



TECHNICAL SPECIFICATION FOR ELECTRICAL CALIBRATOR

Ref. : EMT/SPEC/1035

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- 1.0 **Equipment** : Electrical Calibrator
2.0 **Introduction** : The Electrical Calibrator is required for calibration of Analog and digital voltmeters, ammeters, Resistance measuring equipment, Temperature measuring equipment by thermocouples & RTD sensors, power measuring equipment and frequency measuring equipment.

- 2.0 **Scope** : Supply and commissioning of Electrical Calibrator as per the specifications.

3.0 **Technical Specifications :**

Overall accuracy specified includes effect of operating temperature variance by $\pm 5^\circ\text{C}$

	Parameter	Range	Overall Accuracy %	Resolution	Compliance/burden
3.1.	AC Voltage 45 Hz to 10 kHz	0- 30 mV	± 0.2	1 μV	50 Ohms
		30 to 300 mV	± 0.06	1 μV	50 Ohms
		0.3 to 3 V	± 0.04	10 μV	10 mA
		3 to 30 V	± 0.04	100 μV	10 mA
		30 to 300 V	± 0.06	1 mV	5 mA
		300 to 1000 V	± 0.06	10 mV	2 mA
3.2	AC Current 45 Hz to 1 kHz	0.03 to 0.3 mA	± 0.18	0.01 μA	1 μH
		0.3 to 3 mA	± 0.12	0.01 μA	1 μH
		3 to 33 mA	± 0.12	0.1 μA	200 μH 10 to 500 Hz and 5 μH for 500 to 10kHz
		30 to 300 mA	± 0.12	1 μA	-Do-
		0.3 to 2 A	± 0.12	10 μA	200 μ (45 to 500 Hz) 5 μ fro 500 to 1 kHz)
		2 to 10 A	± 0.08	100 μA	200 μ (45 to 65 Hz) 1 μ fro 65 to 1 kHz)

Date : 02.05.2005

Prepared by :

[Signature]

Approved by :

[Signature]
S.D. PANDHEY
Sr. Dy. General Manager, Testing
BHEL, Hyd-32



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3.3	DC Voltage	0 to 330 mV	± 0.006	0.1 μ V	50 Ohms
		0 to 3 V	± 0.006	1 μ V	10 mA
		0 to 30 V	± 0.006	10 μ V	10 mA
		30 to 300 V	± 0.006	100 μ V	5 mA
		100 to 1000 V	± 0.006	1000 μ V	5 mA
3.4	DC Current	0 to 3 mA	± 0.02	0.01 μ A	1 μ H
		0 to 30 mA	± 0.02	0.1 μ A	200 μ H
		0 to 300 mA	± 0.02	1 μ A	200 μ H
		0 to 2.2 A	± 0.04	10 μ A	200 μ H
		0 to 10 A	± 0.07	100 μ A	200 μ H
3.5	AC Power (at)	3 to 10 mA	10 to 30 mA	30 to 90 mA	90 to 300 mA
		33 to 330 mV	0.4	0.25	0.35
	At upto 1000 V	0.25	0.15	0.25	0.15
		AC Power (at)	0.3 to 0.5 A	0.9 to 2 A	2 to 5 A
	33 to 330 mV	0.35	0.25	0.35	0.25
		At upto 1000 V	0.25	0.15	0.2
	Phase	45 to 65 Hz	65 to 500 Hz	500 to 1 kHz	
		0.15°	0.9°	2.0 °	
3.6	DC Power	3 to 300 mA	0.3 to 5 A	5 to 10 A	
		33 to 330 mV	0.03	0.08	0.06
		33 mV 1000 V	0.04	0.12	0.09
	Parameter	Range	Overall Accuracy %	Resolution	
3.7	Frequency	0.01 to 120 Hz	0.004	0.01 Hz	
		120 to 1200 Hz	0.004	0.1 Hz	
		1.2 to 12 kHz	0.004	1 Hz	
		12 to 120 kHz	0.02	10 Hz	
		120 to 1200 kHz	0.02	100 Hz	
		1.2 to 2 MHz	0.02	1 kHz	

Date : 02.05.2005

Prepared by :

Approved by :

बि. डी. पांडेय
B.D. PANDHEY
Sr. Dy. General Manager, Testing
बी. डी. पांडेय / BHEL, Hyd-32



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3.8	Resistance	Range	Overall % of inaccuracy	Resolution	Compliance
		0 to 10 Ω	0.005	0.001 Ω	125 mA
		10 to 30 Ω	0.004	0.001 Ω	125 mA
		30 to 100 Ω	0.004	0.001 Ω	70 mA
		100 to 300 Ω	0.004	0.001 Ω	40 mA
		300 Ω to 1 k Ω	0.004	0.01 Ω	18 mA
		1 to 3 k Ω	0.004	0.01 Ω	5 mA
		3 to 10 k Ω	0.004	0.1 Ω	1.8 mA
		10 to 30 k Ω	0.004	0.1 Ω	0.5 mA
		30 to 100 k Ω	0.004	1 Ω	0.18 mA
		100 to 300 k Ω	0.004	1 Ω	0.05 mA
		330 to 1.1 k Ω	0.006	10 Ω	0.018 mA
		1 to 3 M Ω	0.02	10 Ω	5 μ A
		3 to 10 M Ω	0.03	100 Ω	1.8 μ A
		10 to 30 M Ω	0.06	100 Ω	500 nA
		30 to 100 M Ω	1.00	1000 Ω	180 nA
3.9	Temperature Thermocouple Type K	Up to 1000 $^{\circ}$ C	0.4 $^{\circ}$ C	0.01 $^{\circ}$ C	
	Type S	Up to 1000 $^{\circ}$ C	0.5 $^{\circ}$ C	0.01 $^{\circ}$ C	
	Type T	Up to 1000 $^{\circ}$ C	0.25 $^{\circ}$ C	0.01 $^{\circ}$ C	
	Temperature RTD type PT 100	Up to 300 $^{\circ}$ C 300 to 630 $^{\circ}$ C	0.1 $^{\circ}$ C 0.25 $^{\circ}$ C	0.01 $^{\circ}$ C 0.01 $^{\circ}$ C	
4.0	Interface	: IEEE 488 Interface programming Commands shall be provided.			
5.0	Cables and accessories	: Complete set of measuring / output cables of 2 meters length shall be provided for voltage, current and temperature. In addition spare set of measuring/output cables of 2 meter length shall be supplied. Interface cable of 2 meters length shall be provided. Input supply cable as per Indian standard shall be provided. Interface programming Commands shall be provided. Any other accessory necessary for complete operation of the calibrator shall be supplied.			

Date : 02.05.2005

Prepared by : B. B. Rao

Approved by : [Signature]

By: [Signature]
B.D. PAUDYAL
Sr. Dy. General Manager, Testing
at TQ & TQ / BHEL, Hyd-32



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6.0	Environmental conditions	Operating temperature up to 50 °C Calibration shall be from 15°C to 35 °C Storage : up to 60 °C and 95% humidity
9.0	Input supply	: 220 V $\pm$ 10% AC 50 Hz $\pm$ 5%,
10.0	Commissioning	The equipment supplied shall be commissioned and demonstrated for proper Operation and functioning at BHEL works.
11.0	Documents	: 1. Calibration and Test Certificates shall be supplied. Calibration shall be traceable to national / international standards. 2. Three sets of O & M manuals are to be supplied.
12.0	Guarantee	: The entire supply shall be guaranteed for satisfactory performance and workmanship for a period of 18 months from date of commissioning.
13.0	General	: 1. Suppliers, who have supplied similar equipment to national calibrating laboratories / calibration laboratories of repute in last 5 years, are only eligible to quote. Documentary evidence of supply shall be attached with technical offer. 2. The bidder shall submit compliance statement basing on the Specifications. 3. All other terms and conditions as per BHEL guidelines.

Date : 02.05.2005

Prepared by : B. S. Rao

Approved by :

S.D. PANDEY
S.D. General Manager, Testing
BHEL, Hyd-32