



Council of the
European Union

Brussels, 4 April 2016
(OR. en)

7477/16
ADD 1

ENV 189

COVER NOTE

From:	European Commission
date of receipt:	29 March 2016
To:	General Secretariat of the Council
Subject:	Annex to the Commission Decision of XXX establishing the ecological criteria for the award of the EU Ecolabel for personal, notebook and tablet computers

Delegations will find attached document D038863/05 - Annex.

Encl.: D038863/05 - Annex

EN

ANNEX

EU ECOLABEL CRITERIA AND ASSESSMENT AND VERIFICATION
REQUIREMENTS

Criteria for awarding the EU Ecolabel to personal, notebook and tablet computers:

1. Energy Consumption
 - (a) Total energy consumption of the computer
 - (b) Power management
 - (c) Graphics capabilities
 - (d) Internal power supplies
 - (e) Enhanced performance displays
2. Hazardous substances and mixtures in the product, sub-assemblies and component parts
 - (a) Restrictions on Substances of Very High Concern (SVHCs)
 - (b) Restrictions on the presence of specific hazardous substances
 - (c) Restrictions based on CLP hazard classifications
3. Lifetime extension
 - (a) Durability testing for portable computers
 - (b) Rechargeable battery quality and lifetime
 - (c) Data storage drive reliability and protection
 - (d) Upgradeability and Repairability
4. Design, material selection and end-of-life management
 - (a) Material selection and compatibility with recycling
 - (b) Design for disassembly and recycling
5. Corporate Social Responsibility
 - (a) Sourcing of 'conflict-free' minerals
 - (b) Labour conditions and human rights during manufacturing
6. User information
 - (a) User instructions

(b) Information appearing on the EU Ecolabel

Assessment and verification

The specific assessment and verification requirements are indicated within each criterion.

Where the applicant is required to provide declarations, documentation, analyses, test reports, or other evidence to show compliance with the criteria, these may originate from the applicant and/or his supplier(s) and/or their supplier(s), and/or third party certification and testing bodies, as appropriate.

Where possible, verification should be performed by conformity assessment bodies that have been accredited by a national accreditation body according to Regulation (EC) No. 765/2008¹ setting out the requirements for accreditation and market surveillance. Competent Bodies shall preferentially recognise:

- Test reports which are issued by conformity assessment bodies accredited according to the relevant harmonised standard for testing and calibration laboratories,
- Verifications by conformity assessment bodies that are accredited according to the relevant harmonised standard for bodies certifying products, processes and services,
- Verifications by conformity assessment bodies that are accredited according to the relevant harmonised standard for bodies carrying out inspections.

Where appropriate, test methods other than those indicated for each criterion may be used if these are described in the user manual of the Ecolabel criteria application and the Competent Body assessing the application accepts their equivalence.

Where appropriate, competent bodies may require supporting documentation and may carry out independent verifications or site visits.

Changes in suppliers and production sites pertaining to products to which the ecolabel has been granted shall be notified to Competent Bodies, together with supporting information to enable verification of continued compliance with the criteria.

Criterion 1. Energy consumption

1(a) Total energy consumption of the computer

The total energy consumption of the computer shall meet the energy-efficiency requirements set out in Regulation (EC) No 106/2008² and as amended by Energy Star v6.1³.

¹ Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93 (OJ L 218, 13.8.2008, p. 30)

² Regulation (EC) No 106/2008 of the European Parliament and of the Council of 15 January 2008 on a Union energy-efficiency labelling programme for office equipment (recast version) (OJ L 39, 13.2.2008, p. 1–7)

³ Commission Decision (EU) 2015/1402 of 15 July 2015 determining the European Union position with regard to a decision of the management entities under the Agreement between the Government of the United States of America and the European Union on the coordination of energy-efficiency labelling programmes for office

Capability adjustments specified under the Agreement as amended by Energy Star v6.1 may be applied, with the exception of:

- Discrete Graphics Processing Units (GPUs): See sub-criterion 1(c);
- Internal power supplies: See sub-criterion 1(d)

A specific additional requirement shall apply to enhanced-performance integrated displays, which can be found in sub-criterion 1(e).

Assessment and verification: The applicant shall submit a test report for the computer model carried out according to the Energy Star v6.1 test methods for computers. Energy Star v6.1 registrations in the USA shall be accepted provided that testing according to European input power requirements has been carried out.

1(b) Power management

Power management functions shall be provided as a default setting. Whenever the user or a software attempts to deactivate the default power management functions, a warning message shall be displayed communicating to the user that an energy saving function will be disabled and giving the option to retain the default function.

Assessment and verification: The applicant shall provide the description of the power management settings that appears in the model's user manual, accompanied by screen shots of examples of when warning messages are displayed.

1(c) Graphics capabilities

The Functional Adder TEC_{graphics} allowances for discrete graphics cards (dGfx) in desktop, integrated desktop and notebook computers in Table 1 shall apply in place of those in the Energy Star v6.1 eligibility criteria. dGfx shall have power management that shuts down the Graphics Processor (GPU) in the long idle state.

Table 1. Functional Adder allowances for discrete graphics cards (dGfx) in desktop, integrated desktop and notebook computers

dGfx category (Gigabytes/second) ¹	TEC Allowance (kWh/year)	
	Desktop and integrated desktops	Notebooks
G1 (FB_BW≤16)	30	9
G2 (16<FB_BW≤32)	37	12
G3 (32<FB_BW≤64)	47	20

equipment on the revision of specifications for computers included in Annex C to the Agreement (OJ L 217, 18.8.2015, p.9)

G4 (64<FB_BW≤96)	62	25
G5 (96<FB_BW≤128)	76	38
G6 (FB_BW>128 with data width <192 bits)	76	38
G7 (FB_BW>128 with data width ≥192 bits)	90	48
<i>Notes:</i> 1. Categories are defined according to the frame buffer bandwidth in gigabytes per second (GB/s).		

Assessment and verification: The applicant shall declare Energy Star v6.1 compliance based on the stricter allowances and provide the supporting E_{TEC_MAX} calculation and performance data from the model's test report.

1(d) Internal Power Supplies

Internal power supplies in desktop and integrated desktop computers shall meet the requirements for the TEC_{PSU} allowances of Energy Star v6.1 and shall achieve minimum efficiencies as a proportion of the rated output current of 0.84 at 10%, 0.87 at 20%, 0.90 at 50% and 0.87 at 100%.

Assessment and verification: The applicant shall declare compliance of the model's internal power supply, supported by the products Energy Star v6.1 E_{TEC_MAX} calculation and either performance data from the model's test report or independent power supply performance certifications.

1(e) Enhanced-performance displays

Integrated desktop and notebook computers that have Enhanced Performance Displays, as defined by Energy Star v6.1, and thereby qualify for the $TEC_{INT_DISPLAY}$ allowance shall automatically adjust the picture brightness to the ambient light conditions. This Automatic Brightness Control (ABC) function shall be installed as a default setting and it shall be possible for the user to adjust and calibrate. The ABC default setting shall be validated according to the following test procedure:

$$\text{Test (i)} \quad \left(\frac{P_{50} - P_{10}}{P_{10}} \right) \geq 5\% \quad \text{Test (ii)} \quad \left(\frac{P_{100} - P_{50}}{P_{50}} \right) \geq 5\% \quad \text{Test (iii)} \quad P_{300} \geq P_{100}$$

Where P_n is the Power consumed for On Mode with ABC enabled at n lux with a direct light source.

Assessment and verification: The applicant shall submit a test report for the computer model showing compliance with the specified test procedure.

Criterion 2. Hazardous substances and mixtures in the product, sub-assemblies and component parts

The presence in the product, or defined sub-assemblies and component parts, of substances that are identified according to Article 59 (1) of Regulation (EC) No 1907/2006 ⁴ (the 'REACH Regulation') or substances and mixtures that meet the criteria for classification according to Regulation (EC) No 1272/2008 ⁵ (the 'CLP Regulation') for the hazards listed in Table 2, shall be restricted in accordance with sub-criterion 2(a), (b) and (c). For the purpose of this criterion Candidate List Substances of Very High Concern (SVHCs) and CLP hazard classifications are grouped in Table 2 according to their hazardous properties.

Table 2. Grouping of Candidate List SVHCs and CLP hazards

Group 1 hazards <i>Hazards that identify a substance or mixture as being within Group 1:</i> - Substances that appear on the Candidate List for Substances of Very High Concern (SVHC) - Carcinogenic, Mutagenic and/or Toxic for Reproduction (CMR) Category 1A or 1B CMR: H340, H350, H350i, H360, H360F, H360D, H360FD, H360Fd, H360Df
Group 2 hazards <i>Hazards that identify a substance or mixture as being within Group 2:</i> - Category 2 CMR: H341, H351, H361f, H361d, H361fd , H362 - Category 1 aquatic toxicity: H400, H410 - Category 1 and 2 acute toxicity: H300, H310, H330 - Category 1 aspiration toxicity: H304 - Category 1 Specific Target Organ Toxicity (STOT): H370, H372
Group 3 hazards <i>Hazards that identify a substance or mixture as being within Group 3:</i> - Category 2, 3 and 4 aquatic toxicity: H411, H412, H413 - Category 3 acute toxicity: H301, H311, H331, EUH070 - Category 2 STOT: H371, H373

⁴ Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (OJ L 396, 30.12.2006, p.1).

⁵ Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (OJ L 353, 31.12.2008, p. 1).

2(a) Restriction of Substances of Very High Concern (SVHCs)

The product shall not contain substances that have been identified according to the procedure described in Article 59 (1) of the 'REACH Regulation' and are included in the Candidate List of SVHCs at concentrations of greater than 0.10% (weight by weight). The same restriction shall apply to the sub-assemblies and component parts forming part of the product that are listed in Table 3.

No derogation from this requirement shall be given to Candidate List SVHCs present in the product or in the listed sub-assemblies or component parts at concentrations greater than 0.10 % (weight by weight).

Table 3. Sub-assemblies and component parts to which Criterion 2(a) shall apply

- | |
|--|
| <ul style="list-style-type: none"> - Populated motherboard (including CPU, RAM, graphics units) - Data storage devices (HDD and SSD) - Optical Drive (CD and DVD) - Display unit (including backlighting) - Chassis and fixings - Casings and bezels - External keyboard, mouse and/or trackpad - Internal and external Power Supply Units - External AC and DC power cords - Rechargeable batteries packs |
|--|

In communicating this requirement to suppliers of the listed sub-assemblies and component parts, applicants may pre-screen the REACH Candidate List using the IEC 62474 declarable substance list ⁶. The screening shall be based on identification of the potential for presence of substances in the product.

Assessment and verification: The applicant shall compile declarations of the non-presence of SVHCs at or above the specified concentration limit for the product and the sub-assemblies and component parts identified in Table 3. Declarations shall be with reference to the latest version of the Candidate List published by ECHA ⁷. Where declarations are made based on a pre-screening of the Candidate List using IEC 62474 the screened list given to sub-assembly and component suppliers shall also be provided by the applicant. The version of the IEC 62474 declarable substance list used shall reflect the latest version of the Candidate List.

2(b) Restrictions on the presence of specific hazardous substances

⁶ International Electrotechnical Commission (IEC), IEC 62474: Material declaration for products of and for the electrotechnical industry, <http://std.iec.ch/iec62474>

⁷ ECHA, Candidate List of substances of very high concern for Authorisation, <http://www.echa.europa.eu/candidate-list-table>

The sub-assemblies and component parts identified in Table 4 shall not contain the specified hazardous substances at or above the stipulated concentration limits.

Table 4. Substance restrictions that shall apply to sub-assemblies and component parts

Substance group or material	Scope of restriction	Concentration limits (where applicable)	Assessment and verification
i) Metal solder and contacts	Exemption 7b in accordance with Directive 2011/65/EU ⁸ relating to the use of lead solder in <i>small-scale servers</i> shall not be permitted.	0.1% w/w	Declaration to be provided by the manufacturer or final assembler supported by a valid test report. <i>Test method:</i> IEC 62321-5
	Exemption 8b in accordance with Directive 2011/65/EU ⁸ relating to the use of <i>cadmium in electrical contacts</i> shall not be permitted.	0.01% w/w	
ii) Polymer stabilisers, colourants and contaminants	The following organotin stabiliser compounds classified with Group 1 and 2 hazards shall not be present in <i>external AC and DC power cords and power packs</i> : - Dibutyltin oxide - Dibutyltin diacetate - Dibutyltin dilaurate - Dibutyltin maleate - Dioctyl tin oxide - Dioctyl tin dilaurate	n/a	Declaration to be provided by the sub-assembly supplier.
	<i>Plastic casings and bezels</i> shall not contain the following colourants: - Azo dyes that may cleave to the carcinogenic aryl amines listed in Appendix 8 of the REACH Regulation, and/or - Colourant compounds included in the IEC 62474 declarable substances list.	n/a	Declaration to be provided by the sub-assembly supplier.
	Polycyclic Aromatic Hydrocarbons (PAHs) classified with Group 1 and 2 hazards shall not be present at concentrations greater than or equal to individual and sum total concentration limits in any external plastic or man-made rubber surfaces of: - Notebooks and tablets; - Peripheral keyboards, - Mice,	The individual concentration limits for PAHs restricted under REACH shall be 1 mg/kg The sum total concentration of the 18 listed PAHs shall not be	Test report to be provided by the applicant for relevant parts of the identified parts of the product. <i>Test method:</i> AfPS GS 2014:01 PAK.

⁸ Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast) (OJ L 174, 1.7.2011, p.88)

	- Stylus and/or trackpads; - External power cables. The presence and concentration of the following PAHs shall be verified: <i>PAH's restricted by the REACH Regulation:</i> - Benzo[a]pyrene, - Benzo[e]pyrene, - Benzo[a]anthracene, - Chrysen, - Benzo[b]fluoranthene, - Benzo[j]fluoranthene, - Benzo[k]fluoranthene - Dibenzo[a,h]anthracene, <i>Additional PAH's subject to restriction:</i> - Acenaphthene - Acenaphthylene - Anthracene - Benzo[ghi]perylene - Fluoranthene - Fluorene - Indeno[1,2,3-cd]pyrene - Naphthalene - Phenanthrene - Pyrene	greater than 10 mg/kg	
iii) Biocidal products	Biocidal products intended to provide an anti-bacterial function shall not be incorporated into plastic or rubber parts of keyboards and peripherals.	n/a	Declaration to be provided by the sub-assembly supplier.
iv) Mercury in backlights	Exemption 3 in accordance with Directive 2011/65/EU ⁸ relating to the use of mercury in <i>cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL)</i> shall not be permitted.	n/a	Declaration to be provided by the sub-assembly supplier.
v) Glass fining agents	Arsenic and its compounds shall not be used in the manufacturing of LCD display unit glass, screen cover glass and glass used in track pad surfaces.	0.0050% w/w	Declaration to be provided by the screen glass supplier(s) supported by an analytical testing report.

Assessment and verification: The applicant shall provide declarations of compliance and test reports according to the requirements in Table 4. Test reports, where required, shall be valid at the time of application for the relevant production model and all associated suppliers.

Where sub-assemblies or component parts with the same technical specification originate from a number of different suppliers tests, where applicable, shall be carried out on parts from each supplier.

2(c) Restrictions based on CLP hazard classifications

Flame retardants, plasticisers, steel additives and coatings, cathode materials, solvents and salts that meet the criteria for classification with the CLP hazards in Table 2 shall not be present in the sub-assemblies and component parts in Table 5 at or above a concentration limit of 0.10% (weight by weight).

Table 5. Sub-assemblies and component parts to which Criterion 2(c) shall apply

<i>Parts containing flame retardants</i>
- Main Printed Circuit Boards (PCBs)
- Central Processing Units (CPUs)
- Connectors and sockets
- Data storage devices (HDD and SSD)
- Plastic casings and bezels
- Internal and external Power Supply Units
- External AC and DC power cords
<i>Parts containing plasticisers</i>
- Internal cables and cords
- External AC and DC power cords
- External Power Supply Units
- Plastic casings and bezels
<i>Parts with stainless steel alloys and/or nickel coatings</i>
- Chassis, casings, bolts, nuts, screws and brackets
<i>Rechargeable battery packs</i>
- Rechargeable battery cells

(i) Derogations for the use of hazardous flame retardants and plasticisers

The use of flame retardants and plasticisers meeting the criteria for classification with CLP hazards listed in Table 2 are derogated from the requirements of criterion 2(c) provided that they meet the conditions specified in Table 6. Inherently flame retardant external AC and DC power cord materials shall also meet the conditions in Table 6(ii)(b).

Table 6. Derogations conditions that shall apply to the use of flame retardants and plasticisers

<i>Substances and mixtures</i>	<i>Sub-assembly or component part</i>	<i>Scope of derogation</i>	<i>Assessment and verification</i>
Flame retardants	i) Main Printed Circuit Board	The use of flame retardants in motherboard laminates is derogated under either of the following conditions: (a) The flame retardant is classified with a Group 3 hazard. Where a claim is	Declaration to be provided by the sub-assembly supplier supported by documentation to verify

		made in conformance with IEC 61249-2-21⁹ a fire test of the PCB simulating improper WEEE disposal shall show carcinogenic polycyclic aromatic hydrocarbon (PAHs) emissions to be ≤ 0.1 mg TEQ /g. (b) The flame retardant is reacted into the polymer resin and a fire test of the PCB simulating improper WEEE disposal shall show polybrominated dibenzo-p-dioxin and polybrominated dibenzofuran (PBDD/DF) emissions to be ≤ 0.4 ng TEQ/g and carcinogenic PAHs emissions to be ≤ 0.1 mg TEQ/g.	hazard classifications. <i>and where required:</i> A third party test report for the combination of board material, components and flame retardant. <i>Test method:</i> ISO 5660 in oxidative pyrolysis conditions (IEC 60695-7-1 fire type 1b with a heat flux of 50 kW/m²). Quantification shall be made according to EN 1948 (PBDD/DF) and/or ISO 11338 (PAHs).
	ii) External AC and DC power cords.	The use of flame retardants and their synergists is derogated under either of the following conditions: (a) The flame retardant and its synergist are classified with a Group 3 hazard. Where a claim is made in conformance with IEC 62821¹⁰ a fire test of the power cord polymer shall show halogen acid gas emissions of less than 5.0 mg/g. (b) Fire test results for the power cord simulating improper WEEE disposal shall show polychlorinated dibenzo-p-dioxin and polychlorinated dibenzofuran (PCDD/DF) emissions to be ≤ 0.3 ng TEQ/g Power cords insulated with inherently flame retardant materials shall be subject to the part ii)(b) fire testing requirement.	Declaration to be provided by the sub-assembly supplier supported by documentation to verify hazard classifications. <i>and where required:</i> A third party test report for the power cord. <i>Test method:</i> IEC 60754-1 or ISO 19700 in under-ventilated conditions (IEC 60695-7-1 fire type 3a with a heat flux of 50 kW/m²) PCDD/DF quantification shall be made according to EN 1948.
	iii) External plastic casings and bezels.	Flame retardants and their synergists classified with Group 2 and 3 hazards are derogated for use.	Declaration to be provided by the sub-assembly supplier supported by documentation to verify hazard classifications.
	iv) Miscellaneous	Flame retardants classified with Group 3	Declaration to be provided by the sub-

⁹ According to IEC 61249-2-21 claims can be made for the 'halogen free' composition of a printed circuit board material

¹⁰ According to IEC 62821 claims can be made for 'halogen free low smoke' cables

	subassemblies and parts: - CPU assembly - Data storage drives - Internal connectors and sockets - Power supply units.	hazards are derogated for use.	assembly supplier supported by documentation to verify hazard classifications.
Plasticisers	i) External power cords and power packs, external casings and internal cables	Plasticisers classified with Group 3 hazards are derogated for use.	Declaration to be provided by the sub-assembly supplier supported by documentation to verify hazard classifications.

(ii) Derogations for the use of additives, coatings, cathode materials, solvents and salts

The use of metal additives and coatings, battery cathode materials, and battery solvents and salts meeting the criteria for classification with the CLP hazards listed in Table 2 are derogated from the requirements of criterion 2(c) provided that they meet the conditions specified in Table 7.

Table 7. Components and subassemblies that are specifically derogated

Substances and mixtures	Sub-assembly or component part	Scope of the derogation	Assessment and verification
Metal additives and coatings	i) Metal components	Stainless steel alloys and scratch resistant coatings containing nickel metal classified with H351, H372 and H412. <i>Derogation condition:</i> The release rate of metallic nickel from scratch resistance coatings on parts of a casing where they may in direct and prolonged contact with skin shall not exceed 0.5 µg/cm²/week.	Identification of relevant parts by weight and location in the product. Where external casing parts come into direct and prolonged skin contact a test report shall be provided. <i>Test method:</i> EN 1811
Battery cell cathode materials	ii) Lithium ion and polymer batteries	Cell cathode materials classified with group 2 and 3 hazards. These shall include: - Lithium cobalt oxide - Lithium manganese dioxide - Lithium iron phosphate - Lithium cobalt nickel manganese oxide	Declaration to be provided by the battery or cell supplier supported by documentation to verify hazard classifications.
Battery electrolyte solvents and salts		Electrolyte solvents and salts classified with group 2 and 3 hazards. These shall include: - Propylene carbonate - Ethylene carbonate - Diethyl carbonate	

		- Di-Methyl Carbonate - Ethyl methyl carbonate - Lithium Hexafluorophosphate	
--	--	--	--

Assessment and verification: The applicant shall provide a declaration of compliance with criterion 2(c). The declaration shall be supported by information about the flame retardants, plasticisers, steel additives and coatings, cathode materials, solvents and salts used in the sub-assemblies and component parts listed in Table 5 together with declarations of their hazard classification or non-classification.

The following information shall be provided to support declarations of the hazard classification or non-classification for each substance or mixture:

- The CAS, EC or list number (where available for mixtures);
- The physical form and state in which a substance is used;
- Harmonised CLP hazard classifications for substances;
- Self-classification entries in ECHA's REACH registered substance database ¹¹ (if no harmonised classification is available);
- Mixture classifications according to the criteria laid down in the CLP Regulation.

When considering self-classification entries in the REACH registered substance database, priority shall be given to entries from joint submissions.

Where a classification is recorded as 'data lacking' or 'inconclusive' according to the REACH registered substance database, or where a substance has not yet been registered under the REACH system, toxicological data meeting the requirements in Annex VII to the REACH Regulation shall be provided that is sufficient to support conclusive self-classifications in accordance with Annex I of the CLP Regulation and ECHA's supporting guidance. In the case of 'data lacking' or 'inconclusive' database entries, self-classifications shall be verified, with the following information sources being accepted:

- Toxicological studies and hazard assessments by ECHA peer regulatory agencies ¹², Member State regulatory bodies or Intergovernmental bodies;
- A Safety Data Sheet fully completed in accordance with Annex II to the REACH Regulation;
- A documented expert judgement provided by a professional toxicologist. This shall be based on a review of scientific literature and existing testing data, where necessary supported by results from new testing carried out by independent laboratories using methods recognised by ECHA;
- An attestation, where appropriate based on expert judgement, issued by an accredited conformity assessment body that carries out hazard assessments according to the GHS or CLP hazard classification systems.

Information on the hazardous properties of substances or mixtures may, in accordance with Annex XI to the REACH Regulation, be generated by means other than tests, for instance through the use of alternative methods such as in vitro methods, by quantitative structure activity models or by the use of grouping or read-across.

¹¹ ECHA, *REACH registered substances database*, <http://www.echa.europa.eu/information-on-chemicals/registered-substances>

¹² ECHA, *Co-operation with peer regulatory agencies*, <http://echa.europa.eu/en/about-us/partners-and-networks/international-cooperation/cooperation-with-peer-regulatory-agencies>

For the derogated substances and mixtures listed in Tables 6 and 7, the applicant shall provide proof that all the derogation conditions are met. Where test reports are required, they shall be valid at the time of application for a production model.

Criterion 3. Product lifetime extension

3(a) Durability testing of portable computers

(i) Tests that shall apply to notebook computers

The notebook computer model shall pass durability tests. Each model shall be verified to function as specified and meet the stipulated performance requirements after performing the mandatory tests in Table 8 and a minimum of one additional test selected from Table 9.

Table 8. Mandatory durability test specification for notebook computers

Test	Test conditions and functional performance requirements	Test method
Resistance to shock	<i>Specification:</i> A minimum of a 40G peak half-sine wave pulse shall be applied three times for a duration of a minimum of 6 ms to the top, bottom, right, left, front and rear side of the product. <i>Functional requirement:</i> The notebook shall be switched on and running a software application during the test. It shall continue to function following the test.	IEC 60068 Part 2-27: Ea Part 2-47
Resistance to vibration	<i>Specification:</i> Randomised sinusoidal vibrations in the frequency range 5Hz up to a maximum of 250Hz shall be applied for a minimum of 1 sweep cycle to the end of each axis of the top, bottom, right, left, front and back side of the product. <i>Functional requirement:</i> The notebook shall be switched on and running a software application during the test. It shall continue to function following the test.	IEC 60068 Part 2-6: Fc Part 2-47
Accidental drop	<i>Specification:</i> The notebook shall be dropped from a height of 76 cm onto a non-yielding surface covered with a minimum of 30mm of wood. One drop shall be made on the top, bottom, right, left, front and rear side, as well as each bottom corner. <i>Functional requirement:</i> The notebook shall be switched off during the test and shall successfully boot up following each drop. The casing shall remain integral and the screen undamaged following each test.	IEC 60068 Part 2-31: Ec (Freefall, procedure 1)

Table 9. Additional durability test specifications for notebook computers

Test	Test conditions and performance benchmarks	Test method
Temperature stress	<i>Specification:</i> The notebook shall be subjected to a minimum of four 24 hour exposure cycles in a test chamber. The notebook shall be switched on during a cold cycle at -25°C and a dry heat cycle at +40°C. The notebook shall be switched off during a cold cycle at -50°C and dry heat cycling between +35 and +60°C. <i>Functional requirement:</i> The notebook shall be checked that it functions following each of the four exposure cycles.	IEC 60068 Part 2-1: Ab/e Part 2-2: B
Screen resilience	<i>Specification:</i> Two loading tests shall be carried out. A minimum load of 50kg shall be uniformly applied to the screen. A minimum load of 25kg shall be applied to the centre of the screen. The notebook shall be placed on a flat surface during each test. <i>Functional requirement:</i> The screen surface and pixels shall be inspected for the absence of lines, spots and cracks after application of each loading.	The test equipment and setup used shall be confirmed by the applicant.
Water spill ingress	<i>Specification:</i> The test shall be carried out two times. A minimum of 30 ml of liquid shall be poured evenly over the keyboard of the notebook or onto three specific, separated locations, then actively drained away after a maximum of 5 seconds, and the computer then tested for functionality after 3 minutes. The test shall be carried for a hot and a cold liquid. <i>Functional requirement:</i> The notebook shall remain switched on during and after the test. The notebook shall then be dismantled and visually inspected so as to ensure it passes the IEC 60529 acceptance conditions for water ingress.	Acceptance conditions: IEC 60529 (water ingress)
Keyboard lifespan	<i>Specification:</i> 10 million random keystrokes shall be applied to the keyboard. The number of keystrokes per key shall be weighted to reflect the most commonly used keys. <i>Functional requirement:</i> The keys shall then be inspected for their integrity and functionality.	The test equipment and setup used shall be confirmed by the applicant.

Screen hinge lifespan	<i>Specification:</i> The screen shall be fully opened and then closed 20,000 times. <i>Functional requirement:</i> The screen shall then be inspected for any loss of stability and hinge integrity.	The test equipment and setup used shall be confirmed by the applicant.
-----------------------	---	--

(ii) Tests that shall apply to tablet and two-in-one computers

The tablet computer model or the tablet component of a two-in-one computer model shall pass durability tests. Each model shall be verified to function as specified and meet the stipulated performance requirements for each test as specified in Table 10.

Table 10. Mandatory durability test specification for tablet and two-in-one notebook computers

Test	Test conditions and functional performance requirements	Test method
Accidental drop	<i>Specification:</i> The tablet shall be dropped from a height of 76 cm onto non-yielding surface covered with a minimum of 30mm of wood. One drop shall be made on the top, bottom, right, left, front and rear side, as well as each bottom corner. <i>Functional requirement:</i> The tablet shall be switched off during the test and shall successfully boot up following each drop. The casing shall remain integral and the screen undamaged following each test.	IEC 60068 Part 2-31: Ec (Freefall, procedure 1)
Screen resilience	<i>Specification:</i> Two loading tests shall be carried out. A minimum load of 50kg shall be uniformly applied to the screen. A minimum load of 25kg shall be applied to the centre of the screen. The tablet shall be placed on a flat surface during each test. <i>Functional requirement:</i> The screen surface and pixels shall be inspected for the absence of lines, spots and cracks after application of each loading.	The test equipment and setup used shall be confirmed by the applicant.

Assessment and verification: The applicant shall provide test reports showing that the model has been tested and has met the functional performance requirements for durability. Testing shall be verified by a third party. Existing tests for the same model, carried out to the same or a stricter specification, shall be accepted without the need to retest.

3(b) Rechargeable battery quality and lifetime

- (i) Minimum battery life: Notebooks, tablets and two-in-one computers shall provide the user with a minimum of 7 hours of rechargeable battery life after the first full charge.

For notebooks this shall be benchmarked using either:

- For home and consumer products the Futuremark PCMark 'Home' scenario.
- For business or enterprise products the BAPCo Mobilemark 'Office productivity' scenario. For models which qualify for Energy Star TEC_{graphics} allowances, the 'Media creation & consumption' scenario shall be used instead.

- (ii) Charging cycle performance: Notebook, tablet and two-in-one computer rechargeable batteries shall meet the following performance requirements, which are dependent on whether the rechargeable battery can be changed without tools (as specified in criterion 3(d)):

- Models in which rechargeable batteries can be changed without tools shall maintain 80% of their declared minimum initial capacity after 750 charging cycles;
- Models in which rechargeable batteries cannot be changed without tools shall maintain 80% of their declared minimum initial capacity after 1000 charging cycles.

This performance shall be verified for rechargeable battery packs or their individual cells according to the IEC EN 61960 'endurance in cycles' test, to be carried out at 25°C and at a rate of either 0.2 I_t A or 0.5 I_t A (accelerated test procedure). Partial charging may be used to comply with this requirement (as specified in sub-criterion 3(b)(iii)).

- (iii) Partial charging option for achieving charging cycle performance: The performance requirements described in sub-criterion 3(b)(ii) may be achieved using factory installed software and firmware which partially charges the battery up to 80% of its capacity. In this case partial charging shall be set as the default charging routine and the battery performance shall then be verified at up to 80% charging according to the requirements in sub-criterion 3(b)(ii). The maximum partial charge shall provide a battery life that complies with sub-criterion 3(b)(i).

- (iv) Minimum guarantee: The applicant shall provide a minimum two year commercial guarantee for defective batteries¹³.

- (v) User information: Information about known factors influencing the lifetime of rechargeable batteries, as well as instructions on how the user can prolong battery life, shall be included in factory installed energy management software, written user instructions and posted on the manufacturer's website.

Assessment and verification: The applicant shall provide a third party test report showing that the rechargeable battery pack or cell types making up the pack used in the product meet the specified rechargeable battery life and charging cycle capacity. Partial charging and the accelerated test method specified by IEC EN 61960 may be used to demonstrate compliance. The applicant shall also provide a demonstration version of the energy management software and the text content of user instructions and website postings.

3(c) Data storage drive reliability and protection

- (i) Desktop computers, workstations, thin clients and small-scale servers

¹³ Defects shall be considered to include failure to charge and to detect the battery's connection. A progressive reduction in the battery's capacity due to usage shall not be considered to be a defect unless it is covered by a specific warranty provision.

The data storage drive or drives used in desktops, workstations and thin clients marketed for business use shall have a projected Annualised Failure Rate (AFR) ¹⁴ of less than 0.25%.

Small-scale servers shall have a projected AFR of less than 0.44% and a Bit Error Rate for non-recoverable data of less than 1 in 10¹⁶ bits.

(ii) Notebook computers

The primary data storage drive used in notebooks shall be specified to protect both the drive and data from shock and vibration. The drive shall comply with one of the following options:

- The Hard Disk Drive (HDD) shall be designed to withstand a half sine wave shock of 400 G (operating) and 900 G (non-operating) for 2 ms without damage to data or operation of the drive.
- The HDD head should retract from the disc surface in less than or equal to 300 milliseconds upon detection of the notebook having been dropped.
- A solid state storage drive technology such as SSD (Solid State Drive) or eMMC (embedded Multi Media Card) is used.

Assessment and verification: The applicant shall provide a specification for the drive or drives integrated into the product. This shall be obtained from the drive manufacturer and for shock resistance and drive head retraction shall be supported by an independently certified technical report verifying that the drive complies with the specified performance requirements.

3(d) Upgradeability and Repairability

For the purpose of upgrading older components or undertaking repairs and replacements of worn out components or parts, the following criteria shall be fulfilled:

(i) Design for upgrade and repair: The following components of computers shall be easily accessible and exchangeable by the use of universal tools (i.e. widely used commercially available tools such as a screwdriver, spatula, plier, or tweezers):

- Data storage (HDD, SSD or eMMC),
- Memory (RAM),
- Screen assembly and LCD backlight units (where integrated),
- Keyboard and track pad (where used)
- Cooling fan assemblies (in desktops, workstations and small-scale servers)

(ii) Rechargeable battery replacement: The rechargeable battery pack shall be easy to extract by one person (either a non-professional user or a professional repair service provider) according to the steps defined below ¹⁵. Rechargeable batteries shall not be glued or soldered into a product and there shall be no metal tapes, adhesive strips or cables that prevent access in order to extract the battery. In addition, the following requirements and definitions of the ease of extraction shall apply:

- For notebooks and portable all-in-one computers it shall be possible to extract the rechargeable battery manually without tools;

¹⁴ The AFR shall be calculated based on the Mean Time Between Failure (MTBF). The MTBF shall be determined based on Bellcore TR-NWT-000332, issue 6, 12/97 or field collected data.

¹⁵ A step consists of an operation that finishes with the removal of a component or part, and/or with a change of tool.

- For sub-notebooks it shall be possible to extract the rechargeable battery in a maximum of three steps using a screwdriver;
- For tablets and two-in-one notebooks it shall be possible to extract the rechargeable battery in a maximum of four steps using a screwdriver and spudger.

Simple instructions on how the rechargeable battery packs are to be removed shall be provided in a repair manual or via the manufacturer's website.

- (iii) Repair manual: The applicant shall provide clear disassembly and repair instructions (e.g. hard or electronic copy, video) to enable a non-destructive disassembly of products for the purpose of replacing key components or parts for upgrades or repairs. This shall be made publicly available or by entering the product's unique serial number on a webpage. Additionally, a diagram shall be provided on the inside of the casing of stationary computers showing the location of the components listed in point (i) and how they can be accessed and exchanged. For portable computers a diagram showing the location of the battery, data storage drives and memory shall be made available in pre-installed user instructions and via the manufacturers website for a period of at least five years.
- (iv) Repair Service / Information: Information should be included in the user instructions or on the manufacturer's website to let the user know where to go to obtain professional repairs and servicing of the computer, including contact details. During the guarantee period referred to in (vi) this may be limited to the applicant's Authorised Service Providers.
- (v) Availability of spare parts: The applicant shall ensure that original or backwardly compatible spare parts, including rechargeable batteries (*if applicable*), are publicly available for at least five years following the end of production for the model.
- (vi) Commercial Guarantee: The applicant shall provide at no additional cost a minimum of a three year guarantee effective from purchase of the product. This guarantee shall include a service agreement with a pick-up and return or on-site repair option for the consumer. This guarantee shall be provided without prejudice to the legal obligations of the manufacturer and seller under national law.

Assessment and verification: The applicant shall declare the compliance of the product with these requirements to the competent body. Additionally, the applicant shall provide:

- A copy of the user instructions
- A copy of the repair manual and supporting diagrams
- A description supported by photographs showing compliance for battery extraction
- A copy of the guarantee and service agreement
- Pictures of any diagrams, markings and instructions on the computer casing

Criterion 4. Design, material selection and end-of-life management

4(a). Material selection and recyclability

Applicants shall comply with, as a minimum, criterion part (i) together with either part (ii) or part (iii). *Tablets, subnotebooks, two-in-one notebooks and products with metal casings and enclosures are exempt from sub-criteria (ii) and (iii).*

- (i) Material information to facilitate recycling: Plastic parts with a weight greater than 25 grams for tablet computers and 100 grams for all other computers shall be marked in accordance with ISO 11469 and ISO 1043, sections 1-4. The markings shall be large enough

and located in a visible position in order to be easily identified. Exemptions are made in the following cases:

- *Printed circuit boards, Polymethyl Methacrylate Board (PMMA) and display optical plastics forming part of display units;*
- *Where the marking would impact on the performance or functionality of the plastic part;*
- *Where the marking is technically not possible due to the production method;*
- *Where the marking causes higher defect rates under quality inspection, leading to an avoidable wastage of materials;*
- *Where parts cannot be marked because there is not enough appropriate surface area available for the marking to be of a legible size to be identified by a recycling operator.*

(ii) Improving the recyclability of plastic casings, enclosures and bezels:

Parts shall not contain molded-in or glued-on metal inserts unless they can be removed with commonly available tools. Disassembly instructions shall show how to remove them (see sub-criterion 3(d)).

For parts with a weight greater than 25 grams for tablet computers and 100 grams for all other computers, the following treatments and additives shall not result in recycled resin with a >25% reduction in the notched izod impact when tested according to ISO 180:

- Paints and coatings
- Flame retardants and their synergists

Existing test results for recycled resin shall be accepted provided that the recycled resin is derived from the same input material that the plastic parts of the product are composed of.

(iii) Minimum recycled plastic content: The product shall contain on average a minimum 10% content of post-consumer recycled plastic measured as a percentage of the total plastic (by weight) in the product excluding Printed Circuit Boards and display optical plastics. Where the recycled content is greater than 25% a declaration may be made in the text box accompanying the Ecolabel (see criterion 6(b)).

Assessment and verification:

The applicant shall verify recyclability by providing valid mechanical/physical test reports according to ISO 180 and disassembly instructions. Valid test reports obtained from plastics recyclers, resin manufacturers or independent pilot tests shall be accepted.

The applicant shall provide the Competent Body with an exploded diagram of the computer or a parts listing in written or audio-visual format. This shall identify the plastic parts by their weight, their polymer composition, and their ISO 11469 and ISO 1043 markings. The dimension and position of the marking shall be visually illustrated and, where exemptions apply, technical justifications shall be provided.

The applicant shall provide third party verification and traceability back to plastic component suppliers for post-consumer recycled content claims. Average content claims may be calculated on a periodic or annual basis for the model.

Criterion 4(b) Design for disassembly and recycling

For recycling purposes computers shall be designed so that target components and parts can be easily extracted from the product. A disassembly test shall be carried out according to the test procedure in Appendix 1. The test shall record the number of steps required and the associated tools and actions required to extract the target components and parts identified under points (i) and (ii).

- (i) The following target components and parts, as applicable to the product, shall be extracted during the disassembly test:

All products

- Printed Circuit Boards $>10 \text{ cm}^2$ relating to computing functions

Stationary computers

- Internal Power Supply Unit
- HDD drive(s)

Portable computers

- Rechargeable battery

Displays (where integrated into the product enclosure)

- Printed Circuit Boards $>10 \text{ cm}^2$
- Thin Film Transistor unit and film conductors in display units $>100 \text{ cm}^2$
- LED backlight units

- (ii) At least *two* of the following target components and parts, selected as applicable to the product, shall also be extracted during the test, following-on in the test from those in point (i):

- HDD drive (portable products)
- Optical drives (where included)
- Printed circuit boards $\leq 10 \text{ cm}^2$ and $> 5 \text{ cm}^2$
- Speaker units (notebooks, integrated desktops and portable all-in-one computers)
- Polymethyl Methacrylate (PMMA) film light guide (where the screen size is $>100 \text{ cm}^2$)

Assessment and verification:

The applicant shall provide a 'disassembly test report' to the competent body detailing the adopted disassembly sequence, including a detailed description of the specific steps and procedures, for the target parts and components listed under points (i) and (ii).

The disassembly test may be carried out by:

- The applicant, or a nominated supplier, in their own laboratory, or;
- An independent third party testing body, or;

- A recycling firm that is a permitted electrical waste treatment operation in accordance with Article 23 of Directive 2008/98/EC¹⁶ or is certified under national regulations.

Criterion 5. Corporate Social Responsibility

5(a) Sourcing of 'conflict-free' minerals

The applicant shall support the responsible sourcing of tin, tantalum, tungsten and their ores and gold from conflict-affected and high-risk areas by:

- (i) Conducting due diligence in line with the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas, and
- (ii) Promoting responsible mineral production and trade within conflict-affected and high-risk areas for the identified minerals as used in components of the product and in accordance with OECD guidance.

Assessment and verification: The applicant shall provide a declaration of compliance with these requirements together with the following supporting information:

- A report describing their due diligence activities along the supply chain for the four minerals identified. Supporting documents such as certifications of conformity issued by the European Union's scheme shall also be accepted.
- Identification of component(s) which contain the identified minerals, and their supplier(s), as well as the supply chain system or project used for responsible sourcing.

5(b) Labour conditions and human rights during manufacturing

Having regard to the International Labour Organisation's (ILO) Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy, the UN Global Compact (Pillar 2), the UN Guiding Principles on Business and Human Rights and the OECD Guidelines for Multi-National Enterprises, the applicant shall obtain third party verification supported by site audits that the applicable principles included in the ILO fundamental conventions and the supplementary provisions identified below have been respected at the final assembly plant for the product.

Fundamental conventions of the ILO:

- (i) **Child Labour:**
 - Minimum Age Convention, 1973 (No. 138)
 - Worst Forms of Child Labour Convention, 1999 (No. 182)
- (ii) **Forced and Compulsory Labour:**
 - Forced Labour Convention, 1930 (No. 29) and 2014 Protocol to the Forced labour Convention
 - Abolition of Forced Labour Convention, 1957 (No. 105)

¹⁶ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (OJ L 312, 22.11.2008, p. 3–30)

(iii) Freedom of Association and Right to Collective Bargaining:

- Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)
- Right to Organise and Collective Bargaining Convention, 1949 (No. 98)

(iv) Discrimination:

- Equal Remuneration Convention, 1951 (No. 100)
- Discrimination (Employment and Occupation) Convention, 1958 (No. 111)

Supplementary provisions:

(v) Working Hours:

- ILO Hours of Work (Industry) Convention, 1919 (No. 1)

(vi) Remuneration:

- ILO Minimum Wage Fixing Convention, 1970 (No. 131)
- Living wage: The applicant shall ensure that wages paid for a normal work week shall always meet at least legal or industry minimum standards, are sufficient to meet the basic needs of personnel and provide some discretionary income. Implementation shall be audited with reference to the SA8000¹⁷ guidance on “Remuneration”;

(vii) Health & Safety

- ILO Occupational Safety and Health Convention, 1981 (No.155)
- ILO Safety in the use of chemicals at work Convention, 1990 (No.170)

In locations where the right to freedom of association and collective bargaining are restricted under law, the company shall recognise legitimate employee associations with whom it can enter into dialogue about workplace issues.

The audit process shall include consultation with external stakeholders in local areas around production sites, including trade unions, community organisations, NGOs and labour experts. The applicant shall publish aggregated results and key findings from the audits online in order to provide evidence of their supplier's performance to interested consumers.

Assessment and verification: the applicant shall show compliance with these requirements by providing copies of certificates of compliance and supporting audit reports for each final product assembly plant for the model(s) to be eco labelled, together with a web link to where online publication of the results and findings can be found.

Third party site audits shall be carried out by auditors qualified to assess the compliance of the electronics industry supply chain with social standards or codes of conduct or, in countries where ILO Labour Inspection Convention, 1947 (No 81) has been ratified and ILO supervision indicates that the national labour inspection system is effective and the scope of the inspection system covers the areas listed above¹⁸, by labour inspector(s) appointed by a public authority.

Valid certifications from third party schemes or inspection processes that, together or in part, audit compliance with the applicable principles of the listed fundamental ILO Conventions and the supplementary provisions on working hours, remuneration and health & safety, shall be accepted. These certifications shall be not more than 12 months old.

¹⁷ Social Accountability International, *Social Accountability 8000 International Standard*, <http://www.sa-intl.org>

¹⁸ See ILO NORMLEX (<http://www.ilo.org/dyn/normlex/en>) and supporting guidance in the User Manual

Criterion 6. User information**(a) User instructions**

The computer shall be sold with relevant user information that provides advice on the environmental performance of the product. The information shall be located in a single, easy-to-find place in the user instructions as well as on the manufacturer's website. The information shall include, as minimum:

- (i) Energy consumption: The TEC value in accordance with Energy Star v6.1, as well as the maximum power demand in each operating mode. In addition, instructions shall be provided on how to use the device's energy-saving mode and information that energy efficiency cuts energy consumption and thus saves money by reducing electricity bills.
- (ii) The following indications on how to reduce power consumption when the computer is not being used:
 - Putting the computer into off mode will reduce energy consumption but will still draw some power;
 - Reducing the brightness of the screen will reduce energy use;
 - Screen savers can stop computer displays from powering down into a lower power mode when not in use. Ensuring that screen savers are not activated on computer displays can therefore reduce energy use;
 - Charging tablet computers via a USB-interface from another desktop or notebook computer may increase the energy consumption in case of leaving the desktop or notebook computer in an energy-consuming idle-mode for the sole reason of charging the tablet computer.
- (iii) For notebooks, tablets and two-in-one computers information that extension of the computer's lifetime reduces the product's overall environmental impacts.
- (iv) The following indications on how to prolong the lifetime of the computer:
 - Information to let the user know the factors influencing the lifetime of rechargeable batteries as well as instructions for the user facilitating prolongation of their life (only applicable to mobile computers powered with rechargeable batteries).
 - Clear disassembly and repair instructions to enable a non-destructive disassembly of products for the purpose of replacing key components or parts for upgrades or repairs.
 - Information to let the user know where to go to obtain professional repairs and servicing of the computer, including contact details. Servicing should not be limited exclusively to the applicant's Authorised Service Providers.
- (v) End-of-life instructions for the proper disposal of computers, including separate instructions for the proper disposal of rechargeable batteries, at civic amenity sites or through retailer take-back schemes as applicable, which shall comply with Directive 2012/19/EU ¹⁹.
- (vi) Information that the product has been awarded the EU Ecolabel together with a brief explanation as to what this means together with an indication that more information on the EU Ecolabel can be found at the website address <http://www.ecolabel.eu>

¹⁹ Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE), (recast) (OJ L 197, 24.7.2012, p.38)

- (vii) Instruction and repair manual(s) shall be provided in a print version, and also online in electronic form for a period of at least five years.

Assessment and verification: The applicant shall declare the compliance of the product with these requirements to the competent body and shall provide a link to the online-version or a copy of the user instructions and repair manual.

6(b) Information appearing on the EU Ecolabel

The optional label with text box shall contain three out of the following texts:

- High energy efficiency
- Designed to have a longer lifetime (*applicable to notebooks, two-in-one notebooks and tablets only*)
- Restriction of hazardous substances
- Designed to be easy to repair, upgrade and recycle
- Audited factory working conditions

The following texts may be displayed if the plastic recycled content is greater than 25% as a percentage of the total plastic (by weight):

- *Contains xy% post-consumer recycled plastic*

The guidelines for the use of the optional label with text box can be found in the "Guidelines for the use of the EU Ecolabel logo" on the website:

http://ec.europa.eu/environment/ecolabel/documents/logo_guidelines.pdf

Assessment and verification: The applicant shall provide a sample of the product label or an artwork of the packaging where the EU Ecolabel is placed, together with a declaration of compliance with this criterion.

APPENDIX

Appendix 1. Protocol for a product disassembly test

(a) Terms and definitions

- (i) Target parts and components: Parts and/or components that are targeted for the extraction process.
- (ii) Disassembly step: An operation that finishes with the removal of a component or part and/or with a change of tool.

(b) Operating conditions for the test

- (i) Personnel: The test shall be carried out by one person.
- (ii) Test sample: The sample product to be used for the test shall be undamaged.
- (iii) Tools for extraction: The extraction operations shall be performed using manual or power-driven standard commercially available tools (i.e. pliers, screw-drivers, cutters and hammers as defined by ISO 5742, ISO 1174, ISO 15601).
- (iv) Extraction sequence: The extraction sequence shall be documented and, where the test is to be carried out by a third party, this information provided to those carrying out the extraction.

(c) Documentation and recording of the test conditions and steps

- (i) Documentation of steps: The individual steps in the extraction sequence shall be documented and the tools associated with each step shall be specified.
- (ii) Recording media: Photos shall be taken and a video recorded of the extraction of the components. The video and photos shall enable clear identification of the steps in the extraction sequence.