TÜVRheinland®	List of Criteria	Product Group Printing Modules with Toner
Test specification: 2 PfG S 0136/04.14	Keywords: (1) Emission tested (2) Tested for harmful substances	Creation date: 21.03.2013 Revision date: 24.03.2014
TÜV Rheinland LGA Products GmbH, Business Field Softlines	Created: Alexandra Kubina, Stefanie Hahn	Reviewed: Dr. C. Schelle TCC C 1.3, Technical Competence Center VOC Emission and Test Chamber Testing

1. Purpose

The present criteria catalogue for the product group “Printing Modules with Toner” for electrographic printing and copying systems includes the requirements for products regarding potential and relevant emission/contaminant loads. After successful testing and evaluation by TÜV Rheinland LGA Products GmbH, the products may be awarded with a test mark / certificate.

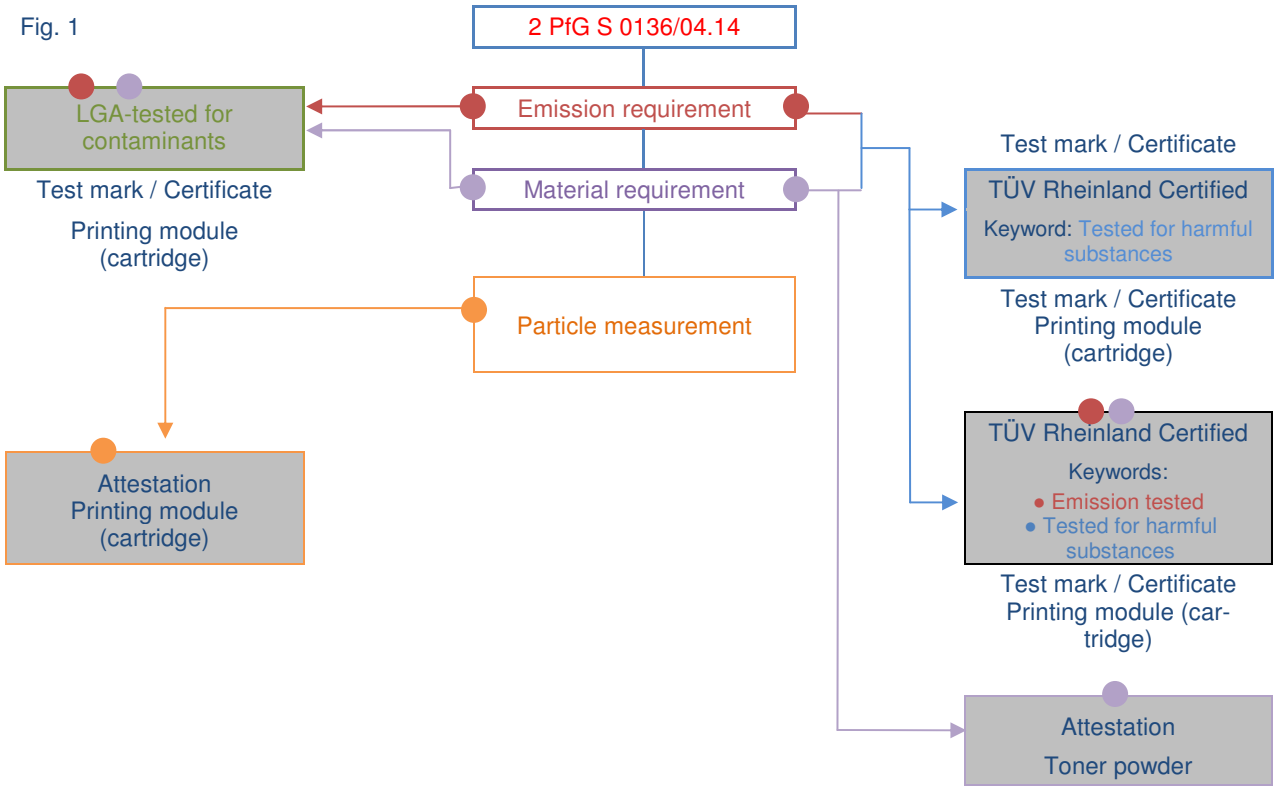
Based on the positive test and considering the Testing and Certification Regulations of TÜV Rheinland LGA Products GmbH (TRLP), either the certification mark “LGA-tested for contaminants” or, alternatively, the TÜV Rheinland Certified mark - keywords: “Tested for harmful substances” and optionally “Emission tested” can be awarded for the printing modules (including the toner powder contained in it). Within the scope of awarding the TÜV Rheinland certification according to the keyword “Tested for harmful substances” – if applicable – both the defined requirements of the emission parameters of the complete copying/printing system [toner cartridges in combination with a designated printer for the printing module] and the demands of the material parameters of the toner powder must be met. At the client’s request and when a complete examination is carried out, the keyword “Emission tested” can be additionally awarded next to the keyword “Tested for harmful substances”.

If the toner powder is solely subject to a material test, then an attestation can be issued when the specified requirements are complied with. There is also the possibility of issuing an attestation if the complete printing/copying system is subject to a particle measurement.

The definition of the test parameters was made considering the decisive state-of-the-art technology, existing legal requirements as well as the relevance of a contaminant load with reference to a potential exposure effect. The testing of a product refers exclusively to the designated test parameters, a comprehensive statement about the marketability as well as other relevant aspects on the safety of the product cannot be made.

The following flowchart shows the possibilities of a certificate and label award or a creation of an attestation taking into account the corresponding partial test sample aspects.

Fig. 1



2. Scope of Application

The following requirements apply to

- black and coloured toner powder [it is only possible to issue an attestation in accordance with the performed material tests], refer to Section A
- printing modules based on black and coloured toner powder [implementation of an emission test of the complete printing/copying system], refer to Section B

The current test specification 2 PfG_S_0136/04.14 supersedes the document 2 PfG_S_0105.

3. Basics

The requirements of this list of criteria and the implementing rules were set and defined in consideration of the indexed and literature accessible documents listed below.

The following test specification and implementing rules have been considered for the generation of the relevant criteria catalogue (applicable rules are marked):	
Act on the provision of products on the market (product safety law - ProdSG), ProdSG, date of issue: 08.11.2011; Product Safety Act of 8. November 2011 (Federal Law Gazette I page 2179; 2012 I p. 131).	☒
Food, Commodities and Feed Code (Food and Feed Code – LFGB) in the version published on 26.04.2006 (Federal Law Gazette. I p. 945), last amended by Article 12 of the law from 26.02.2008 (Federal Law Gazette I p. 215).	☒
Commodities Regulation in the version published on 23.12.1997 (Federal Law Gazette 1998 I p. 5), recently changed by Regulation from 23.09. 2009 (Federal Law Gazette I p. 3130).	☒
Chemical Prohibition Ordinance (ChemProhDecree) Regulation on bans and restrictions on the marketing of dangerous substances, preparations and products under the Chemical Act in the version promulgated on 13. June 2003, Federal Law Gazette I p. 867, last amended on 23.12.2004, Federal Law Gazette I p. 3855.	☒
Regulation (EC) No. 1907/2006 (REACH) OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL Annex XVII on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing an European Chemicals Agency, amending Directive 1999/45/EC and repealing Regulation (EEC) No. 793/93 of the Council, the Commission Regulation (EC) No. 1488/94, Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.	☒
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.	☒
Directive 2004/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21. April 2004 on the limitation of emissions of volatile organic solvents in certain paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC.	☒
Directive 98/8/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20. June 2002 concerning the placing of biocidal products on the market (Biocidals Act).	☒
DIRECTIVE 2002/61/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19. July 2002 amending for the nineteenth time Council Directive 76/769/EEC relating to restrictions on the marketing and use of certain dangerous substances and preparations (azocolourants).	☒
TVOC concept of the ad hoc working group of members of the Indoor Air Hygiene Commission (IRK) of the Federal Environment Agency and the highest health authorities of the countries (ad hoc working group IRK/AOLG).	☒
Guide values for indoor air of the ad hoc working group IRK/AOLG (RW I / RW II) taking into account the current release status.	☒

BGA News Service 19/77 of 12.10.1977. / Bundesgesundheitsbl. – Gesundheitsforsch. – Gesundheitsschutz Evaluation for formaldehyde in indoor air 7:2007.	☒
DIN ISO / IEC 28360 Information technology – Office equipment – Determination of chemical emission rates from electronic equipment (ISO/IEC 28360:2007+Cor. 1:2008).	☒
DIN EN 71-9: 2007-09 Safety of toys – Part 9: Organic chemical compounds – Requirements; German version EN 71-9:2005+A1:2007.	☒
DIN ISO 16000-3 Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air – Active sampling method (ISO 16000-3:2011).	☐
DIN ISO 16000-6 Indoor air - Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA® sorbent, thermal desorption and gas chromatography using MS or MS-FID (ISO 16000-6:2011).	☒
DIN ISO 16000-9 2008-04 Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method (ISO 16000-9:2006); German version EN ISO 16000-9:2006.	☒
DIN EN ISO 16000-11 2006-06 Indoor air – Part 11: Determination of the emission of volatile organic compounds from building products and furnishing – Sampling, storage of samples and preparation of test specimens.	☒
RAL-UZ 55 Reprocessed Printing Modules with Toner	☒
RAL-UZ 171 Basic Criteria for Award of the Environmental Label – Office Equipment with Printing Function (Printers, Copiers, Multi-Function Devices)	☒
RAL-UZ 177 Recycled Toner Modules for Electrophotographic Printers, Copiers and Multi-Function Devices	☒

4. Required Documents and Certificates/Declarations

In the scope of the certification process, the applicant / manufacturer has to provide complete information regarding all installed or used materials and components, including information of all sources of materials (supplier companies) of the used materials / components. A material list must be completed by the applicant / manufacturer in terms of materials / components used. Detailed information of the toner powder used must be provided.

Furthermore, the applicant / manufacturer confirms in a manufacturer's declaration that compounds listed under Point 6.5 have not been used as structural components in the toner powders.

In the case of used materials and components that are not covered by these test requirements, TÜV Rheinland reserves the right to carry out more appropriate material-typical examinations.

In the scope of the certification process of the printing module, the following documents have to be provided by the client / manufacturer corresponding to the “Check list” referring to the List of Criteria:

- Data referring to the client
- Safety data sheet [toner powder]
- Sampling protocol
  To be completed in the scope of test sample configuration.
- Manufacturer’s Declaration
- Tabulation of the printing modules / cartridge types which are expected to be filled with the toner to be certified and the appropriate printer specifying the page output.
- Photographs of the printing modules / cartridges to be certified
- Completed “Declaration” of the original sign (trade mark or name sign)
- Signed “Information sheet for using the LGA-tested for contaminants test mark”
- Signed Factory Inspection Questionnaire CIG 022 (Section B)
- Signed General Contract (for new certifications and change of company name)
- Factory inspection and signed factory inspection report CIG 023

In order to issue an attestation of compliance of the demanded material requirements of the toner powder, the following documents have to be provided:

- Data referring to the client
- Safety data sheet [toner powder]
- Sampling protocol
  To be completed in the scope of test sample configuration.
- Manufacturer’s declaration

5. Test Requirements and Guideline Limits

5.1. Section A – Material Testing

5.1.1. Black and Coloured Toner Powder

5.1.1.1. Volatile Organic Compounds using Thermal Extraction

Testing method	The toner sample is heated in the tube furnace (Gerstel Thermal Extractor TE-2) and the compounds emitting from the sample into the vapour phase are transported using a nitrogen feed gas flow to and trapped on a thermal desorption pipe that is filled with adsorption material (Tenax TA). Determination and quantification of the adsorbed compounds is done by using the thermal desorption GC/MS method. For colour toner sets, a test of the black toner by itself and a test of a mixed sample of three colours (cyan, magenta and yellow) must be carried out.
Analytical method	Based on DIN ISO 16000-6

Test parameters	**Requirements**
Total of volatile organic compounds in the retention range C_6 – C_{16} (TVOC) [1]	≤ 300 mg/kg [2]
Styrene	≤ 40 mg/kg [2]
Benzene	≤ 0.35 mg/kg
Volatile CMR compounds [3] of Category 1A and 1B and 1 and 2 and Pregnancy Group A and B, respectively	each ≤ 1 mg/kg
Volatile CMR compounds of Category 2 and 3, respectively [4]	≤ 20 mg/kg (total) [6]
Substances classified as acutely toxic according to Category 1, 2 and 3 (Acute Tox. 1, 2, 3), or specific target organ toxic according to Category 1 (STOT single exposure 1, STOT repeated exposure 1) [5]	≤ 40 mg/kg (total) [6]
Substances classified in Appendix VI of EU Regulation No. 1272/2008 (GHS) as inhalant allergens (Category 1) and skin allergens (Category 1) and acc. to TRGS 907 or MAK and BAT Value Lists as sensitizing [7, 8]	≤ 40 mg/kg (total) [6]

5.1.1.2. Heavy Metals [9]

Analytical method	Microwave digestion, determination by means of ICP-OES

Test parameters	**Requirements**
Cobalt	≤ 25 mg/kg
Nickel	≤ 70 mg/kg

5.1.1.3. Tin-Organic Compounds [9]

Analytical method (method A)	Derivatization with sodium tetraethyl borate, extraction with methanol, determination by means of GC/MS
Analytical method (method B)	Derivatization with sodium tetraethyl borate, extraction with artificial sweat solution (DIN EN ISO 105-E04), determination by means of GC/MS

Test parameters	**Requirements**	
	Method A [10]	Method B [10]
Total of tributyltin (TBT) and dibutyltin (DBT)	≤ 0.5 mg/kg	≤ 0.05 mg/kg
Total of other tin-organic compounds [11]	≤ 5 mg/kg	≤ 0.5 mg/kg

5.1.1.4. Azo Dyes (only for colour toner) [9]

Analytical method	The material samples are analysed based on the official method according to § 64 LFGB (DIN EN 14362). The primary aromatic amines that are listed in Directive 2002/61/EC are tested.

Test parameters	**Requirement**
Amines that are specified in the EU Directive 2002/61/EC	< 15 mg/kg

5.2. Section B – Emission Requirements on the Complete Printing/Copying System

5.2.1. Volatile Organic Compounds (Test Chamber Examination)

Testing method	The test chamber examination is carried out in accordance with DIN EN ISO 16000-9: Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method (ISO 16000-9:2006); German version EN ISO 16000-9:2008.		
Test chamber conditions	Air flow rate	n	1.0 h^{-1} ± 0.05 h^{-1} (blank test) 1.5 – 5.0 h^{-1} ± 5 % (print and follow-up phase, depending on the chamber size)
	Relative air humidity	r.h.	50 % ± 5 %
	Temperature	T	23 °C ± 2 °C
	Test chamber volume	V_{PK}	1 - 3 m³, 25 m³

Analytical method	Test chamber method based on DIN ISO 16000-6 and RAL-UZ 171 with individual determination of benzene, styrene and other volatile CMR compounds

Test parameters	**Permissible emission rate**	
	Monochrome (black) printing	Colour printing
Total of volatile organic compounds in the retention range C_6 – C_{16} (TVOC) [1]	≤ 10 mg/h	≤ 18 mg/h
Styrene	≤ 1 mg/h	≤ 1.8 mg/h
Benzene	≤ 0.05 mg/h	≤ 0.05 mg/h
Volatile CMR compounds [3] (Cat. 1A and 1B or 1 and 2 and Pregnancy Group A and B, respectively)	≤ 0.1 mg/h (total) [12]	≤ 0.1 mg/h (total) [12]
Volatile CMR compounds of Category 2 and 3, respectively [4]	≤ 1 mg/h (total) [12]	≤ 1 mg/h (total) [12]
Substances classified as acutely toxic acc. to Cat. 1, 2 and 3 (Acute Tox. 1, 2, 3), and specific target organ toxic acc. to Cat. 1 (STOT single exposure 1, STOT repeated exposure 1) [5]	≤ 1 mg/h (total) [12]	≤ 1 mg/h (total) [12]
Substances classified in Appendix VI of EU Regulation No. 1272/2008 (GHS) as inhalant allergens (Category 1) and skin allergens (Category 1) and acc. to TRGS 907 or MAK and BAT Value Lists [6] as sensitizing	≤ 1 mg/h (total) [12]	≤ 1 mg/h (total) [12]

6. Further Requirements

6.1. Factory Inspection

An (initial) inspection of the production plant(s) is (are) required as part of the certification process.

No factory inspection is required when an attestation is issued for the toner powder.

6.2. Surveillance Tests

Monitoring checks are to be carried out once a year on selected certified toner powders to manage or extend the certificate or alternatively a new inspection of the production facility is required. A monitoring check can take the form of a full or partial test using selected test parameters. A complete check is required at an interval of 2 years.

No monitoring check is required when an attestation is issued for the toner powder. The validity of the attestation is limited to one year.

6.3. Sampling, Packaging and Shipping

The test samples can be provided as follows:

Required test sample for the material test:

- One printing module (cartridge) filled with the toner powder to be tested (toner will be taken from this cartridge), or
- Approximately 150 g of toner powder in a **glass container**, filled to the brim and closed with a tight lid (preferable with a Teflon seal or an aluminium foil liner).

Required test samples for the emission test:

- Two printing modules (cartridges) filled with the toner system to be tested (or, according to the agreement).
- A laser printer as good as new for the emission testing with the highest page printing performance for the toner systems to be certified (or, according to the agreement). The printing modules may not be cleaned with solvents.

The following has to be recorded in the appendix of the certificate: Toner designation/identification, Batch No., filling date of the cartridge, day of packaging.

Certified toner modules can be taken directly from retail stores for monitoring tests.

The packaging of the test object (printing modules) to be tested has to follow the standardized and common merchandising and marketing procedure in its original box. This also applies to the usual time interval between the manufacturing point and packaging. (The filling date may not be older than six months.)

6.4. Manufacturer's Declaration

The applicant / manufacturer must provide a tabular list, including photographs of the printing modules to be certified, including the appropriate printer including the printing performance, as well as information of all sources of supply of the toner.

The manufacturer guarantees that only certified toner is used in all printing modules.

The applicant / manufacturer confirms in manufacturer's declaration that compounds listed under Point 6.5 are not used as constituents/structural components.

6.5. Exclusion of Chemicals as Constituents in Toner Powder

6.5.1. Exclusion of Chemicals

☝	All materials used shall comply with EU or national law statutory requirements of
❖	the Chemicals Prohibition Ordinance (ChemVerbotsV),
❖	the Biocides Regulation (EU) No. 528/2012 (BiozidV),
❖	Regulation (EC) No. 1907/2006 [1].
☝	The use of halogenated plastics (e.g. PVC) in the *packaging* of the product is not permissible. The non-use of halogenated plastics in the packaging is confirmed.
☝	The following substances and substance classes are not used as constitutional/structural components in the production of individual materials, formulations, components etc.:
	Halogenated compounds and their polymers
❖	Halogenated foaming agents (e.g. CFCs)
❖	Halogenated flame retardants (fluorine, chlorine, bromine, iodine derivatives)
❖	Halogenated plastics (e.g. PVC)

	Acute or chronic toxic and toxicologically relevant compounds
❖	CMR compounds: CMR = carcinogenic (C), mutagenic (M), reprotoxic (R) under EC classification as per Annex VI of Regulation (EC) No. 1272/2008 (GHS) and according to national classification as per TRGS 905 or MAK and BAT value list of the German Research Foundation (DFG), (Categories 1, 2 and 3, Pregnancy Groups A and B).
❖	Substances classified in Annex VI of EC Regulation No. 1272/2008 (GHS) as acutely toxic of Categories 1, 2 and 3, as specific target organ toxic for single or repeated exposure of Category 1 and 2 or according to Paragraph 3 Points 6. and 7. Classified by the Ordinance on Hazardous Substances (GefStoffV) as highly poisonous (T+) or poisonous (T).
❖	Substances classified in Annex VI of EC Regulation No. 1272/2008 (GHS) as inhalant allergens (Category 1) and skin allergens (Category 1) or in TRGS 907 or MAK and BAT value lists as sensitising.
❖	Substances that, according to the criteria of Annex XIII of EC Regulation No. 1907/2006 are persistent, bioaccumulative and toxic or very persistent, very bioaccumulative and very toxic, identified as such or are already included in Annex XIV of the aforementioned Regulation (SVHC, Substances of Very High Concern, www.echa.eu). [1]
❖	Phthalates, which are limited under EC Regulation No. 1907/2006/EC or were identified as SVHC and other representatives: Di-ethylhexyl phthalate (DEHP), di-n-butyl phthalate (DBP), benzyl butyl phthalate (BBP),di-iso-nonyl phthalates (DINP), di-iso-decylphthalates (DIDP), di-n-octyl phthalate (DNOP), di-iso-butyl phthalate (DIBP), bis(2-methoxyethyl) phthalate (DMEP), di-iso-hexylphthalates (DIHexP), di-iso-heptylphthalates (DIHeP), di-iso-octylphthalates (DIOP), di-iso-undecyl phthalates (DIUP), di-n-hexylphthalate, di-n-heptylphthalate, di-n-nonyl phthalate, di-n-decyl phthalate, di-n-undecylphthalate
❖	Compounds that have been identified according to the present knowledge as endocrine disruptors [compare this: Annex II of the document “State of the Science of Endocrine Disrupting Chemicals, WHO, 2012”], http://www.who.int/ceh/publications/endocrine/en/
❖	Azo dyes (the amines listed in EU Regulation 2002/61/EC)
❖	Carcinogenic, mutagenic, reprotoxic and potentially sensitising dyes according to Oeko-Tex Standard 100 requirement (Product Class I / II) or as per Decision 2002/371/EC for the award of an eco-label for textile products.
	Preservatives and biocides
❖	Biocides, which are not listed in Annex I of EC Regulation No. 528 / 2012 or are not permitted according to the requirements of the regulation.
❖	Biocides, which are prohibited according to Oeko-Tex Standard 100 requirement (Product Class I / II).
❖	Class 1a pesticides acc. to: WHO recommended classification of pesticides by hazard classified as 1 a (extremely hazardous).
❖	Class 1b pesticides acc. to: WHO recommended classification of pesticides by hazard classified as 1 b (highly hazardous).
❖	Pyrethroides
[1]	Germany as well as Denmark, Austria, France, Belgium, Sweden and Norway take the view that a one-time produced product does not lose its product character when it is installed in a composite product. The interpretation “Once a product is always a product” applies to each individual product that fulfills the product definition within a composite product. Consequently, the individual product is the reference value for the 0.1% threshold that triggers the information and reporting requirements relating to candidate substances (SVHC substances).
☝	TRLP must be notified of any changes in the materials used including change of component or a change of supplier. In the event of a change of component or a change of supplier, the certified product might require to be retested. A material list / recipe list must be completed for the initial inspection and made available to TRLP.
	If the products are intended for the US market – respectively for the Californian market – the following requirements on the exclusion or non-use of “critically assessed chemicals” must be adhered to. The following substances and substance classes are not used as constitutional/structural components in the production of individual materials, formulations, components etc.:
➢	Chemicals that are persistent, bioaccumulative and toxic in accordance with EPCRA, Section 313, Final Rule of PBTs, Table 1 and 3; http://www.gpo.gov/fdsys/pkg/FR-1999-10-29/pdf/99-28169.pdf
➢	Carcinogens according to
➢	• **the listing by IARC [International Agency for Research on Cancer]; IARC Monographs, Volume 100, Review of Human**

Carcinogens (25.07.2012) in the current version	
➢	• California Proposition 65, http://oehha.ca.gov/prop65/prop65_list/files/P6509272013.pdf
➢	• National Toxicology Program, Report on Carcinogens (RoC), Part A and B, http://ntp.niehs.nih.gov/ntp/roc/twelfth/roc12.pdf
➢	Reprotoxic compounds according to the
➢	• California Proposition 65, http://oehha.ca.gov/prop65/prop65_list/files/P6509272013.pdf

6.6. Product Changes

The manufacturer guarantees to indicate any changes regarding the production process, the formulations used, and the materials applied including any supplier switch and to inform TRLP representatives immediately. In the scope of a component change or supplier switch, a retest of the already certified product can be claimed by TRLP. The material list must be supplemented and updated.

Indices to Test Parameters for Emission and Material Testings

1 TVOC = total volatile organic compounds

2 An exceedance of both the TVOC and the styrene value is permissible in the material examination if the guideline values for TVOC and styrene are met for the emission test.

3 CMR = carcinogenic (C), mutagenic (M), toxic to reproduction (R) classified according to the EU classification with reference to Annex VI of Regulation (EC) No. 1272/2008 (GHS) of Categories 1A and 1B and according to the national classification in compliance with TRGS 905 or the MAK and BAT Value Lists of the DFG (German Research Foundation), (Categories 1 and 2 and Pregnancy Group A and B).

4 The imposed requirement for the sum of CMR substances of Category 2 (or according to national requirement Category 3, Pregnancy Groups A and B) is not taken into account when evaluating the mattress. The quantified sum of CMR substances of Category 2 is initially classified only as supplementary information for the manufacturer for the validity period of this test specification. In the course of updating the test specification and taking into account the state-of-the-art technology, this parameter will be completely effective as an evaluation criterion.

5 Substances that are classified in Annex VI of Regulation (EC) No. 1272/2008 (GHS) as acutely toxic and specific target organ toxic and according to § 3 Points 6. and 7. of the Ordinance on Hazardous Substances (GefStoffV) as very toxic (T+) and toxic (T). The CMR substances and the individually listed substances under aforementioned index [3] are not included since these are already limited.

6 In forming the corresponding totals, all individually quantified components are included with a mass-based emission rate of ≥ 0.3 mg/kg. Insofar as possible concentrations of all individual compounds are quantified against authentic standard. Unidentified substances are quantified on basis of substance groups against substance-like compounds from this group.

7 The substances listed under Indices [3] and the individually listed substances are not included as these are already limited.

8 Excluded are acrylate-based toners due to technical requirements.

9 For colour toner sets, a test of the black toner by itself and a test of a mixed sample of three colours (cyan, magenta and yellow) must be carried out.

10 Method A is valid when extracted with methanol. If the specified guideline value of method A is exceeded, method B applies (extraction using artificial sweat solution).

11 Total of butyltin, tetrabutyltin, octyltin, dioctyltin, tricyclohexyltin and triphenyltin.

12 In forming the corresponding totals, all individually quantified components are included with a test chamber concentration of ≥ 1 µg/m³. Insofar as possible concentrations of all individual compounds are quantified against authentic standard. Unidentified substances are quantified on basis of substance groups against substance-like compounds from this group.