



**SLOVENSKI STANDARD**  
**SIST EN 437:2021**

**01-julij-2021**

**Nadomešča:**  
**SIST EN 437:2019**

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**Preskusni plini - Preskusni tlaki - Kategorije naprav**

Test gases - Test pressures - Appliance categories

Prüfgase - Prüfdrücke - Gerätekategorien

Gaz d'essais - Pressions d'essais - Catégories d'appareils

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**Ta slovenski standard je istoveten z: EN 437:2021**

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**ICS:**

27.060.20	Plinski gorilniki	Gas fuel burners
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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 437**

April 2021

ICS 27.060.20; 91.140.40

Supersedes EN 437:2018

English Version

## Test gases - Test pressures - Appliance categories

Gaz d'essais - Pressions d'essais - Catégories  
d'appareils

Prüfgase - Prüfdrücke - Gerätekategorien

This European Standard was approved by CEN on 19 January 2021.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## European foreword

This document (EN 437:2021) has been prepared by Technical Committee CEN/TC 238 “Test gases, test pressures, appliance categories and gas appliance types”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2021, and conflicting national standards shall be withdrawn at the latest by October 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 437:2018.

EN 437 is intended to provide all the CEN Technical Committees preparing standards on gas appliances with definitions for test gases, test pressures and categories of appliances for use by these committees within the limits of the scope defined in Clause 1.

The document seeks to clarify the present situation with respect to test gases, test pressures and appliance categories.

The concern for clarity has led to the elucidation of numerous categories and national situations or conditions. The complexity of the document is likely to increase as new members join the Union.

This document can be considered as an important stage in the harmonization of test gases, test pressures and appliance categories and the quality of information on gas usage in Europe.

In comparison with the previous version, this document incorporates updates of Table 6, Table 7, Table B.4 and some editorial changes.

Annex B gives national situations relating to gases, gas pressures and appliance categories that apply nationally or locally. The information provided is included under the responsibility of the national standardization bodies. The tables of Annex B give the available information. Therefore, Annex B is informative.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

**EN 437:2021 (E)****1 Scope**

This document specifies the test gases, test pressures and categories of appliances relative to the use of gaseous fuels of the first, second and third families. It serves as a reference document in the specific standards for appliances.

The document makes recommendations for the use of the gases and pressures to be applied for the tests of appliances burning gaseous fuels.

NOTE Procedures for tests are given in the corresponding appliance standards. The test gases and the test pressures specified in this standard are in principle intended to be used with all types of appliances.

However, the use of some test gases and test pressures may not be appropriate in the following cases:

- appliances with nominal heat input greater than 300 kW;
- appliances constructed on site;
- appliances in which the final design is influenced by the user;
- appliances constructed for use with high supply pressures (notably direct use of the saturated vapour pressure).

In these cases, the specific appliance standards may specify other test conditions in order to establish compliance with their requirements.

**2 Normative references**

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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.

EN ISO 3166-1:2020, *Codes for the representation of names of countries and their subdivisions - Part 1: Country code (ISO 3166-1:2020)*

EN ISO 6976:2016, *Natural gas - Calculation of calorific values, density, relative density and Wobbe indices from composition (ISO 6976:2016)*

**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:

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

**3.1****gas appliance**

appliance burning gaseous fuels

Note 1 to entry: For the purposes of this standard the term “gaseous fuels” means any fuel which is in a gaseous state at a temperature of 15 °C under an absolute pressure of 1 bar.

**3.2****distributed gas**

gaseous fuel used on the territory of a CEN member

**3.3****test gas**

gases intended for the verification of the operational characteristics of gas appliances

Note 1 to entry: Test gases include reference and limit gases.

**3.4****reference gas**

test gas with which appliances operate under nominal conditions when they are supplied at the corresponding normal pressure

**3.5****limit gas**

test gas representative of the extreme variations in the characteristics of the gases for which appliances have been designed

**3.6****test pressure**

gas pressure used to verify the operational characteristics of gas appliances, consisting of normal and limit pressures

Note 1 to entry: Gas pressure is expressed in millibars (mbar) 1 mbar = 10<sup>2</sup> Pa.

**3.7****normal pressure**

$p_n$

pressure under which the appliances operate in nominal conditions when they are supplied with the corresponding reference gas

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**3.8****limit pressure**

pressure representative of the extreme variations in the appliance supply conditions

Note 1 to entry: Limit pressures comprise a maximum pressure  $p_{\max}$  and a minimum pressure  $p_{\min}$ .

**3.9****pressure couple**

combination of two distinct gas distribution pressures applied by reason of the significant difference existing between the Wobbe indices within a single family or group in which

- the higher pressure corresponds only to gases of low Wobbe index;
- the lower pressure corresponds to gases of high Wobbe index.

Note 1 to entry: The pressure couple is indicated by using the symbol ( $\rightleftharpoons$ ).

**3.10****reference conditions**

conditions which correspond to 15 °C, 1 013, 25 mbar, unless otherwise specified

**3.11****relative density**

$d$

ratio of the masses of equal volumes of dry gas and dry air under the same conditions of temperature and pressure: 15 °C or 0 °C and 1 013, 25 mbar

**EN 437:2021 (E)****3.12****calorific value**

quantity of heat produced by the complete combustion, at a constant pressure equal to 1 013,25 mbar, of a unit volume or mass of gas, the constituents of the combustible mixture being taken at reference conditions and the products of combustion being brought back to the same conditions

Note 1 to entry: A distinction is made between:

- the gross calorific value  $H_g$ : the water produced by combustion is assumed to be condensed;
- the net calorific value  $H_n$ : the water produced by combustion is assumed to be in the vapour state.

Note 2 to entry: The calorific value is expressed:

- either in megajoules per cubic metre ( $\text{MJ}/\text{m}^3$ ) of dry gas under the reference conditions;
- or in megajoules per kilogram ( $\text{MJ}/\text{kg}$ ) of dry gas.

**3.13****Wobbe index**

ratio of the calorific value of a gas per unit volume and the square root of its relative density under the same reference conditions

Note 1 to entry: The Wobbe index is expressed in megajoules per cubic metre ( $\text{MJ}/\text{m}^3$ ) of dry gas under the reference conditions.

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Note 2 to entry: The Wobbe index is said to be gross ( $W_g$ ) or net ( $W_n$ ) according to whether the calorific value used is the gross or net calorific value.

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**3.14****heat input**

$Q$

quantity of energy used in unit time corresponding to the volumetric or mass flow rates, the calorific value used being either the net or gross calorific value

Note 1 to entry: The heat input is expressed in kilowatts (kW).

**3.15****nominal heat input**

$Q_n$

value of the heat input declared by the manufacturer

**3.16****mass flow rate**

$M$

mass of gas consumed by the appliance in unit time during continuous operation

Note 1 to entry: The mass flow rate is expressed in kilograms per hour (kg/h) or grams per hour (g/h).



**3.17****volume flow rate** $V$ 

volume of gas consumed by the appliance in unit time during continuous operation

Note 1 to entry: The volume flow rate is expressed in cubic metres per hour (m<sup>3</sup>/h), litres per minute (l/min), cubic decimetres per hour (dm<sup>3</sup>/h) or cubic decimetres per second (dm<sup>3</sup>/s).

**3.18****gas family**

group of gaseous fuels with similar burning behaviour linked together by a range of Wobbe indices

Note 1 to entry: See Table 1.

**3.19****gas group**

specified range of Wobbe index within that of the family concerned

Note 1 to entry: This range is determined on the general principle that appliances using this gas group operate safely when burning all gases within this range without adjustment.

Note 2 to entry: Adjustment of the appliance may be permitted in accordance with the special national or local conditions that apply in some countries (see B.4). For gases corresponding to national or local conditions, see Tables B.5, B.6 and B.7.

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Note 3 to entry: See Table 1.

**3.20****appliance category**

means of identifying the gas families and/or gas groups for which a gas appliance is designed to operate safely and to the desired performance level

Note 1 to entry: General appliance categories are described in 6.1. Special appliance categories marketed nationally or locally are described in B.4.

Note 2 to entry: See individual appliance standards.

**4 Gases****4.1 Classification in gas families and groups**

Gases are classified into three families, each family may be divided into groups, (themselves being divided into ranges, see Annex B), as a function of the Wobbe index, according to the values given in Table 1.

NOTE 1 See Annex D for more details.

NOTE 2 The classification given in Table 1 is used for the communication of the types of gases and corresponding supply pressures of gaseous fuels used on the territories of Member States.

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**Table 1 — Classification of gas families and groups as a function of the Wobbe indices, dry gas at 15 °C and 1 013,25 mbar**

Gas families and groups	Gross Wobbe index, dry gas at 15 °C and 1 013,25 mbar MJ/m <sup>3</sup>	
	Minimum	Maximum
First family		
— Group a	22,4	24,8
Second family	39,1	54,7
— Group H	45,7	54,7
— Group L	39,1	44,8
— Group E	40,9	54,7
Third family	72,9	87,3
— Group B/P	72,9	87,3
— Group P	72,9	76,8
— Group B	81,8	87,3

## 4.2 Test gases

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The composition and principal characteristics of the different test gases corresponding to the gas families or groups are given in Tables 2 and 3.

In particular cases specified in the individual appliance standards, gas G 24, whose characteristics are given in Table 3, may be used but only at the normal test pressure.

The calorific values of the third family gases, expressed in mega joules per cubic metre in Table 2, may also be expressed in mega joules per kilogram of dry gas, as shown in Table 3.

The values in Tables 2 and 3, measured and expressed at 15 °C, are derived from EN ISO 6976:2016.

The conditions for the preparation of the test gases are given in Annex A.

NOTE The characteristics of second family gases at reference conditions other than 15 °C for metering and 15 °C for combustion can be calculated using the coefficients given in EN ISO 13443:2005, Annex A (normative). As an example, the characteristics of the reference gases of the second family at 0 °C for metering and for combustion and 1 013,25 mbar (dry gas) are given in Table 4.

**Table 2 — Characteristics of the test gases <sup>a</sup> for the first and second families, gas dry at 15 °C and 1 013,25 mbar**

Gas family and Group	Test gases	Designation	Composition by volume % <sup>c</sup>	$W_i$	$H_i$	$W_s$	$H_s$	$d$
				MJ/m <sup>3</sup>	MJ/m <sup>3</sup>	MJ/m <sup>3</sup>	MJ/m <sup>3</sup>	
Gases of the first family <sup>b</sup>								
Group a	Reference gas	G 110	CH <sub>4</sub> = 26	21,76	13,95	24,75	15,87	0,411
	Incomplete combustion, flame lift and sooting limit gas		H <sub>2</sub> = 50 N <sub>2</sub> = 24					
	Light back limit gas	G 112	CH <sub>4</sub> = 17	19,48	11,81	22,36	13,56	0,367
			H <sub>2</sub> = 59 N <sub>2</sub> = 24					
Gases of the second family <sup>b</sup>								
Group H	Reference gas	G 20	CH <sub>4</sub> = 100	45,67	34,02	50,72	37,78	0,555
	Incomplete combustion and sooting limit gas	G 21	CH <sub>4</sub> = 87 C <sub>3</sub> H <sub>8</sub> = 13	49,60	41,01	54,69	45,28	0,684
	Light back limit gas	G 222	CH <sub>4</sub> = 77 H <sub>2</sub> = 23	42,87	28,53	47,87	31,86	0,443
	Flame lift limit gas	G 23	CH <sub>4</sub> = 92,5 N <sub>2</sub> = 7,5	41,11	31,46	45,66	34,95	0,586
	Over heating limit gas <sup>d</sup>	G 24	CH <sub>4</sub> = 68 C <sub>3</sub> H <sub>8</sub> = 12 H <sub>2</sub> = 20	47,01	35,70	52,09	39,55	0,577

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Gas family and Group	Test gases	Designation	Composition by volume	$W_i$	$H_i$	$W_s$	$H_s$	$d$
			% <sup>c</sup>	MJ/m <sup>3</sup>	MJ/m <sup>3</sup>	MJ/m <sup>3</sup>	MJ/m <sup>3</sup>	
Group L	Reference gas light back limit gas	G 25	CH <sub>4</sub> = 86 N <sub>2</sub> = 14	37,38	29,25	41,52	32,49	0,612
	Incomplete combustion and sooting limit gas	G 26	CH <sub>4</sub> = 80 C <sub>3</sub> H <sub>8</sub> = 7 N <sub>2</sub> = 13	40,52	33,36	44,83	36,91	0,678
	Flame lift limit gas	G 27	CH <sub>4</sub> = 82 N <sub>2</sub> = 18	35,17	27,89	39,06	30,98	0,629
Group E	Reference gas	G 20	CH <sub>4</sub> = 100	45,67	34,02	50,72	37,78	0,555
	Incomplete combustion and sooting limit gas	G 21	CH <sub>4</sub> = 87 C <sub>3</sub> H <sub>8</sub> = 13	49,60	41,01	54,69	45,28	0,684
	Light back limit gas	G 222	CH <sub>4</sub> = 77 H <sub>2</sub> = 23	42,87	28,53	47,87	31,86	0,443
	Flame lift limit gas	G 231	CH <sub>4</sub> = 85 N <sub>2</sub> = 15	36,82	28,91	40,90	32,11	0,617
	Over heating limit gas <sup>d</sup>	G 24	CH <sub>4</sub> = 68 C <sub>3</sub> H <sub>8</sub> = 12 H <sub>2</sub> = 20	47,01	35,70	52,09	39,55	0,577

<sup>a</sup> For gases used nationally or locally, see B.5.

<sup>b</sup> For other groups, see B.5.

<sup>c</sup> See also Annex A.

<sup>d</sup> Limit gas used only for certain types of appliance, specified in the individual appliance standards (e.g. fully premixed burners, forced draught burners, ...).

Table 3 — Characteristics of the test gases <sup>a</sup> for the third family, gas dry at 15 °C and 1 013,25 mbar

Gas family and group	Test gases	Designation	Composition by volume % <sup>c</sup>	$W_i$ MJ/m <sup>3</sup>	$H_i$		$W_s$ MJ/m <sup>3</sup>	$H_s$		$d$
					MJ/m <sup>3</sup>	MJ/kg		MJ/m <sup>3</sup>	MJ/kg	
Gases of the third family <sup>b</sup>										
Groups B/ P and B	Reference gas	G 30	n-C <sub>4</sub> H <sub>10</sub> = 50	80,58	116,09	45,65	87,33	125,81	49,47	2,075
	Incomplete combustion and sooting limit gas		i- C <sub>4</sub> H <sub>10</sub> = 50							
	Flame lift limit gas	G 31	C <sub>3</sub> H <sub>8</sub> = 100	70,69	88,00	46,34	76,84	95,65	50,37	1,550
	Light back limit gas	G 32	C <sub>3</sub> H <sub>6</sub> = 100	68,14	82,78	45,77	72,86	88,52	48,94	1,476
Group P	Reference gas, Incomplete combustion, flame lift and sooting limit gas <sup>a</sup>	G 31	C <sub>3</sub> H <sub>8</sub> = 100	70,69	88,00	46,34	76,84	95,65	50,37	1,550
	Light back and sooting limit gas <sup>d</sup>	G 32	C <sub>3</sub> H <sub>6</sub> = 100	68,14	82,78	45,77	72,86	88,52	48,94	1,476

<sup>a</sup> For gases used nationally or locally, see B.5.

<sup>b</sup> For other groups, see B.5.

<sup>c</sup> See also Annex A.

<sup>d</sup> Limit gas used only for certain types of appliance, specified in the individual appliance standards (e.g. fully premixed burners, forced draught burners, ...).

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Table 4 — Characteristics of the reference gases of the second family at 0 °C and 1 013,25 mbar

Gas group	Test gas	Designation	Composition by volume %	$W_i$ MJ/m <sup>3</sup>	$H_i$ MJ/m <sup>3</sup>	$W_s$ MJ/m <sup>3</sup>	$H_s$ MJ/m <sup>3</sup>	$d$
Group H	Reference gas	G 20	CH <sub>4</sub> = 100	48,20	35,90	53,61	39,94	0,555
Group L	Reference gas, light back limit gas	G 25	CH <sub>4</sub> = 86  N <sub>2</sub> = 14	39,45	30,87	43,88	34,34	0,613
Group E	Reference gas	G 20	CH <sub>4</sub> = 100	48,20	35,90	53,61	39,94	0,555

## 5 Test pressures

The values of the test pressures, i.e. the static pressure to be applied at the gas inlet connection to the appliance whilst in operation, are given in Tables 5 and 6.

NOTE The test conditions are specified in the individual appliance standards.

However:

- for the combustion test in still air with G 21 the appliance is first adjusted on G 20 to give an increase of 5 % in the nominal heat input where a gas pressure governor exists, and an increase of 7,5 % in the absence of a governor. Gas G 21 is then substituted for G 20 without altering this adjustment;
- tests for ignition and crosslighting should be carried out at an inlet pressure of 0,7 times the normal pressure ( $p_n$ ) using the reference gas(es) for the first and second families.

Table 5 — Test pressures where no pressure couple exists <sup>a</sup>

Appliance categories having as index	Test gas	$p_n$ mbar	$p_{min}$ mbar	$p_{max}$ mbar
1 <sup>st</sup> family 1a	G 110 G 112	8	6	15
2 <sup>nd</sup> family 2H	G 20, G 21, G 222, G 23	20	17	25
2 <sup>nd</sup> family 2L	G 25, G 26, G 27	25	20	30
2 <sup>nd</sup> family 2E	G 20, G 21, G 222, G 231	20	17	25
2 <sup>nd</sup> family	G 20, G 21, G 222, G 231, G 25, G 26, G 27 <sup>a</sup>	20	17	30
2N <sup>d</sup>	G 25, G 26, G 27	25	20	30
3 <sup>rd</sup> family 3B/P	G 30, G 31, G 32	29 <sup>b</sup>	25	35
	G 30, G 31, G 32	50	42,5	57,5
3 <sup>rd</sup> family, 3P	G 31, G 32	30	25	35
3 <sup>rd</sup> family 3P	G 31, G 32	37	25	45
	G 31, G 32	50	42,5	57,5
3 <sup>rd</sup> family 3B <sup>c</sup>	G 30, G 31, G 32	29	20	35

<sup>a</sup> For test pressures corresponding to gases distributed nationally or locally, refer to Table B.5.

<sup>b</sup> Appliances of this category may be used, without adjustment, at the specified supply pressures of 28 mbar to 30 mbar.

<sup>c</sup> The tests with G 31 and G 32 are carried out at the normal pressure only ( $p_n = 29$  mbar), these test gases being more severe than any gas distributed. This condition covers the normal variations in the gas supply.

<sup>d</sup> See definition in 6.1.2.3.