

Natural Gas odorisation practices in Europe

LEGAL SECTION:

Country	Odourisation required on Transit	Transit Pressure (bar)	Odourisation required on transport ¹ ?	Transport Pressure (bar)	Odourisation required on distribution	Distribution pressure (bar)	Is a Level of concentration/ olfactory sensation Required? (Yes or Not)	If Yes, please specify the requirement (i.e.: minimum concentration or olfactory degree)	Control required	Requirements specified standards or codes
AT	No		No		Yes		Yes	ÖVGW G 79	Yes	ÖVGW G 79 EN ISO 13734
BE	No	-	No	-	Yes	P < 14,7 bar	No	-	Yes	Synergrid recommendation 2000.50.32
CH	No	> 5 bar	No	20 to 70 bar	Yes	< 5 bar	Yes	10 mg THT / Nm ³	Yes	SVGW G 11
CZ	No	> 40 bar	Not defined in CZ	Not defined in CZ	Yes	≤ 40 bar	Yes	Level 3, Table 1, A 3, TPG 918 01	Yes	TPG 918 01, TPG 905 01 (codes of practice)
DE	No		No ²	> 16 bar	Yes	< 16 bar	Yes	Minimum concentration: THT: 10 mg/Nm ³ SF: 8 mg/Nm ³ Mercaptanes: 3 mg/Nm ³ DVGW G 280-1 (July 2012)	Yes	DVGW G 280-1 EN ISO 13734
DK	No	< 80 bar	No	< 80 bar	Yes	<50 bar	Yes	Minimum concentration THT: 10.5 mg/Nm ³ Mercaptanes: 4 mg/Nm ³	Yes	DVGW G 280 GR-A (Danish Gas Code)
EL			Yes		Yes	19 bar	Yes	15-35 mg/Nm ³	Yes	National Regulation 1712/06
ES	Yes	80 bar	Yes	>16 bar	Yes	<16 bar	Yes	Minimum concentration	yes	NGTS Code and R.D. 919/2006

¹ For the purpose of this document, and although the terms may relate to different notion in EU countries, Distribution network is the network delivering gas to domestic customers, transit network is the network transmitting gas (generally connected to other big network or infrastructure as storages), transport network is the network transmitting gas to distribution network, sometime identified as regional transport.

² D: The German law refers to DVGW codes or equivalent; odourisation in only a few transport systems, mostly based on sulphur free odorant.

Country	Odourisation required on Transit	Transit Pressure (bar)	Odourisation required on transport ¹ ?	Transport Pressure (bar)	Odourisation required on distribution	Distribution pressure (bar)	Is a Level of concentration/ olfactory sensation Required? (Yes or Not)	If Yes, please specify the requirement (i.e.: minimum concentration or olfactory degree)	Control required	Requirements specified standards or codes
FR	Not defined in France		No ³	25 to 80 bars	Yes	< 20 bar	No		Yes	Arrêté 13 juillet 2000 (law), RSDG 10 (Industry requirement), Décret n°2004-251 du 19/03/2004 (law)
HU	No		No	40 – 75	Yes ⁴		Yes	Minimum concentration	Yes	MSZ-09-74011/5-84
IE	Yes	70	Yes	70	Yes	<4 bar	Yes	Olfactory index 2	Yes	Code of Operations
IT	No		No ⁵	> 5 > 24 from the fields 12-24 outside cities < 12 inside the cities	Yes	0,004-5 bar	Yes ⁶	UNI CIG 7133 : both ⁷	Yes	UNI CIG 7133 ⁽⁶⁾ UNI CIG 9463 Dir 120/08 AEEG
NL	No	>40	No	<40	Yes	<8bar	Yes	Yes ⁸	No	NEN 1059 NEN 1091
NO					Yes		Yes		Yes	No
PL	No	<84	No	20<p<63	Yes	<4	Yes olfactory	Olfactory is primary measurements	Yes	National Regulation Dz.U. 2010, No 133, 89 PN-C-04751:2011 PN-C-04753:2011
PT			No ⁹		Yes ¹⁰		Yes, olfactory	According to Portuguese law ¹¹	Yes	DVGW G 280
RO			Yes		No		Yes	SR 13406 ¹² Level 2	Yes	SR 13406 ⁽¹⁶⁾ SR 3317 ⁽¹⁶⁾ EN ISO 13734
SK	No	---	No	18 to 40 bar	Yes	< 4 bar	Yes	Minimum 8 mg/ Nm ³ THT	Yes	TPP 918 01
TR										

³ F: The law requires that transmission companies deliver gas to all customers (industrial and distributors), not to odourise network. However, the current practice (all transported gas is odourised) is recognised by French authorities as best practice in safety studies.

⁴ HU: Transmission company does the odourisation.

⁵ I: The gas transmission network is not odourised except for the gas delivered to the domestic customers and premises directly connected with them. For Transmission all the updated data reported in the table for Italy refer to the scenario only.

⁶ I: Directive 120/08 from AEEG (Regulatory body) considers only “positive controls” referred to UNI 7133.

⁷ I: From the legal point of view, an olfactory control is accepted, but the authority accepts only a determination of the level of concentration by gas chromatography.

⁸ NL: The concentration of odourant in natural gas will be such to achieve the alert olfactory degree 2 on the scale of Sales, which corresponds to a gas leak of 1 % natural gas concentration into the air (equivalent to 20 % of LEL).

⁹ PT: The Portuguese law and regulations do not require for odourisation in transport, and the Portuguese TSO (REN Gasodutos) does not odourise the gas transmission network; nevertheless the gas entering by pipeline through the interconnection(s) with the Spanish grid (operated by Enagas) is, from the 18th January 2010 received in an odourized condition, as in Spain the odourisation in transport is mandatory. Thus, the transported gas has, now, a variable odourant concentration (ranging between 0 and 15mg/m³(n)).

¹⁰ PT: Distribution (pressure lower than 20 bar), the gas is odourised at the Transport Grid Delivery Points (GRMS - Gas Metering and Regulating Stations); The gas is also odourised at Delivery Points from the Transport Grid to Direct Consumers, which receive the gas at pressures > 20 bar.

¹¹ PT: The Portuguese TSO REN Gasodutos holds a concession from the Portuguese State granted for the high pressure gas transmission system. The concession law, refers that the gas quality shall be defined on a Technical regulation to be issued by the Energy Office. The present concession law, which is dated 2006, did not yet formally published the referred Technical Regulation, so REN Gasodutos is following the previous mandatory article (from Decree Law 285/90, that states”... The supplied gas shall be odourized in a way that any potential leak can be easily detected by human olfact when the mixture gas/air presents a volumetric composition equals to 1/5 of LIL (Lower Inflammable Limit).

¹² RO: SR 13406 (The Natural Gas Odourisation), SR 3317 (Natural Gas. Quality Requirements).

Country	Odourisation required on Transit	Transit Pressure (bar)	Odourisation required on transport ¹³ ?	Transport Pressure (bar)	Odourisation required on distribution	Distribution pressure (bar)	Is a Level of concentration/ olfactory sensation Required? (Yes or Not)	If Yes, please specify the requirement (i.e.: minimum concentration or olfactory degree)	Control required	Requirements specified standards or codes
UK	No	<85bar	No ¹³	<85bar	Yes	<35bar	Yes	Yes olfactory is primary measurement ¹⁴	Yes	Gas Safety Management Regulations 1996

¹³ UK: from 1998 must odourise 7bar and below. National Transmission System is not odourised (>35bar). Distribution Networks Systems are odourised.

¹⁴ UK: The concentration of odourant in natural gas will be such to achieve the alert olfactory degree 2 on the scale of Sales, which corresponds to a gas leak of 1 % natural gas concentration into the air (equivalent to 20 % of LEL).

ODORISATION CONTROL SECTION:

Country	Control on Transit	Control on Transport	Control on Distribution	Exact location of the control (end point of the pipe ¹⁵ , entry point of the pipes, odorisation station,...).	Frequency: continuous (CI) or periodical inspection (P)	Who asks for the control (regulation, voluntary)	Who does work the control (third part or not)	What is controlled (odorant concentration, smell, etc.)	Controlled by Olfaction	Controlled by gas chromatography	Controlled by chemical sensor	Controlled by odorant consumption
AT			Yes	End point of pipe	yearly	legal	Grid operator	Odorant concentration	No	Yes	Yes	Yes
BE	N.A.	N.A.	Yes	Pressure station MP/LP & LP grid (End point of pipe)	P (min./ 3 months)	Royal Decree 28.06.1971	Third party	Odorant concentration	No	Yes	No	Visual inspection, monitoring of odorant consumption & calculation of odorant concentration in the gas and in more recent installations alarm in case of anomaly
CH	Yes	No	Yes	Exit point and distribution system	P (Several times per year)	Government	Transport companies	Concentration	No	Yes	No	No
CZ	No	-	Yes	Exit point and distribution system (fixed points)	P / 6 months	Technical rules, TPG 918 01, TPG 905,01	DSO	Odorant smell and concentration	Yes	Yes	Yes	Yes
DE	No	No	Yes	End point of pipe	P (2 x p.a.) Sometime CI near injection	DVGW G 280-1	Grid operator	Odorant concentration and smell	Yes	Yes (legal)	Yes	Yes
DK	No	No	Yes	At fixed strategic points. They are located far from the dosing plants.	P (2 times per year)	Danish Safety Technology Authority	Grid Operator	Odorant concentration	No	Yes	No	Yes, the odorant consumption is monitored continuously
EL	No	No	Yes	City gates	P	Regulation	Distribution companies	Odorant concentration		Yes		
ES	Yes	?	Yes	In distribution: city gate and end point of the pipe	CI P (1/month)	Government	Dist. company (CI) and third part (P)	Concentration	-	Yes	Yes	-

¹⁵ It means the furthest location from injection point

Country	Control on Transit	Control on Transport	Control on Distribution	Exact location of the control (end point of the pipe ¹⁶ , entry point of the pipes, odourisation station,...).	Frequency: continuous (CI) or periodical inspection (P)	Who asks for the control (regulation, voluntary)	Who does work the control (third part or not)	What is controlled (odorant concentration, smell, etc.)	Controlled by Olfaction	Controlled by gas chromatography	Controlled by chemical sensor	Controlled by odorant consumption
FR	Not defined	Yes	Yes	Transport: At odourisation station (entry points) + 25 locations on network Distribution: Random locations on network (100/year)	CI. (Transport) P (Distribution)	Regulation (Transport) Voluntary (Distribution)	Internal	Odorant concentration	No	Yes	No	No
HU	No	Yes		Exit point and distribution system	CI - P	Regulation	Third party	Proportional to gas volume				Odorant consumption
IE	Yes	Yes	No	Entry point	P (Monthly)	TSO	TSO/Third Party	Concentration	No	No	No	Yes
IT		Yes ¹⁷	Yes	End point of the pipe, and odourisation station	6 months	UNI CIG 7133 UNI CIG 9463	Grid operator	Odorant concentration, smell	Yes	Yes	No	No
NL	No	No	Yes	City gate station	P (3 weeks)		Grid operator	Concentration	No	No	Yes	
NO			D		P					analyt		
PL			Yes	End point of the pipe, pressure stations MP/LP	P (2 weeks) Ci	Dz.U. 2010, No 133, 89 PN-C-04751:2011 PN-C-04753:2011	Distribution and/or grid operator	Odorant concentration, and/or smell	Yes	Yes	Yes (indicative measurements)	Yes
PT		Yes			CI and P (monthly)	Voluntary	TSO (O&M Department)	Odorant concentration			Yes	Yes
RO		Yes	Yes		P/ 3 monts				Yes ¹⁸	Analyt	Yes	
SK	No	No	Yes	Selected point of the Transport and end point of the distribution system	CI – P, 6-months	State legislation	Distribution company	Concentration and smell	Yes ¹⁹	No	Yes	No
TR												
UK	No	No	Yes	Leaving the transmission system	CI – P	Regulation	Distribution companies	Concentration	Yes	No ²⁰	No	Continuously monitored

¹⁶ It means the furthest location from injection point

¹⁷ The gas transmission network is not odourised except for the gas delivered to the domestic customers and premises directly connected with them.

¹⁸ RO: Olfactory is primary method.

¹⁹ SK: Olfactory is primary method

²⁰ UK: Olfactory is primary method, analytical when required.

ODORISATION PLANTS SECTION:

Country	Injection on transit	Injection on Transport	Injection on City Gate	Injection on other	Number of plants	Use of Electronic pump	Use of Pneumatic pump	Use of Bypass	Can odorized gas be received from outside the Country?
AT	No	Yes	Yes	Yes	About 300	Yes	Yes	Yes	No
BE	No	No	Yes	NA	+/- 150	Yes	-	-	No
CH	No	Yes	No	No	Unknown	Yes	Yes	Yes	Yes
CZ	No	-	No	Pressure reduction station from transmission to distribution	Approx. 100	Yes	No	No	No
DE	No	No	Yes	HP 16→70 bar City gate 0 →16 bar	Unknown	Yes	No ²¹	No ²⁰	No ²²
DK	No	No	No	Pressure reduction station from transmission to distribution	45	Yes	No	No	No
EL	No	No	Yes			Yes			
ES	No	Yes	Yes		7 + ≈ 300	Yes	No	No	Yes
FR	Yes				7 + (13) ²³	Yes			Yes
HU	Yes	No	No	No	14 central at transmission node, 100 at exit points	Electronic point			No
IE				Entering Transm. Systems		Electronic pump			
IT	No	No	Yes		> 1250	Yes	Yes	Yes	Yes
NL	No	Yes	Yes		80 + 50	Yes			No
NO				4 bar		Electronic Pump			
PL	No	Yes				Yes	Yes	Yes	No
PT	No	No	No	Leaving National Transport System		Yes			Yes (from the Spanish Transport Grid)
RO	No	No	No	0 – 10 bar		Electronic pump		Bypass	No
SK	No	No	Yes	No	cca 1600	Yes	No	No	No
TR									

²¹ D: Generally not, but exceptions, e.g. LNG stations, may exist.

²² D: Possible only, if gas odourisation is guaranteed by contract to be contained in accordance with DVGW-G 280-1, gas to comply with DVGW-G 260

²³ Distinction is made between main stations at entry point of transmission network (including LNG terminals) operating continuously and those reodorising at the exit of underground storages operating only when emitting.

Country	Injection on transit	Injection on Transport	Injection on City Gate	Injection on other	Number of plants	Use of Electronic pump	Use of Pneumatic pump	Use of Bypass	Can odorized gas be received from outside the Country?
UK	No	No	No	Leaving National Transmission	49 Distribution	No	Electrically Controlled Gas powered pump	No	Yes ²⁴

²⁴ UK: Gas entering via Interconnectors connected to the Transmission system is unodorised.

ODORANTS CONCENTRATIONS SECTION:

Country	Odorant	Percent consumption	Minimum concentration	Maximum concentration	Typical concentration	Unit Standard or Normal (mg/m ³)	Customers receiving non-odorized gas: specify what type of industry is receiving non odorised gas	Odorised gas in Salt cavern?	Odorised gas in lined cavern?	Odorised gas in aquiferous storage?	Odorised gas in depleted field?
AT	THT Other odorants Sulphur Free Odorant	93 5 2	9,0 - 8,0	As required at the endpoint	12-14 - 10	Normal	Industry: glass, ceramics, chemical, power plants	No	No	No	No
BE	THT TBM+IPM+NPM	-	17 5,4	34 7,1	20 6	Normal	Chemical Industry & power plants	No	No	No	No
CH	THT	100%	10	30	15-30	Normal	some Industry	No	No	No	No
CZ	THT TBM+DMS Different odorant mixture	10 90 -	8 5 -	30 30 -	12 10 -	Normal	Industry	No	No	No	No
DE	THT Other odorants mixtures THT + EA Sulphur Free Odorant	55 – 70% 2% 25%	10 Not specified 8 8,8	20 - - 16	15 – 18 - 11 - 15 11 - 15	Normal	Industries: glass, ceramics, chemical	No	No	No	No
DK	THT	100%	10,5 (at consumer location)	Not specified	11-17	Normal	Not allowed in Denmark. All gas is odorized	No	No	No	No
EL	THT	100%	15	35	20	Normal					
ES	THT	100%	15-trans. 18-dist.	-	22	Normal	No	?	?	?	?
FR	THT	100%	15	40	25	Normal	None	Yes	None in France	Yes	Yes
HU	THT + TBM	100%	13	25	16	(?)	Every customer receives odorized gas	(16)	No	No	No
IE	TBM+DMS	100%	3	10	6	Standard	Every customer receives odorized gas	None	None	None	Yes
IT	THT TBM+IPM+NPM TBM+MES	50% 50%	32 8 3	-	-	Standard	Industry	No	No	No	Yes
NL	THT	100%	10	36	18	Normal	Industry Power plant Dedicated Pipe	No	No	No	No
NO	THT	100%	12	15	-		Industry				
PL	THT	100 %	Not specified	Not specified	25	Standard	Industry				
PT	THT	100%	8	40	24	Normal	Combined Cycle Power Plants ²⁵	Yes	No	No	No
RO	EM	100%	3	30	8		Some Industry	No	No	No	No
SK	THT THT + TBM	99 % 1 %	8 mg/Nm ³ 2,1 mg/Nm ³	40 15	18 7	Normal	Chemical industry and some technological customers	No	No	No	No

²⁵ For the customers to be exempted from receiving odorised gas the Energy Office (DGEG – Direcção Geral de Energia e Geologia) must issue a formal permit. This permit is supported on a demonstration that the customer have installed a gas detection system or, alternatively, a leak detection system; in one of the CCPP, REN Gasodutos installed a leak detection system based on flow measurement by annubar metering devices.

Country	Odorant	Percent consumption	Minimum concentration	Maximum concentration	Typical concentration	Unit Standard or Normal mg/m ³)	Customers receiving non-odorized gas: specify what type of industry is receiving non odorised gas	Odorised gas in Salt cavern?	Odorised gas in lined cavern?	Odorised gas in aquiferous storage?	Odorised gas in depleted field?
TR											
UK	TBM+DMS	100%	5	8	6	Standard	Any before injection ⁽¹⁵⁾	Yes	No	No	No

NOTE 1: The unit can be expressed in reference to normal or standard conditions: the difference is related to the temperature to which the volume is expressed; the following definitions are taken from the EN ISO 14532:

Normal reference conditions: reference conditions of pressure, temperature and humidity (state of saturation) equal to: 101,325 kPa and 273,15 K for a dry, real gas.

Standard reference conditions: reference conditions of pressure, temperature and humidity (state of saturation) equal to: 101,325 kPa and 288,15 K for a dry, real gas.

NOTE 2: data in red colour are not confirmed.

ODORANTS TABLE											
Odorant	Composition %										% S
	THT Tetrahydro thiophene	TBM Tertiary Butyl Mercaptan	IPM Isopropyl Mercaptan	NPM Normal Propyl Mercaptan	MES Methyl Ethyl sulfide	DMS Diethyl sulfide	EM Ethyl Mercaptan	Ethyl Acrylate	Methyl Acrylate	2-Ethyl-3- Methylpyrazin	
Formula	C ₄ H ₈ S	C ₄ H ₁₀ S	C ₃ H ₈ S	C ₃ H ₈ S	C ₃ H ₈ S	C ₂ H ₆ S	C ₂ H ₆ S	C ₅ H ₈ O ₂	C ₄ H ₆ O ₂	C ₇ H ₁₀ N ₂	
Molecular weight	88,2	90,2	76,2	76,2	76,2	62,1	62,1	100,1	86,1	122,2	
Sulphur Free								66 %	32 %	2 %	0,0
THT + EA (Ethyl Acrylate)	12 %							88 %			4,4
THT + TBM	70 %	30 %									36,1
THT	100 %										36,4
TBM + IPM + NPM		76 %	16 %	8 %							37,1
TBM + MES		50 %			50 %						38,8
TBM + DMS (UK + IE)		80 %				20 %					38,8
TBM + DMS (CZ)		65 %				35 %					41,2
EM							100 %				51,6

NOTE

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