
Barve in laki - Določevanje hlapnih organskih spojin (VOC) in polhlapnih organskih spojin (SVOC) - 2. del: Metoda plinske kromatografije (ISO/DIS 11890-2:2019)

Paints and varnishes - Determination of volatile organic compound (VOC) and semi volatile organic compound (SVOC) content - Part 2: Gas-chromatographic method (ISO/DIS 11890-2:2019)

Beschichtungsstoffe - Bestimmung des Gehaltes an flüchtigen organischen Verbindungen (VOC-Gehalt) und des Gehaltes an halbflüchtigen organischen Verbindungen (SVOC-Gehalt) - Teil 2: Gaschromatographisches Verfahren (ISO/DIS 11890-2:2019)

Peintures et vernis - Détermination de la teneur en composés organiques volatils (COV) et composés organiques semi-volatils (COVS) - Partie 2: Méthode par chromatographie en phase gazeuse (ISO/DIS 11890-2:2019)

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Part 2: Gas-chromatographic method

Peintures et vernis — Détermination de la teneur en composés organiques volatils (COV) et composés organiques semi-volatils (COVS) —

Partie 2: Méthode par chromatographie en phase gazeuse

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*.

This fourth edition cancels and replaces the third edition (ISO 11890-2:2013), which has been technically revised.

The main changes compared to the previous edition are as follows:

- scope expanded to determination of semi volatile organic compounds (SVOC);
- scope expanded to concentration ranges from 0,01% to 100%;
- specifications for determination of semi-volatile organic compounds added;
- standard editorially revised.

A list of all parts in the ISO 11890 series can be found on the ISO website.

Paints and varnishes — Determination of volatile organic compound (VOC) and semi volatile organic compound (SVOC) content —

Part 2: Gas-chromatographic method

WARNING — The use of this document can involve hazardous materials, operations and equipment. This Standard does not purport to address all of the safety problems associated with its use. It is the responsibility of users of this document to take appropriate measures to ensure the safety and health of personnel prior to the application of the standard, and to determine the applicability of any other restrictions for this purpose.

1 Scope

This document is one of a series of standards dealing with the sampling and testing of coating materials and their raw materials.

It specifies a method for the determination of the volatile organic compounds (VOC) content and the semi-volatile organic compounds (SVOC) content of coating materials and their raw materials.

This part is applicable for the determination of VOC and SVOC if the expected VOC and/or SVOC content is greater than 0,01 % by mass up to 100% by mass.

If the VOC content is greater than 15 % by mass, the less complicated method given in ISO 11890-1 may be used. If the system contains VOC and SVOC, the VOC result of ISO 11890-1 may be influenced by SVOC. In this case ISO 11890-2 shall be preferred. For VOC content smaller than 0,1 %, the head space method described in ISO 17895 can be used as an alternative. ISO 11890-1 and ISO 17895 cannot be used for the determination of the SVOC content.

NOTE 1 Some ingredients of coating materials and their raw materials can decompose during analysis and cause artificial VOC and SVOC signals. When determining VOC and SVOC for coating materials and their raw materials, these signals are artefacts of the method and should not be taken into account (examples are given in [Annex B](#)).

This method assumes that the volatile matter is either water or organic. However, other volatile inorganic compounds can be present and might need to be quantified by another suitable method and allowed for in the calculations. The method defined in this standard is not applicable for determination of water content.

NOTE 2 If organic acids or bases and their corresponding salts are present in the coating material or its raw materials, the amount that is quantified by this method may not be accurate due to a change in the acid or base equilibrium.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 760, *Determination of water — Karl Fischer method (General method)*

ISO 1513, *Paints and varnishes — Examination and preparation of test samples*

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ISO 2811-1, *Paints and varnishes — Determination of density — Part 1: Pycnometer method*

ISO 2811-2, *Paints and varnishes — Determination of density — Part 2: Immersed body (plummet) method*

ISO 2811-3, *Paints and varnishes — Determination of density — Part 3: Oscillation method*

ISO 2811-4, *Paints and varnishes — Determination of density — Part 4: Pressure cup method*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <http://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 volatile organic compound VOC

any organic liquid and/or solid that evaporates spontaneously at the prevailing temperature and pressure of the atmosphere with which it is in contact

Note 1 to entry: As to current usage of the term VOC in the field of coating materials, see volatile organic compound content (VOC content, 3.4).

Note 2 to entry: Under US government legislation, the term VOC is restricted solely to those compounds that are photochemically active in the atmosphere (see ASTM D3960). Any other compound is then defined as being an exempt compound.

[SOURCE: ISO 4618:2014, 2.270]

3.2 semi-volatile organic compound SVOC

any organic liquid and/or solid that evaporates spontaneously but slower in comparison to VOC at the prevailing temperature and pressure of the atmosphere with which it is in contact

Note 1 to entry: As to current usage of the term SVOC in the field of coating materials, see semi-volatile organic compound content (SVOC content, 3.5).

3.3 non-volatile organic compound NVOC

any organic liquid and/or solid not classified as *VOC* or *SVOC*

3.4 volatile organic compounds content VOC content VOCC

mass of the *volatile organic compounds* present in a coating material, as determined under specified conditions

Note 1 to entry: The properties and the amounts of the compounds to be taken into account will depend on the field of application of the coating material. For each field of application, the limiting values and the methods of determination or calculation are stipulated by regulations or by agreement.

Note 2 to entry: If the term VOC refers to compounds with a defined maximum boiling point, the compounds considered to be part of the VOC content are those with boiling points below and including that limit, and compounds with higher boiling points are considered to be semi-volatile or non-volatile organic compounds.

[SOURCE: ISO 4618:2014, 2.271 modified — Note 2 to entry has been added.]

3.5

semi-volatile organic compounds content

SVOC content

mass of the *semi-volatile organic compounds* present in a coating material, as determined under specified conditions

Note 1 to entry: The properties and the amounts of the compounds to be taken into account will depend on the field of application of the coating material. For each field of application, the limiting values and the methods of determination or calculation are stipulated by regulations or by agreement.

Note 2 to entry: If the term SVOC refers to compounds with a defined maximum boiling point and minimum boiling point, the compounds considered to be part of the SVOC content are those with boiling points below and including the upper and above the lower limit, and compounds with higher boiling points are considered to be non-volatile organic compounds.

3.6

exempt compound

organic compound that does not participate in atmospheric photochemical reactions

Note 1 to entry: This expression is only relevant in some countries.

3.7

ready for use

state of a product when it is mixed in accordance with the manufacturer's instructions in the correct proportions and thinned if required using the correct thinners so that it is ready for application by the approved method

3.8

internal standard

compound which is not present in the sample, is completely separated from the other components in the chromatogram, is inert with respect to the sample constituents, stable in the required temperature range and of known purity and which is added to the sample to control the dilution and the injection step of the analysis

3.9

surrogate standard

compound of known purity which is used to quantify unidentified VOCs and SVOCs

3.10

marker compound

compound which is used to differentiate between VOC and SVOC, or SVOC and NVOC if the differentiation has to be made on the basis of retention time

3.11

retention time

t_R

time elapsed from injection of the sample component to the recording of the peak maximum

3.12

extraction solvent

liquid used to extract the VOCs and SVOCs from the matrix under investigation

3.13

major peaks

peaks that contribute most to the VOC and/or SVOC content, i. e. peaks $\geq 0,1$ % by mass (as DEA equivalent)

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3.14**minor peaks**

peaks that contribute only to a minor extent to the VOC and/or SVOC content, i. e. <0,1 % by mass (as DEA equivalent)

3.15**reagent**

substance used in chemical/biochemical analysis or other reactions

[SOURCE: ISO 20391-1:2018, 3.19]

4 Principle

After preparation of the sample, the VOCs, SVOCs and NVOCs are separated by a gas chromatographic technique. Either a hot or a cold sample injection system is used, depending on the sample type. Hot injection is the preferred method. After the compounds have been identified, e.g. via GC-MS, they are quantified from the peak areas with respect to their compound specific relative response with the help of an internal standard, via GC-FID. Non-identifiable substances are quantified with respect to a surrogate standard that can be identical to the internal standard. A calculation is performed to give the VOC and/or SVOC content of the sample.

5 Required information

For any particular application, the information required should preferably be agreed between the interested parties and may be derived, in part or totally, from an international or national standard or other document related to the product under test.

The required information can include the following points:

- a) The organic compound(s) to be determined (see [Clause 9](#)).
- b) The experimental conditions to be used (see [Clause 8.5](#)).
- c) The classification criteria for VOC and/or SVOC.
- d) Which of the organic compounds in a) are exempt compounds (if relevant).
- e) The method of calculation to be used (see [Clause 10](#) and [11](#)).

6 Apparatus**6.1 Gas chromatograph**

All of the instrumental parts coming into contact with the test sample shall be made of a material (e.g. glass) which is resistant to the sample and will not change it chemically.

6.2 Sample injection system**6.2.1 General**

Use one of the two types specified in [6.2.2](#) and [6.2.3](#).

6.2.2 Hot-injection system (preferred system)

The instrument shall have a variable-temperature injection block. The injection temperature shall be capable of being set to an accuracy of 1 °C. Standard operating temperature shall be between 250 °C and 280 °C.