

ISO 22734-1:2025-07 (E)

Hydrogen generators using water electrolysis - Part 1: Safety

Contents		Page
Foreword		vi
Introduction		vii
1	Scope	1
1.1	General	1
1.2	Applicable hydrogen generators	1
1.3	Applicable ion transport mediums	1
1.4	Applicability to large scale hydrogen generators	1
1.5	Applicability to certain hydrogen generator subassemblies	2
1.6	Excluded hydrogen generators	2
2	Normative references	2
3	Terms and definitions	4
4	Requirements	10
4.1	Operating conditions	10
4.1.1	Energy input specification	10
4.1.2	Feed water specifications	10
4.1.3	Ambient environment	11
4.1.4	Protective gas	11
4.1.5	Delivery of hydrogen	12
4.1.6	Delivery of oxygen	12
4.1.7	Hydrogen venting	12
4.1.8	Oxygen venting	13
4.2	Risk management	14
4.2.1	General requirements	14
4.2.2	Fire and explosion hazard protection requirements	16
4.2.3	Pressure safety requirements	19
4.2.4	Temperature safety requirements	20
4.2.5	Spillage, overflow, and drain	20
4.2.6	Protection of service and maintenance personnel	21
4.3	Chemical reaction equipment	21
4.3.1	General	21
4.3.2	Electrochemical Cells and Stacks	21
4.3.3	Oxygen removal catalytic reactors	22
4.3.4	Hydrogen removal catalytic reactors	23
4.3.5	Gas drying systems	23
4.4	Mechanical equipment	23
4.4.1	General requirements	23
4.4.2	General materials requirements	24
4.4.3	Pressure-bearing equipment	25
4.4.4	Pressure relief devices	27
4.4.5	Fans and ventilators	28
4.4.6	Heat transfer system	28
4.5	Electrical equipment and wiring	28
4.5.1	General requirements	28
4.5.2	Grounding and bonding	29
4.5.3	Touch current and protective conductor current	29
4.5.4	Overcurrent protection	29
4.5.5	Electric heaters	29

4.5.6	Cord anchorage and conductor pull-out	29
4.5.7	Power conversion equipment	29
4.6	Control systems	30
4.6.1	General	30
4.6.2	Safety control circuit	30
4.6.3	Control function in the event of failure	31
4.6.4	Programmable electronic equipment	31
4.6.5	Start	31
4.6.6	Emergency-stop	31
4.6.7	Stop	32
4.6.8	Self-correctable conditions	32
4.6.9	Interconnected installations	32
4.6.10	Safety components	32
4.6.11	Remote control systems	32
4.6.12	Alarms	33
4.6.13	Protective gas quantity	33
4.6.14	Reset	33
4.6.15	Suspension of safeguards	33
4.7	Enclosure requirements	33
4.7.1	Minimum strength	33
4.7.2	Ingress protection	33
4.7.3	Fire resistance	34
4.7.4	Thermal insulating materials	34
4.7.5	Access openings	34
4.7.6	Ventilation openings	34
4.7.7	Containment of hazardous liquid leakage	34
5	Test methods	35
5.1	General	35
5.2	Type (qualification) tests	35
5.2.1	General requirements	35
5.2.2	Basic test arrangements	35
5.2.3	Electrical tests	37
5.2.4	Pressure test	38
5.2.5	Leakage test	40
5.2.6	Dilution tests	41
5.2.7	Protection against the spread of fire tests	42
5.2.8	Temperature tests	42
5.2.9	Environmental test	42
5.2.10	Combustible gas mixture safety test	43
5.2.11	Spillage, overflow, and drain test	43
5.2.12	Stability test	43
5.2.13	Vent tests	43
5.2.14	Operational functional tests	45
5.2.15	Minimum generation rate test	45
5.3	Routine tests	46
5.3.1	General requirements	46
5.3.2	Continuity of the protective bonding circuit test	46
5.3.3	Voltage test	46
5.3.4	Inspection of electrical equipment in hazardous areas	46
5.3.5	Safety-control circuit functional tests	46
5.3.6	Leakage test	46
6	Marking and labelling	46
6.1	General requirements	46
6.2	Hydrogen generator marking	46
6.3	Marking of equipment	47
6.4	Warning labels	48
7	Documentation	48
7.1	General	48

7.2	Hydrogen generator ratings	49
7.3	Hydrogen generator installation	49
7.3.1	General	49
7.3.2	Additional requirements for permanently connected hydrogen generators	49
7.3.3	Additional requirements for indoor installations	50
7.3.4	Additional requirements for built-in hydrogen generators	50
7.3.5	Lifting	50
7.4	Hydrogen generator operation	51
7.5	Hydrogen generator maintenance	51
Annex A (informative) Hydrogen-assisted corrosion		53
Annex B (informative) Flammability limits of hydrogen		54
Annex C (informative) Reporting Crossover Of Hydrogen And Oxygen		55
Annex D (informative) Non-safety related performance tests		57
Bibliography		60