

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:-

DENEL DYNAMICS
A DIVISION OF
DENEL (PTY) LTD
Co. reg no: 1992/001337/07

Facility Accreditation Number: **111**

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 schedule 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 17025:2005

*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

Mr R Josias
Acting Chief Executive Officer

Effective Date: 31 March 2008
Certificate Expires: 31 March 2013

ANNEXURE A

SCHEDULE OF ACCREDITATION

DC LOW FREQUENCY METROLOGY

Laboratory Accreditation Number 111

<p>Permanent Address of Laboratory: Denel Dynamics Electrical Laboratory Old Production Building Nellmapius Drive Irene</p> <p>Postal Address P O Box 7412 Centurion 0046</p> <p>Tel : (012) 671-2614 Fax : (012) 675-2614 Email : sdumo.hlope@deneldynamics.co.za</p>			<p>Technical Signatories : Mr HJ de Beer</p> <p>Nominated Representative : Mr S Hlope</p> <p>Issue No. : 07 Date of issue : 17 November 2009 Expiry date : 31 March 2013</p>		
ITEM	FUNCTION	NOMINAL RANGE	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	NOTES
1	DC Voltage	Specific values: 10 V 0 V to 1 kV		$2 \cdot 10^{-6} \cdot U$ $1 \cdot 10^{-5} \cdot U + 1 \mu V$	
2	DC Current	0 A to 2 A 2 A to 20 A 20 A to 100 A		$5 \cdot 10^{-5} \cdot I + 0,05 \mu A$ $5 \cdot 10^{-5} \cdot I$ $1 \cdot 10^{-4} \cdot I$	1

Original date of accreditation: 1981

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Note 1: Measure only

Note 2: Generate only

Note 3: As per accreditation of electrical parameters expressed in terms of an equivalent temperature with a "floor spec" of 0,1 K.

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%

Field Manager

ANNEXURE A

Laboratory Accreditation Number: 111
Date of Issue: 17 November 2009
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ITEM	FUNCTION	NOMINAL RANGE	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	NOTES
3	Resistance	Specific values: 1 Ω and 10 k Ω 10 m Ω , 100 m Ω 1 Ω , 10 Ω , 100 Ω 1 k Ω , 10 k Ω , 100 k Ω 1 M Ω 10 M Ω , 100 M Ω , 1 G Ω 10 m Ω to 1 Ω 1 Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω		5•10 ⁻⁶ •R 3•10 ⁻⁵ •R 2•10 ⁻⁵ •R 2•10 ⁻⁵ •R 3•10 ⁻⁵ •R 2•10 ⁻⁵ •R 1•10 ⁻³ •R 1•10 ⁻⁴ •R + 2 $\mu\Omega$ 1•10 ⁻⁴ •R + 1 m Ω 2•10 ⁻⁴ •R 5•10 ⁻⁴ •R 1•10 ⁻³ •R	2
4	AC Voltage	22 mV to 200 mV 200 mV to 20 V 20 V to 1 kV	10 Hz to 10 kHz 10 Hz to 20 kHz 20 kHz to 100 kHz 10 Hz to 20 kHz 20 kHz to 100 kHz	5•10 ⁻⁴ •U + 20 μ V 2•10 ⁻⁴ •U 5•10 ⁻⁴ •U 3•10 ⁻⁴ •U 3•10 ⁻⁴ •U	
5	AC Current	100 μ A to 2A 2 A to 20 A	20 Hz to 5 kHz 50 Hz to 5 kHz	3•10 ⁻⁴ •I + 10 μ A 5•10 ⁻⁴ •I	
6	Inductance	100 μ H to 100 mH	1 kHz	5•10 ⁻⁴ •L	2

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ITEM	FUNCTION	NOMINAL RANGE	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	NOTES
7	Capacitance	1 pF to 1 μ F	1 kHz	$2 \cdot 10^{-4} \cdot C$	2
8	Electrical calibration of temperature measuring equipment	As per accreditation for electrical parameters			3
9	Oscilloscopes Amplitude Timebase Bandwidth Risetime	2 mV to 100 V 1 ns to 0,5s 50 kHz to 250 MHz 1ns to 35 ns		$\pm 1 \%$ $\pm 1 \%$ $\pm 5 \%$ $+ 0,1 \text{ ns}$	
10	On-site calibration for items 1 to 8 above				

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ISSUED BY THE SOUTH AFRICAN NATIONAL ACCREDITATION SYSTEM

Field Manager