

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

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

---

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

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

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 <sub>x</sub> .....	82
8.13.1	Requirement .....	82
8.13.2	Test methods.....	83
8.13.3	NO <sub>x</sub> 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

<b>12.1</b>	<b>Boiler marking</b> .....	<b>107</b>
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
<b>12.2</b>	<b>Instructions</b> .....	<b>108</b>
12.2.1	Technical instructions .....	108
12.2.2	User's instructions.....	111
12.2.3	Conversion instructions.....	111
<b>12.3</b>	<b>Presentation</b> .....	<b>112</b>
<b>12.4</b>	<b>Supplementary marking and instructions in the case of boilers to be installed in partially protected places</b> .....	<b>112</b>
12.4.1	General information .....	112
12.4.2	Warning on the boilers and the packaging .....	112
12.4.3	Technical instructions .....	112
<b>13</b>	<b>Requirements for Eco-design Regulation (No 813/2013) and Energy Labelling Regulation (No 811/2013)</b> .....	<b>119</b>
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 NOx.....	144
Annex K	(informative) Example of calculation of the weighting factors NOx.....	145
Annex L	(informative) Practical method of calibrating the test rig to enable the heat loss Dp 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

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

<b>Annex CC (normative) Product label for packages required by the Labelling Regulation 811/2013.....</b>	<b>176</b>
<b>CC.1 PACKAGES OF SPACE HEATER, TEMPERATURE CONTROL AND SOLAR DEVICE.....</b>	<b>176</b>
<b>CC.2 PACKAGES OF COMBINATION HEATER, TEMPERATURE CONTROL AND SOLAR DEVICE.....</b>	<b>176</b>
<b>CC.3 Design of the label for packages of space heater, temperature control and solar device</b>	<b>177</b>
<b>CC.4 Design of the label for packages of combination heater, temperature control and solar device.....</b>	<b>177</b>
<b>Annex DD (normative) Calculation of the seasonal space heating energy efficiency of a package of space heater, temperature control and solar .....</b>	<b>179</b>
<b>DD.1 Calculation of the seasonal space heating energy efficiency of a package.....</b>	<b>179</b>
<b>DD.2 Classes of the temperature controls.....</b>	<b>179</b>
<b>DD.3 Weighting of the preferential boiler or preferential combination boiler and supplementary heater .....</b>	<b>180</b>
<b>DD.4 Calculation of the water heating efficiency of a package .....</b>	<b>180</b>
<b>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).....</b>	<b>181</b>
<b>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.....</b>	<b>184</b>
<b>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 .....</b>	<b>185</b>
<b>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.....</b>	<b>186</b>
<b>Bibliography.....</b>	<b>188</b>