

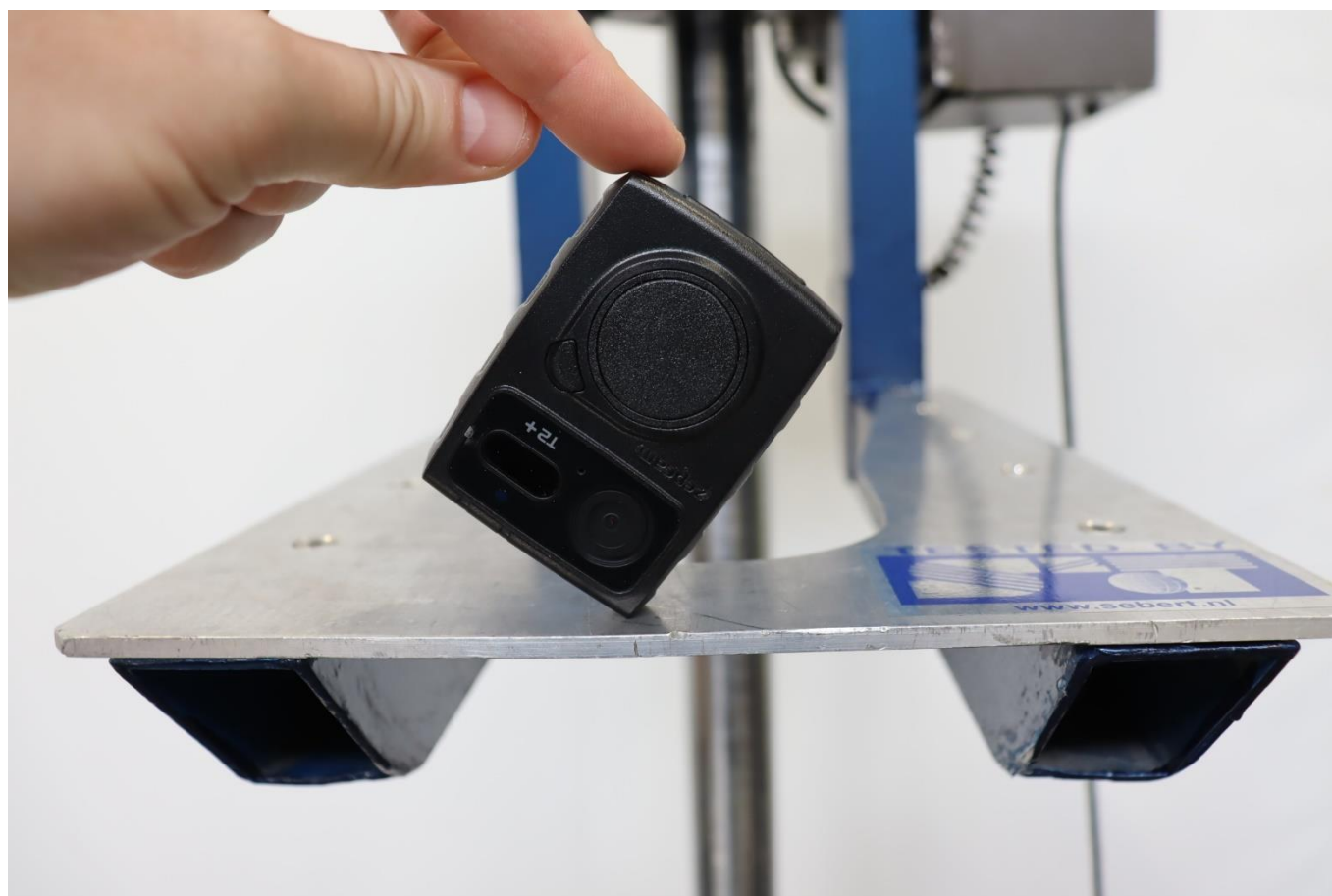


Sebert Trillingstechniek B.V.

Report M21.001-P21.001 Zepcam
Date 16 November 2021



Drop tests on six body cameras according to test standard MIL-STD 810G



ISO/IEC 17025 Accredited* and ISTA® Certified Testing Laboratory

Sebert Trillingstechniek B.V.
Weg en land 18
2661 DB Bergschenhoek
The Netherlands

web: www.sebert.nl
tel: (+31)-(0)10-5240606
fax: (+31)-(0)10-5240605
mail: info@sebert.nl



*visit www.rva.nl to check the valid scope (registration number L540)

Client

ZEPCAM B.V.
Hogeweg 29
5301 LB Zaltbommel
The Netherlands

Contact Person

Mr. R. Zuidema

Order conformation

ZEPCAM B.V. Purchase Order Number Email confirmation

Present at the tests

No representative of ZEPCAM B.V. was present

S2T Quotation

Q21.001 ZEPCAM B.V., date 04 November 2021

Tester / Author

Mr. R. Morris

Approved by

Mr. M. Magendans

No of pages

23



Table of contents

1. Introduction	4
2. Test procedure and equipment	4
2.1. General	4
2.2. Test plan	6
2.3. Description of the used apparatus and instrumentation	7
3. Transport simulation test	8
3.1. Test A (Drop test)	8
3.1.1 Results	8
3.2. Final inspection	10
3.3. Laboratory ambient (during test)	11
4. Conclusion and remarks	12
Annexes	13
Figures	14
Abbreviations	20
ISO/IEC 17025 accreditation certificate	21
ISTA certified	22
Distribution	23



1. Introduction

Under contract of ZEPCAM B.V. at Zaltbommel in The Netherlands, drop tests have been carried out according to the test standard MIL-STD 810 G on six test items on 12 November 2021. All dynamic tests (for example impact and vibration tests) have been carried out under ISO 17025 accreditation and all static tests (for example the ambient test registrations) are not carried out under accreditation. ZEPCAM B.V. will carry out the final inspection after the completed test sequence.

The purpose of the tests is to determine if the body cameras are able to withstand the mechanical stress requirements. Although acceptance criteria are recommended, in accordance with ZEPCAM B.V. these criteria were not defined. The test results in this report will be related to the tested test items only.

2. Test procedure and equipment

2.1. General

Six test items have been used for the transport simulation tests, see Table 1A -1F for the details of the test items. The ASTM D 5276-98 (2004) procedure has been used for identification of the faces of the test items, see Figure #3. The test items which were delivered on 12 November 2021 were checked before starting the test for visual damage and no deviations were found.

Table 1A: Test item #1

Product description*	Body camera
Manufacturer*	Zepcam
Serial number*	T2P-2101-47941-41
Dimensions [LxWxH]	75 x 56 x 26 mm
Weight	0,1 kg
Figure	#1 and #2

*IFC (Information from Customer)

Table 1B: Test item #2

Product description*	Body camera
Manufacturer*	Zepcam
Serial number*	T2P-2105-49173-41
Dimensions [LxWxH]	75 x 56 x 26 mm
Weight	0,1 kg
Figure	#1 and #2

*IFC (Information from Customer)

Table 1C: Test item #3

Product description*	Body camera
Manufacturer*	Zepecam
Serial number*	T2P-2105-48902-41
Dimensions [LxWxH]	75 x 56 x 26 mm
Weight	0,1 kg
Figure	#1 and #2

*IFC (Information from Customer)

Table 1D: Test item #4

Product description*	Body camera
Manufacturer*	Zepecam
Serial number*	T2P-2105-48911-41
Dimensions [LxWxH]	75 x 56 x 26 mm
Weight	0,1 kg
Figure	#1 and #2

*IFC (Information from Customer)

Table 1E: Test item #5

Product description*	Body camera
Manufacturer*	Zepecam
Serial number*	T2P-2105-48444-41
Dimensions [LxWxH]	75 x 56 x 26 mm
Weight	0,1 kg
Figure	#1 and #2

*IFC (Information from Customer)

Table 1F: Test item #6

Product description*	Body camera
Manufacturer*	Zepecam
Serial number*	T2P-2118-50246-41
Dimensions [LxWxH]	75 x 56 x 26 mm
Weight	0,1 kg
Figure	#1 and #2

*IFC (Information from Customer)





2.2. Test plan

The transportation tests will be performed in accordance with the test standard ASTM D 4169-16, DC 2. The following test plan will be used:

Test A: Drop test

Test standard	MIL-STD 810 G - w/Change I – Procedure IV – transit drop
Test Method	Method 516.7 – Table 516.7-VIII
Scenario	Unpacked handling
Category	Infantry and man-carried equipment
Impact velocity	5,4 m/s
Drop Height	1,5 meters
Configuration	Unpacked
Orientation	Flat Bottom, left side, right side, bottom right end edge, top left edge
Number of drops	1 per direction
Impact surface	Steel backed by concrete (> 2,5 cm thick)
Functional test	Yes
Additional info	4.6.5.3 Procedure IV - Transit Drop. Step 1 After performing a visual inspection and operational check for baseline data, install the test item in its transit or combination case as prepared for field use (if measurement information is to be obtained, install and calibrate such instrumentation in this Step). If the test item operates satisfactorily, proceed to Step 2. If not, resolve the problems and repeat this step. Step 2 From paragraph 4.6.5.1 and Tables 516.7-VII-516.7-IX, determine the height of the drops to be performed, drop orientation, the number of drops per test item, and the drop surface. Step 3 Perform the required drops using the apparatus and requirements of paragraphs 4.6.5 and 4.6.5.1 and Tables 516.7-VII through 516.7-IX notes. Recommend visually and/or operationally checking the test item periodically during the drop test to simplify any follow-on evaluation that may be required. If any degradation is noted, see paragraph 4.3.2. Step 4 Document the impact point or surface for each drop and any obvious damage. Step 5 Following completion of the required drops, visually examine the test item(s), and document the results. Step 6 Conduct an operational checkout in accordance with the approved test plan. See paragraph 5 for analysis of results. Step 7 Document the results for comparison with data obtained in Step 1, above.
Remark	This test will be carried out under accreditation

*Max pitch and roll moment 19.500Nm and Max Yaw moment 250Nm



2.3. Description of the used apparatus and instrumentation

Apparatus and/or instrumentation	Supplier	Model Number	Serial Number	Last / Next date of Calibration, Verification and/or Inspection	
Position Drop Table	Lansmont Corporation	PDT-56E	PT-56E-0216	30/09/21	30/09/23
Steel Rule 1000mm	Mitutoyo	1779586	179	17/04/20	17/04/22
Weighing instrument	Weegtechniek Holland	SATEX	2811072	05/06/20	05/06/22
Monitoring of the environmental conditions	E+E Elektronik	HUMOLOG20 THIP	XX802034	03/04/20	03/04/22

3. Transport simulation test

3.1. Test A (Drop test)

This test method (516.7 – Table 516.7-VIII) covers procedures for the drop testing of items by the free-fall method. This procedure is used to assess the ability of an item and /or container to endure rough handling. The test method is divided in several handlings and drop heights depending upon the scenario and category of the test item.

The drop test sequence has been performed with the use of a Position Drop Tester. The used dropping surface is a rigid 13mm flat steel plate, backed by a concrete base. The test items have had several impacts on different sides and edges, see Table 2 for the specified drop heights of the 516.7 test method for unpackaged handling and see Figure #3 and #4 for the test setup.

Table 2: Tactical transport drop test (516.7-VIII)

Scenario	Category	Impact Velocity (m/sec)	Drop Height	Configuration	Orientation ³		Impact Surface ⁷
Ship Transport ¹	Storage and transport to theatre storage area, transport by ship	5.4	1.5m (5 ft)	Packaged ⁶	LCEP (minimum of 3)	Flat bottom and two faces. ⁴	Steel ⁸ backed by concrete
Unpackaged Handling	Infantry and man-carried equipment	5.4	1.5m (5 ft)	Unpackaged	5	Flat bottom, two faces ⁴ and two edges ⁵	Steel ⁸ backed by concrete
Packaged Handling	Loading and offloading from side of transport vehicle - transport by truck, forklift, & helicopter	6.4	2.1m (7 ft)	Packaged ⁶	5	Flat bottom	Steel ⁸ backed by concrete
Helicopter	Underslung load, quick release onto land or ship	6.4	2.1m (7 ft)	Packaged ⁶	1 Flat	Flat bottom	Steel ⁸ backed by concrete
Parachute Drop ²	Low velocity drop	9.2	4.3m (14 ft)	Packaged with appropriate honeycomb or other shock absorbing system used in delivery	Shipping configuration		Flat compact soil
Parachute Drop	High velocity drop	27.3	38.1m (125 ft)				Flat compact soil

3.1.1 Results

Six test items have been used for the drop test, see Table 3A – 3F for the results. All the drops were carried at a drop height of 1500 mm.

Table 3A: Test item #1 results

Drop no.	Impact on	Side	Results/remarks*	Figure
1	Flat bottom	3	Pass, minimal damage and continued to function	-
2	Left end	4	Pass, minimal damage and continued to function	-
3	Right end	2	Pass, minimal damage and continued to function	-
4	Bottom right end edge	2-3	Pass, minimal damage and continued to function	-
5	Top left edge	1-4	Pass, minimal damage and continued to function	-

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

Table 3B: Test item #2 results

Drop no.	Impact on	Side	Results/remarks*	Figure
1	Flat bottom	3	Pass, minimal damage and continued to function	-
2	Left end	4	Pass, minimal damage and continued to function	-
3	Right end	2	Pass, minimal damage and continued to function	-
4	Bottom right end edge	2-3	Pass, minimal damage and continued to function	-
5	Top left edge	1-4	Pass, minimal damage and continued to function	-

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

Table 3C: Test item #3 results

Drop no.	Impact on	Side	Results/remarks*	Figure
1	Flat bottom	3	Pass, minimal damage and continued to function	-
2	Left end	4	Pass, minimal damage and continued to function	-
3	Right end	2	Pass, minimal damage and continued to function	-
4	Bottom right end edge	2-3	Pass, minimal damage and continued to function	-
5	Top left edge	1-4	Pass, minimal damage and continued to function	-

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

Table 3D: Test item #4 results

Drop no.	Impact on	Side	Results/remarks*	Figure
1	Flat bottom	3	Pass, minimal damage and continued to function	-
2	Left end	4	Pass, minimal damage and continued to function	-
3	Right end	2	Pass, minimal damage and continued to function	-



4	Bottom right end edge	2-3	Pass, minimal damage and continued to function	-
5	Top left edge	1-4	Pass, minimal damage and continued to function	-

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

Table 3E: Test item #5 results

Drop no.	Impact on	Side	Results/remarks*	Figure
1	Flat bottom	3	Pass, minimal damage and continued to function	-
2	Left end	4	Pass, minimal damage and continued to function	-
3	Right end	2	Pass, minimal damage and continued to function	-
4	Bottom right end edge	2-3	Pass, minimal damage and continued to function	-
5	Top left edge	1-4	Pass, minimal damage and continued to function	-

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

Table 3F: Test item #6 results

Drop no.	Impact on	Side	Results/remarks*	Figure
1	Flat bottom	3	Pass, minimal damage and continued to function	-
2	Left end	4	Pass, minimal damage and continued to function	-
3	Right end	2	Pass, minimal damage and continued to function	-
4	Bottom right end edge	2-3	Pass, minimal damage and continued to function	-
5	Top left edge	1-4	Pass, minimal damage and continued to function	-

*Pass and fail remarks refer only to the ability of the test item to complete the test sequence.

3.2. Final inspection

After the complete test sequence, a visual inspection has been carried out on the test items. See Table 4 for the inspection results.

Table 4: Visual inspection results

Test item	Results/remarks	Figure
#1	Small indentation on the corner of 3-4-6	#6 to #11
#2	Small indentation on the corner of 3-4-5	
#3	Slight scuffing and small indentation of corner 3-4-5	
#4	Small indentation on corners 1-2-5 and 3-4-5	
#5	Small area of scuffing damage on side 4	
#6	Small indentation on the corner of 3-4-5	



ZEPCAM B.V. will carry out the final inspection and report the results after the completed test sequence.

3.3. Laboratory ambient (during test)

See Annex A1 for the environmental measurements during the test sequence.





4. Conclusion and remarks

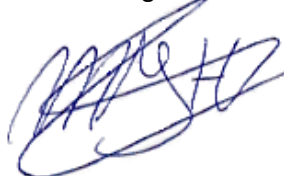
Six test items have been successfully subjected to the test procedure A according to the test standard MIL-STD 810 G - w/Change I – Procedure IV – transit drop.

See the following Table for the summary of the results:

Test A: Drop test	All test items continued to function normally throughout the test sequence. Only minor scuffing and impact marks were detected.
----------------------	---

ZEPCAM B.V. will carry out the final inspection on the test items after the completed test sequence.

Approved by
M. Magendans



Test Specialist

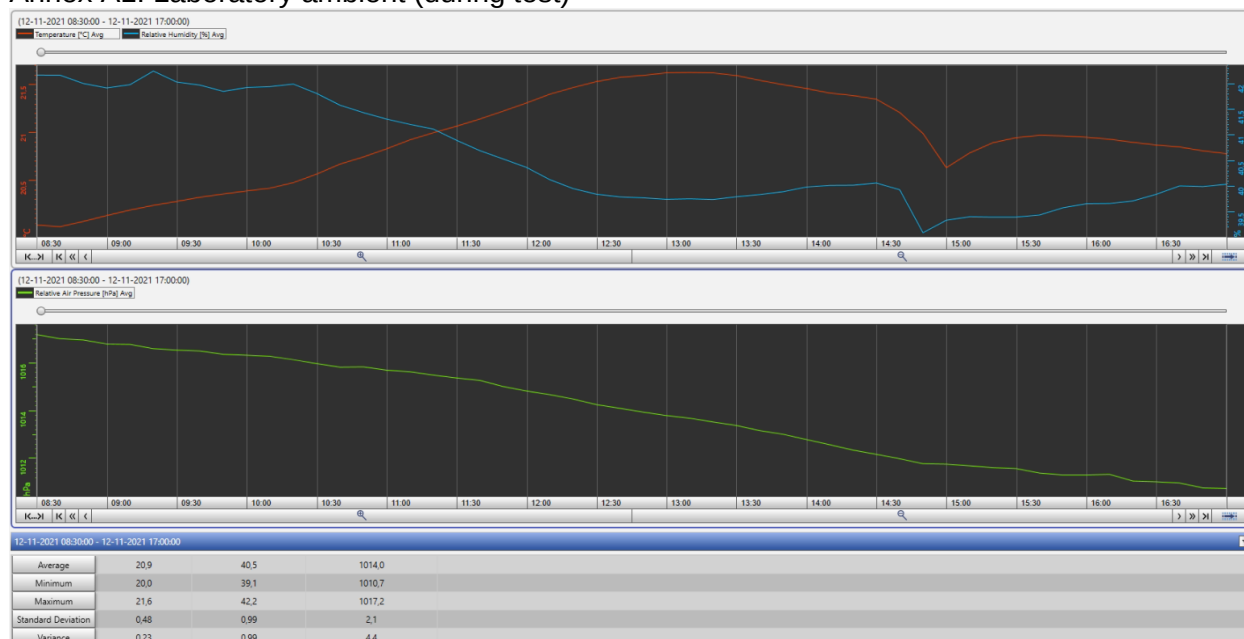
Testing carried out by
R. Morris



Test Engineer

Annexes

Annex A1: Laboratory ambient (during test)



Figures

Figure 1: Test items #1 - #6



Figure 2: Test items #1 - #6



Figure 3: Test item orientations

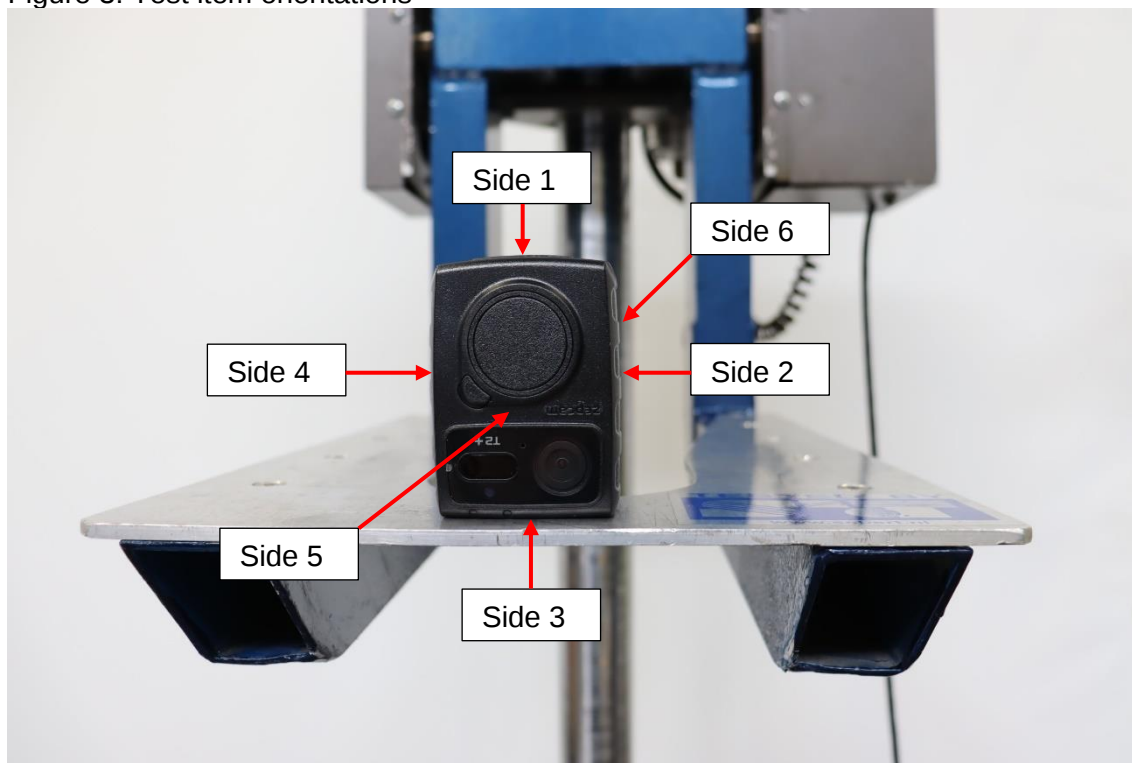


Figure 4: Test A Drop test setup

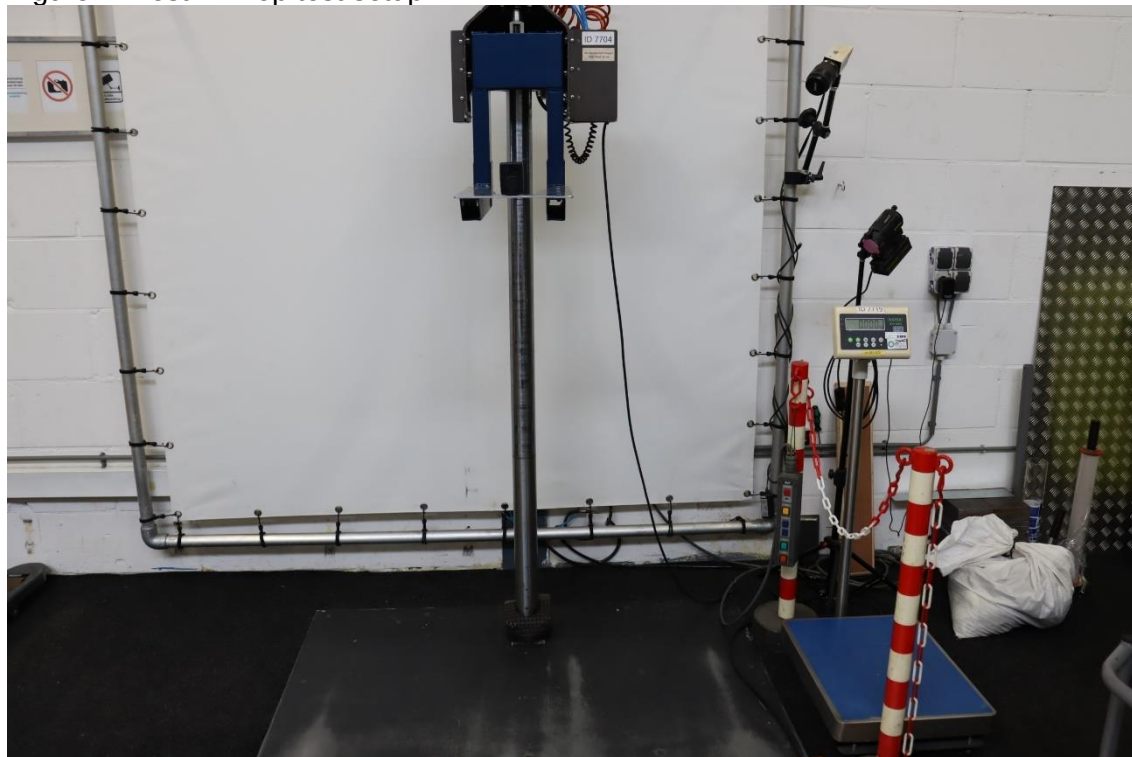


Figure 5: Test A Drop test setup

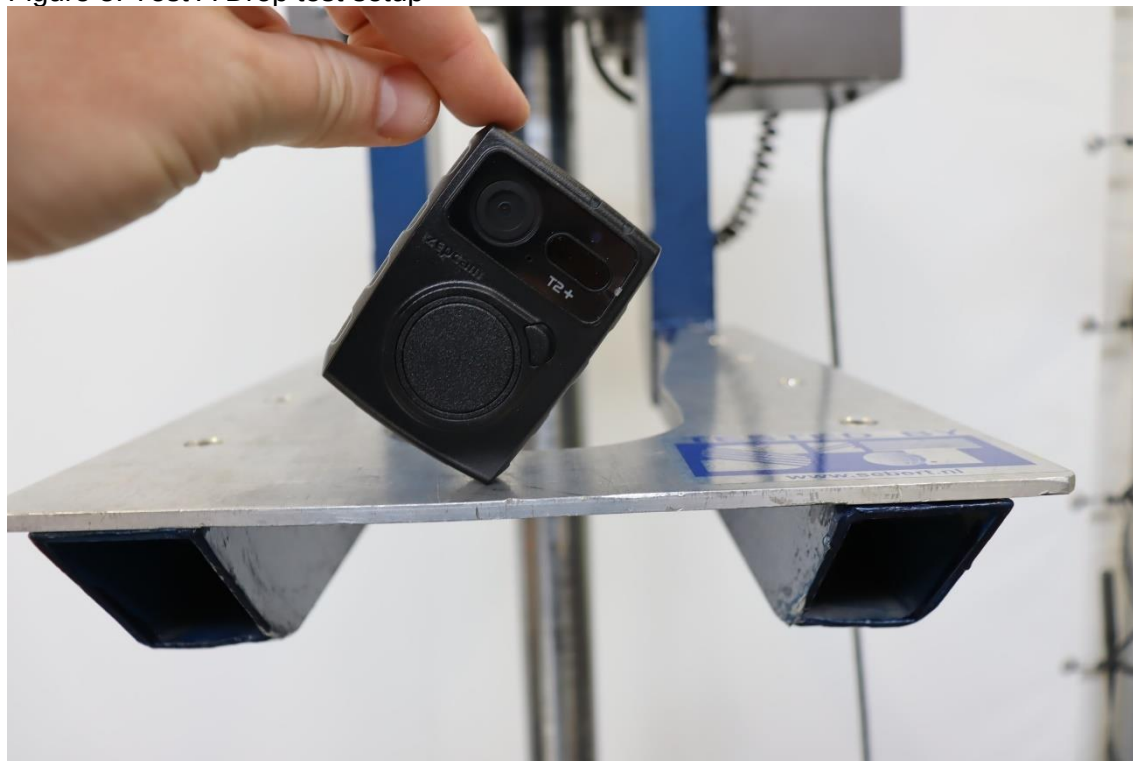


Figure 6: Final inspection



Figure 7: Final inspection



Figure 8: Final inspection, scuffing damage example



Figure 9: Final inspection, scuffing damage example



Figure 10: Final inspection, indentation example



Figure 11: Final inspection, edge damage example



Abbreviations

Acc	Acceleration
ASD	Acceleration Spectral Density
AvC	Average Control
dB	decibel
DOF	Degrees of Freedom
Drive	Voltage output of the controller used to drive the shaker
DUT	Device under test
Dwell	Endurance test on 'fixed' frequency
Fail	Criteria if the DUT is tested outside the described TS of the normative doc
Fn	Natural frequency
g	Acceleration due to gravity (equal to 9,81 m/s ²)
Hz	Hertz
IFC	Information from customer
kg	Kilogram
Manuf	Manufacturer
ms	Milliseconds, nominal duration
N	Newton (force)
Oct/min.	Sweep rate
Oper	Operational
Pa	Pressure
Pass	Criteria if the DUT is tested as described in the TS of the required normative doc
PK	Peak
PK-PK	Peak to Peak
PSD	Power Spectral Density
Q	Quality, Sharpness measure of a resonance
Res	Resonance
RS	Resonance Survey
RMS	Root Mean Square
Seq	Sequence
S/N	Serial Number
SRS	Shock Response Spectrum
Sweep	One sweep up or down
TS	Test Specification
V	Voltage

ISO/IEC 17025 accreditation certificate

RAAD VOOR ACCREDITATIE 

Postbus 2768 3500 GT Utrecht

The Dutch Accreditation Council RvA, by law appointed as the national accreditation body for The Netherlands, hereby declares that accreditation has been granted to:

**Sebert Trillingstechniek B.V.
Laboratorium
Bergschenhoek**

The organisation has demonstrated to be able to generate technical valid results in a competent way and work according to a management system.

This accreditation is based on an assessment against the requirements as laid down in EN ISO/IEC 17025:2017.

The accreditation covers the activities as specified in the authorized annex bearing the registration number.

The accreditation is valid provided that the organisation continues to meet the requirements.

The accreditation with registration number:

L 540

is granted on 29 February 2012

This declaration is valid until
1 March 2025

The board of the Dutch Accreditation Council,
on its behalf,

mr. J.A.W.M. de Haas

The Dutch Accreditation Council (RvA) is a signatory of the European co-operation for Accreditation (EA) Multilateral Agreement for accreditation in this field.

ILAC stands for International Laboratory Accreditation Cooperation. The European Union (EU) has entered into mutual recognition agreements (MRAs) with various countries. This means that the countries have to accept each other's products. The technical aspect of the ISO/IEC 17025 standard relates to the use of qualified and experienced staff. All test equipment in our Sebert Trillingstechniek laboratory has been calibrated and checked in accordance with the ISO/IEC 17025 standard. This ensures that the tests, obtained in an independent, professional and objective manner, are extremely reliable



ISTA certified



Sebert Trillingstechniek B.V.

Weg en Land 18
Bergschenhoek, 2661 DB
Phone: [+31] (0)10 52 40 606

Website: <http://www.sebert.nl>
[Contact Form](#)

Additional Member Information



General Services: Atmospheric Chambers Supplier, Compression Test System Supplier, Drop Tester Supplier, Field Data Recording Equipment, Field Data Recording Services, Inclined Impact Tester Supplier, Product Testing Services, Shock Testing Machine Supplier, Thermal Package Testing Services, Vibration Test Equipment Supplier, Wrapping Equipment

Class: Commercial

Protocols: 1A, 1B, 1C, 1D, 1E, 1G, 1H, 2A, 2B, 2C, 3A, 3B, 3E, 3H, 4AB, 6-AMAZON.com-Over Boxing, 6-AMAZON.com-SIOC Type A, 6-AMAZON.com-SIOC Type B, 6-AMAZON.com-SIOC Type C, 6-AMAZON.com-SIOC Type D, 6-AMAZON.com-SIOC Type E, 6-FedEx-A, 6-FedEx-B, 6-SAMSCLUB, 7D



This recognizes that the company listed below is a **Certified Testing Laboratory** member of the International Safe Transit Association (ISTA).

Member ID: 9704

Valid through: March 1, 2022

Location: Bergschenhoek, , Netherlands

Sebert Trillingstechniek B.V.

A.J. Gruber
ISTA President

Eric Hiser
ISTA Vice President - Technical





Distribution

Report M21.001-P21.001 Zepcam
Title Drop tests on six body cameras according to test standard MIL-STD 810G
Institute Sebert Trillingstechniek B.V at Bergschenhoek in The Netherlands

Company:	Number of copies
<u>ZEPCAM B.V.</u> Mr. R. Zuidema	1
<u>Sebert Trillingstechniek B.V.</u> Mr. M.J.H. Magendans	1

All rights reserved. No part of this report may be reproduced in any form by print, photo print, microfilm or any other means without the previous written permission from Sebert Trillingstechniek B.V. All information which is classified according to Dutch regulations shall be treated by the recipient in the same way as classified information corresponding value in his own country.
No part of this information will be disclosed to any third party.