DARE!! Measurements
Test & measurement services

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Product Safety Assessment Report
Results of DOT Movement tracker

Customer	:	Xsens Technologies B.V. Pantheon 6A 7521 PR Enschede The Netherlands
Customer's representative	:	Mr. R. Gielians
In the capacity of	:	Manufacturer
Reference number	:	19C00441RPT03

Assessed:	Assessed:	Released:
N.J. Cuper	B. van Uden	W. Sjoerdsma
Engineer Product Safety	Engineer Product Safety	Team leader Product Safety

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Contents

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1 Introduction

DARE!! Measurements is requested by Xsens Technologies B.V., to perform a product safety assessment including the relevant tests.
The objective of the tests and measurements is to assess the DOT Movement tracker in accordance with the test requirements of the standards as mentioned in chapter 2 of this report, within the framework of the CE marking process. This report may only be used for this purpose.

At request of Xsens Technologies B.V., the Product Safety assessment was carried out to assess whether the DOT Movement tracker complies with the harmonized European standards under the relevant directive.

The product sample(s) were received on 2019 November, 10.
The assessment and tests were performed on 2019 October, 7- November, 28, December, 17, 2020 June, 5
The test report is issued on 2020 June, 11.

The assessment and the relevant tests have been performed at the facilities of DARE!! Measurements located in Woerden, the Netherlands.

The results and verdicts presented in this report relate only to the assessed sample of the product and the corresponding documentation as it was delivered to DARE!! Measurements.

In this report, the product tested will be referred to as Equipment Under Test (EUT).

All assessments, as described in the applied standard(s), are carried out unless otherwise specified in this report.

The tests with the following indication are performed under accreditation:
"*Tests and/or measurements reported in this paragraph are performed under ISO17025 accreditation*".

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Some tests and all assessments including opinions and/or interpretations and the conclusion mentioned in this report are excluded from accreditation. These chapters are indicated with the phrase:
"*The tests and/or assessments in this paragraph are excluded from accreditation*".

2 Information on this report

2.1 Applied Standards

The EUT is tested and assessed against the requirements of the following standards.

Standard(s) & Amendments	Description
EN-IEC 62368-1:2014 + AC:2015 + A11:2017 + AC:2017	Audio/video, information and communication technology equipment Part 1: Safety requirements

2.2 Measurement Uncertainties

The reported expanded uncertainty of measurement is based on a standard uncertainty of measurement multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%, but excluding the contribution of the EUT. The expanded uncertainty of measurement has been determined in accordance with UKAS publication LAB34. The uncertainties are displayed in the Annex.

The measurement uncertainty is not taken into account for any decision.

2.3 Possible test case verdicts

NA or --	:	Not applicable / Not required
Pass	:	EUT meets the requirement
Fail	:	EUT does not meet the requirement
OK	:	Does not give rise to remark
UNK	:	Information is unavailable or unknown
NR	:	Not requested
NT	:	Not tested

2.4 Separators

In this report, a point "." is used as a decimal separator. In order to prevent errors a space " " is used as a thousand separator.

2.5 Definitions

In this report, the terms are defined as in the table below.

Term	Description	Example(s)
Assessment	The activity by which a certain characteristic, property and/or feature of the EUT is evaluated	Assessing single fault conditions or abnormal operation of a EUT
Measurement	The activity by which the value of a specific quantity of the EUT is determined.	Temperature measurement, power measurement.
Test	The activity where a certain action is exerted on the EUT	Climate test, mechanical strength test.

3 EUT details

3.1 General information

Test item	:	DOT Movement tracker
Manufacturer	:	Xsens Technologies B.V.
Brand name / trade mark	:	Xsens
Model	:	DOT Tracker XS-T01 DOT charger XS-C01
Serial number	:	204-810005 (charger)
Manufacturing date	:	2019
Receipt Condition	:	Not damaged and fully functional

3.2 Generic description EUT

The EUT is constructed as follows:

- DOT charger:
  - Plastic enclosure with separate cover
    - 1 USB 2.0 in and 5 USB out connectors
    - ESD protection and EMI filtering
    - Indication LED
- DOT tracker
  - Plastic enclosure (sealed)
    - Rechargeable battery
    - Charge circuit
    - Electronics for movement tracking (gyroscope, magnetometer and accelerometer)
    - Blue tooth module
- USB (charge) cable; no communication

The app for a smartphone is not included in this assessment
Straps for mounting are not included and therefore excluded from this assessment

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3.3 Intended use (purpose), functional and physical description of the EUT

Motion detection for persons. Intended for sport activities and revalidation.

3.4 Intended environment for use of the EUT

- ☒ Domestic
- ☒ Light industrial
- ☐ Industrial
- ☐ Restricted access location

3.5 Classification intended user(s)

- ☐ Skilled person
- ☐ Instructed person
- ☒ Ordinary person
- ☒ Children likely to be present

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4 Test item information

4.1 General specifications		
Temperature range	:	0 -50 °C
Humidity	:	Unk %RH NC
Intended Environment	:	Tracker: ☒ In door ☒ Out door Charger: ☒ In door ☐ Out door
Enclosure protection degree	:	Tracker: IP68; Charger: IPx0
Operating condition	:	☒ Continuous ☐ Intermittent ☐ Short time operation
Equipment mobility	:	☐ Stationary ☐ For Building-in ☐ Rack mounted ☐ Wall/ceiling mounted ☐ Direct plug-in ☐ Movable ☒ Transportable ☐ Hand-held ☐ EUT mounted on castors
Product mass	:	Tracker: <50 grams Charger: <1 kg
Product dimensions (WxHxD)	:	Tracker: 31 x 11 x 37 mm Charger: 184 x 22 x 54 mm
Enclosure material	:	☐ Metal ☒ Plastic ☐ Combination of metal and plastic ☐ Other: .....
Laser	:	☒ Not applicable ☐ <Laser class>
Max. sound pressure	:	☒ Not applicable ☐ <Pressure> dBA

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4.2 Electrical specifications		
Supply connection	:	☐ AC Mains ☐ DC Mains ☒ External (not mains) circuit ☒ ES1 ☐ ES2 ☐ ES3
Phases	:	☐ Single ☐ Three-phase
Power system	:	☐ TN ☐ TT ☐ TI - ..... V_{LL}
Type of supply connection	:	☐ Pluggable equipment type A (Non-industrial plug) ☐ Non-detachable power cord ☐ Appliance coupler ☐ Direct plug-in ☐ Mating connector ☐ Pluggable equipment type B (Industrial plug) ☐ Non-detachable power cord ☐ Appliance coupler ☐ Permanent connection ☒ Other: USB 2.0
Voltage rating	:	5 VDC
Frequency	:	NA
Amperage rating	:	300 mA
Max. power rating	:	Not specified
Accessible fuse value	:	Not applicable
Current rating building (fuse)	:	Not applicable
Electric protection class	:	☐ Class I ☐ Class II ☒ Class III
Overvoltage Category	:	☒ OVC I ☐ OVC II ☐ OVC III ☐ OVC IV ☐ Other: .....
Altitude during operation	:	☒ ≤ 2 000 meters above sea level ☐ ..... meters above sea level
Altitude of test laboratory	:	☒ ≤ 2 000 meters above sea level ☐ ..... meters above sea level

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4.2 Electrical specifications		
Pollution Degree	:	☐ PD 1 ☒ PD 2 ☐ PD 3 ☐ PD 4
Tested for IT systems	:	☒ Not applicable ☐ Analogue telephone line ☐ Digital telephone line ☐ Undefined Ethernet ☐ Other: .....

4.3 Documentation		
Language user manual	:	English; Quick Start Up Guide - ABv2- for TEST HOUSE Xsens DOT SDK data logging Xsens DOT compliance - for TEST HOUSE
Language ins./service manual	:	No installation or service required
Risk assessment	:	Not required; very low risk
Hardware version	:	XS-T01 (DOT tracker): 1.7 XS-C01 (DOT charger): 1.3
Firmware / Software version	:	0.3.10

4.4 Energy source identification and classification

4.4.1 Electrically-caused injury (Clause 5):

Source of electrical energy	Corresponding classification (ES)
Primary Circuit	Not present
Secondary Circuit	USB 2.0 (5 VDC/ 500 mA); ES1
Secondary HV circuit	Not present
TNV circuit	Not present

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4.4.2 Electrically-caused fire (Clause 6):

Source of power or PIS	**Corresponding classification (PS)**
Hazardous voltage primary circuit	Not present
Hazardous voltage secondary circuit	5 VDC; PS1
Hazardous voltage TNV circuit	Not present
Hazardous power primary circuit	Not present
Hazardous power secondary circuit	Not present
Hazardous power of a battery	3.6 VDC Li battery; PS1

4.4.3 Injury caused by hazardous substances (Clause 7):

Source of hazardous substances	**Corresponding chemical**
Electrolyte (leaking battery)	Li battery
Chemicals used in or with EUT	Not present

4.4.4 Mechanically-caused injury (Clause 8):

Source of kinetic/mechanical energy	**Corresponding classification (MS)**
Fan blades	Not present
Motor movement	Not present
Sharp edges	MS1
Weight(s)	MS1
Stability	Not applicable

4.4.5 Thermal burn injury (Clause 9):

Source of thermal energy	**Corresponding classification (TS)**
Heating device	Not present
Electronic components	Not present

4.4.6 Radiation (Clause 10):

Type of radiation	**Corresponding classification (RS)**
Magnetic fields (EN-IEC 62233)	Not applicable
LASER	Not present
LED	Indicative LED's; RS1
IR / UV	Not present
Ionizing radiation	Not present
Acoustic (audio and/or ultrasonic)	Not present

4.5 Overview of employed safeguards

4.5.1 Electrically caused injury

Body part	Energy source	Safeguard		
		Basic	Supplementary	Reinforced
Any body part	USB 2.0 (5 VDC/ 500 mA); ES1	Enclosure	--	--

4.5.2 Electrically caused fire

Material part	Energy source	Safeguard		
		Basic	Supplementary	Reinforced
Any body part	5 VDC; PS1	Enclosure	--	--
Any body part	3.6 VDC Li battery; PS1	Enclosure	--	--

4.5.3 Injury by hazardous substances

Body part	Energy source	Safeguard		
		Basic	Supplementary	Reinforced
Any body part	Li battery	Enclosure	Enclosure battery	--

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4.5.4 Mechanically caused injury

Body part	Energy source	Safeguard		
		Basic	Supplementary	Reinforced
Any body part	Sharp edges; MS1	Enclosure	--	--
Any body part	Weight(s); MS1	< 1 kg	--	--

4.5.5 Thermal burn

Body part	Energy source	Safeguard		
		Basic	Supplementary	Reinforced
--	--	--	--	--

4.5.6 Injury cause by radiation

Body part	Energy source	Safeguard		
		Basic	Supplementary	Reinforced
Eye	Indicative LED's; RS1	Low intensity LED	--	--

Note: In most cases 'any body part' is indicated because the DOT tracker is body worn.

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5 Summary

This report contains results of test and measurements that are performed under accreditation (5.1) and tests (5.2) and assessments (5.3) that are excluded from accreditation.

5.1 Tests and measurements - performed under accreditation

The table below presents a summary of the tests that are performed. The test results are gained from testing the DOT Movement tracker and are performed under accreditation. In case a certain test is not performed the rationale is given.

Clause of EN-IEC 62368-1	Test / Measurement	Applicable	If not, rationale	Used Equipm.	Verdict
Electrical measurements					
B.2.5	Input power measurement	Yes	--	ID 1392; 1393; 2102;	Pass
5.5.2.2	Residual voltage measurement	No	No mains connection	--	NA
5.6.6	Ground Bonding test	No	No PE present; Class III	--	NA
5.4.2 (Cl) 5.4.3 (Cr)	Clearances and creepage distance	No	No isolation required, class III, ES1	--	NA
5.4.4.2	Distance through insulation	No	No thin film material used	--	NA
M.4	Lithium reverse current test	Yes	-	--	OK
5.7	Earth leakage current measurement / Touch current	No	Powered by USB 2.0	--	NA
B.3 B.4	Abnormal operation and fault conditions	Yes	--	--	OK
5.4.5 5.4.10	Insulation resistance	No	No isolation required, class III, ES1	--	NA
5.4.2.4 5.4.2.5 5.4.2.6	Electric strength test; Verification of clearance	No	No isolation required, class III, ES1	--	NA

Clause of EN-IEC 62368-1	Test / Measurement	Applicable	If not, rationale	Used Equipm.	Verdict
5.4.9.1 (5.4.1.2) (5.4.1.3)	Electric strength test Verification of solid insulation	No	No isolation required, class III, ES1	--	NA
5.4.10.2.2	Impulse tests	No	No isolation required, class III, ES1	--	NA
5.4.8	Humidity test	No	No isolation required, class III, ES1	--	NA
Thermal measurements					
9.2.5	Thermal behaviour	Yes	--	ID 2177; 2049; 2392;1393; 2102	Pass
Mechanical tests					
4.8, 8, Annex T,	Mechanical strength test	Yes	Enclosure contains coin cell battery	ID 2035; 2152;	Pass
8, Annex T	Mechanical stability test	No	MS1	--	NA
Miscellaneous tests					
F.3.9	Durability and Legibility of Labelling	Yes	--	ID 2175;	OK
10.6	Sound pressure	No	No sound production	--	NA
EN-IEC 62233	Magnetic field measurement	No	Not required by the standard	--	NA

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5.2 Tests and measurements - excluded from accreditation

No tests were performed that are excluded from accreditation.

5.3 Assessments - excluded from accreditation

A summary of the results gained from assessing the DOT Movement tracker is shown in the table below. These results are excluded from accreditation.

5.3.1 Product standard: EN-IEC 62368-1

Clause	Requirement	Remark	Verdict
1	Scope		Pass
2	Normative references	Noted	OK
3	Terms, definitions and abbreviations	Noted	OK
4	General requirements		Pass
5	Electrically-caused injury		Pass
6	Electrically-caused fire		Pass
7	Injury caused by hazardous substances		Pass
8	Mechanically-caused injury		Pass
9	Thermal burn injury		Pass
10	Radiation		NA
Annex A	Examples of equipment within the scope of this standard	Noted	--
Annex B	Normal operating condition tests, abnormal operating condition tests and single fault condition tests		Pass
Annex C	UV radiation		NA
Annex D	Test generators	Noted	--
Annex E	Test conditions for equipment containing audio amplifiers		NA
Annex F	Equipment markings, instructions, and instructional safeguards		Pass
Annex G	Components		NA
Annex H	Criteria for telephone ringing signals		NA
Annex I	Overvoltage categories	Noted	--
Annex J	Insulated winding wires for use without interleaved insulation		NA
Annex K	Safety interlocks		NA

Clause	Requirement	Remark	Verdict
Annex L	Disconnect devices		NA
Annex M	Equipment containing batteries and their protection circuits		Pass
Annex N	Electrochemical potentials (V)	Noted	--
Annex O	Measurement of creepage distances and clearances	Noted	--
Annex P	Safeguards against conductive objects		NA
Annex Q	Circuits intended for interconnection with building wiring		NA
Annex R	Limited short-circuit test		NA
Annex S	Tests for resistance to heat and fire		NA
Annex T	Mechanical strength tests		NA
Annex U	Mechanical strength of CRTs and protection against the effects of implosion		NA
Annex V	Determination of accessible parts		NA
Annex W	Comparison of terms introduced in this standard	Noted	--

5.3.2 Particular of the product standard

None

5.4 Non-compliances with the standard(s)

None

5.5 Test and assessment considerations

1. The app for a smartphone is not included in this assessment.
2. Straps for mounting are not included and therefore excluded from this assessment.
3. Although the DOT tracker can be used out-door, the EN-IEC 60950-22 is not applicable because it is not an “out-door installation” or connected to mains.
4. No risk assessment could be found. However, as far as could be established at this point only very low risks might be present. Hence, the absence of a risk assessment is acceptable.
5. The DOT tracker can be directly connected to USB for charging. When connected the full functionality will remain available.
6. The marking on the identification label is too small, however as there is no hazard related to the identification label, the font size is sufficient.
7. The CE marking size was too small, the manufacturer updated the CE marking to a larger size. However, the new marking is not measured again. It is the manufacturer’s responsibility to conform to the requirements for CE marking as set out in the low voltage directive.
8. In the manual, no specifications are found of the environmental humidity conditions that are allowed for the EUT. However, considering the construction of the EUT and the IP68 rating, it is likely that humidity will not influence the safety of the EUT negatively.
   It is recommended to state the maximal humidity in the manual.

6 Conclusion

The conclusion is excluded from accreditation.

The DOT Movement tracker has been assessed in conformity with the standard(s) EN-IEC 62368-1:2014 + AC:2015 + A11:2017 + AC:2017 and has been found in compliance.

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7 Electrical measurements

7.1 Input power measurement

Accreditation

Tests and/or measurements reported in this paragraph are performed under ISO17025 accreditation.

7.1.1 Applicable clause of standard(s)

Applied Basic Standard: EN 62018

Clause of EN-IEC 62368-1*	Criteria	Restriction/conditions/remarks
B.2.5	U_{nom} - 10%, U_{nom}, U_{nom} +10% Unless otherwise specified by the manufacturer	$P_{marked} \geq 90\% P_{max}$

* Note: If relevant, add or correct for sub-standard (particular).

7.1.2 Measurement conditions

Parameter	Range	Value	Unit
Ambient temperature	+16 – +34	22	°C
EUT mode of operation	Charging 5 trackers		

Analysis of environmental conditions (document 1545 in QMS) has shown that registration of other environmental conditions is not required.

7.1.3 Primary check test set-up and equipment

Visual inspection equipment okay?	YES
Show the used meters give a significant difference between connected and not connected state?	YES

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7.1.4 *Input power measurement results*

Rated power		300	mA
Limit stated in the standard	$P/I_{Max} \leq P/I_{stated}$ +10%	330	mA

Test voltage	Test voltage (VDC)	Frequency (Hz)	Measured current (A)	Apparent Power (VA)	Real Power (W)	Power factor (Cos φ)	Verdict
U_{nom}	5	--	251.8 mA	--	1.38	--	Pass

7.2 Lithium reverse current test

Accreditation

Tests and/or measurements reported in this paragraph are performed under ISO17025 accreditation.

7.2.1 Applicable clause of standard(s)

Applied Basic Standard: EN 60068-4 (the IEC 60950-1 is used as guide)

Product Standard*	Clause	Criteria	Restriction/conditions/remarks
EN-IEC 62368-1	B.4.9 M.4	Refer to work instruction.	NA

* Note: If relevant, add or correct for sub-standard (particular).

7.2.2 Secondary requirement' and limits

Specifications Lithium battery	Value	Unit
Brand Lithium battery	EEMB	--
Type (model)	LIR2032	--
Typical voltage	3.7	V
Typical capacity	45	mAh
Max. charge current ("reverse current")	45	mA
Max. discharge current	450	mA

7.2.3 Measurement conditions

Parameter	Range	Value	Unit
Ambient temperature	+16 – +34	--	°C

Analysis of environmental conditions (document 1545 in QMS) has shown that registration of other environmental conditions is not required.

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7.2.4 *Primary check test set-up and equipment*

Visual inspection equipment okay?	YES
Does reference resistor ID2018 (1MΩ) the expected measurement result?	YES

7.2.5 *Reverse current test results*

Abnormal condition	Test voltage (V DC)	Maximum allowed current (mA)	Measured Normal reverse current (mA)	Measured Abnormal reverse current (mA)	Verdict
Short of U402	5	45	--	--	OK*

Note* Protected by Q404 and R407 and R408

7.3 Abnormal operation and fault conditions

Accreditation

Tests and/or measurements reported in this paragraph are performed under ISO17025 accreditation while assessments reported in this paragraph are excluded from ISO17025 accreditation, as is indicated per test / assessment in the table.

7.3.1 Applicable clause of standard(s)

Applied Basic standard: None

Product Standard*	Clause	Criteria	Restriction/conditions/remarks
EN-IEC 62368-1	B.3 B.4	No hazardous situation may occur. Depending on the end user, EL2 or EL3 is acceptable	NA

* Note: If relevant, add or correct for sub-standard (particular).

7.3.2 Measurement conditions

Parameter	Range	Value*	Unit
Ambient temperature	+16 – +34	--	°C
Ambient humidity	35 – 70	--	% RH NC

Analysis of environmental conditions (document 1545 in QMS) has shown that registration of other environmental conditions is not required.
Note*: In case of assessments only, no value is recorded.

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7.3.3 *Abnormal operation and Fault Conditions test results*

Abnormal operation or Single Fault Condition	Under Accreditation	Safety Risk Present (Yes/No)	Result or Explanation	Verdict
Short circuit in secondary circuitry	NO	No	USB port cannot deliver more current	OK
Fire hazard: Max. (short-circuit) power > 15 VA Max. (short-circuit) power > 100 VA Max. (short-circuit) power > 4000 W	NO	No	Low power < 15 W	OK
Reversed polarity of a DC power supply	NO	No	USB connector	OK
Reasonable foreseeable by-pass of a safeguard	NO	No	Enclosure sealed	OK
Short circuit of clearance and creepage functional isolation unless requirements for basic insulation (or dielectric strength) are met	NO	No	Low power circuit, no hazard	OK
Short circuit or interruption of passive components	NO	No	Low power circuit, no hazard	OK
Uncontrolled charging or discharging of batteries	NO	No	Circuit protection present (U402)	OK
Interruption power supply	NO	No	No function, creates no hazard	OK
Failure of communication (USB, Internet)	NO	No	No function, creates no hazard	OK
Failure of firmware	NO	No	No function, creates no hazard	OK
Failure of (external) software	NO	No	No function, creates no hazard	OK

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8 Thermal and Environmental measurements

8.1 Thermal behaviour

Accreditation

Tests and/or measurements reported in this paragraph are performed under ISO17025 accreditation.

8.1.1 Applicable clause of standard(s)

Applied Basic Standard: NA

Product Standard*	Clause	Criteria	Restriction/conditions/remarks
EN-IEC 62368-1	9.2.5	Touch limits: Table 38	U_{max} or U_{nom}+10% Ambient temperature: 20 - 25°C

* Note: If relevant, add or correct for sub-standard (particular).

8.1.2 Secondary requirements and limits

Parameter	
Black test corner used	--
If not, reason:	Not required by the EN-IEC 62368-1

8.1.3 Measurement conditions

Parameter	Range	Value	Unit
Ambient temperature	+20 – +25	22	°C
Ambient humidity	35 – 70	53	% RH NC

Analysis of environmental conditions (document 1545 in the QMS) has shown that registration of other environmental conditions is not required.

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8.1.4 *Primary check test set-up and equipment*

Visual inspection equipment okay?	YES
Do the thermo-couplers or does the IR thermometer react to the applied temperature in an acceptable manner?	YES

8.1.5 *Temperature behaviour measurement results*

Voltage	5	(V)
Frequency	--	(Hz)
Operation mode EUT	Charging	--
Deviation test ambient temperature <25 °C	3	(°C)

Location	Measu-rement time (min)	Tape used	Maximum Allowable Temperature (°C)	Measured Temperature (°C)	Extrapolated Temperature (°C)	Verdict
Enclosure tracker	60	No	48	25	28	Pass
Enclosure Charger	60	No	60	23	26	Pass
USB connector	60	No	85	23	26	Pass

Note: In case of reflecting surfaces, applied black tape on the surface of the EUT prior to the measurements
Note: The extrapolated temperature = Measured temperature + Deviation test ambient temperature <25 °C

9 Mechanical tests

9.1 Mechanical strength test (IK 2 – 8)

Accreditation

Tests and/or measurements reported in this paragraph are performed under ISO17025 accreditation.

9.1.1 Applicable clause of standard(s)

Applied Basic Standards: EN 60068-2-31, EN 60068-2-75 and EN 62262

Product Standard*	Clause	Criteria	Restriction/conditions/remarks
EN-IEC 62368-1	4.8.4 Annex T	Enclosures with coin batteries	--

* Note: If relevant, add or correct for sub-standard (particular).

9.1.2 Measurement conditions

Parameter	Range	Value	Unit
Ambient temperature	+16 – +34	22	°C

Analysis of environmental conditions (document 1545 in QMS) has shown that registration of other environmental conditions is not required.

9.1.3 Primary check test set-up and equipment

Visual inspection equipment okay?	YES

9.1.4 Mechanical strength test results

Location of impact	Type of test*	Energy (J)	Height (cm)	Number of Impacts	Remarks (visual damage)	Verdict
Tracker enclosure	F	--	100	3	No	Pass
Tracker enclosure	B	2	40.8	3	No	Pass

*Note: H = Impact with hammer; B = Ball impact test; F = EUT falling test (note type of surface); P = push test

Location of impact	Type of test*	Energy/ Force/ Weight	Height (cm)	Duration (s)	Remarks (visual damage)	Verdict

*Note: H = Impact with hammer; B = Ball impact test; F = EUT falling test (note type of surface); P = push test; PL = pull test

9.1.5 Pictures of the mechanical strength tests

Picture 1: Test setup

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Picture 2: Impact locations

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10 Miscellaneous tests

10.1 Durability and Legibility of Labelling test

10.1.1 Accreditation

Tests and/or measurements reported in this paragraph are performed under ISO17025 accreditation.

10.1.2 Applicable clause of standard(s)

Applied Basic Standard: NA

Product Standard*	Clause	Criteria	Restriction/conditions/remarks
EN-IEC 62368-1	F.3.9	Label should remain legible	15s with petroleum spirit and 15 with water

* Note: If relevant, add or correct for sub-standard (particular).

10.1.3 Measurement conditions

Parameter	Range	Value	Unit
Ambient temperature	+16 – +34	RSLT	°C

Analysis of environmental conditions (document 1545 in QMS) has shown that registration of other environmental conditions is not required.

10.1.4 Primary check test set-up and equipment

Do the solvents look and smell as to be expected?	YES

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10.1.5 Durability of markings test results

Solvent	Rubbing Time (s)	Visual inspection			Verdict
		Damage of print	(Partial) Detachment of label	Other remark	
Water	15	--	--	--	Pass
Petroleum spirit	15	--	--	--	Pass

10.1.6 Legibility of markings measurement results

Marking	Measured height (mm)	Minimum required height (mm)	Other remark (Reason for aberration)	Verdict
Min. size text	1.1	--	1.5 mm is assumed to be sufficient	OK*
Min. size information signs	--	--	3 mm is assumed to be sufficient	NA
Min. size warning signs	--	--	3 mm is assumed to be sufficient	NA
Min. size CE marking	4.1	5.0	The CE mark is not described in this standard, but in the LVD	OK*
Lay-out CE marking	OK	--		OK

Note*: refer to chapter 5.5

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10.1.7 *Pictures of the durability tests*

Before durability tests

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After durability tests

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11 Appendix A: List of safety critical components

Object / part number	Manufacturer / trade mark	Type / model	Technical data	Standard	Mark(s) of conformity
DOT charger					
Enclosure material main enclosure	Sabic	Cycoloy Resin C6200	UL 94 HB at 0.71 mm UL 94 V-1 at 1.21 mm UL94 V-0 at 1.47 mm	--	*1
Enclosure material transparent cover	Sabic	Lexan 940A	Vicat: 151°C UL 94 V-2 at 1.47 mm UL 94 V-0 at 2.99 mm	--	*1
USB connector (input)	FCI	10118193-0001LF	USB 2.0 -55 – 85 °C	--	*1
USB connectors (outputs)	Hirose	ZX60B5S	USB 2.0 -30 – 85 °C	--	*1
Coil LB100	Wurth Elektronik	742792062	500mA 80R@100MHz -55 – 125 °C	--	*1
LED DS100	Inolux	IN-S63AS5UW	White -40 – 100 °C	--	*1
DOT Tracker					
Charger IC U402	Texas Instruments	BQ29700DSER	For Li-Ion/Li-Pol $U_{in,max}$: 30V Limit to 100 and 500 mA OVP: 4.275V UVP: 2.8V -40 - 150°C	--	*1
Fuel gauge U404	ST	STC3115AIJT	6 V -55 – 85 °C	--	*1
Battery	EEMB	LIR2032	Li-Ion 3.7V/45mAh Charge @ 25°C: 0.2CmA/4.2VDC	IEC 62133 UN38.3	CB: DK-97355-UL

Object / part number	Manufacturer / trade mark	Type / model	Technical data	Standard	Mark(s) of conformity
			Discharge: 0.2CmA/2.75VDC Fast charge (25°C): 1.0CmA/4.2VDC Fast discharge: 10CmA/2.75VDC -20 - 60°C		
Enclosure	Sabic	Lexan Resin 223R	Vicat 154 °C UL 94 V-2 at 0.75 mm	--	*1
	Lupoy	GN5001RF	UL 94 V-0	--	*1
	Onflex	S KE 70A	Tensile break 11.3 MPa	--	*1
USB connector	Amphenol	MUC-20PFFR-JS8C02	IP68 1.8 A	--	*1
LED DS300	Osram	Q65110A1647	White -40 – 100 °C	--	*1
Coil LB100	Wurth Elektronik	74279279	200mA 600R@100MH -55 – 125 °C	--	*1

Note *1: Components have been checked as part of the appliance.

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12 Appendix B: Picture(s) of the EUT

Picture 1: The EUT

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Picture 2: The DOT charger with 3 DOT trackers

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Picture 3: Power (USB) connection charger

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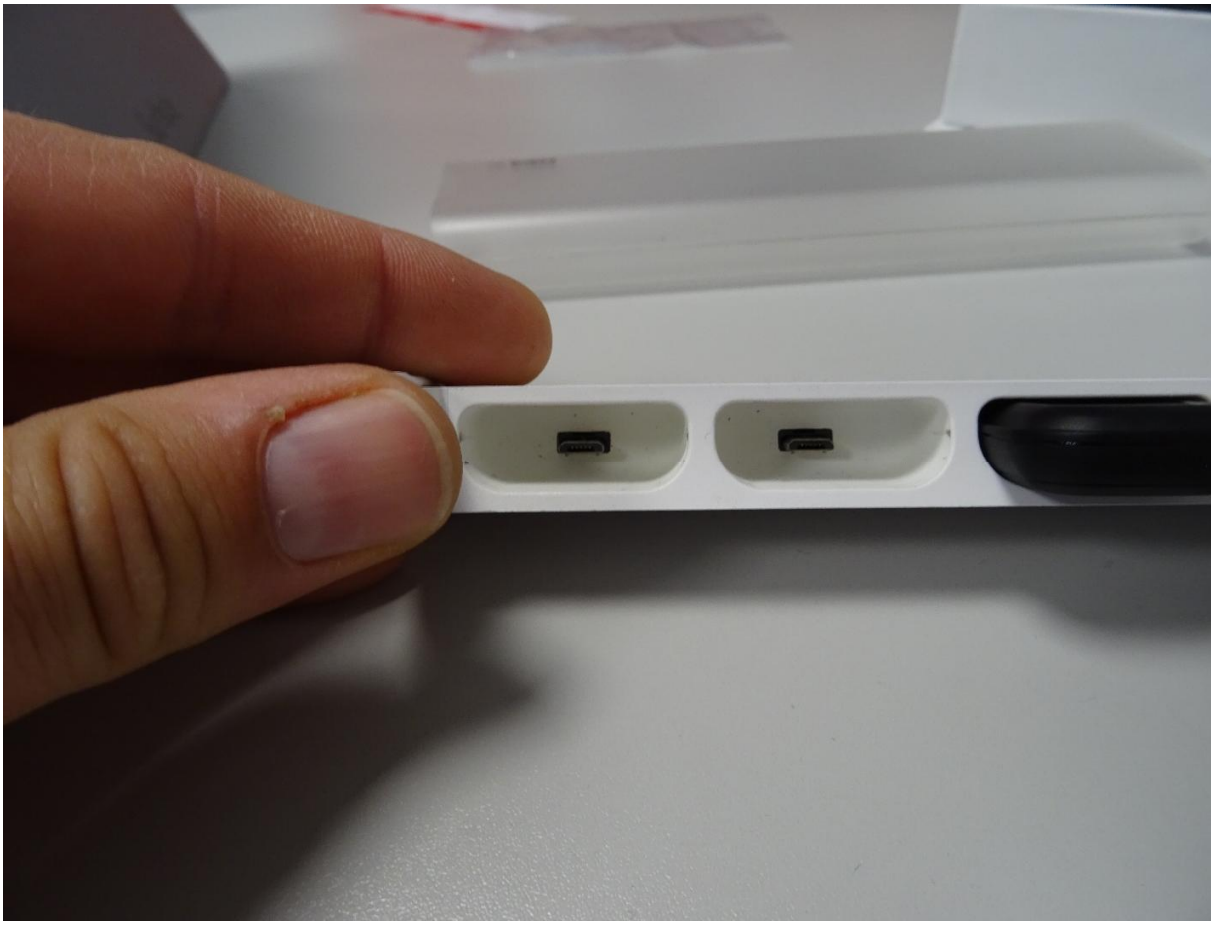

Picture 4: USB connectors to trackers

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Picture 5: Identification label charger

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Picture 6: The DOT tracker

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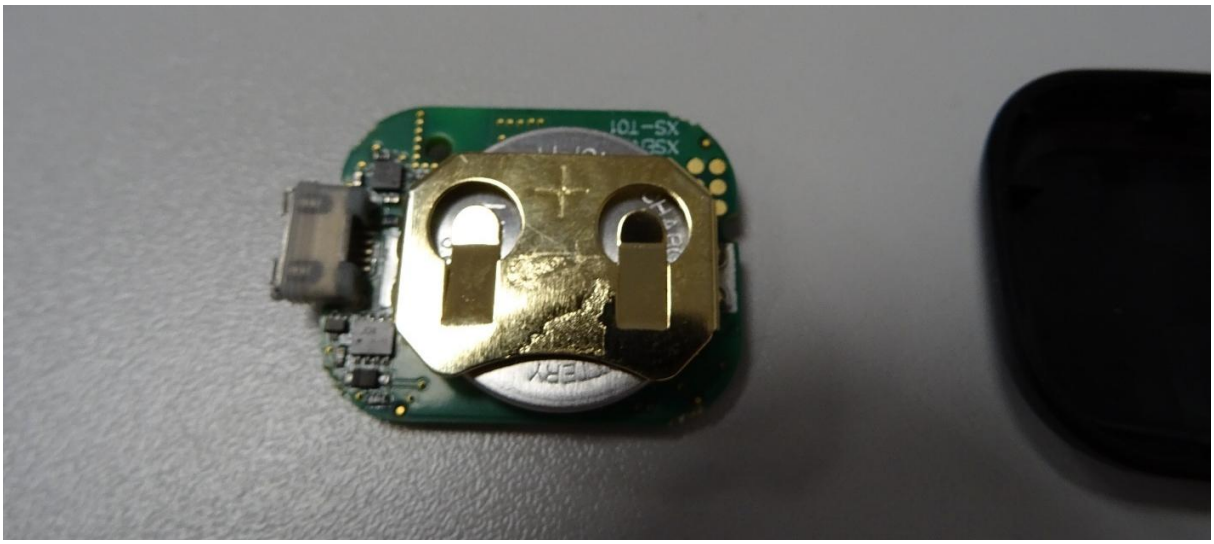
Picture 7: DOT tracker opened



Picture 8: DOT tracker rear side of the PCB

Picture 9: Battery

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Picture 10: Identification label DOT tracker

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13 Appendix C: Measurement uncertainty

Quantity	Measurement arrangement	Equipment	Measurement uncertainty
Voltage	Breakdown test	High voltage tester Quadcheck	0-3 mAAC: ±0.138 mA 3-10 mAAC: ±0.418 mA 10-30 mAAC: ±1.15 mA 30-99 mAAC: ±3.70 mA 0-350 µADC: ±13.0 µA 300-3500 µADC: ±131 µA 3000-9999 µAAC: ±416 µA 500 – 1000VAC/DC ±29V 1000 to 6000VAC/DC ±144V
		High voltage tester Secutest SIII	500-4000VAC ± 69V 750-6000VDC ± 104V
	Capacitance discharge check	Digital oscilloscope Oscilloscope probe 1:100	± 4.27 V
	Capacitance discharge check	Voltmeter and stopwatch	AC/DC <250V: ±3.24 V ±1.17 s
	Rated voltage	Power meter	AC/DC <300V: ±0.53 V
	Rated voltage	Power source system	±0.13V
	Rated voltage	Multimeter	0-600 mVAC/DC: ±7.28 mV 0.6-6 V: ±0.073 V 6-60 V: ±0.73 V 60-270 V: ±3.47 V
Resistance	Earth resistance	Protective wire/insulation tester	0-0.25 Ω: 0.013 Ω 0-0.6 Ω: ±0.024 Ω
	Insulation resistance	Protective wire/insulation tester	1-1.5 MΩ; 500-1000V: ±0.057 MΩ 5-15 MΩ; 500-1000V: ±0.51 MΩ 0.5-1.5 GΩ; 500-1000V:±50.7 MΩ 1-1.5 MΩ; 100 -500 V: ±0.15 MΩ 5-15 MΩ; 100-500V: ±1.45 MΩ 0.5-1.5 GΩ; 100-500V: ±145 MΩ
	Insulation resistance	Fluke insulation tester	0.5-1.5 MΩ; 100V: ±0.11 MΩ 0.01-6 MΩ; 100V: ±0.27 MΩ 6.0-15 MΩ; 100V: ±1.10 MΩ 6-60 MΩ; 100V: ±2.66 MΩ

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Quantity	Measurement arrangement	Equipment	Measurement uncertainty
			60-100 MΩ; 100V: ±9.31 MΩ 0.1-60 MΩ; 250-1000V: ±1.62 MΩ 0.5-1.5 MΩ; 250-1000V: ±0.61 MΩ 6-15 MΩ; 250-1000V: ±0.85 MΩ 60-600 MΩ; 250-1000V: ±16.2 MΩ 0.6-2 GΩ; 1000V: ±0.59 GΩ
Current	Reverse current	Multimeter	0-60 mAAC/DC: ±1.074 A 60-400 mAAC/DC: ±7.28 A 0.4-6 AAC/DC: ±0.107 A
	Leakage current	Multimeter and measurement network AM1 and 3	0-600 mV: ±0.060 mA 0-6000 mV: ±0.15 mA
		Multimeter and measurement network AM4	0-600 mV: ±8.06 µA 0-6000 mV: ±75.1 µA 0-600 mVDC: ±3.70 µA
		Current clamp	0-3 mAAC: ±0.040 mA 0-30 mAAC: ±0.404 mA
Power	Rated power	Power meter	Cos phi=1: ±0.17% Cos phi=0.5: ±0.17%
	Rated power	Power source system	AC: ±7.43 W DC: ±57.77 W
	Apparent power	Power meter	100-300 V: ±0.55%
	Apparent power	Power source system	100-300 V: ±13.08 VA
	Apparent power	Multimeter	±4.42%
	Apparent power	Multimeter and current clamp	±8.97%
Temperature	Component temperature	Hybrid recorder	±0.70ºC
	Component temperature	Infrared thermometer	±3.17ºC
	Component temperature	Temperature probe	±3.73ºC
	Component temperature	Isolation tester	±3.80ºC
	Environment	Temperature & humidity chamber	±0.35ºC
	Environment	Data logger (ID2128)	±0.9ºC

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Quantity	Measurement arrangement	Equipment	Measurement uncertainty
Humidity	Environment	Temperature & humidity chamber	±2.9%
	Environment	Data logger (ID2128)	±4.6%
Air pressure	Environment	Data logger (ID2128)	±3.5 hPa
Energy	Mechanical strength	Spring impact hammer 0.2 –1.0 J	±0.023 J
Distance	Touchable	Jointed test finger	± 0.2 mm
	Touchable	Unjointed test finger 0 - 100N Force gauge 0-500N	±10 N ±0.25 N
	Touchable	Test pin 4mm - 3mm diameter Test pin 3mm diameter Test pin 4mm diameter Test pin 1mm diameter Test hook 8mm – 5mm Unjointed test finger	± 0.2 mm
	Distance through insulation	Vernier callipers	±0.401 mm
		Vernier callipers (digital)	±0.023 mm
		Micrometer	±0.0242 mm
	Creepage Clearance	Calibre	±0.21 mm
		Vernier callipers Vernier callipers (digital) Test finger 0 - 100N (force) Force gauge 0-500N	±0.401 mm ±0.023 mm ±10.0 N ±0.25 N
		Magnifying glass 10x	±0.021 mm
Distance, weight, Energy, force	Mechanical strength housing	Steel-ball test set	±0.15 J
		Spring impact hammer 0.2 –1.0 J	±0.023 J
		Unjointed test finger 0 - 100N Force gauge 0-500N	±10.0 N ±0.25 N
Force Distance Angle	Stability	Urnster 50N	±5 N
		Urnster 100N	±10 N
		Urnster 250N	±10 N
		Tape measure	±2.5 mm
		Unjointed test finger 0 - 100N	±10.0 N
		Force gauge 0-500N	±0.25 N
		Digital level	±0.3 º

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Quantity	Measurement arrangement	Equipment	Measurement uncertainty
Magnetic field	Human exposure to magnetic fields	Exposure Level Tester	± 9 %
Decibel (A)	Sound pressure	Sound pressure meter	±1.7 dBA
Lux	Light intensity	Light intensity meter Scale: 0 ... 1999 lux	±61
Energy	Pulse Energy	Defibrillation tester	±3.5 J
Voltage	Voltage on defibrillation proof applied parts	Oscilloscope	±1.2%

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14 Appendix D: Used Equipment

Description	Brand	Type / Model	ID
True RMS Multimeter	Fluke	175	1392
True RMS Multimeter	Fluke	175	1393
Temp and &RH data logger	Lascar electronics	Easylog	1467
Temp and &RH data logger	Lascar electronics	Easylog	1468
Temp and &RH data logger	Lascar electronics	Easylog	1469
3 phase EFT / Surge coupling network	EM test	CNI 503A2	1533
Surge generator	EM test	UCS 500N5	1534
High voltage probe	Fluke	80K-6	2003
Jointed test finger	PTL Dr. Grabenhorst	P 10.14	2004
Calibre	PTL Dr. Grabenhorst	L 25.81	2005
Ball-pressure test apparatus	DARE!! Development	KD 1	2006
Test pin 4mm - 3mm diameter	DARE!! Development	TP 1	2009
Test pin 3mm diameter	DARE!! Development	TP 2	2010
Test pin 4mm diameter	DARE!! Development	TP 3	2011
Test pin 1mm diameter	DARE!! Development	TP 4	2012
Test hook 8mm – 5mm	DARE!! Development	TP 5	2013
Unjointed test finger	DARE!! Development	TP 6	2014
Test probe	DARE!! Development	TP 7	2015
Metal plate ø30mm	DARE!! Measurements	ø30mm/M6	2020
Safety insulating transformer/adjustable transformer	Wesemann	0-280VAC, 3kW	2022
IEC Leakage current measurement circuit with integrated wall outlet	DARE!! Development	AM 1	2025
Adjustible Resistor	MCB	2Ω/20A	2027
Steel-ball test set	DARE!! Development	KPS 1	2028
Steelyard 100N	Salter	VU 2	2029
Spring impact hammer 0.2 –1.0 J	PTL Dr. Grabenhorst	F 22.50	2030
Unjointed test finger 0 - 100N	PTL Dr. Grabenhorst	P 10.49	2031
Steelyard 50N	Salter	VU 1	2032
Steelyard 250N	Salter	VU 3	2033
Vernier callipers	Mitutoyo	SM 1	2034
Tape measure	Sola	Video-Flex 1	2035
Test finger telecom	DARE!! Development	TP 8	2037

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Description	Brand	Type / Model	ID
Leakage current measurement circuit for high frequency	DARE!! Development	AM 2	2038
10mm thick wooden board (small)	DARE!! Development	PK 1	2039
20mm thick wooden board	DARE!! Development	PK 2	2040
IEC leakage current measurement circuit	DARE!! Development	AM 3	2041
Test corner (black) for thermal behaviour measurements	DARE!! Measurements	--	2049
Adjustible Resistor	MCB	11.5Ω/10A	2052
Adjustible Resistor	MCB	8.4Ω/8A	2053
Fume cabinet (fire proof)	DARE!! Measurements	--	2061
Stopwatch	Conrad	JS-9004	2065
Nozzle with flowmeter	Friborg	6000	2076
Nozzle with flowmeter	Friborg	6990	2077
Burner set-up	Friborg	4500	2078
Sound pressure meter	Bureau Geluid	BG-1	2083
Test probe 30x80 cone	DARE!! Development	--	2086
Temperature probe	Fluke	80TK	2087
Exposure Level Tester	Narda	ELT-400	2091
Isolation tester	Fluke	1587	2099
Test system	Quadcheck II	7504SA	2100
AC/DC current clamp meter	Fluke	376	2101
Power supply	Agilent	U8002A	2102
AC current probe	Fluke	360	2103
Micrometer	Hitech	190-00	2105
Level	Avit	AVO02032	2111
Test system	GMC Messtechnik	Secutest SIII+ MH	2114
Test probe (50mm sphere)	DARE!! Measurements	TP 9	2116
Test probe (2.5 x 100 mm)	DARE!! Measurements	TP 10	2117
Test probe (1.0 x 100 mm)	DARE!! Measurements	TP 11	2118
Oscilloscope probe 1:100	Multicontact	Isoprobe III RZ 087	2122
Adjustible Resistor	MCB	145Ω/3A	2124
Adjustible Resistor	MCB	110Ω/2A	2125
Torque gauge 2-25Nm	Tremotec	K4549-02	2126
Rule	Praxis	2 meters	2127
T, RH, P logger	Extech	SD700	2128
Torque gauge 0-2 Nm	Proto	J6169NMF	2130
Force gauge 500 N	SLD	50FGN	2132

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Description	Brand	Type / Model	ID
Digital oscilloscope	Rigol	DS1054Z	2133
IEC leakage current measurement circuit; 61010	DARE!! Measurements	AM 6/7	2134
Non inductive resistor	DARE!! Measurements	1k2 30W	2135
Non inductive resistor	DARE!! Measurements	500R/1k 30W	2136
Non inductive resistor	DARE!! Measurements	2k/5k 30W	2137
Weighing scale	Stimag	EOB 300K100L	2138
Needle flame test apparatus	ED&D	NFB-02	2139
Needle flame test apparatus; flame height	ED&D	NFB-FHJ	2139
Needle flame test calibration tool	ED&D	NFB-C1	2140
Testfinger 19 (children) d 5.6mm	ED&D	5.6 mm	2141
Testfinger 18 (children) d 8.6mm	ED&D	8.6 mm	2142
Inclined plane	DARE!! Measurements	0-18°; 1 m²	2143
Digital level	Laserliner	081.202A	2144
Isolatie transformator	Reo	MED R600	2145
High voltage probe	Testec	HVP-15HF	2149
RVS Force test area 25x25mm (625mm²)	DARE!! Measurements	625mm²	2150
RVS Force test area 125x200mm (250cm²)	DARE!! Measurements	250cm²	2151
50mm thick hardwood (>700kg/m3) board	Balvert	950 x 1100 x 50 mm	2152
13 mm Hard wood on 36 mm plywood	Balvert	1000x1000x49mm	2154
Manometer	ICH	306.40.10	2155
Vernier callipers	Helios Preisser	1220 417 DIGI-MET	2163
Temperature (volt) recorder	Yokogawa	GP-10	2167
Test probe (12.5mm sphere)	Guangzhou Hongce Equipment	HT-I06	2168
Peak value on/off switch	DARE!! Measurements	--	2170
Digital Power meter	Yokogawa	WT333E	2172
Flow meter	Brooks	GT-1000-R-2-127-AAAAT	2173
Pressure gauge (water column)	Vos Instrumenten	6393-45296	2174
Magnifying glass	Peak	1983 10x	2175
Light intensity meter	Ideal	61-666	2176
Infrared temperature meter	Fluke	63	2177
Temperature & humidity chamber	ESPEC	ARS-0680	2180
Differential probe	Cal Test	CT3681	2181
Microscope	Amscope Ischope Corp	SM-4TPZ-FOR-5M	3143
Function generator	Rigol	DG4102	7474

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Tel. +31 348 430 979
www.dare.nl
measurements@dare.nl

Description	Brand	Type / Model	ID
Cheesecloth	ED&D	--	--
Gas	Westfalen	Methane 2.5	--
Gas	Campinggaz	Butane	--
Weights	DARE!! Measurements	0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10kg	--
Iso-propylalcohol 70% (30% water)	Amresco	Mixed by DARE!!	--
Iso-propylalcohol	Alfa Aesar	99.5%	--
Petroleum spirit	VWR	60-80°C	--
Medical grade cotton	--	--	--
Plywood 18 mm thick	DARE!! Development	60x60x60cm	--
Tissue paper	ED&D	--	--
Wall/ceiling mounting location	DARE!! Measurements	--	--
Water (distilled)	--	--	--
Water (tap)	--	--	--

DARE!! Services B.V.
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Rabobank Utrechtse Waarden e.o.
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15 Appendix E: Abbreviations

EUT	Equipment Under Test
ES	Electrical energy Source
PS	Power Source (energy source to initiate electrical fire)
PIS	Potential Ignition Source
HS	Hazardous Substances (energy source)
PPE	Personal Protective Equipment
MS	Mechanical energy Source
TS	Thermal energy Source
RS	Radiation energy Source