



CERTIFICATE OF ACCREDITATION

In terms of section 22(2) (b) of the Accreditation for Conformity Assessment, Calibration and Good Laboratory Practice Act, 2006 (Act 19 of 2006), read with sections 23(1), (2) and (3) of the said Act, I hereby certify that:-

MONTECH CALIBRATION SERVICES (PTY) LTD

Co. Reg. No.: 2014/182132/07

ELECTRICAL DCLF CALIBRATION LABORATORY

Accreditation Number: CAL 071-01-00

is a South African National Accreditation System Accredited Calibration laboratory provided that all SANAS conditions and requirements are complied with

This certificate is valid as per the scope as stated in the accompanying scope of accreditation Annexure "A", bearing the above accreditation number for

DC LOW FREQUENCY METROLOGY

The facility is accredited in accordance with the recognised International Standard

ISO/IEC 17025:2017

The accreditation demonstrates technical competency for a defined scope and the operation of a laboratory quality management system

While this certificate remains valid, the Accredited Facility named above is authorised to use the relevant SANAS accreditation symbol to issue facility reports and/or certificates

A handwritten signature in black ink, appearing to read 'F Osman', is written over a horizontal line.

Mr F Osman
Acting Chief Executive Officer

Effective Date: 07 October 2024
Certificate Expires: 09 March 2026



ANNEXURE A

SCOPE OF ACCREDITATION
DC LOW FREQUENCY METROLOGY

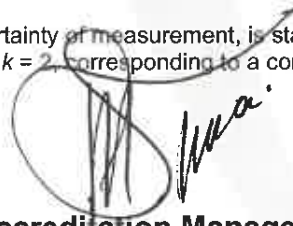
Accreditation Number: CAL 071-01-00

| <p>Permanent Address of Laboratory: Montech Calibration Services (Pty) Ltd Electrical DCLF Calibration Laboratory 47 Fabriek Street Strydompark Randburg Gauteng 2169</p> <p>Postal Address: Postnet Suite 266 Private Bag X21 Bryanston 2021</p> <p>Tel: 011 464 5071 Cell: 072 779 4076 E-mail: seola@moncal.co.za</p> | | <p>Technical Signatories: Mrs S Targett Mr J Targett</p> <p>Nominated Representative: Mrs S Targett</p> <p>Issue No.: 01 Date of Issue: 07 October 2024 Expiry Date: 09 March 2026</p> | | |
|--|---|--|--|--|
| ITEM | MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT AND RANGE OF MEASURED QUANTITY | NOMINAL FREQUENCY | CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm) | METHOD / PROCEDURE |
| 1 | DC Voltage (up to 1 100 V) | | | |
| 1.1 | DC voltage sources | | | |
| 1.1.2 | Low values (≤ 10 V) Multifunction calibrator | | | |
| | 0 mV to 10 mV | DC | 0,005 mV | Multifunction Calibrator and Multimeter, Direct Comparison |
| | 10 mV to 100 mV | DC | $2 \cdot 10^{-4} \cdot U$ | |
| | 0.1 V to 10 V | DC | $1 \cdot 10^{-5} \cdot U$ | |
| 1.1.3 | Intermediate values (> 10 V to 1 100 V) Multifunction calibrator | | | |
| | 100 V to 1 000 V | DC | $6 \cdot 10^{-6} \cdot U$ | Multifunction Calibrator and Multimeter, Direct Comparison |

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The CMC, expressed as an expanded uncertainty of measurement, is stated as the standard uncertainty of measurement multiplied by a coverage factor $k = 2$, corresponding to a confidence level of approximately 95%



Accreditation Manager

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|------------|--|-------------------|--|--|
| 1.2 | DC voltage meters | | | |
| 1.2.1 | Very low value (≤ 1 mV) Digital Multimeter, nano voltmeters | | | |
| | 0 mV to 1 mV | | 0,004 mV | Multifunction Calibrator and Multimeter, Direct Comparison |
| 1.2.2 | Intermediate values (> 1 mV to 1100 V) Digital multimeters, nano voltmeters | | | |
| | 1 mV to 10 mV 10 mV to 100 mV 0,1 V to 1 000 V | | 0,004 mV $5 \cdot 10^{-5} \cdot U$ $7 \cdot 10^{-5} \cdot U$ | Multifunction Calibrator and Multimeter, Direct Comparison |
| 2 | DC resistance | | | |
| 2.1 | DC resistance standards and sources. | | | |
| 2.1.2 | Intermediate values ($> 1 \Omega$ to 1 M Ω) Fixed resistor, resistance box, multifunction calibrator | | | |
| | 1 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 100 k Ω 100 k Ω to 1 M Ω | | $6 \cdot 10^{-4} \cdot R$ $6 \cdot 10^{-4} \cdot R$ $2 \cdot 10^{-4} \cdot R$ $2 \cdot 10^{-4} \cdot R$ | Multifunction Calibrator and Multimeter, Direct Comparison |
| 2.1.3 | High values (> 1 M Ω) Fixed resistor, resistance box, multifunction calibrator | | | |
| | 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω | | $7 \cdot 10^{-4} \cdot R$ $5 \cdot 10^{-3} \cdot R$ | Multifunction Calibrator and Multimeter, Direct Comparison |

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|------------|--|----------------------------|--|--|
| 2.2 | DC resistance meters | | | |
| 2.2.1 | Low values ($\leq 1 \Omega$) Micro-ohm meter, multimeter, resistance bridge | | | |
| | 1 Ω | | 0,01 Ω | Multifunction Calibrator and Multimeter, Direct Comparison |
| 2.2.2 | Intermediate values ($> 1 \Omega$ to 1GΩ) ohm meter, Multimeter, resistance bridge | | | |
| | 10 Ω 10 Ω to 1 k Ω 1 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω | | 6 \cdot 10 ⁻⁵ ·R 6 \cdot 10 ⁻⁵ ·R 5 \cdot 10 ⁻⁵ ·R 5 \cdot 10 ⁻⁴ ·R 5 \cdot 10 ⁻⁵ ·R 5 \cdot 10 ⁻³ ·R | Multifunction Calibrator and Multimeter, Direct Comparison |
| 3 | DC current (up to 100 A) | | | |
| 3.1 | DC current sources. | | | |
| 3.1.1 | Low values ($\leq 0,1$ mA) Current generator, Multifunction calibrator. | | | |
| | 0 mA 0,1 mA | DC DC | 0,5 μ A 0,1 μ A | Multifunction Calibrator and Multimeter, Direct Comparison |
| 3.1.2 | Intermediate values ($> 0,1$ mA to 20 A) Current generator, multifunction calibrator | | | |
| | 0,1 mA to 1 mA 1 mA to 100 mA 0,1 A to 1 A 1 A to 2 A 2 A to 10 A | DC DC DC DC DC | 0.2 μ A 2 \cdot 10 ⁻⁴ ·I 2 \cdot 10 ⁻⁴ ·I 6 \cdot 10 ⁻⁴ ·I 4 \cdot 10 ⁻³ ·I | Multifunction Calibrator and Multimeter, Direct Comparison |

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|------------|--|--|--|--|
| 3.2 | DC current meters. | | | |
| 3.2.1 | Low Values ($\leq 0,1$ mA) pico ammeter, nano ammeter, multimeter | | | |
| | 0 mA 0,1 mA | | 0,2 μ A $2 \cdot 10^{-5}$ % | Multifunction Calibrator and Multimeter, Direct Comparison |
| 3.2.2 | Intermediate values ($> 0,1$ mA to 20 A) multimeter, current meter | | | |
| | 0,1 mA to 1 mA 1 mA to 1 mA 10 mA to 100 mA 0,1 A to 2 A 2 A to 2,5 A | | $2 \cdot 10^{-4}$ % $3 \cdot 10^{-5}$ % $2 \cdot 10^{-5}$ % $4 \cdot 10^{-4}$ % $3 \cdot 10^{-3}$ % | Multifunction Calibrator and Multimeter, Direct Comparison |
| 4 | Impedance (up to 200 kHz range) | | | |
| 4.2.4 | Meters, capacitance bridge, LCR meter | | | |
| | 1 nF 1 nF to 10 nF 10 nF to 1 μ F 1 μ F to 100 μ F 100 μ F to 1 mF | 50 Hz | 2 % 1 % 1 % 1 % 1 % | Multifunction Calibrator and Multimeter, Direct Comparison |
| 5 | AC voltage (up to the MHz range) | | | |
| 5.2 | Sources, Multifunction calibrator | | | |
| | 1 mV 10 mV 100 mV 1 V to 10 V 100 V 750 V | 40 Hz to 50 kHz 40 Hz 1 kHz 1 kHz to 50 kHz 40 Hz 1 kHz 10 kHz to 20 kHz 50 kHz 100 kHz 40 Hz 1 kHz 10 kHz to 20 kHz 50 kHz 100 kHz 1 kHz 10 kHz to 20 kHz 1 kHz | 0,03 mV $4 \cdot 10^{-3}$ % $10 \cdot 10^{-3}$ % $5 \cdot 10^{-3}$ % $3 \cdot 10^{-3}$ % $2 \cdot 10^{-4}$ % $2 \cdot 10^{-3}$ % $2 \cdot 10^{-4}$ % $5 \cdot 10^{-3}$ % $2 \cdot 10^{-3}$ % $5 \cdot 10^{-4}$ % $2 \cdot 10^{-3}$ % $2 \cdot 10^{-3}$ % $5 \cdot 10^{-3}$ % $6 \cdot 10^{-4}$ % $2 \cdot 10^{-3}$ % $5 \cdot 10^{-3}$ % | Multifunction Calibrator and Multimeter, Direct Comparison |

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|------------|---|-----------------------------|--|--|--|
| 5 | AC voltage (up to the MHz range) | | | | |
| 5.2 | AC voltage up to 1 100 V | | | | |
| 5.2.2 | Meters, ac voltmeter, multimeter | | | | |
| | 1 mV to 10 mV | 40 Hz 1 kHz to 20 kHz | $5 \cdot 10^{-4} \cdot U$ $5 \cdot 10^{-4} \cdot U$ | Measurement with AC/DC transfer standard | |
| | 10 mV | 50 Hz 100 kHz | $5 \cdot 10^{-4} \cdot U$ $5 \cdot 10^{-4} \cdot U$ | | |
| | 100 mV | 40 kHz 1 kHz to 10 kHz | $7 \cdot 10^{-5} \cdot U$ $7 \cdot 10^{-5} \cdot U$ | | |
| | 1 V to 10 V | 20 kHz to 50 kHz 100 kHz | $2 \cdot 10^{-4} \cdot U$ $7 \cdot 10^{-5} \cdot U$ | | |
| | | 40 Hz 1 kHz to 10 kHz | $6 \cdot 10^{-4} \cdot U$ $6 \cdot 10^{-4} \cdot U$ | | |
| | 100 V | 20 kHz to 50 kHz 100 kHz | $2 \cdot 10^{-4} \cdot U$ $6 \cdot 10^{-4} \cdot U$ | | |
| | 750 V | 1 kHz 10 kHz to 20 kHz | $6 \cdot 10^{-4} \cdot U$ $6 \cdot 10^{-4} \cdot U$ | | |
| | | 1 kHz 10 kHz | $4 \cdot 10^{-4} \cdot U$ $4 \cdot 10^{-4} \cdot U$ | | |
| 6 | AC Current | | | | |
| 6.2 | AC Current up to 100 A | | | | |
| 6.2.1 | Sources, multifunction calibrator | | | | |
| | 10 mA to 100 mA | 45 Hz to 5 kHz | $2 \cdot 10^{-3} \cdot I$ | Multifunction Calibrator and Multimeter, Direct Comparison | |
| | 1 A to 2A | 40 Hz 1 kHz | $2 \cdot 10^{-3} \cdot I$ $2 \cdot 10^{-3} \cdot I$ | | |
| | 10 A | 40 Hz to 1 kHz | $4 \cdot 10^{-3} \cdot I$ | | |
| | | | | | |
| 6.2.2 | Meters, ac ammeter, multimeter | | | | |
| | 10 mA to 100 mA | 40 Hz to 1 kHz 10 kHz | $2 \cdot 10^{-3} \cdot I$ $2 \cdot 10^{-3} \cdot I$ | Multifunction Calibrator and Multimeter, Direct Comparison | |
| | 1 A to 2A | 40 Hz 1 kHz | $2 \cdot 10^{-3} \cdot I$ $2 \cdot 10^{-3} \cdot I$ | | |
| | 10 A | 45 Hz 1 kHz | $2 \cdot 10^{-2} \cdot I$ $9 \cdot 10^{-3} \cdot I$ | | |
| | | | | | |
| 8 | High voltage and current | | | | |
| 8.1 | High DC voltage | | | | |
| 8.1.1 | High Voltage Sources, DC Kilovolt Source | | | | |
| | 1 kV to 40 kV | DC | 1,0 % | High voltage divider (HV probe) and Multimeter, Ratio Method | |

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|--|---|--|--|---|
| 8.3 | AC High voltage | | | |
| 8.3.1 | Sources: High Voltage AC Source | | | |
| | 1 kV to 28 kV | 40 Hz to 60 Hz | 1.0 % | High voltage divider (HV probe) and Multimeter, Ratio Method |
| 8.6 | AC high Current | | | |
| 8.6.2 | Meters: dedicated measurement set-up, current transducer | | | |
| | 20 A 20 A to 500 A (clamp meter) | 40 Hz to 60 Hz | 2 % 1 % | Multifunction Calibrator and Current coil, Simulation Method |
| 8.7 | High DC current | | | |
| 8.7.2 | Meters, measurement set-up | | | |
| | 20 A 20 A to 500 A (clamp meter) | DC | 2 % 0,9 % | Multifunction Calibrator and Current coil, Simulation Method |
| Additional accreditation Parameters | | | | |
| A | Thermometry Equipment (Electrical Simulation) | | | |
| | Source | | | |
| A1 | | - 250 °C to 100 °C - 100 °C to 2 000 °C | 0,2 K 0,2 K | Multifunction Calibrator and Digital Thermometry, Direct Comparison |
| A2 | Meter | | | |
| | | - 250 °C to 100 °C - 100 °C to 2 000 °C | 0,2 K 0,2 K | Multifunction Calibrator and Digital Thermometry, Direct Comparison |
| B | Meter: Frequency | | | |
| | | 40 Hz to 100 Hz 100 Hz to 100 kHz | $1 \cdot 10^{-3} \cdot f$ $1 \cdot 10^{-4} \cdot f$ | Multifunction Calibrator and Current coil, Simulation Method |
| C | On-site calibration for all Parameters | | | |

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