

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 |