ICS 27.070 SLOVENSKÁ TECHNICKÁ NORMA August 2015

STN	**Technológia palivových článkov. Časť 4-101: Výkonové sústavy palivových článkov na pohon iných ako cestných vozidiel a pomocných výkonových jednotiek. Bezpečnosť elektricky napájaných priemyselných vozíkov.**	**STN EN 62282-4-101** 36 4512

Fuel cell technologies - Part 4-101: Fuel cell power systems for propulsion other than road vehicles and auxiliary power units (APU) - Safety of electrically powered industrial trucks

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 07/15

Obsahuje: EN 62282-4-101:2014, IEC 62282-4-101:2014

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62282-4-101

October 2014

ICS 27.070

English Version

Fuel cell technologies - Part 4-101: Fuel cell power systems for propulsion other than road vehicles and auxiliary power units (APU) - Safety of electrically powered industrial trucks (IEC 62282-4-101:2014)

Technologies des piles à combustible - Partie 4-101: Systèmes à piles à combustible pour la propulsion, autres que les véhicules routiers et groupes auxiliaires de puissance (GAP) - Sécurité pour chariots de manutention électriques
(CEI 62282-4-101:2014)

Brennstoffzellen-Technologien - Teil 4-101: Antriebe mit Brennstoffzellen-Energiesystemen (mit Ausnahme von Straßenfahrzeugen und Hilfsantrieben) - Elektrisch betriebene Flurförderfahrzeuge - Sicherheit
(IEC 62282-4-101:2014)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Foreword

The text of document 105/506/FDIS, future edition 1 of IEC 6228-4-101, prepared by IEC/TC 105 "Fuel cell technologies" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62282-4-101:2014.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2015-06-16
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2017-09-16

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

Endorsement notice

The text of the International Standard IEC 62282-4-101:2014 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60034 Series	NOTE	Harmonised as EN 60034 Series.
IEC 60034-11	NOTE	Harmonised as EN 60034-11.
IEC 60079-20-1	NOTE	Harmonised as EN 60079-20-1.
IEC 60112	NOTE	Harmonised as EN 60112.
IEC 60243 Series	NOTE	Harmonised as EN 60243 Series.
IEC 60695-11-5	NOTE	Harmonised as EN 60695-11-5.
IEC 60812	NOTE	Harmonised as EN 60812.
IEC 62282-3-100	NOTE	Harmonised as EN 62282-3-100.
IEC 62282-5-1	NOTE	Harmonised as EN 62282-5-1.
ISO 16017-1	NOTE	Harmonised as EN ISO 16017-1.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60079-0	-	Explosive atmospheres Part 0: Equipment - General requirements	EN 60079-0	-
IEC 60079-10-1	-	Explosive atmospheres Part 10-1: Classification of areas - Explosive gas atmospheres	EN 60079-10-1	-
IEC 60079-29-1	-	Explosive atmospheres Part 29-1: Gas detectors - Performance requirements of detectors for flammable gases	EN 60079-29-1	-
IEC 60079-29-4	-	Explosive atmospheres Part 29-4: Gas detectors - Performance requirements of open path detectors for flammable gases	EN 60079-29-4	-
IEC 60204-1	-	Safety of machinery - Electrical equipment of machines Part 1: General requirements	EN 60204-1	-
IEC 60227-3	-	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V Part 3: Non-sheathed cables for fixed wiring	HD 21.3 S3 [1)]	-
IEC 60227-5	-	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V Part 5: Flexible cables (cords)	-	-
IEC 60335-2-41	-	Household and similar electrical appliances – Safety Part 2-41: Particular requirements for pumps	EN 60335-2-41	-
IEC 60335-2-80	-	Safety of household and similar electrical appliances Part 2-80: Particular requirements for fans	EN 60335-2-80	-
IEC 60364-4-41 (mod)	2005	Low-voltage electrical installations Part 4-41: Protection for safety - Protection against electric shock	HD 60364-4-41 + corr. July	2007 2007
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-

[1)] Superseded by EN 50525-2-31:2011.

Publication	Year	Title	EN/HD	Year
IEC 60584-1	-	Thermocouples Part 1: Reference tables	EN 60584-1	-
IEC 60664-1	-	Insulation coordination for equipment within low-voltage systems Part 1: Principles, requirements and tests	EN 60664-1	-
IEC 60695	Series	Fire hazard testing	EN 60695	Series
IEC 60695-1-30	-	Fire hazard testing Part 1-30: Guidance for assessing the fire hazard of electrotechnical products - Preselection testing process - General guidelines	EN 60695-1-30	-
IEC 60695-10-2	-	Fire hazard testing Part 10-2: Guidance and test methods for the minimization of the effects of abnormal heat on electrotechnical products involved in fires - Method for testing products made from non-metallic materials for resistance to heat using the ball pressure test	EN 60695-10-2	-
IEC 60695-11-4	-	Fire hazard testing Part 11-4: Test flames - 50 W flame - Apparatus and confirmational test method	EN 60695-11-4	-
IEC 60695-11-10	-	Fire hazard testing Part 11-10: Test flames - 50 W horizontal and vertical flame test methods	EN 60695-11-10	-
IEC 60730-1 (mod)	2013	Automatic electrical controls Part 1: General requirements	EN 60730-1 [2)]	-
IEC 60730-2-17	-	Automatic electrical controls for household and similar use Part 2-17: Particular requirements for electrically operated gas valves, including mechanical requirements	-	-
IEC 60947-3	-	Low-voltage switchgear and controlgear Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units	EN 60947-3	-
IEC 60947-5-1	-	Low-voltage switchgear and controlgear Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices	EN 60947-5-1	-
IEC 60950-1 (mod)	2005	Information technology equipment - Safety Part 1: General requirements	EN 60950-1+ corr. October	2006 2011
IEC 61204-7	-	Low-voltage power supplies, d.c. output Part 7: Safety requirements	EN 61204-7	-

[2)] At draft stage.

Publication	Year	Title	EN/HD	Year
IEC/TS 61430	-	Secondary cells and batteries - Test methods for checking the performance of devices designed for reducing explosion hazards - Lead-acid starter batteries	-	-
IEC 61558-1	-	Safety of power transformers, power supplies, reactors and similar products Part 1: General requirements and tests	EN 61558-1	-
IEC 62103	-	Electronic equipment for use in power installations	-	-
IEC 62133	-	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications	EN 62133	-
IEC 62282-2	-	Fuel cell technologies Part 2: Fuel cell modules	EN 62282-2	-
ISO 179	Series	Plastics - Determination of Charpy impact properties Part 1: Non-instrumented impact test	EN ISO 179	Series
ISO 180	-	Plastics - Determination of Izod impact strength	EN ISO 180	-
ISO 877	Series	Plastics - Methods of exposure to solar radiation Part 1: General guidance	EN ISO 877	Series
ISO 1419	-	Rubber- or plastics-coated fabrics - Accelerated-ageing tests	-	-
ISO 1421	-	Rubber- or plastics-coated fabrics - Determination of tensile strength and elongation at break	EN ISO 1421	-
ISO 1798	-	Flexible cellular polymeric materials - Determination of tensile strength and elongation at break	EN ISO 1798	-
ISO 2440	-	Flexible and rigid cellular polymeric materials - Accelerated ageing tests	EN ISO 2440	-
ISO 2626	-	Copper - Hydrogen embrittlement test	EN ISO 2626	-
ISO 3691-1	-	Industrial trucks - Safety requirements and verification Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks	EN ISO 3691-1	-
ISO/TS 3691-7	-	Industrial trucks - Safety requirements and verification Part 7: Regional requirements for countries within the European Community	-	-
ISO/TS 3691-8	-	Industrial trucks - Safety requirements and verification Part 8: Regional requirements for countries outside the European Community	-	-

Publication	Year	Title	EN/HD	Year
ISO 3864-1	-	Graphical symbols - Safety colours and safety signs Part 1: Design principles for safety signs and safety markings	-	-
ISO 3996	-	Road vehicles - Brake hose assemblies for hydraulic braking systems used with non-petroleum-base brake fluid	-	-
ISO 4038	-	Road vehicles - Hydraulic braking systems -- Simple flare pipes, tapped holes, male fittings and hose end fittings		-
ISO 4080	-	Rubber and plastics hoses and hose assemblies - Determination of permeability to gas	EN ISO 4080	-
ISO 4675	-	Rubber- or plastics-coated fabrics; low-temperature bend test	-	-
ISO 7010	-	Graphical symbols - Safety colours and safety signs - Safety signs used in workplaces and public areas	-	-
ISO 7866	2012	Gas cylinders - Refillable seamless aluminium alloy gas cylinders - Design, construction and testing	EN ISO 7866	2012
ISO 9809-1	-	Gas cylinders - Refillable seamless steel gas cylinders - Design, construction and testing Part 1: Quenched and tempered steel cylinders with tensile strength less than 1100 MPa	EN ISO 9809-1	-
ISO 10380	-	Pipework - Corrugated metal hoses and hose assemblies	EN ISO 10380	-
ISO 10442	-	Petroleum, chemical and gas service industries - Packaged, integrally geared centrifugal air compressors	EN ISO 10442	-
ISO 10806	-	Pipework - Fittings for corrugated metal hoses	EN ISO 10806	-
ISO 11114-4	-	Transportable gas cylinders - Compatibility of cylinder and valve materials with gas contents Part 4: Test methods for selecting metallic materials resistant to hydrogen embrittlement	EN ISO 11114-4	-
ISO 13226	-	Rubber - Standard reference elastomers (SREs) for characterizing the effect of liquids on vulcanized rubbers	-	-
ISO 13849-1	-	Safety of machinery - Safety-related parts of control systems Part 1: General principles for design	EN ISO 13849-1	-
ISO 14113	-	Gas welding equipment - Rubber and plastics hose and hose assemblies for use with industrial gases up to 450 bar (45 MPa)	EN ISO 14113	-

Publication	Year	Title	EN/HD	Year
ISO/TS 14687-2	-	Hydrogen fuel - Product specification Part 2: Proton exchange membrane (PEM) fuel cell applications for road vehicles	-	-
ISO 15500-12	-	Road vehicles - Compressed natural gas (CNG) fuel system components Part 12: Pressure relief valve (PRV)	-	-
ISO 15649	-	Petroleum and natural gas industries - Piping	-	-
ISO/TS 15869	2009	Gaseous hydrogen and hydrogen blends - Land vehicle fuel tanks	-	-
ISO/TR 15916	-	Basic considerations for the safety of hydrogen systems	-	-
ISO 16010	-	Elastomeric seals - Material requirements for seals used in pipes and fittings carrying gaseous fuels and hydrocarbon fluids	-	-
ISO 16111	2008	Transportable gas storage devices - Hydrogen absorbed in reversible metal hydride	-	-
ISO 17268	-	Elastomeric seals - Material requirements for seals used in pipes and fittings carrying gaseous fuels and hydrocarbon fluids	-	-
ISO 21927-3	-	Smoke and heat control systems Part 3: Specification for powered smoke and heat exhaust ventilators	-	-
ISO 23551-1	-	Safety and control devices for gas burners and gas-burning appliances - Particular requirements Part 1: Automatic valves	-	-

IEC 62282-4-101

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fuel cell technologies – Part 4-101: Fuel cell power systems for propulsion other than road vehicles and auxiliary power units (APU) – Safety of electrically powered industrial trucks

Technologies des piles à combustible – Partie 4-101: Systèmes à piles à combustible pour la propulsion, autres que les véhicules routiers et groupes auxiliaires de puissance (GAP) – Sécurité pour chariots de manutention électriques

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INTERNATIONAL STANDARD

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CONTENTS

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FUEL CELL TECHNOLOGIES –

Part 4-101: Fuel cell power systems for propulsion other than road vehicles and auxiliary power units (APU) – Safety of electrically powered industrial trucks

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62282-4-101 has been prepared by IEC technical committee 105: Fuel cell technologies.

The text of this standard is based on the following documents:

FDIS	Report on voting
105/506/FDIS	105/513/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 62282 series, published under the general title *Full cell technologies*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

IEC 62282-4 deals with categories such as safety, performance and interchangeability of fuel cell power systems for propulsion other than road vehicles and auxiliary power units (APU). Among the categories mentioned above, this standard, IEC 62282-4-101, focuses on safety of industrial electric trucks with fuel cell power systems because such an application is urgently demanded in the world. The future standards in the Part 4 series will deal with other applications related to onboard vehicles other than road vehicles and auxiliary power units (APU).

FUEL CELL TECHNOLOGIES –

Part 4-101: Fuel cell power systems for propulsion other than road vehicles and auxiliary power units (APU) – Safety of electrically powered industrial trucks

1 Scope

1.1 This part of IEC 62282 covers safety requirements for fuel cell power systems intended to be used in electrically powered industrial trucks.

1.2 This standard is limited to electrically powered industrial trucks and is applicable to material-handling equipment, e.g. forklifts.

1.3 This standard applies to gaseous hydrogen-fuelled fuel cell power systems and direct methanol fuel cell power systems for electrically powered industrial trucks.

1.4 The following fuels are considered within the scope of this standard:

– gaseous hydrogen

– methanol.

1.5 This standard covers the fuel cell power system as defined in 3.8 and Figure 1.

1.6 This standard applies to d.c. type fuel cell power systems, with a rated output voltage not exceeding 150 V d.c. for indoor and outdoor use.

1.7 This standard covers fuel cell power systems whose fuel source container is permanently attached to either the industrial truck or the fuel cell power system.

1.8 The following are not included in the scope of this standard:

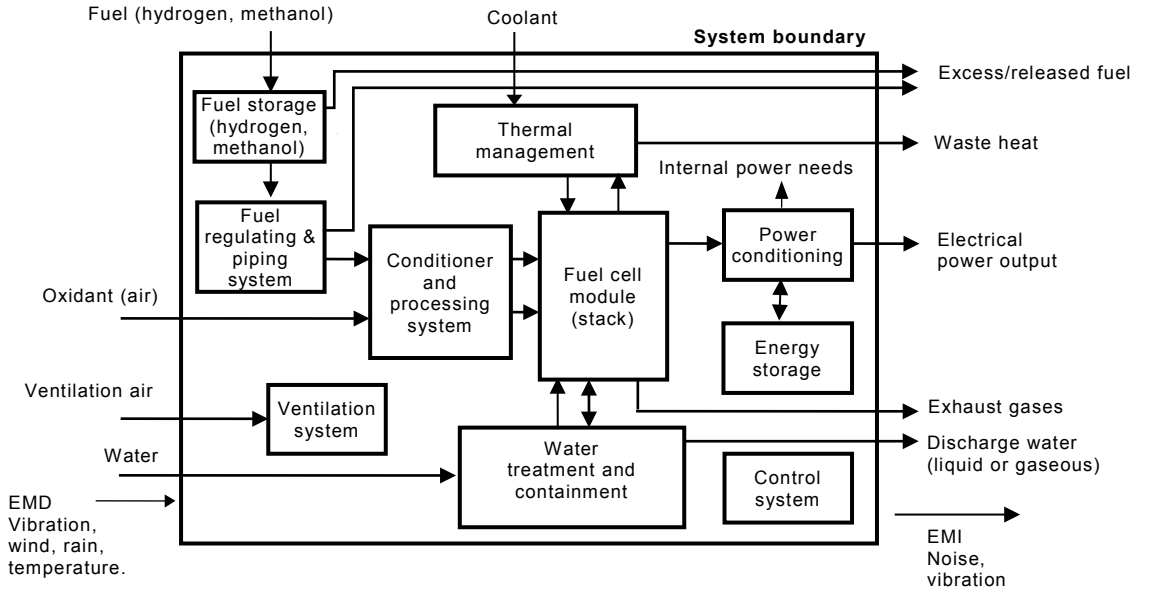
– detachable type fuel source containers;

– hybrid trucks that include an internal combustion engine;

– reformer-equipped fuel cell power systems;

– fuel cell power systems intended for operation in potentially explosive atmospheres;

– fuel storage systems using liquid hydrogen.



Key

EMD electromagnetic disturbance.

EMI electromagnetic interference.

NOTE A fuel cell power system may contain all or some of the above components.

Figure 1 – Fuel cell power systems for industrial trucks

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas atmospheres*

IEC 60079-29-1, *Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases*

IEC 60079-29-4, *Explosive atmospheres – Part 29-4: Gas detectors – Performance requirements of open path detectors for flammable gases*

IEC 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 60227-3, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 3: Non-sheathed cables for fixed wiring*

IEC 60227-5, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)*

IEC 60335-2-41, *Household and similar electrical appliances – Safety – Part 2-41: Particular requirements for pumps*

IEC 60335-2-80, *Household and similar electrical appliances – Safety – Part 2-80: Particular requirements for fans*

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60584-1, *Thermocouples – Part 1: Reference tables*

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60695 (all parts), *Fire hazard testing*

IEC 60695-1-30, *Fire hazard testing – Part 1-30: Guidance for assessing the fire hazard of electrotechnical products – Preselection testing process – General guidelines*

IEC 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test*

IEC 60695-11-4, *Fire hazard testing – Part 11-4: Test flames – 50 W flame – Apparatus and confirmational test method*

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60730-1:2013, *Automatic electrical controls for household and similar use – Part 1: General requirements*

IEC 60730-2-17, *Automatic electrical controls for household and similar use – Part 2-17: Particular requirements for electrically operated gas valves, including mechanical requirements*

IEC 60947-3, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination untis*

IEC 60947-5-1, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 60950-1:2005, *Information technology equipment – Safety – Part 1: General requirements*

IEC 61204-7, *Low-voltage power supplies, d.c. output – Part 7: Safety requirements*

IEC TS 61430, *Secondary cells and batteries – Test methods for checking the performance of devices designed for reducing explosion hazards – Lead-acid starter batteries*

IEC 61558-1, *Safety os power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests*

IEC 62103, *Electronic equipment for use in power installations*

IEC 62133, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications*

IEC 62282-2, *Fuel cell technologies – Part 2: Fuel cell modules*

ISO 179 (all parts), *Plastics – Determination of Charpy impact properties*

ISO 180, *Plastics – Determination of Izod impact strength*

ISO 877 (all parts), *Plastics – Methods of exposure to solar radiation*

ISO 1419, *Rubber- or plastics-coated fabrics – Accelerated-ageing tests*

ISO 1421, *Rubber- or plastics-coated fabrics – Determination of tensile strength and elongation at break*

ISO 1798, *Flexible cellular polymeric materials – Determination of tensile strength and elongation at break*

ISO 2440, *Flexible and rigid cellular polymeric materials – Accelerated ageing tests*

ISO 2626, *Copper – Hydrogen embrittlement test*

ISO 3691-1, *Industrial trucks – Safety requirements and verification – Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

ISO 3691-7, *Industrial trucks – Safety requirements and verification – Part 7: Regional requirements for countries within the European Community*

ISO 3691-8, *Industrial trucks – Safety requirements and verification – Part 8: Regional requirements for countries outside the European Community*

ISO 3864-1, *Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings*

ISO 3996, *Road Vehicles – Brake hose assemblies for hydraulic braking systems used with a non-petroleum-base brake fluid*

ISO 4038, *Road vehicles – Hydraulic braking systems – Simple flare pipes, tapped holes, male fittings and hose end fittings*

ISO 4080, *Rubber and plastics hoses and hose assemblies – Determination of permeability to gas*

ISO 4675, *Rubber- or plastics-coated fabrics – Low-temperature bend test*

ISO 7010, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

ISO 7866:2012, *Gas cylinders – Refillable seamless aluminum alloy gas cylinders – Design, construction and testing*

ISO 9809-1, *Gas cylinders – Refillable seamless steel gas cylinders – Design, construction and testing – Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa*

ISO 10380, *Pipework – Corrugated metal hoses and hose assemblies*

ISO 10442, *Petroleum, chemical and gas service industries – Packaged, integrally geared centrifugal air compressors*

ISO 10806, *Pipework – Fittings for corrugated metal hoses*

ISO 11114-4, *Transportable gas cylinders – Compatibility of cylinder and valve materials with gas contents – Part 4: Test methods for selecting metallic materials resistant to hydrogen embrittlement*

ISO 13226, *Rubber – Standard reference elastomers (SREs) for characterizing the effect of liquids on vulcanized rubbers*

ISO 13849-1, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*

ISO 14113, *Gas welding equipment – Rubber and plastic hose and hose assemblies for use with industrial gases up to 450 bar*

ISO/TS 14687-2, *Hydrogen fuel – Product specification – Part 2: Proton exchange membrane (PEM) fuel cell applications for road vehicles*

ISO 15500-12, *Road vehicles – Compressed natural gas (CNG) fuel system components – Part 12: Pressure relief valve (PRV)*

ISO 15649, *Petroleum and natural gas industries – Piping*

ISO/TS 15869:2009, *Gaseous hydrogen and hydrogen blends – Land vehicle fuel tanks*

ISO 15916, *Basic considerations for the safety of hydrogen systems*

ISO 16010, *Elastomeric seals – Material requirements for seals used in pipes and fittings carrying gaseous fuels and hydrocarbon fluids*

ISO 16111:2008, *Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride*

ISO 17268, *Compressed hydrogen surface vehicle refuelling connection devices*

ISO 21927-3, *Smoke and heat control systems – Part 3: Specification for powered smoke and heat exhaust ventilators*

ISO 23551-1, *Safety and control devices for gas burners and gas-burning appliances – Particular requirements – Part 1: Automatic valves*