



شرکت ملی گاز ایران - مدیریت پژوهش و فناوری

امور تدوین استانداردها

IGS

Iranian Gas Standards

مشخصات فنی خرید

موادبودار کننده گاز طبیعی مصرفی

Odorant to be used for Odorization of Natural Gas

ابلاغ مصوبه هیأت مدیره

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باسلام.

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FOREWORD

This standard specification is intended to be mainly used by NIGC and contractors and has been prepared on interpretation recognized standards , technical documents , knowledge , backgrounds and experiences in gas industries at national and international levels .

Iranian gas standards (IGS) are prepared , reviewed and amended by technical standard committees within NIGC Standardization division and submitted to the NIGC's "STANDARDS COUNCIL" for approval .

IGS Standards are subject to revision , amendment or withdrawal , if required , thus the latest edition of IGS shall be checked/inquired by NIGC users .

This standard must not be modified or altered by the end users within NIGC and her contractors . Any deviation from normative references and / or well known manufacturers specifications must be reported to Standardization division .

Any comments from concerned parties on NIGC distributed IGS are welcome to technical standards committees and will receive serious attention and consideration should a revision to standards is recommended .

GENERAL DEFINITIONS :

Throughout this standard the following definitions , where applicable , should be followed :

1- "STANDARDIZATION DIV." has been organized to deal with all aspects of industrial standards in NIGC . Therefore , all queries for clarification or amendments are requested to be directed to mentioned div.

2- "COMPANY" : refers to national Iranian gas company .

3- "SUPPLIER" : refers to a firm who will supply the service , equipment or material to IGS specification whether as the prime producer or manufacturer or a trading firm.

4- "SHALL " : is used where a provision is mandatory .

5- "SHOULD" : is used where a provision is advised only .

6- "MAY" : is used where a provision is completely discretionary .

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1. SCOPE

This standard specification covers the minimum requirements for odorant suitable for odorization of natural gas for public gas supply . This standard specification specifies materials , properties , test methods , packaging , handling and storage of odorant .

2. REFERENCES

Throughout this standard specification the following standards are referred to . The editions of these standards that are in effect at the time of issues of this standard specification (2009) shall , to the extent specified herein , form part of this standard specification . The applicability of changes in standards that occur after the date of this standard specification shall be mutually agreed upon by the purchaser and the supplier .

2.1 Normative References

ASTM D 86 (2005) "Standard Method for Distillation of Petroleum Products"

IPS-E-TP-100 (2006) "Engineering Standard for Paints"

ISO 13734 (1998) "Natural Gas – Organic Sulfur Compounds Used as Odorants – Requirements and Test Methods"

ISO 15750-2 (2002) "Packaging – Steel drums – Part 2 : Non-Removable Head (Tight Head) with a Minimum Total Capacity of 212 l , 216.5 l and 230 l"

3. DEFINITIONS

3.1 Odorant

A defined mixture of organic sulfur compounds with strong , persistent and unpleasant odor added to natural gas and can be detected at very low concentration and recognized as a gas smell by most people and distinctive warning odor so gas leaks can be detected at concentrations below their lower flammability limit .

Note : This standard specification covers natural odorant which is generally mixture of parafinic mercaptans , (such as isopropyl mercaptan , normal propyl mercaptan , tertiary butyl mercaptan , normal butyl mercaptan , isobutyl mercaptan) .

Parafinic mercaptan are any of a class of organic chemical compounds having the general formula $C_nH_{2n+1}S$.

Table B – 1 shows specification of mercaptans which are used as gas odorant compounds .

3.2 Cloud Point

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

4. REQUIREMENTS

4.1 Properties

The physical and chemical properties of odorant shall be in accordance with Table 1 when tested in accordance with specified test methods.

TABLE 1. Physical and Chemical Properties of Odorant

| ITEM | CHARACTERISTIC | UNIT | VALUE | TEST METHOD |
|------|---|-------------|---|------------------------|
| 1 | Total Mercaptans including Propyl Mercaptans and Butyl Mercaptans , min | %wt | 95 | ISO 13734 (clause 6.3) |
| 2 | Methyl Mercaptan , max | ppm | 1 | |
| 3 | Ethyl Mercaptan , max | %wt | 1 | |
| 4 | Free Water , max | ppm wt | 1 | |
| 5 | H ₂ S , max | ppm wt | 1 | |
| 6 | Cloud Point , max | °C | -30 | ISO 13734 (clause 6.4) |
| 7 | Initial Boiling Point , min | °C | 55 | ASTM D 86 |
| 8 | Final Boiling Point , max | °C | 64 | ASTM D 86 |
| 9 | Evaporation Residue , max | % | 0.2 | ISO 13734 (clause 6.6) |
| 10 | Insoluble Matter | --- | no contain any visible insoluble matter | ISO 13734 (clause 6.7) |
| 11 | Solubility in Water , max | % by volume | 2 | ISO 13734 (clause 6.8) |

5. DOCUMENTATION

The manufacturer/supplier shall provide sufficient information to identify the odorant and shall supply the technical information as a minimum requirement as follows :

A : ISO 9001: 2008 " CERTIFICATION" for "Design , Manufacturing and Quality Control" of odorant for "odorization of natural gas" issued by an internationally recognized body .

B : Certificate and approval test report from a certifying body for the compatibility with this standard specification .

Note : Certifying body shall be according to approval list by standard council of NIGC .

C : Original technical catalogues , manufacturing product data sheet and application procedure recommendation and guidelines .

D : Material Safety Data Sheet (MSDS) .

E : Filled , signed and stamped data sheet stating in Annex A .

6. QUALITY ASSURANCE

Manufacturer shall operate an effective , documented quality system based on the relevant part of the BS EN ISO 9001:2008 and maintain records identifying the product , date of manufacturing , batch numbers and all results of inspection and testing .

7. INSPECTION AND TESTING

The manufacturer/supplier shall be responsible for carrying out all the tests required by this standard specification , using his own or other reliable facilities , and he shall maintain complete records of all such tests and qualifications . Such records shall be available for review by the purchaser .

The manufacturer/supplier shall furnish to the purchaser a certificate of quality stating that each lot has been sampled , tested , and qualified in accordance with this standard specification and has been found to meet the requirements specified .

An inspection lot shall consist of a batch (or batches) of production processed from the same material components , and offered for inspection at one time .

The manufacturer/supplier shall afford the purchaser's inspector all reasonable facilities required for inspection of each batch of production in accordance with this standard specification . Such inspection in no way relieves the manufacturer/supplier's responsibilities under the term of this standard specification .

The purchaser reserves the right to perform any inspections set forth in this standard specification where such inspections are deemed necessary to assure that supplies and services conform to the prescribed requirements .

The purchaser's inspector reserve the right to have access to the materials subject to inspection for the purpose of witnessing selection of the samples , preparation of the test samples and performance of the test(s) .

For such tests , the inspector reserves the right to indicate the sample(s) from which the quantities will be taken in accordance with the provisions of this standard specification .

8. MARKING

8.1 Marking of Containers

Each container shall be legibly marked at least with following information :

Name and trade mark of manufacturer

Product designation (type and trade name)

Composition

IGS No.

MESC No.

Handling Guidelines

Safety precautions

Storage

Date of Manufacture

Date of expiry

Order No.

Batch No.

Net weight

Gross weight

Manufacturer's address

HMIS (including Health , Fire , Reactivity , Personal Protection , Specified Hazard , etc.)

8.2 Instruction

Supplier shall provide complete sets of instructions for use .

8.3 Precautionary Marking

All individual containers shall be marked with precautionary symbols and/or phrases .

Note : Odorants are irritating , harmful and flammable . Each container shall be marked with following precautions and their symbols :

HIGHLY FLAMMABLE

IRRITANT

SENSITIZER

WITH VAPOURS EXPLOSIVE IN AIR

DANGEROUS FOR THE ENVIRONMENT

9. PACKAGING

9.1 The drums shall be according to Type C ISO 15750-2 and internally coated with minimum 240 microns dry film thickness of epoxy paint system number 7B according to Table 7 IPS-E-TP-100 .

The drums should be 212 liters and not be filled more than 90% by volume and for sealing test , filled drums shall be kept downward for 30 minutes .

The drums shall be dry , clean , without any corrosion , with suitable cap and mechanically withstand .

Caps shall be sealed with types of sealing materials which shall be compatible with liquid odorant and do not swell when in contact with odorant .

Note : PTFE (polytetrafluoroethylene) , FEP (ethylene propylene fluorated) , PFA (perfluoroalkoxy) , PVDF (polyfluorovinylidene) , ETFE (copolymer modified of ethylene and tetrafluoroethylene) , ECTFE (ethylene chlorotri-fluoroethylene) and polyamide 11 are acceptable materials which used for sealing .*

**The names of some trade marks are Teflon , Viton , Fluoral , Kalrez , Chemraz , Rilson .*

The color of drums shall be white and signed with a yellow warning strip . Warning alarms notes with a black specific font and size shall be written on drums body . Warning notes comprises of at least warning sign and specific danger code .

9.2 The drums shall be protected against all damages or defects which may occur during handling and shipment .

Note : This standard specification provides the minimum requirements for drums but ISO containers are also considered . Due to limited available design data , the application of ISO containers requires a certain investigations that is in progress .

10. STORAGE LIFE

The odorant shall meet all requirements of this standard specification at least 24 months from date of delivery .

Note : The temperature range is between -29 °C to +50 °C .

ANNEX A
"Data Sheet for Odorant"

| | |
|---------------------------------|--|
| Manufacturer's name and address | |
| Product designation | |

TABLE A – 1. Physical and Chemical Properties of Odorant

| ITEM | CHARACTERISTIC | UNIT | VALUE | TEST METHOD |
|------|---|------|-------|-------------|
| 1 | Total Mercaptans including Propyl Mercaptans and Butyl Mercaptans | | | |
| 2 | Methyl Mercaptan | | | |
| 3 | Ethyl Mercaptan | | | |
| 4 | Free Water | | | |
| 5 | H ₂ S | | | |
| 6 | Cloud Point | | | |
| 7 | Initial Boiling Point | | | |
| 8 | Final Boiling Point | | | |
| 9 | Evaporation Residue | | | |
| 10 | Insoluble Matter | | | |
| 11 | Solubility in Water | | | |

Notes:

1. This data sheet shall be filled , signed , and stamped by manufacturer/supplier .
2. Any deviation from this standard specification shall clearly be specified by manufacturer/supplier .

| |
|---------------------|
| DEVIATION(S) |
| |

AUTHORIZED SIGNATURE

COMPANY'S STAMP :

ANNEX B
(Informative)

TABLE B – 1. Properties of Sulfur Compounds Used as Odorants

| Sulfur Compound | Formula | Boiling Point °C | Density g/cm ³ | Flash Point °C | Vapour Pressure mmHg | Explosive Limit % in Air |
|--|---|------------------|---------------------------|----------------|----------------------|--------------------------|
| Methyl mercaptan (methanethiol) | CH ₃ SH | 5.96 | 0.87 | -17.8 | 1520 at 26.1 °C | 3.9 – 21.8 |
| Ethyl mercaptan (ethanethiol) | C ₂ H ₅ SH | 36 | 0.84 | 26.6 | 837.8 at 38.7°C | 2.8 – 18.2 |
| Dimethyl sulfide (dimethyl thioether) | SH ₃ SCH ₃ | 37.5 | 0.845 | -17.8 | 775.7 at 38 °C | 2.2 – 19.7 |
| Isopropyl mercaptan (2 – propanethiol) | (CH ₃) ₂ CHSH | 51 – 55 | 0.814 | -34.4 | 455.1 at 37.8 °C | 1.8 |
| Tert . butyl mercaptan (2 – methyl – 2 – propanethiol) | (CH ₃) ₃ CSH | 62 – 67 | 0.79–0.82 | -26.1 | 305.1 at 38 °C | --- |
| N – propyl mercaptan (1 – propanethiol) | C ₃ H ₇ SH | 67 – 73 | 0.84 | -20.5 | 263.7 at 37.8 °C | --- |
| Methyl ethyl sulfide (methyl ethyl thioether) | CH ₃ SC ₂ H ₅ | 66.6 | 0.837 | -15 | 272.0 at 37.8 °C | 1.8 – 13.9 |
| Sec. butyl mercaptan (2 – butanethiol) | CH ₃ CH(SH)C ₂ H ₅ | 73 – 84 | 0.829 | -23.3 | 142.2 at 38 °C | 1.4 |
| Isobutyl mercaptan (2 – methyl – 1 – propanethiol) | (CH ₃) ₂ CHCH ₂ SH | 85 – 95 | 0.836 | -9.4 | 124.0 at 37.8 °C | --- |
| Diethyl sulfide (diethyl thioether) | (C ₂ H ₅) ₂ S | 92 – 93 | 0.837 | -9 | 50.3 at 20 °C | --- |
| N – butyl mercaptan (1 – butanethiol) | C ₄ H ₉ SH | 97.2-101.7 | 0.84 | 1.67 | 82.7 at 38 °C | 1.4 – 11.3 |
| Tetrahydrothiophene (tetramethylene sulfide) | C ₄ H ₈ S | 115–124.4 | 1.0 | 13 | 41.4 at 38 °C | 1.1 – 12.3 |
| N – pentyl mercaptan (1 – pentanethiol) | C ₅ H ₁₁ SH CH ₃ (CH ₂) ₄ SH | 104 – 130 | 0.83–0.84 | 18.3 | 27.4 at 37.7 °C | --- |

ANNEX C (Informative)

This Annex provides the physical and chemical characteristics of two types of odorant (Type A and Type B) which are used for odorization of natural gas in Iran as follows :

TYPE A :

| | |
|---|--|
| Composition as follows | (Chromatographic method) |
| Isopropyl Mercaptan | 80% approx. |
| N – Propyl Mercaptan | 10% max. |
| Tertiary Butyl Mercaptan | 10% approx. |
| Colour | water white |
| KOH insolubles | 3% max. |
| Total Mercaptans | 99% min. of the three given mercaptans |
| Specific gravity at 15.5 °C /15.5 °C | 0.822 (ASTM D 1298) |
| I.B.P. | 52 °C (ASTM D 86) |
| Cloud point | - 32 °C |
| Freezing point | - 40 °C (ASTM D 1015) |
| Vapour pressure 38 °C | 0.5 bars (ASTM D 1250) |
| Flash point open cup (spotleak 1440) | -18 °C estimated |

TYPE B :

Tertiobutyl Mercaptan 80% , Methylethyl Sulfide 20%
(spotleak 1007)
REF : "ATOFINA" (ARKEMA) or approved equivalent

Note : drums shall be legibly marked with :

- Name of chemical
- Date of manufacture
- Order No.
- MESG No.

In 160 kg containers .