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# Deutschen Kalibrierdienst



## Kalibrierschein

### *Calibration Certificate*

## Kalibrierzeichen



Deutsche  
Akkreditierungsstelle  
D-K-15183-01-00

02917
D-K-
15183-01-00
2020-02

# Gegenstand *Object*

# Triaxial-Accelerometer

**Hersteller**  
*Manufacturer*

**Typ**  
*Type*

Fabrikat/Serien-Nr. **LC18060782**  
*Serial number*

Auftraggeber  
*Customer* Montronix GmbH  
DE-71720 Oberstenfeld

Auftragsnummer **AG20-00436**  
Order No.

Anzahl der Seiten des Kalibrierscheines  
*Number of pages of the certificate*

Datum der Kalibrierung **17/02/2020**  
*Date of calibration*

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Stellv. Leiter des Kalibrierlaboratoriums  
*Deputy head of the calibration laboratory*

## Bearbeiter *Person in charge*

Datum  
*Date*

06/03/2020

Mario Guthier

Michael Bürger

  
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## 1. Object of Calibration

Object: **Triaxial-Accelerometer**  
Manufacturer: **Montronix**  
Type: **PulseNG**  
Serial number: **LC18060782**

## 2. Calibration Method

Calibration was performed using the method of comparison according to Directive DAkkS-R 3-1.  
The transducer was exposed to sinusoidal acceleration which was applied by means of an electrodynamic vibration exciter. The measurement chain was calibrated by comparing the display of the object of calibration with that of a reference measuring device.

## 3. Environmental Conditions

Environmental temperature of the test object: **(23.8 ± 1) °C**  
Relative humidity: **(37 ± 5) %**

## 4. Test Conditions

Position of exciting axis (axes) relative to the earth gravity: **vertical**  
Temperature of test object: **(23.8 ± 2) °C**

Attachment of test object to vibration exciter: **glued (Cyanacrylat)**

Technical data of the connecting cable  
Manufacturer: **customer cable**  
Type: **NN**

Switch position on the object of calibration  
Application software: **Matlab**  
Settings: **no**

Determinating of the deviation of display  
Frequency range: **122 Hz**  
Acceleration (rms): **20 m/s<sup>2</sup>**  
(acceleration due to gravity 1 g<sub>n</sub> = 9.80665 m/s<sup>2</sup>)

Determinating of the deviation of display  
Frequency range: **10 Hz - 1300 Hz**  
Acceleration (rms): **see table**  
Number of frequency points on log scale: **11**



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## 5. Measurement Uncertainty

These are the total relative measurement uncertainties at **provided** values:

- for determination of the deviation of displayed values within the frequency range

10 Hz bis	<20 Hz	1.5%
20 Hz bis	1000 Hz	1.0%
>1000 Hz bis	1300 Hz	1.5%

The specified values are the extended measurement uncertainties obtained by multiplying the standard measurement uncertainties by extension factor  $k = 2$ . They were ascertained in line with EA-4/02 M:2013. The values of the measuring quantity fall into the assigned intervals with a probability of 95 %.

The Deutsche Akkreditierungsstelle GmbH is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates. The other signatories inside and beyond Europe can be taken from the web pages of EA ([www.european-accreditation.org](http://www.european-accreditation.org)) and ILAC ([www.ilac.org](http://www.ilac.org)).

## 6. Components of the Reference Measuring Equipment

	Manufacturer	Type	Serial number
Vibration exciter	SPEKTRA	SE-10	017
Ref. standard transducer	PCB	M353B17	LW196211
Calibration system	SPEKTRA	CS18 DKD 7	200819

## 7. Results

### 7.1 Determination of calibration value at reference point

Frequency range: **122 Hz**  
Acceleration (rms): **20 m/s<sup>2</sup>**



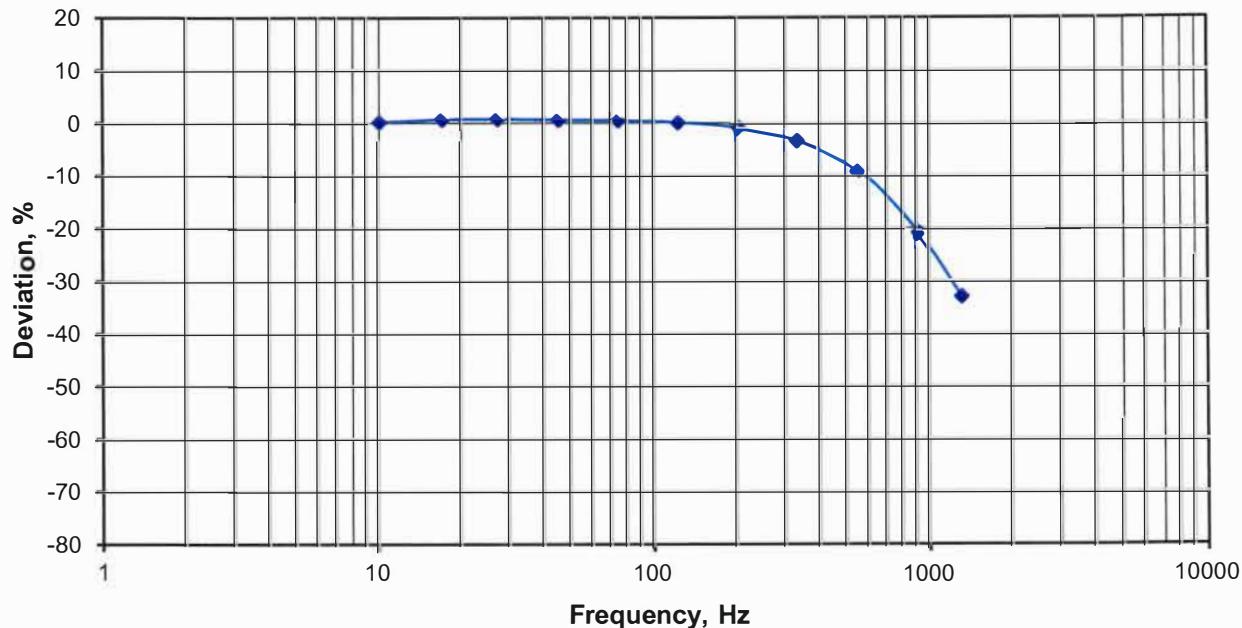
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### Deviation of displayed value (absolute and frequency response relative to 122 Hz)

#### x-axis

Frequency, in Hz	provided acceleration, (rms) in m/s <sup>2</sup>	Displayed value, in m/s <sup>2</sup>	Deviation of displayed value, in dB	Deviation of displayed value, relat. to 122 Hz in %	Deviation of displayed value, relat. to 122 Hz in %
10	4.1	4.150	0.06	0.7	0.1
17	20.2	20.41	0.10	1.2	0.6
27	20.1	20.33	0.11	1.3	0.7
45	20.0	20.27	0.10	1.2	0.5
74	20.0	20.22	0.09	1.0	0.4
<b>122</b>	<b>20.0</b>	<b>20.13</b>	<b>0.05</b>	<b>0.6</b>	<b>0.0</b>
202	20.0	19.94	-0.03	-0.3	-1.0
334	20.0	19.48	-0.23	-2.7	-3.3
551	20.0	18.34	-0.76	-8.4	-9.0
909	20.0	15.95	-1.97	-20.3	-20.9
1300	20.0	13.52	-3.40	-32.4	-33.0

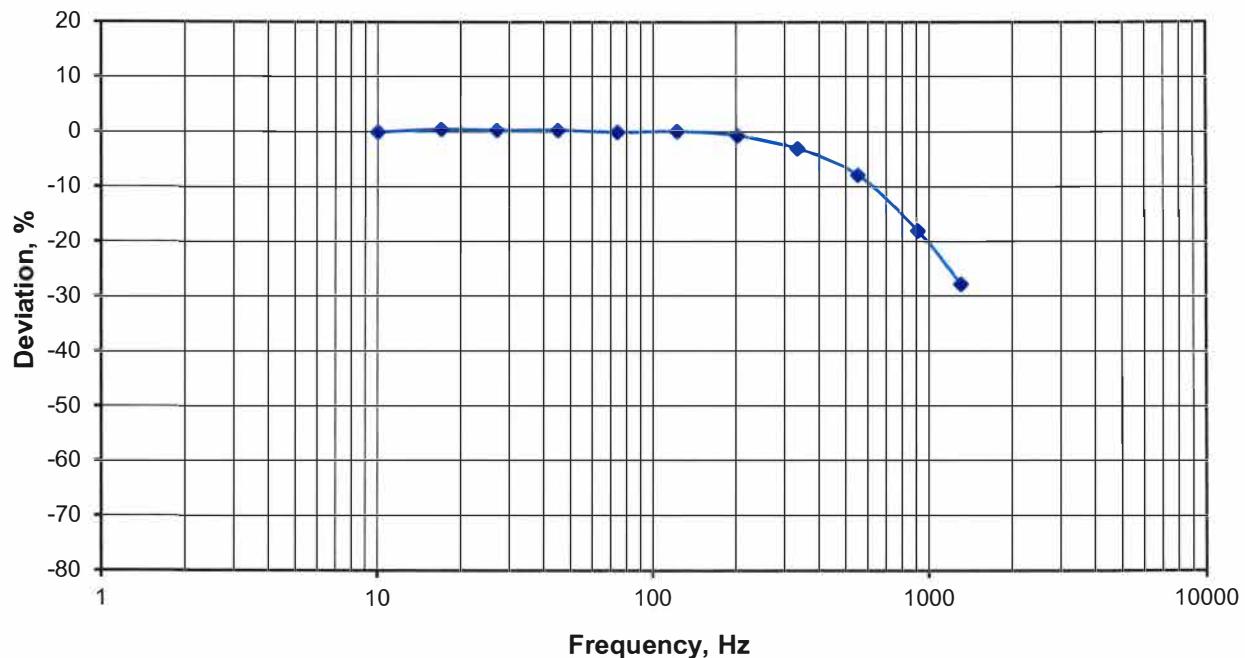
#### Frequency response relative to 122 Hz



y-axis

Frequency, in Hz	provided acceleration, (rms) in m/s <sup>2</sup>	Displayed value, in m/s <sup>2</sup>	Deviation of displayed value, in dB	Deviation of displayed value, in %	Deviation of displayed value, relat. to 122 Hz in %
10	4.1	4.186	0.14	1.6	-0.2
17	20.1	20.56	0.18	2.1	0.4
27	20.1	20.46	0.17	1.9	0.2
45	20.0	20.43	0.17	2.0	0.2
74	20.0	20.34	0.14	1.6	-0.1
<b>122</b>	<b>20.0</b>	<b>20.36</b>	<b>0.15</b>	<b>1.7</b>	<b>0.0</b>
202	20.0	20.21	0.09	1.0	-0.8
334	20.0	19.73	-0.13	-1.4	-3.2
551	20.0	18.78	-0.56	-6.2	-8.0
909	20.0	16.74	-1.55	-16.3	-18.1
1300	20.0	14.79	-2.62	-26.1	-27.8

Frequency response relative to 122 Hz



**z-axis**

Frequency, in Hz	provided acceleration, (rms) in m/s <sup>2</sup>	Displayed value, in m/s <sup>2</sup>	Deviation of displayed value,		Deviation of displayed value, relat. to 122 Hz in %
			in dB	in %	
10	4.1	4.017	-0.20	-2.3	-0.2
17	20.1	19.68	-0.20	-2.3	-0.1
27	20.1	19.64	-0.19	-2.1	0.0
45	20.0	19.58	-0.20	-2.3	-0.2
74	20.0	19.59	-0.19	-2.1	0.0
<b>122</b>	<b>20.0</b>	<b>19.58</b>	<b>-0.19</b>	<b>-2.1</b>	<b>0.0</b>
202	20.0	19.37	-0.28	-3.2	-1.1
334	20.0	19.16	-0.38	-4.3	-2.2
551	20.0	18.52	-0.68	-7.5	-5.4
909	20.0	17.17	-1.33	-14.2	-12.1
1300	20.0	14.80	-2.62	-26.0	-23.9

**Frequency response relative to 122 Hz**

