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Road vehicles — Technical personnel dealing with natural gas vehicles (NGVs) — Training and qualification

Véhicules routiers — Personnel technique s'occupant des véhicules au gaz naturel (GNV) — Programmes de formation et de qualification

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 41, *Specific aspects for gaseous fuels*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Since the effectiveness of any application on natural gas vehicles (NGVs) depends upon the capabilities of the persons who perform or are responsible, a procedure has been developed to provide a means of evaluating and documenting the competence of personnel whose duties require the appropriate theoretical and practical knowledge of the work they perform, specify, supervise, monitor or evaluate.

When certification of personnel working on NGVs is required in product standards, regulations, codes or specifications, it is important to certify the personnel in accordance with this document. When latitude is provided in the criteria within this document, the certification body has the final decision in determining specific requirements.

When there is no mandatory requirement in national legislation, or in case a member State does not adopt this document concerning certification of NGV's personnel, the employers of such personnel take the steps to decide how to ensure themselves that employees are competent to do the work assignment. Thus, they may employ people who are already certified or they may apply their own expertise and under their responsibility ensure themselves that their employee has the necessary competence.

This document gives particular emphasis on:

— the way in which qualifications are expressed;

— application of the principle that "learning outcomes" are crucial instead of the path to allow transferability between formal, informal and non-formal areas.

This document is mainly directed to:

— workshop personnel,

— vehicle park owner/personnel,

— NGV dealer/owner,

— CNG, LNG and L-CNG fuelling station owner/personnel,

— first responders,

— inspectors,

— training course providers,

— certification bodies,

— original equipment manufacturer (OEM),

— system manufacturer,

— workshop owner/operator,

— CNG and L-CNG fuelling station owner/operator,

— parking and garages owner/operator.

Road vehicles — Technical personnel dealing with natural gas vehicles (NGVs) — Training and qualification

1 Scope

This document specifies the requirements for the provisions of personnel dealing with the operation on natural gases (NG) fuelled vehicles in order to demonstrate their competence.

This document specifies the minimum requirements for training and qualification of personnel according to the level of safety required by the activity.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
ability
capacity and human attribute to perform an activity

[SOURCE: ISO/IEC TS 17027:2014, 2.1, modified — The phrase "and human attribute" was added.]

3.2
authorized qualification body
body, independent of the *NGV workshop* (3.20), authorized by the *certification body* (3.4) to prepare and administer *qualification* (3.24) examinations

Note 1 to entry: Qualification examination is an activity administered by the certification body or the authorized qualification body, which assesses the general, specific and practical knowledge and the *skill* (3.28) of the candidate.

[SOURCE: ISO 9712:2021, 3.2, modified — "employer" has been changed to "NGV workshop", the word "qualifications" and the Note 1 to entry were added.]

3.3
certification
third party attestation related to products, processes, systems, or persons

[SOURCE: ISO 7240-1:2014, 2.1.16]

3.4
certification body
third-party conformity assessment body operating *certification* (3.3) schemes

Note 1 to entry: A certification body can be non-governmental or governmental (with or without regulatory authority).

Note 2 to entry: A conformity assessment body is a body that performs conformity assessment activities and that can be the object of accreditation.

Note 3 to entry: A third-party conformity assessment is the conformity assessment activity that is performed by a person or body that is independent of the person or organization that provides the object, and of user interests in that object

[SOURCE: ISO/IEC 17065:2012, 3.12, modified — Notes 2 and 3 to entry were added.]

3.5
competence
ability (3.1) to apply knowledge and *skills* (3.28) to achieve intended results

[SOURCE: ISO/IEC 17024:2012, 3.6]

3.6
competence assessment
formal outcome of an evaluation process (e.g. examination) and validation by means of objective elements, obtained when a *competent body* (3.7) states that the learning outcomes of a person meet given standards and safety regulations

3.7
competent body
person or corporate body, defined by the national or relevant authority, which by combination of appropriate *qualification* (3.24), *training* (3.32), experience and resources is able to make objective judgments on a subject

[SOURCE: ISO 10691:2004, 3.2]

3.8
competent person
person who has acquired, through *training* (3.32), *qualification* (3.24), experience or a combination of these, the knowledge and *skill* (3.28) enabling that person to correctly perform the required tasks

[SOURCE: ISO 11525-1:2020, 3.4]

3.9
CNG
compressed natural gas
natural gas (3.18) which has been compressed and stored for use as a vehicle fuel

[SOURCE: ISO 15500-1:2015, 3.2]

3.10
CNG cylinder
any container used for the storage of *compressed natural gas (CNG)* (3.9) according to the following classifications:

— CNG-1: an all metal cylinder

— CNG-2: a hoop wrapped cylinder with a load-sharing metal liner and composite reinforcement on the cylindrical part only

— CNG-3: a fully wrapped cylinder with a load-sharing metal liner and composite reinforcement on both the cylindrical part and dome ends

— CNG-4: a fully wrapped cylinder with a non-load sharing non-metallic liner and composite reinforcement on both the cylindrical part and dome ends

3.11
garage
building used for the storage and servicing of NGVs

3.12
formal training
organized and documented program of learning activities designed to impart the knowledge and *skills* (3.28) necessary to be qualified to this document

3.13
fuelling station
facility at which vehicle fuels are dispensed

3.14
learning outcome
what a person is expected to know, understand or be able to do at the end of a training programme, course or module

[SOURCE: ISO/IEC TS 17027:2014, 2.57]

3.15
LNG
liquefied natural gas
natural gas (3.18) which has been liquefied, after processing, for storage or transportation purposes

[SOURCE: ISO 16924:2016, 3.38]

3.16
L-CNG fuelling station
facility at which *compressed natural gas (CNG)* (3.9) derived from *liquefied natural gas (LNG)* (3.15) is dispensed to vehicles

3.17
LNG fuelling station
facility at which *liquefied natural gas* (3.15) is dispensed to vehicles

3.18
natural gas
NG
complex gaseous mixture of hydrocarbons primarily methane, but which generally includes ethane, propane and higher hydrocarbons, and some non-combustible gases such as nitrogen and carbon dioxide

Note 1 to entry: The definition includes renewable natural gas (biogas, biomethane, etc.).

[SOURCE: ISO 14532:2014, 2.1.1.1, modified — Note 1 to entry was replaced.]

3.19
natural gas vehicle
NGV
road vehicle that is powered, either fully or partially, by *natural gas* (3.18) stored on board vehicle in liquid or/and gaseous form

3.20
NGV workshop
competent organization, appropriately equipped, that assumes technical responsibility for correct and safe service, inspection, repair and retrofit on *compressed natural gas (CNG)* (3.9) or *liquefied natural gas (LNG)* (3.15) vehicles

3.21
notified body
independent, accredited body which is entitled by an authorized accrediting body

Note 1 to entry: Upon definition of standards and regulations, the accrediting body may allow a notified body to provide verification and *certification* (3.3) services. These services are meant to ensure and assess compliance to the previously defined standards and regulations, but also to provide an official *certification* (3.3) mark or a declaration of conformity.

3.22
operator
person working in an *NGV workshop* (3.20) or in a *compressed natural gas (CNG)* (3.9) /LNG/*L-CNG fuelling station* (3.16) under the supervision of the *competent person* (3.8)

3.23
practical examination
assessment of practical *skills* (3.28), in which the candidate demonstrates familiarity with, and the *ability* (3.1) to perform, the test

3.24
qualification
demonstrated education, *training* (3.32), and work experience, where applicable, required to properly perform the assigned task as awarded or conferred as described in the document.

Note 1 to entry: Adapted from ISO/IEC 17024:2012, 3.7 and ISO/IEC 19479:2019.

3.25
qualification level

Level 1: the learning outcomes relevant to Level 1 are basic general knowledge

Level 2: the learning outcomes relevant to Level 2 are basic factual knowledge of a field of work or study

Level 3: the learning outcomes relevant to Level 3 are knowledge of facts, principles, processes and general concepts, in a field of work or study

Level 4: the learning outcomes relevant to Level 4 are factual and theoretical knowledge in broad contexts within a field of work or study

Level 5: the learning outcomes relevant to Level 5 are comprehensive, specialized, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge

3.26
qualified person
individual subjected to qualification process which has passed the *qualification* (3.24)

3.27
recognized training course
training course which contents (for instance: *qualification* (3.24) of teachers, training procedures, documents, examination program and procedures) are assessed against applicable standards and approved by a *certification body* (3.4)

3.28
skill
ability (3.1) to perform a task or activity with a specific intended outcome acquired through education, *training* (3.32), experience or other means

[SOURCE: ISO/IEC/TS 17027:2014, 2.74]

3.29
skilled organization
entity comprising multiple people, such as an institution or an association, that has a collective goal and is linked to an external environment and shall be recognized by National Authorities for the specific field of application

3.30
system manufacturer
company which can assume technical responsibility for the manufacturing or retrofitting of NGV fuel system and can demonstrate that it possesses the features required and the necessary means to provide quality assessment and conformity of production of the NGV fuel system

[SOURCE: Reference [14], 2.3, modified — "LPG and CNG" have been replaced by "NGV fuel system".]

3.31
technical manager
qualified person (3.26) that takes responsibility for decisions relating to parking, fuelling, installation, maintenance and repair of an NGV system

Note 1 to entry: See also EN 13423.

3.32
training
activities designed to facilitate the learning and development of knowledge, *skills* (3.31), and abilities, and to improve the performance of specific tasks or roles

[SOURCE: ISO 22398:2013, 3.23]

3.33
training course provider
organization competent to provide *training* (3.32) by specific courses to persons carrying out operations or activities on an NGV

3.34
LNG tank
any storage system used for *liquefied natural gas (LNG)* (3.15)

4 Figures involved on NGVs use and operations

4.1 General

Figures operating on NGVs, as per subject of this document, shall be differentiated by their own responsibilities.

This shall be defined by the following areas of relevance:

— workshop;

— CNG, LNG and L-CNG fuelling station;

— parking and garage.

Figure 1 is an example of how this document applies.

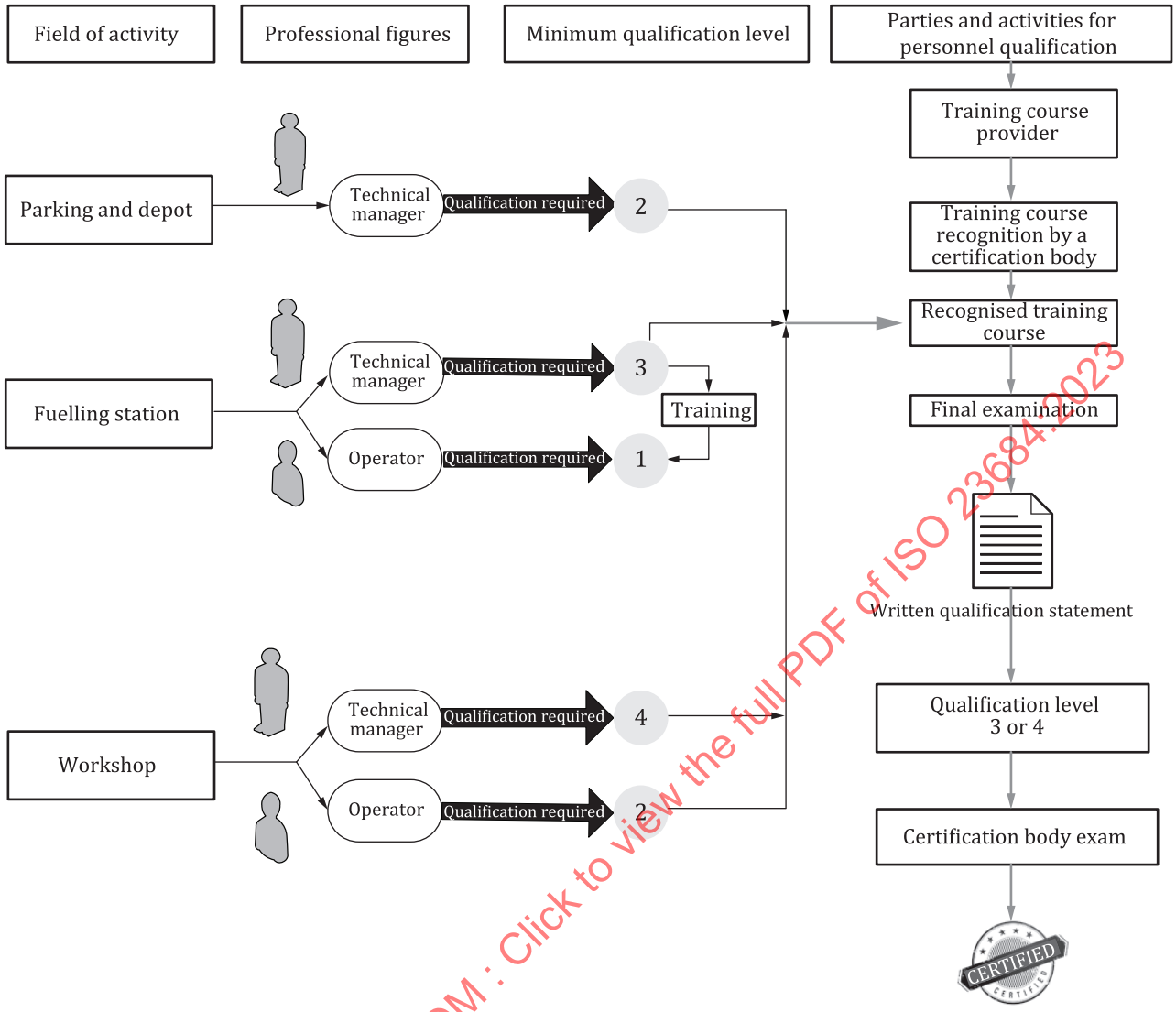

Figure 1 — Application of this document

4.2 Professionals on workshop

Different qualification levels are defined as follows:

— technical manager;

— operator.

4.2.1 Technical manager of workshop

The technical manager is a competent person who has a high level of skill, knowledge and abilities in installing and maintaining an NGV system, as defined in 5.1.1. The technical manager is responsible for the declaration of conformity provided for the activities performed or supervised on NGVs.

The technical manager has technical autonomy and he or she is able to perform independently on or to supervise and coordinate any operation on NGVs.

Level 4 or higher of qualification shall be appropriate for this person.

4.2.2 Operators on workshop

Operators have a basic level knowledge of vehicles, their main components and NGVs, as defined in 5.1.2.

They act (partially independent) to perform the installation or maintenance work under technical manager supervision.

Level 2 or higher of qualification shall be appropriate for this person.

4.3 Professionals on CNG, LNG and L-CNG fuelling station

Different qualification levels are defined as follow:

— technical manager;

— operator.

4.3.1 Technical manager of CNG, LNG and L-CNG fuelling station

The technical manager is a competent person who has a high level of skill, knowledge and abilities to provide proper and safe fuelling of NGVs, as defined in 5.2.1.

The technical manager has technical autonomy and he or she is able to perform independently on or to supervise and coordinate the fuelling operations.

Level 3 or higher of qualification shall be appropriate for this person.

4.3.2 Operators of CNG, LNG and L-CNG fuelling station

Operators have a basic level knowledge about fuelling operation of NGVs, as defined in 5.2.2.

They act (partially independent) under the mandate of the technical manager of the fuelling station.

Change to requirement (not in note) and make a list of task and corresponding competence level required.

4.4 Professionals on parking and garages

The person involved in parking or garages activities has the competence defined in 5.3.

Level 2 or higher of qualification shall be appropriate for this person.

5 Requirements for figures involved on NGVs use and operation

5.1 Professionals on workshop

5.1.1 Technical manager of workshop facilities (Table 1)

Table 1 — Skills, abilities and knowledge of technical manager of workshop

Technical/professional skills	Abilities	Knowledge
Technical manager shall be able to	**Relevant abilities to every skill**	**Relevant knowledge to every skill**
1) Plan and manage independently the activities of installation and/or maintenance and repair OEM and/or retrofitted NGVs, providing instructions, directives and information for the operatives.	a) To apply procedures to plan and manage installation or maintenance of NGVs b) To prepare documentation, materials, equipment and tools for the different activities	— Elements of planning — Processes and work cycles for car repair garage — Time and methods — Warehouse management procedures (stock management, warehousing and materials handling) — Maintenance, diagnostic procedures and related tools
2) Apply the applicable regulations to the operations including safety and take decisions accordingly.	a) To identify the applicable regulations for NGVs operation and working areas b) To check that operators have the necessary competence and knowledge on applicable regulations, procedures, contractual terms, risks associated with the task to be performed c) To check the prevention and protection measures for the environment and health and safety at work d) To assess suitability and conformity of the components depending on vehicles approval e) To interact with the responsible body for the control and testing activities	— Applicable regulations — Health risks for the specific jobs, methods of prevention and protection (especially the explosion risk) — Specific risks for the environment and prevention and protection methods — Natural gas characteristics, safe use and handling — Technical rules concerning the approval of vehicles, components and systems — Operating procedures

Table 1 *(continued)*

Technical/professional skills	Abilities	Knowledge
Technical manager shall be able to	**Relevant abilities to every skill**	**Relevant knowledge to every skill**
3) Keep to and improve the workshop internal procedures and instructions in accordance with technical manual of the OEM or retrofitted NGVs.	a) To use the specific documentation correctly (e.g. manuals, diagrams, drawings, procedures, BoM and specific instructions for the different activities) both in electronic and in paper form b) To identify tools and working sequences to be performed c) To use appropriate tools for diagnostics and inspection	— Engine and fuel systems principles, mechanisms and working parameters — Types and characteristics of the main components of fuel systems — Diagnostics software and hardware
4) Supervise and coordinate the installation, maintenance and repair of the OEMs and/or retrofitted NGVs, ensuring the quality of the product.	a) To provide specific training to operators in order to give the due information to carry out the work assigned b) To control and setup operative parameters of tools and equipment, ensuring their maintenance c) To check the conformity of the components and/or the whole retrofit system d) To identify non-compliance of products and/or customer complaints, to analyse causes, and to propose corrective actions	— Use, maintenance and upgrading of the diagnosis and equipment — Use, maintenance and calibration of measuring equipment — Procedures and monitoring techniques — Procedures and techniques for failure detection — Risks related to not conforming operations on vehicle
5) Check the accurate execution of the works carried out and the whole system functionality.	a) To apply check-up techniques for vehicles b) To understand data and datasheets c) To perform leakage test on system power supply	— Technical relevant requirements provided by OEMs or system manufactures — Technical relevant requirements coming from applicable regulations and standards

Table 1 *(continued)*

Technical/professional skills	Abilities	Knowledge
Technical manager shall be able to	**Relevant abilities to every skill**	**Relevant knowledge to every skill**
6) Relate to the customer in acceptance and delivery of the vehicle.	a) To communicate properly with customer b) To gather information to define the state of the vehicle, the engine and the customer needs c) To define the budget for work d) To define and follow procedures for customer identification and for specific activities carried out on the vehicle, ensuring systems and components traceability and recording (archive management) e) To record and explain the actions and/or any corrective action performed	— Effective communication skills — Customer satisfaction monitoring

5.1.2 Operators on workshop (Table 2)

Operators have a basic level knowledge of vehicles, their main components and NGV fuel system retrofit for vehicles.

They act (partially independent) to perform the installation or maintaining work under technical manager supervision.

Table 2 — Skills abilities and knowledge of operators on workshop

Technical/professional skills	Abilities	Knowledge
Operators shall able to	**Relevant abilities to every skill**	**Relevant knowledge to every skill**
1) Perform, under technical manager supervision, assigned tasks to install maintain and repair OEM and/or retrofitted NGVs.	a) To perform the installation, maintenance and repair tasks for the gas fuel system with tools and equipment needed b) To apply monitoring techniques under technical manager supervision c) To check equipment and tools setup and operating parameters, ensuring routine maintenance d) To check conformity of system components e) To fix possible failure based on customer complaints, following technical manager instructions f) To collaborate with technical manager to identify the non-compliance causes and propose corrective actions	— Process and work cycles of NGVs installation, maintenance and repair — Maintenance, diagnostic procedures and related tools — Use, maintenance and upgrading of diagnostics equipment and tools — Use, maintenance and calibration of measurement tools — Monitoring procedures and techniques — Procedures and techniques for Failure identification — Risks related to incorrect performed work
2) Ensure the proper execution of the performed tasks and the system functionality.	a) To apply check-up techniques for vehicles b) To understand data and to use datasheets c) To perform testing of system	— How to use measurement and control tools — How to use diagnostics tools and techniques — How to conduct test on NGVs
3) Comply with the internal procedures of the workshop and the instructions given by the technical documents of OEM and/or retrofitted NGVs system manufacturers.	a) To use the documentation (digital format also) like: manuals, diagrams, drawings, procedures, BoM and specific instructions for the different activities b) To apply sequences and tools to perform specific tasks c) To use appropriate diagnostic tools	— To know engine and fuel systems principles, mechanisms and working parameters — To know types and characteristics of the main components of fuel systems — To know how to use diagnostics software and hardware

Table 2 *(continued)*

Technical/professional skills	Abilities	Knowledge
Operators shall able to	**Relevant abilities to every skill**	**Relevant knowledge to every skill**
4) Comply with the regulations and standards to the workshop operations (installation, preventive maintenance and repair), including work health and safety.	a) To apply regulations and standards b) To apply measures of prevention and protection for the environment and health and safety at work c) To recognize the components suitability and conformity based on vehicle type-approval	Basic elements of: — regulations and standards — specific risks to the health and safety at work and methods of prevention and protection (especially the risk of explosion) — specific risks for the environment and prevention and protection methods — natural gas characteristics, use and handling in safety — technical rules concerning the type-approval of vehicles, components and systems

5.2 Professionals on CNG, LNG and L-CNG fuelling station

Different qualification levels are defined as follow:

— technical manager;

— operator.

5.2.1 Technical manager of CNG, LNG and L-CNG fuelling station

The technical manager is a competent person who has a high level of skill, knowledge and abilities to provide proper and safe fuelling of NGVs, as defined in 5.2.1.

The technical manager has technical autonomy and he or she is able to perform independently on or to supervise and coordinate the fuelling operations as specified in Table 3.

Level 3 or higher of qualification shall be appropriate for this person.

Table 3 — Skills, abilities and knowledge of technical manager of CNG, LNG and L-CNG fuelling station

Technical/professional skills	Abilities	Knowledge
Technical manager shall be able to	**Relevant abilities to every skill**	**Relevant knowledge to every skill**
1) Organize in an appropriate manner the control of fuelling operations both in case of attended or unattended service (including written warning and information) and the access of the vehicles at the fuelling station.	a) To know how to perform the operations for the gas refuelling system with appropriate tools and equipment b) To apply monitoring techniques, check and prevent any leakage c) To check equipment and tools setup and operating parameters, ensuring routine maintenance d) To provide the customer with useful information concerning different NG refuelling systems (attended and/ or unattended self- service refuelling)	— Elements of planning — Physical and thermal processes and properties of Natural Gas — Methods for fuelling operations — Identification of the vehicle volume needs and conditions of use of the cylinders (e.g. validity period). — Basic requirements for fuelling connectors — Identification of the vehicle volume needs (cylinder capacity) and conditions of use of the cylinders (e.g. validity period).
2) Apply the applicable regulations and standards to the operations including the emergency procedures.	a) To identify the applicable regulations and standard for natural gas fuelling station and working areas b) To check that operators have the necessary competence and knowledge on applicable regulations, procedures, risks associated with the work to be performed c) To identify and/or perform the consequent training needs d) To check the prevention and protection measures for the environment and health and safety at work e) To assess suitability and conformity of the operations depending on vehicles storage characteristics and capacity f) To interact with the competent authorities for the control and testing activities g) To verify the compliance with the applicable regulations and standards	— Applicable regulations and standards — Natural gas safe storage management procedures — Safety devices of natural gas equipment and their management procedures — Health risks for the specific jobs with or without gas odorization, methods of prevention and protection (especially the risk of explosion, fire and high pressure or cryogenic gas release) — Specific Natural Gas risks for the environment and prevention and protection methods — fire prevention, fire-fighting equipment and related procedures — Natural gas fuel characteristics, their use and handling — Technical rules concerning the metering of the fuel delivered — Environmental issues concerning waste disposal

Table 3 *(continued)*

Technical/professional skills	Abilities	Knowledge
Technical manager shall be able to	**Relevant abilities to every skill**	**Relevant knowledge to every skill**
3) Maintain the operability of the fuelling station.	a) To understand, find, and use documentation (digital format also) like: manuals, diagrams, drawings, procedures, registers and specific instructions for the different maintenance activities b) To identify tools and sequence of works to be performed within the fuelling station c) To use appropriate tools for diagnostics and inspection of fuelling station equipment d) To identify the appropriate actions in order to maintain the conformity of the components and of the whole fuelling system	— Principles, mechanisms and maintenance parameters of natural gas equipment (e.g. compressors, vaporizers system, dispensers, pumps) — Types and characteristics of gas and fire detectors — Regulatory inspection of fuelling station components
4) Provide support for safe installation of new facilities.	a) To comply with the requirements coming from regulations and standards b) To provide specific requirements in order to design a new installation facilities c) To provide control setup and to check operating parameters of critical equipment, ensuring the safety of the complete fuelling station d) To check the conformity of the components and/or the whole fuelling system e) To identify non-conformity, and propose corrective actions before the start-up f) To train operatives on the use of new facilities g) To suggest technical improvement to ensure efficiency in the fuelling station operation	— Basic elements for design, and building of fuelling station — Risk analysis — Procedures and techniques for failure detection — Risks related to unsafe connection with vehicles — Training methods and competence assessment — Regulations and standards

5.2.2 Operators of CNG, LNG and L-CNG fuelling station (Table 4)

Operators have a basic level knowledge of natural gas fuelling station, its maintenance and operation, its components, and how to fuel vehicles.

They act (partially independent) under the mandate of the technical manager according to the training received, in compliance with the applicable environmental and safety regulations.

Table 4 — Skills abilities and knowledge of operators on CNG, LNG and L-CNG fuelling station

Technical/professional skills	Abilities	Knowledge
Operator shall be able to	**Relevant abilities to every skill**	**Relevant knowledge to every skill**
1) Control the access of the vehicles at the fuelling station including warning, mandatory information and perform fuelling of natural gas vehicles.	a) To operate the gas fuelling system with tools and equipment needed b) To check and prevent any leakage c) To check equipment and tools setup and operating parameters	— Applicable procedures — Methods for fuelling operations — Identification of the vehicle volume needs and conditions of use of the cylinders (e.g. validity period). — Basic knowledge of fuelling connectors
2) Comply with the operative and emergency procedures.	a) To respect the applicable regulations and standards for natural gas operations and working areas b) To apply the prevention and protection measures for the environment and health and safety at work c) To ensure the conformity during the operations depending on vehicles storage characteristics	— Applicable regulations, standards and procedures — CNG or LNG safety storage procedures — Health risks for the specific tasks, prevention and protection (especially the risk of explosion, fire or high pressure or cryogenic gas release) — Waste disposal procedures — Natural gas fuel characteristics, their use and handling — Metering of the fuel delivered
3) Do the maintenance of the fuelling station.	a) Use documentation like: manuals, diagrams, drawings, procedures, and specific instructions for the different maintenance activities b) Use appropriate tools and working procedures for diagnostics and inspection c) Maintain the conformity of the components and the whole fuelling system	— Principles, mechanisms and maintenance parameters of natural gas equipment (e.g. compressors, vaporizers system, dispensers, pumps) — Types and characteristics of components of gas and fire detectors — fire prevention and procedures of the fire-fighting — How to conduct inspection of natural gas components

5.3 Professional on parking

The technical manager has a good level knowledge of the fuel and safety issues concerned with parking areas (underground or not), for LD, MD, HD vehicles (see Table 5).

Table 5 — Skills abilities and knowledge of technical manager on natural gas vehicles park

Technical/professional skills	Abilities	Knowledge
Technical manager shall be able to	**Relevant abilities to every skill**	**Relevant knowledge to every skill**
1) Organize the control and the access of the vehicles inside the park/garage, including warning and mandatory information.	a) To know how to drive and/ or park the vehicle inside the volume of the confined area b) To apply monitoring techniques, check and prevent any fire c) To check the compliance of gas, smoke and heat detectors d) To know the ventilation requirements in order to prevent dangerous gas concentration according to the applicable regulations	— Elements of planning — NGVs and safety issues concerned with natural gas components
2) Apply the applicable regulations and standards to the emergency procedures.	a) To identify the applicable regulations and standards for natural gas vehicles and closed areas b) To provide park users with relevant information concerning applicable emergency procedures c) To ensure that prevention and protection measures are properly organized and maintained d) Interact with the competent authorities and fire-brigades for the control and testing activities	— Applicable regulations and standards — Natural gas safety management procedures — Health and fire risks for the specific area, methods of detection, prevention and protection — Natural gas fuel characteristics, their use and risk analysis — Safe evacuation

6 Training

6.1 General

Candidates for qualification to all levels shall complete a sufficient formal training to achieve the competence, skill and ability described in Clause 5. Formal training shall be conducted prior to, or in conjunction with, on-the-job training. All completed training shall be documented.

The minimum training hours for figures involved with NGVs are provided in Table 6

Table 6 — Minimum training hours for figures involved with NGVs

Minimum training program [h]			
Figures	**Theoretical**	**Practical**	**Refresh**
Workshop technical manager	60	36	16
Workshop operator	30	18	8
Filling station manager	22	6	8

Table 6 *(continued)*

	Minimum training program [h]		
Filling station operator	12	6	4
Parking manager	No requirements		

6.2 Training course

The training course is mandatory to any figure described in Table 6. In the case of these professionals who acquired the necessary skills by practical and theoretical training as part of an apprenticeship or similar craft training, they shall move directly to competence assessment as indicated in Clause 8 without the need for the training outlined below. If they fail the competency assessment, then they shall undergo training as outlined below by a training provider before a second competency assessment as indicated in Clause 8.

6.3 Requirements related to the theoretical-practical professional training courses

6.3.1 Recognized training course

Courses, including learning assessment, shall be qualified by a notified body with at least 3-year experience in qualification/assessment of courses.

Acknowledgement includes a preliminary assessment of the documentation's course control process and assessment of suitability of the teaching material. A procedure shall be included to define training methods and qualification of teachers. The positive outcome of documentation is propaedeutic to the evaluation of course's application.

Acknowledgement includes also the examination and verification of the validation program of the course that the training course provider has defined and applied. This validation includes at least:

— textbook;

— competent trainer;

— facilities and equipment used;

— final examination procedures.

Preliminary acknowledgement and subsequent maintenance should also include the evaluation in progress, according to appropriate sampling criteria.

6.3.2 Competence of trainers

Each course shall be taught by teachers whose competence has been previously ascertained by the training course provider. The competence of the teachers shall be consistent with the topics covered.

The qualification criteria to establish the teachers' competence shall include, for example, (but not exhaustively):

— the curriculum vitae (training process, scientific and technical publications, conference speeches on the subject, etc.);

— proven experience in professional and training activities for the subject of at least five years.

6.3.3 Training method

Theoretical parts are carried out in classroom or by e-learning (requirements and procedures for e-learning which shall be followed are given in Annex A), while practical parts in appropriate hardware, as explained in 6.3.5.

6.3.4 Training bodies

To provide compliance to this document, only training bodies with appropriate facilities, permanent organization and a minimum of three-year verifiable experience in the field of NGV or automotive technical/training shall be accepted.

6.3.5 Training location

Training shall either take place at a suitable training centre within the framework of professional training or a craft apprenticeship or at the facility where the technician normally works. The location shall include both a suitable classroom and a suitably equipped facility so that the personnel being trained gain both a theoretical understanding and practical experience.

6.4 General on training for workshop professional

The technical manager shall give documented evidence that any operatives working in the facility, including himself, have been trained in accordance with this document.

6.4.1 Technical manager of workshop

Training course provider shall ensure minimum training course hours as specified in Table 6.

Technical manager shall comply with the competence, skill and ability requisites as per the applicable part of this document

An individual who can demonstrate his technical position in a workshop for at least three of the past five years and can attest specific qualification shall:

— ask for a pre-examination;

— attend the part of the professional training in which he appears to have lack of knowledge according to the initial assessment made by the training course provider;

— skip practical training and practical examination;

— pass the final examination.

Theoretical training courses could be performed either in classroom or by e-learning. If an individual pass a pre-examination he or she shall be exempted from participation of training course; in case of lack of knowledge in some unit of competence the individual shall attend the training course for the specific units.

Practical training courses with e-learning are not permitted.

6.4.2 Main knowledge of the course

For the workshop technical manager, the theoretical/practical course shall transmit as minimum the following notions:

— fundamentals on vehicles motors and related fuels;

— general aspects of vehicles manufacturing;

— fundamentals on electronics and electromechanics;

— technical features of new systems on the market;

— natural gas characteristics;

— regulations and standards;

— health, risks and safety rules at work;

— quality management system general features;

— installation, requalification, handling and operative procedures for CNG cylinders and/or LNG tanks;

— (practical): assembly and disassembly of kits;

— (practical): detection and troubleshooting of fault;

— (practical): maintenance concerned operations.

An example is given in Annex B.

6.5 Workshop operator

Training course provider shall ensure minimum training course hours as specified in Table 6.

Workshop operator shall comply with the competence, skill and ability requisites as per the applicable part of this document.

The training courses shall be carried out and qualified by certification body, system manufacturer association and/or by skilled organizations representing natural gas sector having at least three years of experience in training courses.

6.5.1 Main knowledge of the course

— Basics on vehicles motors and related fuels.

— Knowledge about natural gas systems and components.

— General aspects of vehicles manufacturing.

— Basics on electronics and electromechanics.

— Natural gas characteristics.

— Knowledge on Regulations and standards.

— Health, risk and safety rules at work.

6.6 Technical manager of CNG /LNG / L-CNG fuelling station

Training course provider shall ensure minimum training course hours as specified in Table 6.

Technical manager shall comply with the competence, skill and ability requisites as per the applicable part of this document.

The acquisition of the above-mentioned competences is verified by the competent body by means of a final examination.

If the candidate already has proven competence and abilities that can be related to the units of competence, either by:

— having worked in the CNG, LNG and/or L-CNG distribution sector for at least three years in the last five years; or by

— having accredited education in a technical field; or by

— having attended professional training courses concerning the distribution, transport and dispensing techniques of CNG/LNG/L-CNG;

in accordance with the training procedures established by the competent body the candidate may:

— attend only part of the training course, or

— skip the training course and directly proceed to examination.

The training courses shall be carried out and qualified by representatives of association of CNG/LNG/L-CNG filling stations and/or of CNG/LNG/L-CNG equipment manufacturers, recognized at national level.

6.6.1 Training for technical managers of CNG/LNG/L-CNG fuelling stations

The theoretical/practical course for the CNG/LNG/L-CNG fuelling station technical manager shall transmit the following notions:

— CNG and LNG characteristics;

— equipment for CNG, LNG and L-CNG fuelling (connectors, etc.);

— filling station equipment and their maintenance;

— applicable regulations and standards;

— health, risk and safety assurance in the filling station;

— quality management system general features.

An example is given in Annex C.

The examination committee is made up of the course trainers, training course provider and professionals having proven experience and expertise in the natural gas sector.

The training course provider shall verify and evaluate all the evidence produced by the candidate and decide whether the candidate must attend part of the training course or take the examination without attending it.

The trainee/candidate who passes the examination is officially qualified as technical manager of CNG/LNG/L-CNG filling station.

6.7 Operator of CNG/LNG/L-CNG fuelling stations

The operator of CNG/LNG/L-CNG fuelling station shall have the competence, skill and ability requisites as per the applicable part of this document.

6.7.1 Training for operator of CNG/LNG/L-CNG fuelling stations

The operator of CNG/LNG/L-CNG fuelling station shall attend a training course as per Table 6.

The operator of CNG/LNG/L-CNG fuelling station shall have basic knowledge of the components involved in the process of connecting/disconnecting and fuelling NGVs. The operator shall work under the technical manager's supervision in accordance with the training and information received.

7 Competence assessment and qualification achievement

The status of competent person is attested by a competent body in accordance with Clause 8 and Clause 9.

For workshops professionals, OEMs and system manufacturers are considered to be a competent body when the competence assessment is conducted with reference only to installation and/or maintenance and/or repair of their own products.

7.1 Final examination

Examinations to verify the technical qualifications of candidates shall consist of a general, specific theoretical and/or practical examination as applicable for each figure.

It shall be conducted by the training course provider at the end of each course.

Questionnaires and practical activities to be used for the competence assessment shall be made available to the candidates only during examination.

For example, in the case of workshop technical manager, such practical part may include the installation or replacement of parts of the system, the detection of malfunctions of individual devices or the whole system, as well as the identification of solutions to restore functionality and compliance.

The final examination shall not exceed 8 h per attendee.

Once passing the examination it shall be issued a certificate which constitutes a prerequisite for admission to the certification examination.

8 Qualification levels

The professional figures are subjected to minimum qualification levels as indicated in Table 7.

Table 7 — Minimum qualification levels

	Professional figures	Minimum level
Workshop	technical manager	4
	operator	2
CNG/LNG/ L-CNG fuelling station	technical manager	3
	operator	1
Parking and garages	technical manager	2

The qualification of any professional figure shall be maintained accordingly with Clause 10.

9 Type of qualification

A competence assessment shall be conducted by means of examinations accordingly with the qualification level required as specified in Table 8.

Table 8 — Qualification level required

Qualification level	Level 1	Level 2	Level 3 and higher
type of qualification	first party	second party	third party

10 Authorized qualification body

Where established, the accredited qualification body shall:

a) work under the control of and apply the specifications issued by the certification body;

b) be independent of any single predominant interest;

c) ensure that it is impartial with respect to each candidate seeking qualification, bringing to the attention of the certification body any actual or potential threat to its impartiality;

d) apply a documented quality management system approved by the certification body;

e) have the resources and expertise necessary to establish, monitor and control examinations centres, including examinations and the calibration and control of the equipment;

f) prepare, supervise and administer examinations under the responsibility of an examiner authorized by the certification body;

g) maintain appropriate qualification and examination records according to the requirements of the certification body.

Annex A
(normative)

E-learning and e-learning requirements

A.1 General statements

E-learning represents a teaching/learning activity when:

— students and teachers lie for the most in a physically separation context;

— distance could be overridden by means of digital networks or internet and a dedicated platform;

— student can choice, autonomously and depending on its needs, places, timing and training modality.

E-learning system shall provide for at least one configuration with essential functions to guarantee communication between tutor-student, student-student, student-teacher (e.g. notice-board, communities); the whole documents corpus shall be self-consistent in order to ensure the traceability, and linked with teaching activity in order to meet and integrate methods, information and, if applicable, learning verifications.

A.2 General requirements

E-learning should be accomplished only for theoretical parts as per point 6.3.3. More in detail, for each part the following topics can be discussed:

a) vehicle engines and fuels

   1) Otto and diesel cycles; different equipment characteristics; gasoline and diesel fuel; fundamentals, mechanics and operating parameters of engine and fuel system; differences and characteristics of main components of fuel system; pollutant emission of exhaust gases and emission control devices;

   2) To integrate in classroom for practice: knowledge of diagnostics devices functions.

b) CNG e LPG for vehicles

   1) Extraction and distribution of CNG; chemical and physical structure of gas; refuelling system in refuelling station; environmental benefits associated to CNG use;

   2) To integrate in classroom for practice: different components functionality of the whole retrofit system to convert engine to CNG as fuels; risks related to incorrectly performed work or system issues on the vehicle.

   Should not be explained with e-learning: failure identification procedures and techniques; use, maintenance and upgrading of operational tools and diagnostics.

c) Standards on CNG e LPG

   Regulations on safety and gas vehicles operations (see EN 13423); relationships with local department of transport; regulations on emission pollutant; regulations and procedures to upgrade CNG cylinders; technical standards on vehicles, components and system approval.

d) Safety in working areas

   1) Specific risks for safety and health on work and prevention and protection program; information about electrical systems in vehicle garages; fire-fighter procedures information; specific risks for the environment related to work and prevention and protection program;

   2) To integrate in classroom for practice: handling and treatment of CNG cylinders.

e) Quality management

   1) Certification system management; regulations and requirements for environment management; quality management system for CNG business; hints on effective communication techniques; hints on customer satisfaction detection; basics of planning; process and cycles on vehicles operations; timing, methods and standard rates; stock management techniques, warehousing, handling;

   2) To integrate in classroom for practice: data, record and documentation management; measurement and control tools (use, maintenance and calibrating methods).

Courses only with e-learning are not accepted.

Almost three meetings in classroom should be planned: at the beginning, in the middle (after third part) and at the end of the course (included final examination, to be fulfilled in classroom as per mandatory).

E-learning is applicable only for first participants of a specific course. Any further registration after course start or transition from one to another course shall not be allowed.

Maximum time of e-learning shall be decided and declared beforehand from training course provider; furthermore, shall be between the initial meeting and the final meeting with examination. It is appropriate not exceed 2-3 months as a maximum length of time.

A.3 Planning and validation

The training course provider shall define and apply a specific procedure to planning e-learning and train with it, having at least:

— definition and verification procedures for skills needed to plan and train;

— technical support for devices;

— teaching support;

— tutoring activities to help learning;

— problem-solving activities;

— interactive activities: tutor-students and between students.

A.4 Course delivery

The training course provider shall ensure relevant information about topics, rules and courses fulfilment, including a demo version.

Before registration acceptance, the training course provider shall verify:

— the students' appropriate familiarity with IT devices;

— the students' hardware and software compliance needed to access to digital platform.