

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