

Contents

	Page
Foreword	vi
Introduction	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Abbreviated terms	2
5 Guide for reading this document	2
6 Safety principles	3
7 Safety studies	4
7.1 General	4
7.2 Risk assessment and evaluation	4
7.2.1 Risk assessment construction, start-up and maintenance	4
7.2.2 HAZOP/HAZID	4
7.3 Explosion protection document (EPD)	5
7.4 Environmental requirements	5
8 General design requirements	6
8.1 Materials and structures	6
8.1.1 General	6
8.1.2 Materials	6
8.1.3 Structures, weight and stability calculations	7
8.1.4 Use of used materials and equipment	7
8.2 Process system facilities	7
8.2.1 General	7
8.2.2 Gas-side part of the system	7
8.2.3 Cooling systems	8
8.3 Pressure protection	8
8.4 Safety distances	9
8.5 Electronic monitoring of the process	11
8.5.1 General	11
8.5.2 Monitoring of the process	11
8.6 Buildings and building services	12
8.6.1 General	12
8.6.2 Gas detection and electronic monitoring inside buildings	12
8.6.3 Ventilation	13
8.7 Noise protection	14
8.8 Odour prevention	14
8.9 Soil and surface water protection	14
8.10 Condensate and particle removal	15
8.11 Storage of hazardous substances	15
8.11.1 Storage hazardous substances in general	15
8.12 Facilities at power failure	15
8.13 Air pollution control devices for removal of superfluous biogas (flares, thermal oxidizers gas, etc.)	16
8.14 Unwanted venting and discharges of hazardous gases	17
8.15 Flame protection and mitigation	17
8.16 Fire-fighting and extinguishing	17
8.17 Earthing and lightning protection	18
8.18 Emergency routing	18
8.19 Anti-collision	18
8.20 Access control	18
8.21 Electrical, instrumentation and process control	18

9	Biogas pipelines for untreated biogas	19
9.1	General.....	19
9.2	Materials	19
9.3	Civil design.....	20
9.4	Removal of moisture and contaminants	20
10	Technical specifications and requirements biogas production.....	20
10.1	General.....	20
10.2	Biomass supply and storage	21
10.3	Desulphurization	21
10.4	Biogas buffer.....	21
10.5	Storage, removal and stabilizing digestate	21
10.6	Specific attention points and requirements landfill sites	22
10.7	Specific requirements additional to Clause 8	22
10.7.1	Materials and structures	22
10.7.2	Equipment, pipes, valves and other process system facilities	23
10.7.3	Pressure protection.....	23
10.7.4	Foam	23
10.7.5	Safety distances	24
10.7.6	Electronic monitoring of the process	24
10.7.7	Buildings and building services	24
10.7.8	Noise protection	24
10.7.9	Soil and surface water protection	24
10.7.10	Condensate and particle removal	25
10.7.11	Storage of hazardous substances	25
10.7.12	Facilities at power failure	25
10.7.13	Air pollution control devices for removal of superfluous biogas (flares, thermal oxidizers gas etc.)	25
10.7.14	Venting	25
10.7.15	Flame protection and mitigation	25
10.7.16	Firefighting and extinguishing	25
10.7.17	Earthing and lightning protection	26
10.7.18	Emergency routing	26
10.7.19	Anti-collision	26
10.7.20	Electrical, instrumentation & process control	26
11	Technical specifications and requirements biogas treatment, CHP, upgrading and liquefaction	26
11.1	General.....	26
11.2	Desulphurization	26
11.3	Biogas upgrading and liquefaction	27
11.4	Process system facilities	27
11.4.1	General	27
11.4.2	Gas-side part of the system	27
11.4.3	Cooling systems	27
11.5	Specific requirements additional to Clause 8	28
11.5.1	Materials and structures	28
11.5.2	Pressure protection	28
11.5.3	Safety distances	28
11.5.4	Electronic monitoring of the process	28
11.5.5	Buildings and building services	28
11.5.6	Noise protection	28
11.5.7	Soil protection	28
11.5.8	Condensate and particle removal	29
11.5.9	Storage of hazardous substances	29
11.5.10	Facilities at power failure	30

11.5.11	Air pollution control devices for removal of superfluous biogas (flares, thermal oxidizers gas etc.)	30
11.5.12	Venting.....	30
11.5.13	Flame protection and mitigation.....	30
11.5.14	Fire-fighting and extinguishing.....	30
11.5.15	Earthing and lightning protection	30
11.5.16	Emergency routing.....	30
11.5.17	Anti-collision.....	30
11.5.18	Electrical, instrumentation & process control.....	30
12	Construction and testing.....	31
12.1	General.....	31
12.2	Construction.....	31
	12.2.1 Safety during construction.....	31
	12.2.2 Prefabrication.....	31
	12.2.3 Construction on site.....	31
12.3	Testing and commissioning.....	31
12.4	Start-up.....	32
12.5	Requirements for commissioning and start-up of specific systems.....	32
	12.5.1 Biogas production systems.....	32
	12.5.2 Biogas treatment, CHP, upgrading and liquefaction systems.....	32
13	Operations and maintenance.....	32
13.1	General.....	32
13.2	Supplier of the biogas system.....	33
13.3	System owner.....	33
13.4	Emergency plan	34
13.5	Service technician	35
13.6	Requirements for commissioning and start-up of specific systems.....	35
	13.6.1 Biogas production systems.....	35
	13.6.2 Biogas treatment, CHP, upgrading and liquefaction systems.....	35
13.7	Requirements for shut-down of biogas system.....	36
Annex A (informative) Explanation to the scope	37	
Annex B (informative) Biogas characteristics, processes and classifications	40	
Annex C (informative) Guidelines to prevent risks from gases and explosive atmospheres in buildings	48	
Bibliography	50	