</sup> (4 Wire)	100 $\mu\Omega$	0.71 %	Using Micro ohm meter Tinsley 5891 by Direct Method
	0.1 $\Omega$ to 1 $\Omega$ 1 $\Omega$ to 1 M $\Omega$ 1 M $\Omega$ to 100 M $\Omega$ 100 M $\Omega$ to 1 G $\Omega$ 1 G $\Omega$ to 10 G $\Omega$	0.058 % to 0.002 % 0.002 % to 0.0015 % 0.0015 % to 0.022 % 0.022 % to 0.2 % 0.2 % to 0.5 %	Using DMM Fluke 8508A by Direct Method
<b>4. AC VOLTAGE</b> <sup>\$</sup>	<b>20 Hz to 1 kHz</b> 10 mV to 100 mV 100 mV to 1000 V	0.11 % to 0.02 % 0.02 %	Using DMM Fluke 8508A by Direct Method
	<b>1 kHz to 100 kHz</b> 100 mV to 100 V	0.09 %	
	<b>100 kHz to 1 MHz</b> 1 V to 10 V	3.5 %	
<b>5. AC CURRENT</b> <sup>\$</sup>	<b>20 Hz to 1 kHz</b> 100 $\mu$ A to 1 A 1 A to 20 A	0.082 % 0.1 % to 0.12 %	Using DMM Fluke 8508A by Direct Method
	<b>1 kHz to 10 kHz</b> 10 mA to 1 A 1 A to 10 A	0.11 % 0.11 % to 0.31 %	

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6. FREQUENCY \$	1 Hz to 1 GHz	10 mHz to 1.2 Hz	Using Frequency counter Fluke PM6681R by Direct Method
7. TIME \$	1 s to 5400 s	10.3 $\mu$ s to 5.4 ms	Using Frequency counter Fluke PM6681R by Direct Method
8. AC POWER # SINGLE PHASE (UPF)	50 Hz 15 V to 1000 V, 0.5 A to 20 A 7.5 W to 20 kW	1.1 %	Using Digital Power Meter Yokogawa WT1030M by Direct Method
9. TEMPERATURE SIMULATION # Thermocouple			
Type-B	600 °C to 1820 °C	0.44 °C	Using MFC Fluke 5520A by Direct Method
Type-C	0 to 2316 °C	0.84 °C	
Type-E	-250 °C to 1000 °C	0.5 °C	
Type-J	-210 °C to 1200 °C	0.27 °C	
Type-K	-200 °C to 1372 °C	0.4 °C	
Type-N	-200 °C to 1300 °C	0.45 °C	
Type-R	0 to 1767 °C	0.57 °C	
Type-S	0 to 1767 °C	0.47 °C	
Type-T	-250 °C to 400 °C	0.63 °C	
RTD Sensor (PT-100)	-200 °C to 850 °C	0.006 °C to 0.015 °C	Using DMM Fluke 8508A with ITS-90 Table by Direct Method
RTD Sensor (PT-1000)	-200 °C to 630 °C	0.006 °C to 0.015 °C	
10. DC VOLTAGE *	0.1 mV to 100 mV 100 mV to 1 V 1 V to 1000 V	4.2 % to 0.1 % 0.1 % to 0.007 % 0.007 %	Using DMM 34401A by Direct Method
11. DC CURRENT *	0.1 mA to 10 mA 10 mA to 100 mA 100 mA to 3 A	2.42 % to 0.1 % 0.1 % to 0.07 % 0.07 % to 0.22 %	Using DMM 34401A by Direct Method

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12. AC VOLTAGE *	40 Hz to 1 kHz 10 mV to 1 V 1 V to 750 V	0.87 % to 0.12 % 0.12 % to 0.15 %	Using DMM 34401A by Direct Method
13. AC CURRENT *	40 Hz to 1 kHz 0.1 A to 1.0 A 1.0 A to 3 A	0.82 % to 0.17 % 0.17 % to 0.25 %	Using DMM 34401A by Direct Method
14. DC RESISTANCE *	100 $\mu\Omega$	0.71 %	Using Micro ohmmeter Tinsley 5891 by Direct Method
	10 $\Omega$ to 100 $\Omega$ 100 $\Omega$ to 1 M $\Omega$ 1 M $\Omega$ to 10 M $\Omega$ 10 M $\Omega$ to 100 M $\Omega$	0.082 % to 0.015 % 0.015 % 0.015 % to 0.05 % 0.05 % to 1.0 %	Using DMM 34401A by Direct Method
15. TIME *	1 s to 5400 s	4.5 $\mu$ s to 5.4 ms	Using Universal Counter Agilent 53131A by Direct Method
16. FREQUENCY *	1 Hz to 225 MHz	16.5 $\mu$ Hz to 0.46 Hz	Using Universal Counter Agilent 53131A by Direct Method

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

\$ Only in Permanent Laboratory

\* Only for Site Calibration

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