

DIN EN 13445-2:2023-12 (E)

Unfired pressure vessels - Part 2: Materials (includes Amendment A1:2023)

Contents	Page
European foreword.....	4
1 Scope.....	6
2 Normative references.....	6
3 Terms, definitions, symbols and units	8
3.1 Terms and definitions	8
3.2 Symbols and units	10
4 Requirements for materials to be used for pressure-bearing parts	12
4.1 General.....	12
4.2 Special provisions	15
4.2.1 Special properties	15
4.2.2 Design temperature above 20 °C	15
4.2.3 Prevention of brittle fracture	15
4.2.4 Design properties in the creep range	16
4.2.5 Specific requirements for steels for fasteners.....	16
4.3 Technical delivery conditions	17
4.3.1 European Standards.....	17
4.3.2 European Approval for Materials.....	17
4.3.3 Particular material appraisals	17
4.3.4 Clad products.....	17
4.3.5 Welding consumables.....	17
4.4 Marking.....	17
5 Requirements for materials to be used for non-pressure parts	18
Annex A (normative) Grouping system for steels for pressure equipment.....	19
Annex B (normative) Requirements for prevention of brittle fracture at low temperatures.....	21
B.1 General.....	21
B.2 Material selection and impact energy requirements.....	22
B.2.1 Introduction.....	22
B.2.2 Method 1.....	22
B.2.3 Method 2.....	32
B.2.4 Method 3 — Fracture mechanics analysis.....	44
B.3 General test requirements.....	45
B.3.1 General.....	45
B.3.2 Sub-sized specimens	46
B.4 Welds	47
B.4.1 General.....	47
B.4.2 Welding procedure qualification	47
B.4.3 Production test plates	47
B.5 Materials for use at elevated temperatures	47
B.5.1 General.....	47
B.5.2 Materials.....	48
B.5.3 Welding procedure qualification and production test plates.....	48
B.5.4 Start up and shut down procedure	48
B.5.5 Pressure test	48

Annex C (informative) Procedure for determination of the weld creep strength reduction factor (WCSRF)	56
Annex D (informative) Technical delivery conditions for clad products for pressure purposes	57
D.1 Introductory note	57
D.2 Requirements for the material	57
D.3 Requirements for the deposited material	57
D.4 Qualification of the cladding procedure.....	58
D.5 Production tests	59
Annex E (informative) European steels for pressure purposes.....	61
E.1 European Standards for steels and steel components for pressure purposes.....	61
E.2 European standardised steels grouped according to product forms	62
Annex F (normative) Special provisions for materials and components	85
F.1 General	85
F.2 Mechanical properties and technical delivery conditions for fasteners in accordance with EN ISO 3506.....	85
F.2.1 Mechanical properties for austenitic bolts in accordance with EN ISO 3506-1	85
F.2.2 Delivery conditions for austenitic fasteners.....	86
Annex Y (informative) History of EN 13445-2.....	87
Y.1 Differences between EN 13445-2:2014 and EN 13445-2:2021.....	87
Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2014/68/EU aimed to be covered	88
Bibliography	89