
**Natural gas — Organic components
used as odorants — Requirements
and test methods**

*Gaz naturel — Composés organiques utilisés comme odorants —
Exigences et méthodes d'essai*

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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. www.iso.org/directives

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The committee responsible for this document is ISO/TC 193, *Natural gas*.

This second edition cancels and replaces the first edition (ISO 13734:1998), which has been technically revised. It also incorporates the Corrigendum ISO 13734:1998/Corr.1:1999.

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Introduction

Processed natural gas received from suppliers normally has little or no odour. For safety reasons, natural gas is therefore odorized to permit the detection by smell of the gas at very low concentrations in air.

NOTE It is a common requirement that natural gas in air be readily detectable by smell at a concentration of 20 % of the lower flammability limit (LFL). The LFL of natural gas is normally taken as the volume fraction in air of 4 % to 5 %.

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Natural gas — Organic components used as odorants — Requirements and test methods

1 Scope

This International Standard specifies requirements and test methods for organic compounds suitable for odorization of natural gas and natural gas substitutes for public gas supply, hereafter referred to as odorants.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3007:2005, *Petroleum products and crude petroleum — Determination of vapour pressure — Reid method*

ISO 3015:1992, *Petroleum products — Determination of cloud point*

ISO 4256:1996, *Liquefied petroleum gases — Determination of gauge vapour pressure — LPG method*

ISO 4626:1980, *Volatile organic liquids — Determination of boiling range of organic solvents used as raw materials*

ISO 14532, *Natural gas — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14532 (in particular [3.1](#) to [3.4](#)) and the following apply.

3.1

odorization

addition of odorants, normally intensely smelling organic sulfur compounds, to natural gas (normally odourless) to allow the recognition of gas leaks by smell at very low concentration (before a build up to a dangerous gas in air concentration can occur)

Note 1 to entry: Adapted from ISO 14532.

Note 2 to entry: Natural gas is normally odourless. The addition of an odorant to the gas fed into the distribution system for safety reasons permits the detection of the gas by smell at very low concentrations.

3.2

odorant

intensely smelling organic chemical or combination of chemicals added to natural gas at low concentration and capable of imparting a characteristic and distinctive (usually disagreeable) warning odour so gas leaks can be detected at concentrations below their lower flammability limit

[SOURCE: ISO 14532]

3.3
odour character

type of sensation of an odour

[SOURCE: ISO 14532]

Note 1 to entry: Odour character is a qualitative parameter.

3.4
odour intensity

strength of odour perception

[SOURCE: ISO 14532]

3.5
threshold concentration

concentration at which an individual has a probability of 0,5 in perceiving the odour

Note 1 to entry: To detect an odour does not imply that this odour may be identified.

3.6
odour intensity curve

relationship between odour intensity and odorant concentration in air

Note 1 to entry: The odour intensity can only be determined by the human olfactory organ.

3.7
diluent

organic liquid, normally consisting of paraffinic hydrocarbons, used to reduce the concentration of an odorant to a suitable level at which the solution may be injected into the natural gas

3.8
cloud point

temperature at which a cloud of crystals first appears in a liquid when it is cooled under specified conditions

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4 Requirements

4.1 Recommendations of an effective odorant

Gas odorants should meet the following general recommendations:

- a) The gas odorant should have a strong odour at very low concentration.
- b) The odour character of the odorant needs to be unpleasant, distinctive and not confusable with other frequently occurring odours so that it is unmistakably associated with a gas leak.
- c) The odour character should be the same at different dilutions of natural gas with air.
- d) The odorant should be sufficiently stable during storage and when mixed with natural gas.
- e) The volatility of the odorant should be high enough so that the odorant does not appreciably condense under the conditions (temperature and pressure) existing in the pipeline system.
- f) Evaporation of the gas odorant should not appreciably leave residues.
- g) The odorant should be useable at low temperatures, when required.
- h) The combustion of the odorant should not leave significant solid deposits.
- i) The addition of the odorant to natural gas should not make the resulting gas harmful.

These general recommendations should be assessed against the specific conditions of use of the odorant (conditions of the natural gas transportation grid, odorization installation, type of odorant, composition of the gas).

Experience in many countries has shown that these basic requirements are best met by organic sulfur compounds - sulfides (thioethers) and mercaptans (thiols) - with boiling points below 130 °C. Since primary mercaptans are easily oxidized to disulfides which have a much lower odour intensity, mercaptan-based odorants need to predominantly contain secondary and tertiary mercaptans.

While it has been established that the above sulfur compounds fulfil the basic requirements listed above under a) to i), other, non-sulfurous odorants have been developed and are available.

4.2 Composition of odorants

The mass fraction of the declared chemical product in the undiluted odorant shall be at least 95 %. The composition of the odorant, and where applicable the dilution range, shall be declared by the producer or distributor. It shall be stable over the maximum shelf time as declared by the manufacturer.

In sulfur containing odorants, the mass fraction of sulfides (thioethers) or secondary or tertiary mercaptans (thiols) shall be at least 80 %. Primary mercaptans are more easily oxidized than secondary or tertiary mercaptans.

For non-sulfurous odorants based on acrylates, care shall be taken e.g. by use of an appropriate additive to avoid polymerisation.

4.3 Cloud point

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The cloud point of the undried odorant, to be determined in accordance with 6.4, shall be below -30 °C.

4.4 Phase properties

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4.4.1 Boiling point

The boiling point of the components of the odorants and diluent, measured in accordance with 6.5, shall not be higher than 130 °C.

4.4.2 Vapour pressure curve

The vapour pressure curve of the odorant and eventually the diluent shall be given. It shall be determined in accordance with 6.5.

4.5 Evaporation residue

The mass fraction of the evaporation residue, to be determined in accordance with 6.6, shall be less than 0,2 %.

4.6 Insoluble matter

Odorants shall not contain any visible insoluble matter, to be determined in accordance with 6.7.

4.7 Solubility in water

When the odorant is added to water in the way specified in 6.8, less than 2 % by volume of the odorant shall be soluble.