



Testing **H**ydrogen admixture for **G**as **A**pplications

WP4 – certification & standardization framework

D4.1 – Overview of current standardization & certification framework and the impact of H₂NG mixtures

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List of abbreviations

EU	European Union
GAD	Gas Appliances Directive
GAR	Gas Appliances Regulation
OJ	Official Journal (of the European Union)
NG	Natural Gas
H ₂ NG	Hydrogen / Natural Gas blend

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1. Scope and objectives

This document describes the current certification and testing standardization framework for residential and commercial appliances covered by Regulation (EU) 2016/426 on appliances burning gaseous fuels and more specifically those burning natural gas of group H. Further, it identifies the way this framework is impacted by adding hydrogen to natural gas.

REMARK: as far as gas quality variations are concerned the THyGA project considers only the existing gas appliances certification practice based on the use of standard EN 437:2018 (see chapter 2.3). It does not take in account any proposals and/or ongoing discussions related to a possible review of the current approach as long as it is not directly linked to the addition of hydrogen to natural gas.

2. Current certification & standardization framework

2.1 Applicable legislation

Residential and commercial appliances burning gaseous fuels are subject to

- European (framework) legislation as far as product certification is concerned;
- national/regional legislation as far as their installation and on-site environmental performance are concerned.

Regarding product certification, several legal requirements apply. The products in the scope of the THyGA project are all subject to the General Product Safety Directive 2001/95/EC and the Regulation (EU) 2016/426 on appliances burning gaseous fuels. Other legislation applies depending on the design and properties of the appliance. A non-exhaustive list is given in fig. 1.

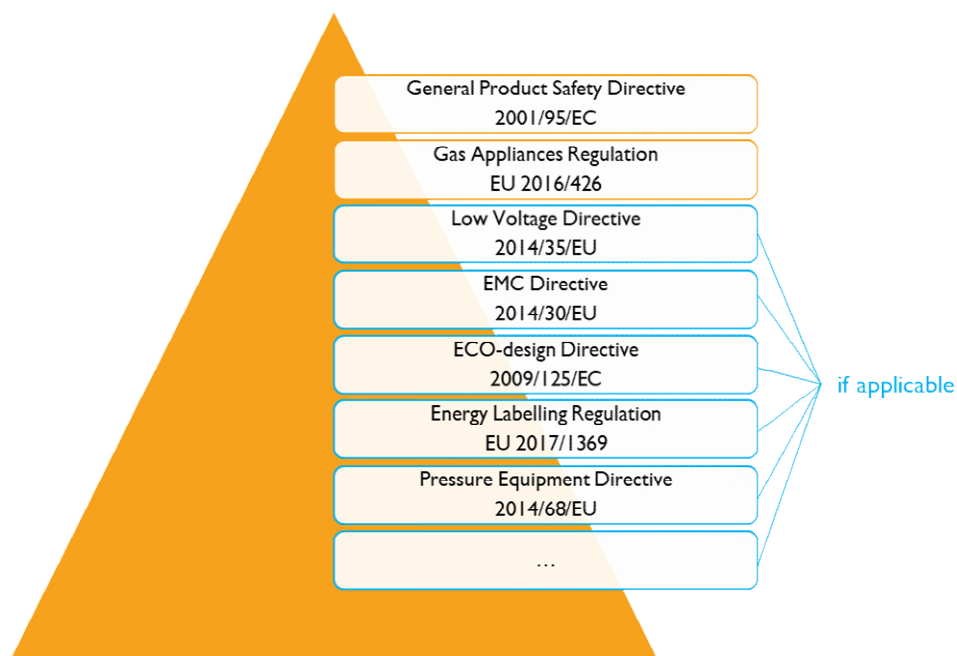


Figure 1 - EU legislation applicable to appliances burning gaseous fuels

This Union harmonization legislation applies to products which are intended to be placed (or put into service¹) on the market². For the purposes of Union harmonization legislation, a product is placed on the market when it is made available for the first time on the Union market.

The gas related safety risks, of utmost relevance when considering hydrogen admixture, are covered by the essential requirements of the EU regulation on appliances burning gaseous fuels.

2.2 Regulation (EU) 2016/426 on appliances burning gaseous fuels

Provisions on certification of appliances burning gaseous fuels used for cooking, refrigeration, air-conditioning, space heating, hot water production, lighting or washing, and also forced-draught burners and heating bodies to be equipped with such burners, are laid down in Regulation (EU) 2016/426 (referred to as GAR – Gas Appliances Regulation – in the further document).

The GAR repeals and replaces Directive 2009/142/EC (generally referred to as GAD – Gas Appliances Directive –) which was a codified version of the original Directive 90/396/EEC and its amendments over time. Contrary to an EU Regulation a Directive needs to be transposed in national legislation. The original Directive asked Member States to adopt and publish the related national legislation before the 1st of January 1992 with a transitional period till the 31st of December 1995 during which the placing on the market and/or the putting into service of appliances fulfilling the applicable national legislation was still allowed.

Appliances burning gaseous fuels as stated by the GAR means appliances burning any fuel which is in a gaseous state at a temperature of 15 °C under an absolute pressure of 1 bar.

The GAR states that appliances shall only be made available on the market and put into service if, when *normally used*, they comply with its provisions. An appliance is considered being '*normally used*' where the following conditions are met:

- a) it is correctly installed and regularly serviced in accordance with the manufacturer's instructions;
- b) it is used with *a normal variation in the gas quality and a normal fluctuation in the supply pressure* as set out by Member States;
- c) it is used in accordance with its intended purpose or in a way which can be reasonably foreseen.

To get a view on the *normal variation in the gas quality and normal fluctuation in the supply pressure* the Member States are asked to communicate to the Commission and the other Member States³ the types of gas and corresponding supply pressures of gaseous fuels used on their territory. They shall communicate any changes thereof within six months after the announcement of the envisaged changes. The Commission is empowered however to adopt delegated acts concerning modifications to the content of the Member States' communications of the gas supply conditions on their territory in order to take into account the technical developments with regard to the gas supply conditions.

These Member States' communications have always been limited to the Wobbe index range and the minimum, maximum and nominal supply pressure. Since the publication of the GAR Member States are asked to complete that information with the gross calorific value (GCV), the gas composition (and

¹ Commission Notice – The 'Blue Guide' on the implementation of EU products rules 2016: Putting into service takes place at the moment of first use within the Union by the end user for the purposes for which it was intended.

² Commission Notice – The 'Blue Guide' on the implementation of EU products rules 2016: A product is made available on the market when supplied for distribution, consumption or use on the Union market in the course of a commercial activity, whether in return for payment or free of charge.

³ These Member States' communications are published in the Official Journal of the European Union.

more specifically C_1 to C_5 – the sum⁴, $N_2 + CO_2$, CO, unsaturated hydrocarbons and H_2) and the possible presence of toxic components (cf. annex II of GAR).

In the framework of the GAR, the Wobbe index is considered being the most relevant combustion parameter. Looking to the Member States' communications the situation is as follows for gases of the 2nd family and of group H (see chapter 2.3 on harmonized standards):

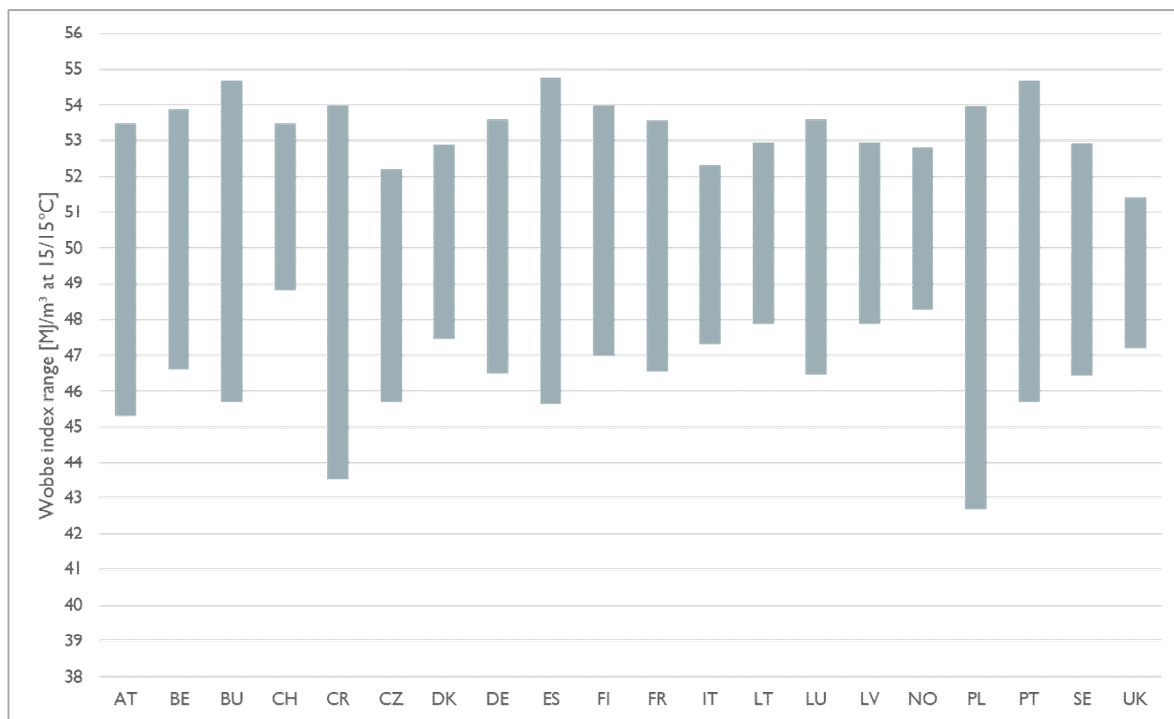


Figure 2 - Wobbe index range as communicated in the GAR framework^{5 6}

The above minimum and maximum Wobbe index values correspond to the national gas quality regulations/specifications, not necessarily the actual values experienced in the grid.

⁴ The sum of the hydrocarbon content including methane CH_4 and higher hydrocarbons up to pentane C_5H_{12} .

⁵ OJ C 206, 14 June 2018, OJ C 275, 6 August 2018, OJ C 26, 21 January 2019 and OJ C 88, 7 March 2019. The list includes other countries than only Member States as the Union harmonization legislation also applies to countries having a relevant agreement with the European Union (e.g. EEA EFTA).

⁶ Certain values as published in the Official Journal of the European Union have been converted to show all Wobbe index values under the same reference conditions of 15°C as combustion reference temperature, 15°C as volume measurement reference temperature and 1013,25 mbar as volume measurement reference pressure. Concerned countries: Croatia, Lithuania, Luxemburg, Latvia, Poland, Portugal and Sweden.

As far as hydrogen is concerned the situation is more complicated since many countries communicated not to dispose of data ('not measured', 'not regulated' or 'no information'). Only the following countries stated a max. value:

Country	Max. H ₂ concentration [vol%]
Croatia	0
Czech Republic	0
Finland	0
Spain	0 ⁷
Sweden	0
The Netherlands	0,02 ⁸
Latvia	0,07
United Kingdom	0,1 ⁷
Italy	0,5
Switzerland	1,99
Austria	4 ⁷
Spain	5 ⁹
France	< 6
Germany	0,2 - 10 ¹⁰

Table 1 - max. H₂ concentration as communicated in the GAR framework

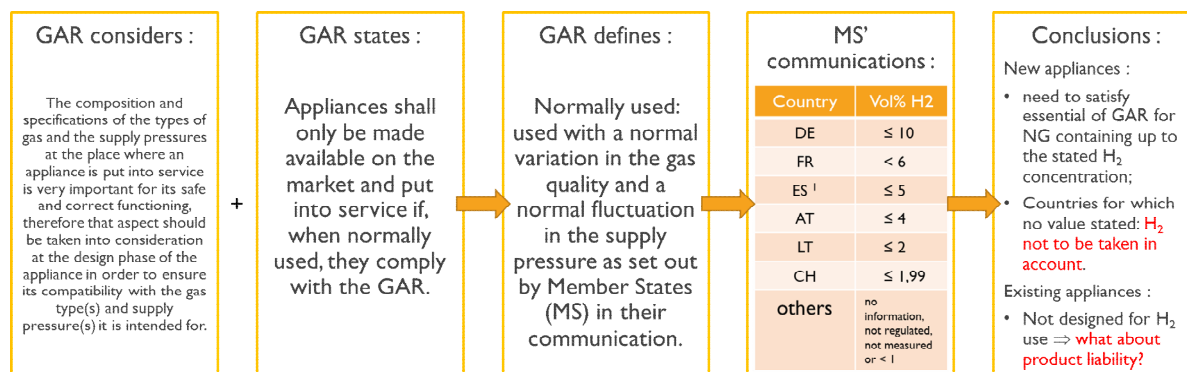


Figure 3 - GAR 'normally used' + H₂ concentration communications by MS ⇒ consequences.

⁷ In natural gas.

⁸ Mol% instead of vol%, but for gases these are almost the same.

⁹ In gases of unconventional origin (Table 4 of PD-01).

¹⁰ The current German G 260 states « single digit H₂ concentrations as long as other GQ criteria, e.g. density or WI, are complied with ».

The conformity assessment procedure in the GAR framework looks as follows:

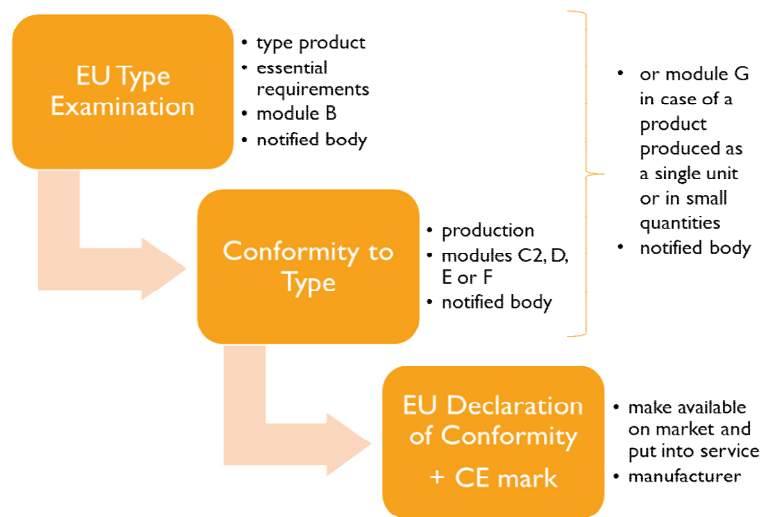


Figure 4 - GAR conformity assessment procedure

Product certification under GAR is a so-called third-party certification as it imposes the intervention of an independent body notified by the competent national authorities for the conformity assessment of a type product (during the design phase) followed by a regular assessment of the conformity to type (during the production phase)¹¹.

Appliances need to satisfy the essential product requirements¹² stated in the GAR as far as they apply to them. These essential requirements typically define the results to be attained, or the hazards to be dealt with, but do not specify the detailed criteria and technical solutions for doing so.

Their wording is intended to be precise enough to facilitate the elaboration of harmonized standards.

2.3 Harmonized standards

‘Standards’ are defined as technical specifications, adopted by a recognized standardization body, for repeated or continuous application, with which compliance is not compulsory.

‘Harmonized standards’ are European standards adopted, upon a request made by the Commission for the application of Union harmonization legislation.

Standards harmonized and published in the Official Journal of the European Union provide presumption of conformity with the related essential requirements. Although harmonized standards are commonly used to check conformity to GAR’s essential requirements, their use is not compulsory.

The conformity of a product may be demonstrated not only by harmonized standards but also by other technical specifications. The manufacturer can choose whether to apply and refer to harmonized

¹¹ Commission Notice - The ‘Blue Guide’ on the implementation of EU products rules 2016 (2016/C 272/01): Decision N° 768/2008/EC, lays down a ‘horizontal menu’ of conformity assessment modules (A, B, C1, C2, D, ...) and the ways procedures are built of modules. The legislator selects from the menu of conformity assessment modules/procedures the most appropriate one(s) in order to address the specific needs of the concerned sector.

¹² Commission Notice - The ‘Blue Guide’ on the implementation of EU products rules 2016 (2016/C 272/01): Essential requirements are designed to provide and ensure a high level of protection. They either arise from certain hazards associated with the product (for example physical and mechanical resistance, flammability, chemical, electrical or biological properties, hygiene, radioactivity, accuracy), or refer to the product or its performance (for example provisions regarding materials, design, construction, manufacturing process, instructions drawn up by the manufacturer), or lay down the principal protection objective (for example by means of an illustrative list).

standards or not to do so. However, if the manufacturer chooses not to follow the harmonized standards, he has the obligation to demonstrate that his products are in conformity with essential requirements by the use of other means of his own choice that provide for the level of safety or protection of other interests required by the applicable legislation. These requirements can be technical specifications such as national standards, European or international standards which are not harmonized, i.e. not published in the OJ or the manufacturer's own specifications.

In the framework of the THyGA project, it is obviously relevant to know is how appliances are tested for the normal variations in the quality of the natural gas used on the territory of the different countries, taking into account the non-harmonized Wobbe index situation (cf. Figure 2 - Wobbe index range as communicated in the GAR framework).

A European standard, referenced EN 437 'Test gases – Test pressures – Appliance categories', has been elaborated based on a mandate to CEN. The first version was adopted in November 1993, trying to structure and harmonize as much as possible by covering several national gas quality specifications:

- gaseous fuels with similar burning behaviour linked together by a range of Wobbe indices are called a **gas family**; distinctions are made between 1st family, gathering the so-called town gases, 2nd family, gathering the natural gases, and 3rd family, gathering the LPG's;
- a **gas group** is a specified range of Wobbe index within that of the family concerned; this range is determined on the general principle that appliances utilising this gas group would operate safely when burning all gases within this range;
- and an **appliance category** finally identifies the gas families and/or gas groups that a gas appliance is designed for to utilize safely and to the desired performance level, together with the supply pressure it is designed for.

In the context of this project only the 2nd family (natural gases) and group H are considered.

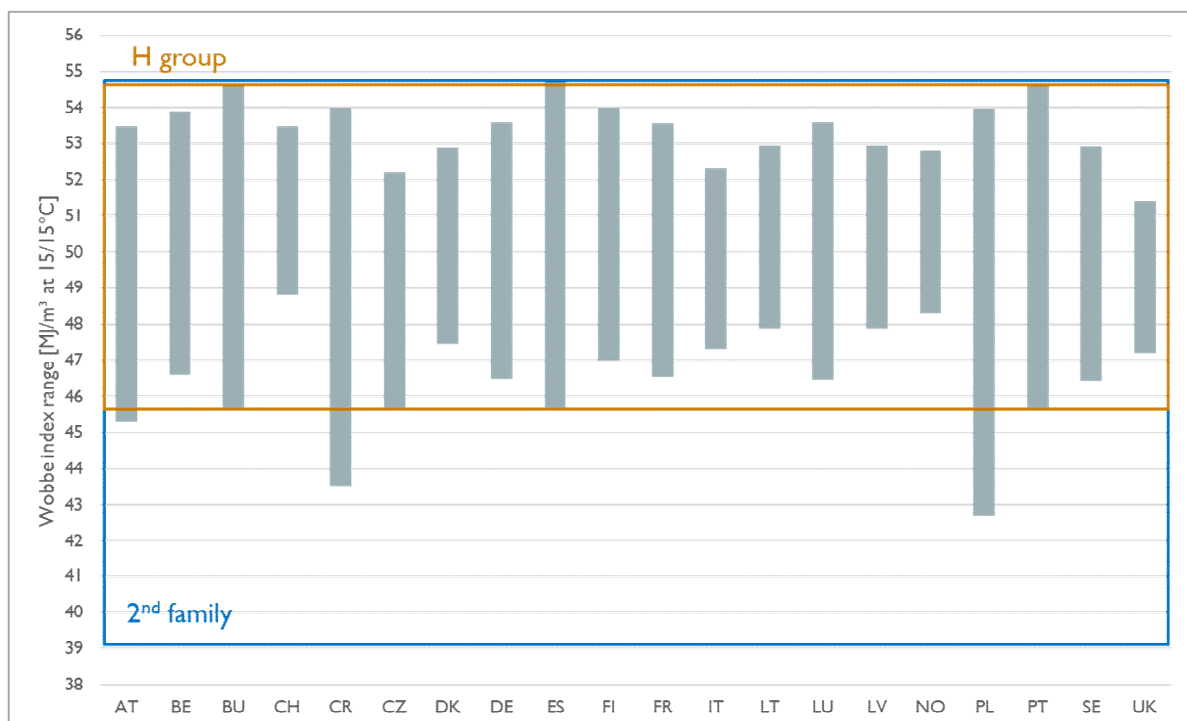


Figure 5 - Gross Wobbe index range as communicated (GAR) and 2nd gas family and gas group H (EN 437).

EN 437 defines several test gases for each group intended for the verification of the operational characteristics of gas appliances. They consist of reference gases and limit gases:

- reference gas: test gas with which appliances operate under nominal conditions (when they are supplied at the corresponding normal pressure);
- limit gas: test gas representative of the extreme variations in the characteristics of the gases for which appliances have been designed.

Each of the limit gases stresses the proper function of the appliance for a specific possible issue to be avoided or at least limited. For the H-gas group the following reference gas and limit gases have been defined:

Name	Code	Composition	WI [MJ/m ³] ¹³	Purpose
Reference gas	G20	100% CH ₄	50,72	
Incomplete combustion and sooting limit gas	G21	87% CH ₄ + 13% C ₃ H ₈	54,76	due to insufficient oxygen ⇒ incomplete combustion with higher CO concentrations) and sooting (carbon particles)
Flame lift limit gas	G23	92,5% CH ₄ + 7,5% N ₂	45,66	due to too much oxygen ⇒ unstable burning ⇒ incomplete combustion with higher CO concentrations/vibrations/noise
Overheating limit gas	G24 ¹⁴	68% CH ₄ + 12% C ₃ H ₈ + 20% H ₂	52,09	higher calorific load and combustion velocity ⇒ higher thermal load on burner surface and other components
Light-back limit gas	G222	77% CH ₄ + 23% H ₂	47,87	higher combustion velocity ⇒ combustion moves faster than gas flow leaving the orifice (= light-back)

Table 2 - reference gas and limit gases for gas group H (EN 437).

Although the first version of the EN 437 standard dates from 1993, most of the above test gases were already used in several countries several years before.

¹³ Gross Wobbe index under the following reference conditions: 15°C as combustion reference temperature, 15°C as volume measurement reference temperature and 1013,25 mbar as volume measurement reference pressure.

¹⁴ Limit gas used only for certain types of appliance, specified in the individual appliance standards (e.g. fully premixed burners, forced draught burners, ...).

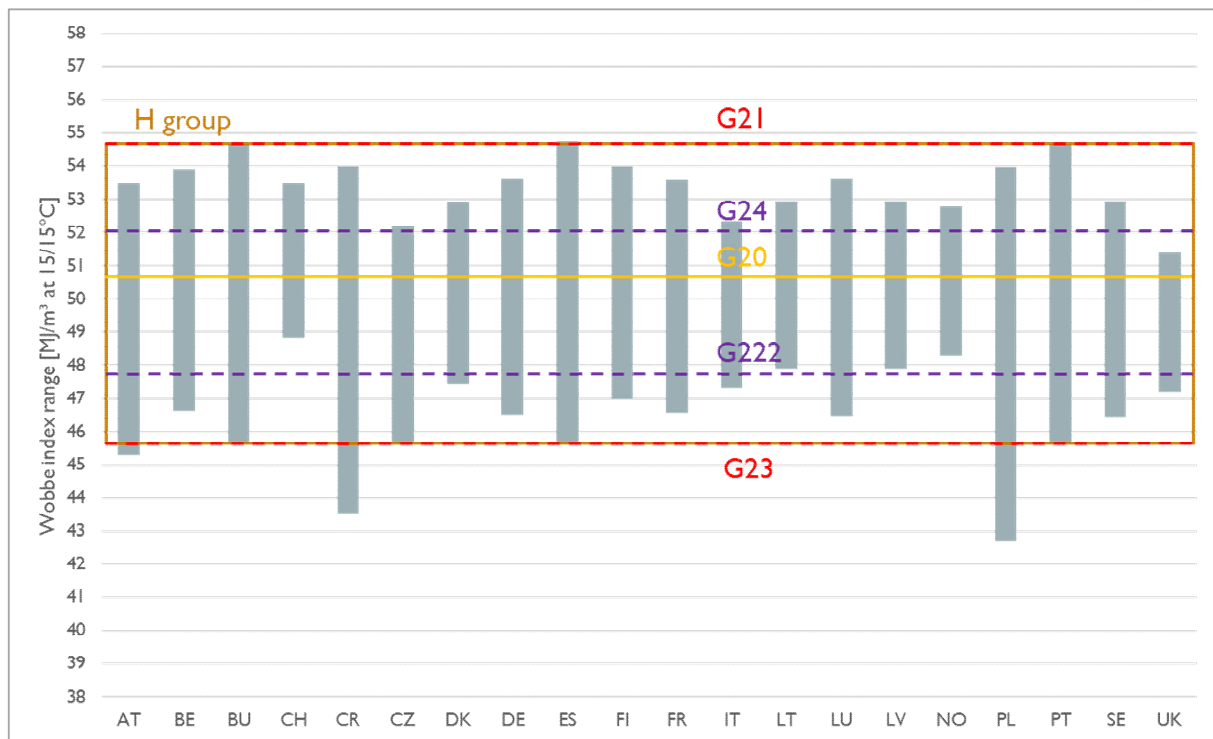


Figure 6 - Wobbe index range as communicated (GAR) and test gases for gas group H (EN 437).

Apart from test gases and test pressures, the detailed test conditions are defined in each of the specific appliance standards. As no standards are yet harmonized to GAR the latest list of standards harmonized to Gas Appliances Directive 2009/142/EC and published in the Official Journal of the European Union was considered relevant for this project and can be found in annex I to this document. Presumption of conformity under Directive 2009/142/EC ceased as from 21 April 2018. Some of the standards mentioned are superseded by newer versions or new standards in the meanwhile.

REMARK: besides the gas quality variations communicated by Member States for the gases distributed on their territory and the gas families and gas groups defined by EN 437, another European standard, EN 16726:2015 elaborated by CEN TC234, specifies gas quality characteristics, parameters and their limits, for gases classified as group H that are to be transmitted, injected to and from storages, distributed and utilized. The current version does not yet include Wobbe index nor H₂ content specifications. This standard is not harmonized to the GAR.

2.4 Other applicable legislation

Depending on the type of appliance other legislation may apply like

- the low voltage directive 2014/35/EU, the EMC directive 2014/30/EU and the pressure equipment directive 2014/68/EU all related to safety aspects;
- the ECO-design directive 2009/125/EC and the energy labelling regulation (EU) 2017/1369 related to environmental aspects (efficiency, emissions and/or noise level);
- national or regional legislation related to installation, commissioning, maintenance and inspection (including efficiency and/or emissions).

3. Identification of impact of hydrogen addition

3.1 Applicable legislation

Using hydrogen or a hydrogen/natural gas mixture as fuel does not impact the legislation that applies to a gas appliance (cf. chapter 2.1).

3.2 Regulation (EU) 2016/426 on appliances burning gaseous fuels

Hydrogen and hydrogen/natural gas mixtures satisfy the definition of a gaseous fuel. Appliances using them are by consequence well in the GAR's scope. The content of the GAR is appropriate for these fuels, but some questions, not necessarily specific only to hydrogen or hydrogen addition, will however need to be addressed considering

- the composition and specifications of the types of gas and the supply pressures at the place where an appliance is put into service is very important for its safe and correct function, therefore this aspect should be taken into consideration at the design phase of the appliance in order to ensure its compatibility with the gas type(s) and supply pressure(s) it is intended for;
- that appliances shall only be made available on the market and put into service if, when normally used, they comply with the GAR;
- that normally used = used with a normal variation in the gas quality and a normal fluctuation in the supply pressure as set out by Member States (MS) in their communication;
- the Member States' communications on H₂ content (cf. Table 1 - max. H₂ concentration as communicated in the GAR framework);
- appliances are designed and produced in conformity with the essential requirements for the supply conditions as communicated by the Member States for the gases used on their territory.

The above leads to the following conclusion and questions:

- **for the countries stating specifications for the hydrogen content, new appliances need to satisfy the essential requirements for natural gas with up to the stated hydrogen concentration;**
- **is hydrogen content to be considered for the countries communicating 'no information', 'no data available' or 'not regulated' as far as hydrogen content is concerned → and if yes, how?**
- **how to prepare for a future with higher hydrogen concentrations? Does the Commission need to make use of its possibility to adopt delegated acts concerning modifications to the content of the Member States' communications of the gas supply conditions on their territory, in order to take into account the technical developments with regard to the gas supply conditions?**
- **what about product liability for the existing appliances on the market that have not been designed for the use of natural gas with any significant H₂ content?**

The GAR requires gas appliances to satisfy the essential requirements as stated in its annex I. To evaluate the impact of adding hydrogen, a closer look is needed on the physical and chemical properties of hydrogen. These are significantly different from those of methane, the major component of natural gas.

Property	Unit	CH ₄	H ₂
Atomic weight	u	16	2
Gross Wobbe index ¹⁵	MJ/m ³	50,72	45,88
Gross calorific value ¹⁵	MJ/m ³	37,78	12,10
Relative density	-	0,56	0,07
Flammability range	vol% in air	5 – 15	4 – 75
Auto-ignition temperature	°C	about 595	about 560
Min. ignition energy with air	mJ	0,3	0,02
Max. laminar combustion velocity at stoichiometric conditions	cm/s	about 39	about 209
Max. adiabatic combustion temperature	°C	about 1.950	about 2.110
Flue gas dew point temperature at stoichiometric conditions and dry air	°C	55	72
Other	-	-	burns with colorless, invisible flame

Table 3 - comparison of some relevant properties of CH₄ and H₂.

More information on the differences between hydrogen, methane and hydrogen/methane mixtures and their impact on combustion can be found in THyGA deliverable D2.2 on 'Impact of hydrogen admixture on combustion processes – Part I: Theory'.

As far as the essential requirements are concerned the risk of non-conformity due to the hydrogen addition is impacted and needs to be assessed.

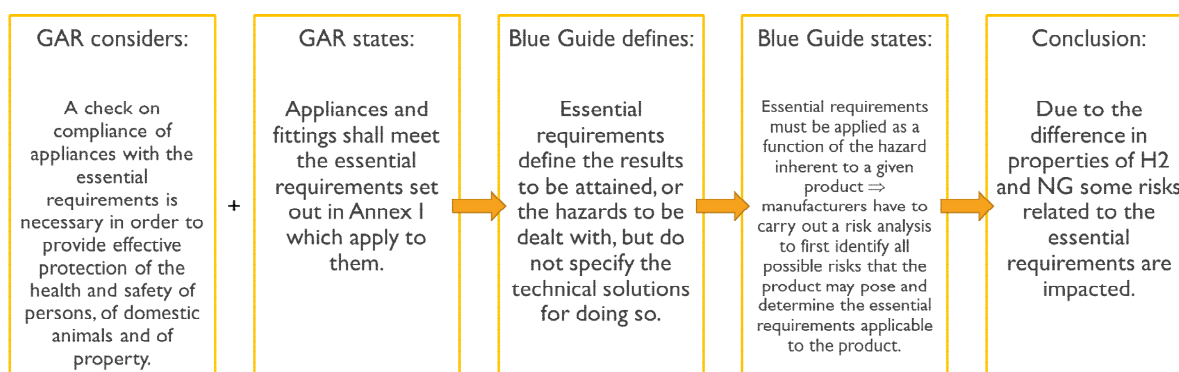


Figure 7 - risks of non-conformity to GAR's essential requirements due to H₂ addition need to be assessed.

¹⁵ Reference conditions: 15°C as combustion reference temperature, 15°C as volume measurement reference temperature and 1013,25 mbar as volume measurement reference pressure.

The above hydrogen properties (cf. Table 3 - comparison of some relevant properties of CH₄ and H₂.) allow to identify the essential requirements possibly impacted by the addition of hydrogen:

ESSENTIAL REQUIREMENT		Possibly impacted? (Y: yes / N: no)	Cause
N°	Description		
1	GENERAL REQUIREMENTS		
1.1	Appliances shall be so designed and constructed as to operate safely and present no danger to persons, domestic animals or property, when normally used.	Y	• very different properties of H ₂ increasing several risks.
	Fittings shall be so designed and constructed as to fulfil correctly their intended purpose when incorporated into an appliance or assembled to constitute an appliance.	Y	• very different properties of H ₂ increasing several risks.
1.2	The manufacturer is under an obligation to analyse the risks in order to identify those which apply to his appliance or fitting. He shall then design and construct it taking into account its risk assessment.	Y	• very different properties of H ₂ increasing several risks.
1.3	In selecting the most appropriate solutions, the manufacturer shall apply the principles set out below, in the following order:		
	(a) eliminate or reduce risks as far as possible (inherently safe design and construction);	Y	• very different properties of H ₂ increasing several risks.
	(b) take the necessary protective measures in relation to risks that cannot be eliminated;	Y	• very different properties of H ₂ increasing several risks.
	(c) inform users of the residual risks due to any shortcomings of the protection measures adopted and indicate whether any particular precautions are required.	N	-
1.4	When designing and constructing the appliance, and when drafting the instructions, the manufacturer shall envisage not only the intended use of the appliance, but also the reasonably foreseeable uses.	Y	• if supply with H ₂ NG mixtures is to be considered as 'foreseeable use'.
1.5	All appliances shall:		
	(a) be accompanied by instructions for installation intended for the installer;	N	-
	(b) be accompanied by instructions for use and servicing, intended for the user;	N	-
	(c) bear appropriate warning notices, which shall also appear on the packaging.	N	-
1.6.1	The instructions for installation intended for the installer shall contain all the instructions for installation, adjustment and servicing required to ensure that those operations are correctly performed so that the appliance may be used safely.	Y	• if supply with H ₂ NG mixtures is to be considered as 'foreseeable use'.
	The instructions for installation intended for the installer shall include also information on the technical specifications of the interface between the appliance and its installation environment allowing its correct connection to the gas supply network, the supply of auxiliary energy, the combustion air supply and the flue gas evacuation system.	N	-
1.6.2	The instructions for use and servicing intended for the user shall contain all the information required for safe use and in particular shall draw the user's attention to any restrictions on use.	N	-

ESSENTIAL REQUIREMENT		Possibly impacted? (Y: yes / N: no)	Cause
N°	Description		
	The manufacturers shall note in the instructions where additional care is needed or where it would be advisable that any of the above work be carried out by a professional. This shall be without prejudice to national requirements to that effect.	N	-
	The manufacturer of the appliance shall include in the instructions accompanying the appliance all necessary information for adjustment, operation and maintenance of the fittings as part of the finished appliance, as appropriate.	Y	<ul style="list-style-type: none"> H₂ injection widens the local Wobbe index range which may require a different (methodology of) on-site adjustment of combustion settings or even a hardware change.
1.6.3	The warning notices on the appliance and its packaging shall clearly state the type of gas to be used, the gas supply pressure, the appliance category and any restrictions on use, in particular the restriction whereby the appliance shall be installed only in areas where there is sufficient ventilation so as to ensure that the risks presented by it are minimised.	Y	<ul style="list-style-type: none"> very different properties of H₂ may require a new gas family and/or a gas group.
1.7	The instructions for incorporation of the fitting into an appliance or its assembly in order to constitute an appliance and for its adjustment, operation and maintenance shall be provided with the fittings concerned as part of the EU declaration of conformity.	N	-
2	MATERIALS		
	Materials for appliances or fittings shall be appropriate for their intended purpose and shall withstand the mechanical, chemical and thermal conditions to which they will foreseeably be subjected.	Y	<ul style="list-style-type: none"> material integrity may be impacted by H₂'s higher combustion temperature, velocity and by embrittlement.
3	DESIGN AND CONSTRUCTION		
	The obligations arising for appliances from the essential requirements set out in this point apply also to fittings, as far as relevant.		
3.1	General		
3.1.1	Appliances shall be so designed and constructed that, when normally used, no instability, distortion, breakage or wear likely to impair their safety may occur.	Y	<ul style="list-style-type: none"> material integrity may be impacted by H₂'s higher combustion temperature and velocity.
3.1.2	Condensation produced at the start-up and/or during use shall not affect the safety of appliances.	Y	<ul style="list-style-type: none"> relative humidity of combustion products increases and so dewpoint temperature rises (if constant air excess); more water vapor in combustion products ⇒ volume of condensate may increase.
3.1.3	Appliances shall be so designed and constructed as to minimise the risk of explosion in the event of a fire of external origin.	N	-
3.1.4	Appliances shall be so designed and constructed that water and inappropriate air penetration into the gas circuit does not occur.	Y	<ul style="list-style-type: none"> air penetration is sooner "inappropriate" due to much higher upper flammability limit.
3.1.5	In the event of a normal fluctuation of auxiliary energy, appliances shall continue to operate safely.	N	-
3.1.6	Abnormal fluctuation or failure of auxiliary energy or its restoration shall not lead to an unsafe situation.	N	-
3.1.7	Appliances shall be so designed and constructed as to obviate any gas-related risks due to hazards of electrical	N	-

ESSENTIAL REQUIREMENT		Possibly impacted? (Y: yes / N: no)	Cause
N°	Description		
	origin. As far as relevant, the results of the conformity assessment in relation to the safety requirements of Directive 2014/53/EU of the European Parliament and of the Council (1) or the safety objectives of Directive 2014/35/EU of the European Parliament and of the Council (2) shall be taken into account.		
3.1.8	Appliances shall be so designed and constructed as to obviate any gas-related risks due to hazards originating from electromagnetic phenomena. As far as relevant, the results of the conformity assessment in relation to the electromagnetic compatibility requirements of Directive 2014/53/EU or Directive 2014/30/EU of the European Parliament and of the Council (3) shall be taken into account.	N	-
3.1.9	All pressurised parts of an appliance shall withstand the mechanical and thermal stresses to which they are subjected without any deformation affecting safety.	N	-
3.1.10	Appliances shall be so designed and constructed that failure of a safety, controlling or regulating device may not lead to an unsafe situation.	N	-
3.1.11	If an appliance is equipped with safety and controlling devices, the functioning of the safety devices shall not be overruled by that of the controlling devices.	N	-
3.1.12	All parts of appliances which are set or adjusted at the stage of manufacture and which should not be manipulated by the user or the installer shall be appropriately protected.	N	-
3.1.13	Levers and other controlling and setting devices shall be clearly marked and give appropriate instructions so as to prevent any error in operation/use. Their design shall be such as to preclude accidental operation.	N	-
3.2	Unburned gas release		
3.2.1	Appliances shall be so designed and constructed that the gas leakage rate is not dangerous.	Y	<ul style="list-style-type: none"> • H₂ molecule is a lot smaller than natural gas components molecules.
3.2.2	Appliances shall be so designed and constructed that gas release at any state of operation is limited in order to avoid a dangerous accumulation of unburned gas in the appliance.	Y	<ul style="list-style-type: none"> • H₂ molecule is a lot smaller than natural gas components molecules; • the flammability range is a lot wider (especially due to high upper limit); • easier ignition due to lower ignition energy and temperature. • and what about stratification ← H₂ has a low density, but is highly diffusive?
3.2.3	Appliances intended to be used in indoor spaces and rooms shall be so designed and constructed as to prevent the release of unburned gas in all situations which could lead to a dangerous accumulation of unburned gas in such spaces and rooms.	Y	<ul style="list-style-type: none"> • H₂ molecule is a lot smaller than natural gas components molecules; • the flammability range is a lot wider (especially due to high upper limit); • easier ignition due to lower ignition energy and temperature. • and what about stratification ← H₂ has a low density, but is highly diffusive?

ESSENTIAL REQUIREMENT		Possibly impacted? (Y: yes / N: no)	Cause
N°	Description		
3.2.4	Appliances designed and constructed to burn gas containing carbon monoxide or other toxic components shall not present a danger to the health of persons and domestic animals exposed.	N	-
3.3	Ignition		
	Appliances shall be so designed and constructed that, when normally used, ignition and re-ignition is smooth and cross-lighting is assured.	Y	<ul style="list-style-type: none"> the flammability range is a lot wider (especially due to high upper limit); easier ignition due to lower ignition energy and temperature.
3.4	Combustion		
3.4.1	Appliances shall be so designed and constructed that, when normally used, the combustion process is stable and combustion products do not contain unacceptable concentrations of substances harmful to health.	Y	<ul style="list-style-type: none"> lower Wobbe index will lead to higher air excess which may on its turn cause flame lift/unstable burning which may lead to more CO. This may however (partly) be compensated due to the higher flame speed.
3.4.2	Appliances shall be so designed and constructed that, when normally used, there will be no accidental release of combustion products.	N	-
3.4.3	Appliances connected to a flue for the dispersal of combustion products shall be so designed and constructed that in abnormal draught conditions there is no release of combustion products in a dangerous quantity into the indoor spaces or rooms concerned.	Y	<ul style="list-style-type: none"> the impact on flue gas volume and temperature on the proper functioning of safety devices is to be evaluated; the impact of H₂ molecules being a lot smaller than natural gas components molecules on one-way valves used in pressurized common flue gas ducts is to be evaluated.
3.4.4	Appliances shall be so designed and constructed that, when normally used, they do not cause a concentration of carbon monoxide or other substances harmful to health, such as they would be likely to present a danger to the health of persons and domestic animals exposed.	Y	<ul style="list-style-type: none"> lower Wobbe index will lead to higher air excess which may on its turn cause flame lift/unstable burning which may lead to more CO.
3.5	Rational use of energy		
	Appliances shall be so designed and constructed as to ensure rational use of energy, reflecting the state of the art and taking into account safety aspects.	Y	<ul style="list-style-type: none"> the impact on air excess and condensation is to be evaluated.
3.6	Temperature		
3.6.1	Parts of appliances which are intended to be installed or placed in close proximity to surfaces shall not reach temperatures which present a danger.	N	-
3.6.2	The surface temperature of parts of appliances intended to be handled during normal use shall not present a danger to the user.	N	-
3.6.3	The surface temperatures of external parts of appliances, with the exception of surfaces or parts which are associated with the transmission of heat, shall not under operating conditions present a danger to the health and safety of persons exposed and in particular to children and elderly people, for whom an appropriate reaction time shall be taken into account.	N	-

ESSENTIAL REQUIREMENT		Possibly impacted? (Y: yes / N: no)	Cause
N°	Description		
3.7	Contact with food and water intended for human consumption		
	Without prejudice to Regulations (EC) No 1935/2004 (1) and (EU) No 305/2011 (2) of the European Parliament and of the Council, materials and parts used in the construction of an appliance which may come into contact with food or water intended for human consumption as defined in Article 2 of Council Directive 98/83/EC (3), shall not impair quality of the food or water.	N	-

Table 4 - GAR essential requirements and H₂ admixture impact

The THyGA project should communicate issues and eventual recommendations related to the certification framework to the competent EU administrations.

The impacted risk on non-conformity to the essential requirements of the GAR is to be evaluated. Therefor harmonized standards will have to be reviewed appropriately.

3.3 Harmonized standards

Several standardization organizations and committees already committed to some level of work on H₂ and H₂NG. Their status of work is obviously relevant for this project and so a certain level of exchange is established between the concerned committee and this project.

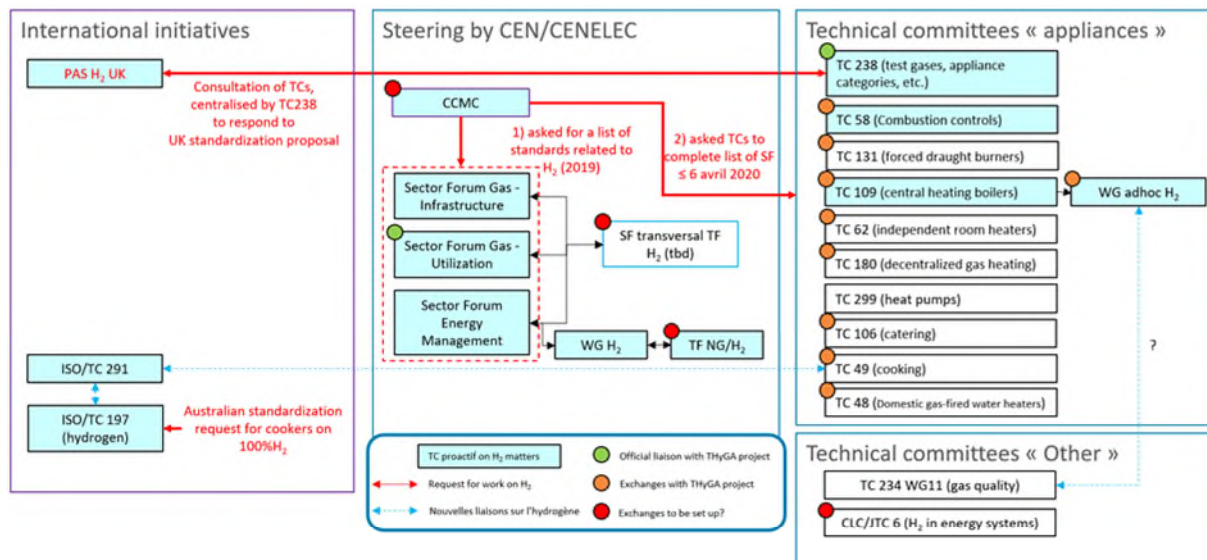


Figure 8 - standardization activities on H₂ and exchange with THyGA project (June 2020)

Experience with H₂NG mixtures related to certification and standardization is starting and developing in Europe like in other parts of the world. The latter are the subject of deliverable D4.2.

Hydrogen has been used for decades as a component of the test gases defined in standard EN 437. This concerns the limit gases G222 and G24, used for assessing the conformity to the essential requirements of appliances designed for use of 2nd family gases of group H and group E. Thus, the project will need to evaluate to what extent these test gases can help making conclusions on the appliances' compatibility with H₂NG supplies, especially for existing appliances as these have only

been supplied with these test gases for checking conformity with the essential requirements. For new appliances, new test gases could obviously be defined to properly assess supply with H₂NG mixtures.

Although little used in the EU today, experiences with town gases could also be relevant as they contain about 50 vol% of hydrogen. EN 437 defines test gases for this 1st family. Only Denmark, France and Sweden communicated specifications for 1st family gases used on their territory.

EN 437 defining the test gases will have to be reviewed by CEN TC238 to cover supply with H₂NG mixtures addressing the following questions:

- **Is there a need for a new gas family and/or a new gas group knowing that hydrogen has a very different combustion behavior and that it lowers the Wobbe index of natural gas possibly leading to a Wobbe index range wider than the current one of the H group (i.e. a lower minimum Wobbe index)?**
- **What new test gases (reference and limit gases) are needed to cover all supplementary risks induced by a significant hydrogen concentration in the supplied gas?**

Besides EN437, the harmonized appliance standards will also need to be reviewed to address the following question:

- **What tests and test conditions are needed for assessing the risks induced by a significant hydrogen concentration in the supplied gas?**

The THyGA project should bring forward recommendations to CEN TC238 and the different TC's covering appliance standards (cf. Figure 8 - standardization activities on H₂ and exchange with THyGA project (June 2020).

3.4 Other applicable regulation

Other applicable legislation may also be impacted by adding hydrogen to natural gas:

LEGISLATION	Conformity may be impacted by adding hydrogen?
SAFETY ASPECTS covered by the low voltage directive 2014/35/EU, the EMC directive 2014/30/EU and the pressure equipment directive 2014/68/EU	NO
ENVIRONMENTAL ASPECTS covered by the ECO-design directive 2009/125/EC and the energy labelling regulation EU N° 2017/1369	YES IF (a) new reference gas(es) ¹⁶ would be introduced.
National or regional legislation related to installation, commissioning, maintenance and inspection (including efficiency and/or emissions)	YES

Table 5 - impact on conformity to requirements imposed by other legislation than the GAR.

¹⁶ Only reference gases are used for testing conformity to these requirements. The reference gas used for natural gases of the H group is G20 (methane) as defined by EN 437.

4. Conclusions and remaining action points

Based on the above analysis the following can already be concluded:

N°	CONCLUSIONS
1	GAR: there does not seem to be a need to change anything to the current requirements and provisions of this legal tool when hydrogen is added to natural gas.
2	GAR: to prepare for future higher hydrogen concentrations in natural gas it is recommended to adopt these as soon as possible in the quality specifications for the distributed gases (cf. annex II of GAR) for which a new appliance needs to be designed.
3	GAR: the existing appliances on the market did not have to be designed for the use of natural gas with any (significant) H ₂ content; higher H ₂ concentrations could by consequence not be considered as 'normal use' and so manufacturers would not be liable for any negative impact caused by the supply of any such H ₂ NG mixtures.
4	GAR: adding significant concentrations of hydrogen to the gas supply of an appliance designed for the use of natural gas may compromise its conformity to a significant number of essential requirements.
5	EN 437: a new gas family and/or a new gas group may be needed knowing that hydrogen has a very different combustion behavior and that it lowers the Wobbe index of natural gas which possibly leads to a Wobbe index range wider than the current one of the H group (i.e. a lower lower limit).
6	EN 437: the current test gases for group H are not appropriate to cover all supplementary risks induced by a significant hydrogen concentration in the supplied gas.
7	Appliance standards: the current tests and test conditions need to be complemented (or reviewed) for assessing the risks induced by a significant hydrogen concentration in the supplied gas.

Table 6 - conclusions of THyGA WP4.1.

Based on the above analysis the following action points related to product certification and standardization are identified for the further work in the THyGA project:

N°	ACTION POINTS
1	Communicate conclusions (cf. Table 6 - conclusions of THyGA WP4.1.) to relevant stakeholders.
2	Check with GAD-AC if and how hydrogen content is to be taken into account for the countries communicating 'no information', 'no data available' or 'not regulated' as far as hydrogen content is concerned (cf. annex II of GAR)?
3	Check with GAD-AC (and CEN TC238) how hydrogen is taken into account for countries indicating a value for the max. hydrogen content?
4	Bring together and evaluate relevant existing experiences with certification and testing of appliances with H ₂ NG mixtures outside of the EU (cf. THyGA task 4.2).
4	Evaluate the need for (a) new/(an)other reference gas(es). Make recommendations to CEN TC238.
5	Define limit gases to cover the risks induced by a significant hydrogen concentration in the supplied gas. Make recommendations to CEN TC238.
6	Identify new tests and test conditions to cover the risks induced by a significant hydrogen concentration in the supplied gas. Make recommendations to the different CEN TC's working on gas appliance standards.

Table 7 - remaining action points for further work in the THyGA project

ANNEX I – LIST OF HARMONIZED STANDARDS

AS NO STANDARDS ARE YET HARMONIZED TO GAR THE FOLLOWING LATEST LIST OF STANDARDS HARMONIZED TO GAS APPLIANCES DIRECTIVE 2009/142/EC AND PUBLISHED IN THE OFFICIAL JOURNAL OF THE EUROPEAN UNION WAS CONSIDERED RELEVANT FOR THE THYGA PROJECT. SOME OF THE STANDARDS MENTIONED ARE SUPERSEDED BY NEWER VERSIONS OR NEW STANDARDS IN THE MEANWHILE.

Commission communication in the framework of the implementation of Directive 2009/142/EC of the European Parliament and of the Council relating to appliances burning gaseous fuels (*Publication of titles and references of harmonised standards under Union harmonization legislation*)

(Text with EEA relevance)

(2018/C 118/05)

In accordance with the transitional provision of Article 44 of Regulation (EU) 2016/426 of the European Parliament and of the Council of 9 March 2016 on appliances burning gaseous fuels and repealing Directive 2009/142/EC ⁽¹⁾, Member States shall not impede the making available on the market or the putting into service of appliances covered by Directive 2009/142/EC of the European Parliament and of the Council ⁽²⁾ which are in conformity with that Directive and which were placed on the market before 21 April 2018. Accordingly, harmonised standards the references to which have been published under Directive 2009/142/EC, as listed in column 2 of this Commission Communication, continue to confer a presumption of conformity only with that Directive only until 20 April 2018. Such presumption of conformity under Directive 2009/142/EC will cease as from 21 April 2018.

ESO ⁽¹⁾	Reference and title of the standard (and reference document)	Reference of superseded standard	Date of cessation of presumption of conformity of superseded standard Note 1
(1)	(2)	(3)	(4)
CEN	EN 26:1997 Gas-fired instantaneous water heaters for sanitary uses production, fitted with atmospheric burners (Including Corrigendum 1998)		
	EN 26:1997/AC:1998		
	EN 26:1997/A1:2000	Note 3	18.7.2001

	EN 26:1997/A3:2006	Note 3	30.6.2007
	EN 26:1997/A2:2004	Note 3	18.11.2009
CEN	EN 30-1-1:2008+A1:2010 Domestic cooking appliances burning gas — Part 1-1: Safety — General	EN 30-1-1:2008 Note 2.1	31.1.2011
CEN	EN 30-1-2:1999 Domestic cooking appliances burning gas — Part 1-2: Safety — Appliances having forced-convection ovens and/or grills		

(1) OJ L 81, 31.3.2016, p. 99.

(2) OJ L 330, 16.12.2009, p. 10.

(1)	(2)	(3)	(4)
CEN	EN 30-1-3:2003+A1:2006 Domestic cooking appliances burning gas — Part 1-3: Safety — Appliances having a glass ceramic hotplate	EN 30-1-3:2003 Note 2.1	30.6.2007
CEN	EN 30-1-4:2002 Domestic cooking appliances burning gas — Part 1-4: Safety — Appliances having one or more burners with an automatic burner control system		
	EN 30-1-4:2002/A1:2006	Note 3	30.6.2007

CEN	EN 30-2-1:1998 Domestic cooking appliances burning gas — Part 2-1: Rational use of energy — General		
	EN 30-2-1:1998/A1:2003	Note 3	10.12.2004
	EN 30-2-1:1998/A2:2005	Note 3	11.11.2005
	EN 30-2-1:1998/A1:2003/AC:2004		
CEN	EN 30-2-2:1999 Domestic cooking appliances burning gas — Part 2-2: Rational use of energy — Appliances having forced-convection ovens and/or grills		
CEN	EN 88-1:2007 Pressure regulators and associated safety devices for gas appliances — Part 1: Pressure regulators for inlet pressures up to and including 500 mbar	EN 88:1991 Note 2.1	31.5.2008
CEN	EN 88-2:2007 Pressure regulators and associated safety devices for gas appliances — Part 2: Pressure regulators for inlet pressures above 500 mbar up to and including 5 bar		
(1)	(2)	(3)	(4)
CEN	EN 89:1999 Gas-fired storage water heaters for the production of domestic hot water		

	EN 89:1999/A4:2006	Note 3	30.6.2007
	EN 89:1999/A3:2006	Note 3	30.6.2007
	EN 89:1999/A2:2000	Note 3	18.7.2001
	EN 89:1999/A1:1999	Note 3	17.10.2000
CEN	EN 125:2010 Flame supervision devices for gas burning appliances — Thermoelectric flame supervision devices	EN 125:1991 Note 2.1	22.12.2010
CEN	EN 126:2004 Multifunctional controls for gas burning appliances	EN 126:1995 Note 2.1	10.12.2004
CEN	EN 161:2007 Automatic shut-off valves for gas burners and gas appliances	EN 161:2001 Note 2.1	31.7.2007
CEN	EN 203-1:2005+A1:2008 Gas heated catering equipment — Part 1: General safety rules	EN 203-1:2005 Note 2.1	18.11.2009
CEN	EN 203-2-1:2005 Gas heated catering equipment — Part 2-1: Specific requirements — Open burners and wok burners	EN 203-2:1995 Note 2.1	31.12.2008

CEN	EN 203-2-2:2006 Gas heated catering equipment — Part 2-2: Specific requirements — Ovens	EN 203-2:1995 Note 2.1	31.12.2008
(1)	(2)	(3)	(4)
CEN	EN 203-2-3:2005 Gas heated catering equipment — Part 2-3: Specific requirements — Boiling pans	EN 203-2:1995 Note 2.1	31.12.2008
CEN	EN 203-2-4:2005 Gas heated catering equipment — Part 2-4: Specific requirements — Fryers	EN 203-2:1995 Note 2.1	31.12.2008
CEN	EN 203-2-6:2005 Gas heated catering equipment — Part 2-6: Specific requirements — Hot water heaters for beverage	EN 203-2:1995 Note 2.1	31.12.2008
CEN	EN 203-2-7:2007 Gas heated catering equipment — Part 2-7: Specific requirements — Salamanders and rotisseries	EN 203-2:1995 Note 2.1	31.12.2008
CEN	EN 203-2-8:2005 Gas heated catering equipment — Part 2-8: Specific requirements — Brat pans and paëlla cookers	EN 203-2:1995 Note 2.1	31.12.2008
CEN	EN 203-2-9:2005 Gas heated catering equipment — Part 2-9: Specific requirements — Solid tops, warming plates and griddles	EN 203-2:1995 Note 2.1	31.12.2008

CEN	EN 203-2-10:2007 Gas heated catering equipment — Part 2-10: Specific requirements — Chargrills	EN 203-2:1995 Note 2.1	31.12.2008
CEN	EN 203-2-11:2006 Gas heated catering equipment — Part 2-11: Specific requirements — Pasta cookers	EN 203-2:1995 Note 2.1	31.12.2008
CEN	EN 203-3:2009 Gas heated catering equipment — Part 3: Materials and parts in contact with food and other sanitary aspects		

(1)	(2)	(3)	(4)
CEN	EN 257:2010 Mechanical thermostats for gas-burning appliances	EN 257:1992 Note 2.1	31.12.2010
CEN	EN 297:1994 Gas-fired central heating boilers — Type B11 and B11BS boilers fitted with atmospheric burners of nominal heat input not exceeding 70 kW		
	EN 297:1994/A3:1996	Note 3	24.2.1998
	EN 297:1994/A6:2003	Note 3	23.12.2003
	EN 297:1994/A5:1998	Note 3	31.12.1998
	EN 297:1994/A4:2004	Note 3	11.6.2005

	EN 297:1994/A2:1996	Note 3	29.10.2002
	EN 297:1994/A2:1996/AC:2006		
CEN	EN 298:2003 Automatic gas burner control systems for gas burners and gas burning appliances with or without fans	EN 298:1993 Note 2.1	30.9.2006
CEN	EN 303-3:1998 Heating boilers — Part 3: Gas-fired central heating boilers — Assembly comprising a boiler body and a forced draught burner		
	EN 303-3:1998/AC:2006		
	EN 303-3:1998/A2:2004	Note 3	11.6.2005
CEN	EN 303-7:2006 Heating boilers — Part 7: Gas-fired central heating boilers equipped with a forced draught burner of nominal heat output not exceeding 1 000 kW		
(1)	(2)	(3)	(4)
CEN	EN 377:1993 Lubricants for applications in appliances and associated controls using combustible gases except those designed for use in industrial processes		
	EN 377:1993/A1:1996	Note 3	11.6.2005

CEN	EN 416-1:2009 Single burner gas-fired overhead radiant tube heaters for non-domestic use — Part 1: Safety	EN 416-1:1999 Note 2.1	18.11.2009
CEN	EN 416-2:2006 Single burner gas-fired overhead radiant tube heaters for non-domestic use — Part 2: Rational use of energy		
CEN	EN 419-1:2009 Non-domestic gas-fired overhead luminous radiant heaters — Part 1: Safety	EN 419-1:1999 Note 2.1	18.11.2009
CEN	EN 419-2:2006 Non-domestic gas-fired overhead luminous radiant heaters — Part 2: Rational use of energy		
CEN	EN 437:2003+A1:2009 Test gases — Test pressures — Appliance categories	EN 437:2003 Note 2.1	18.11.2009
CEN	EN 449:2002+A1:2007 Specification for dedicated liquefied petroleum gas appliances — Domestic flueless space heaters (including diffusive catalytic combustion heaters)	EN 449:2002 Note 2.1	23.12.2008
CEN	EN 461:1999 Specification for dedicated liquefied petroleum gas appliances — Flueless nondomestic space heaters not exceeding 10 kW		
	EN 461:1999/A1:2004	Note 3	10.12.2004
(1)	(2)	(3)	(4)

CEN	EN 483:1999 Gas-fired central heating boilers — Type C boilers of nominal heat input not exceeding 70 kW		
	EN 483:1999/A2:2001/AC:2006		
	EN 483:1999/A2:2001	Note 3	31.1.2002
CEN	EN 484:1997 Specification for dedicated liquefied petroleum gas appliances — Independent hotplates, including those incorporating a grill for outdoor use		
CEN	EN 497:1997 Specification for dedicated liquefied petroleum gas appliances — Multipurpose boiling burners for outdoor use		
CEN	EN 498:1997 Specification for dedicated liquefied petroleum gas appliances — Barbecues for outdoor use		
	EN 498:1997/AC:2000		
CEN	EN 509:1999 Decorative fuel-effect gas appliances		
	EN 509:1999/A1:2003	Note 3	31.12.2003

	EN 509:1999/A2:2004	Note 3	30.6.2005
CEN	EN 521:2006 Specifications for dedicated liquefied petroleum gas appliances — Portable vapour pressure liquefied petroleum gas appliances	EN 521:1998 Note 2.1	31.8.2006

Warning (1): This publication does not cover portable flat gas stoves (2).

(1) In accordance with Commission Implementing Decision (EU) 2015/2414 of 17 December 2015 on the publication with a restriction in the *Official Journal of the European Union* of the reference of harmonised standard EN 521:2006 'Specifications for dedicated liquefied petroleum gas appliances — Portable vapour pressure liquefied petroleum gas appliances' in accordance with Directive 2009/142/EC of the European Parliament and of the Council (OJ L 333, 19.12.2015, p. 120).

(2) Flat gas stoves consist of a burner assembly fitted on a horizontal body containing an integrated compartment for a gas cartridge beside the burner.

CEN	EN 525:2009 Non-domestic direct gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW	EN 525:1997 Note 2.1	30.11.2009
CEN	EN 549:1994 Rubber materials for seals and diaphragms for gas appliances and gas equipment	EN 279:1991 EN 291:1992 Note 2.1	31.12.1995
CEN	EN 613:2000 Independent gas-fired convection heaters		
	EN 613:2000/A1:2003	Note 3	23.12.2003

CEN	EN 621:2009 Non-domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW, without a fan to assist transportation of combustion air and/or combustion products	EN 621:1998 Note 2.1	31.5.2010
CEN	EN 624:2000 Specification for dedicated LPG appliances — Room sealed LPG space heating equipment for installation in vehicles and boats		
	EN 624:2000/A2:2007	Note 3	5.6.2009
CEN	EN 625:1995 Gas-fired central heating boilers — Specific requirements for the domestic hot water operation of combination boilers of nominal heat input not exceeding 70 kW		
(1)	(2)	(3)	(4)
CEN	EN 656:1999 Gas-fired central heating boilers — Type B boilers of nominal heat input exceeding 70 kW but not exceeding 300 kW		
	EN 656:1999/A1:2006	Note 3	18.11.2009
CEN	EN 676:2003+A2:2008 Automatic forced draught burners for gaseous fuels	EN 676:2003 Note 2.1	30.6.2010

	EN 676:2003+A2:2008/AC:2008		
CEN	EN 677:1998 Gas-fired central heating boilers — Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW		
CEN	EN 732:1998 Specifications for dedicated liquefied petroleum gas appliances — Absorption refrigerators		
CEN	EN 751-1:1996 Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 1: Anaerobic jointing compounds		
CEN	EN 751-2:1996 Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 2: Non-hardening jointing compounds		
CEN	EN 751-3:1996 Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 3: Unsintered PTFE tapes		
	EN 751-3:1996/AC:1997		
CEN	EN 777-1:2009 Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use — Part 1: System D — Safety	EN 777-1:1999 Note 2.1	18.11.2009
(1)	(2)	(3)	(4)

CEN	EN 777-2:2009 Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use — Part 2: System E — Safety	EN 777-2:1999 Note 2.1	18.11.2009
CEN	EN 777-3:2009 Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use — Part 3: System F — Safety	EN 777-3:1999 Note 2.1	18.11.2009
CEN	EN 777-4:2009 Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use — Part 4: System H — Safety	EN 777-4:1999 Note 2.1	18.11.2009
CEN	EN 778:2009 Domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 70 kW, without a fan to assist transportation of combustion air and/or combustion products	EN 778:1998 Note 2.1	6.5.2010
CEN	EN 1020:2009 Non-domestic forced convection gas-fired air heaters for space heating not exceeding a net heat input of 300 kW incorporating a fan to assist transportation of combustion air or combustion products	EN 1020:1997 Note 2.1	31.5.2010
CEN	EN 1106:2010 Manually operated taps for gas burning appliances	EN 1106:2001 Note 2.1	22.12.2010
CEN	EN 1196:1998 Domestic and non-domestic gas-fired air heaters — Supplementary requirements for condensing air heaters		

CEN	EN 1266:2002 Independent gas-fired convection heaters incorporating a fan to assist transportation of combustion air and/or flue gases		
	EN 1266:2002/A1:2005	Note 3	28.2.2006

(1)	(2)	(3)	(4)
CEN	EN 1319:2009 Domestic gas-fired forced convection air heaters for space heating, with fan assisted burners not exceeding a net heat input of 70 kW	EN 1319:1998 Note 2.1	30.6.2010
CEN	EN 1458-1:1999 Domestic direct gas-fired tumble dryers of types B22D and B23D, of nominal heat input not exceeding 6 kW — Part 1: Safety		
CEN	EN 1458-2:1999 Domestic direct gas-fired tumble dryers of types B22D and B23D, of nominal heat input not exceeding 6 kW — Part 2: Rational use of energy		
CEN	EN 1596:1998 Specification for dedicated liquefied petroleum gas appliances — Mobile and portable non-domestic forced convection direct fired air heaters		
	EN 1596:1998/A1:2004	Note 3	10.12.2004

CEN	EN 1643:2000 Valve proving systems for automatic shut-off valves for gas burners and gas appliances		
CEN	EN 1854:2010 Pressure sensing devices for gas burners and gas burning appliances	EN 1854:2006 Note 2.1	31.5.2012
CEN	EN 12067-1:1998 Gas/air ratio controls for gas burners and gas burning appliances — Part 1: Pneumatic types		
	EN 12067-1:1998/A1:2003	Note 3	23.12.2003

(1)	(2)	(3)	(4)
CEN	EN 12067-2:2004 Gas/air ratio controls for gas burners and gas burning appliances — Part 2: Electronic types		
CEN	EN 12078:1998 Zero governors for gas burners and gas burning appliances		
CEN	EN 12244-1:1998 Direct gas-fired washing machines, of nominal heat input not exceeding 20 kW — Part 1: Safety		

CEN	EN 12244-2:1998 Direct gas-fired washing machines of nominal heat input not exceeding 20 kW — Part 2: Rational use of energy		
CEN	EN 12309-1:1999 Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW — Part 1: Safety		
CEN	EN 12309-2:2000 Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW — Part 2: Rational use of energy		
CEN	EN 12669:2000 Direct gas-fired hot air blowers for use in greenhouses and supplementary nondomestic space heating		
CEN	EN 12752-1:1999 Gas-fired type B tumble dryers of nominal heat input not exceeding 20 kW — Part 1: Safety		
CEN	EN 12752-2:1999 Gas-fired type B tumble dryers of nominal heat input not exceeding 20 kW — Part 2: Rational use of energy		
(1)	(2)	(3)	(4)
CEN	EN 12864:2001 Low-pressure, non adjustable regulators having a maximum outlet pressure of less than or equal to 200 mbar, with a capacity of less than or equal to		

	4 kg/h, and their associated safety devices for butane, propane or their mixtures		
	EN 12864:2001/A1:2003	Note 3	10.12.2004
	EN 12864:2001/A2:2005	Note 3	28.2.2006
	EN 12864:2001/A3:2009	Note 3	28.2.2010
CEN	EN 13278:2003 Open fronted gas-fired independent space heaters		
CEN	EN 13611:2007 Safety and control devices for gas burners and gas burning appliances — General requirements	EN 13611:2000 Note 2.1	31.5.2008
CEN	EN 13785:2005+A1:2008 Regulators with a capacity of up to and including 100 kg/h, having a maximum nominal outlet pressure of up to and including 4 bar, other than those covered by EN 12864 and their associated safety devices for butane, propane or their mixtures	EN 13785:2005 Note 2.1	5.6.2009
CEN	EN 13786:2004+A1:2008 Automatic change-over valves having a maximum outlet pressure of up to and including 4 bar with a capacity of up to and including 100 kg/h, and their associated safety devices for butane, propane or their mixtures	EN 13786:2004 Note 2.1	5.6.2009

CEN	EN 13836:2006 Gas fired central heating boilers — Type B boilers of nominal heat input exceeding 300 kW, but not exceeding 1 000 kW		
CEN	EN 14438:2006 Gas-fired insets for heating more than one room		
(1)	(2)	(3)	(4)
CEN	EN 14543:2005+A1:2007 Specification for dedicated liquefied petroleum gas appliances — Parasol patio heaters — Flueless radiant heaters for outdoor or amply ventilated area use	EN 14543:2005 Note 2.1	24.5.2008
CEN	EN 14829:2007 Independent gas-fired flueless space heaters for nominal heat input not exceeding 6 kW		
CEN	EN 15033:2006 Room sealed storage water heaters for the production of sanitary hot water using LPG for vehicles and boats		
	EN 15033:2006/AC:2008		

(¹) ESO: European standardisation organisation:

- CEN: Rue de la Science 23, 1040 Brussels, BELGIUM. Tel. +32 25500811; fax +32 25500819 (<http://www.cen.eu>)
- Cenelec: Rue de la Science 23, 1040 Brussels, BELGIUM. Tel. +32 25500811; fax +32 25500819 (<http://www.cenelec.eu>)
- ETSI: 650, route des Lucioles, 06921 Sophia Antipolis, FRANCE. Tel. +33 492944200; fax +33 493654716 (<http://www.etsi.eu>)

Note Generally the date of cessation of presumption of conformity will be the date of withdrawal ('dow'),
1: set by the European standardisation organisation, but attention of users of these standards is drawn to the fact that in certain exceptional cases this can be otherwise.

Note The new (or amended) standard has the same scope as the superseded standard. On the date stated,
2.1: the superseded standard ceases to give presumption of conformity with the essential or other requirements of the relevant Union legislation.

Note The new standard has a broader scope than the superseded standard. On the date stated the
2.2: superseded standard ceases to give presumption of conformity with the essential or other requirements of the relevant Union legislation.

Note The new standard has a narrower scope than the superseded standard. On the date stated the
2.3: (partially) superseded standard ceases to give presumption of conformity with the essential or other requirements of the relevant Union legislation for those products or services that fall within the scope of the new standard. Presumption of conformity with the essential or other requirements of the relevant Union legislation for products or services that still fall within the scope of the (partially) superseded standard, but that do not fall within the scope of the new standard, is unaffected.

Note In case of amendments, the referenced standard is EN CCCC:YYYY, its previous amendments, if any,
3: and the new, quoted amendment. The superseded standard therefore consists of EN CCCC:YYYY and its previous amendments, if any, but without the new quoted amendment. On the date stated, the superseded standard ceases to give presumption of conformity with the essential or other requirements of the relevant Union legislation.

NOTE:

Any information concerning the availability of the standards can be obtained either from the European standardisation organisations or from the national standardisation bodies the list of which is published in the *Official Journal of the European Union* according to Article 27 of Regulation (EU) No 1025/2012 of the European Parliament and of the Council¹⁷.

Standards are adopted by the European standardisation organisations in English (CEN and Cenelec also publish in French and German). Subsequently, the titles of the standards are translated into all other required official languages of the European Union by the national standardisation bodies. The European Commission is not responsible for the correctness of the titles which have been presented for publication in the Official Journal.

References to Corrigenda '.../AC:YYYY' are published for information only. A Corrigendum removes printing, linguistic or similar errors from the text of a standard and may relate to one or more language versions (English, French and/or German) of a standard as adopted by a European standardisation organisation.

Publication of the references in the *Official Journal of the European Union* does not imply that the standards are available in all the official languages of the European Union.

This list replaces all the previous lists published in the Official Journal of the European Union.

More information about harmonised standards and other European standards on the internet at http://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/index_en.htm

¹⁷ (1) OJ C 338, 27.9.2014, p. 31.