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Types of gas and the corresponding supply pressures according to Article 4(1) of Regulation (EU) 2016/426 of the European Parliament and of the Council on appliances burning gaseous fuels and repealing Directive 2009/142/EC (*This publication is based on information received by the Commission from the Member States*) .....

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## IV

(Notices)

## NOTICES FROM MEMBER STATES

**Types of gas and the corresponding supply pressures according to Article 4(1) of Regulation (EU) 2016/426 of the European Parliament and of the Council on appliances burning gaseous fuels and repealing Directive 2009/142/EC**

(This publication is based on information received by the Commission from the Member States)

(2018/C 206/01)

## BELGIUM

Belgium								
Gas Family	2 <sup>nd</sup> Family				3 <sup>rd</sup> Family			
Gas Group	Group L		Group H		Group B		Group P	
	minimum	maximum	minimum	maximum	minimum	maximum	minimum	maximum
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	32,54	36,70	32,81	43,69	—	—	—	—
Wobbe index [MJ/m <sup>3</sup> ]	41,65	44,49	46,61	53,91	87,50 <sup>(a)</sup>		77,26 <sup>(b)</sup>	

Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )
N <sub>2</sub> + CO <sub>2</sub> content	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )
CO content	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )
Unsaturated HC content	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	0	25	0	25
Hydrogen content	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )
Information on toxic components contained in the gaseous fuel	—		—		—		—	

Belgium								
Gas Family	2 <sup>nd</sup> Family				3 <sup>rd</sup> Family			
Gas Group	Group L		Group H		Group B		Group P	
	minimum	maximum	minimum	maximum	minimum	maximum	minimum	maximum

Supply pressure:

	min	nom	max	min	nom	max	min	nom	max	min	nom	max
Supply pressure at the inlet of appliances [mbar]	18	25	30	15	20	25	20	28 – 30	35	25 42,5 <sup>(d)</sup>	37 50 <sup>(d)</sup>	45 57,5 <sup>(d)</sup>

Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C											
Volume measurement reference temperature [°C]	15 °C											
Volume measurement reference pressure [mbar]	1 013,25 mbar											

<sup>(a)</sup> Commercial butane as described in the Royal Decree of 20 December 1999;<sup>(b)</sup> Commercial propane as described in the Royal Decree of 20 December 1999;<sup>(c)</sup> Not regulated;<sup>(d)</sup> Only for certain non-domestic appliances (catering etc.).

## BULGARIA

Bulgaria				
Gas Family	2 <sup>nd</sup> Family <sup>(a)</sup>		3 <sup>rd</sup> Family <sup>(d)</sup>	
Gas Group	Group H		Group B/P	
	minimum	maximum	minimum	maximum
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	36	45,7	94	—
Wobbe index [MJ/m <sup>3</sup> ]	45,7	54,7	79,94	86,84

Gas composition by volume in % of the total content:

	minimum	maximum	minimum	maximum
C <sub>1</sub> to C <sub>5</sub> content (sum)	92	100	—	100
N <sub>2</sub> + CO <sub>2</sub> content	0	3	<sup>(b)</sup>	<sup>(b)</sup>
CO content	<sup>(b)</sup>	<sup>(b)</sup>	<sup>(b)</sup>	<sup>(b)</sup>

Bulgaria				
Gas Family	2 <sup>nd</sup> Family <sup>(a)</sup>		3 <sup>rd</sup> Family <sup>(d)</sup>	
Gas Group	Group H		Group B/P	
	minimum	maximum	minimum	maximum
Unsaturated HC content	<sup>(b)</sup>	<sup>(b)</sup>	<sup>(b)</sup>	<sup>(b)</sup>
Hydrogen content	<sup>(b)</sup>	<sup>(b)</sup>	<sup>(b)</sup>	<sup>(b)</sup>
Information on toxic components contained in the gaseous fuel	<sup>(b)</sup>		<sup>(b)</sup>	

## Supply pressure:

	min	nom	max	min	nom	max
Supply pressure at the inlet of appliances [mbar]	17	20	25	30	30 <sup>(e)</sup> /50	2 000
Supply pressure at the point of delivery [mbar]	22	—	130	2 000	—	16 000
admissible pressure loss in the end-user gas installation [mbar]	1	3	<sup>(c)</sup>	<sup>(f)</sup>	<sup>(f)</sup>	<sup>(f)</sup>

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C
Volume measurement reference pressure [mbar]	1 013,25 mbar

<sup>(a)</sup> Source: Bulgarian Natural Gas Association;<sup>(b)</sup> No data available;<sup>(c)</sup> At 130 mbar supply pressure at delivery point pressure losses are not specified. Required flow rate shall be below 6 m/s;<sup>(d)</sup> Source: Bulgarian Petrol and Gas Association;<sup>(e)</sup> Indicated value corresponds to the traditionally distributed pressure regulators in Bulgaria. Nominal value of 50 mbar is also allowable as an option;<sup>(f)</sup> Depends on the installation. The question is not relevant.

## CZECH REPUBLIC

Czech Republic				
Gas Family	2 <sup>nd</sup> Family		3 <sup>rd</sup> Family	
Gas Group	Group H		Group B/P	
	minimum	maximum	minimum	maximum
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	33,8	42,5	101,8	134
Wobbe index [MJ/m <sup>3</sup> ]	45,7	52,2	82,6	94,7

## Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	92 – 99,5	100
N <sub>2</sub> + CO <sub>2</sub> content	0,5 – 8	0
CO content	0	0

Czech Republic				
Gas Family	2 <sup>nd</sup> Family		3 <sup>rd</sup> Family	
Gas Group	Group H		Group B/P	
	minimum	maximum	minimum	maximum
Unsaturated HC content	0		0 – 65	
Hydrogen content	0		0	
Information on toxic components contained in the gaseous fuel	—		—	

Supply pressure:

	min	nom	max	min	nom	max
Supply pressure at the inlet of appliances [mbar]	17	20	25	25	30	35

Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C
Volume measurement reference pressure [mbar]	1 013,25 mbar

## DENMARK

Denmark						
Gas Family	1 <sup>st</sup> Family		2 <sup>nd</sup> Family		3 <sup>rd</sup> Family	
Gas Group	Group a <sup>(a)</sup>		Group H		Group B/P	
	minimum	maximum	minimum	maximum	minimum	maximum
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	<sup>(b)</sup>	<sup>(b)</sup>	<sup>(g)</sup>	<sup>(g)</sup>	<sup>(b)</sup>	<sup>(b)</sup>
Wobbe index [MJ/m <sup>3</sup> ]	22,37	24,84	48,12 <sup>(h)</sup>	52,90 <sup>(h)</sup>	72,90 <sup>(i)</sup>	87,31 <sup>(i)</sup>

Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>
N <sub>2</sub> + CO <sub>2</sub> content	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>
CO content	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>
Unsaturated HC content	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>
Hydrogen content	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>

## Denmark

Gas Family	1 <sup>st</sup> Family		2 <sup>nd</sup> Family		3 <sup>rd</sup> Family	
Gas Group	Group a <sup>(a)</sup>		Group H		Group B/P	
	minimum	maximum	minimum	maximum	minimum	maximum
Information on toxic components contained in the gaseous fuel <sup>(d)</sup>	0	H <sub>2</sub> S and COS <sup>(e)</sup> : 5 mg/m <sup>3</sup> ; Mercaptan <sup>(e)</sup> : 5 mg/m <sup>3</sup> ; S: 30 mg/m <sup>3</sup>	0	H <sub>2</sub> S and COS <sup>(e)</sup> : 5 mg/m <sup>3</sup> ; Mercaptan <sup>(e)</sup> : 5 mg/m <sup>3</sup> ; S: 30 mg/m <sup>3</sup>	—	—

## Supply pressure:

	min	nom	max	min	nom	max	min	nom	max
Supply pressure at the inlet of appliances [mbar]	6	8	15	17	20	25	25	30	35
Supply pressure at the point of delivery [mbar]	<sup>(f)</sup>	<sup>(f)</sup>	<sup>(f)</sup>	<sup>(f)</sup>	<sup>(f)</sup>	<sup>(f)</sup>	<sup>(e)</sup>	30	<sup>(e)</sup>
Admissible pressure loss in the end-user gas installation [mbar]	<sup>(e)</sup>	<sup>(e)</sup>	2	<sup>(e)</sup>	<sup>(e)</sup>	2	<sup>(e)</sup>	<sup>(e)</sup>	2

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C
Volume measurement reference pressure [mbar]	1,013 bar

<sup>(a)</sup> Town gas in Denmark is composed of a mixture of natural gas and air;

<sup>(b)</sup> Gross calorific value is not regulated by the Danish Safety technology Authority;

<sup>(c)</sup> Not regulated;

<sup>(d)</sup> The values listed are all without sulphur from odorant;

<sup>(e)</sup> Measured as sulphur;

<sup>(f)</sup> Supply pressure at the point of delivery is decided by the local town gas distributors;

<sup>(g)</sup> Gross calorific value is not regulated by the Danish Safety Technology Authority but by regulation the relative density of natural gas shall be within 0,555 and 0,7;

<sup>(h)</sup> Abnormal supply conditions: provided that the Danish Safety Technology Authority has approved a special contingency plan allowing supply in an abnormal supply range, the Wobbe index can be between 47,44 and 48,12 MJ/m<sup>3</sup>;

<sup>(i)</sup> Supply pressure at the point of delivery is decided by the local natural gas distributors;

<sup>(j)</sup> Gases in the 3<sup>rd</sup> family must always comply with the international standard ISO 9162.

## GERMANY

## Germany

Gas Family	2 <sup>nd</sup>				3 <sup>rd</sup>			
Gas Group	Group H		Group L		Group P		Group B	
	Min	Max	Min	Max	Min	Max	Min	Max
Gross calorific value (GCV) [MJ/m <sup>3</sup> ]	34,5	44,7	28,7	38,6	101,2 <sup>(d)</sup>		133,8 <sup>(d)</sup>	
Wobbe index [MJ/m <sup>3</sup> ]	46,50 <sup>(a)</sup>	53,60	37,60 <sup>(b)</sup>	44,40	72,90 <sup>(e)</sup>	87,30 <sup>(e)</sup>	81,80	87,30

Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	—	100	—	100	—	100	—	100
N <sub>2</sub> + CO <sub>2</sub> content	2,5	4		—		—		—
CO content	—		—		—		—	
Unsaturated HC content	—		—		10 %		10 %	
Hydrogen content	0	0,2 – 10	0	0,2 – 10	0	0,2 <sup>(f)</sup>	0	0,2 <sup>(f)</sup>
Information on toxic components contained in the gaseous fuel	—	H <sub>2</sub> S and COS: 5 mg/m <sup>3</sup>	—	H <sub>2</sub> S and COS: 5 mg/m <sup>3</sup>	—	H <sub>2</sub> S: technically free / S from COS: 5 mg/kg	—	H <sub>2</sub> S: technically free/ S from COS: 5 mg/kg

Supply pressure:

	Minimum	Nominal	Maximum	Minimum	Nominal	Maximum	Minimum	Nominal	Maximum	Minimum	Nominal	Maximum
Supply pressure at the inlet of appliances [mbar]:	18	20	25	18	20	25	42,5	50	57,5	42,5	50	57,5
Supply pressure at the point of delivery [mbar]	20	23	25,3	20	23	25,3	42,5	50	57,5	42,5	50	57,5
Admissible pressure loss in the end-user gas installation [mbar]	3 (°)			3 (°)			5 (°)			5 (°)		

Reference conditions for Wobbe index and gross calorific value:

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C



## Germany

Gas Family	2 <sup>nd</sup>				3 <sup>rd</sup>			
Gas Group	Group H		Group L		Group P		Group B	
	Min	Max	Min	Max	Min	Max	Min	Max
Volume measurement reference pressure [mbar]	1 013,25 mbar							

(<sup>a</sup>) Group H: For suitable gas appliances (e.g. appliance category I2E), shortfalls in the Wobbe index down to  $WS_n = 43,2 \text{ MJ/m}^3$  (12,0 kWh/m<sup>3</sup>) can be tolerated for limited periods of time in order to avoid supply shortages, with the appliance setting remaining unchanged at  $WS_n = 54,0 \text{ MJ/m}^3$  (15,0 kWh/m<sup>3</sup>). (40,95 MJ/m<sup>3</sup> (15 °C));

(<sup>b</sup>) Group L: For suitable gas appliances (e.g. appliance category I2ELL), shortfalls in the Wobbe index down to  $WS_n = 36,0 \text{ MJ/m}^3$  (10,0 kWh/m<sup>3</sup>) can be tolerated for limited periods of time in order to use natural gases which are rich in inert gases, with the appliance setting remaining unchanged at  $WS_n = 44,6 \text{ MJ/m}^3$  (12,4 kWh/m<sup>3</sup>). (34,13 MJ/m<sup>3</sup> (15 °C ));

(<sup>c</sup>) Domestic or similar use only; deviations possible for commerce or industry;

(<sup>d</sup>) Nominal;

(<sup>e</sup>) Only from stationary tank;

(<sup>f</sup>) Hydrogen, nitrogen, oxygen and methane.

## SPAIN

## Spain

Gas family	Second		Third			
Gas group	Group H		Group P		Group B	
	minimum	maximum	minimum	maximum	minimum	maximum
Gross calorific value (GCV) [MJ/m <sup>3</sup> ]	31,86	45,28	95,65	101,68	119,78	126,1
Wobbe index [MJ/m <sup>3</sup> ]	45,66	54,76	76,61	78,94	85,23	87,43

## Gas composition by volume in % of the total content:

	(a)		(i)			
C <sub>1</sub> to C <sub>5</sub> content and traces of C <sub>6+</sub> in % (sum)	(b)	100 ( <sup>c</sup> )	—	—	—	—
C <sub>2</sub> content in %	—	—	0	2,5	0	2
C <sub>3</sub> content in %	—	—	80	100	0	20
C <sub>4</sub> content in %	—	—	0	20	80	100
C <sub>5</sub> content in %	—	—	0	1,5	0	1,5
N <sub>2</sub> + CO <sub>2</sub> content in %	0	2,5 ( <sup>d</sup> )	—	—	—	—
CO content in %	0 ( <sup>e</sup> ) 0 ( <sup>f</sup> )	0 ( <sup>e</sup> ) 2 ( <sup>f</sup> )	—	—	—	—
Unsaturated HC content in %	(g)		0 ( <sup>k</sup> ) 0 ppm ( <sup>l</sup> )	35 ( <sup>k</sup> ) 1 000 ppm ( <sup>l</sup> )	0 ( <sup>k</sup> ) 0 ppm ( <sup>l</sup> )	20 ( <sup>k</sup> ) 1 000 ppm ( <sup>l</sup> )

Spain						
Gas family	Second		Third			
Gas group	Group H		Group P		Group B	
	minimum	maximum	minimum	maximum	minimum	maximum
Hydrogen content in %	0 <sup>(e)</sup> 0 <sup>(f)</sup>	0 <sup>(e)</sup> 5 <sup>(f)</sup>	—	—	—	—

Information on toxic components contained in the gaseous fuel:

	<sup>(h)</sup>	<sup>(m)</sup>
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Supply pressure:

	minimum <sup>(i)</sup>	nominal <sup>(i)</sup>	maximum <sup>(i)</sup>	minimum <sup>(i)</sup>	nominal <sup>(i)</sup>	maximum <sup>(i)</sup>	minimum <sup>(i)</sup>	nominal <sup>(i)</sup>	maximum <sup>(i)</sup>
Supply pressure at the inlet of appliances [mbar]	17	20	25	20 <sup>(n)</sup> 42,5 <sup>(o)</sup> 25 <sup>(p)</sup> 20/25/ 42,5 <sup>(q)</sup>	(28–30) 37 <sup>(n)</sup> 50 <sup>(o)</sup> 37 <sup>(p)</sup> 29/37/ 50 <sup>(q)</sup>	45 <sup>(n)</sup> 57,5 <sup>(o)</sup> 45 <sup>(p)</sup> 35/45/ 57,5 <sup>(q)</sup>	20 <sup>(n)</sup> 20 <sup>(i)</sup> 20/25/ 42,5 <sup>(q)</sup>	(28–30) 37 <sup>(n)</sup> 29 <sup>(i)</sup> 29/37/ 50 <sup>(q)</sup>	45 <sup>(n)</sup> 35 <sup>(i)</sup> 35/45/ 57,5 <sup>(q)</sup>

The reference conditions for Wobbe index and gross calorific value shall be the following:

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C
Volume measurement reference pressure [mbar]	1,01325 bar

<sup>(a)</sup> Based on the Detailed Protocol of the standards for the technical management of the gas system PD-01 'Measurement, Quality and Odourisation of Gas';

<sup>(b)</sup> Undefined minimum, which allows for compliance with the minima GCV and WI;

<sup>(c)</sup> Must not exceed that which allows for compliance with the maxima GCV and WI;

<sup>(d)</sup> For CO<sub>2</sub>. For mixtures, which allows for compliance with the minima GCV and WI;

<sup>(e)</sup> In natural gas;

<sup>(f)</sup> In gases of unconventional origin (Table 4 of PD-01);

<sup>(g)</sup> Not defined. Allows for compliance with a maximum dew point of + 5°C between 1 and 70 bar;

<sup>(h)</sup> Natural gas must not contain toxic components;

<sup>(i)</sup> In the case of appliances intended for non-domestic use, the pressure may vary depending on the operating mode of the appliance (all-nothing, all-little-nothing or modulating), in line with the indications in the manufacturer's instruction manual;

<sup>(j)</sup> Composition of the gas legally defined in Royal Decree 61/2006 of 31 January 2006 laying down the specifications for petrol, diesel and liquefied petroleum gas and regulating the use of certain biofuels;

<sup>(k)</sup> Total olefins;

<sup>(l)</sup> Diolefins + Acetylene;

<sup>(m)</sup> LPG must not contain toxic components;

<sup>(n)</sup> Appliance category 3+;

<sup>(o)</sup> Appliance category 3P(50);

<sup>(p)</sup> Appliance category 3P(37);

<sup>(q)</sup> Appliance category 3R;

<sup>(r)</sup> Appliance category 3B.

## FRANCE

France [Table I]

Gas Family	1 <sup>st</sup> Family				2 <sup>nd</sup> Family			
Gas Group	Group c				Group H		Group L	
	min	max	min	max	min	max	min	max
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	24,27 <sup>(a)</sup>		25,93 <sup>(a)</sup>		37,16	44,45	32,99	36,47
Wobbe index [MJ/m <sup>3</sup> ]	26,5 <sup>(a)</sup>		23,9 <sup>(a)</sup>		46,55	53,58	40,99	44,57

## Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	( <sup>b</sup> )	~ 21	( <sup>b</sup> )	( <sup>b</sup> )
N <sub>2</sub> + CO <sub>2</sub> content	( <sup>b</sup> )	0	CO <sub>2</sub> < 3,5 CO <sub>2</sub> < 2,5 <sup>(c)</sup>	CO <sub>2</sub> < 11,7 CO <sub>2</sub> < 2,5 <sup>(c)</sup>
CO content	( <sup>b</sup> )	0	< 2	< 2
Unsaturated HC content	( <sup>b</sup> )	0	( <sup>b</sup> )	( <sup>b</sup> )
Hydrogen content	( <sup>b</sup> )	0	< 6	< 6
Information on toxic components contained in the gaseous fuel	( <sup>b</sup> )	( <sup>b</sup> )	Hg < 1 mg/m <sup>3</sup> Cl < 1 mg/ m <sup>3</sup> F < 10 mg/m <sup>3</sup>	Hg < 1 mg/m <sup>3</sup> Cl < 1 mg/ m <sup>3</sup> F < 10 mg/m <sup>3</sup>

## Supply pressure:

	min	nom	max	min	nom	max	min	nom	max	min	nom	max
Supply pressure at the inlet of appliances [mbar]	6	8	15	6	8	15	17	20	25	20	25	30
Supply pressure at the point of delivery [mbar]	—	—	—	—	—	—	—	—	—	—	—	—
Admissible pressure loss in the end-user gas installation [mbar]	—			—			—			—		

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C
Volume measurement reference pressure [mbar]	1 013,25 mbar

France [Table II]

Gas Family	3 <sup>rd</sup> Family					
Gas Group	Group P		Group B		Group B/P	
	min	max	min	max	min	max
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	97	104	124	134	97	134
Wobbe index [MJ/m <sup>3</sup> ]	79	82	89	93	75,46	85,22

Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	99	100	99	100	99	100
N <sub>2</sub> + CO <sub>2</sub> content	< 0,5		< 0,5		< 0,5	
CO content	< 0,5		< 0,5		< 0,5	
Unsaturated HC content	0,05	50	0,05	50	0,05	50
Hydrogen content	< 0,5		< 0,5		< 0,5	
Information on toxic components contained in the gaseous fuel	0		0		0	

Supply pressure:

	min	nom	max	min	nom	max	min	nom	max
Supply pressure at the inlet of appliances [mbar]	25 42,5 <sup>(d)</sup> 100 <sup>(d)</sup>	37 50 <sup>(d)</sup> 148 <sup>(d)</sup>	45 57,5 <sup>(d)</sup> 180 <sup>(d)</sup>	20 60 <sup>(d)</sup>	28–30 112 <sup>(d)</sup>	35 140 <sup>(d)</sup>	25	28–30	35
Supply pressure at the point of delivery [mbar]	—	—	—	—	—	—	—	—	—
Admissible pressure loss in the end-user gas installation [mbar]	—			—			—		

Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C
Volume measurement reference pressure [mbar]	1 013,25 mbar

<sup>(a)</sup> Average value;<sup>(b)</sup> Not available;<sup>(c)</sup> If connected to a transmission network;<sup>(d)</sup> Only for some non-domestic appliances.

## CROATIA

## Croatia

Gas Family	2 <sup>nd</sup> Family		3 <sup>rd</sup> Family			
Gas Group	Group H		Group B/P		Group P	
	minimum	maximum	minimum	maximum	minimum	maximum
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	37	45,9	97,99	123,8	97,99	123,8
Wobbe index [MJ/m <sup>3</sup> ]	45,9	56,92	72,5	91,58	72,5	91,58

## Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	85	98	95	99	95	99
N <sub>2</sub> + CO <sub>2</sub> content	0	7	0	9,8	—	
CO content	—		—	—	—	
Unsaturated HC content	0		—	—	—	
hydrogen content	0		0		0	

## Information on toxic components contained in the gaseous fuel

H <sub>2</sub> S+COS [mg/m <sup>3</sup> ]	0	5	0	13,9	—	
S [mg/m <sup>3</sup> ]	0	30	0	38	—	
*RHS toxins [mg/m <sup>3</sup> ]	—	6 <sup>(a)</sup>	—		—	

## Supply pressure:

	min	nom	max	min	nom	max	min	nom	max
Supply pressure at the point of delivery [mbar]	22	22	50	22	30	37	22	37	50
Admissible pressure loss in the end-user gas installation [mbar]	5	0	8	—	0	—	—	0	—

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C								
Volume measurement reference temperature [°C]	15 °C								
Volume measurement reference pressure [mbar]	1 013,25 mbar								

<sup>(a)</sup> This data is an experiential figure defined as a limit value from the practical experience. The standard on the quality of gas fuels does not contain references to RHS toxins [mg/m<sup>3</sup>].

## CYPRUS

## Cyprus

Gas Family	3 <sup>rd</sup> Family	
Gas Group		
	minimum	maximum
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	<sup>(a)</sup>	<sup>(a)</sup>
Wobbe index [MJ/m <sup>3</sup> ]	85,9 <sup>(b)</sup> 80,2 <sup>(c)</sup>	85,9 <sup>(b)</sup> 80,2 <sup>(c)</sup>

Gas composition by volume in % of the total content <sup>(d)</sup>:

C <sub>1</sub>	—	
C <sub>2</sub>	1,0	1,0
C <sub>3</sub>	38,2	38,2
C <sub>4</sub>	60,1	60,1
C <sub>5</sub>	0,7	0,7
N <sub>2</sub> + CO <sub>2</sub> content	<sup>(a)</sup>	
CO content	<sup>(a)</sup>	
Unsaturated HC content	0,03	42,78
Hydrogen content	<sup>(a)</sup>	
Information on toxic components contained in the gaseous fuel	<sup>(a)</sup>	

## Supply pressure:

	min	nom	max
Supply pressure at the inlet of appliances <sup>(e)</sup> [mbar]	—	—	50 <sup>(f)</sup> 100 <sup>(g)</sup> 100 <sup>(h)</sup> 300 <sup>(i)</sup> 50 <sup>(j)</sup> 100 <sup>(k)</sup> 50 <sup>(l)</sup> 300 <sup>(m)</sup>
Supply pressure at the point of delivery [mbar]	<sup>(a)</sup>		
admissible pressure loss in the end-user gas installation [mbar]	<sup>(a)</sup>		

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C
Volume measurement reference pressure [mbar]	1 013,25 mbar

<sup>(a)</sup> Not specified;<sup>(b)</sup> LPG with 100 % Butane;

- (c) LPG with 60 % Propane and 40 % butane;  
 (d) Average LPG content by volume for 2017;  
 (e) The maximum allowable operating pressure of LPG pipes within a building, depending on its usage, should not exceed the limits provided, unless the gas burning devices have been certified by the manufacturer for higher pressures and after inspection by an Inspector of the Department of Labour Inspection;  
 (f) Gas burning devices with connection pressure up to 50 mbar;  
 (g) Central heating boiler rooms;  
 (h) Large building boiler rooms, hospitals, hotels, etc. of total supply up to 300 kg/h;  
 (i) Large building boiler rooms, hospitals, hotels, etc. of total supply exceeding 300 kg/h;  
 (j) Commercial kitchens;  
 (k) Other commercial appliances;  
 (l) Academic laboratories;  
 (m) Research laboratories.

## LATVIA

Latvia				
Gas Family	2 <sup>nd</sup> Family		3 <sup>rd</sup> Family	
Gas Group	Group H		Group B/P	
	minimum	maximum	minimum	maximum
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	31,82	34,87	101,27	110,02
Wobbe index [MJ/m <sup>3</sup> ]	47,02	51,98	76,7	83,3

## Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	96,5	98,5	98,8	
N <sub>2</sub> + CO <sub>2</sub> content	~ 1		0	1
CO content	~ 0,36		0	1
Unsaturated HC content	0,06	0,07	0	1
Hydrogen content	0,06	0,07	0	1
Information on toxic components contained in the gaseous fuel	—		—	

## Supply pressure:

	min	nom	max	min	nom	max
Supply pressure at the inlet of appliances [mbar]	17	20	25	20	30	45
Supply pressure at the point of delivery [mbar]	17	20	25	20	30	45
Admissible pressure loss in the end-user gas installation [mbar]	0	0,5	1	0	0,5	1

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	20 °C <sup>(a)</sup>	15 °C
Volume measurement reference temperature [°C]	20 °C <sup>(a)</sup>	15 °C
Volume measurement reference pressure [mbar]	1 013,25 mbar	1 013,25 mbar

<sup>(a)</sup> Convention according to conditions for dry gas in Latvia: temperature 20 °C, atmospheric pressure 1,01325 bar.

## LITHUANIA

Lithuania			
Gas Family	2 <sup>nd</sup> Family		
Gas Group	Group H		
	minimum	maximum	
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	34,56	—	
Wobbe index [MJ/m <sup>3</sup> ]	47,016	51,984	
Gas composition by volume in % of the total content:			
C <sub>1</sub> to C <sub>5</sub> content (sum)	90	—	
N <sub>2</sub> + CO <sub>2</sub> content	—	5,5	
CO content	(a)		
Unsaturated HC content	—	—	
Hydrogen content	—	2	
Information on toxic components contained in the gaseous fuel	prohibited		
Supply pressure:			
	min	nom	max
Supply pressure at the inlet of appliances [mbar]	21	—	30
Supply pressure at the point of delivery [mbar]	—		
Admissible pressure loss in the end-user gas installation [mbar]	—		
Reference conditions for Wobbe index and Gross Calorific Value (GCV)			
Combustion reference temperature [°C]	25 °C		
Volume measurement reference temperature [°C]	20 °C		
Volume measurement reference pressure [mbar]	1 013,25 mbar		
(a) Not regulated.			



## LUXEMBOURG

## Luxembourg

Gas Family	2 <sup>nd</sup> Family	
Gas Group	Group H	
	minimum	maximum
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	36,5	47,2
Wobbe index [MJ/m <sup>3</sup> ]	49,0	56,5

## Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	> 86	99
N <sub>2</sub> + CO <sub>2</sub> content	—	4,5
CO content	(a)	
Unsaturated HC content	(a)	
Hydrogen content	(a)	
Information on toxic components contained in the gaseous fuel	—	

## Supply pressure:

	min	nom	max
Supply pressure at the inlet of appliances [mbar]	17 (15) (b)	20	25 (c)
Supply pressure at the point of delivery (d) [mbar]	19,7	20	24,3
Admissible pressure loss in the end-user gas installation [mbar]	—	—	1,6

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C
Volume measurement reference pressure [mbar]	1 013,25 mbar

(a) Not measured;

(b) For forced-draught power burners;

(c) The minimum and maximum set by the appliance manufacturers are to be complied with (these may vary markedly);

(d) Pressure at meter outlet; allowing for permitted tolerance and pressure loss of the meter.

## THE NETHERLANDS

The Netherlands <sup>(1)</sup>

Gas family	First		Second		Third	
Gas group						
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Gross calorific value (GCV) [MJ/m <sup>3</sup> ]						
Wobbe index <sup>(2)</sup> [MJ/m <sup>3</sup> ]			H gas network: 44,59  G gas network, G conditions: 41,23  G gas network, G+ conditions: 41,23	H gas network: 52,84  G gas network, G conditions: 42,13  G gas network, G+ conditions: 42,98		

Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum) <sup>(3)</sup>						
N <sub>2</sub> + CO <sub>2</sub> content				H gas network: ≤ 3,2 mol % (Oude Pekela subsystem), ≤ 2,5 mol % (the rest of the Netherlands)  G gas network, G and G+ conditions: ≤ 10,3 mol % (RTL and RNB networks), ≤ 8 mol % (HTL in the provinces of North Holland, South Holland, Utrecht and Flevoland), ≤ 3 mol % (HTL in the rest of the Netherlands) <sup>(4)</sup> .		

The Netherlands <sup>(1)</sup>

Gas family	First		Second		Third	
Gas group						
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
CO content				<p>H gas network:  <math>\leq 1,5</math> mol %  (refinery gas system);  <math>\leq 2\,900</math> mg/m<sup>3</sup>(n)  (the rest of the Netherlands)</p> <p>G gas network: G and G+ conditions:  <math>\leq 2\,900</math> mg/m<sup>3</sup>(n); for E conditions no value has yet been determined.</p>		
Unsaturated HC content				See Gas Quality Order.		
Hydrogen content				<p>H gas network:  <math>\leq 40</math> mol %  (refinery gas system); <math>\leq 0,02</math> mol % (the rest of the Netherlands)</p> <p>G gas network: G and G+ conditions: <math>\leq 0,02</math> mol % (in RTL and HTL); <math>\leq 0,5</math> mol % (in RNB network)</p> <p>For E conditions: no value has yet been determined.</p>		
Information on toxic components contained in the gaseous fuel				See Gas Quality Order. The REACH Regulation also applies.		

The Netherlands <sup>(1)</sup>						
Gas family	First		Second		Third	
Gas group						
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum

Supply pressure: <sup>(5)</sup>

Gas family	First			Second			Third		
	Minimum	Nominal	Maximum	Minimum	Nominal	Maximum	Minimum	Nominal	Maximum
Supply pressure at the inlet of appliances [mbar]				H gas network: no specific expectations  G gas network: G and G+ conditions: 20 mbar, E conditions: minimum 17 mbar	H gas network: no specific expectations  G gas network: G and G+ conditions: nominal 25 mbar <sup>(6)</sup> , E conditions: nominal 20 mbar	H gas network: no specific expectations  G gas network: G and G+ conditions: maximum mbar: 30 mbar, E conditions: maximum 25 mbar	propane (1): 25 propane (2): 25 propane (3): 42,5 propane/butane: 25	propane (1): 30 propane (2): 37 propane (3): 50 propane/butane: 30	propane (1): 35 propane (2): 45 propane (3): 57,5 propane/butane: 35
Supply pressure at the point of delivery [mbar]									
Admissible pressure loss in the end-user gas installation [mbar]									

## The reference conditions for the Wobbe index and the gross calorific value

Combustion reference temperature [°C]	15
Volume measurement reference temperature: [°C]	15
Volume measurement reference pressure [mbar]	1 013,25

<sup>(1)</sup> For gas appliances connected to the (natural) gas network (second family):

Article 11 of the Gas Act (the Gas Act relates to the public gas network) reads as follows:

1. Gas fed into the gas transportation network or delivered by network managers at exit points shall meet requirements to be laid down by ministerial order. Such requirements may be different for feed-in and exit points and depending on energy content, pressure level and region.
2. The requirements referred to in point 1 above shall in any event cover the safety, efficiency (including in any event minimisation of social costs), reliability and sustainability of the transportation and use of gas.

Point 2 in particular is taken to mean that, irrespective of the provisions of the ministerial order, safety and efficiency must be maintained in the supply of gas or when changes are made to that supply. In this connection, the technical capabilities of the existing appliances and the existing gas networks are of overriding importance.

Classification of the gas supply of the (natural) gas network: From the perspective of gas appliances, there are three main groups of public gas networks in the Netherlands:

1. The H gas network, comprising regional systems, some of which have their own specifications for gas supply conditions. Approximately 80 large-scale consumers are connected to the H network and an RNB (*Regionale netbeheerders*) [Regional network managers] H network of large-scale consumers.
2. The G gas network which involves switching between three stable supply conditions:
  - (a) the G supply conditions which apply at the present time throughout the G gas network;
  - (b) the G+ supply conditions which will not start before 2022;
  - (c) the E supply conditions which will not start before 2030. It is expected that these supply conditions may occur within the lifetime of gas appliances to be newly connected in 2018. No explicit statutory gas supply requirements, such as exist for G and G+ conditions, have as yet been drawn up for E supply conditions. They will be drawn up when the E supply conditions are actually going to be implemented. They will involve the supplied gases being suitable (within the meaning of Article 11 of the Gas Act) for appliances in appliance category I<sub>2,E</sub> with a nominal appliance pressure of 20 mbar.
3. The L gas network which is intended for export and from which no gas is supplied within the meaning of Regulation (EU) 2016/426 on the territory of the Netherlands.

In addition, the networks are classified in three sub-levels depending on pressure level:

1. the HTL [*hoofdtransportleiding*] (main transportation pipeline) network;
2. the RTL [*regionale transportleiding*] (regional transportation pipeline) network;
3. the RNB network.

Gas can be supplied on the basis of any pressure level. The gas supply conditions may differ from one pressure level to another.

For other gas appliances:

There is no specific legislation on gas supply conditions for gases other than those supplied through the (natural) gas network, such as propane and butane and mixtures thereof. The parties involved usually make arrangements under private law for the supply of such gases, often involving voluntary standards. For information purposes, this annex indicates the standard values often used.

(<sup>2</sup>) For gas appliances connected to the (natural) gas network (second family):

H gas network: depends on the regional system

Regional system of the H gas network as referred to in the Gas Quality Order	Wobbe index, Gas Quality Order	Wobbe index, Gas Quality Order	Converted Wobbe index	Converted Wobbe index
	min.	max.	min.	max.
	MJ/m <sup>3</sup> (25/0)	MJ/m <sup>3</sup> (25/0)	MJ/m <sup>3</sup> (15/15)	MJ/m <sup>3</sup> (15/15)
Other gas systems	47,0	55,7	44,59	52,84
Delfzijl gas system	48,6	55,7	46,11	52,84
Eemshaven gas system	47,2	55,7	44,78	52,84
Zuidoost-Drenthe gas system	49,0	55,7	46,49	52,84
GZI ( <i>gaszuiveringsinstallatie</i> ) [gas purification plant] gas system	43,46	55,7	41,23	52,84
IJmond gas system	49,3	55,7	46,77	52,84
Province of Limburg	49,0	55,7	46,49	52,84
Provinces of North Holland, South Holland and Groningen	48,3	55,7	45,82	52,84
Refinery gas system	48,3	55,7	45,82	52,84
Westgas/Waalhaven gas system	47,0	57,5	44,59	54,55
Maasmond gas system	47,0	56	44,59	53,13
LNG gas system	47,0	57,2	44,59	54,27
Conversion factor used from 25/0 to 15/15			0,9487	0,9487

G gas network:

G gas network supply conditions as referred to in the Gas Quality Order	Wobbe index, Gas Quality Order	Wobbe index, Gas Quality Order	Converted Wobbe index	Converted Wobbe index
	min.	max.	min.	max.
	MJ/m <sup>3</sup> (25/0)	MJ/m <sup>3</sup> (25/0)	MJ/m <sup>3</sup> (15/15)	MJ/m <sup>3</sup> (15/15)
G conditions	43,46	44,41	41,23	42,13
G+ conditions	43,46	45,30	41,23	42,98
E conditions	i)	i)	i)	i)
Conversion factor used from 25/0 to 15/15			0,9487	0,9487

Note (1) The admissible Wobbe index bandwidth in E supply conditions has not yet been determined. The bandwidth chosen will allow category I<sub>2,E</sub> appliances to be used safely and efficiently. It will be laid down in the Gas Quality Order in due course.

(<sup>3</sup>) For gas appliances connected to the (natural) gas network (second family):

No specific statutory requirements for the sum of the C<sub>1</sub> to C<sub>5</sub> content. However, there are requirements for the maximum propane equivalent under certain supply conditions in the G gas network.

(Explanation of propane equivalent (PE): unit of content of higher hydrocarbons in gas, calculated as the sum of the proportions in mol % of the higher hydrocarbons in the gas, each higher hydrocarbon being assigned a weighting factor of the number of carbon atoms in the higher hydrocarbon in question minus one, divided by two.)

The requirements are:

G conditions: maximum of 5 mol % propane equivalent (PE)

G+ conditions: maximum of 8,1 mol % propane equivalent (PE)

E conditions: no specific statutory requirements. The admissible content in E supply conditions has not yet been determined. The content chosen will allow category I<sub>2,E</sub> appliances to be used safely and efficiently. It will be laid down in the Gas Quality Order in due course.

(<sup>4</sup>) Second gas family, G gas network, G conditions: The following restriction applies to the content of carbon dioxide (CO<sub>2</sub>) if at least 99 mol % of the gas is made up of methane, carbon dioxide, nitrogen (N<sub>2</sub>) and oxygen (O<sub>2</sub>) and more than 6 mol % is made up of CO<sub>2</sub>.

Maximum CO<sub>2</sub> content is the minimum of:

\* 10,32 – 0,72 \* N<sub>2</sub> content – 0,87 \* O<sub>2</sub> content, and

\* 10,56 – 0,746 \* N<sub>2</sub> content – 1,01 \* O<sub>2</sub> content,

where the contents are expressed in mol %.

(<sup>5</sup>) The customer expectations shown below are based on voluntary standards and practices.

(<sup>6</sup>) In non-domestic applications, nominal pressures of 100 mbar and above are sometimes used.

## AUSTRIA

## Austria

Gas family	Second	
Gas group	Group H	
	Minimum	Maximum
GCV: Gross Calorific Value [MJ/m <sup>3</sup> ]	36,5	43,6
Wobbe Index [MJ/m <sup>3</sup> ]	45,3	53,5

## Gas composition

C <sub>1</sub> to C <sub>5</sub> , content (total) [Mol %]	89	100
N <sub>2</sub> + CO <sub>2</sub> , content [Mol %]	0	7
CO, content [Mol %]	0	0
Unsaturated hydrocarbons, content [Mol %]	0	0
Hydrogen, content [Mol %]	0	4
Information on the toxic components contained in the gaseous fuel	Technically free	

## Supply pressure:

	Minimum	Nominal value	Maximum
Supply pressure at the inlet of appliances in mbar:	18	20	25
Supply pressure at the point of delivery in mbar:	In accordance with the contract between the gas network operator and the customer		
Admissible pressure loss in the end-user gas installation in mbar:	—		

## Reference conditions for Wobbe Index and Gross Calorific Value:

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C
Volume measurement reference pressure [mbar]	1 013,25 mbar

## POLAND

## Poland

Gas Family	2 <sup>nd</sup> Family		Gases combined with 2 <sup>nd</sup> Family								3 <sup>rd</sup> Family <sup>(a)</sup>
Gas Group	Group H		Group Lm		Group Ln		Group Ls		Group Lw		—
	minimum	maximum	minimum	maximum	minimum	maximum	minimum	maximum	minimum	maximum	
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	—	—	—	—	—	—	—	—	—	—	
Wobbe index [MJ/m <sup>3</sup> ] <sup>(b)</sup>	45,0	56,9	23,0	27,0	27,0	32,5	32,5	37,5	37,5	45,0	

## Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	—	—	—	—	—	—	—	—	—	—	—
N <sub>2</sub> + CO <sub>2</sub> content	—	—	—	—	—	—	—	—	—	—	—
CO content	—	—	—	—	—	—	—	—	—	—	—
Unsaturated HC content	—	—	—	—	—	—	—	—	—	—	—
Hydrogen content	—	—	—	—	—	—	—	—	—	—	—
Information on toxic components contained in the gaseous fuel	—		—		—		—		—		—

## Supply pressure:

	min	nom	max	min	nom	max	min	nom	max	min	nom	max	min	nom	max	
Supply pressure at the inlet of appliances [mbar]	14	20	25	6	8	11	10,5	13	16	10,5	13	16	17,5	20	23	—
Supply pressure at the point of delivery [mbar]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Admissible pressure loss in the end-user gas installation [mbar]	—			—			—			—			—			—



## Poland

Gas Family	2 <sup>nd</sup> Family		Gases combined with 2 <sup>nd</sup> Family								3 <sup>rd</sup> Family <sup>(a)</sup>
Gas Group	Group H		Group Lm		Group Ln		Group Ls		Group Lw		—
	minimum	maximum	minimum	maximum	minimum	maximum	minimum	maximum	minimum	maximum	

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	25 °C										
Volume measurement reference temperature [°C]	0 °C										
Volume measurement reference pressure [mbar]	1 013,25 mbar										

<sup>(a)</sup> 3<sup>rd</sup> Family Gas is not supplied in Poland through gas distribution network;

<sup>(b)</sup> Values given in MJ/m<sup>3</sup> can be converted into kWh/m<sup>3</sup> by dividing by 3,6.

## PORTUGAL

## Portugal

Gas Family	2 <sup>nd</sup> Family		3 <sup>rd</sup> Family			
Gas Group	Group H		Group P		Group B	
	minimum	maximum	minimum	maximum	minimum	maximum
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	35,88 <sup>(a)</sup>	48,25 <sup>(a)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>
Wobbe index [MJ/m <sup>3</sup> ]	48,17 <sup>(a)</sup>	57,66 <sup>(a)</sup>	70,44	77,01	83,26	87,3

## Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	<sup>(c)</sup>	<sup>(c)</sup>	90 <sup>(b)</sup>	15,1 <sup>(b)</sup>	80 <sup>(b)</sup>	23 <sup>(b)</sup>
N <sub>2</sub> + CO <sub>2</sub> content	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>
CO content	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>
Unsaturated HC content	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>
Hydrogen content	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>	<sup>(c)</sup>

## Portugal

Gas Family	2 <sup>nd</sup> Family		3 <sup>rd</sup> Family			
Gas Group	Group H		Group P		Group B	
	minimum	maximum	minimum	maximum	minimum	maximum
Information on toxic components contained in the gaseous fuel	( <sup>c</sup> )	( <sup>c</sup> )	( <sup>c</sup> )	S ( <sup>b</sup> ): 50 mg/kg; NH <sub>3</sub> ( <sup>b</sup> ): 1 ppmv; H <sub>2</sub> S < 4 mg/m <sup>3</sup>	( <sup>c</sup> )	S ( <sup>b</sup> ): 50 mg/kg; NH <sub>3</sub> ( <sup>b</sup> ): 1 ppmv; H <sub>2</sub> S < 4 mg/m <sup>3</sup>

## Supply pressure:

	min	nom	max	min	nom	max	min	nom	max
Supply pressure at the inlet of appliances [mbar]		20			37 ( <sup>d</sup> )			30 ( <sup>d</sup> )	
Supply pressure at the point of delivery [mbar]		21		35,5		37	28,5		30
Admissible pressure loss in the end-user gas installation [mbar]	1,5			1,5			1,5		

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	—	25 °C ( <sup>e</sup> )
Volume measurement reference temperature [°C]	0 °C ( <sup>b</sup> )	0 °C ( <sup>e</sup> )
Volume measurement reference pressure [mbar]	P <sub>abs</sub> = 1,013 bar ( <sup>b</sup> )	P <sub>abs</sub> = 1,01325 bar ( <sup>e</sup> )

(<sup>a</sup>) Values from the quality of service regulation from Regulator of Energy Services;

(<sup>b</sup>) Values from the Decree Law number 214E/2015;

(<sup>c</sup>) No information available;

(<sup>d</sup>) Some appliances in the catering industry also use pressure 50 mbar for commercial butane and 67 mbar for commercial propane. These are residual cases;

(<sup>e</sup>) According to ISO 13443:1996 Natural Gas - Standard reference conditions.

## FINLAND

## Finland

Gas Family	2 <sup>nd</sup> Family			3 <sup>rd</sup> Family		
Gas Group	Group H			Group B/P		
	min	nom	maxi	min	nom	max
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	36,67	38,25	39,23	88,5	—	125,8
Wobbe index [MJ/m <sup>3</sup> ]	47,0	50,57	54,0	72,9	—	87,3

## Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	95	99,19	100	99	—	100
N <sub>2</sub> + CO <sub>2</sub> content	0	0,80	4,5	—	—	0,04
CO content	0	0	0	—	—	0,02
Unsaturated HC content	0	0	0	0	0	0,01
Hydrogen content	0	0	0	—	—	—
Information on toxic components contained in the gaseous fuel	0	0	H <sub>2</sub> S: 0,00025 vol-% (5 mg/ m <sup>3</sup> )	—	—	1,3 butadiene: 0,01

## Supply pressure:

	min	nom	max	min	nom	max
Supply pressure at the inlet of appliances [mbar]	17	20	25	25	30	35
Supply pressure at the point of delivery [mbar]	—	—	—	—	—	—
Admissible pressure loss in the end-user gas installation [mbar]	—	—	3,5 <sup>(a)</sup> 10 % <sup>(b)</sup>	—	—	—

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C
Volume measurement reference pressure [mbar]	1 013,25 mbar

<sup>(a)</sup> When coupling pressure is no greater than 35 mbar;

<sup>(b)</sup> When coupling pressure exceeds 35 mbar.

## SWEDEN

Sweden								
Gas Family	1 <sup>st</sup> Family		2 <sup>nd</sup> Family				3 <sup>rd</sup> Family	
Gas Group			Group H		(a)			
	min	max	min	max	min	max	min	max
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	20,9	23,0	36,47	46,69	36	39,6	95,75 (b)	
Wobbe index [MJ/m <sup>3</sup> ]	23,2	25,7	48,96	55,8	45,5	50,2	70,78	77,02

## Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	52	57	88,92	99,48	96	98	—	99,9
N <sub>2</sub> + CO <sub>2</sub> content	35	38	0,50	2,48	0	4	0	
CO content	0		0		0		0	
Unsaturated HC content	0		0		0		0	
Hydrogen content	0	0,5	0		0	1	0	
Information on toxic components contained in the gaseous fuel	—		—		—		—	

## Supply pressure:

	min	nom	max	min	nom	max	min	nom	max	min	nom	max
Supply pressure at the inlet of appliances [mbar]	6	12	15	17	20	25	17	20	25	25	30	35
Supply pressure at the point of delivery [mbar]	10	8	15	—	—	—	80	100	100	—	—	—
admissible pressure loss in the end-user gas installation [mbar]	2			—			2			—		

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C											
Volume measurement reference temperature [°C]	15 °C											
Volume measurement reference pressure [mbar]	1 013,25 mbar											

(a) Upgraded biogas;

(b) Nominal value.

## UNITED KINGDOM

## United Kingdom

Gas Family	2 <sup>nd</sup> Family		3 <sup>rd</sup> Family			
Gas Group	Group H		Group P		Group B	
	min	max	min	max	min	max
Gross Calorific Value (GCV) [MJ/m <sup>3</sup> ]	( <sup>a</sup> )	( <sup>a</sup> )	88,2	100,1	121,3	126,7
Wobbe index [MJ/m <sup>3</sup> ]	47,20 ( <sup>b</sup> )	51,41 ( <sup>b</sup> )	72,7	78,5	85,7	87,7

## Gas composition by volume in % of the total content:

C <sub>1</sub> to C <sub>5</sub> content (sum)	( <sup>c</sup> )	( <sup>c</sup> )	100	100	100	100
N <sub>2</sub> + CO <sub>2</sub> content	—	N <sub>2</sub> ( <sup>c</sup> ) CO <sub>2</sub> : 2,5 mol % ( <sup>d</sup> )	NIL		NIL	
CO content	( <sup>c</sup> )	( <sup>c</sup> )	NIL		NIL	
Unsaturated HC content	( <sup>c</sup> )	( <sup>c</sup> )	0	100	0	100
Hydrogen content	—	0,1 mol %	NIL		NIL	
Information on toxic components contained in the gaseous fuel	H <sub>2</sub> S limit ≤ 5mg/m <sup>3</sup>		( <sup>e</sup> )		( <sup>e</sup> )	

## Supply pressure:

	min	nom	max	min	nom	max	min	nom	max
Supply pressure at the inlet of appliances ( <sup>f</sup> ) [mbar]	—	—	—	25 25 ( <sup>g</sup> )	37 29 ( <sup>g</sup> )	45 35 ( <sup>g</sup> )	20 25 ( <sup>g</sup> )	29 29 ( <sup>g</sup> )	35 35 ( <sup>g</sup> )
Supply pressure at the point of delivery [mbar]	18,5	—	22	32 ( <sup>h</sup> ) 27 ( <sup>i</sup> ) 30 ( <sup>k</sup> ) 30 ( <sup>l</sup> )	37 ( <sup>h</sup> ) 37 ( <sup>i</sup> ) 37 ( <sup>k</sup> ) 30 ( <sup>l</sup> )	45 ( <sup>h</sup> ) 45 ( <sup>i</sup> ) 45 ( <sup>k</sup> ) 35 ( <sup>l</sup> )	22 ( <sup>l</sup> ) 30 ( <sup>l</sup> )	29 ( <sup>l</sup> ) 30 ( <sup>l</sup> )	35 ( <sup>l</sup> ) 35 ( <sup>l</sup> )
admissible pressure loss in the end-user gas installation [mbar]	—	—	1 ( <sup>m</sup> )	—	—	0,5 ( <sup>n</sup> ) 2 ( <sup>o</sup> ) 5 ( <sup>p</sup> )	—	—	0,5 ( <sup>n</sup> ) 2 ( <sup>o</sup> ) 5 ( <sup>p</sup> )

United Kingdom						
Gas Family	2 <sup>nd</sup> Family			3 <sup>rd</sup> Family		
Gas Group	Group H		Group P		Group B	
	min	max	min	max	min	max

## Reference conditions for Wobbe index and Gross Calorific Value (GCV)

Combustion reference temperature [°C]	15 °C
Volume measurement reference temperature [°C]	15 °C
Volume measurement reference pressure [mbar]	1 013,25 mbar

- (<sup>a</sup>) No specific limits that apply network wide, normally within the range of 36,9 MJ/m<sup>3</sup> and 42,3 MJ/m<sup>3</sup> but the Wobbe Index provides the overriding limit;
- (<sup>b</sup>) Under a supply emergency these limits can be extended to 46,5–52,85 MJ/m<sup>3</sup> to allow for maintenance of supply, this is expected only in exceptional circumstances. The supply conditions are set out in the Gas Safety (Management) Regulations S.I. 1996 No 551 which can be found at [www.legislation.gov.uk/ukSI/1996/551/made](http://www.legislation.gov.uk/ukSI/1996/551/made);
- (<sup>c</sup>) No specified limit;
- (<sup>d</sup>) Normally 2,5 mol % but this is variable at some entry points to the transmission system;
- (<sup>e</sup>) Commercial Propane and Butane may contain the substance 1,3 butadiene which is classified as Class II carcinogenic;
- (<sup>f</sup>) As EN437;
- (<sup>g</sup>) LPG for Leisure Accommodation Vehicles to EN 1949;
- (<sup>h</sup>) Bulk Tank or Cylinders (supplying a property) Ref EN 16129 Table 5 and BS6891 Table 7 Note A - These figures relate to the delivery point at the outlet of the regulator or meter (whichever is last);
- (<sup>i</sup>) Cylinder Appliance (directly connected to the cylinder) ΔP2 (2 mbar pressure loss). Note: These figures assume the delivery point is the outlet of the regulator;
- (<sup>j</sup>) Cylinder Appliance (directly connected to the cylinder) Ref EN 16129 Table 5. Note: These figures assume the delivery point is the outlet of the regulator;
- (<sup>k</sup>) Cylinder Appliance (directly connected to the cylinder) ΔP2 (5 mbar pressure loss). Note: These figures assume the delivery point is the outlet of the regulator;
- (<sup>l</sup>) Cylinder Appliance (directly connected to the cylinder) LPG (for Leisure Accommodation Vehicles to EN 1949), Ref EN 16129 Annex D. Note: These figures assume the delivery point is the outlet of the regulator;
- (<sup>m</sup>) Ref BS 6891: 2015 clause 5.3.2 and IGEM/UP/Table 2 for larger pipes;
- (<sup>n</sup>) UKLPG COP 22 Service Pipework;
- (<sup>o</sup>) BS 6891, Property installation pipework; directly connected cylinder appliance systems specifying 2 mbar;
- (<sup>p</sup>) EN 1949; directly connected cylinder appliance systems specifying 5 mbar.



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