

ISO 11120:2015-02 (E)

Gas cylinders - Refillable seamless steel tubes of water capacity between 150 l and 3000 l - Design, construction and testing

| Contents | | Page |
|--------------------|--|-------------|
| Foreword | | v |
| Introduction | | vi |
| 1 | Scope | 1 |
| 2 | Normative references | 1 |
| 3 | Terms and definitions | 1 |
| 4 | Symbols | 2 |
| 5 | Inspection and testing | 3 |
| 6 | Materials | 3 |
| 6.1 | General requirements | 3 |
| 6.2 | Controls on chemical composition | 4 |
| 6.3 | Heat treatment | 5 |
| 6.4 | Mechanical properties | 5 |
| 6.5 | Failure to meet test requirements | 5 |
| 7 | Design | 6 |
| 7.1 | Calculation of cylindrical shell thickness | 6 |
| 7.2 | Design of tube ends | 6 |
| 7.3 | Design drawing | 7 |
| 8 | Construction and workmanship | 7 |
| 8.1 | General | 7 |
| 8.2 | Surface imperfections | 7 |
| 8.3 | Ultrasonic examination | 7 |
| 8.4 | End closure (fitting) | 7 |
| 8.5 | Dimensional tolerances | 7 |
| 8.5.1 | Out-of-roundness | 7 |
| 8.5.2 | Outside diameter | 7 |
| 8.5.3 | Straightness | 8 |
| 8.5.4 | Eccentricity | 8 |
| 8.5.5 | Length | 8 |
| 8.5.6 | Water capacity | 8 |
| 8.5.7 | Mass | 8 |
| 9 | Type approval procedure | 9 |
| 9.1 | General requirements | 9 |
| 9.2 | Prototype tests | 9 |
| 9.3 | Type approval test report | 10 |
| 9.4 | Type approval certificate | 10 |
| 10 | Batch tests | 10 |
| 10.1 | General requirements | 10 |
| 10.2 | Mechanical tests | 10 |
| 10.2.1 | General requirements | 10 |
| 10.2.2 | Tensile test | 11 |

| | | |
|---|--|----|
| 10.2.3 | Impact testing | 11 |
| 10.3 | Interpretation of results | 11 |
| 11 | Tests on every tube | 11 |
| 11.1 | General | 11 |
| 11.2 | Hydraulic test | 12 |
| 11.2.1 | Proof pressure test | 12 |
| 11.2.2 | Volumetric expansion test | 12 |
| 11.3 | Hardness testing | 12 |
| 11.4 | Visual inspection | 13 |
| 11.5 | Dimensional inspection | 13 |
| 11.5.1 | Thickness | 13 |
| 11.5.2 | Diameter and length | 13 |
| 11.5.3 | Water capacity and mass | 13 |
| 11.5.4 | Neck threads and openings | 13 |
| 11.6 | Ultrasonic non-destructive test | 13 |
| 12 | Special requirements for tubes for embrittling gases | 14 |
| 12.1 | General | 14 |
| 12.2 | Materials | 14 |
| 12.3 | Design | 14 |
| 12.4 | Construction and workmanship | 14 |
| 12.4.1 | General | 14 |
| 12.4.2 | Surface imperfections | 14 |
| 12.5 | Mechanical tests | 15 |
| 12.5.1 | Tensile and impact tests | 15 |
| 12.5.2 | Hardness test | 15 |
| 13 | Inspection certificate | 15 |
| 14 | Marking | 16 |
| Annex A (informative) Typical chemistry groupings for seamless steel tubes | | 17 |
| Annex B (normative) Ultrasonic examination | | 18 |
| Annex C (informative) Description and evaluation of manufacturing imperfections and conditions for rejection of seamless steel tubes at time of final inspection by the manufacturer | | 23 |
| Annex D (informative) Acceptance certificate | | 29 |
| Annex E (informative) Type approval certificate | | 31 |
| Annex F (informative) Bend stress calculation | | 32 |
| Bibliography | | 33 |