

DIN EN 1442:2017-08 (E)

LPG equipment and accessories - Transportable refillable welded steel cylinders for LPG - Design and construction

Contents		Page
European foreword		5
Introduction		6
1	Scope	7
2	Normative references	7
3	Terms, definitions and symbols	8
3.1	Terms and definitions	8
3.2	Symbols	9
4	Materials	10
5	Design	11
5.1	General requirements	11
5.2	Calculation of cylindrical shell thickness	12
5.3	Design of torispherical and semi-ellipsoidal ends concave to pressure	12
5.4	Design of ends of shapes other than torispherical and semi-ellipsoidal	16
5.5	Minimum wall thickness	16
5.6	Design of openings	17
5.7	Valve protection	17
5.8	Non-pressure containing attachments	17
5.9	Over-moulded cylinders	17
6	Construction and workmanship	17
6.1	General	17
6.2	Welding qualification	18
6.3	Plates and formed parts	18
6.4	Welded joints	18
6.5	Tolerances	20
6.5.1	Out-of-roundness	20
6.5.2	Straightness	20
6.5.3	Verticality	20
6.6	Closure of openings	20
6.7	Heat treatment	20
7	Tests and examinations	21
7.1	General	21
7.2	Types of test and evaluation of test results	21
7.3	Test specimens and related tests and examinations	22
7.3.1	All cylinders	22
7.3.2	Two-piece cylinders	22
7.3.3	Three-piece cylinders	23
7.3.4	Valve boss welds	25
7.4	Tensile test	25
7.4.1	Parent metal	25
7.4.2	Welds	25
7.5	Bend test	25
7.5.1	Procedure	25
7.5.2	Requirements	26

7.6	Burst test under hydraulic pressure	28
7.6.1	Procedure	28
7.6.2	Requirements	28
7.7	Pressure test	29
7.7.1	Procedure	29
7.7.2	Requirements	29
7.8	Radiographic examination	30
7.8.1	Procedure	30
7.8.2	Assessment	31
7.8.3	Requirements	31
7.9	Macro examination	31
7.9.1	Procedure	31
7.9.2	Requirement	31
7.10	Visual examination of the surface of the weld	32
7.10.1	Procedure	32
7.10.2	Requirements	32
7.11	Fatigue test	32
7.11.1	Procedure	32
7.11.2	Requirements	32
8	Technical requirements for type approval	32
8.1	General	32
8.2	Extent of testing	33
8.3	Cylinder types	33
8.4	Type approval certificate	34
9	Initial inspection and tests	34
9.1	Tests and examinations applicable to all cylinders	34
9.2	Radiographic examination	34
9.3	Macro examination	35
9.4	Examination of valve boss weld	35
9.5	Examination of non-pressure containing attachment welds	35
9.6	Unacceptable imperfections found by the radiographic or macro examinations	35
9.7	Production batch testing (mechanical / burst tests)	35
9.7.1	Production batch	35
9.7.2	Inspection lots	36
9.7.3	Rate of sampling	36
9.7.4	Verification of conformance with type approval	37
9.8	Failure to meet mechanical and burst test requirements	37
9.8.1	Mechanical	37
9.8.2	Burst	38
9.8.3	Production batch retest	38
9.8.4	Resubmission of a production batch	38
9.8.5	Weld repairs	38
10	Marking	39
11	Documentation	39
12	Certificate	39
Annex A (normative) Standard specific marking		40
Annex B (normative) Over-moulded cylinders		41
B.1	Over-moulded cylinder case design	41
B.2	Tests and examinations	41
B.2.1	General	41
B.2.2	Types of additional test and evaluation of results	42
B.2.3	Coated cylinder - resistance to external corrosion	42
B.2.3.1	Procedure	42
B.2.3.2	Requirements	42

B.2.4	Over-moulding adhesion test procedure	44
B.2.4.1	General	44
B.2.4.2	Preparation	44
B.2.4.3	Breaking strength	44
B.2.4.4	Results	44
B.2.4.5	Test report	44
B.2.4.6	Requirements	45
B.2.5	Over-moulding material requirements	45
B.2.6	Additional technical requirements for type approval	46
B.2.7	Additional initial inspection and tests	46
B.2.7.1	Production adhesion test for over-moulded cylinders	46
B.2.7.2	Production water absorption test	47
B.3	Over-moulded cylinder identification system	47
B.3.1	Requirements	47
B.4	Certification	48
Annex C (informative) Example of over-moulded cylinder		49
Bibliography		50