DIN EN ISO 11120:2015-05 (E)

Gas cylinders - Refillable seamless steel tubes of water capacity between 150 l and 3000 l - Design, const ruction and testing (ISO 11120:2015)

Contents

Page

Foreword 4

Introduction 5

1 Scope 6

2 Normative references 6

3 Terms and definitions 6

4 Symbols 7

5 Inspection and testing 8

6 Materials 8
6.1 General requirements 8
6.2 Controls on chemical composition 9
6.3 Heat treatment 10
6.4 Mechanical properties 10
6.5 Failure to meet test requirements 10

7 Design 11
7.1 Calculation of cylindrical shell thickness 11
7.2 Design of tube ends 11
7.3 Design drawing 12

8 Construction and workmanship 12
8.1 General 12
8.2 Surface imperfections 12
8.3 Ultrasonic examination 12
8.4 End closure (fitting) 12
8.5 Dimensional tolerances 12
8.5.1 Out-of-roundness 12
8.5.2 Outside diameter 12
8.5.3 Straightness 13
8.5.4 Eccentricity 13
8.5.5 Length 13
8.5.6 Water capacity 13
8.5.7 Mass 13

9 Type approval procedure 14
9.1 General requirements 14
9.2 Prototype tests 14
9.3 Type approval test report 15
9.4 Type approval certificate 15

10 Batch tests 15
10.1 General requirements 15
10.2 Mechanical tests 15
10.2.1 General requirements 15
10.2.2 Tensile test 16

10.2.3 Impact testing 16
10.3 Interpretation of results 16

11 Tests on every tube 16
11.1 General 16
11.2 Hydraulic test 17
11.2.1 Proof pressure test 17
11.2.2 Volumetric expansion test 17
11.3 Hardness testing 17
11.4 Visual inspection 18
11.5 Dimensional inspection 18
11.5.1 Thickness 18
11.5.2 Diameter and length 18
11.5.3 Water capacity and mass 18
11.5.4 Neck threads and openings 18
11.6 Ultrasonic non-destructive test 18

12 Special requirements for tubes for embrittling gases 19
12.1 General 19
12.2 Materials 19
12.3 Design 19
12.4 Construction and workmanship 19
12.4.1 General 19
12.4.2 Surface imperfections 19
12.5 Mechanical tests 20
12.5.1 Tensile and impact tests 20
12.5.2 Hardness test 20

13 Inspection certificate 20

14 Marking 21

Annex A (informative) Typical chemistry groupings for seamless steel tubes 22

Annex B (normative) Ultrasonic examination 23

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 28

Annex D (informative) Acceptance certificate 34

Annex E (informative) Type approval certificate 36

Annex F (informative) Bend stress calculation 37

Bibliography 38