ISO 19880-1:2020-03 (E)

Gaseous hydrogen - Fuelling stations - Part 1: Gene ral requirements

Contents

Page

Foreword vii

1 Scope 1

2 Normative references 3

3 Termsanddefinitions 3

4 Abbreviated terms 15

5 Risk management 16
5.1 Hydrogen fuelling station safety recommendations 16
5.2 Risk assessment 17
5.3 Mitigation measures to improve system safety 17
5.3.1 General 17
5.3.2 Mitigations which reduce the potential for the formation of a flammable mixture 17
5.3.3 Mitigation for the formation of a flammable mixture in enclosures 18
5.3.4 Mitigation for the formation of a flammable mixture under a canopy 18
5.3.5 Mitigations which reduce the potential for ignition 19
5.3.6 Mitigation of the escalation and/or impact of a fire or explosion originating from the fuelling installation 20
5.3.7 Mitigation of the effect of an external fire/events on the fuelling station installation 21
5.3.8 Mitigation of risk to the high pressure hydrogen storage system of the vehicle being fuelled 23
5.4 Safety distances 23
5.4.1 General 23
5.4.2 Safety distances relating to hydrogen vent stack outlets 24
5.5 Protection measures for non-hydrogen hazards 24
5.5.1 General 24
5.5.2 Protection measures for asphyxiation hazard in an enclosure (confined space).24 5.5.3 Protection measures for emergency egress from enclosed spaces 25
5.5.4 Ingress protection measures 25
5.5.5 Protection measures for hose whip 25
5.5.6 Protection measures for noise 26
5.5.7 Protection against exposure to extremely cold or hot temperatures 26

6 Hydrogen supply safety and operation 26
6.1 On site generation 26
6.1.1 Hydrogen generators using water electrolysis 26
6.1.2 Hydrogen generators using fuel processing technologies 26
6.2 Hydrogen delivery 27
6.2.1 Gaseous hydrogen supply by tube trailers and multiple element gas containers (MEGC) .27
6.2.2 Liquid hydrogen supply by tanker 28
6.3 Pipeline 31

7 Equipment and Components 32
7.1 General recommendations 32
7.1.1 Hydrogen materials 32
7.1.2 Material hydrogen compatibility 32
7.1.3 Other material recommendations 33
7.2 Piping carrying hydrogen 33
7.2.1 General 33

7.2.2 Pipe fittings, valves, hoses, for gaseous hydrogen 33
7.3 Hydrogen storage recommendations 34
7.3.1 General 34
7.3.2 Gaseous hydrogen storage vessels 34
7.3.3 Gaseous hydrogen storage siting recommendations 34
7.4 Hazardous areas (with potentially flammable mixtures) 36
7.4.1 General 36
7.4.2 Equipment in hazardous areas 37
7.5 Hydrogen compressors 37
7.5.1 General 37
7.5.2 Vibration and movement 38
7.5.3 Control and monitoring 38
7.6 Instruments for gaseous hydrogen systems 39
7.7 Filters for gaseous hydrogen 39
7.8 Gaseous hydrogen vent systems 40
7.8.1 General 40
7.8.2 Vent outlet 40
7.8.3 Vent sizing 41
7.8.4 Multiple relief devices 42
7.9 Pneumatics and hydraulics 42
7.10 Hydrogen purifier 43
7.11 Enclosures and buildings containing hydrogen equipment 43
7.11.1 General design 43
7.11.2 Maintenance access and possible occupancy 43
7.11.3 Ventilation of enclosures and buildings containing hydrogen equipment 44
7.11.4 Use of enclosures or compartments within enclosures to control hazards areas44 7.11.5 Electrical and mechanical equipment within enclosures and buildings containing hydrogen equipment 45
7.11.6 Over-pressure protection of enclosures and buildings containing hydrogen equipment .. 45

8 Dispensing systems 45
8.1 General requirements 45
8.2 Hydrogen vehicle fuelling 46
8.2.1 Dispensing system process control 46
8.2.2 Dispensing system safety devices 49
8.3 Dispensing systems 52
8.3.1 General design and assembly 52
8.3.2 Dispensing system hydrogen components 52
8.3.3 Dispenser housings and cabinets 55
8.3.4 Dispenser fuelling assembly 55
8.4 Dispenser installation 56
8.4.1 General 56
8.4.2 Location and protection of dispensers 56
8.4.3 Fuelling pad 57
8.4.4 Hazardous area around the dispenser 57
8.4.5 Installation of the fuelling assembly to prevent damage in service 57
8.4.6 Electrical continuity for bonding and grounding 57
8.5 Operating considerations 58
8.6 Maintenance and inspection 58

9 Hydrogen quality 58
9.1 General 58
9.2 Dispensing system fuel filters 58

10 Electrical 59
10.1 General electrical 59
10.1.1 Components 59
10.1.2 Site (interconnections to and/or between equipment assemblies) 59
10.1.3 Electrical bonding and grounding 60
10.1.4 Lightning protection 60
10.2 Hazardous areas (potentially flammable mixtures) 60

10.2.1 General 60
10.2.2 Protection requirements for electrical equipment within hazardous areas 60
10.2.3 Protection from ignition due to accumulation of static charge 60
10.3 Electromagnetic compatibility and interference (EMC) 62
10.3.1 General 62
10.3.2 Industrial (EMC) Environments 62
10.3.3 Residential, Commercial, and Light-Industrial (EMC) Environments 62

11 Instrumentation and control system 62
11.1 General 62
11.2 Emergency shutdown functionality 63
11.2.1 General 63
11.2.2 Manually actuated emergency stop devices 64
11.2.3 Hydrogen detection systems 64
11.3 Remote system control 65
11.4 Modifications to control system 66

12 Station inspection and tests 66
12.1 General 66
12.2 Pressure test 66
12.3 Leak test 67
12.4 Electrical testing 67
12.5 Fuelling safety and performance functional testing 68
12.5.1 General 68
12.5.2 Fuelling protocol test 68
12.5.3 Test procedure 69
12.5.4 Site acceptance testing options 69
12.5.5 Additional performance considerations for fuelling 71
12.6 Hydrogen quality testing 72
12.7 Station inspection and tests following modifications 72

13 Operation 72
13.1 General 72
13.2 Warning signs 72
13.3 Dispenser operational instructions 73
13.4 Functional identification 74
13.5 Marking of equipment (data plate) 74
13.6 Reference designations 75
13.7 Training 75
13.8 Emergency response plan 75
13.9 Emergency contact information 76

14 Technical documentation 76
14.1 General 76
14.2 Information to be provided 76
14.3 Recommendations applicable to all documentation 78
14.4 Installation documents 78
14.4.1 General 78
14.4.2 Installation documentation for hazardous areas 79
14.4.3 Venting documentation 79
14.4.4 Seismic documentation 79
14.4.5 Handling and lifting documentation 79
14.5 Overview diagrams and function diagrams 80
14.6 Circuit diagrams 80
14.7 Flow (P&ID) diagrams 80
14.8 Fuelling station operating manual 81
14.9 Maintenance and service manuals 81
14.10 Parts list 81

15 Inspection and maintenance 82
15.1 Inspection and maintenance program 82
15.2 Maintenance and testing frequency of gas detection 83

15.3 Maintenance and inspection frequency of filters 83
15.4 Maintenance of pressure relief devices 84
15.5 Hot work 84
15.6 Modifications to the hydrogen fuelling station and associated equipment 84

Annex A (informative) Safety methodologies and risk assessment 85

Annex B (informative) Further guidance on risk management 107

Annex C (informative) Hydrogen dispensing and examples of fuelling and communications protocols,andcorrespondingverificationtesting 113

Annex D (informative) Reference fuelling limits of hydrogen and fuel cell vehicles 131

Annex E (informative)Pressurelevelapplicationtodesignverificationrequirementsfor hydrogen dispensing systems and compressed hydrogen storage systems 132

Annex F (informative) Countermeasures for unsuitable hydrogen fuelling protocols 137

Annex G (informative) Recommendations for, and example of, vehicular impact protection measures 138

Annex H (informative) Example for leakage testing of hydrogen fuelling system 141

Annex I (informative) Minimum fuelling station acceptance inspection, testing and validation checklist 142

Annex J (informative) Hydrogen station testing apparatus (HSTA) 149

Annex K (informative) Sampling procedures and hardware for hydrogen fuel quality analysis 151

Bibliography 167