ISO 19881:2025-06 (E)

Gaseous hydrogen - Land vehicle fuel containers

Contents

Page

Foreword ..... **vi**

Introduction ..... **vii**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **2**

4 Service conditions **6**
4.1 General 6
4.1.1 Standard service conditions 6
4.1.2 Container category 6
4.1.3 Service life 6
4.1.4 Periodic in-service inspections 6
4.2 Pressures 6
4.2.1 Nominal working pressures 6
4.2.2 Maximum pressures 6
4.3 Maximum number of filling cycles 7
4.4 Temperature range 7
4.4.1 Settled gas temperatures 7
4.4.2 Container temperatures 7
4.4.3 Extreme gas temperatures 7
4.4.4 Test temperatures 7
4.5 Gas composition 7
4.6 External surfaces 8
4.7 Installation requirements 8

5 Conformance **8**

6 Material qualification tests and requirements **8**
6.1 General 8
6.2 Material requirements 9
6.3 Metal containers and metal liners 9
6.3.1 Material properties 9
6.3.2 Impact test for steel 9
6.3.3 Tensile tests for metals 10
6.3.4 Sustained load cracking (SLC) test for aluminium alloys 10
6.3.5 Corrosion tests for aluminium alloys 10
6.4 Ultraviolet resistance of external coatings 10
6.5 Fibres 10
6.6 Resins 10
6.7 Nonmetallic liners (Type 4) 10
6.8 Bosses for Type 4 containers 11

7 Wall thickness **11**
7.1 Type 1 containers 11
7.2 Liners for Type 2, Type 3, and Type 4 containers 11
7.3 Composite reinforcement for Type 2, Type 3, and Type 4 containers 11
7.3.1 Stress analysis 11
7.3.2 Composite reinforcement stress ratios 11
7.3.3 Modified stress ratio test 12
7.3.4 Hybrid designs 12
7.4 External loads on containers 12

8 Threaded openings **12**

9 Manufacture **12**
9.1 General 12
9.2 Metal containers and metal liners 12
9.3 Nonmetallic liners 13
9.4 Composite containers with metallic liners 13
9.5 Composite containers with nonmetallic liners 13
9.6 Brazing 13
9.7 Welding 13
9.8 End closing by forming 14
9.9 Mounting and protection 14
9.10 Batch definitions 14
9.11 Design qualification tests 14

10 Production tests and examinations **14**
10.1 General 14
10.2 Hydrostatic proof and volumetric expansion test 15
10.3 Leak test 16

11 Batch tests **16**
11.1 General 16
11.2 Batch material tests 16
11.3 Coated containers 16
11.4 Burst test 17
11.4.1 Batch burst test 17
11.4.2 Periodic burst test 17
11.5 Ambient cycle test 17
11.5.1 Batch cycle test 17
11.5.2 Periodic pressure cycling test 18

12 Rejected containers and liners **18**
12.1 Physical test 18
12.2 Leak test 19
12.3 Hydrostatic proof and volumetric expansion test 19
12.4 Ambient cycle test 19
12.5 Burst test 19

13 Thermally-activated pressure relief devices **19**

14 Records of manufacture **19**

15 Marking and dispatch **19**
15.1 Markings 19
15.1.1 General 19
15.1.2 Marking information 20
15.2 Dispatch inspection 20

16 Quality assurance **20**

17 Design qualification tests **20**
17.1 General 20
17.2 Test requirements 21
17.3 Category A, B and C: design qualification tests 22
17.3.1 Test requirements 22
17.3.2 Ambient cycling test 22
17.3.3 Environmental test 23
17.3.4 Extreme temperature cycling test 24
17.3.5 Hydrostatic burst test 25
17.3.6 Flaw tolerance test 25
17.3.7 Drop test 27
17.3.8 Fire test 28
17.3.9 High temperature pressure static test 35
17.3.10 High strain rate impact test 35
17.3.11 Permeation test 35
17.3.12 Boss torque test 36
17.3.13 Hydrogen gas cycling test 36
17.3.14 Leak before break test 37

17.4 Change of design 38
17.5 Category B: design qualification tests 41
17.5.1 General test requirements 41
17.5.2 Ambient cycling test 41
17.5.3 Hydrostatic burst test 41
17.5.4 Container test for performance durability 41
17.5.5 Container test for expected on-road performance 43
17.6 Category C: design qualification conditions and limitations 43
17.6.1 Marking information 43
17.6.2 Material tests for steel containers and liners 43
17.6.3 Material tests for aluminium alloy containers and liners 43
17.7 Qualification test results 44
Annex A (normative) **Visual inspection** **45**
Annex B (normative) **Non-destructive examination** **46**
Annex C (normative) **Records of manufacture** **48**
Annex D (normative) **Pre-test checkout of burner** **54**
Annex E (informative) **Design qualification test rationale** **60**
Bibliography **84**