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:-

HJR MICROPTIC CC

Co. Reg. No.: 1989/032363/23

ELECTRICAL DCLF CALIBRATION LABORATORY

Accreditation Number: **CAL 022-01-00**

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

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Mr F Osman
Acting Chief Executive Officer

Effective Date: 20 June 2025
Certificate Expires: 31 August 2029

ANNEXURE A

SCOPE OF ACCREDITATION

DC LOW FREQUENCY METROLOGY

Accreditation Number: CAL 022-01-00

Permanent Address of Laboratory:
HJR Microptic CC
Electrical DCLF Calibration Laboratory
593 Smook Avenue
Roseville
Pretoria
0031

Postal Address:
PO Box 31230
Wonderboompoort
0033

Tel: (012) 335-6663/4
Fax: (012) 335-6665
E-mail: microptic@mweb.co.za
jacques@microptic.net

Technical Signatories: Mr AA George
Mr HJ Le Roux

Nominated Representative: Mr H van Deventer

Issue No.: 14
Date of Issue: 20 June 2025
Expiry Date: 31 August 2029

ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT AND RANGE OF MEASURED QUANTITY	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	METHOD / PROCEDURE
1	**DC Voltage (up to 1100 V, for higher voltages see 8.1)**			
1.1	**DC Voltage sources**			
1.1.2	**Low values ranges (<= 10 V)**			
	0,01 mV to 1 mV 1 mV to 10 mV 10 mV to 100 mV 100 mV to 10 V	DC	$8 \cdot 10^{-3} \cdot U + 3\ \mu V$ $8 \cdot 10^{-4} \cdot U + 3\ \mu V$ $2 \cdot 10^{-4} \cdot U + 3\ \mu V$ $6 \cdot 10^{-5} \cdot U + 3\ \mu V$	Direct measurement or comparison with a DC voltage reference standard
1.1.3	**Intermediate values (> 10 V to 1100 V)**			
	10 V to 1 000 V	DC	$6 \cdot 10^{-5} \cdot U + 3\ \mu V$	Direct measurement or comparison with DC Voltage source or Multi-function calibrator
1.2	**DC Voltage meters**			
1.2.1	**Very low values (<= 1 mV)**			
	0,01 mV to 1 mV	DC	$8 \cdot 10^{-3} \cdot U + 3\ \mu V$	Direct measurement or comparison with DC voltage source and short
1.2.2	**Intermediate values (> 1 mV to 1100 V)**			
	1 mV to 10 mV 10 mV to 100 mV 100 mV to 1 100 V	DC	$8 \cdot 10^{-3} \cdot U + 3\ \mu V$ $8 \cdot 10^{-4} \cdot U + 3\ \mu V$ $6 \cdot 10^{-5} \cdot U + 3\ \mu V$	Direct measurement or comparison with DC Voltage source or Multi-function calibrator

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

ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT AND RANGE OF MEASURED QUANTITY	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	METHOD / PROCEDURE
2 **2.1**	**DC resistance** **DC resistance standards and sources**			
2.1.5	**Multiple ranges**			
	0,1 Ω to 1 Ω 1 Ω to 10 Ω 10 Ω to 10 MΩ 10 MΩ to 300 MΩ 300 MΩ to 1 GΩ	DC	$1 \cdot 10^{-2} \cdot R + 8\ m\Omega$ $6 \cdot 10^{-3} \cdot R + 8\ m\Omega$ $2 \cdot 10^{-3} \cdot R + 8\ m\Omega$ $5 \cdot 10^{-3} \cdot R$ $1 \cdot 10^{-2} \cdot R$	Direct measurement or Substitution Method.
2.2 **2.2.2**	**DC resistance meters** **Intermediate values (> 1 Ω to 1 GΩ)**			
	0,1 Ω to 1 Ω 1 Ω to 10 Ω 10 Ω to 10 MΩ 10 MΩ to 300 MΩ 300 MΩ to 1 GΩ	DC	$1 \cdot 10^{-2} \cdot R + 8\ m\Omega$ $6 \cdot 10^{-3} \cdot R + 8\ m\Omega$ $2 \cdot 10^{-3} \cdot R + 8\ m\Omega$ $5 \cdot 10^{-3} \cdot R$ $1 \cdot 10^{-2} \cdot R$	Direct measurement or Substitution Method.
3 **3.1**	**DC current (up to 100 A, for higher currents see 8.7)** **DC current sources**			
3.1.2	**Intermediate values (> 0,1 mA to 20 A)**			
	1 µA to 1 mA 1 mA to 1 A 1 A to 10 A 10 A to 20 A	DC	$5 \cdot 10^{-3} \cdot I$ $1 \cdot 10^{-3} \cdot I$ $3 \cdot 10^{-3} \cdot I$ $5 \cdot 10^{-3} \cdot I$	Direct measurement or Current Volt Drop Method
3.2 **3.2.2**	**DC current meters** **Intermediate values (> 0,1 mA to 20 A)**			
	1 mA to 1 A 1 A to 10 A 10 A to 20 A	DC	$1 \cdot 10^{-3} \cdot I$ $3 \cdot 10^{-3} \cdot I$ $5 \cdot 10^{-2} \cdot I$	Calibration by direct measurement
3.2.3	**High values (> 20 A to 100 A)**			
	20 A to 100 A (Current clamps only)	DC	$6 \cdot 10^{-2} \cdot I$	Calibration by direct measurement
4 **4.2**	**Impedance (up to the MHz range)** **Capacitance**			
4.2.4	**Meters**			
	330 pF to 1 mF 1 mF to 110 mF	50 Hz to 400 Hz	$5 \cdot 10^{-3} \cdot C + 20\ pF$ $3 \cdot 10^{-2} \cdot C$	Direct measurement of a reference standard capacitor or simulated through the use of a Multi-function calibrator

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Accreditation Manager

Accreditation No.: CAL 022-01-00
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ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT AND RANGE OF MEASURED QUANTITY	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	METHOD / PROCEDURE
5 **5.2**	**AC voltage (up to the MHz range)** **AC voltage up to 1000 V (for high voltage see 8.3)**			
5.2.1	**Sources**			
	3 mV to 100 mV 100 mV to 30 V 30 V to 1 000 V	45 Hz to 10 kHz 45 Hz to 10 kHz 10 kHz to 100 kHz 45 Hz to 1 kHz 1 kHz to 10 kHz	$5 \cdot 10^{-3} \cdot U$ $1 \cdot 10^{-3} \cdot U$ $1 \cdot 10^{-2} \cdot U$ $1 \cdot 10^{-3} \cdot U$ $3 \cdot 10^{-3} \cdot U$	Calibration by direct Measurement
5.2.2	**Meters**			
	3 mV to 100 mV 100 mV to 30 V 30 V to 1 000 V	45 Hz to 10 kHz 45 Hz to 10 kHz 10 kHz to 100 kHz 45 Hz to 1 kHz 1 kHz to 10 kHz	$5 \cdot 10^{-3} \cdot U$ $1 \cdot 10^{-3} \cdot U$ $1 \cdot 10^{-2} \cdot U$ $1 \cdot 10^{-3} \cdot U$ $3 \cdot 10^{-3} \cdot U$	Calibration by direct Measurement
6 **6.2**	**AC current** **AC current up to 100A (for high current see 8.6)**			
6.2.1	**Sources**			
	1 mA to 1 A 1 A to 10 A 10 A to 100 A	45 Hz to 1 kHz 45 Hz to 1 kHz	$3 \cdot 10^{-3} \cdot I$ $5 \cdot 10^{-3} \cdot I$ $3 \cdot 10^{-2} \cdot I$	Calibration by the direct measurement or volt drop method
6.2.2	**Meters**			
	1 mA to 1 A 1 A to 10 A 10 A to 20 A 20 A to 100 A (Clamp meters only)	45 Hz to 1 kHz 45 Hz to 1 kHz 50 Hz 50 Hz	$3 \cdot 10^{-3} \cdot I$ $5 \cdot 10^{-3} \cdot I$ $3 \cdot 10^{-3} \cdot I$ $3 \cdot 10^{-2} \cdot I$	Calibration by the direct measurement or volt drop method
7 **7.1** **7.1.1**	**AC power** **AC power and energy** **Single phase (f <= 400 Hz)**			
	1 V to 1 000 V 10 mA to 20 A	50 Hz	$1 \cdot 10^{-2} \cdot P$ @ PF 0,1 to 0,5 $5 \cdot 10^{-3} \cdot P$ @ PF 0,5 to 0,8 $3 \cdot 10^{-3} \cdot P$ @ PF 0,8 to 1	Calibration by direct comparison with a reference standard
8 **8.1**	**High voltage and current** **High DC voltage (for voltages < 1100 V see 1)**			
8.1.1	**High voltage sources**			
	1 100 V to 30 kV	DC	$1.5 \cdot 10^{-2} \cdot U$	Calibration by direct measurement or the ratio method

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Accreditation Manager

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8.3 8.3.2	**High AC voltage and voltage transformers (for voltages <1100V see 5.2 and 5.3) Sources**			
	1 kV to 25 kV	50 Hz	$4 \cdot 10^{-2} \cdot U$	Calibration by direct measurement or the Ratio Method.
8.6 8.6.2	**High AC current and current transformers (for currents <= 100 A see 6.2 and 6.3) Meters**			
	100 A to 1 000 A (Clamp meters only)	50 Hz	$5 \cdot 10^{-3} \cdot I$	Calibration by direct measurement or the Ratio Method.
8.7 8.7.2	**High DC current (for currents <= 100 A see 3, for shunts see 2.1.4) Meters**			
	100 A to 1 000 A (Clamp Meters only)	DC	$5 \cdot 10^{-3} \cdot I$	Calibration by direct measurement or the Ratio Method.
A	**Thermometry equipment (Electrical Simulation)**			
A1	**Sources**			
	Voltage	- 200 °C to + 700 °C + 700 °C to + 2 000 °C	0,5 K 1,0 K	Calibration by the measurement of the voltage or resistance equivalent to the thermometer type.
	Resistance	- 200 °C to + 600 °C	0,9 K	
A2	**Meters**			
	Voltage	-200 °C to +700 °C +700 °C to + 2 000 °C	0,5 K 1,0 K	Calibration by the sourcing of voltages or resistance equivalent to the thermometer type.
	Resistance	- 200 °C to + 600 °C	0,9 K	
C	**Frequency**			
	Sinusoidal	1 Hz to 10 MHz	$3 \cdot 10^{-4} \cdot f$ + 10 mHz	Calibration by the direct measurement of frequency source.
Z	On-site calibrations for items 1,2,3,4,5,6,7,8, and A and C above			

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