

ISO 9809-1:2019 (E)

Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa

Contents

| | |
|---------|-----------------------------------------|
| | Foreword |
| | Introduction |
| 1 | Scope |
| 2 | Normative references |
| 3 | Terms and definitions |
| 4 | Symbols |
| 5 | Inspection and testing |
| 6 | Materials |
| 6.1 | General requirements |
| 6.2 | Controls on chemical composition |
| 6.3 | Typical steels |
| 6.4 | Heat treatment |
| 6.5 | Failure to meet test requirements |
| 7 | Design |
| 7.1 | General requirements |
| 7.2 | Limitation on tensile strength |
| 7.3 | Design of cylindrical shell thickness |
| 7.4 | Design of convex ends (heads and bases) |
| 7.5 | Design of concave base ends |
| 7.6 | Neck design |
| 7.7 | Foot rings |
| 7.8 | Neck rings |
| 7.9 | Design drawing |
| 8 | Construction and workmanship |
| 8.1 | General |
| 8.2 | Wall thickness |
| 8.3 | Surface imperfections |
| 8.4 | Ultrasonic examination |
| 8.5 | Out-of-roundness |
| 8.6 | Mean diameter |
| 8.7 | Straightness |
| 8.8 | Verticality and stability |
| 8.9 | Neck threads |
| 9 | Type approval procedure |
| 9.1 | General requirements |
| 9.2 | Prototype tests |
| 9.2.1 | General requirements |
| 9.2.2 | Pressure cycling test |
| 9.2.3 | Base check |
| 9.2.4 | Bend test and flattening test |
| 9.2.4.1 | Bend test |
| 9.2.4.2 | Flattening test |

- 9.2.4.3 Ring flattening test
- 9.2.5 Torque test for taper thread only
 - 9.2.5.1 Procedure
 - 9.2.5.2 Acceptance criteria
- 9.2.6 Shear stress calculation for parallel threads
 - 9.2.6.1 Procedure
 - 9.2.6.2 Acceptance criteria
- 9.3 Type approval certificate
- 10 Batch tests
 - 10.1 General requirements
 - 10.2 Tensile test
 - 10.3 Impact test
 - 10.4 Hydraulic burst test
 - 10.4.1 Test installation
 - 10.4.2 Test conditions
 - 10.4.3 Interpretation of test results
 - 10.4.4 Acceptance criteria
- 11 Tests/examinations on every cylinder
 - 11.1 General
 - 11.2 Hydraulic test
 - 11.2.1 Proof pressure test
 - 11.2.2 Volumetric expansion test
 - 11.3 Hardness test
 - 11.4 Leak test
 - 11.5 Capacity check
- 12 Certification
- 13 Marking
- Annex A (normative) Description and evaluation of manufacturing imperfections in seamless gas cylinders
 - A.1 Overview
 - A.2 General
 - A.3 Manufacturing imperfections and the procedure for their evaluation
 - A.4 Acceptance and rejection conditions
- Annex B (normative) Ultrasonic examination
 - B.1 General
 - B.2 General requirements
 - B.3 Flaw detection of the cylindrical parts
 - B.3.1 Procedure
 - B.3.2 Reference standard
 - B.3.3 Calibration of equipment
 - B.4 Wall thickness measurement
 - B.5 Interpretation of results
 - B.6 Certification
- Annex C (informative) Example of type approval certificate
- Annex D (informative) Example of acceptance certificate
- Annex E (informative) Bend stress calculation
- Annex F (informative) Chemical compositions of internationally-recognized steel
- Annex G (informative) An example of shear strength calculation for parallel threads