

CERTIFICATE OF CALIBRATION

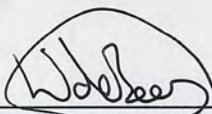
CERTIFICATE NUMBER	2012-0733
ORGANISATION	BUSINESS ENTERPRISES AT UNIVERSITY OF PRETORIA, DEPARTMENT OF MECHANICAL & AERONAUTICAL ENGINEERING
ORGANISATION ADDRESS	ROOM 10-8, UNIVERSITY OF PRETORIA, PRETORIA, 0002
CALIBRATION OF	ACCELEROMETER
CALIBRATED BY	M.W. DE BEER
MANUFACTURER	PCB
MODEL NUMBER	U 353 B16
SERIAL NUMBER	22597
DATE OF CALIBRATION	7 MAY 2012
RECOMMENDED DUE DATE	-----
PAGE NUMBER	PAGE 1 OF 4

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Calibrations performed by this laboratory are in terms of standards, the accuracies of which are traceable to national measuring standards as maintained by NMISA

The measurement results recorded in this certificate were correct at the time of calibration. The subsequent accuracy will depend on factors such as care, handling, frequency of use and the amount of different users. It is recommended that re-calibration should be performed at an interval, which will ensure that the instrument remains within the desired limits and/or manufacturer's specifications.

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M.W. DE BEER (SANAS TECHNICAL SIGNATORY)

8 May 2012
DATE OF ISSUE

1. PROCEDURE

The instrument was calibrated using procedure 1302/P/003 against a laboratory standard accelerometer with the back-to-back method.

2. MEASURING EQUIPMENT

PCB	301A10	Standard Accelerometer	1406
PCB	482B	ICP Power Supply	145
PCB	482A03	ICP Power Supply	1304
Agilent	33120A	Function Generator	MY 40012904
HP	34401A	Multimeter	7110-001
B&K	4808	Vibration Exciter c/w Amplifier	11420932

3. RESULTS

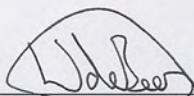
3.1 SENSITIVITY

The accelerometer output sensitivity, with an applied vibration level of 1,0 g at 159,2 Hz, was found to be: 8,94 mV/g with supplied cable.

3.2 LEVEL LINEARITY

APPLIED LEVEL g rms	REQUIRED UUT OUTPUT LEVEL mVrms	UUT MEASURED OUTPUT LEVEL mVrms	ERROR IN %
1,0	8,94	8,94	0,0
0,1	0,894	0,889	+0,6
0,5	4,470	4,922	+10,1 *
1,0	8,94	8,94	0,0
2,0	17,88	17,89	+0,1
3,0	26,82	26,83	0,0
5,0	44,70	44,69	0,0
7,0	62,58	62,54	-0,1
10,0	89,40	89,44	+0,1
1,0	8,94	8,94	0,0

* UUT is used normally for shock measurements



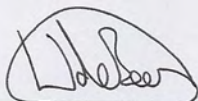
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3.3 FREQUENCY RESPONSE

APPLIED FREQUENCY (Hz)	REQUIRED UUT OUTPUT LEVEL mVrms	UUT MEASURED OUTPUT LEVEL mVrms	ERROR IN %
159,2 (Ref.)	8,94	8,94	0,0
3,15	0,894	0,784	-12,3 *
5	1,788	1,753	-2,0
10	1,788	1,785	-0,2
20	4,470	4,399	-1,6
31,5	8,94	8,83	-1,2
63	8,94	8,89	-0,6
125	8,94	8,94	0,0
159,2	8,94	8,94	0,0
255	8,94	8,94	0,0
510	8,94	8,95	+0,1
1000	8,94	8,98	+0,5
2000	8,94	9,03	+1,0
3000	8,94	9,19	+2,8
4000	8,94	9,04	+1,1
5000	8,94	9,07	+1,5
6300	8,94	9,38	+4,9 **
8000	8,94	9,48	+6,0 **
10000	8,94	9,64	+7,8 **
159,2	8,94	8,94	0,0

* Limitation on our calibration system on low frequencies due to 12,5 mm maximum displacement of shaker

** High frequency influence due to mounting limitation of the small size of UUT fixed stud

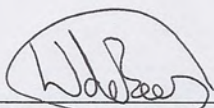


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4. REMARKS

- 4.1 The reported expanded uncertainties of measurements are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95,45 %, the uncertainties of measurements have been estimated in accordance with the principles defined in the GUM (Guide to Uncertainty of Measurement) ISO, Geneva, 1993
- 4.2 The environmental conditions were: Temperature: $(23 \pm 2) ^\circ\text{C}$
Relative Humidity: $(50 \pm 15) \%$
- 4.3 Calibration labels bearing cal date, due date (if requested), certificate number and serial number have been affixed to the instrument.
- 4.4 The uncertainty of measurements was estimated for:
- | | |
|------------------------|-------------|
| 3,15 Hz to 10 Hz: | $\pm 10 \%$ |
| 10 Hz to 1 000 Hz: | $\pm 5 \%$ |
| 1 000 Hz to 10 000 Hz: | $\pm 10 \%$ |
- 4.5 The measurements were performed with the following mounting conditions: back-to-back using a modified nut.

-----SECTION 4.5 THE END OF CERTIFICATE-----



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