

Gas-fired instantaneous water heaters for the production of domestic hot water

Contents

	Page
European foreword	8
1 Scope	9
2 Normative references	9
3 Terms and definitions	12
4 Classification	28
4.1 Gases and appliance categories	28
4.2 Mode of air supply and evacuation of the combustion products	28
4.3 Water pressure	28
5 Constructional requirements	28
5.1 Conversion to different gases	28
5.1.1 General	28
5.1.2 Permissible operations for changing gases	29
5.2 Materials	29
5.2.1 General requirements related to the use of materials in water heaters	29
5.2.2 Materials in contact with water for human consumption	30
5.2.3 Durability against corrosion of combustion product evacuation duct	31
Table 1 -- Metallic flue duct material specifications	32
5.2.4 Disassembly, recycling and disposal	32
5.2.5 Design - Assembly - Strength	33
5.2.6 Accessibility - Ease of maintenance - Fitting and removal	33
5.2.7 Connection to gas and water pipes	33
5.2.8 Soundness	34
5.2.9 Supply of combustion air and evacuation of the combustion products	35
5.2.10 Checking the state of operation	39
5.2.11 Drainage	39
5.2.12 Electrical and electromagnetic safety	39
5.2.13 Operational safety in the event of failure of the auxiliary energy	40
5.3 Adjusting, control and safety devices	41
5.3.1 General	41
5.3.2 Shut off valves and/or gas rate adjusters	41
5.3.3 Preset gas rate adjusters	42
5.3.4 Gas pressure regulator	43
5.3.5 Pressure test points	43
5.3.6 Automatic water-operated gas valve	43
5.3.7 Ignition devices	43
5.3.8 Flame supervision device	44
5.3.9 Atmosphere sensing device for type AAS appliances	45
5.3.10 Combustion products discharge safety device for type B11BS, B12BS and B13BS appliances	46
5.3.11 Protection against accidental overheating of thermostatic appliances	46
5.3.12 Composition of the gas circuit	46
5.3.13 Protection for appliances intended to be installed in a partially protected place	47
5.4 Main burner	47
5.5 Supplementary requirements for condensing water heaters	48
5.5.1 Materials in contact with condensate	48
5.5.2 Discharge of condensate	48

5.5.3	Control of the combustion products temperature	48
5.5.4	Chemical composition of the condensate	49
6	Operational requirements	49
6.1	General	49
6.1.1	Introduction	49
6.1.2	Characteristics of the test gases	49
6.1.3	Requirements for preparation of the test gases	49
6.1.4	Choice of test gases	49
6.1.5	Test pressures	49
6.1.6	General test conditions	49
6.2	Soundness	54
6.2.1	Soundness of the gas circuit	54
6.2.2	Soundness of the combustion circuit and evacuation of the combustion products	55
Table 2 -- Maximum admissible leakage rates	57	
6.2.3	Soundness of the water circuit	61
6.3	Heat inputs	61
6.3.1	General	61
6.3.2	Nominal heat input	63
6.3.3	Minimum heat input	64
6.4	Temperature of the control knobs	64
6.4.1	Requirements	64
6.4.2	Test	64
6.5	Temperature of the adjusting, control and safety devices	64
6.5.1	Requirement	64
6.5.2	Test	64
6.6	Temperature of the appliance casing, the surface on which it is installed and adjacent surfaces and external temperature of the ducts	64
6.6.1	Requirements	64
6.6.2	Tests	65
6.7	Ignition - Cross-lighting - Flame stability	66
6.7.1	Operation in still air for all appliances	66
6.7.2	Supplementary tests for appliances of types AAS and B1 except for B14	67
6.7.3	Supplementary tests for type C11 appliances and outdoors and/or partially protected appliances	68
6.7.4	Supplementary tests for type C2 appliances	70
6.7.5	Supplementary tests for appliances of types C12, C13, C32, C33, B4 and B5	70
6.7.6	Supplementary tests for type C42 and type C43 appliances	71
6.7.7	Supplementary tests for type C52 and type C53 appliances	71
6.7.8	Supplementary tests for type C6 appliances	71
6.7.9	Supplementary tests for type C72 and type C73 appliances	71
6.7.10	Supplementary tests for type C82 and type C83 appliances	71
6.7.11	Functioning of a permanent ignition burner when the fan stops during the standby time	72
6.7.12	Air proving device for fan assisted water heaters	72
6.7.13	Functioning of the fan of types C42 and C43 water heaters	75
6.7.14	Protection against the accumulation of gas in the combustion circuit for water heaters equipped with a fan	75
6.7.15	Leakage of combustion products from type C7 water heaters	76
6.7.16	Supplementary tests for type B14, B2 and B3 water heaters	76
6.8	Adjusting, control and safety devices	77
6.8.1	General	77
6.8.2	Control devices	77
6.8.3	Closing mechanisms	77
6.8.4	Ignition devices	79
6.8.5	Safety times	80
6.8.6	Gas pressure regulator	82
6.8.7	Adjustment of the water rate - Maximum water temperature (all appliances)	83
6.8.8	Overheating of the water	83
6.8.9	Effectiveness of the protection against accidental overheating of thermostatic appliances	84
6.8.10	Atmosphere sensing device for type AAS appliances	84

6.8.11	Combustion products discharge safety device of type B11BS appliances	86
Table 3 -- Shutdown times in relation to blockage		87
6.9	Combustion	88
6.9.1	Requirements	88
6.9.2	Test	89
Table 4 -- Percentage of CO₂		89
6.9.3	Nitrogen oxides emissions	93
Table 5 -- Weighting factors		94
6.10	Soot deposition	95
6.10.1	Requirement	95
6.10.2	Test	95
6.11	Frost protection system for appliances intended to be installed in a partially protected place	96
6.12	Protection against ingress of rain for appliances intended to be installed in a partially protected place	96
6.13	Condensing water heaters	96
6.13.1	Formation of condensate	96
6.13.2	Temperature of combustion products	97
6.14	Electrical power measurements	97
6.14.1	General	97
6.14.2	Nominal and minimal conditions	97
6.14.3	Standby	98
6.15	Measurement of standby heat losses	98
7	Rational use of energy	98
7.1	General	98
7.2	Heat input of ignition burners	98
7.2.1	Requirement	98
7.2.2	Test	98
7.3	Efficiency	98
7.3.1	Requirement	98
7.3.2	Test	98
8	Fitness for purpose	100
8.1	General	100
8.2	Constructional characteristics	100
8.2.1	Preset water rate adjuster	100
8.2.2	Temperature selector and summer-winter switch	100
8.2.3	Designation and measurement of reference temperatures of flue systems	100
8.2.4	Mechanical resistance and stability of ducts, terminal and fitting pieces	101
8.3	Requirements for plastic in the combustion product evacuation ducts, terminals and fitting pieces for appliances	102
8.3.1	Thermal resistance	102
8.3.2	Materials	103
Table 6 -- Criteria for testing long-term resistance to thermal load		104
Table 7 -- Exposure time in weeks at raised temperatures		104
Table 8 --Criteria for testing long-term resistance to condensate exposure		105
Table 9 -- Composition of test condensate for corrosion		106
Table 10 -- Criteria for testing resistance to condensing/ non- condensing cycling		106
8.4	Requirements for elastomeric seals and elastomeric sealants in the combustion product evacuation ducts, terminals and fitting pieces	108
8.4.1	Characterization	108
8.4.2	Long-term resistance to thermal load	109

Table 11 -- Criteria for testing long-term resistance to thermal load	109
8.4.3 Long-term resistance to condensate exposure	109
Table 12 -- Criteria for testing-long term resistance to condensate exposure	110
Table 13 -- Condensate composition, related to construction classes	110
8.4.4 Cyclic condensate resistance test	110
8.4.5 Relaxation behaviour	111
8.4.6 Compression set	111
8.4.7 Low temperature resistance	111
8.4.8 Joints in elastomeric seals	112
8.5 Operational characteristics	112
8.5.1 Minimum heat input	112
8.5.2 Nominal and minimum useful outputs	112
8.5.3 Ignition of permanent ignition burners by a spark generator	112
8.5.4 Ignition opening time (TIA)	113
8.5.5 Automatic water-operated gas valve	113
8.5.6 Adjustment of the water rate - Water temperature	114
Table 14 -- Maximum permitted deviation for the water rate in relation to the mean rate	115
8.5.7 Heating-up time	118
Table 15 -- Water temperature conditions depending on the control mode of the appliance	119
8.5.8 Specific rate	119
9 Marking and instructions	120
9.1 Water heater marking	120
9.1.1 Data plate	120
9.1.2 Markings related to the state of adjustment	121
9.1.3 Packaging	121
9.1.4 Warnings notices on the water heater and the packaging	122
9.1.5 Other information	123
9.2 Instructions	123
9.2.1 Instructions for installation	123
9.2.2 Instructions for use and servicing	129
9.2.3 Conversion instructions	131
9.3 Presentation	131
10 Nitrogen oxides emissions	132
11 Sound power level (LWA)	132
12 Figures referenced in this standard	133
Figure 1 -- Apparatus for verifying soundness of the gas circuit (see 6.1.6.5, 6.2.1.3 and Annex E)	133
Figure 2 -- Test of an appliance of types B11 and B11BS under abnormal draught conditions (see 6.7.2.2, test n° 1)	134
Figure 3 -- Probe for sampling the combustion products of appliances of types B11 and B11BS (see 6.9.2.1)	135
Figure 4 -- Test of a type C2 appliance mounted on the common duct (see 6.7.4.2)	136
Figure 5 -- Position of the sampling points in the horizontal plane of the sealed room (see 6.8.10.1.2.1 and Annex D)	137
Figure 6 -- Device for sampling the combustion products above the deflector for type AAS appliances (see 6.8.10.2.1.2 and 6.9.2.1)	138
Figure 7 -- Sampling probe for test flues of diameter equal to or greater than DN 100 (see 6.9.2.1)	139

Figure 8 -- Sampling probe for test flues of diameter less than DN 100 (see 6.9.2.1)	140
Figure 9 -- Probe for sampling and measuring the temperature of the combustion products (see 6.9.2.1)	141
Figure 10 -- Location of the probe for type C appliances (see 6.9.2.1)	142
Figure 11 -- Combustion products discharge safety device for type B11BS appliances (see 6.8.11.4.2.1 and 6.8.11.4.2.2)	143
Figure 12 -- Down-draught test for the type C7 water heaters (see 6.7.9.2 and 6.9.2.4.10)	144
Annex A (informative) National situations	145
A.1 General	145
A.2 Gas connections in common use in the various countries	145
Table A.1 -- Gas connections in common use	146
A.3 Flue pipe diameters in force in the various countries	148
Table A.2 -- Flue pipe diameters marketed	148
Annex B (normative) Test apparatus for type C1, C3, B4 and B5 water heaters (see 6.7.3.2)	149
Figure B.1 -- Test apparatus for type C1, B4 and B5 water heaters fitted with a horizontal terminal installed on a vertical wall	149
Figure B.2 --Test apparatus for type C1, B4 and B5 water heaters fitted with a horizontal terminal installed on an inclined wall	150
Figure B.3 --Test apparatus for type C3, B4 and B5 water heaters fitted with a vertical terminal installed on a horizontal wall	151
Figure B.4 -- Test apparatus for type C3, B4 and B5 water heaters fitted with a vertical terminal installed on an inclined wall	152
Annex C (normative) Test apparatus for type C21 appliances (see 6.7.4.2)	153
Annex D (normative) Description of the sealed room for the tests of type AAS appliances (see 6.8.10.1.2.1)	154
D.1 Configuration of the sealed room	154
D.2 Soundness of the room	154
D.3 Effectiveness of mixing	154
D.4 Equipment of the room	154
Annex E (informative) Soundness of the gas circuit test - Volumetric method (6.2.1)	155
E.1 Equipment	155
E.2 Test method	155
Annex F (informative) Principal symbols and abbreviations used	156
Annex G (informative) Guidelines for extension to other appliances categories	158
Annex H (normative) Lists of materials currently used for the construction of the gas water heaters	159
H.1 General	159
H.2 Special types of steel	159
Table H.1 -- Special types of steel	159

H.3	Copper and copper alloys	159
Table H.2 -- Copper and copper alloys	159	
H.4	Plastic materials	160
Table H.3 -- Examples of plastic materials	160	
Annex I (normative) Test methods to determine the effects of to long-term thermal load, long-term condensate exposure, condensing/ non-condensing cycling and resistance to UV radiation	161	
Annex J (informative) NOx conversion calculation	162	
Table J.1 -- Conversion of the emission value of NOx for first family gases	162	
Table J.2 -- Conversion of the NOx emission value for second family gases	162	
Table J.3 -- Conversion of the NOx emission value for third family gases	162	
Table J.4 -- Table of Ratio Gross/Net and Net/Gross for Gas Families 1, 2 and 3	163	
Annex K (normative) Parts in copper or copper alloys	164	
Table K.1 - Properties of parts in copper or copper alloys	164	
Annex L (informative) Compilation of the test conditions for the various gas families	165	
Table L.1 - First family	165	
Table L.2 - Second family	165	
Table L.3 - Third family	166	
Annex M (informative) Alternative Method for the determination of the nominal heat input or the maximum and minimum heat input (according to 6.3.1) for appliances using a pneumatic gas/air ratio control system	167	
Bibliography	168	