

DIN EN 15502-1:2015-10 (E)

Gas-fired heating boilers - Part 1: General requirements and tests (includes Amendment A1:2015)

Contents	Page
Foreword	12
Introduction	14
1 Scope	15
2 Normative references	15
3 Terms, definitions and symbols	17
3.1 Terms and definitions	17
3.1.1 Gas supply	17
3.1.2 Burners	18
3.1.3 Air supply and combustion products circuit	19
3.1.4 Adjusting, control and safety devices	19
3.1.5 Operation of the boiler	23
3.1.6 Outputs	23
3.1.7 Combustion	24
3.1.8 Times	24
3.1.9 Auxiliary energy	25
3.1.10 Design types of boilers	25
3.1.11 Installation	26
3.1.12 Operation of the boiler	26
3.1.13 Relevant eco-design and labelling regulations terms	26
3.2 Symbols	28
4 Classification	29
4.1 Gases and categories	29
4.2 Mode of air supply and evacuation of the combustion products	29
4.3 Maximum water-side operating pressure	29

5	Construction	30
5.1	General	30
5.2	Conversion to different gases	30
5.3	Materials	30
5.3.1	General	30
5.3.2	Materials and thicknesses of walls or tubes with water side operating pressure for boilers of pressure class-3	31
5.3.3	Domestic water connections	32
5.3.4	Thermal Insulation	32
5.4	Method of construction	32
5.4.1	Design	32
5.4.2	Checking the state of operation	33
5.4.3	Use and servicing	33
5.4.4	Connections to the gas and water pipes	34
5.4.5	Soundness	34
5.4.6	Supply of combustion air and evacuation of the combustion products	35
5.4.7	Dampers	35
5.4.8	Air proving	35
5.4.9	Gas/air ratio controls	36
5.4.10	Fan	36
5.4.11	Drainage	36
5.4.12	Operational safety in the event of failure of the auxiliary energy	36
5.4.13	Special provision for Low Temperature Boilers and Condensing Boilers	36
5.5	Burners	37
5.6	Pressure test points	38
5.7	Requirements for the application of control and safety devices	38
5.7.1	General	38
5.7.2	djusters and range-rating devices	38
5.7.3	Gas circuit	39
5.7.4	Gas pressure regulator	40
5.7.5	Ignition devices	40
5.7.6	Flame supervision devices	41

- 5.7.7 Gas/air ratio control tubes 42
- 5.7.8 Thermostats and water temperature limiting devices..... 42
- 5.7.9 Remote control..... 43
- 5.7.10 Expansion vessel and pressure gauge..... 44
- 5.7.11 Protection against frost for boilers intended to be installed in a partially protected place 44
- 5.7.12 Adjusting, control and safety devices for the domestic hot water circuit..... 44
- 6 Electrical safety..... 45
- 7 Controls..... 45
- 7.1 General..... 45
- 7.2 Detailed specifications 45
- 7.3 Thermostats and water temperature limiting devices 46
- 7.3.1 General 46
- 7.3.2 Construction requirements..... 47
- 7.3.3 Performance 48
- 8 Operational requirements 50
- 8.1 General..... 50
- 8.1.1 Characteristics of the reference and limit gases..... 50
- 8.1.2 General test conditions 51
- 8.2 Soundness..... 55
- 8.2.1 Soundness of the gas circuit..... 55
- 8.2.2 Soundness of the combustion circuit..... 55
- 8.2.3 Soundness of the water circuit..... 55
- 8.2.4 Soundness of the domestic water circuit..... 57
- 8.3 Hydraulic resistance 57
- 8.4 Heat inputs and heat output 57
- 8.4.1 Determination of the nominal heat input or the maximum and minimum heat input 57
- 8.4.2 Adjustment of the heat input by the downstream gas pressure..... 59
- 8.4.3 Ignition rate..... 59

8.4.4	Nominal output	59
8.4.5	Verification of the nominal condensing output	60
8.4.6	Nominal domestic hot water heat input	60
8.4.7	Water pressure to obtain the nominal heat input for instantaneous combination boilers	60
8.4.8	Obtaining the domestic hot water temperature for instantaneous combination boilers	60
8.4.9	Heating-up time of the domestic hot water	61
8.5	Limiting temperatures	61
8.5.1	General.....	61
8.5.2	Limiting temperatures of the adjusting, control and safety devices	62
8.5.3	Limiting temperatures of the side walls, the front and the top.....	62
8.5.4	Limiting temperature of the test panels and the floor	62
8.6	Ignition, cross lighting, flame stability	63
8.6.1	General.....	63
8.6.2	Limit conditions	63
8.6.3	Special flue conditions.....	65
8.6.4	Reduction of the gas rate of the ignition burner	65
8.7	Reduction of the gas pressure	66
8.8	Defective closure of the gas valve immediately upstream of the main burner.....	66
8.9	Pre-purge.....	66
8.10	Functioning of a permanent ignition burner when the fan stops during the standby time	66
8.11	Adjustment, control and safety devices	67
8.11.1	General.....	67
8.11.2	Boilers intended to be installed in a partially protected place	67
8.11.3	Combination Boilers.....	67
8.11.4	Control devices	70
8.11.5	Ignition devices.....	70
8.11.6	Flame supervision device	72

8.11.7	Gas pressure regulator	75
8.11.8	Thermostats and water temperature limiting devices.....	76
8.12	Carbon monoxide.....	78
8.12.1	General	78
8.12.2	Limit conditions	80
8.12.3	Special conditions	80
8.12.4	Sooting.....	81
8.12.5	Supplementary test for low temperature boilers and condensing boilers	82
8.13	NO _x	82
8.13.1	Requirement	82
8.13.2	Test methods.....	83
8.13.3	NO _x requirement for Eco-design regulation.....	85
8.14	Special provisions for boilers intended to be installed in a partially protected place	86
8.14.1	Frost protection system for boilers intended to be installed in a partially protected place	86
8.14.2	Protection against the ingress of rain	86
8.15	Formation of condensate	86
8.16	Temperature of combustion products.....	87
8.17	Sound power level	87
9	Useful efficiencies.....	88
9.1	General.....	88
9.1.1	Use of correction formulae	88
9.1.2	Use of the general test conditions	88
9.2	Useful efficiency at the nominal heat input.....	88
9.2.1	Requirements	88
9.2.2	Tests	89
9.3	Useful efficiency at part load	90
9.3.1	Requirements	90
9.3.2	Tests	90

9.4	Losses of combination boilers.....	96
9.4.1	Requirements for losses of combination boilers	96
9.4.2	Test of losses of combination boilers	96
9.5	Compliance with the eco-design regulation for efficiency.....	98
9.5.1	Requirements for seasonal space heating energy efficiency.....	98
9.5.2	Calculations for seasonal space heating energy efficiency	99
9.5.3	Useful efficiency for nominal heat output > 70kW and ≤ 400kW	100
9.5.4	Water heating energy efficiency for combined heaters.....	101
9.6	Compliance with the Labelling delegated regulation for efficiency.....	101
9.6.1	Seasonal space heating energy efficiency classes	101
9.6.2	Annual energy consumption of space heating	102
9.6.3	Water heating energy efficiency classes	102
9.6.4	Annual Fuel consumption of water heating.....	103
9.6.5	Annual electricity consumption	103
10	Electric auxiliary energy	103
10.1	General	103
10.2	System boundaries.....	103
10.3	Auxiliary energy at nominal heat input	104
10.4	Auxiliary energy at part load	105
10.5	Auxiliary energy at stand-by	105
10.6	Auxiliary electricity consumption measurements required for eco-design and labelling regulations.....	105
10.6.1	General.....	105
10.6.2	System boundaries.....	105
10.6.3	Auxiliary electricity consumption [kW] at nominal heat input.....	106
10.6.4	Auxiliary electricity consumption at part load [kW].....	106
10.6.5	Auxiliary electricity consumption at stand by [kW]	106
11	Risk assessment.....	106
12	Marking and instructions	107

12.1	Boiler marking	107
12.1.1	Data plate	107
12.1.2	Supplementary markings	108
12.1.3	Packaging	108
12.1.4	Warnings on the boiler and the packaging	108
12.1.5	Other information	108
12.2	Instructions	108
12.2.1	Technical instructions	108
12.2.2	User’s instructions.....	111
12.2.3	Conversion instructions.....	111
12.3	Presentation	112
12.4	Supplementary marking and instructions in the case of boilers to be installed in partially protected places	112
12.4.1	General information	112
12.4.2	Warning on the boilers and the packaging	112
12.4.3	Technical instructions	112
13	Requirements for Eco-design Regulation (No 813/2013) and Energy Labelling Regulation (No 811/2013)	119
13.1	Requirements for product information for the Eco-design Regulation (Annex II, Regulation No 813/2013)	119
13.2	Energy label for Energy Labelling Regulation No 811/2013 Energy Label	119
13.2.1	Boiler energy label	119
13.2.2	Additional energy label for boilers intended to be used in a package.....	119
13.2.3	Energy label for a package of space heater and temperature control and/or solar device	119
13.3	Product fiche for Energy Labelling Regulation 811/2013	119
13.3.1	General	119
13.3.2	Boilers	120
13.3.3	Combination boilers	120
13.3.4	Packages of space heater and temperature control and/or solar device	121
13.3.5	Packages of combination heater and temperature control and/or solar device	121

13.3.6	Technical documentation for Energy Labelling Regulation No 811/2013.....	122
Annex A (informative)	Properties of carbon and stainless steels	123
Annex B (normative)	Minimum requirements for cast iron.....	124
Annex C (normative)	Parts in aluminium and aluminium alloys	125
Annex D (normative)	Parts in copper or copper alloys	126
Annex E (normative)	Minimum thicknesses for rolled parts	127
Annex F (normative)	Nominal minimum thicknesses of boiler sections of cast materials under water pressure	128
Annex G (normative)	Parameters for welded joints and welding processes.....	129
Annex H (informative)	Composition of the gas circuit	134
H.1	General.....	134
H.2	Boilers with permanent ignition burner or alternating ignition burner or leakage control device or with pre-purge.....	134
H.2.1	Heat inputs not exceeding 70 kW.....	134
H.2.2	Heat inputs exceeding 70 kW but not exceeding 150 kW	135
H.2.3	Heat inputs exceeding 150 kW but not exceeding 300 kW	136
H.2.4	Heat Inputs exceeding 300 kW but not exceeding 1 000 kW	137
H.3	Boilers without permanent ignition burner or alternating ignition burner, without leakage control device and without pre-purge.....	138
H.3.1	Heat inputs up to 70 kW	138
H.3.2	Heat inputs exceeding 70 kW but not exceeding 150 kW	139
H.3.3	Heat inputs exceeding 150 kW but not exceeding 300 kW	140
H.3.4	Heat inputs exceeding 300 kW but not exceeding 1000 kW	141
Annex I (informative)	Compilation of the test conditions for the various gas families	142
Annex J (informative)	Calculation of conversions of NO _x	144
Annex K (informative)	Example of calculation of the weighting factors NO _x	145
Annex L (informative)	Practical method of calibrating the test rig to enable the heat loss D _p to be determined.....	147
Annex M (informative)	Means of determining the ignition time at full rate	148
Annex N (informative)	Determination of the heat losses from the test rig of the indirect method and the contributions of the circulating pump of the test rig.....	149
Annex O (informative)	Example of a risk assessment method	150

Annex P (informative) Examples of risk assessment with a method described in Annex O....	153
P.1 Introduction	153
P.2 Risks.....	153
P.3 Risk assessment	153
Annex Q (informative) Realisation of a protective measure	158
Annex R (informative) Overall classification of a basic risk	160
Annex S (informative) Not exhaustive list of classification examples	163
Annex T (normative) Correction for the determined efficiency in the low water temperature test of low temperature boilers (LTB) and condensing boilers (CB).....	165
Annex U (informative) Use of test gases.....	166
U.1 Boilers within a range.....	166
U.2 Guidance on the use of test gases.....	166
Annex V (informative) Standards intended to be replaced by this standard in combination with the relevant part 2.....	167
Annex W (informative) Alternative Method for the determination of the nominal heat input or the maximum and minimum heat input (according to 8.4.1) for appliances using a pneumatic gas/air ratio control system.....	169
Annex AA (normative) Product Information related to Eco-design Regulation and Labelling Regulation	170
AA.1 Product information – technical parameters required by the ErP Regulation (813/2013).....	170
AA.2 Product information – technical parameters required by the Labelling Regulation (811/2013).....	171
Annex BB (normative) Product label for boilers required by the Labelling Regulation 811/2013	172
BB.1 Boiler space heaters in seasonal space heating efficiency classes A++ to G	172
BB.2 Boiler combination space heaters in seasonal space heating efficiency classes A++ to G and in water heating energy efficiency classes A to G	172
BB.3 Boiler space heaters in seasonal space heating efficiency classes A+++ to D (from 26-9-2019)	173
BB.4 Boiler combination space heaters in seasonal space heating efficiency classes A+++ to D and in water heating energy efficiency classes A+ to F (from 26-9-2019)	173
BB.5 The design of the label for boiler space heaters.....	174
BB.6 The design of the label for combination boilers	174
BB.7 Water heating load profiles of combination heaters	175

Annex CC (normative) Product label for packages required by the Labelling Regulation 811/2013.....	176
CC.1 PACKAGES OF SPACE HEATER, TEMPERATURE CONTROL AND SOLAR DEVICE.....	176
CC.2 PACKAGES OF COMBINATION HEATER, TEMPERATURE CONTROL AND SOLAR DEVICE.....	176
CC.3 Design of the label for packages of space heater, temperature control and solar device	177
CC.4 Design of the label for packages of combination heater, temperature control and solar device.....	177
Annex DD (normative) Calculation of the seasonal space heating energy efficiency of a package of space heater, temperature control and solar	179
DD.1 Calculation of the seasonal space heating energy efficiency of a package.....	179
DD.2 Classes of the temperature controls.....	179
DD.3 Weighting of the preferential boiler or preferential combination boiler and supplementary heater	180
DD.4 Calculation of the water heating efficiency of a package	180
Annex ZA (informative) Clauses of this European Standard addressing essential requirements or provisions of EU Directive 2009/142/EC, "Directive relating to appliances burning gaseous fuels (codified version)" (GAD).....	181
Annex ZB (informative) Clauses of this European Standard addressing the methods for the verification of the efficiency of the EU Directive 92/42/EEC, relating to the efficiency of new hot boilers with an output of 4 – 400 kW.....	184
Annex ZC (informative) Relationship between this European Standard and the Requirements of COMMISSION REGULATION (EU) No 813/2013 of 2 August 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for space heaters and combination heaters	185
Annex ZD (informative) Relationship between this European Standard and the Requirements of COMMISSION DELEGATED REGULATION (EU) No 811/2013 of 18 February 2013 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device.....	186
Bibliography.....	188