

ISO 19887-1:2024-10 (E)

Gaseous Hydrogen - Fuel system components for hydrogen-fuelled vehicles - Part 1: Land vehicles

Contents

	Page
Foreword.....	viii
Introduction.....	ix
1 Scope	1
1.1 Inclusions.....	1
1.2 Applicability.....	2
1.3 Exclusions.....	2
2 Normative references	2
3 Terms and definitions	3
4 General requirements	7
4.1 General construction and assembly.....	7
4.1.1 Intended use.....	7
4.1.2 Material requirements.....	8
4.1.3 Threaded openings.....	9
4.1.4 Service temperatures.....	10
4.1.5 Design service life.....	10
4.2 Failure modes and effects analysis (FMEA).....	10
4.3 Electrical equipment and wiring.....	10
4.3.1 Openings.....	10
4.3.2 Equipment.....	10
4.3.3 Materials.....	10
4.3.4 Connectors.....	10
4.4 Component literature.....	11
4.4.1 General.....	11
4.4.2 Instructions – General.....	11
4.4.3 Instructions – Additional considerations.....	11
4.4.4 Installation instructions.....	11
4.5 Marking.....	11
4.5.1 General marking information.....	11
4.5.2 Marking methods.....	12
4.5.3 Exclusion of markings.....	12
5 General test methods	12
5.1 General test requirements.....	12
5.1.1 Testing samples.....	12
5.1.2 References to other standards.....	12
5.1.3 Pressure and temperature requirements.....	13
5.1.4 Test gases.....	13
5.1.5 Material acceptance.....	14
5.1.6 Multi-functional components.....	14
5.1.7 Pre-cooling effects.....	14
5.1.8 Electrically operated components.....	14
5.2 Hydrostatic strength.....	14
5.2.1 General.....	14
5.2.2 Test method.....	14
5.3 Leakage.....	15
5.3.1 General.....	15
5.3.2 External leakage.....	15
5.3.3 Internal leakage.....	15
5.3.4 Test conditions.....	15

5.4	Excess torque resistance.....	16
5.5	Bending moment.....	16
5.6	Continuous operation.....	17
	5.6.1 General.....	17
	5.6.2 Test method.....	17
5.7	Corrosion resistance.....	18
	5.7.1 General.....	18
	5.7.2 Salt spray exposure.....	19
	5.7.3 Accelerated cyclic corrosion.....	19
5.8	Ultraviolet resistance of external surfaces.....	21
	5.8.1 General.....	21
	5.8.2 Ultraviolet resistance test.....	21
	5.8.3 Pass criteria.....	22
5.9	Automotive fluid exposure.....	22
	5.9.1 General.....	22
	5.9.2 Test method.....	22
	5.9.3 Fluids.....	22
	5.9.4 Pass criteria.....	22
5.10	Atmospheric exposure.....	22
	5.10.1 Oxygen aging.....	23
	5.10.2 Ozone.....	23
5.11	Abnormal electrical voltages.....	23
	5.11.1 Overvoltage testing.....	23
	5.11.2 Minimum opening voltage.....	24
5.12	Non-metallic material hydrogen compatibility.....	24
	5.12.1 General.....	24
	5.12.2 Hydrogen gas exposure.....	24
5.13	Vibration resistance.....	24
	5.13.1 Test method.....	24
	5.13.2 Pass criteria.....	25
5.14	Stress corrosion cracking resistance.....	25
	5.14.1 General.....	25
	5.14.2 Test method.....	25
	5.14.3 Pass criteria.....	25
5.15	Insulation resistance.....	25
5.16	Pre-cooled hydrogen exposure.....	26
6	Quality assurance.....	26
7	Production inspection and acceptance testing.....	26
	7.1 Inspection and acceptance testing plan.....	26
	7.2 Inspection of system critical components.....	26
	7.3 External leak testing.....	26
8	Check valves.....	26
	8.1 Marking.....	26
	8.2 Construction and assembly.....	27
	8.3 Tests.....	27
	8.3.1 General.....	27
	8.3.2 Continuous operation.....	28
	8.3.3 Pass criteria.....	28
9	Manual valves.....	28
	9.1 Marking.....	29
	9.2 Construction and assembly.....	29
	9.2.1 General.....	29
	9.2.2 Handles.....	29
	9.2.3 Emergency manual shut-off valves.....	29
	9.2.4 Quarter-turn valves.....	29
	9.2.5 Multi-turn valves.....	29
	9.3 Tests.....	29
	9.3.1 General.....	29
	9.3.2 Continuous operation.....	30
	9.3.3 Operating torque.....	31
	9.3.4 Valve stem torque.....	32

10	Manual container valves	32
10.1	Marking	32
10.2	Construction and assembly	32
	10.2.1 General	32
	10.2.2 Handle	32
	10.2.3 Quarter-turn valves	33
	10.2.4 Multi-turn valves	33
	10.2.5 Internal excess flow valve	33
10.3	Tests	33
	10.3.1 General	33
	10.3.2 Continuous operation	33
	10.3.3 Operating torque	34
	10.3.4 Valve stem torque	34
11	Automatic valves and automatic container valves	35
11.1	Marking	35
11.2	Construction and assembly	35
	11.2.1 General	35
	11.2.2 De-energized position	35
	11.2.3 Shut-off valve failure position	35
	11.2.4 Internal excess flow valve	35
11.3	Tests	35
	11.3.1 General	35
	11.3.2 Continuous operation	36
	11.3.3 Automatic valve manual override torque	37
12	Hydrogen injectors	37
12.1	Marking	37
12.2	Construction and assembly	38
	12.2.1 General	38
	12.2.2 De-energized position	38
12.3	Tests	38
	12.3.1 General	38
	12.3.2 Continuous operation	38
	12.3.3 Insulation resistance	39
	12.3.4 Pneumatic strength	39
	12.3.5 Extreme temperature cycling	39
13	Pressure sensors, temperature sensors, and pressure gauges	40
13.1	Marking	40
13.2	Construction and assembly	41
	13.2.1 General	41
	13.2.2 Pressure gauge lens	41
13.3	Tests	41
	13.3.1 General	41
	13.3.2 Continuous operation	41
	13.3.3 Abnormal electrical voltages	42
	13.3.4 Insulation resistance	43
14	Pressure regulators	43
14.1	Marking	43
14.2	Construction and assembly	43
	14.2.1 General	43
	14.2.2 Nominal outlet pressure	43
	14.2.3 Pressure regulator PRV	43
14.3	Tests	43
	14.3.1 General	43
	14.3.2 Hydrostatic strength	44
	14.3.3 Leakage	45
	14.3.4 Continuous operation	45
	14.3.5 Pressure impulse	45

	14.3.6	Pressure chamber – PRV operation.....	46
15		Pressure relief valves.....	46
	15.1	Marking.....	46
	15.2	Construction and assembly.....	46
	15.2.1	General.....	46
	15.2.2	Venting.....	46
	15.2.3	Inspection and acceptance testing.....	46
	15.3	Tests.....	46
	15.3.1	General.....	46
	15.3.2	Hydrostatic strength.....	47
	15.3.3	Leakage.....	47
	15.3.4	Continuous operation.....	47
	15.3.5	Opening and reseating characteristics.....	48
16		Pressure relief devices.....	48
17		Excess flow valves.....	48
	17.1	Marking.....	48
	17.2	Construction and assembly.....	49
	17.3	Tests.....	49
	17.3.1	General.....	49
	17.3.2	Continuous operation.....	49
	17.3.3	Bypass flow.....	49
18		Gastight housing and leakage capture passages.....	50
	18.1	Marking.....	50
	18.2	Construction and assembly.....	50
	18.2.1	General.....	50
	18.2.2	Inspection and acceptance testing.....	50
	18.3	Tests.....	50
	18.3.1	General.....	50
	18.3.2	Leakage.....	51
	18.3.3	Venting ability and pressure retention.....	51
	18.3.4	Pull-off.....	52
19		Rigid fuel lines.....	52
	19.1	Marking.....	52
	19.2	Construction and assembly.....	52
	19.3	Tests.....	52
	19.3.1	General.....	52
	19.3.2	Continuous operation.....	53
	19.3.3	Bending.....	53
20		Flexible fuel lines, hoses, and hose assemblies.....	53
	20.1	Markings.....	54
	20.1.1	General.....	54
	20.1.2	Bulk hoses.....	54
	20.1.3	Hose assemblies.....	54
	20.1.4	Marking surfaces.....	55
	20.1.5	Date code.....	55
	20.2	Construction, assembly, and installation instructions.....	55
	20.2.1	General.....	55
	20.2.2	Linings.....	55
	20.2.3	Hose cover.....	55
	20.2.4	Protection from permeation or leakage.....	55
	20.2.5	Static electricity dissipation.....	56
	20.2.6	End connections.....	56
	20.2.7	Component literature.....	56
	20.3	Tests.....	56
	20.3.1	General.....	56
	20.3.2	Hydrostatic strength.....	57

20.3.3	Leakage.....	58
20.3.4	Corrosion resistance.....	58
20.3.5	Automotive fluid exposure.....	59
20.3.6	Vibration resistance.....	60
20.3.7	Pressure cycle.....	61
20.3.8	Electrical conductivity.....	63
20.3.9	Hose permeation.....	64
20.3.10	Ultraviolet light and water exposure.....	65
20.3.11	Hydrogen impulse.....	65
20.3.12	Ozone exposure resistance.....	67
20.4	Manufacturing plan.....	67
20.4.1	Documentation.....	67
20.4.2	Production processes.....	67
20.4.3	Leakage test conducted as production test.....	67
21	Filter assemblies.....	68
21.1	Marking.....	68
21.2	Construction and assembly.....	69
21.2.1	General.....	69
21.2.2	Electrical conductivity.....	69
21.3	Tests.....	69
21.3.1	General.....	69
21.3.2	Continuous operation.....	69
22	Fittings.....	70
22.1	Marking.....	70
22.2	Construction and assembly.....	70
22.3	Tests.....	70
22.3.1	General.....	70
22.3.2	Continuous operation.....	71
22.3.3	Repeated assembly.....	71
23	Non-metallic low-pressure rigid fuel lines.....	71
23.1	General.....	71
23.2	Marking.....	71
23.3	Construction and assembly.....	72
23.4	Tests.....	72
23.4.1	General.....	72
23.4.2	Hydrostatic strength.....	72
23.4.3	Continuous operation.....	72
23.4.4	Chloride resistance.....	73
24	Discharge line closures.....	73
24.1	Markings.....	73
24.2	Construction and assembly.....	74
24.2.1	General.....	74
24.2.2	Inspection and acceptance testing.....	74
24.3	Tests.....	74
24.3.1	General.....	74
24.3.2	Continuous operation.....	75
24.3.3	Water jet protection.....	75
24.3.4	Leakage venting.....	75
	Annex A (Informative) Extreme thermal cycling test.....	76
	Bibliography.....	78