ANTENNE THALES ALENIA SPACE − TOULOUSE
avenue Jean−François Champollion

31100 TOULOUSE
Tel. :
Fax :

THALES ALENIA SPACE
26 avenue Jean François Champollion

31037 TOULOUSE CEDEX 1

Notre référence *(Our reference)* : OT 1761559 / ID 890238

DOSSIER DE SOUS TRAITANCE

OUTSOURCING REPORT

N° FR162911179

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

Désignation *(Designation)* :	Accelerometre		
Marque *(Manufacturer)* :	PCB	N° de série *(Serial number)* :	1338
Modèle *(Model)* :	3503A1060KG	Identification client *(Customer ID)* :	**MET15/1039**

Détail de l'intervention *(Detail of intervention)*

Observations *(remarks)* : /

Sous−traitant : *(Subcontractor)*	TRESCAL GMBH (ESSLINGEN)
Type d'intervention : *(Type of calibration)*	Vérification
Numéro de document : *(Document number)*	6608038681

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

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

6608038681_x

Auftraggeber *Customer*	**Trescal -THALES TAS- Toulouse** **26 rue Champollion** **F-31100 Toulouse Cedex**
Auftragsnummer *Order No.*	**ES 83619**
Gegenstand *Object*	**Accelerationsensor**
Hersteller *Manufacturer*	**PCB**
Typ *Type*	**3503A1060KG** **x-axis**
Fabrikat/Seriennummer *Serial number*	**1338**
Nutzer-ID *User-ID*	**1338**
Inventarnummer *Stock number*	
Schlüsselnummer *Key number*	**008044516900**
Standort *Location*	
Prüfauftragsnummer *Test Order No.*	**6608038681_x**
Datum der Kalibrierung *Date of calibration*	**22.07.2016**
Seitenanzahl des Kalibrierscheins *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 *Print Date*	Sachbearbeiter *Person in charge*	Leiter des Kalibrierlabor *Head of the calibration laboratory*
22.07.2016	Dietz	Markovic

Trescal GmbH
Limburgstraße 6
D-73734 Esslingen
Tel (0711) 553651-0
Fax (0711) 553651-51

Barcode

008044516900

6608038681_x				
Page - 2 – calibration from 22.07.2016				
Sensor:	Manufacturer Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

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 *Standards used*	Hersteller *Manufacturer*	Typ *Type*	Serien/Inv.-Nr. *Serial/ Inv. No.*	Kalibriert am *Calibration at*	Kalibrierschein-Nr. *Calibration Cert. No.*
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

4. Conditions

During the calibration the following conditions was actual:

Umgebungsbedingungen *Environmental conditions*	Temperatur *Temperature*	**20,8** °C	Rel. Feuchte *Rel. Humidity*	**60** %	Luftdruck *Air Pressure*	**976** 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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Page - 3 – calibration from 22.07.2016				
Sensor:	Manufacturer Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

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 m/s^2)

Acceleration peak in g: **838,9**

Pulse duration $t_{I,\ 10\%}$: **0,556 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: **1636,34 Ω**

Ausgangswiderstand: **5071,86 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 Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

5. Results of measurement

The calibrated value is sensitivity.
Following results were measured:

Sensitivity

Average value (from **5** values): **0,002533 mV/g**

Standard deviation in %: **0,00123**

Calibration Nr.	Shock amplitude in g	Sensitivity S in mV/g	Pulse duration in ms
1	810,6	0,002537	0,556
2	819,2	0,002527	0,548
3	828,7	0,002538	0,552
4	838,9	0,002532	0,551
5	836,5	0,002532	0,553

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Page - 5 – calibration from 22.07.2016				
Sensor:	Manufacturer Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

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

6608038681_y

Auftraggeber *Customer*	**Trescal -THALES TAS- Toulouse** **26 rue Champollion** **F-31100 Toulouse Cedex**
Auftragsnummer *Order No.*	**ES 83619**
Gegenstand *Object*	**Accelerationsensor**
Hersteller *Manufacturer*	**PCB**
Typ *Type*	**3503A1060KG** **y-axis**
Fabrikat/Seriennummer *Serial number*	**1338**
Nutzer-ID *User-ID*	**1338**
Inventarnummer *Stock number*	
Schlüsselnummer *Key number*	**008044516900**
Standort *Location*	
Prüfauftragsnummer *Test Order No.*	**6608038681_y**
Datum der Kalibrierung *Date of calibration*	**22.07.2016**
Seitenanzahl des Kalibrierscheins *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.
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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 *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

008044516900

6608038681_y				
Page - 2 – calibration from 22.07.2016				
Sensor:	Manufacturer Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

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 *Standards used*	Hersteller *Manufacturer*	Typ *Type*	Serien/Inv.-Nr. *Serial/ Inv. No.*	Kalibriert am *Calibration at*	Kalibrierschein-Nr. *Calibration Cert. No.*
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

4. Conditions

During the calibration the following conditions was actual:

Umgebungsbedingungen *Environmental conditions*	Temperatur *Temperature*	**20,8** °C	Rel. Feuchte *Rel. Humidity*	**60** %	Luftdruck *Air Pressure*	**976** 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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Page - 3 – calibration from 22.07.2016				
Sensor:	Manufacturer Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

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 m/s^2)

Acceleration peak in g: **846,5**

Pulse duration $t_{I,\ 10\%}$: **0,549 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: **1636,94 Ω**

Ausgangswiderstand: **5149,51 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 Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

5. Results of measurement

The calibrated value is sensitivity.
Following results were measured:

Sensitivity

Average value (from **5** values): **0,00253 mV/g**

Standard deviation in %: **0,00113**

Calibration Nr.	Shock amplitude in g	Sensitivity S in mV/g	Pulse duration in ms
1	824,3	0,002531	0,549
2	831,1	0,002534	0,555
3	846,5	0,002534	0,555
4	845,4	0,002524	0,548
5	845,4	0,002529	0,549

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Page - 5 – calibration from 22.07.2016				
Sensor:	Manufacturer Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

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

6608038681_z

Auftraggeber *Customer*	**Trescal -THALES TAS- Toulouse** **26 rue Champollion** **F-31100 Toulouse Cedex**
Auftragsnummer *Order No.*	**ES 83619**
Gegenstand *Object*	**Accelerationsensor**
Hersteller *Manufacturer*	**PCB**
Typ *Type*	**3503A1060KG** **z-axis**
Fabrikat/Seriennummer *Serial number*	**1338**
Nutzer-ID *User-ID*	**1338**
Inventarnummer *Stock number*	
Schlüsselnummer *Key number*	**008044516900**
Standort *Location*	
Prüfauftragsnummer *Test Order No.*	**6608038681_z**
Datum der Kalibrierung *Date of calibration*	**22.07.2016**
Seitenanzahl des Kalibrierscheins *Number of pages of the certificate*	**5**

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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

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Limburgstraße 6
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Tel (0711) 553651-0
Fax (0711) 553651-51

Barcode

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6608038681_z				
Page - 2 – calibration from 22.07.2016				
Sensor:	Manufacturer Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

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 *Standards used*	Hersteller *Manufacturer*	Typ *Type*	Serien/Inv.-Nr. *Serial/ Inv. No.*	Kalibriert am *Calibration at*	Kalibrierschein-Nr. *Calibration Cert. No.*
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

4. Conditions

During the calibration the following conditions was actual:

Umgebungsbedingungen *Environmental conditions*	Temperatur *Temperature*	**20,8** °C	Rel. Feuchte *Rel. Humidity*	**60** %	Luftdruck *Air Pressure*	**976** 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:

6608038681_z				
Page	- 3 – calibration from 22.07.2016			
Sensor:	Manufacturer Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

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 m/s^2)

Acceleration peak in g: **835,4**

Pulse duration $t_{I,\ 10\%}$: **0,555 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: **1635,54 Ω**

Ausgangswiderstand: **5132,45 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 Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

5. Results of measurement

The calibrated value is sensitivity.
Following results were measured:

Sensitivity

Average value (from **5** values): **0,002564 mV/g**

Standard deviation in %: **0,000857**

Calibration Nr.	Shock amplitude in g	Sensitivity S in mV/g	Pulse duration in ms
1	811,9	0,002566	0,555
2	827,3	0,002570	0,554
3	831,6	0,002563	0,551
4	834,9	0,002563	0,554
5	835,4	0,002560	0,552

6608038681_z				
Page - 5 – calibration from 22.07.2016				
Sensor:	Manufacturer Serial-Nr.	**PCB** **1338**	Typ	**3503A1060KG**

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