

# DIN EN 15420:2011-11 (E)

## Gas-fired central heating boilers - Type C boilers of nominal heat input exceeding 70 kW, but not exceeding 1 000 kW

---

<b>Contents</b>		<b>Page</b>
Foreword .....		7
<b>1</b>	<b>Scope .....</b>	<b>8</b>
<b>2</b>	<b>Normative references .....</b>	<b>8</b>
<b>3</b>	<b>Terms and definitions .....</b>	<b>10</b>
3.1	Combustible gases .....	10
3.2	Constituent parts of the boiler .....	12
3.2.1	Gas supply .....	12
3.2.2	Air supply and combustion products evacuation .....	13
3.2.3	Adjusting, control and safety devices .....	15
3.3	Operation of the boiler .....	17
3.3.1	Gas rates .....	17
3.3.2	Outputs .....	18
3.3.3	Efficiency .....	18
3.3.4	Gas combustion .....	19
3.3.5	Times .....	19
3.3.6	spark restoration .....	20
3.3.7	recycling .....	20
3.3.8	controlled shutdown .....	20
3.3.9	safety shutdown .....	20
3.3.10	Locking out .....	20
3.4	Auxiliary energy .....	21
3.4.1	electric auxiliary energy .....	21
3.5	Country of destination .....	21
3.5.1	direct country of destination .....	21
3.5.2	indirect country of destination .....	21
<b>4</b>	<b>Classification of boilers .....</b>	<b>21</b>
4.1	Gases and categories .....	21
4.2	Mode of air supply and evacuation of the combustion products .....	22
4.2.1	Type C Boilers .....	22
4.2.2	Type of installation of the boiler .....	22
4.2.3	Presence and position of a fan .....	23
4.3	Classification according to operating conditions .....	23
4.3.1	Standard boiler .....	23
4.3.2	Low-temperature boiler .....	23
4.3.3	Gas condensing boiler .....	24
4.4	Modular boiler .....	24
<b>5</b>	<b>Constructional requirements .....</b>	<b>24</b>
5.1	General .....	24
5.2	Conversion to different gases .....	24
5.3	Materials and method of construction .....	24
5.3.1	General .....	24
5.3.2	Materials and thicknesses of walls or tubes under water pressure .....	25
5.3.3	Thermal insulation .....	33
5.4	Combustion products evacuation duct .....	34
5.4.1	Stability under mechanical loading .....	34
5.4.2	Stability under exposure to heat .....	34

5.4.3	Corrosion resistance .....	34
5.4.4	Resistance to condensate and moisture under normal operating conditions .....	34
5.5	Design .....	34
5.5.1	General .....	34
5.5.2	Modular boilers .....	35
5.6	Use and servicing .....	35
5.7	Connections to the gas and water pipes .....	35
5.7.1	General .....	35
5.7.2	Connections to the gas pipe .....	35
5.7.3	Connections to the central heating circuit .....	36
5.8	Soundness .....	36
5.8.1	Soundness of the gas circuit .....	36
5.8.2	Soundness of the combustion circuit .....	36
5.9	Supply of combustion air and the evacuation of the combustion products .....	37
5.9.1	General .....	37
5.9.2	Air supply and combustion products evacuation duct ) .....	37
5.9.3	Terminal .....	37
5.9.4	Terminal guard .....	37
5.9.5	Fitting piece .....	38
5.9.6	Control dampers in the air or combustion products circuit .....	38
5.9.7	Special requirements for certain components of boilers with a fan .....	38
5.9.8	Condensate discharge .....	39
5.10	Checking the state of operation .....	40
5.11	Drainage .....	40
5.12	Electrical equipment .....	40
5.13	Operational safety in the event of failure of the auxiliary energy .....	40
5.14	Adjusting, control and safety devices .....	40
5.14.1	General .....	40
5.14.2	Adjusters and range rating devices .....	41
5.14.3	Gas circuit .....	41
5.14.4	Gas pressure regulator .....	43
5.14.5	Ignition devices .....	43
5.14.6	Flame supervision systems .....	44
5.14.7	Thermostats and water temperature limiting devices .....	45
5.15	Burners .....	46
5.16	Pressure test points .....	46
5.17	Chemical composition of the condensate .....	46
6	Operational requirements .....	46
6.1	General .....	46
6.2	Soundness .....	46
6.2.1	Soundness of the gas circuit .....	46
6.2.2	Soundness of the combustion circuit .....	47
6.2.3	Soundness of the water circuit .....	48
6.3	Nominal, maximum and minimum heat inputs, and nominal output .....	48
6.3.1	Nominal heat input or maximum and minimum heat inputs .....	48
6.3.2	Adjustment of the heat input by the downstream pressure .....	48
6.3.3	Ignition rate .....	48
6.3.4	Nominal output .....	48
6.3.5	Gas pressure regulator .....	48
6.4	Safety of operation .....	49
6.4.1	Limiting temperatures .....	49
6.4.2	Ignition - Cross-lighting - Flame stability .....	50
6.4.3	Pre-purge .....	51
6.4.4	Functioning of a permanent ignition burner when the fan stops during the standby time .	52
6.5	Adjusting, control and safety devices .....	52
6.5.1	General .....	52
6.5.2	Ignition devices .....	52
6.5.3	Flame supervision devices .....	53
6.5.4	Ignition burner and ignition rates .....	55
6.5.5	Air proving .....	55
6.5.6	Gas pressure switches .....	56

6.5.7	Control thermostat and safety temperature limiter .....	57
6.5.8	Condensate discharge blockage .....	58
6.6	Combustion .....	58
6.6.1	Carbon monoxide .....	58
6.6.2	Limit conditions .....	58
6.6.3	Special conditions .....	58
6.6.4	Sooting .....	58
6.6.5	Other pollutants .....	58
6.7	Useful efficiencies .....	59
6.7.1	Useful efficiency at the nominal heat input .....	59
6.7.2	Useful efficiency at part load .....	59
6.8	Criteria for condensation in the flue .....	60
6.9	Resistance of the materials to pressure .....	60
6.9.1	General .....	60
6.9.2	Boilers of sheet steel or non-ferrous metals .....	60
6.9.3	Boilers of cast iron and cast materials .....	60
6.10	Hydraulic resistance .....	61
6.11	Condensation in the boiler .....	61
6.12	Combustion air and flue dampers .....	61
7	Test methods .....	61
7.1	General .....	61
7.1.1	Characteristics of the reference and limit gases .....	61
7.1.2	General test conditions .....	67
7.2	Soundness .....	70
7.2.1	Soundness of the gas circuit .....	70
7.2.2	Soundness of the combustion circuit .....	71
7.2.3	Soundness of the water circuit .....	72
7.3	Nominal, maximum and minimum heat inputs, and nominal output .....	72
7.3.1	Nominal heat input or maximum and minimum heat inputs .....	72
7.3.2	Adjustment of the heat input by the downstream pressure .....	73
7.3.3	Ignition rate .....	74
7.3.4	Nominal output .....	74
7.3.5	Gas pressure regulator .....	74
7.4	Safety of operation .....	74
7.4.1	Limiting temperatures .....	74
7.4.2	Ignition - Cross-lighting - Flame stability .....	76
7.4.3	Pre-purge .....	79
7.4.4	Functioning of a permanent ignition burner when the fan stops during standby time .....	80
7.5	Adjusting, control and safety devices .....	80
7.5.1	General .....	80
7.5.2	Ignition devices .....	80
7.5.3	Flame supervision devices .....	81
7.5.4	Ignition burner and ignition rates .....	83
7.5.5	Air proving .....	83
7.5.6	Gas pressure switches .....	85
7.5.7	Control thermostat and safety temperature limiter .....	85
7.5.8	Condensate discharge blockage .....	87
7.6	Combustion .....	87
7.6.1	Carbon monoxide .....	87
7.6.2	Limit conditions .....	88
7.6.3	Special conditions .....	89
7.6.4	Other pollutants .....	91
7.7	Useful efficiencies .....	95
7.7.1	Useful efficiency at the nominal heat input .....	95
7.7.2	Useful efficiency at part load .....	96
7.8	Criteria for condensation in the flue .....	101
7.8.1	Determination of flue losses .....	101
7.8.2	Minimum temperature of the combustion products .....	102
7.9	Resistance of materials to pressure .....	102
7.9.1	General .....	102
7.9.2	Boilers of sheet steel or non-ferrous metals .....	102

7.9.3	Boilers of cast iron and cast materials .....	103
7.10	Hydraulic resistance .....	103
7.11	Condensation in the boiler .....	103
7.12	Combustion air and flue dampers .....	103
8	Marking and instructions .....	104
8.1	Marking of the boiler .....	104
8.1.1	General .....	104
8.1.2	Data plate .....	104
8.1.3	Supplementary marking .....	106
8.1.4	Packaging .....	108
8.1.5	Warnings on the boiler and on the packaging .....	108
8.1.6	Other information .....	108
8.2	Instructions .....	108
8.2.1	Technical instructions for the installer .....	108
8.2.2	For installation of the combustion circuit .....	109
8.2.3	Use and maintenance instructions for the user .....	110
8.2.4	Conversion instructions .....	111
8.3	Presentation .....	111
Annex A (informative) National situations .....		127
A.1	Categories marketed in the various countries .....	127
A.2	Special categories marketed nationally or locally .....	129
A.3	Gas groups distributed locally .....	129
A.4	Boiler supply pressures .....	130
A.5	Gas connections in common use in the various countries .....	132
Annex B (informative) Special national conditions .....		133
Annex C (informative) A-deviations .....		134
Annex D (informative) Classification of type C boilers .....		135
Annex E (informative) Practical method of calibrating the test rig to enable the heat loss $D_p$ to be determined .....		142
Annex F (informative) Main symbols and abbreviations used .....		143
Annex G (informative) Compilation of test conditions .....		144
Annex H (informative) Valving .....		147
H.1	General .....	147
H.2	Boilers with permanent ignition burner or alternating ignition burner or leakage control device or with pre-purge .....	147
H.2.1	Heat inputs up to 150 kW .....	147
H.2.2	Heat inputs up to 300 kW .....	148
H.3	Boilers without permanent ignition burner or alternating ignition burner, without leakage control device and without pre-purge .....	149
H.3.1	Heat inputs up to 150 kW .....	149
H.3.2	Heat inputs up to 300 kW .....	150
H.4	Heat inputs exceeding 300 kW but not exceeding 1 000 kW .....	151
H.4.1	Boilers with permanent ignition burner or alternating ignition burner or leakage control device or with pre-purge .....	151
H.4.2	Boilers without permanent ignition burner or alternating ignition burner, without a leakage control device and without pre-purge .....	152
Annex I (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 .....		153
Annex J (informative) Means of determining the ignition time at full rate .....		154

<b>Annex K (informative) Example of the calculation of the NO<sub>x</sub> weighting factors for a boiler with several rates</b>	<b>155</b>
<b>K.1 Apportioning of Q<sub>pi</sub> = 20 %</b>	<b>155</b>
<b>K.2 Apportioning of Q<sub>pi</sub> = 40 %</b>	<b>155</b>
<b>K.3 Apportioning of Q<sub>pi</sub> = 60 %</b>	<b>155</b>
<b>K.4 Apportioning of Q<sub>pi</sub> = 70 %</b>	<b>156</b>
<b>K.5 Total apportioning</b>	<b>156</b>
<b>Annex L (informative) Calculation of conversions of NO<sub>x</sub></b>	<b>157</b>
<b>Annex M (normative) Test apparatus for type C2 boilers (see 7.4.2.3.3)</b>	<b>158</b>
<b>Annex N (informative) Requirements and test methods for separate air supply and combustion products evacuation ducts of type C6 boilers</b>	<b>159</b>
<b>N.1 Requirements</b>	<b>159</b>
<b>N.1.1 Pressure losses</b>	<b>159</b>
<b>N.1.2 Pressure loss under the influence of wind</b>	<b>159</b>
<b>N.1.3 Suction under the influence of wind</b>	<b>159</b>
<b>N.1.4 Recirculation of the combustion products</b>	<b>159</b>
<b>N.2 Test methods</b>	<b>160</b>
<b>N.2.1 Pressure loss in still air</b>	<b>160</b>
<b>N.2.2 Pressure loss under the influence of wind</b>	<b>160</b>
<b>N.2.3 Suction under the influence of wind</b>	<b>160</b>
<b>N.2.4 Recirculation of the combustion products</b>	<b>161</b>
<b>N.2.5 Wind test conditions</b>	<b>161</b>
<b>Annex O (informative) Use of test gases</b>	<b>164</b>
<b>O.1 Boilers within a range</b>	<b>164</b>
<b>O.2 Guidance on the use of test gases</b>	<b>164</b>
<b>Annex ZA (informative) Clauses of this European Standard addressing essential requirements or provisions of EU Directives</b>	<b>165</b>
<b>Bibliography</b>	<b>168</b>