

# ISO 11120:2015-02 (E)

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

---

<b>Contents</b>		<b>Page</b>
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