



## 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:-*

### **PRECISION MEASUREMENTS (PTY) LTD**

**Co. Reg. No.: 2015/168932/07**

**Facility Accreditation Number: 150**

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

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**Mr R Josias**  
**Chief Executive Officer**

**Effective Date: 28 October 2016**  
**Certificate Expires: 29 September 2021**



## ANNEXURE A

## SCHEDULE OF ACCREDITATION

### DC LOW FREQUENCY METROLOGY

Facility Number: 150

<b>Permanent Address of Laboratory:</b> Precision Measurements (Pty) Ltd Building 8 CSIR Campus Meiring Naude Road Lynnwood 0081  <b>Postal Address:</b> P O Box 39203 Moreleta Park 0044  Tel: (012) 035-0219 Fax: (086) 768-3066 E-mail: <a href="mailto:willemb@precisiongroupsa.com">willemb@precisiongroupsa.com</a>		<b>Technical Signatories:</b> Mr W Botha Mr R Singh  <b>Nominated Representative:</b> Mr W Botha  Issue No.: 02 Date of Issue: 28 October 2016 Expiry Date: 29 September 2021	
ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT AND RANGE OF MEASURED QUANTITY	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS UNCERTAINTY ( $\pm$ )
1	DC Voltage (up to 1100 V for higher voltages see 8.1)		
1.1	DC voltage sources		
1.1.2	Low values ( $\leq 10$ V)		
	0 V to 10 V	DC	$3 \cdot 10^{-5} \cdot U + 5 \mu\text{V}$
1.1.3	Intermediate Values ( $>10$ V to 1100 V)		
	10 V to 1 000 V	DC	$3 \cdot 10^{-5} \cdot U + 5 \mu\text{V}$
1.2	DC voltage meters		
1.2.1	Very low values ( $\leq 1$ mV)		
	0V	DC	5 $\mu\text{V}$
	1 mV	DC	5 $\mu\text{V}$
1.2.2	Intermediate values ( $> 1$ Mv to 1100 V)		
	1 mV to 1 000 V	DC	$3 \cdot 10^{-5} \cdot U + 5 \mu\text{V}$

Original Date of Accreditation: 27 May 2016

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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



## ANNEXURE A

Facility No.: 150  
Date of Issue: 28 October 2016  
Expiry Date: 29 September 2021

ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT AND RANGE OF MEASURED QUANTITY	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS UNCERTAINTY ( $\pm$ )
2	DC resistance		
2.1	DC resistance standards and sources		
2.1.1	Low values ( $\leq 1\Omega$ )		
	1 $\Omega$	DC	$2 \cdot 10^{-4} \cdot R$
2.1.2	Intermediate values ( $> 1\Omega$ to 1 M $\Omega$ )		
	1 $\Omega$ to 190 $\Omega$	DC	$1 \cdot 10^{-4} \cdot R$
	190 $\Omega$ to 100 k $\Omega$	DC	$5 \cdot 10^{-5} \cdot R$
	100 k $\Omega$ to 1 M $\Omega$	DC	$1 \cdot 10^{-4} \cdot R$
2.1.3	High Values ( $>1\text{ M}\Omega$ )		
	1 M $\Omega$ to 1.9 M $\Omega$	DC	$1 \cdot 10^{-4} \cdot R$
	1.9 M $\Omega$ to 19 M $\Omega$	DC	$2 \cdot 10^{-4} \cdot R$
	19 M $\Omega$ to 100 M $\Omega$	DC	$5 \cdot 10^{-5} \cdot R$
2.2	DC resistance meters		
2.2.1	Low values ( $\leq 1\Omega$ )		
	1 $\Omega$	DC	$2 \cdot 10^{-4} \cdot R$
	1.9 $\Omega$ , 10 $\Omega$ , 19 $\Omega$ , 100 $\Omega$ , 190 $\Omega$	DC	$1 \cdot 10^{-4} \cdot R$
	1 k $\Omega$ , 1.9 k $\Omega$ , 10 k $\Omega$ , 19 k $\Omega$ , 100 k $\Omega$	DC	$5 \cdot 10^{-5} \cdot R$
	190 k $\Omega$ , 1 M $\Omega$ , 1.9 M $\Omega$	DC	$1 \cdot 10^{-4} \cdot R$
	10 M $\Omega$ , 19 M $\Omega$	DC	$2 \cdot 10^{-4} \cdot R$
	100 M $\Omega$	DC	$5 \cdot 10^{-5} \cdot R$
3	DC current (up to 100 A, for higher currents see 8.7)		
3.1	DC current sources		
3.1.1	Low values ( $\leq 0,1\text{ mA}$ )		
	100 $\mu\text{A}$	DC	$2 \cdot 10^{-4} \cdot I + 0.02\ \mu\text{A}$
3.1.2	Intermediate values ( $\leq 0,1\text{ mA}$ to 20 A)		
	100 $\mu\text{A}$ to 1 A	DC	$2 \cdot 10^{-4} \cdot I + 0.02\ \mu\text{A}$
3.2	DC current meters		
3.2.1	Low value ( $\leq 0,1\text{ mA}$ )		
	100 $\mu\text{A}$	DC	$2 \cdot 10^{-4} \cdot I + 0.02\ \mu\text{A}$
3.2.2	Intermediate values ( $\leq 0,1\text{ mA}$ to 20 A)		
	100 $\mu\text{A}$ to 1 A	DC	$2 \cdot 10^{-4} \cdot I + 0.02\ \mu\text{A}$

Original Date of Accreditation: 27 May 2016

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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





## ANNEXURE A

Facility No.: 150  
Date of Issue: 28 October 2016  
Expiry Date: 29 September 2021

ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT AND RANGE OF MEASURED QUANTITY	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS UNCERTAINTY ( $\pm$ )
5	AC voltage (up to the MHz range)		
5.2	AC voltage up to 1000 V (for high voltage see category 8.3)		
5.2.1	Sources		
	10 mV to 30 V	50 Hz to 10 kHz	$3 \cdot 10^{-3} \cdot U + 10 \mu\text{V}$
	30 V to 100 V	50 Hz to 10 kHz	$2 \cdot 10^{-4} \cdot U$
	100 V to 1 000 V	50 Hz to 1 kHz	$2 \cdot 10^{-3} \cdot U$
5.2.2	Meters		
	10 mV to 200 mV	40 Hz to 20 kHz	$5 \cdot 10^{-4} \cdot U + 10 \mu\text{V}$
	10 mV to 200 mV	20 kHz to 100 kHz	$1 \cdot 10^{-3} \cdot U + 30 \mu\text{V}$
	200 mV to 2 V	40 kHz to 20 kHz	$2 \cdot 10^{-4} \cdot U$
	200 mV to 2 V	20 kHz to 100 kHz	$4 \cdot 10^{-4} \cdot U$
	2 V to 100 V	40 Hz to 20 kHz	$2 \cdot 10^{-4} \cdot U$
	100 V to 1 000 V	50 Hz to 10 kHz	$3 \cdot 10^{-4} \cdot U$
6	AC current		
6.2	AC current up to 100A (for high current see category 8.6)		
6.2.1	Sources		
	100 $\mu\text{A}$ to 1 A	40 Hz to 50 kHz	$5 \cdot 10^{-4} \cdot I + 2 \mu\text{V}$
6.2.2	Meters		
	100 $\mu\text{A}$ to 1 A	40 Hz to 50 kHz	$5 \cdot 10^{-4} \cdot I + 2 \mu\text{V}$
<b>Additional accreditations</b>			
B	Oscilloscopes up to 250 MHz		
	Vertical Deflection	2 mV to 5 V/div	$\pm 1 \%$
	Horizontal Deflection	1 nS to 5 S/div	$\pm 1 \%$
	Bandwidth	DC to 250 MHz	$\pm 7 \%$
Z	On-site calibrations for categories <1, 2, 3, 5, 6 B>		

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ISSUED BY THE SOUTH AFRICAN NATIONAL ACCREDITATION SYSTEM

**Accreditation Manager**





## CERTIFICATE OF ACCREDITATION

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### **PRECISION MEASUREMENTS (PTY) LTD**

**Co. Reg. No.: 2015/168932/07**

**Facility Accreditation Number: 550**

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


### **TIME AND 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

  
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**Mr R Josias**  
**Chief Executive Officer**

**Effective Date: 28 October 2016**  
**Certificate Expires: 29 September 2021**



## ANNEXURE A

**SCHEDULE OF ACCREDITATION**  
**TIME AND FREQUENCY METROLOGY**

Facility Number: 550

<u>Permanent Address of Laboratory:</u> Precision Measurements (Pty) Ltd Building 8 CSIR Campus Meiring Naude Road Lynnwood 0081		<u>Technical Signatories:</u> Mr W Botha		
<u>Postal Address:</u> P O Box 39203 Moreleta Park 0044		<u>Nominated Representative:</u> Mr W Botha		
Tel: (012) 035-0219 Fax: (086) 768-3066 E-mail: <a href="mailto:willemb@precisiongroupsa.com">willemb@precisiongroupsa.com</a>		Issue No.: 02 Date of Issue: 28 October 2016 Expiry Date: 29 September 2021		
ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT	RANGE OF MEASURED QUANTITY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	NOTES
1	Frequency			
1.1	Frequency	Specific values 1 MHz; 5 MHz; 10 MHz  Other Values 10 mHz to 1 MHz 1 MHz to 1,3 GHz 1,3 GHz to 26,5 GHz	$3 \cdot 10^{-11} \cdot f$  $1 \cdot 10^{-10} \cdot f + 15 \mu\text{Hz}$ $1 \cdot 10^{-10} \cdot f$ 2 Hz	1
2	Pulse Repetition Frequency			
2.1	Pulse Repetition Frequency (Non sinusoidal signal)	100 mHz to 1 GHz	$5 \cdot 10^{-11} \cdot f + 15 \mu\text{Hz}$	
3	On-site calibration for items 1.1 & 2.1 above			

Original Date of Accreditation: 27 May 2016

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Note 1: For a continuous observation period of  $10^5$  seconds.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%.

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**Accreditation Manager**







## 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:-*

### **PRECISION MEASUREMENTS (PTY) LTD**

**Co. Reg. No.: 2015/168932/07**

Facility Accreditation Number: **750**

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


### **RADIO 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

  
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**Mr R Josias**  
**Chief Executive Officer**

**Effective Date: 28 October 2016**  
**Certificate Expires: 29 September 2021**



## ANNEXURE A

## SCHEDULE OF ACCREDITATION

### RADIO FREQUENCY METROLOGY

Facility Number: 750

<u>Permanent Address of Laboratory:</u> Precision Measurements (Pty) Ltd Building 8 CSIR Campus Meiring Naude Road Lynnwood 0081  <u>Postal Address:</u> P O Box 39203 Moreleta Park 0044  Tel: (012) 035-0219 Fax: (086) 768-0366 E-mail: <a href="mailto:willemb@precisiongroupsa.com">willemb@precisiongroupsa.com</a>		<u>Technical Signatory:</u> Mr E Föck   <u>Nominated Representative:</u> Mr W Botha   Issue No.: 02 Date of Issue: 28 October 2016 Expiry Date: 29 September 2021		
ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT	RANGE OF MEASURED QUANTITY	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )
1	Power 50 $\Omega$			
1.1	Power 50 $\Omega$	0 dBm (1 mW)  -30 dBm to +20 dBm (1 $\mu$ W to 100 mW)  +20 dBm to +44 dBm (100 mW to 25 W)  -110 dBm to -30 dBm (1 pW to 1 $\mu$ W)  -90 dBm to -30dBm (1 pW to 1 $\mu$ W)	50 MHz  10 MHz to 1 GHz 1 GHz to 12 GHz 12 GHz to 18 GHz  50 MHz to 220 MHz  10 MHz to 1 GHz 1 GHz to 12 GHz  12 GHz to 18 GHz	0,1 dB  0,2 dB 0,3 dB 0,4 dB  0,4 dB  0,2 dB + 0,003 dB / dBm 0,3 dB + 0,007 dB / dBm  0,4 dB + 0,01 dB / dBm
2	Calibrator Factor	1 % to 150 %	10 MHz to 1 GHz 1 GHz to 12 GHz 12 GHz to 18 GHz	4 % 7 % 9 %

Original Date of Accreditation: 27 May 2016

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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**





## ANNEXURE A

Facility No.: 750  
Date of Issue: 28 October 2016  
Expiry Date: 29 September 2021

ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT	RANGE OF MEASURED QUANTITY	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	
3	Attenuation 50 $\Omega$				
3.1	Attenuation 50 $\Omega$	0 dB to 60 dB 60 dB to 80 dB 0 dB to 10 dB 10 dB to 100 dB 110 dB 0 dB to 10 dB 10 dB to 90 dB 90 dB to 110 dB 0 dB to 10 dB 10 dB to 90 dB 90 dB to 110 dB 0 dB to 10 dB 10 dB to 90 dB 90 dB to 100 dB	DC DC 10 MHz to 1 GHz 10 MHz to 1 GHz 10 MHz to 1 GHz 1 GHz to 8 GHz 1 GHz to 8 GHz 1 GHz to 8 GHz 8 GHz to 12 GHz 8 GHz to 12 GHz 8 GHz to 12 GHz 12 GHz to 18 GHz 12 GHz to 18 GHz 12 GHz to 18 GHz	0,004 dB 0,02 dB 0,03 dB 0,003 dB / dB 0,5 dB 0,07 dB 0,007 dB / dB 1 dB 0,1 dB 0,01 dB / dB 1,5 dB 0,12 dB 0,012 dB / dB 2 dB	
4	Voltage Reflection Coefficient 50 $\Omega$				
4.1	Voltage Reflection Coefficient 50 $\Omega$	Ratio 0 to 0,5 0,5 to 1	10 MHz to 18 GHz 10 MHz to 18 GHz	0,01 0,04	
5	Amplitude Modulation 50 $\Omega$	Modulation Depth 0 % to 95 % 0 % to 95 %	Carrier 100 kHz to 1 GHz 5 MHz to 1 GHz	Modulation 300 Hz to 10 kHz 10 kHz to 100 kHz	$2 \cdot 10^{-2} \cdot M + 0,01 \%$ $2 \cdot 10^{-2} \cdot M + 0,01 \%$
6	Frequency Modulation 50 $\Omega$	Peak Deviation 0 Hz to 100 kHz 0 Hz to 100 kHz	Carrier 100 kHz 5 MHz to 1 GHz	Modulation 300 Hz to 10 kHz 10 Hz to 100 kHz	$1 \cdot 10^{-2} \cdot \Delta f + 1 \text{ Hz}$ $1 \cdot 10^{-2} \cdot \Delta f + 1 \text{ Hz}$
On-site calibration for all items					

Original Date of Accreditation: 27 May 2016

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Accreditation Manager

