

ISO 13577-2:2023-12 (E)

Industrial furnaces and associated processing equipment - Safety - Part 2: Combustion and fuel handling systems

Contents		Page
	Foreword.....	vi
	Introduction.....	vii
1	Scope	1
2	Normative references	2
3	Terms and definitions	4
4	Safety requirements, measures and verification means	4
4.1	General.....	4
4.1.1	Safety objectives and basic requirements.....	4
4.1.2	Over-temperature protection.....	5
4.1.3	Accumulation of hazardous fluids.....	6
4.1.4	Seismic protection.....	6
4.1.5	Regional requirements.....	6
4.2	Fuel pipework.....	6
4.2.1	General.....	6
4.2.2	Connections.....	6
4.2.3	Unconnected pipework.....	8
4.2.4	Galvanic cells.....	8
4.2.5	Flexible tubing and couplings.....	8
4.2.6	Marking.....	8
4.2.7	Soundness/tightness.....	8
4.2.8	Condensate drains on gas pipework.....	10
4.2.9	Fuel pipe heating.....	10
4.2.10	Purge points.....	10
4.2.11	Pressure relief devices.....	10
4.2.12	Blow-off and breather pipes or conduits.....	10
4.2.13	Equipment supplied with different fuels.....	11
4.2.14	Bypass.....	11
4.2.15	Isolation of required safety devices.....	11
4.3	Required safety devices for gaseous fuels.....	11
4.3.1	Manual isolating valve.....	11
4.3.2	Filter/strainer.....	11
4.3.3	Gas pressure regulator.....	12
4.3.4	Low gas pressure protection.....	12
4.3.5	High gas pressure protection.....	13
4.3.6	Automatic shut-off valves.....	13
4.3.7	Valve proving.....	14
4.3.8	Individual manual shut-off valves for burners.....	15
4.3.9	Flame arrestor.....	15
4.4	Gas pressure boosters.....	15
4.5	Required safety devices for liquid fuels.....	16
4.5.1	Manual isolating valve.....	16
4.5.2	Filter/strainer.....	16
4.5.3	Pressure relief valve.....	16
4.5.4	Liquid fuel pressure regulator.....	16
4.5.5	Pressure regulation of auxiliary fluids.....	16
4.5.6	Liquid fuel and auxiliary fluid pressure protection.....	16
4.5.7	Liquid fuel temperature protection.....	16
4.5.8	Automatic shut-off valves.....	17
4.5.9	Automatic shut-off valves for multiple burners.....	17

4.5.10	Individual manual shut-off valves for multiple burners	17
4.6	Combustion air and fuel/air ratio	18
4.6.1	Combustion air system	18
4.6.2	Air flow and pressure sensing devices	18
4.6.3	Air/fuel ratio	19
4.7	Supply of pre-mixed fuel gas/air	19
4.7.1	Mixture pipework	19
4.7.2	Air and gas supply to the mixture circuit	19
4.8	Liquid fuel atomisation	20
4.9	Burners	20
4.9.1	Main burners	20
4.9.2	Radiant tube burner systems	20
4.9.3	Ignition device/pilot burner	20
4.9.4	Permanent pilots	21
4.9.5	Burner capacity control	21
4.9.6	Flue gas venting	21
4.9.7	Purge of residual fuel	21
4.10	Automatic burner control systems	21
4.10.1	General	21
4.10.2	Low-temperature equipment	22
4.10.3	High-temperature equipment	22
4.10.4	Automatic burner control systems for burners operating in the open air	23
4.10.5	Flame supervision for line-burners	23
4.11	Start-up of the heating system and burner ignition	23
4.11.1	Pre-purging of the combustion chamber	23
4.11.2	Start-up of the fuel supply	25
4.11.3	Start fuel flow rate	25
4.11.4	Ignition	25
4.11.5	Maximum safety times for gas-fired natural draught burners	25
4.11.6	Maximum safety times for forced and induced draught gas-fired burners	26
4.11.7	Maximum safety times for liquid fuel fired burners	27
4.11.8	Flame failure on start-up	28
4.11.9	Flame failure during operation	28
4.12	Multiple fuels	29
4.12.1	General	29
4.12.2	Fuel circuit	29
4.12.3	Combustion air supplies	29
4.12.4	Operation of the safety devices	29
4.12.5	Air/fuel ratio	29
4.13	Oxygen or oxygen-enriched combustion air (OOECA)	29
4.13.1	General	29
4.13.2	Suitability for oxygen service	30
4.13.3	Pipework	30
4.13.4	Flow velocities	30
4.13.5	Connection for oxygen pipework	31
4.13.6	Sealing materials for oxygen pipework	31
4.13.7	Fittings	31
4.13.8	Blow off and venting lines	31
4.13.9	Flexible tubing and couplings	31
4.13.10	Safety devices against backflow	31
4.13.11	Material requirements	31
5	Verification of the safety requirements and/or measures	32
6	Information for use	36
6.1	General	36
6.2	Marking	36
6.3	Instruction handbook	36
6.3.1	General	36
6.3.2	Description of equipment	36
6.3.3	Inspection procedures	37
6.3.4	Commissioning, start-up and operating procedures	37

6.3.5	Shutdown procedures	37
6.3.6	Maintenance procedures.....	38
6.3.7	Documentation.....	38
Annex A	(informative) List of significant hazards.....	39
Annex B	(informative) Examples of fuels	41
Annex C	(normative) Maximum allowed pressure.....	42
Annex D	(informative) Examples for the determination of safety integrity level (SIL) or performance level (PL) using the risk graph method	47
Annex E	(normative) Regional product standards.....	58
Annex F	(informative) Example for manual leak check of automatic shut-off valves.....	63
Annex G	(informative) Example of piping and components	65
Annex H	(informative) Methods for burner start-up.....	76
Annex I	(informative) Requirements specific to Japan	91
Annex J	(informative) Requirements specific to the USA.....	95
Annex K	(informative) Requirements for Europe and associated countries.....	99
Bibliography	102