# Trescal GmbH

Kalibrierlaboratorium für elektrische, mechanische und dimensionelle Größen
*Calibration laboratory for electrical, mechanical and dimensional measurand*

OT 2270194

## Kalibrierschein
## *Calibration Certificate*

Kalibrierscheinnummer
*Number of Calibration Certificate*

**6808029017**

| | |
|---|---|
| **Auftraggeber**<br>*Customer* | **Trescal -THALES TAS- Toulouse**<br>**26 rue Champollion**<br>**F-31100 Toulouse Cedex** |
| **Auftragsnummer**<br>*Order No.* | **ES 94060** |
| **Gegenstand**<br>*Object* | **Accelerationsensor** |
| **Hersteller**<br>*Manufacturer* | **PCB** |
| **Typ**<br>*Type* | **352B01** |
| **Fabrikat/Seriennummer**<br>*Serial number* | **169564** |
| **Nutzer-ID**<br>*User-ID* | **169564** |
| **Inventarnummer**<br>*Stock number* | |
| **Schlüsselnummer**<br>*Key number* | **008039942200** |
| **Standort**<br>*Location* | |
| **Prüfauftragsnummer**<br>*Test Order No.* | **6808029017** |
| **Datum der Kalibrierung**<br>*Date of calibration* | **01.06.2018** |
| **Seitenanzahl des Kalibrierscheins**<br>*Number of pages of the certificate* | **5** |

Die Kalibrierung erfolgt durch den Vergleich mit Normalen oder Messung auf Normalmesseinrichtungen, die auf die Nationalen Normale zurückgeführt sind, mit denen die physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI) dargestellt werden.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums.
Dieser Kalibrierschein wurde elektronisch erstellt und ist ohne Unterschrift und Stempel gültig.

*The calibration is performed by comparison with standards or measurement on instruments that are traceable to National Standards which realize the units of measurement according to the International System of Units (SI).*
*The user is obliged to have the object recalibrated at appropriate intervals.*

*This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory.*
*This calibration certificates is produced with and electronic system. This calibration certifacte without signature and seal are valid.*

State of reception: The measured values were within the range of the specification

Statement: Equipment may be used without exception

| Ausstellungsdatum<br>*Print Date* | Sachbearbeiter<br>*Person in charge* | Leiter des Kalibrierlabor<br>*Head of the calibration laboratory* |
|---|---|---|
| 01.06.2018 | Dietz | Markovic |

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| Sensor: | Manufacturer<br>Serial-Nr. | **PCB**<br>**169564** | Typ | **352B01** |

## 1. Object

The calibration device is an **Accelerationsensor**.

## 2. Measurement procedure

The calibration is based on a compare between calibration device and the standard.

## 3. Equipment

The following equipment was used for the calibration:

| Verwendete Normale<br>*Standards used* | Hersteller<br>*Manufacturer* | Typ<br>*Type* | Serien/Inv.-Nr.<br>*Serial/ Inv. No.* | Kalibriert am<br>*Calibration at* | Kalibrierschein-Nr.<br>*Calibration Cert. No.* |
|---|---|---|---|---|---|
| Shock calibrator | **Endevco** | **2925** | **AB92** | **23.02.2017** | **0698 D-K-15183-01-00 2017-02** |
| Acceleration standard | **Endevco** | **2270** | **10355** | **21.02.2017** | **0697 D-K-15183-01-00 2017-02** |
| Amplifier | **Spektra GmbH** | **SRS 35** | **200427** | **22.02.2017** | **WK Spektra GmbH 17-0356** |
| Scope | **National Instruments** | **NI 5114** | **-** | **23.02.2017** | **0698 D-K-15183-01-00 2017-02** |

Used software CS18 Schockkal Version 1.2

## 4. Conditions

During the calibration the following conditions was actual:

| Umgebungsbedingungen<br>*Environmental conditions* | Temperatur<br>*Temperature* | **20,5** °C | Rel. Feuchte<br>*Rel. Humidity* | **62** % | Luftdruck<br>*Air Pressure* | **985** hPa |
|---|---|---|---|---|---|---|

1. Position of the calibration device in the earth field: **Vertikal**
2. Mounting of calibration device:

   Screw adapter: torque **Nm**

   Additive glue: glue: **Loctite**

   Other:

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3. Technical details of the connecting cable:

Manufacturer:

Typ:

Length: **m**

Capacity: **pF**

Connector:

4. Sensitivity was calculated at following values
(Gravitational acceleration $g_n$ = 9,80665 m/s$^2$)

Acceleration peak in g: **832,3**

Pulse duration $t_{I,\ 10\%}$ : **0,516 ms**

5. Measured voltage: **10,349 V**

6. Amplifier

6.1. Charge amplifier of the standard

Channel of standard: **1**

Amplified factor: **16**

6.2. Amplifier calibration device

Channel of calibration device: **2**

Amplified factor: **4**

Current: **4 mA**

8. Scope

Channel from standard: **1**

Channel from calibration device: **2**

Measuring range channel 1: **10 V**

Measuring range channel 2: **10 V**

Frequency of measure: **2,9 MHz**

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## 5. Results of measurement

The calibrated value is sensitivity.
Following results were measured:

### Sensitivity

Average value (from **5** values): **1,052 mV/g**

Standard deviation in %: **0,295**

| Calibration Nr. | Shock amplitude in g | Sensitivity S in mV/g | Pulse duration in ms |
|---|---|---|---|
| 1 | 812,0 | 1,054 | 0,516 |
| 2 | 820,9 | 1,052 | 0,517 |
| 3 | 820,6 | 1,052 | 0,521 |
| 4 | 825,2 | 1,051 | 0,521 |
| 5 | 832,3 | 1,052 | 0,522 |

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## 6. Uncertainty of measurement

The uncertainty of measurement is: 5,0 %.

The uncertainty of the used normals, is the standard deviation with (k=2) and P=95%.

## 7. Statement of conformity

The statement of conformity is in following to the DIN EN ISO 14253-1 according to Trescal-KUNO variant D.

## 8. Remarks