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26 avenue Jean François Champollion

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DOSSIER DE SOUS TRAITANCE OUTSOURCING REPORT N° FR162911181

Date d'intervention (Calibration Date) : 22/07/2016

Désignation (Designation) : Accelerometre

Marque (Manufacturer) : PCB

N° de série (Serial number) : 554

Modèle (Model) : 3503A1060KG

Identification client (Customer ID) : **MET14/683**

Détail de l'intervention (Detail of intervention)

Observations (remarks) : /

Sous-traitant : TRESCAL GMBH (ESSLINGEN)
(Subcontractor)

Type d'intervention : Vérification
(Type of calibration)

Numéro de document : 6608038682
(Document number)

Conforme (Pass)(*)

Ce document comprend (this document includes) : 16 page(s) dont 15 annexes

Date d'émission (Issue date) : 02/08/2016

Technicien

Laizier Paul

(*) Les résultats pris en compte sont ceux établis par le sous-traitant

(*) The results taken account are those established by the subcontractor

LA, METROLOGIE, AU, SERVICE, DE, VOTRE, PERFORMANCE

> Trescal SA

S.A. au capital de 4 341 950 Euros

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Trescal GmbH

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

Kalibrierschein

Calibration Certificate

Kalibrierscheinnummer

Number of Calibration Certificate

6608038682_x

Auftraggeber
Customer

Trescal -THALES TAS- Toulouse
26 rue Champollion
F-31100 Toulouse Cedex

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.

Auftragsnummer
Order No.

ES 83619

Gegenstand
Object

Accelerationsensor

Hersteller
Manufacturer

PCB

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.

Typ
Type

3503A1060KG
x-axis

Fabrikat/Seriennummer
Serial number

554

Nutzer-ID
User-ID

554

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.

Inventarnummer
Stock number

Schlüsselnummer
Key number

008044517000

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 certificate without signature and seal are valid.

Standort
Location

Prüfauftragsnummer
Test Order No.

6608038682_x

Datum der Kalibrierung
Date of calibration

22.07.2016

Seitenanzahl des Kalibrierscheins
Number of pages of the certificate

5

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

Statement: Equipment may be used without exception

Ausstellungsdatum
Print Date

Sachbearbeiter
Person in charge

Leiter des Kalibrierlabor
Head of the calibration laboratory

22.07.2016

Dietz

Markovic

Trescal GmbH
Tel (0711) 553651-0

Limburgstraße 6
Fax (0711) 553651-51

D-73734 Esslingen

Barcode



008044517000

6608038682_x				
Page - 2 – calibration from 22.07.2016				
Sensor:	Manufacturer	PCB	Typ	3503A1060KG
	Serial-Nr.	554		

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 <i>Standards used</i>	Hersteller <i>Manufacturer</i>	Typ <i>Type</i>	Serien/Inv.-Nr. <i>Serial/ Inv. No.</i>	Kalibriert am <i>Calibration at</i>	Kalibrierschein-Nr. <i>Calibration Cert. No.</i>
Shock calibrator	Endevco	2925	AB92	28.01.2015	0113 D-K-15183-01-00 2015-01
Acceleration standard	Endevco	2270	10355	19.01.2015	0111 D-K-15183-01-00 2015-01
Amplifier	Spektra GmbH	SRS 35	200427	26.01.2015	WK Spektra GmbH 15-0150
Scope	National Instruments	NI 5114	-	28.01.2015	0113 D-K-15183-01-00 2015-01

Used software	CS18 Schockkal	Version	1.2
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4. Conditions

During the calibration the following conditions was actual:

Umgebungsbedingungen <i>Environmental conditions</i>	Temperatur <i>Temperature</i>	20,8 °C	Rel. Feuchte <i>Rel. Humidity</i>	60 %	Luftdruck <i>Air Pressure</i>	976 hPa
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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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Page - 3 – calibration from 22.07.2016				
Sensor:	Manufacturer	PCB	Typ	3503A1060KG
	Serial-Nr.	554		

3. Technical details of the connecting cable:

Manufacturer:

Typ:

Length: **m**

Capacity: **pF**

Connector: **Microdot**

4. Sensitivity was calculated at following values

(Gravitational acceleration $g_n = 9,80665 \text{ m/s}^2$)

Acceleration peak in g: **820,4**

Pulse duration $t_{i, 10\%}$: **0,577 ms**

5. Measured voltage: **- 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: **16**

Current: **- mA**

Bridge voltage: **10,002 V**

Eingangswiderstand: **1517,65 Ω**

Ausgangswiderstand: **4739,38 Ω**

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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Page - 4 – calibration from 22.07.2016			
Sensor:	Manufacturer	PCB	Typ 3503A1060KG
	Serial-Nr.	554	

5. Results of measurement

The calibrated value is sensitivity.
Following results were measured:

Sensitivity

Average value (from 5 values): **0,002836 mV/g**

Standard deviation in %: **0,0298**

Calibration Nr.	Shock amplitude in g	Sensitivity S in mV/g	Pulse duration in ms
1	810,8	0,002380	0,577
2	820,1	0,002674	0,526
3	819,0	0,003015	0,580
4	820,3	0,003005	0,534
5	820,4	0,003105	0,584

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Page - 5 – calibration from 22.07.2016				
Sensor:	Manufacturer	PCB	Typ	3503A1060KG
	Serial-Nr.	554		

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

Trescal GmbH

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

Kalibrierschein

Calibration Certificate

Kalibrierscheinnummer

Number of Calibration Certificate

6608038682_y

Auftraggeber

Customer

Trescal -THALES TAS- Toulouse

**26 rue Champollion
F-31100 Toulouse Cedex**

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.

Auftragsnummer

Order No.

ES 83619

Gegenstand

Object

Accelerationsensor

Hersteller

Manufacturer

PCB

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.

Typ

Type

3503A1060KG

y-axis

Fabrikat/Seriennummer

Serial number

554

Nutzer-ID

User-ID

554

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.

Inventarnummer

Stock number

Schlüsselnummer

Key number

008044517000

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Standort

Location

Prüfauftragsnummer

Test Order No.

6608038682_y

Datum der Kalibrierung

Date of calibration

22.07.2016

Seitenanzahl des Kalibrierscheins

Number of pages of the certificate

5

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

Statement: Equipment may be used without exception

Ausstellungsdatum
Print Date

Sachbearbeiter
Person in charge

Leiter des Kalibrierlabor
Head of the calibration laboratory

22.07.2016

Dietz

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Barcode



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6608038682_y				
Page - 2 – calibration from 22.07.2016				
Sensor:	Manufacturer	PCB	Typ	3503A1060KG
	Serial-Nr.	554		

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 <i>Standards used</i>	Hersteller <i>Manufacturer</i>	Typ <i>Type</i>	Serien/Inv.-Nr. <i>Serial/ Inv. No.</i>	Kalibriert am <i>Calibration at</i>	Kalibrierschein-Nr. <i>Calibration Cert. No.</i>
Shock calibrator	Endevco	2925	AB92	28.01.2015	0113 D-K-15183-01-00 2015-01
Acceleration standard	Endevco	2270	10355	19.01.2015	0111 D-K-15183-01-00 2015-01
Amplifier	Spektra GmbH	SRS 35	200427	26.01.2015	WK Spektra GmbH 15-0150
Scope	National Instruments	NI 5114	-	28.01.2015	0113 D-K-15183-01-00 2015-01

Used software	CS18 Schockkal	Version	1.2
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4. Conditions

During the calibration the following conditions was actual:

Umgebungsbedingungen <i>Environmental conditions</i>	Temperatur <i>Temperature</i>	20,8 °C	Rel. Feuchte <i>Rel. Humidity</i>	60 %	Luftdruck <i>Air Pressure</i>	976 hPa
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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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Page - 3 – calibration from 22.07.2016				
Sensor:	Manufacturer	PCB	Typ	3503A1060KG
	Serial-Nr.	554		

3. Technical details of the connecting cable:

Manufacturer:

Typ:

Length: **m**

Capacity: **pF**

Connector: **Microdot**

4. Sensitivity was calculated at following values

(Gravitational acceleration $g_n = 9,80665 \text{ m/s}^2$)

Acceleration peak in g: **826,5**

Pulse duration $t_{l, 10\%}$: **0,56 ms**

5. Measured voltage: **- 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: **16**

Current: **- mA**

Bridge voltage: **10,002 V**

Eingangswiderstand: **1517,79 Ω**

Ausgangswiderstand: **4713,95 Ω**

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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Page - 4 – calibration from 22.07.2016			
Sensor:	Manufacturer	PCB	Typ
	Serial-Nr.	554	3503A1060KG

5. Results of measurement

The calibrated value is sensitivity.
Following results were measured:

Sensitivity

Average value (from 5 values): **0,002678 mV/g**

Standard deviation in %: **0,00659**

Calibration Nr.	Shock amplitude in g	Sensitivity S in mV/g	Pulse duration in ms
1	821,4	0,002723	0,560
2	824,8	0,002728	0,576
3	826,5	0,002663	0,581
4	820,4	0,002577	0,588
5	825,8	0,002696	0,593

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Page - 5 – calibration from 22.07.2016				
Sensor:	Manufacturer	PCB	Typ	3503A1060KG
	Serial-Nr.	554		

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

Trescal GmbH

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

Kalibrierschein *Calibration Certificate*

Kalibrierscheinnummer
Number of Calibration Certificate

6608038682_z

Auftraggeber <i>Customer</i>	Trescal -THALES TAS- Toulouse 26 rue Champollion F-31100 Toulouse Cedex	<p>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.</p> <p>Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums.</p> <p>Dieser Kalibrierschein wurde elektronisch erstellt und ist ohne Unterschrift und Stempel gültig.</p>
Auftragsnummer <i>Order No.</i>	ES 83619	
Gegenstand <i>Object</i>	Accelerationsensor	
Hersteller <i>Manufacturer</i>	PCB	
Typ <i>Type</i>	3503A1060KG z-axis	<p>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).</p> <p>The user is obliged to have the object recalibrated at appropriate intervals.</p> <p>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.</p>
Fabrikat/Seriennummer <i>Serial number</i>	554	
Nutzer-ID <i>User-ID</i>	554	
Inventarnummer <i>Stock number</i>		
Schlüsselnummer <i>Key number</i>	008044517000	
Standort <i>Location</i>		
Prüfauftragsnummer <i>Test Order No.</i>	6608038682_z	
Datum der Kalibrierung <i>Date of calibration</i>	22.07.2016	
Seitenanzahl des Kalibrierscheins <i>Number of pages of the certificate</i>	5	

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

Statement: Equipment may be used without exception

Ausstellungsdatum <i>Print Date</i>	Sachbearbeiter <i>Person in charge</i>	Leiter des Kalibrierlabor <i>Head of the calibration laboratory</i>
22.07.2016	Dietz	Markovic

Trescal GmbH
 Tel (0711) 553651-0

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D-73734 Esslingen

Barcode



008044517000

6608038682_z				
Page - 2 – calibration from 22.07.2016				
Sensor:	Manufacturer	PCB	Typ	3503A1060KG
	Serial-Nr.	554		

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 <i>Standards used</i>	Hersteller <i>Manufacturer</i>	Typ <i>Type</i>	Serien/Inv.-Nr. <i>Serial/ Inv. No.</i>	Kalibriert am <i>Calibration at</i>	Kalibrierschein-Nr. <i>Calibration Cert. No.</i>
Shock calibrator	Endevco	2925	AB92	28.01.2015	0113 D-K-15183-01-00 2015-01
Acceleration standard	Endevco	2270	10355	19.01.2015	0111 D-K-15183-01-00 2015-01
Amplifier	Spektra GmbH	SRS 35	200427	26.01.2015	WK Spektra GmbH 15-0150
Scope	National Instruments	NI 5114	-	28.01.2015	0113 D-K-15183-01-00 2015-01

Used software	CS18 Schockkal	Version	1.2
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4. Conditions

During the calibration the following conditions was actual:

Umgebungsbedingungen <i>Environmental conditions</i>	Temperatur <i>Temperature</i>	20,8 °C	Rel. Feuchte <i>Rel. Humidity</i>	60 %	Luftdruck <i>Air Pressure</i>	976 hPa
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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:

6608038682_z				
Page - 3 – calibration from 22.07.2016				
Sensor:	Manufacturer	PCB	Typ	3503A1060KG
	Serial-Nr.	554		

3. Technical details of the connecting cable:

Manufacturer:

Typ:

Length: **m**

Capacity: **pF**

Connector: **Microdot**

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

Acceleration peak in g: **829**

Pulse duration $t_{l, 10\%}$: **0,57 ms**

5. Measured voltage: **- 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: **16**

Current: **- mA**

Bridge voltage: **10,002 V**

Eingangswiderstand: **1515,27 Ω**

Ausgangswiderstand: **4740,4 Ω**

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**

6608038682_z			
Page - 4 – calibration from 22.07.2016			
Sensor:	Manufacturer	PCB	Typ
	Serial-Nr.	554	3503A1060KG

5. Results of measurement

The calibrated value is sensitivity.
Following results were measured:

Sensitivity

Average value (from 5 values): **0,002677 mV/g**

Standard deviation in %: **0,00823**

Calibration Nr.	Shock amplitude in g	Sensitivity S in mV/g	Pulse duration in ms
1	810,8	0,002544	0,570
2	819,3	0,002714	0,551
3	823,3	0,002746	0,555
4	824,9	0,002679	0,553
5	829,0	0,002701	0,559

6608038682_z				
Page - 5 – calibration from 22.07.2016				
Sensor:	Manufacturer	PCB	Typ	3503A1060KG
	Serial-Nr.	554		

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