

# DIN EN 15502-1:2022-02 (E)

## Gas-fired heating boilers - Part 1: General requirements and tests

---

<b>Contents</b>	<b>Page</b>
European foreword.....	9
Introduction .....	11
1 Scope .....	12
2 Normative references .....	13
3 Terms, definitions and symbols.....	15
4 Classification.....	36
4.1 Gases and categories .....	36
4.2 Mode of air supply and evacuation of the combustion products .....	36
4.3 Maximum water-side operating pressure .....	36
5 Construction.....	36
5.1 General.....	36
5.1.1 General requirements .....	36
5.1.2 General verification .....	37
5.2 Conversion to different gases.....	37
5.3 Materials.....	37
5.3.1 General.....	37
5.3.2 Materials and thicknesses of walls or tubes with water side operating pressure for boilers of pressure class-3 .....	38
5.3.3 Domestic water connections .....	39
5.3.4 Thermal Insulation.....	39
5.3.5 Materials in contact with water for human consumption .....	39
5.3.6 Durability against corrosion of metallic combustion product circuits.....	40
5.4 Method of construction.....	41
5.4.1 Design .....	41
5.4.2 Checking the state of operation.....	42
5.4.3 Use and servicing.....	42
5.4.4 Connections to the gas and water pipes .....	43
5.4.5 Soundness .....	43
5.4.6 Supply of combustion air and evacuation of the combustion products .....	44
5.4.7 Dampers.....	44
5.4.8 Air proving.....	44
5.4.9 Gas/air ratio controls .....	45
5.4.10 Fan .....	46

5.4.11	Drainage .....	46
5.4.12	Operational safety in the event of failure of the auxiliary energy .....	46
5.4.13	Special provision for Low Temperature Boilers and Condensing Boilers .....	46
5.5	Burners .....	47
5.6	Pressure test points .....	48
5.7	Requirements for the application of control and safety devices .....	48
5.7.1	General .....	48
5.7.2	Adjusters and range-rating devices .....	48
5.7.3	Gas circuit .....	49
5.7.4	Gas pressure regulator .....	50
5.7.5	Ignition devices .....	51
5.7.6	Flame supervision devices .....	51
5.7.7	Gas/air ratio control tubes .....	52
5.7.8	Thermostats and water flow temperature limiting devices .....	52
5.7.9	Remote control .....	53
5.7.10	Expansion vessel and pressure gauge .....	54
5.7.11	Protection against frost for boilers intended to be installed in a partially protected place .....	54
5.7.12	Adjusting, control and safety devices for the domestic hot water circuit .....	55
6	Electrical and electromagnetic safety .....	55
7	Controls .....	55
7.1	General .....	55
7.2	Detailed specifications .....	56
7.2.1	Control and safety devices .....	56
7.2.2	Valves used in boilers .....	56
7.2.3	Not relevant aspects for controls tested in combination with the boiler .....	56
7.2.4	Relevant aspects for controls tested in combination with the boiler .....	57
7.3	Thermostats and flow temperature limiting devices .....	57
7.3.1	General .....	57
7.3.2	Construction requirements .....	58
7.3.3	Performance .....	59
8	Operational requirements .....	61
8.1	General .....	61
8.1.1	Characteristics of the reference and limit gases .....	61
8.1.2	General test conditions .....	62

<b>8.2</b>	<b>Soundness.....</b>	<b>66</b>
<b>8.2.1</b>	<b>Soundness of the gas circuit .....</b>	<b>66</b>
<b>8.2.2</b>	<b>Soundness of the combustion circuit .....</b>	<b>67</b>
<b>8.2.3</b>	<b>Soundness of the water circuit .....</b>	<b>67</b>
<b>8.2.4</b>	<b>Soundness of the domestic water circuit.....</b>	<b>68</b>
<b>8.3</b>	<b>Hydraulic resistance.....</b>	<b>68</b>
<b>8.3.1</b>	<b>Requirements .....</b>	<b>68</b>
<b>8.3.2</b>	<b>Test conditions.....</b>	<b>68</b>
<b>8.4</b>	<b>Heat inputs and heat output.....</b>	<b>69</b>
<b>8.4.1</b>	<b>Determination of the nominal heat input or the maximum and minimum heat input.....</b>	<b>69</b>
<b>8.4.2</b>	<b>Adjustment of the heat input by the downstream gas pressure .....</b>	<b>71</b>
<b>8.4.3</b>	<b>Ignition rate.....</b>	<b>71</b>
<b>8.4.4</b>	<b>Nominal output .....</b>	<b>71</b>
<b>8.4.5</b>	<b>Verification of the nominal condensing output.....</b>	<b>71</b>
<b>8.4.6</b>	<b>Nominal domestic hot water heat input.....</b>	<b>72</b>
<b>8.4.7</b>	<b>Water pressure to obtain the nominal heat input for instantaneous combination boilers.....</b>	<b>72</b>
<b>8.4.8</b>	<b>Obtaining the domestic hot water temperature for instantaneous combination boilers .....</b>	<b>72</b>
<b>8.4.9</b>	<b>Heating-up time of the domestic hot water .....</b>	<b>73</b>
<b>8.5</b>	<b>Limiting temperatures.....</b>	<b>73</b>
<b>8.5.1</b>	<b>General.....</b>	<b>73</b>
<b>8.5.2</b>	<b>Limiting temperatures of the adjusting, control and safety devices .....</b>	<b>73</b>
<b>8.5.3</b>	<b>Limiting temperatures of the side walls, the front and the top.....</b>	<b>74</b>
<b>8.5.4</b>	<b>Limiting temperature of the test panels and the floor.....</b>	<b>74</b>
<b>8.6</b>	<b>Ignition, cross lighting, flame stability.....</b>	<b>75</b>
<b>8.6.1</b>	<b>General.....</b>	<b>75</b>
<b>8.6.2</b>	<b>Limit conditions.....</b>	<b>75</b>
<b>8.6.3</b>	<b>Special flue conditions.....</b>	<b>76</b>
<b>8.6.4</b>	<b>Reduction of the gas rate of the ignition burner .....</b>	<b>77</b>
<b>8.7</b>	<b>Reduction of the gas pressure.....</b>	<b>77</b>
<b>8.7.1</b>	<b>Requirements .....</b>	<b>77</b>
<b>8.7.2</b>	<b>Test conditions.....</b>	<b>77</b>
<b>8.8</b>	<b>Defective closure of the gas valve immediately upstream of the main burner.....</b>	<b>77</b>
<b>8.8.1</b>	<b>Requirements .....</b>	<b>77</b>
<b>8.8.2</b>	<b>Test conditions.....</b>	<b>78</b>

8.9	Pre-purge.....	78
8.10	Functioning of a permanent ignition burner when the fan stops during the standby time.....	78
8.10.1	Requirements.....	78
8.10.2	Test conditions .....	78
8.11	Adjustment, control and safety devices.....	78
8.11.1	Requirement.....	78
8.11.2	Test method for determining the operating temperature range .....	78
8.11.3	Combination Boilers .....	79
8.11.4	Control devices .....	82
8.11.5	Ignition devices.....	82
8.11.6	Flame supervision device .....	84
8.11.7	Gas pressure regulator .....	87
8.11.8	Thermostats and flow temperature limiting devices.....	88
8.12	Carbon monoxide.....	90
8.12.1	General.....	90
8.12.2	Limit conditions.....	92
8.12.3	Special conditions.....	92
8.12.4	Sooting .....	93
8.12.5	Condensate discharge blockage test.....	94
8.13	NO <sub>x</sub> .....	94
8.13.1	Requirement.....	94
8.13.2	Test methods .....	95
8.13.3	Calculation of emissions of NO <sub>x</sub> in mg/kWh based on GCV.....	97
8.14	Special provisions for boilers intended to be installed in a partially protected place.....	98
8.14.1	Frost protection system for boilers intended to be installed in a partially protected place.....	98
8.14.2	Protection against the ingress of rain .....	98
8.15	Formation of condensate .....	98
8.15.1	Requirements.....	98
8.15.2	Test conditions .....	98
8.16	Temperature of combustion products.....	99
8.16.1	Requirements.....	99
8.16.2	Test conditions .....	99
8.17	Sound power level L <sub>WA</sub> .....	99
9	Useful efficiencies.....	99

9.1	General.....	99
9.1.1	Correction of measured efficiency to reference conditions.....	99
9.1.2	Use of the general test conditions .....	100
9.2	Useful efficiency at the nominal heat input .....	100
9.2.1	Requirements .....	100
9.2.2	Tests.....	100
9.3	Useful efficiency at part load.....	102
9.3.1	Requirements .....	102
9.3.2	Tests.....	102
9.4	Heat output, Seasonal energy efficiency and energy consumption.....	109
9.4.1	Rated heat output ( $P_{rated}$ and $P_4$ ).....	109
9.4.2	Useful heat output at 30 % of rated heat output and low-temperature regime ( $P_1$ ) .....	109
9.4.3	Useful efficiency (GCV) at rated heat output and high-temperature regime ( $\eta_A$ )..	109
9.4.4	Useful efficiency (GCV) at 30 % of rated heat output and low-temperature regime ( $\eta_1$ ).....	110
9.4.5	Ignition burner power consumption (GCV) ( $P_{ign}$ ).....	110
9.4.6	Calculation of the seasonal space heating energy efficiency ( $\eta_s$ ).....	110
9.4.7	Calculation of the annual energy consumption for space heating ( $Q_{HE}$ ) (GCV).....	112
9.4.8	Water heating energy efficiency and energy consumption of combination boilers for water heating mode .....	112
10	Electric auxiliary energy.....	113
10.1	Auxiliary energy consumption .....	113
10.1.1	General.....	113
10.1.2	System boundaries.....	113
10.1.3	Auxiliary energy at nominal heat input .....	113
10.1.4	Auxiliary energy at part load .....	114
10.1.5	Auxiliary energy at stand-by .....	114
10.2	Auxiliary electricity consumption measurements required for eco-design and labelling regulations .....	114
10.2.1	General.....	114
10.2.2	System boundaries.....	114
10.2.3	Auxiliary electricity consumption [kW] at nominal heat input.....	115
10.2.4	Auxiliary electricity consumption at part load [kW].....	115
10.2.5	Auxiliary electricity consumption at stand by [kW].....	115
11	Risk assessment.....	115
12	Marking and instructions.....	116

<b>12.1</b>	<b>Boiler marking</b> .....	<b>116</b>
<b>12.1.1</b>	<b>Data plate</b> .....	<b>116</b>
<b>12.1.2</b>	<b>Markings related to the state of adjustment</b> .....	<b>117</b>
<b>12.1.3</b>	<b>Packaging</b> .....	<b>117</b>
<b>12.1.4</b>	<b>Warnings notices on the boiler and the packaging</b> .....	<b>117</b>
<b>12.1.5</b>	<b>Other information</b> .....	<b>118</b>
<b>12.2</b>	<b>Instructions</b> .....	<b>119</b>
<b>12.2.1</b>	<b>Instructions for installation</b> .....	<b>119</b>
<b>12.2.2</b>	<b>Instructions for use and servicing</b> .....	<b>124</b>
<b>12.2.3</b>	<b>Conversion instructions</b> .....	<b>124</b>
<b>12.3</b>	<b>Presentation</b> .....	<b>125</b>
<b>Annex A</b> (normative)	<b>Properties of carbon and stainless steels</b> .....	<b>133</b>
<b>Annex B</b> (normative)	<b>Minimum requirements for cast iron</b> .....	<b>134</b>
<b>Annex C</b> (normative)	<b>Parts in aluminium and aluminium alloys</b> .....	<b>135</b>
<b>Annex D</b> (normative)	<b>Parts in copper or copper alloys</b> .....	<b>136</b>
<b>Annex E</b> (normative)	<b>Minimum thicknesses for rolled parts</b> .....	<b>137</b>
<b>Annex F</b> (normative)	<b>Nominal minimum thicknesses of boiler sections of cast materials under water pressure</b> .....	<b>138</b>
<b>Annex G</b> (normative)	<b>Parameters for welded joints and welding processes</b> .....	<b>139</b>
<b>Annex H</b> (informative)	<b>Examples of the composition of the gas circuit according to 5.7.3.2</b> .....	<b>144</b>
<b>Annex I</b> (informative)	<b>Compilation of the test conditions for the various gas families</b> ..	<b>153</b>
<b>Annex J</b> (normative)	<b>Calculation of conversions of NO<sub>x</sub></b> .....	<b>155</b>
<b>Annex K</b> (informative)	<b>Example of calculation of the weighting factors NO<sub>x</sub></b> .....	<b>157</b>
<b>Annex L</b> (informative)	<b>Practical method of calibrating the test rig to enable the heat loss D<sub>p</sub> to be determined</b> .....	<b>159</b>
<b>Annex M</b> (informative)	<b>Means of determining the ignition time at full rate</b> .....	<b>160</b>
<b>Annex N</b> (informative)	<b>Determination of the heat losses from the test rig of the indirect method and the contributions of the circulating pump of the test rig</b> ....	<b>161</b>
<b>Annex O</b> (informative)	<b>Example of a risk assessment method</b> .....	<b>162</b>
<b>Annex P</b> (informative)	<b>Examples of risk assessment with a method described in Annex O</b> .....	<b>165</b>
<b>Annex Q</b> (informative)	<b>Realisation of a protective measure</b> .....	<b>170</b>
<b>Annex R</b> (informative)	<b>Overall classification of a basic risk</b> .....	<b>172</b>
<b>Annex S</b> (informative)	<b>Not exhaustive list of classification examples</b> .....	<b>175</b>
<b>Annex T</b> (normative)	<b>Correction for the determined efficiency in the low water temperature test of low temperature boilers (LTB) and condensing boilers (CB)</b> .....	<b>178</b>
<b>Annex U</b> (normative)	<b>Use of test gases</b> .....	<b>180</b>
<b>Annex V</b> (informative)	<b>Alternative method for heat output as enthalpy difference</b>	<b>181</b>

<b>Annex AA (informative) Product Information related to Eco-design Regulation and Labelling Regulation .....</b>	<b>184</b>
<b>Annex AB (informative) Variations in gas quality.....</b>	<b>188</b>
<b>Annex AC (normative) Non-exhaustive list of materials used in contact with drinking water.....</b>	<b>193</b>
<b>Annex ZA (informative) Left empty on purpose .....</b>	<b>195</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>196</b>
<b>Annex ZC (informative) Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No 813/2013 L 239/136 aimed to be covered .....</b>	<b>197</b>
<b>Annex ZD (informative) Relationship between this European Standard and the energy labelling requirements of Commission Delegated Regulation (EU) No 811/2013 L 239/1 aimed to be covered.....</b>	<b>200</b>
<b>Annex ZE (informative) Relationship between this European Standard and the essential requirements of Regulation (EU) 2016/426 of the European Parliament and of the Council of 9 March 2016 on appliances burning gaseous fuels and repealing Directive 2009/142/EC aimed to be covered .....</b>	<b>203</b>
<b>Bibliography.....</b>	<b>213</b>