SONOR Kalibratie
Egelweide 2
3437 WJ Nieuwegein
Telefoon: 030 879 79 79
E-mail info@sonorkalibratie.nl
KvK nr.:30238036

Certificate of Calibration

Certificate number: TC-2137-1A

Applicant	Name:	**Sensornet**
	Address :	**Casuariestraat 7**
		2511 VB Den Haag
Transducer	Manufacturer :	**Senteq**
	Model:	**B3 measuring unit / 17200**
	Serial number:	**J0398**
	Description	**SBR module including one accelerometer 17200**
	Customer ID nr.:	**V008**
Preamplifier	Manufacturer :	**Sensornet**
	Model:	**B3 measuring unit**
	Serial number:	**13**
	Description	**Vibration measurements**
	Customer ID nr.:	**13**

Calibration method:

This calibration was performed in accordance with the requirement specified in manufacturer specifications and SONOR Kalibratie procedure related to ISO 16063-21. The lowest measurable frequency from the calibration equipment used in the testing setup is 5Hz.

Uncertainties:

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor *k*=2, which provides a confidence level of approximately 95%. The standard uncertainty has been determined in accordance with EA 04/2.

Traceability:

The measurements have been executed using standards traceable to (inter)national standards. Supporting documentation relative to traceability is on file and is available on request.

Environmental conditions:

Air pressure	1023	hPa
Temperature	24	°C
Relative humidity	49	%

Date of Receipt:	09 October 2015
Date of Calibration :	09 October 2015
Date of Certificate :	20 October 2015

Authorized Signatory : F. Salama

1.Results

Measurement Uncertainty 0.15 dB

Fixture Wax
Orientation vertical

Sensitivity transducer 98.42 **mV/msec2**

Measured values out of the DUT (Device under test) Calculated values based on the Input Acceleration

Input Freq in Hz	Meas Lzeq in dB	Meas DUT Vtop in dB	Meas DUT Veff in dB	Meas DUT DIN A in dB	Meas V REF Volt	Acc input Input	Acc dB Input	Vel Input Input	Vel dB RMS Input	Vel Peak Input
					Volt	m/sec2	dB m/s2	m/sec	dB m/sec	dB m/sec Piek
159.16	119.8	118.5	100.9	104.5	1.014	1.00	119.98	0.00	119.98	122.98
5.01	120.0	153.1	147.1	153.1	1.023	1.03	120.27	0.03	150.31	153.31
6.31	120.1	151.1	146.1	151.1	1.033	1.04	120.33	0.03	148.36	151.36
7.94	120.2	149.1	144.8	149.1	1.029	1.03	120.27	0.02	146.31	149.31
10.00	119.9	146.9	143.0	146.9	1.004	1.00	120.03	0.02	144.07	147.07
12.59	119.9	144.9	141.3	144.9	1.004	1.00	120.01	0.01	142.04	145.04
15.92	119.9	142.8	139.5	142.8	1.001	1.00	119.97	0.01	139.97	142.97
19.95	119.8	140.8	137.6	140.7	0.995	0.99	119.90	0.01	137.94	140.94
25.12	119.8	138.8	135.7	138.7	1.009	1.00	120.01	0.01	136.05	139.05
31.62	119.8	136.7	133.6	136.7	1.006	1.00	119.97	0.01	134.01	137.01
39.81	119.8	134.6	131.6	134.6	1.011	1.00	120.01	0.00	132.04	135.04
50.12	119.4	132.0	129.0	132.0	0.958	0.95	119.53	0.00	129.57	132.57
63.10	119.7	130.1	127.1	130.1	0.999	0.99	119.89	0.00	127.92	130.92
79.43	119.8	127.8	125.5	127.5	1.007	0.99	119.94	0.00	125.98	128.98
100.00	119.8	125.2	120.6	123.7	1.012	1.00	119.97	0.00	124.01	127.01
125.89	119.7	122.1	112.8	115.9	1.004	0.99	119.90	0.00	121.94	124.94
158.49	119.8	118.5	100.9	104.3	1.002	0.99	119.88	0.00	119.92	122.92
199.53	119.8	114.0	87.0	92.0	1.003	0.99	119.88	0.00	117.92	120.92

Acceleration attenuation graphic in dB.

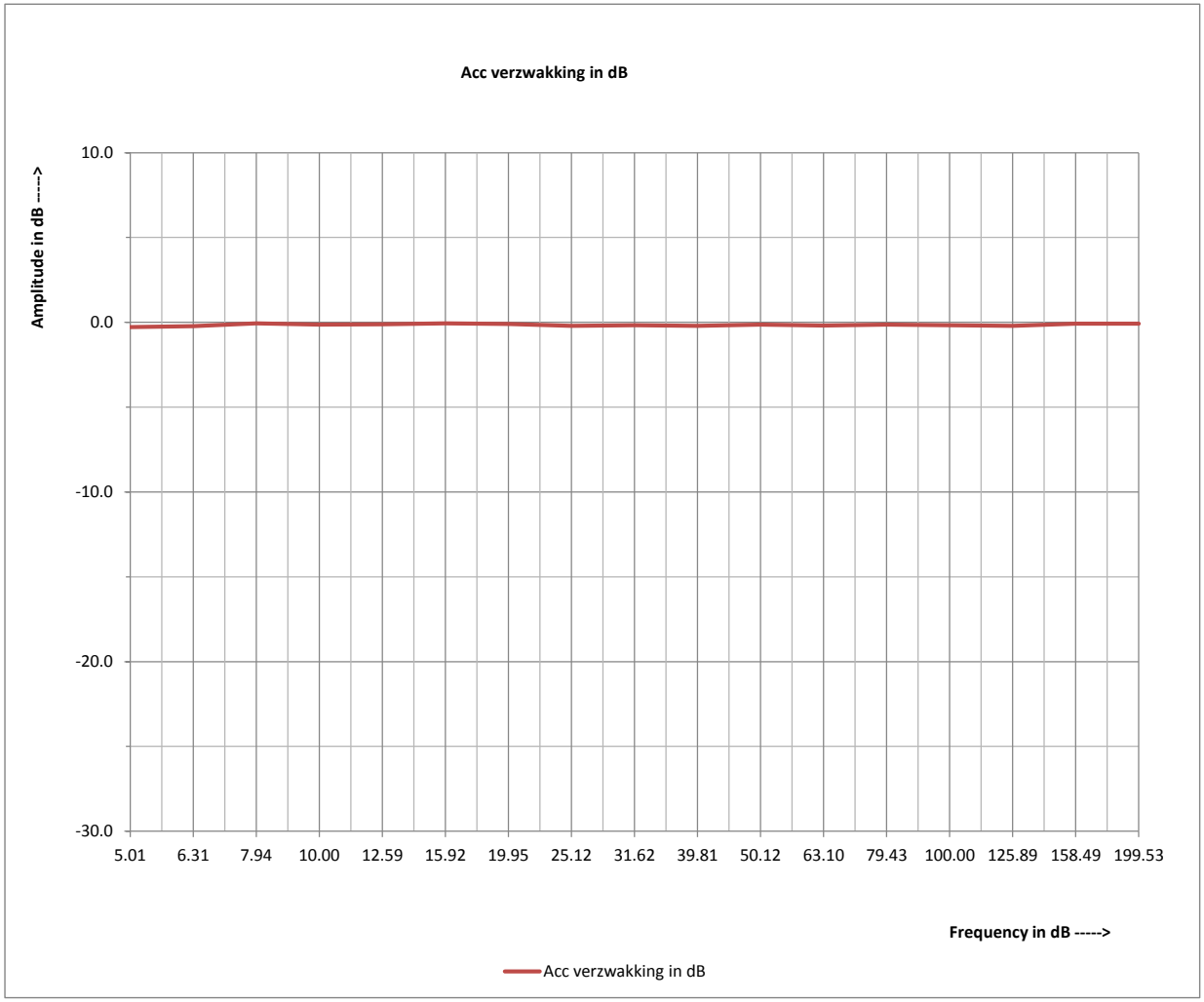
Measured values out of the DUT

Input Freq in Hz	Meas Lzeq in dB
159.16	119.8
5.01	120.0
6.31	120.1
7.94	120.2
10.00	119.9
12.59	119.9
15.92	119.9
19.95	119.8
25.12	119.8
31.62	119.8
39.81	119.8
50.12	119.4
63.10	119.7
79.43	119.8
100.00	119.8
125.89	119.7
158.49	119.8
199.53	119.8

Calculated values based on the Input Acceleration

Acc input Input	Acc dB Input	Input Freq in Hz	Deviation Acc verzwakking in dB
1.00	120.0	159.16	-0.2
1.03	120.3	5.01	-0.3
1.04	120.3	6.31	-0.2
1.03	120.3	7.94	-0.1
1.00	120.0	10.00	-0.1
1.00	120.0	12.59	-0.1
1.00	120.0	15.92	-0.1
0.99	119.9	19.95	-0.1
1.00	120.0	25.12	-0.2
1.00	120.0	31.62	-0.2
1.00	120.0	39.81	-0.2
0.95	119.5	50.12	-0.1
0.99	119.9	63.10	-0.2
0.99	119.9	79.43	-0.1
1.00	120.0	100.00	-0.2
0.99	119.9	125.89	-0.2
0.99	119.9	158.49	-0.1
0.99	119.9	199.53	-0.1

Acceleration attenuation graphic in dB. The input Acceleration is compared to the measured Lzeq dB value



Limits according to "Meet- en beoordelingsrichtlijnen, Schade aan gebouwen, Deel A"

Results of the SBR A filter for Vtop in dB

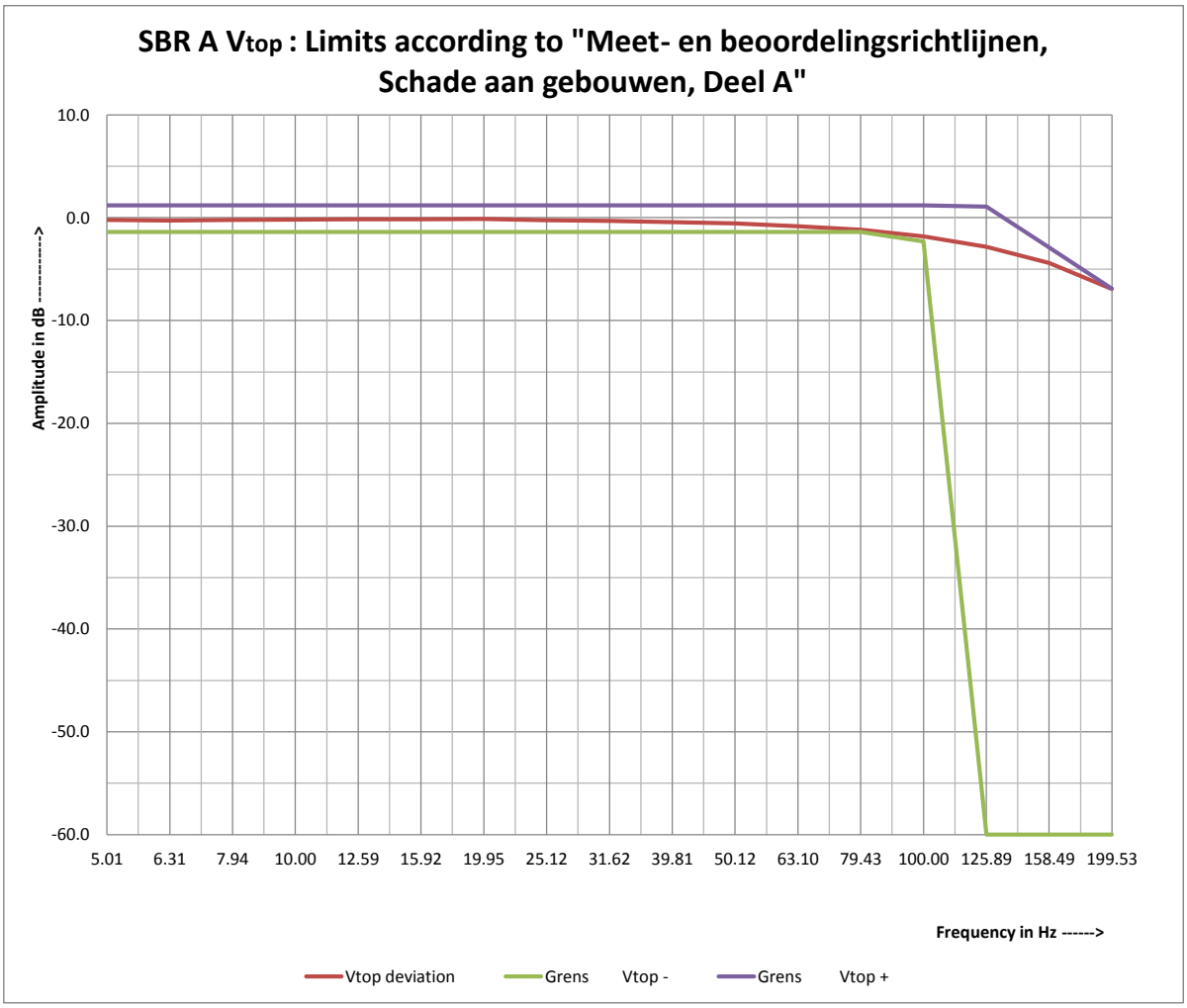
Input Freq in Hz	Input Vel Peak Input	Measured Meas DUT Vtop in dB
159.16	123.0	118.5
5.01	153.3	153.1
6.31	151.4	151.1
7.94	149.3	149.1
10.00	147.1	146.9
12.59	145.0	144.9
15.92	143.0	142.8
19.95	140.9	140.8
25.12	139.0	138.8
31.62	137.0	136.7
39.81	135.0	134.6
50.12	132.6	132
63.10	130.9	130.1
79.43	129.0	127.8
100.00	127.0	125.2
125.89	124.9	122.1
158.49	122.9	118.5
199.53	120.9	114

Calculated values based on the Input Acceleration

Deviation ref 159.16 Hz

Input Freq in Hz	Vtop deviation	Grens Vtop -	Grens Vtop +
159.16	-4.5	-60.0	-2.9
5.01	-0.2	-1.4	1.2
6.31	-0.3	-1.4	1.2
7.94	-0.2	-1.4	1.2
10.00	-0.2	-1.4	1.2
12.59	-0.1	-1.4	1.2
15.92	-0.2	-1.4	1.2
19.95	-0.1	-1.4	1.2
25.12	-0.2	-1.4	1.2
31.62	-0.3	-1.4	1.2
39.81	-0.4	-1.4	1.2
50.12	-0.6	-1.4	1.2
63.10	-0.8	-1.4	1.2
79.43	-1.2	-1.4	1.2
100.00	-1.8	-2.3	1.2
125.89	-2.8	-60.0	1.1
158.49	-4.4	-60.0	-2.9
199.53	-6.9	-60.0	-6.9

Deviation of th Vtop in dB. The measured dB is subtracted from the V top INPUT



Limits according to "Meet- en beoordelingsrichtlijnen, Hinder voor personen in gebouwen, Deel B"

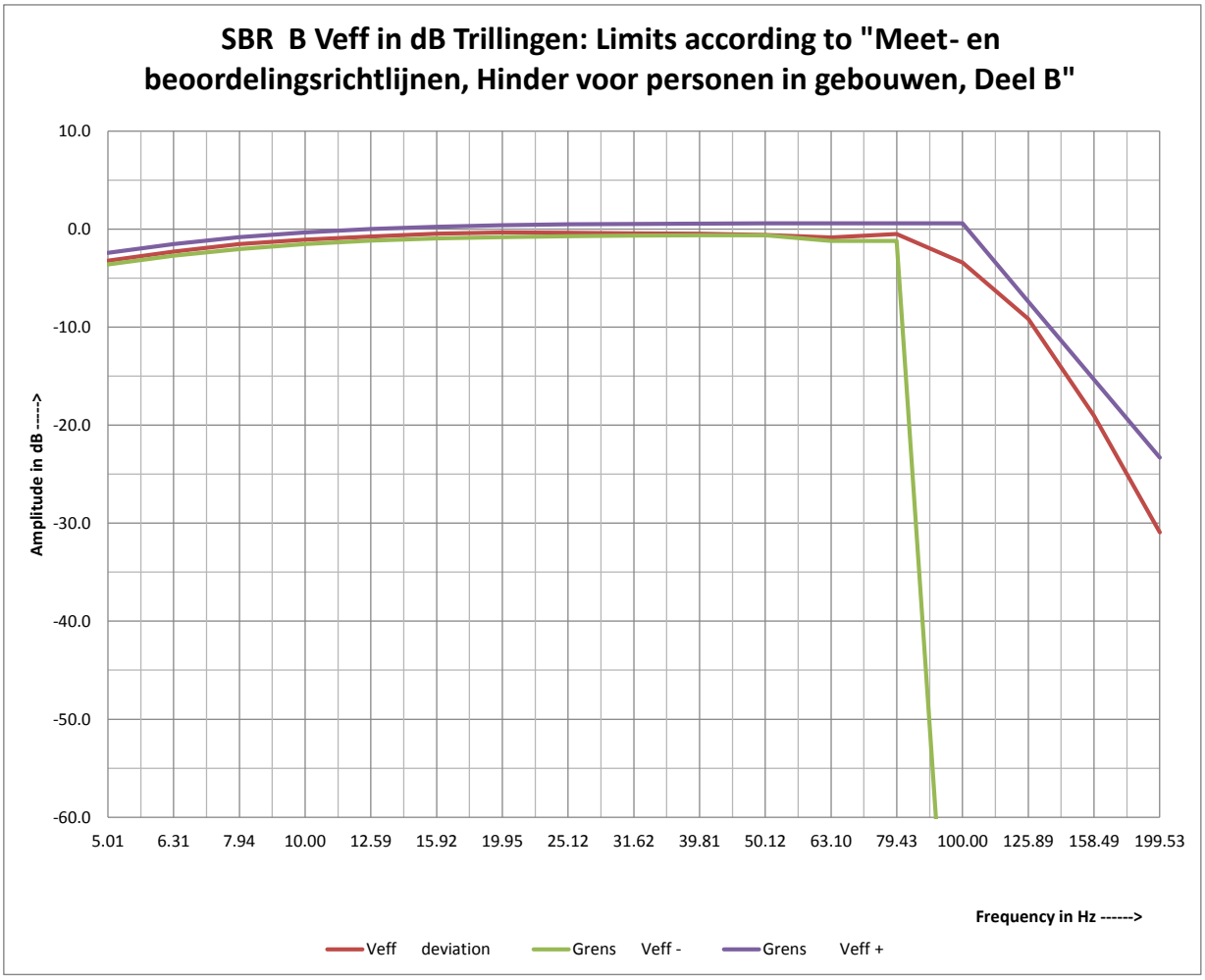
Results of the SBR B filter for Veff in dB

Input Freq in Hz	Input Vel dB RMS Input	Measured Meas DUT Veff in dB
159.16	120.0	100.9
5.01	150.3	147.1
6.31	148.4	146.1
7.94	146.3	144.8
10.00	144.1	143.0
12.59	142.0	141.3
15.92	140.0	139.5
19.95	137.9	137.6
25.12	136.0	135.7
31.62	134.0	133.6
39.81	132.0	131.6
50.12	129.6	129.0
63.10	127.9	127.1
79.43	126.0	125.5
100.00	124.0	120.6
125.89	121.9	112.8
158.49	119.9	100.9
199.53	117.9	87.0

Calculated values based on the Input Acceleration

Deviation ref 159.16 Hz

Input Freq in Hz	Veff deviation	Grens Veff -	Grens Veff +
159.16	-19.1	-100.0	-15.3
5.01	-3.2	-3.6	-2.4
6.31	-2.3	-2.7	-1.5
7.94	-1.5	-2.0	-0.8
10.00	-1.1	-1.5	-0.3
12.59	-0.7	-1.2	0.0
15.92	-0.5	-0.9	0.3
19.95	-0.3	-0.8	0.4
25.12	-0.3	-0.7	0.5
31.62	-0.4	-0.6	0.6
39.81	-0.4	-0.6	0.6
50.12	-0.6	-0.6	0.6
63.10	-0.8	-1.2	0.6
79.43	-0.5	-1.2	0.6
100.00	-3.4	-100.0	0.6
125.89	-9.1	-100.0	-7.4
158.49	-19.0	-100.0	-15.3
199.53	-30.9	-100.0	-23.3



Limits according to DIN-45669-1 Vmax

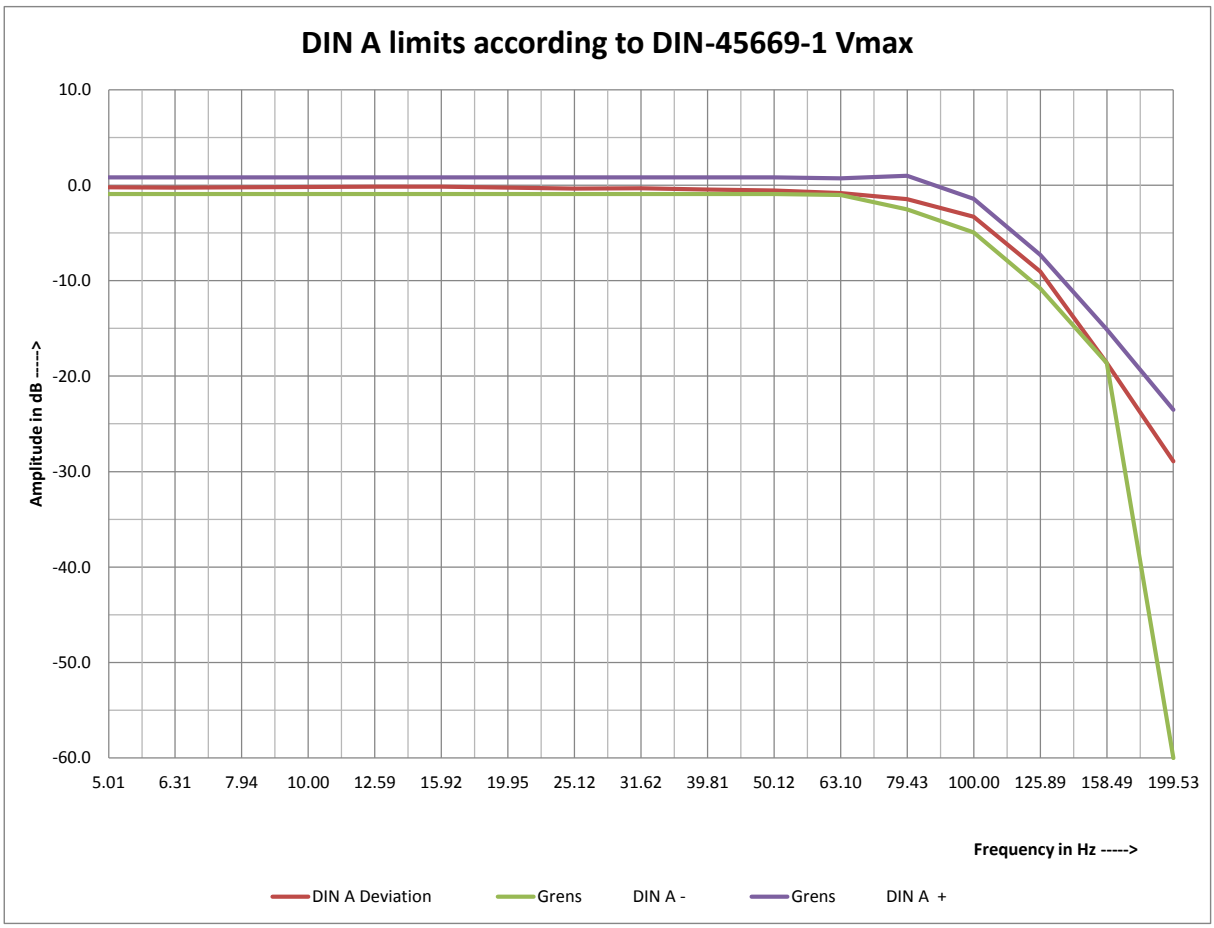
Results of the DIN A filter for Vpiek in dB

Input Freq in Hz	Input Vel Peak Input	Measured Meas DUT DIN A in dB
159.16	123.0	104.5
5.01	153.3	153.1
6.31	151.4	151.1
7.94	149.3	149.1
10.00	147.1	146.9
12.59	145.0	144.9
15.92	143.0	142.8
19.95	140.9	140.7
25.12	139.0	138.7
31.62	137.0	136.7
39.81	135.0	134.6
50.12	132.6	132.0
63.10	130.9	130.1
79.43	129.0	127.5
100.00	127.0	123.7
125.89	124.9	115.9
158.49	122.9	104.3
199.53	120.9	92.0

Calculated values based on the Input Acceleration

Deviation ref 159.16 Hz

Input Freq in Hz	DIN A Deviation	Grens DIN A -	Grens DIN A +
159.16	-18.5	-18.6	-15.1
5.01	-0.2	-0.9	0.8
6.31	-0.3	-0.9	0.8
7.94	-0.2	-0.9	0.8
10.00	-0.2	-0.9	0.8
12.59	-0.1	-0.9	0.8
15.92	-0.2	-0.9	0.8
19.95	-0.2	-0.9	0.8
25.12	-0.3	-0.9	0.8
31.62	-0.3	-0.9	0.8
39.81	-0.4	-0.9	0.8
50.12	-0.6	-0.9	0.8
63.10	-0.8	-1.0	0.7
79.43	-1.5	-2.5	1.0
100.00	-3.3	-4.9	-1.4
125.89	-9.0	-10.8	-7.3
158.49	-18.6	-18.6	-15.1
199.53	-28.9	-60.0	-23.5



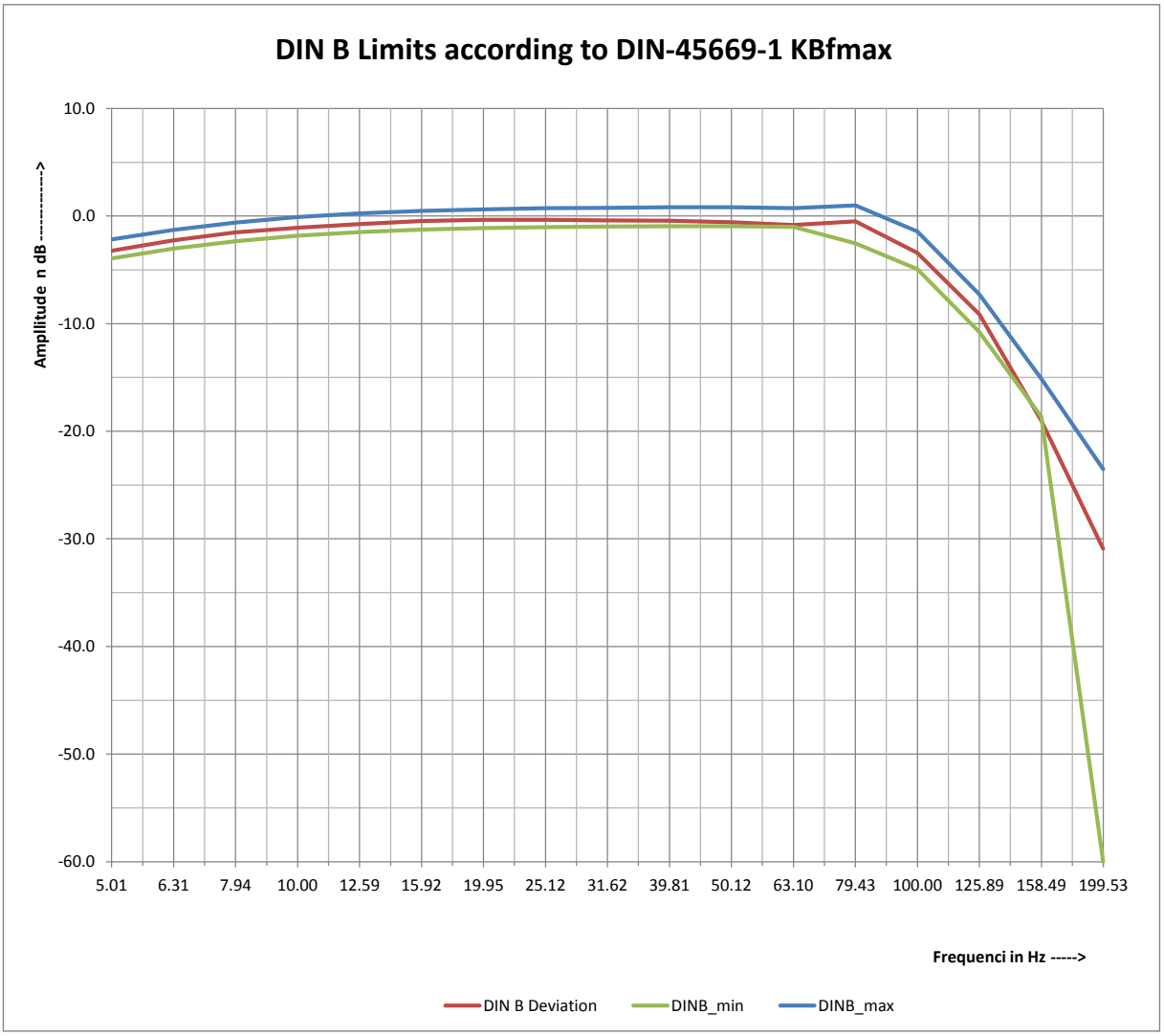
Limits according to DIN-45669-1 KBfmax

Results of the DIN B filter for KB in dB

	Input	Measured
Input Freq in Hz	Vel dB RMS Input	DIN B in dB
159.16	120.0	100.9
5.01	150.3	147.1
6.31	148.4	146.1
7.94	146.3	144.8
10.00	144.1	143.0
12.59	142.0	141.3
15.92	140.0	139.5
19.95	137.9	137.6
25.12	136.0	135.7
31.62	134.0	133.6
39.81	132.0	131.6
50.12	129.6	129.0
63.10	127.9	127.1
79.43	126.0	125.5
100.00	124.0	120.6
125.89	121.9	112.8
158.49	119.9	100.9
199.53	117.9	87.0

Deviation ref 159.16 Hz

Input Freq in Hz	DIN B Deviation	DINB_min	DINB_max
159.16	-19.1	-18.6	-15.1
5.01	-3.2	-3.9	-2.2
6.31	-2.3	-3.0	-1.3
7.94	-1.5	-2.3	-0.6
10.00	-1.1	-1.8	-0.1
12.59	-0.7	-1.5	0.3
15.92	-0.5	-1.3	0.5
19.95	-0.3	-1.1	0.6
25.12	-0.3	-1.0	0.7
31.62	-0.4	-1.0	0.8
39.81	-0.4	-0.9	0.8
50.12	-0.6	-0.9	0.8
63.10	-0.8	-1.0	0.7
79.43	-0.5	-2.5	1.0
100.00	-3.4	-4.9	-1.4
125.89	-9.1	-10.8	-7.3
158.49	-19.0	-18.6	-15.1
199.53	-30.9	-60.0	-23.5



Test equipment

Description	Due date	Traceable to
Reference accelerometer	May-16	DAkkS
Signal conditioner	May-16	DAkkS
DMM	Feb-16	RvA
DMM	Feb-16	RvA