DIN EN ISO 9809-3:2020-02 (E)

Gas cylinders - Design, construction and testing of refillable seamless steel gas cylinders and tubes - Part 3: Normali zed steel cylinders and tubes (ISO 9809-3:2019)

Contents

Page

European foreword ... **4**

Foreword ... **5**

Introduction ... **6**

1 Scope ... **7**

2 Normative references ... **7**

3 Terms and definitions ... **7**

4 Symbols ... **9**

5 Inspection and testing ... **10**

6 Materials ... **10**
6.1 General requirements ... 10
6.2 Controls on chemical composition ... 11
6.3 Heat treatment ... 12
6.4 Failure to meet test requirements ... 12

7 Design ... **13**
7.1 General requirements ... 13
7.2 Design of cylindrical shell thickness ... 13
7.3 Design of convex ends (heads and bases) ... 14
7.4 Design of concave base ends ... 16
7.5 Neck design ... 16
7.6 Foot rings ... 17
7.7 Neck rings ... 17
7.8 Design drawing ... 17

8 Construction and workmanship ... **17**
8.1 General ... 17
8.2 Wall thickness ... 17
8.3 Surface imperfections ... 17
8.4 Ultrasonic examination ... 18
8.5 Out-of-roundness ... 18
8.6 Mean diameter ... 18
8.7 Straightness ... 18
8.8 Verticality and stability ... 18
8.9 Neck threads ... 19

9 Type approval procedure ... **19**
9.1 General requirements ... 19
9.2 Prototype tests ... 20
9.2.1 General requirements ... 20
9.2.2 Hydraulic burst test ... 21
9.2.3 Pressure cycling test ... 24
9.2.4 Base check ... 24
9.2.5 Bend test and flattening test ... 25
9.2.6 Torque test for taper thread only ... 26
9.2.7 Shear stress calculation for parallel threads ... 26
9.3 Type approval certificate ... 27

10 Batch tests **27**
10.1 General requirements 27
10.2 Tensile test 28
10.3 Impact test 29
11 Tests/examinations on every cylinder **31**
11.1 General 31
11.2 Hydraulic test 31
11.2.1 Proof pressure test 31
11.2.2 Volumetric expansion test 31
11.3 Hardness test 32
11.4 Leak test 32
11.5 Capacity check 32
12 Certification **33**
13 Marking **33**
Annex A (normative) **Description and evaluation of manufacturing imperfections in seamless gas cylinders** **34**
Annex B (normative) **Ultrasonic examination** **48**
Annex C (informative) **Example of type approval certificate** **53**
Annex D (informative) **Example of acceptance certificate** **54**
Annex E (informative) **Bend stress calculation** **57**
Annex F (informative) **An example of shear strength calculation for parallel threads** **58**
Bibliography **60**