

# 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

Mr R Josias Chief Executive Officer

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



# SCHEDULE OF ACCREDITATION

## DC LOW FREQUENCY METROLOGY

Facility Number: 150

Permanent Address of Laboratory: Precision Measurements (Pty) Ltd Building 8 CSIR Campus Meiring Naude Road Lynnwood 0081		Technical Signatories:		/ Botha Singh	
S 5 5 5 5 5		Nominated Representative:	Mr W Botha		
Moreleta Par 0044	ж	al .			
Tel: (01:	2) 035-0219	Issue No.:	02		
	6) 768-3066	Date of Issue:	28 O	ctober 2016	
	emb@precisiongroupsa.com	Expiry Date:	29 September 2021		
ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT AND RANGE OF MEASURED QUANTITY	NOMINAL FREQUENCY	P0	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS UNCERTAINTY (±)	
1	DC Voltage (up to 1100 V for high	er voltages see 8.1)			
1.1	DC voltage sources				
1.1.2	Low values ( <= 10 V)				
T	0 V to 10 V	DC	3•10 <sup>-5</sup> •U + 5 μV		
1.1.3	Intermediate Values (>10 V to 110	0 V)			
	10 V to 1 000 V	DC		3•10 <sup>-5</sup> •U +5 μV	
1.2	DC voltage meters				
1.2.1	Very low values (<= 1 mV)				
	0V 1 mV	DC DC		5 μV 5 μV	
1.2.2	Intermediate values ( > 1 Mv to 11			5 μν	
	1 mV to 1 000 V	DC		3•10 <sup>-5</sup> •U + 5 μV	

Original Date of Accreditation: 27 May 2016

Page 1 of 3

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%



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

2.1   DC resistance	ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT AND RANGE OF MEASURED QUANTITY	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS UNCERTAINTY (±)				
2.1.1       Low values ( <= 1Ω)       DC       2·10·4·R         1Ω       DC       2·10·4·R         1Ω to 190 Ω       DC       1·10·4·R         190 Ω to 100 kΩ       DC       5·10·5·R         100 kΩ to 1 MΩ       DC       1·10·4·R         High Values (>1 MΩ)       DC       1·10·4·R         1.9 MΩ to 19 MΩ       DC       2·10·4·R         1.9 MΩ to 19 MΩ       DC       2·10·4·R         1.9 MΩ to 19 MΩ       DC       2·10·4·R         1.9 MΩ to 100 MΩ       DC       2·10·4·R         1.9 MΩ to 100 MΩ       DC       2·10·4·R         1.0 Ω, 10 Ω, 10 Ω, 10 Ω, 10 Ω, 10 Ω       DC       2·10·4·R         1.0 Ω, 10 Ω, 10 Ω, 10 Ω, 10 Ω       DC       3·10·4·R         1.0 Ω, 10 Ω, 10 Ω, 10 Ω, 10 Ω       DC       1·10·4·R         1.0 Ω KΩ, 10	2	DC resistance						
1Ω	2.1	DC resistance standards and source	es					
Intermediate values (> 1 Ω to 1 MΩ)	2.1.1	Low values ( <= 1Ω)						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		1Ω	DC	2•10 <sup>-4</sup> •R				
190 Ω to 100 kΩ 100 kΩ to 1 MΩ DC 1+10 <sup>4</sup> ·R  1+10 <sup>4</sup> ·	2.1.2							
190 Ω to 100 kΩ 100 kΩ to 1 MΩ DC 1+10 <sup>4</sup> ·R  1+10 <sup>4</sup> ·		1 Ω to 190 Ω	DC	1•10 <sup>-4</sup> •R				
100 kΩ to 1 MΩ   DC   1+10 <sup>4</sup> +R		The Administration of the Control of		5•10⁻⁵•R				
2.1.3 High Values (>1 MΩ)  1 MΩ to 1.9 MΩ 1.9 MΩ to 19 MΩ DC 2.410 <sup>-4</sup> -R 19 MΩ to 100 MΩ DC 5.10 <sup>-5</sup> -R  2.2 DC resistance meters  2.2.1 Low values (<= 1 Ω)  1 Ω DC 1.9 Ω, 10 Ω, 19 Ω, 100 Ω, 190 Ω DC 1.00 κΩ 190 κΩ, 1 MΩ, 1.9 MΩ DC 1.00 MΩ DC 1.00 MΩ DC 1.00 MΩ 100 MΩ DC 2.10 <sup>-4</sup> -R 1.00 κΩ 100 μΔ DC 2.10 <sup>-4</sup> -R 1.00 κΩ 100 μΔ DC 2.10 <sup>-4</sup> -R 1.00 κΩ 100 μΔ DC 2.10 <sup>-4</sup> -R 1.00 μΔ DC 2.10 <sup>-4</sup> -R 1.00 μΔ		100 kΩ to 1 MΩ		34000 50000 1000				
1.9 MΩ to 19 MΩ DC $2 \cdot 10^{4} \cdot R$ $19$ MΩ to 100 MΩ DC $5 \cdot 10^{5} \cdot R$ 2.2 DC resistance meters  2.2.1 Low values (<= 1 Ω)  1 Ω DC $2 \cdot 10^{4} \cdot R$ 1.9 Ω, 10 Ω, 19 Ω, 190 Ω DC $1 \cdot 10^{4} \cdot R$ 1.8 Ω, 1.9 $\cdot R$ Ω, 10 $\cdot R$ Ω, 19 $\cdot R$ Ω DC $1 \cdot 10^{4} \cdot R$ 1.00 $\cdot R$ Ω DC $1 \cdot 10^{4} \cdot R$ 1.00 $\cdot R$ Ω DC $1 \cdot 10^{4} \cdot R$ 1.00 $\cdot R$ Ω DC $1 \cdot 10^{4} \cdot R$ 1.00 $\cdot R$ Ω DC $1 \cdot 10^{4} \cdot R$ 1.00 $\cdot R$ Ω DC $1 \cdot 10^{4} \cdot R$ 1.00 $\cdot R$ Ω DC $1 \cdot 10^{4} \cdot R$ 1.00 $\cdot R$ Ω DC $1 \cdot 10^{4} \cdot R$ 1.00 $\cdot R$ Ω DC $1 \cdot 10^{4} \cdot R$ 1.00 $\cdot R$ Ω DC $1 \cdot 10^{4} \cdot R$ 1.11 DC current (up to 100 A, for higher currents see 8.7)  DC current sources  1.12 Low values (<= 0,1 mA)  1.13 DC $1 \cdot 10^{4} \cdot R$ DC $1 \cdot 10^{4} \cdot R$ $1 \cdot 10^{4} \cdot R$ $1 \cdot 10^{4} \cdot R$ DC $1 \cdot 10^{4} \cdot R$ $1 \cdot 10^{4} \cdot R$ DC $1 \cdot 10^{4}$	2.1.3							
1.9 MΩ to 19 MΩ DC $2 \cdot 10^{4} \cdot R$ $19$ MΩ to 100 MΩ DC $5 \cdot 10^{5} \cdot R$ 2.2 DC resistance meters  2.2.1 Low values (<= 1 Ω)  1 Ω DC $2 \cdot 10^{4} \cdot R$ 1.9 Ω, 10 Ω, 19 Ω, 190 Ω DC $1 \cdot 10^{4} \cdot R$ 1 kΩ, 1.9 kΩ, 10 kΩ, 19 kΩ, DC $1 \cdot 10^{4} \cdot R$ 100 kΩ DC $1 \cdot 10^{4} \cdot R$ 100 MΩ DC $1 \cdot 10^{4} \cdot R$ 100 μA to 1 A DC $1 \cdot 10^{4} \cdot R$ 100 μA to 1 A DC $1 \cdot 10^{4} \cdot R$ 100 μA to 1 A DC $1 \cdot 10^{4} \cdot R$ 100 μA to 1 A DC $1 \cdot 10^{4} \cdot R$ 100 μA DC $1 \cdot 1$		1 MΩ to 1.9 MΩ	DC	1•10 <sup>-4</sup> •R				
2.2 DC resistance meters  2.2.1 Low values (<= 1 Ω)  1 Ω 1 Ω 1.9 Ω, 10 Ω, 19 Ω, 100 Ω, 190 Ω 100 kΩ 190 kΩ, 19 MΩ 100 MΩ DC 11·10 <sup>4</sup> ·R 10 MΩ, 19 MΩ DC 11·10 <sup>4</sup> ·R 10 MΩ, 19 MΩ DC 2-10 <sup>4</sup> ·R 100 MΩ DC 11·10 <sup>4</sup> ·R 10 MΩ, 19 MΩ DC 2-10 <sup>4</sup> ·R 100 μA DC 2-10 <sup>4</sup> ·I + 0.02 μA  3.1.2 Intermediate values (<= 0,1 mA to 20 A)  100 μA DC 2-10 <sup>4</sup> ·I + 0.02 μA  3.2 DC current meters 3.2.1 Low value(<= 0,1 mA) 100 μA DC 2-10 <sup>4</sup> ·I + 0.02 μA		The Discription of Themself Discription		2•10 <sup>-4</sup> •R				
2.2.1 Low values (<= 1 Ω)  1 Ω 1 Ω 1.9 Ω, 10 Ω, 19 Ω, 100 Ω, 190 Ω 1 kΩ, 1.9 kΩ, 10 kΩ, 19 kΩ, 100 kΩ 190 kΩ, 1 MΩ, 1.9 MΩ 100 MΩ DC 1*10 <sup>4</sup> ·R 100 MΩ DC 1*10 <sup>4</sup> ·R 100 MΩ DC 2*10 <sup>4</sup> ·R 100 MΩ DC 5*10 <sup>5</sup> ·R   3 3.1 3.1.1 DC current (up to 100 A, for higher currents see 8.7) DC current sources Low values (<= 0,1 mA)  100 μA DC 2*10 <sup>4</sup> ·I + 0.02 μA  3.2 DC current meters 3.2.1 Low value(<= 0,1 mA) 100 μA DC 2*10 <sup>4</sup> ·I + 0.02 μA  Intermediate values (<= 0,1 mA)  100 μA DC 2*10 <sup>4</sup> ·I + 0.02 μA		19 MΩ to 100 MΩ		93594 BASES 1200				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.2							
1.9 Ω, 10 Ω, 19 Ω, 100 Ω, 190 Ω DC $1*10^4*R$ $1 kΩ, 1.9 kΩ, 10 kΩ, 19 kΩ, DC 5*10^{-5}*R 100 kΩ 190 kΩ, 1 MΩ, 1.9 MΩ DC 1*10^{-4}*R 10 MΩ, 19 MΩ DC 2*10^{-4}*R 100 MΩ DC 5*10^{-5}*R 100 MΩ DC 1*10^{-4}*R 100 MΩ DC 1*10^{-4}*R 100 MΩ DC 2*10^{-4}*R 100 MΩ DC 1*10^{-4}*R 1*10^{-4}*R 100 MΩ DC 1*10^{-4}*R 1*10^{-4}*R 100 MΩ DC 1*10^{-4}*R 1*10^{-4}*R 1*10^{-4}*R 1*10^{-4}*R 1*10^{-4}*R 100 MΩ DC 1*10^{-4}*R 1*10^{-4}*R 100 MΩ DC 1*10^{-4}*R 1*10^{-4}*R 1*10^{-4}*R 100 MΩ DC 1*10^{-4}*R 100 MΩ DC 1*10^{-4}*R 1*10^{-4}*R 100 MΩ DC 1*10^{-4}*R 1*10^{-4}*R 100 MΩ DC 1*10^{-4}*R DC 1*10^{$	2.2.1	Low values ( $\leq 1 \Omega$ )						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		1Ω	DC	2•10 <sup>-4</sup> •R				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		1.9 Ω, 10 Ω, 19 Ω, 100 Ω, 190 Ω	DC	1•10 <sup>-4</sup> •R				
		1 kΩ, 1.9 kΩ, 10 kΩ, 19 kΩ,	DC	5•10 <sup>-5</sup> •R				
10 MΩ, 19 MΩ DC $2 \cdot 10^{-4} \cdot R$ 100 MΩ DC $5 \cdot 10^{-5} \cdot R$ 3 DC current (up to 100 A, for higher currents see 8.7)  DC current sources  Low values (<= 0,1 mA)  100 μA DC $2 \cdot 10^{-4} \cdot I + 0.02 \mu A$ 3.1.2 Intermediate values (<= 0,1 mA)  DC $2 \cdot 10^{-4} \cdot I + 0.02 \mu A$ 3.2 DC current meters  3.2.1 Low value(<= 0,1 mA)  100 μA DC $2 \cdot 10^{-4} \cdot I + 0.02 \mu A$ 3.2 DC current meters  3.2.1 Low value(<= 0,1 mA)  100 μA DC $2 \cdot 10^{-4} \cdot I + 0.02 \mu A$ 3.2.2 Intermediate values (<= 0,1 mA to 20 A)		100 kΩ						
100 MΩ DC 5•10 <sup>-5</sup> •R  3 DC current (up to 100 A, for higher currents see 8.7)  DC current sources  Low values (<= 0,1 mA)  100 μA DC 2•10 <sup>-4</sup> •I + 0.02 μA  3.1.2 Intermediate values (<= 0,1 mA)  DC 2•10 <sup>-4</sup> •I + 0.02 μA  3.2 DC current meters  3.2.1 Low value(<= 0,1 mA)  100 μA DC 2•10 <sup>-4</sup> •I + 0.02 μA  3.2.2 Intermediate values (<= 0,1 mA to 20 A)		190 kΩ, 1 MΩ, 1.9 MΩ	DC	1•10 <sup>-4</sup> •R				
3 3.1 3.1 3.1.1 DC current (up to 100 A, for higher currents see 8.7)  DC current sources  Low values (<= 0,1 mA)  100 μA  100 μA  100 μA to 1 A  DC  2•10-4•I + 0.02 μA  3.2 DC current meters  3.2.1 Low value(<= 0,1 mA)  100 μA  DC  2•10-4•I + 0.02 μA  DC  2•10-4•I + 0.02 μA  100 μA		10 ΜΩ, 19 ΜΩ	DC	12000 Lines				
3.1.1 DC current sources  Low values (<= 0,1 mA)  100 μA  DC  2•10-4•I + 0.02 μA  3.1.2 Intermediate values (<= 0,1 mA to 20 A)  100 μA to 1 A  DC  2•10-4•I + 0.02 μA  3.2 DC current meters  3.2.1 Low value(<= 0,1 mA)  100 μA  DC  2•10-4•I + 0.02 μA  3.2.2 Intermediate values (<= 0,1 mA to 20 A)		100 ΜΩ	DC	5•10 <sup>-5</sup> •R				
3.1.1 Low values (<= 0,1 mA)  100 μA  100 μA  100 μA  100 μA  100 μA to 1 A  100 μA to 1 A  100 μA to 1 A  100 μA  10		DC current (up to 100 A, for higher currents see 8.7)						
Low values (<= 0,1 mA)   100 μA   DC   2•10 <sup>-4</sup> •I + 0.02 μA   1100 μA to 1 A   DC   2•10 <sup>-4</sup> •I + 0.02 μA   100 μA to 1 A   DC   2•10 <sup>-4</sup> •I + 0.02 μA   100 μA   100 μA   DC   2•10 <sup>-4</sup> •I + 0.02 μA   100 μA   DC   2•10 <sup>-4</sup> •I + 0.02 μA   100 μA   DC   2•10 <sup>-4</sup> •I + 0.02 μA   100 μA   DC   2•10 <sup>-4</sup> •I + 0.02 μA   100 μA   DC   100 μA   10								
3.1.2 Intermediate values (<= 0,1 mA to 20 A)  100 μA to 1 A  DC  2•10-4•I + 0.02 μA  3.2 DC current meters  3.2.1 Low value(<= 0,1 mA)  100 μA  DC  2•10-4•I + 0.02 μA  3.2.2 Intermediate values (<= 0,1 mA to 20 A)		Low values (<= 0,1 mA)	N A STATE OF THE S	T				
100 μA to 1 A  DC  2•10-4•I + 0.02 μA  3.2  DC current meters  Low value(<= 0,1 mA)  100 μA  DC  2•10-4•I + 0.02 μA  3.2.2 Intermediate values (<= 0,1 mA to 20 A)		100 μΑ	DC	2•10 <sup>-4</sup> •I + 0.02 μA				
3.2 DC current meters 3.2.1 Low value(<= 0,1 mA)  100 μA  DC  2•10 <sup>-4</sup> •I + 0.02 μA  3.2.2 Intermediate values (<= 0,1 mA to 20 A)	3.1.2	Intermediate values (<= 0,1 mA to 20 A)						
3.2.1 Low value(<= 0,1 mA)  100 μA  DC  2•10 <sup>-4</sup> •I + 0.02 μA  3.2.2 Intermediate values (<= 0,1 mA to 20 A)		100 µA to 1 A	DC	2•10 <sup>-4</sup> •I + 0.02 μA				
100 μA DC 2•10 <sup>-4</sup> •I + 0.02 μA  3.2.2 Intermediate values (<= 0,1 mA to 20 A)	3.2	DC current meters						
3.2.2 Intermediate values (<= 0,1 mA to 20 A)	3.2.1	The state of the s						
		100 μΑ	DC	2•10 <sup>-4</sup> •I + 0.02 μA				
100 μA to 1 A DC 2•10 <sup>-4</sup> •I + 0.02 μA	3.2.2	Intermediate values (<= 0,1 mA to 20 A)						
		100 µA to 1 A	DC	2•10 <sup>-4</sup> •I + 0.02 μA				

Original Date of Accreditation: 27 May 2016

Page 2 of 3

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

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 (±)				
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 30 V to 100 V 100 V to 1 000 V	50 Hz to 10 kHz 50 Hz to 10 kHz 50 Hz to 1 kHz	3•10 <sup>-3</sup> •U + 10 μV 2•10 <sup>-4</sup> •U 2•10 <sup>-3</sup> •U				
5.2.2	Meters						
	10 mV to 200 mV 10 mV to 200 mV 200 mV to 2 V 200 mV to 2 V 2 V to 100 V 100 V to 1 000 V	40 Hz to 20 kHz 20 kHz to 100 kHz 40 kHz to 20 kHz 20 kHz to 100 kHz 40 Hz to 20 kHz 50 Hz to 10 kHz	5•10 <sup>-4</sup> •U +10 μV 1•10 <sup>-3</sup> •U + 30 μV 2•10 <sup>-4</sup> •U 4•10 <sup>-4</sup> •U 2•10 <sup>-4</sup> •U 3•10 <sup>-4</sup> •U				
6	AC current						
6.2	AC current up to 100A (for high co	urrent see category 8.6)					
6.2.1	Sources						
	100 μA to 1 Ą	40 Hz to 50 kHz	5•10 <sup>-4</sup> •I + 2 μV				
6.2.2	Meters						
	100 μA to 1 A	40 Hz to 50 kHz	5•10 <sup>-4</sup> •I + 2 μV				
Additiona	l accreditations						
В	Oscilloscopes up to 250 MHz						
	Vertical Deflection Horizontal Deflection Bandwith	2 mV to 5 V/div 1 nS to 5 S/div DC to 250 MHz	± 1 % ± 1 % ± 7 %				
Z	On-site calibrations for categories <1, 2, 3, 5, 6 B>						

Original Date of Accreditation: 27 May 2016

Page 3 of 3

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%

ISSUED BY THE SOUTH AFRICAN NATIONAL ACCREDITATION SYSTEM

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: 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

Mr R Josias Chief Executive Officer

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



## SCHEDULE OF ACCREDITATION

## TIME AND FREQUENCY METROLOGY

Facility Number: 550

Permanent Address of Laboratory:		Technical Signatories:	Mr W Botha	
Precision Measurements (Pty) Ltd				
Building 8 CSIR Campus				
Meiring Nau				
Lynnwood		i e		
0081				
Postal Addr	ess:	Nominated Representative:	Mr W Botha	
P O Box 392				
Moreleta Par	rk			
0044				
Tel: (01	12) 035-0219	Issue No.: 02		
Transact News	36) 768-3066	Date of Issue: 28 October 2016	P	
E-mail: <u>wil</u>	lemb@precisiongroupsa.com	Expiry Date: 29 September 20		
ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR	RANGE OF MEASURED QUANTITY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN	NOTES
	INSTRUMENT	QUANTIT	UNCERTAINTY (±)	
1	Frequency			
1.1	Frequency	Specific values		
at ava	,	1 MHz; 5 MHz; 10 MHz	3·10 <sup>-11</sup> ·f	1
		Other Values	is a second of the second of t	
		10 mHz to 1 MHz	1·10 <sup>-10</sup> ·f + 15 μHz	
		1 MHz to 1,3 GHz	1·10 <sup>-10</sup> ·f	
		1,3 GHz to 26,5 GHz	2 Hz	
2	Pulse Repetition Frequency			
2.1	Pulse Repetition Frequency (Non sinusoidal signal)	100 mHz to 1 GHz	5·10 <sup>-11</sup> ·f + 15 μHz	
3		On-site calibration for items 1.1 &	2.1 above	

Original Date of Accreditation: 27 May 2016

Page 1 of 1

Note 1: For a continuous observation period of 10<sup>5</sup> 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%

ISSUED BY THE SOUTH AFRICAN NATIONAL ACCREDITATION SYSTEM

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

Mr R Josias Chief Executive Officer

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



## SCHEDULE OF ACCREDITATION

## RADIO FREQUENCY METROLOGY

Facility Number: 750

Permanent Address of Laboratory: Precision Measurements (Pty) Ltd Building 8 CSIR Campus Meiring Naude Road Lynnwood 0081		Technical Signatory:	Mr E Föck			
Postal Addi	ress:					
P O Box 392	203	Nominated Representative	e: Mr W Botha			
Moreleta Pa	rk					
0044						
Fax: (08	2) 035-0219 6) 768-0366 emb@precisiongroupsa.com		Date of Issue: 28 October 2016			
ITEM	MEASURED QUANTITY OR TYPE OF GAUGE OR INSTRUMENT	RANGE OF MEASURED QUANTITY	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)		
1	Power 50 Ω		•	•		
1.1	Power 50 Ω	0 dBm (1 mW)	50 MHz	0,1 dB		
*	·	-30 dBm to +20 dBm (1 μW to 100 mW)	10 MHz to 1 GHz 1 GHz to 12 GHz 12 GHz to 18 GHz	0,2 dB 0,3 dB 0,4 dB		
		+20 dBm to +44 dBm (100 mW to 25 W)	50 MHz to 220 MHz	0,4 dB		
		-110 dBm to -30 dBm (1 pW to 1 μW)	10 MHz to 1 GHz 1 GHz to 12 GHz	0,2 dB + 0,003 dB / dBm 0,3 dB + 0,007 dB / dBm		
×		-90 dBm to -30dBm (1 pW to 1 μW)	12 GHz to 18 GHz	0,4 dB + 0,01 dB / dBm		

Original Date of Accreditation: 27 May 2016

Calibrator Factor

Page 1 of 2

4 %

7 % 9 %

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%

1 % to 150 %

10 MHz to 1 GHz

1 GHz to 12 GHz

12 GHz to 18 GHz



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

ITEM	MEASURED QUANTIT TYPE OF GAUGE ( INSTRUMENT		RANGE OF	MEASURED QUANTITY	NOMINAL FREQUENCY	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)
3	Attenuation 50 Ω	Attenuation 50 Ω				
3.1	Attenuation 50 Ω		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 100 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 10 dB to 90 dB 90 dB to 110 dB 10 dB to 90 dB 90 dB to 110 dB 0 dB to 100 dB		DC DC 10 MHz to 1 GHz 10 MHz to 1 GHz 10 MHz to 1 GHz 10 MHz to 8 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	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
4	Voltage Reflection Coef	Voltage Reflection Coefficient 50 Ω				
4.1	Voltage Reflection Coef 50 Ω	ficient		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 Ω	0 9	llation Depth % to 95 % % to 95 %	Carrier 100 kHz to 1 GHz 5 MHz to 1 GHz	Modulation 300 Hz to 10 kHz 10 kHz to 100 kHz	2-10 <sup>-2</sup> -M + 0,01 % 2-10 <sup>-2</sup> -M + 0,01 %
6	Frequency Modulation 50 Ω	0 Hz	k Deviation to 100 kHz to 100 kHz	Carrier 100 kHz 5 MHz to 1 GHz	Modulation 300 Hz to 10 kHz 10 Hz to 100 kHz	1·10 <sup>-2</sup> ·Δ f + 1 Hz 1·10 <sup>-2</sup> ·Δ f + 1 Hz
	On-site calibration for all items					

Original Date of Accreditation: 27 May 2016

Page 2 of 2

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