Danish Indoor Climate Labelling

General test and labelling criteria

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1. Introduction

Danish Indoor Climate Labelling (DICL) is a voluntary material emission labelling scheme. The labelling scheme was first introduced in 1993. The original concept behind the labelling scheme was developed by the Danish Building Research Institute and the National Research Centre on the Working Environment in Denmark.

During 2017 the evaluation method and requirements were thoroughly revised. One of the ideas behind the revision was to harmonise as much as possible with other material emission labelling schemes the test and evaluation methods used. By referring to international standards for testing and using common methods for evaluation of the results, the revision will at the same time reduce the need for individual testing according to different material emission schemes.

The present criteria are based on a harmonised concept using EU-LCI values for evaluation of individual substances for their potential health effect on humans. This concept does not take into account the odour aspect of the emissions. The odour is evaluated using an untrained panel to assess the acceptability of the emissions. The results of the odour assessment is expressed as the so-called 'indoor-relevant time-value' which describes how many days from installation of the product the emissions may give reason to odour. For ceiling products release of particles is also tested and evaluated.

2. Scope

The Danish Indoor Climate Labelling covers emissions from construction products, furniture and other products intended for use indoors. The labelling scheme does not cover electric/electronic equipment such as e.g. computers, printers, fans or air cleaners.

The present general test and labelling criteria specifies the emission testing procedure and the general criteria to fulfil in order to obtain a labelling license. Any specific requirements for a product appear from the testing and labelling criteria for the product area in question. These criteria are issued by DICL.

The Danish Indoor Climate Labelling secretariat decides which of the product specific test and labelling criteria a product is covered by.

The labelling criteria includes requirements for:

- Emission of volatile organic compounds (VOC), volatile aldehydes and semi-volatile organic compounds (SVOC)
- Emission of carcinogens categorized as CARC 1A and CARC 1B (according to Regulation (EC) No 1272/2008)
- Release of particles and fibres (apply to ceiling products only)
- Odour assessment of emissions
- Indoor environment related guidelines

3. Definitions

For the purposes of the present general test and labelling criteria as well as the product specific test and labelling criteria, terms and definitions given in EN 16516:2017 and ISO 16000-28:2012 and with the following specifications apply:

Time schedule for emission determination: The emissions are determined 72 ± 2 hours and 28 ± 2 days after the test specimen is placed in the test chamber, as defined in ISO 16000-9:2006.

TVOC (total volatile organic compounds): TVOC is calculated as described in option 1 of clause 8.2.6.1 and specified in 8.2.6.2 of EN 16516:2017. The sum of all compounds eluting in a defined section of the chromatogram, quantified using the TIC response factor for toluene, after correcting for blank values of the respective compounds quantified in the same way and excluding any compounds determined to be below 5 µg/m^3 using the TIC response factor for toluene.

4. References

EN 16516:2017 Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air.

EN ISO 16000-9:2006 Indoor air Part 9: Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method

ISO 16000-28:2012 Indoor air – Part 28: Determination of odour emissions from building products using test chambers

Danish Indoor Climate Labelling (2018): Determination of release of particles from building products. 2nd edition.

ECA (1997) European Collaborative Action: Evaluation of VOC emissions from Building Products. Report no. 18. European Commission, Joint Research Centre. EUR 17334EN. Luxembourg: Publications Office of the European Union, 1997.

ECA (2012) European Collaborative Action: Harmonisation framework for indoor products labelling schemes in the EU. Report no. 27. European Commission, Joint Research Centre. EUR 25276EN. Luxembourg: Publications Office of the European Union, 2012.

5. Requirements for labelling

Application for a labelling license requires different types of documentation. The documentation includes as a minimum, but is not limited to:

- Completed application form (obtained from the DICL secretariat) with information about the applicant and the product (group) covered by the labelling license
- Short description of the product(s) to be covered by the labelling license
- Instructions and guidelines for transportation, installation, application, cleaning and maintenance of the product(s)
- Emission test results (including release of fibres and particles, if required by the product specific test and labelling criteria)

The indoor environment properties stated in the labelling license are defined as the properties the product is expected to have, when used under conditions similar to those in the reference room and according to the manufacturer's guidelines for installation, use and maintenance.

The labelling license may comprise a group of products, which do not mutually differ essentially in construction and/or selection of material. When a labelling license covers more products it is important that the product which is expected to have the highest/longest emissions is selected for testing.

Only emission test results from an approved testing laboratory are accepted as basis for a DICL labelling license. Laboratories performing the relevant tests under accreditation can as a starting point be approved. A list of approved testing laboratories can be obtained from the DICL secretariat.

The procedure for issue of a labelling license is illustrated in Figure 1 below.

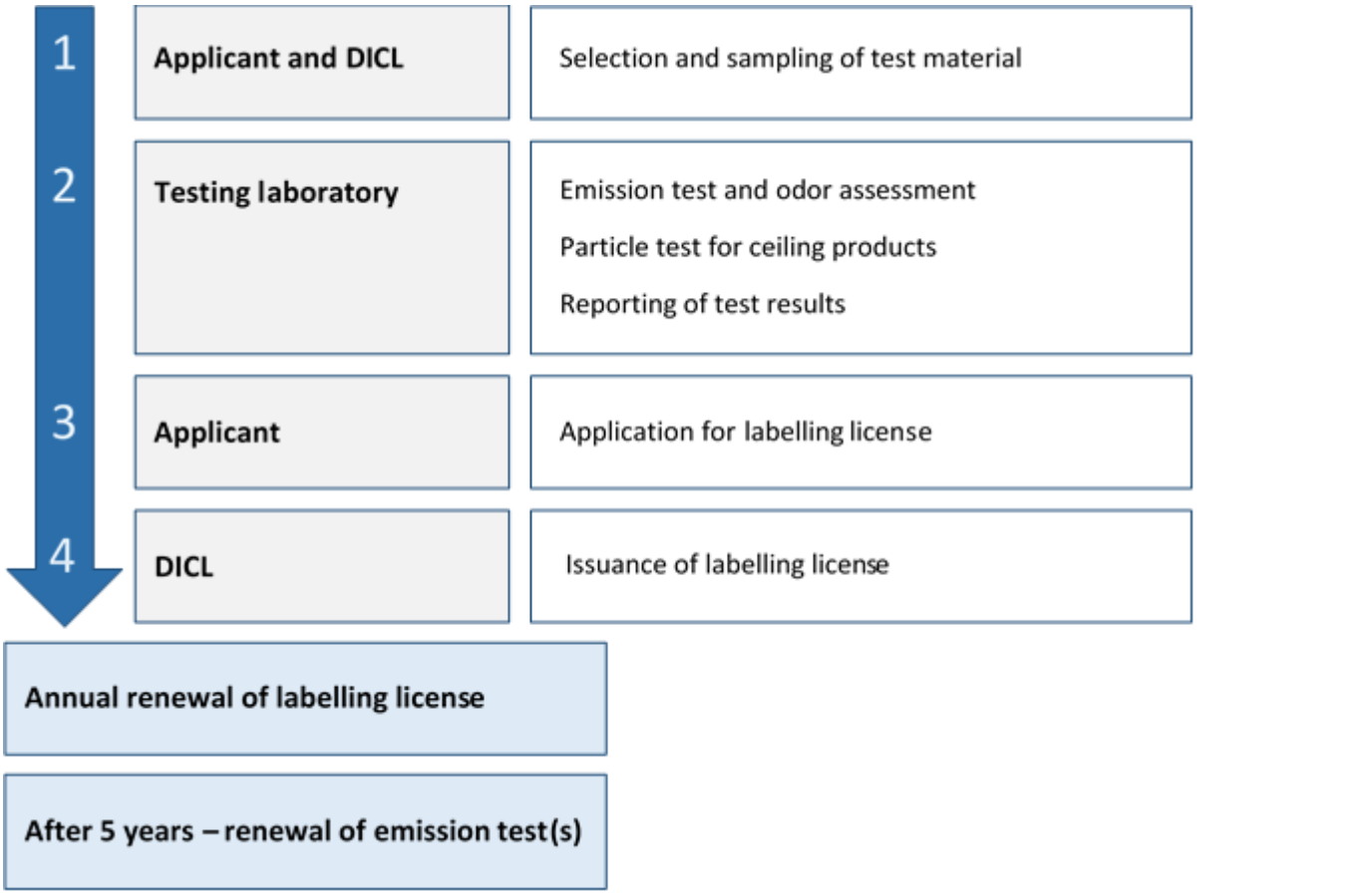

Figure 1 Procedure for obtaining a labelling license

5.1 Application form

The application form is available from the DICL secretariat and should be completed by the applicant. The application form includes information such as the name and address of the applicant, contact person, title of the labelling license etc.

The application must include a list of all trade names covered by the labelling license.

The title of the labelling license is suggested by the applicant and has to be confirmed by the DICL secretariat.

5.2 Description of the products

The applicant shall prepare a (short) complete description of the products covered by the labelling license.

The description should include a specification of materials which the products constitute of and an overview of the manufacturing process. The description should also cover the purpose, place and circumstances of typical application(s) of the products (intended use).

5.3 Guidelines for transportation, installation, application etc.

The supplier shall for products covered by the labelling license prepare guidelines for transportation, installation, application, cleaning and maintenance which also describe the recommended methods and frequency in addition to other conditions which are of importance for the indoor environment.

6. Material sampling and transportation to the laboratory

Collection of a material sample of the product is an important step in the emission testing procedure. The objective of the sampling is to obtain a material sample that is representative of the product being assessed and meets the requirements of the test(s) to be performed.

The dimensions of the material sample are agreed with the test laboratory considering:
- Dimensions of the product in full size
- Material load in the reference room
- Surface area of the product in contact with the room air
- Material load at chamber testing

The applicant is responsible for the sample collection. The sample is collected according to the following instructions.

6.1 Sampling location

The material sample shall be collected directly from the production or stock after normal manufacturing process as soon as the material may be released for sale.

If sampling at the production site is not possible, the material sample may be collected at delivery phase, provided the material has been stored in normal packaging. See also 6.3 Age of material sample below.

6.2 Packaging and transportation of sample to laboratory

The sample is packaged immediately after sampling in normal packaging. Different material samples shall be packed separately to avoid cross-contamination.

6.3 Age of material sample

The age of the material sample delivered to the test laboratory shall be similar to the typical product age when delivered for use/installation. I.e. if the product is available for installation/use only after a longer transportation period (weeks), the material sample should have the same age when arriving at the laboratory.

6.4 Material sample information

At sampling the following is recorded and reported to the laboratory together with the material sample:

- Product name/type
- Date of production, batch or production number
- Date of packing
- Date of sampling
- Number and/or amount of sample(s)
- Sampling procedure (how the sample was taken)
- Other observations relevant to sampling and testing (e.g. storage of material before sampling)
- Name of the person responsible for sampling

An example of a form which can be used for recording the information is given in Annex D of EN 16516:2017.

6.5 Sampling instructions

Instructions on how to collect a material sample from different kinds of products are given in the product specific testing and labelling criteria.

7. Emission testing

The emission of volatile compounds from a product is determined by using two methods:

- An objective method (chemical analysis) to assess health risk and to determine whether undesirable compounds are present in the emission. Compounds considered to be undesirable and therefore not permitted in the emission are compounds that are considered carcinogenic and belonging to EU categories 1A and 1B according to the new GHS system (Regulation (EC) No 1272/2008 Annex VI Table 3.1).
- A subjective method (odour assessment) to determine whether the product emits odours to such an extent that the comfort is impaired.

Determination of the release of particles is required for ceiling products. By the prescribed method the release of particles including fibres is measured as sedimentary dust released from new, intact building products.

Specific requirements, if any, for a product area appear from the testing and labelling criteria for the product area in question.

7.1 Test specimen preparation

It should be ensured that the test specimen reflects the product as it is sold by the manufacturer and used in practise. The test specimen may be prepared in the laboratory or at the sampling site depending on the nature of the product. The relevant requirements of EN 16516:2017 and Determination of release of particles from building products (DICL, 2018) shall be applied together with the requirements which may appear from the individual product specific test and labelling criteria.

7.2 Chemical analysis

The emission of volatile compounds from the product is determined using ventilated test chambers according to the method described in EN 16516:2017.

Determination of the emission is carried out at 2 points of time during testing: 72 ± 2 hours and 28 ± 2 days after the test specimen is placed in the test chamber, as defined in ISO 16000-9:2006.

7.3 Odour assessment

The odour assessment is carried out using the acceptability scale and an untrained odour panel according to the method described in EN ISO 16000-28:2012.

For the odour assessment the air quality in the test chamber should be similar to that of the reference room. This is considered fulfilled when the area specific airflow rate in the test chamber is identical to the area specific airflow rate in the reference room.

The result of the odour assessment is given as the arithmetic mean of the panellists' evaluations, as described in EN ISO 16000-28:2012.

7.4 Release of particles

Ceiling products are subject to test for release of particles including fibres. This may also be the case for other product types. If so, the requirement appear from the product specific test and labelling criteria. If a ceiling product is exempted from test for release of particles it also appears from the specific test and labelling criteria.

Release of particles from ceiling products is determined according to the method described in Determination of release of particles from building products (DICL, 2018).

8. Evaluation procedure

8.1 Evaluation of volatile emissions

The toxicological evaluation of substances emitted for the product is based on the determination of concentration levels below which there is no reason to expect adverse health effects (LCI – Lowest Concentration of Interest).

The evaluation criteria are based on the assessment of individual compounds although building occupants are exposed to a multitude of substances. This is pragmatically accounted for by

summing evaluated individual VOC concentrations in the risk index R and by means of the sum of VOC (TVOC - Total concentration of Volatile Organic Compounds). It should be noted, however, that a TVOC guideline value cannot be based on toxicological assessment – due to the varying composition of the VOC mixtures assessed. However, TVOC provides useful information when combined with the limitation of carcinogenic substances and with the LCI-concept (ECA, 2012). Furthermore, there is evidence that with increasing TVOC concentration the likelihood of complaints and adverse health effects also increases (ECA, 1997).

The evaluation is based on the concentration of compounds in the reference room. Hence, concentrations mentioned below refer to reference room concentrations.

TVOC (total volatile organic compounds): TVOC is calculated as described in option 1 of clause 8.2.6.1 and specified in 8.2.6.2 of EN 16516:2017. The sum of all compounds eluting in a defined section of the chromatogram, quantified using the TIC response factor for toluene, after correcting for blank values of the respective compounds quantified in the same way and excluding any compounds determined to be below 5 µg/m^3 using the TIC response factor for toluene.

Carcinogenic substances: All products must meet the general requirement of not emitting carcinogenic, mutagenic or reprotoxic (CMR) substances belonging to categories 1A and 1B according to Regulation (EC) No 1272/2008 Annex VI Table 3.1. Substances with mutagenic or reprotoxic properties and those with potential carcinogenic effects (belonging to EU category 2) are evaluated within the LCI concept). In the analysis, carcinogens must be quantified using their individual calibration factors.

Carcinogenic, mutagenic and reprotoxic substances shall as far as feasible be quantified and reported down to 1 µg/m^3.

Identified substances without LCI values and non-identified/"unknown" substances are quantified on the basis of toluene equivalents. A list of harmonised EU-LCI values are currently under development. At present the LCI values appearing on the list issued by the German AgBB evaluation scheme are used for evaluation of individual substances. The LCI values used appear from the current list published at www.umweltbundesamt.de/en/topics/health/commissions-working-groups/committee-for-health-related-evaluation-of-building

The procedure for testing and evaluation is shown in Figure 2. Explanations to the procedure are given below.

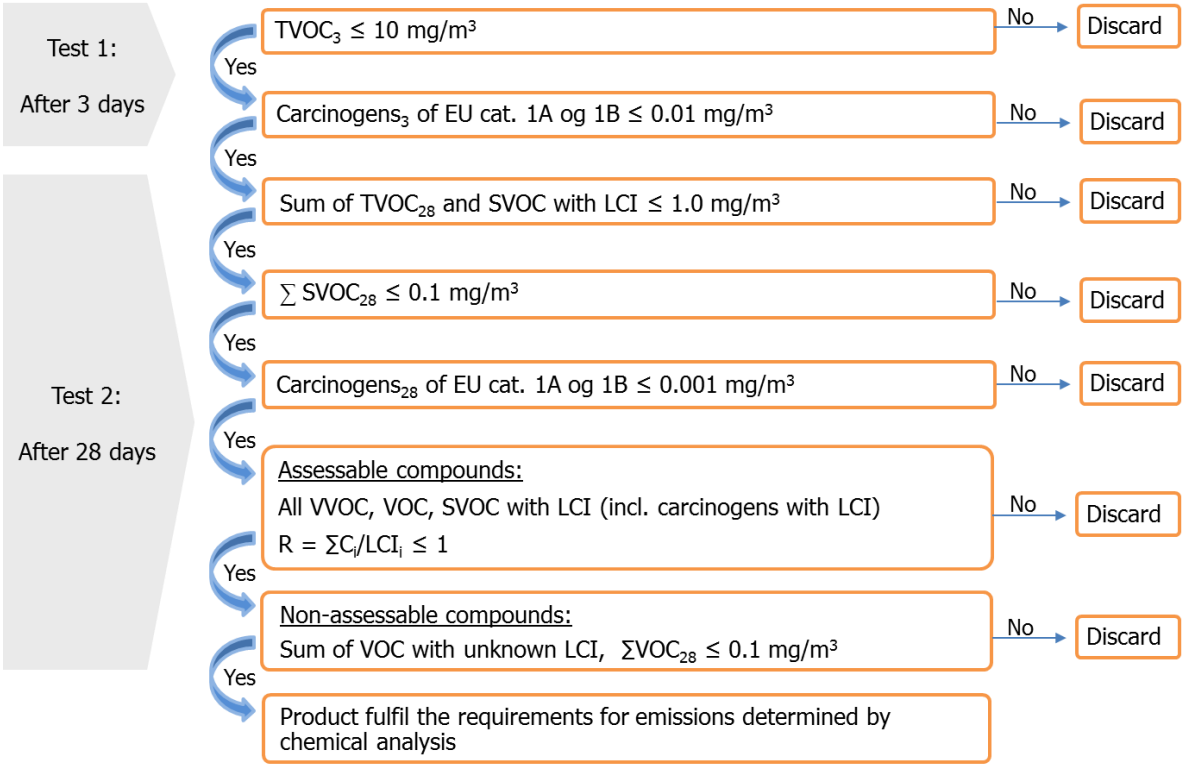

Figure 2 Procedure for testing and evaluation of emissions by chemical analysis

Measurement and testing after 3 days

$TVOC_3$
A product satisfies the criteria, if the TVOC value after 3 days ($TVOC_3$) is ≤ 10 mg/m³.

No carcinogen belonging to EU categories 1A and 1B may exceed a concentration of 0.01 mg/m³.

Excepted from this requirement are certain substances belonging to EU categories 1A or 1B for which a threshold can be derived at which a carcinogenic potential is no longer assumed. For these substances, a LCI value is derived.

Measurement and testing after 28 days

$TVOC_{28}$
The TVOC value is determined again after 28 days ($TVOC_{28}$). This is done in the same way as described for $TVOC_3$.

A product satisfies the criteria, if the $TVOC_{28}$ value is ≤ 1.0 mg/m³. If the $TVOC_{28}$ value is higher, the product cannot obtain a labelling license and is rejected.

Semi Volatile Organic Compounds (SVOC)
The criterion is met if the sum of the SVOC concentrations ($\sum SVOC_{28}$) in the test chamber air after 28 days does not exceed 0.1 mg/m³.

Note: For some SVOC, LCI values are derived. The SVOC for which LCI values are derived must be included in the calculation of the R-value and are *not* included in the $\sum SVOC_{28}$. The sum of

TVOC and the sum of all individual SVOC with LCI value may not exceed a concentration of 1.0 mg/m3 after 28 days.

Very Volatile Organic Compounds (VVOC)
For some VVOC, LCI values are derived. The VVOC for which LCI values are derived must be included in the calculation of the R-value, but are not included in the TVOC value.

Carcinogenic substances
No carcinogen belonging to EU categories 1A and 1B may exceed a concentration of 0.001 mg/m^3 after 28 days.

Excepted from this requirement are certain substances belonging to EU categories 1A or 1B for which a threshold can be derived at which a carcinogenic potential is no longer assumed. For these substances, a LCI value is derived.

Assessable compounds (VVOC, VOC and SVOC with LCI value)
For a large number of volatile organic compounds LCI values are derived. Substances with an LCI value and with a concentration in the reference room air ≥ 5 µg/m³ are evaluated based on LCI. They are quantified using their individual calibration factors.

For the evaluation of each compound *i* the ratio R_i is established as defined in equation (1).

$$R_i = C_i / LCI_i \quad (1)$$

- where C_i is the reference room concentration of compound *i*. For $R_i < 1$, it is assumed that there will be no health effects.

If several compounds with a concentration ≥ 5 µg/m^3 are detected, additivity of the effects is assumed and the individual R_i ratios are summed ad defined in equation (2).

It is required that R, the sum of all R_i ratios, shall not exceed the value 1.

$$R = \sum R_i = \text{sum of all ratios } (C_i / LCI_i) \leq 1 \quad (2)$$

A product which do not fulfil this condition is rejected.

Non-assessable compounds (VOC without LCI value)
A product meets the criterion when the sum of VOC without established LCI value determined at concentrations ≥ 5 µg/m^3 does not exceed 0.1 mg/m³.

A product with a higher emission is rejected.

Determination of emission class

Based on the test results products labelled with the Indoor Climate Label are grouped into one of three emission classes: Class 1, class 2 and class 3. The products with lowest emission fall within class 1 and products with highest emission fall within class 3.

Emission levels associated with the three emission classes are given in figure 3.

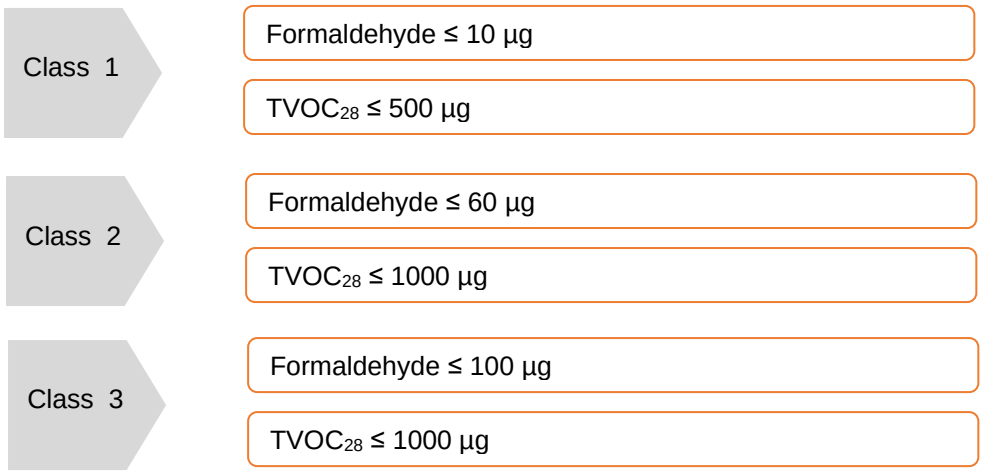

Figure 3 Class 1, 2 and 3 and associated emission levels

8.2 Evaluation of odour assessment

Only a product group with an indoor-relevant time-value lower than or equal to the maximum accepted time-value for the product area in question can obtain a labelling license.

The procedure for odour assessment and evaluation is shown in Figure 4.

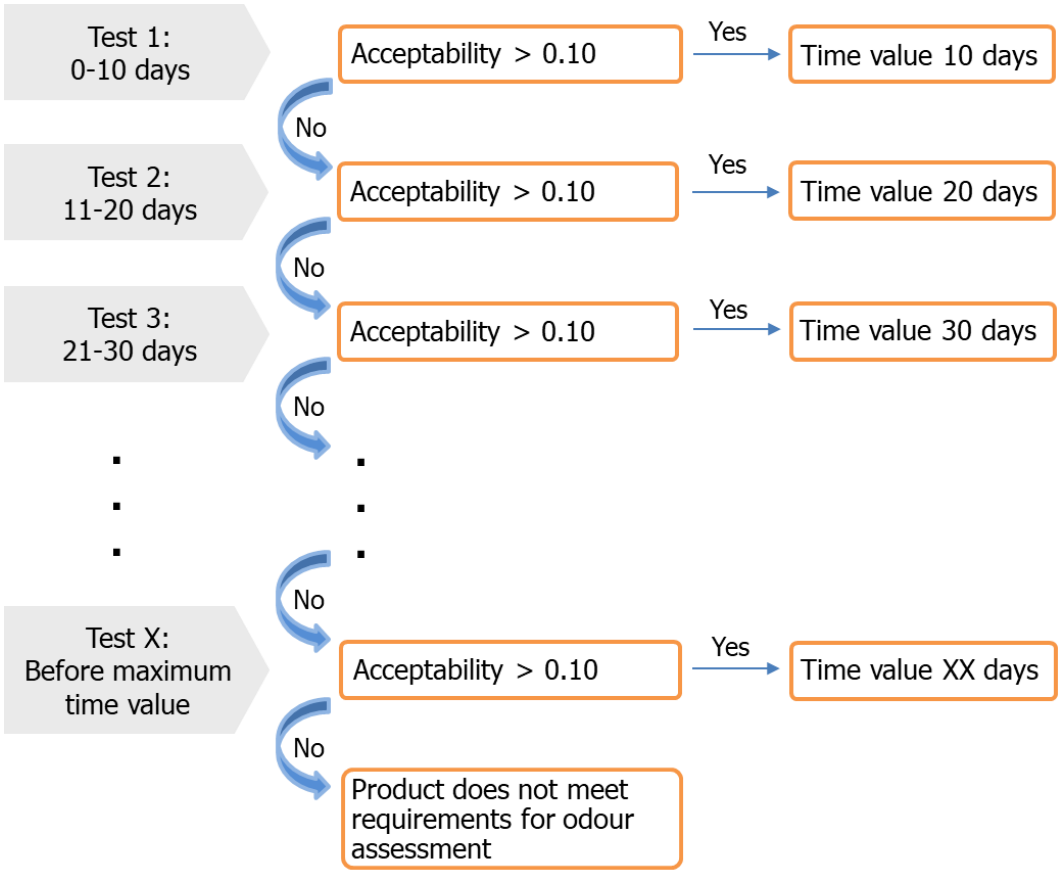

Figure 4 Procedure for odour assessment

The accept criteria for the odour assessment is an arithmetic mean value of the panellists' acceptability votes > 0.10 at any test.

The odour assessment is repeated until the accept criteria is met. The indoor-relevant time-value is determined based on the results of the odour assessment. The time-value is defined as the test time in full days when the accept criteria is met. If this criterion is not fulfilled until the maximum allowed time-value is reached, the odour testing can be terminated. The maximum allowed time-value is stated in the product specific test and labelling criteria.

The result of the odour assessment is given as the time-value rounded up to the nearest value, which can be divided by 10, e.g. 10 days, 20 days etc.

8.3 Evaluation of release of particles including fibres

Only a product group with a release of particles below the maximum threshold for release can obtain a labelling license.

The result is stated as particle release calculated as mg dust per m² after 1, 3 and 15 hours respectively.

The mean value of the measurements after 3 and 15 hours is used for evaluation of the release of particles from the product.

The result is assessed in relation to the classification in 3 classes (see Table 1).

Table 1 Classes for release of particles

Class	**Particle release [mg/m²]**
Low	≤ 0.75
Medium	0.75 < x ≤ 2.00
High	≥ 2.00

Products for which the release of particles is classified as ‘low’ or ‘medium’ can obtain a labelling license.

8.4 Other requirements

Specific supplementary requirements, if any, for a product area appear from the testing and labelling criteria for the product area in question.

8.5 Conclusion

A product which fulfils
- the requirements set out in the flow chart shown in Figure 2
- the requirements set out in the flow chart shown in Figure 3
- the requirement regarding release of particles including fibres, if relevant, and
- any specific requirements appearing from the specific testing and labelling criteria

can obtain a labelling license.