
European Model EPDs (joint Project of DBC, EFCC, FEICA and IVK):

Guideline for the calculation of formulation's single scores

DBC - Deutsche Bauchemie e.V.

EFCC - European Federation for Construction Chemicals

FEICA - Association of the European Adhesive and Sealant Industry

IVK - Industrieverband Klebstoffe e.V.



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Guideline for the calculation of formulation's single scores (including a FAQ section)

This document is part of a joint project of the Association of the European Adhesive and Sealant Industry (FEICA), the European Federation for Construction Chemicals (EFCC), the Industrieverband Klebstoffe (IVK) and Deutsche Bauchemie e.V. (DBC) to update the Model Environmental Product Declarations (EPDs) mentioned below. The following product groups are covered:

Old: FEICA Model EPD:

- Reactive resins based on polyurethane or SMP
- Reactive resins based on epoxy resin
- Dispersion based products
- Silicone based sealants
- Modified mineral mortars

New: European Model EPD*:

- Products based on polyurethane or silane-modified polymer
- Products based on epoxy-resin
- Dispersion-based products
- Silicone-based products
- Modified mineral mortars

*For detailed list see attached Excel file and FAQ.

VALIDITY RANGE OF AN EPD

These EPDs may be utilised by members of the funding associations and their members to represent their respective products. To use the Model EPD for a specific product of an authorised manufacturer, the formulation of the product has to fulfil the following requirements:

- The title of the selected EPD describes the product
- The formulation corresponds to the range of base materials described as mandatory in the respective EPD
- The formulation's total single score is below the maximum single score of the respective EPD

The application of the product is described in the application modules in the text of the EPDs. Manufacturers can individualise the Model EPDs to their specific product and publish in their own name. This follows the rules of the programme operator Institut Bauen und Umwelt e.V. (IBU). For details about the framework conditions, the associations may be contacted.

SUBSTANCE LIST

The basis of the Model EPD system is a substance list containing environmental single scores of the substances (raw materials) of formulations to be covered by the Model EPDs.

There is only one substance list valid for all EPDs of the mentioned product groups. This means that any substance from the list may be chosen to calculate the total score of a formulation.

The list has a hierarchical structure according to the chemical structure of the substances.

Coloured lines represent groupings used to structure the substance list. Three levels of groupings are used, for example:

9915	Organic Substances
9917	Isocyanates
118	4-Toluenesulfonyl isocyanate

In the process of updating the EPDs, the up-to-date methods to calculate the environmental single score values and current Life Cycle Assessment (LCA) data have been used. In column E the new single scores are given.

In some cases, the group names have single score values assigned. These group values represent a worst case value that is derived from the substances listed in this group. Such group values may be used for a substance which is covered by the group name but not listed as specific substance. In cases where the score value is left blank for a group, the classification rules behind the table did not allow for assigning a group value.

The substance list has been modified and amended based on the input by manufacturers (see FAQ). Substances falling under the VOC definition are marked in yellow. Groups of substances covering VOCs and non-VOCs are crosshatched in yellow.

STRUCTURE OF THE MODEL EPDS

An overview about the 21 Model EPDs is given in the following table and can also be found on the Excel sheet ('European Model EPDs').

new: European Model EPD				
short name EPD	Title	base material (mandatory)	maximum formulation's single score updated	maximum formulation's single score - old version 2022-06-16
criteria for the selection of an EPD				
PU 1	Products based on polyurethane or silane-modified polymer group 1	VOC: ≤1% castor oil/-derivatives: ≤10%	< 3500	< 3500
PU 2	group 2	VOC: ≤1% castor oil/-derivatives: ≤10%	< 5300	< 5300
PU 3	group 3	VOC: >1%, ≤10% castor oil/-derivatives: ≤10%	< 4500	< 4500
PU 4	group 4	VOC: >10%, ≤50% castor oil/-derivatives: ≤10%	< 4200	< 4200
Products based on polyurethane,				
PU 5	group 5	VOC: ≤1% castor oil/-derivatives: >10%	< 5600	< 5600
PU 6	group 6	VOC: >1%, ≤30% castor oil/-derivatives: >10%	< 4800	< 4800
Products based on epoxy-resin,				
EP 1	group 1	VOC: ≤1%	< 3400	< 3500
EP 2	group 2	VOC: ≤1%	< 6500	< 6400
EP 3	group 3	VOC: >1%, ≤8%	<4600	<4700
EP 4	group 4	VOC: >8%, ≤18%	<3400	<3500
EP 5	group 5	VOC: >18%, ≤50%	<3000	<3000
Dispersion-based products,				
DIS 1	group 1	VOC: ≤1%	< 950	< 900
DIS 2	group 2	VOC: ≤1%	< 1500	< 1500
DIS 3	group 3	VOC: ≤10%	< 1800	< 1800
DIS 4	group 4	VOC: ≤10%	< 3500	< 3500
Silicone-based products,				
SI 1	group 1	VOC: ≤2%	< 4900	< 4900
SI 2	group 2	VOC: ≤2%	< 7800	< 7800
SI 3	group 3	VOC: ≤30%	< 6400	< 6500
Modified mineral mortars				
MMM 1	group 1		< 370	< 320
MMM 2	group 2		< 560	< 500
MMM 3	group 3		< 1200	< 1000
higher than version 2022-06-16				
lower than version 2022-06-16				

GUIDANCE TO CHECK A FORMULATION'S SINGLE SCORE

To obtain the total single score for a formulation, the mass-weighted sum of the substance single scores has to be calculated.

The attached Excel file shall be used to conduct the calculations. Data should be entered in green fields. The other fields are write-protected.

Step 1: Calculation of the single score value for a formulation

The product's composition has to be entered as %-values (w/w) using the green fields in column F. Column G then gives the resulting weighted single score per substance. Field G3 ('Result: total single score for your formulation') gives the overall result. Field F3 ('Check - %-Sum:') may be used to validate that the formulation's substances sum up to 100 % (w/w).

Step 2: Comparison of the result to the EPD-value

The value obtained for a formulation of a product has to be compared with the maximum score value of the EPD (column D of the file 'European Model EPDs').

Example for the calculation

PU formulation: 50 % Polyol (#295, line 400 in the substance list); 20 % Polymer MDI (#294, line 149); 30 % Calcium carbonate (#15, line 41)

Score value of the formulation: $0.5 \times 2906 + 0.2 \times 1748 + 0.3 \times 18 = 1808$

Comparison with maximum score of the selected EPD: 1808 is lower than the maximum score of EPD PU 1 (3500) → PU 1 is suitable (with respect to the score value; other criteria have to be fulfilled)

QUESTIONS

Please address any questions to your relevant association (FEICA, EFCC, IVK or DBC). If necessary, a direct contact to the project team will be established.

LIST OF CONTACT PERSONS AT THE PARTICIPATING ASSOCIATIONS

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Frequently asked questions

1. Substance list

1.1 Why is the single score of castor oil and its derivatives so high?

The single score of castor oil is much higher due to the different calculation rules. The updated system covers 13 impact categories. Out of these impact categories, water scarcity, accounts for 75 % of the single substance score. The pattern (the relative ratio) of the environmental impacts differs therefore significantly from that of the other substances. Formulations based on castor oil have to be treated differently from the usual fossil-based PU or SMP based EPDs. It was therefore decided to cover formulations with more than 10 % of castor oil by separate EPDs.

1.2 Which substance should be used in case small amounts of additives are used and the substance is not listed?

In case small amounts (<1 %) of substances are used that are not listed, #395 'additives/other substances <1 %' may be used.

1.3 How can the single score of aqueous dispersions with different solids content be adjusted?

If the solid content of a dispersion in the manufacturer's formulation deviates from the %-solids value of the dispersion in the list, the score can be adjusted.

Example: 20 % (w/w) of a 40 % solids dispersion is used in the formulation, a 50 % (w/w) solids dispersion is listed:

16 % (w/w) of the listed dispersion + 4 % (w/w) of water (#241) have to be used for the calculation.

1.4 How are emissions by a chemical reaction considered?

The emissions of substances during installation and/or the use phase resulting from a chemical curing reaction, influence the environmental impact in the same way as intentionally added VOCs. Emissions from SMP (Silane-Modified Polymers) formulations and silicone-based products are considered in the worst-case formulations and in the LCA data of the respective Model EPDs. Therefore, it is no longer necessary to consider 'emissions during installation' separately as part of the calculation procedure.

1.5 In case a substance is not listed what can be done?

The secretariat of the respective association may be contacted for advice.

2. EPD structure and calculation of the score of a formulation

2.1 Where can the latest version of the European Model EPD be found?

The EPDs will be published on the websites of IBU (Institut Bauen und Umwelt), <https://ibu-epd.com/veroeffentlichte-epds/>) and on the websites of the associations DBC, FEICA, EFCC and IVK.

2.2 Why are the EPDs differentiated with respect to the content of volatile organic components (VOCs)?

The emissions of substances into the atmosphere during the use phase resulting from VOCs as components of the formulation influence the environmental impact in a specific way. As the single substance scores only cover the production of a substance, the environmental effect of the VOC content has to be reflected in the LCA data of the worst case formulation in the Model EPD. The EPDs therefore differentiate between formulations with different VOC content.

2.3 How is 'VOC' defined?

VOC is defined according to the VOC Decopaint Directive (VOC: bp <250°C, standard pressure, function as solvent/propellant). Substances falling under the VOC definition are marked in yellow in the substance list. Groups of substances covering VOCs and non-VOCs are crosshatched in yellow. In any case the function of the VOCs has also to be checked – VOCs taking part of the curing and becoming non-volatile have not to be considered as VOCs.

Note: Directive 2004/42/CE of the European Parliament and the Council of 21 April 2004 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC.

2.4 How do VOC-containing formulations have to be calculated?

The appropriate EPD has to be selected by checking the title, the VOC content and possibly other preconditions. The formulation's score has to be calculated as usual.

2.5 Which EPD covers products with a high content of Zn phosphate?

The score for Zn-based substances, e.g. Zn phosphate, is so high (approximately 20,000) that the existing range of EPDs cannot cover formulations with high Zn content. The pattern of the impacts is in addition very different from those of fossil-based products. The Model EPD system cannot cover formulations with a high content of Zn substances. The content of Zn containing substances is therefore limited to 0.4 wt. %.

2.6 Why can the maximum formulation score of a 100 % solids EPD be higher than the maximum score of an EPD with a high VOC (solvent) content?

The single scores include only the environmental impact of the raw materials and the manufacturing of the substance; any emission-related impact is only reflected in the LCA data of the Model EPD. As the production-related impact of a 'simple' solvent per kg is generally lower than that, e.g., of a more sophisticated polymer, the maximum formulation score has to be higher in the case of the formulation with a high polymer content.

The Model EPDs are based on so called 'declared units' (= 1 kg product), not on 'functional units' (e.g. 1 m² or 1 mm bond line). For the function of a product usually a certain amount of solid material is needed. To achieve this amount by using a solvent-based product, the consumption by weight is much higher than with a 100 % solids product and consequently so is the environmental impact per function.

2.7 How does the formulation score of a 2- or 3-component system have to be calculated?

A multi-component system has to be calculated on a 'ready-to-use' basis. All components have to be mixed in the appropriate ratio and then 1 kg of this mixture has to be taken as the basis for the calculation.