

## Kalibrierschein / Calibration Certificate

erstellt durch das Kalibrierlaboratorium  
*issued by the calibration laboratory*

**PCB Piezotronics Europe GmbH**  
**Porschestr. 20-30**  
**41836 Hückelhoven**



Deutsche  
Akkreditierungsstelle  
D-K-19664-01-00

als Kalibrierlaboratorium im / *as calibration laboratory in the*

**Deutschen Kalibrierdienst**



Kalibrierzeichen  
*Calibration mark*

18073
D-K- 19664-01-00
2020-03

Gegenstand  
*Object*

**ICP® Accelerometer**

Hersteller  
*Manufacturer*

**PCB**

Typ  
*Type*

**JM353B18**

Serien-Nr.  
*Serial number*

**227873**

Auftraggeber  
*Customer*

**Mustermann GmbH**  
**Musterstr. 1**  
**12345 Musterstadt**

Auftragsnummer  
*Order No.*

**RMA-20030801**

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

**4**

Datum der Kalibrierung  
*Date of calibration*

**10.03.2020**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).

Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.

Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

*This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).*

*The DAkkS 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 user is obliged to have the object recalibrated at appropriate intervals.*

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums.

Kalibrierscheine sind bei Nennung des für die Freigabe Verantwortlichen in Klarschrift auch ohne Unterschrift gültig.

*This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates with the full name of the approval responsible person are valid without signature.*

Datum  
*Date*

Leiter des Kalibrierlaboratoriums  
*Head of the calibration laboratory*

Bearbeiter  
*Person in charge*

12.03.2020

Dietmar Maaßen

Arno Thétard

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## 1. Sensor Information

Description: ICP® Accelerometer  
Manufacturer: PCB  
Model: JM353B18  
Serial-Number: 227873  
Axis: Uni-Axial

## 2. Calibration Procedure

Results relate only to the items calibrated.

Method: Calibration is performed in compliance with ISO 9001 and ISO 17025  
This calibration was performed with TMS 9155 Calibration Workstation version 6.3.0  
Calibration traceable to NIST (project number 17014/17004).

Back-to-Back Comparison Calibration per ISO 16063 Part 21:2003

## 3. Lab Conditions

Temperature: (23,9 ± 1) °C (75 ± 1 °F)  
Humidity: (36,6 ± 6) %

## 4. Transducer Specifications

Amp. Range: ± 4903 m/s<sup>2</sup> (± 500 g<sub>n</sub>)  
Resolution: 0,049033 m/s<sup>2</sup> (0,005 g<sub>n</sub>)  
Resonant Freq: ≥ 56000 Hz  
Temp. Range: -54 to 121 °C (-65 to 250 °F)

## 5. Equipment Used

Description	Manufacturer	Model	Serial	Due Date
Data Aquisition Card	NI	PCI-4461	15B4AAB	21.01.2021
Reference Std	PCB	080A199	213438	08.01.2021
Air Bearing Shaker	PCB	396C10	627	16.01.2021
Ref Std Conditioner	PCB	442A102	460	08.01.2021
SUT Signal Conditioner	PCB	443B101	328	09.01.2021
Power Amplifier	TMS	2100E21-C	50128	n/a

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## 6. Measurement Conditions

Axis: **Uni-Axial**  
Orientation: **Vertical (0°)**  
Cal Mode: **Sweep Down**  
Test Level: **98,07 m/s<sup>2</sup>** (10,0 g<sub>n</sub>)

Mounting **Mounting Surface: Tungsten Adapter w/Silicone Grease, Fastener: M3 Female Torque: 1 Nm**

Cables: **All cables during the calibration were parts of the workstation TMS 9155. The supplied cables were only subjected a visual and electrical inspection.**

## 7. Measurement Uncertainty

Given the expanded measurement uncertainty, result from the standard uncertainty of measurement multiplying it by the coverage factor  $k = 2$ .

It was determined according to the EA-4/02 M:2013. The value of the measurand is with a confidence level of 95% in the associated value interval.

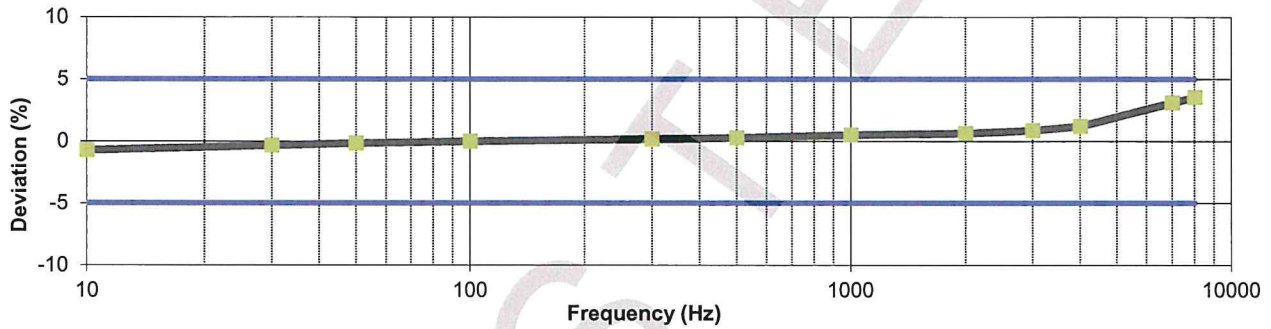
5 Hz to 9 Hz	10 Hz to 99 Hz	100 Hz	101 Hz to 920 Hz	921 Hz to 5000 Hz	5001 Hz to 10000 Hz	10001 Hz to 15000 Hz
<b>1,7%</b>	<b>1,2%</b>	<b>0,8%</b>	<b>1,0%</b>	<b>1,2%</b>	<b>2,1%</b>	<b>2,5%</b>

### 8. Calibration Data for: Uni-Axial

Sensitivity @ 100 Hz: **1,024 mV / (m/s<sup>2</sup>)**  
 10,04 mV / g<sub>n</sub>  
 Output Bias Level: **9,9 V**  
 Numbers of frequency points: **12**

Cal Date: **10.03.2020**

#### Amplitude Response Uni-Axial:



#### Data Table Uni-Axial (relating to 100 Hz):

Freq. (Hz)	Sensitivity (mV / (m/s <sup>2</sup> ))	Sensitivity (mV / g <sub>n</sub> )	relative Deviation to 100 Hz in %	Acceleration (m/s <sup>2</sup> )
10	1,016	9,97	-0,73	14,76
30	1,020	10,01	-0,34	98,15
50	1,022	10,02	-0,17	98,49
<b>100</b>	<b>1,024</b>	<b>10,04</b>	<b>0,00</b>	<b>97,19</b>
300	1,026	10,06	0,17	97,68
500	1,027	10,07	0,28	97,45
1000	1,029	10,09	0,52	97,56
2000	1,030	10,10	0,64	97,44
3000	1,033	10,13	0,88	97,25
4000	1,036	10,16	1,19	97,16
7000	1,056	10,35	3,11	98,08
8000	1,060	10,40	3,54	96,65

The gravitational constant used for calculation by the calibration system is: 1g<sub>n</sub> = 9,80665 m/s<sup>2</sup>