

DIN SPEC 3456:2024-12 (E)

Industrial valves - Guideline on requirements for metallic valves for hydrogen application within European standardization; Text in English

Contents	Page
Foreword	5
Introduction.....	7
1 Scope.....	8
2 Normative references	9
3 Terms and definitions.....	10
4 General information.....	14
5 Hydrogen service (damage mechanisms)	14
5.1 Metallic materials.....	14
5.2 Non-metallic materials	15
6 General information on material selection for each hydrogen service/damage mechanism	15
6.1 Hydrogen in low temperature services.....	15
6.2 Hydrogen environmental embrittlement (HEE)	15
6.2.1 General.....	15
6.2.2 Non-austenitic steels except austenitic-ferritic steels	15
6.2.3 Austenitic stainless steels.....	16
6.2.4 Austenitic-ferritic steels.....	16
6.2.5 Aluminium and aluminium alloys.....	16
6.2.6 Cast irons.....	16
6.2.7 Steel casting.....	16
6.2.8 Copper and its alloys (i.e. bronze, brass).....	16
6.2.9 Nickel, nickel alloys, titanium and titanium alloys	17
6.2.10 Zirconium.....	17
6.2.11 Other metallic materials	17
6.3 High temperature hydrogen attack (HTHA)	17
6.4 Hydrogen service with cyclic loads (fatigue).....	17
6.4.1 General requirements.....	17
6.4.2 Fatigue in combination with the other hydrogen services (damage mechanisms)	17
7 Additional specifications	18
7.1 Design.....	18
7.1.1 General.....	18
7.1.2 Valve type selection	18
7.1.3 Design temperature.....	18
7.1.4 Hydrogen partial pressure.....	19
7.1.5 Tightness aspects	19
7.2 Materials	21
7.2.1 General.....	21
7.2.2 Metallic and non-metallic materials	22
7.2.3 Workmanship of finished valve components.....	23
7.3 Manufacture	23
7.3.1 Surface finishing	23
7.3.2 Welding.....	23
7.3.3 Welding consumables.....	24
7.3.4 Cold forming.....	24

7.3.5	Strain hardening.....	24
7.3.6	Hardness	24
7.3.7	Mechanical properties of welds.....	25
7.4	Final assessment.....	25
7.4.1	General	25
7.4.2	Pneumatic testing of assembled valves.....	25
7.4.3	Options.....	25
7.5	Marking	25
7.6	Surface and coating.....	25
7.7	Preparation for shipment.....	26
7.8	Documentation.....	26
Annex A (normative) Harmonised European industrial valve product standards		27
Annex B (informative) Commonly used materials for components of metallic industrial valves intended to be used in hydrogen applications.....		28
B.1	General	28
B.2	Materials for hydrogen applications.....	28
B.2.1	General	28
B.2.2	Additional considerations for liquid hydrogen service.....	29
B.2.3	Other considerations	29
B.3	Overview of valve components made from metals and non-metals	29
B.4	Stem material and associated seating surface material combination	32
B.5	Operating mechanism sealings and other sealing components.....	32
B.6	Selection of bolting	32
B.7	Lubricants.....	33
B.8	Overviews of commonly used materials	33
Annex C (informative) Requirements for industrial valves for low temperature hydrogen service.....		51
Annex D (informative) Information on the casting quality level and NDT for cast steel.....		52
D.1	General	52
D.2	Initial sample testing	52
D.3	Radiographic testing (RT)	52
D.4	Ultrasonic testing (UT)	53
D.5	Surface testing.....	53
Bibliography.....		54
Tables		
Table 1 — Summary of services		14
Table 2 — Conditions influencing fatigue life.....		20
Table A.1 — European industrial valve product standards.....		27
Table B.1 — Overview — valve components made from metals and non-metals.....		30
Table B.2 — Commonly used ferritic steels specified in European harmonised standards.....		34
Table B.3 — Commonly used austenitic steels specified in European harmonised standards		36
Table B.4 — Commonly used aluminium alloys specified in European harmonised standards.....		37
Table B.5 — Commonly used Spheroidal graphite cast irons specified in European harmonised standards.....		38

Table B.6 — Commonly used copper alloys (i.e. bronze, brass) specified in European standards	39
Table B.7 — Commonly used metallic TRIM materials.....	40
Table B.8 — Commonly used metallic materials for wetted sub-components	43
Table B.9 — Commonly used polymeric materials (thermoplastics and thermosets) for wetted sub-components.....	45
Table B.10 — Commonly used Elastomers for wetted sub-components.....	47
Table B.11 — Commonly used materials for operating mechanism sealings (packing) and other sealing components (gaskets)	48
Table B.12 — Commonly used materials for springs	49
Table B.13 — Commonly used hard facing material.....	49