

Datasheet

**VITOMAX HW** Type M94

High pressure hot water boiler

Low NO_x version

Permissible for flow temperatures up to 150 °C

Suitable for the combustion of gas, EL fuel oil
and S fuel oil

Three-pass boiler

Permissible operating pressure 6 to 16 bar

Specification for burner selection

Note

All diagrams in this document are schematic, illustrative examples.

All dimensions are nominal.

Designation of boiler types

With the boiler type, the respective stage of development is indicated in capital letters.

Example M94B: Boiler type M94 version B

General conditions

The information and values in the tables relate to the following general conditions:

- O₂ content in dry flue gas
 - For natural gas: 3.0 % by vol.
 - For EL fuel oil: 3.0 % by vol.
- Flow/return temperature: 120/80 °C

- 100 % load
- Installation altitude: < 500 m above sea level
- Combustion air temperature: 25 °C

Boiler size				1	2	3	4	5	6	7	8	9
Rated heating output												
– For natural gas		MW		7.90	8.90	9.90	11.80	13.80	15.75	17.75	19.75	21.00
– For EL fuel oil		MW		7.90	8.90	9.90	11.80	12.88	12.93	16.02	16.73	16.70
Permissible combustion heating output*1												
– With natural gas for smooth pipe		MW		8.73	9.83	10.94	13.04	15.25	17.40	19.57*2	–	–
– With natural gas for corrugated pipe		MW		8.73	9.83	10.94	13.04	15.25	17.40	19.61*2	21.82*2	23.20*2
– With EL fuel oil for smooth pipe		MW		8.73	9.83	10.94	13.04	14.00	14.00	16.75*2	–	–
– With EL fuel oil for corrugated pipe		MW		8.73	9.83	10.94	13.04	14.00	14.00	17.33*2	18.00*2	18.00*2
Flame tube dimensions												
Diameter												
– Smooth pipe, internal Ø	6 bar	d1	mm	1318	1366	1414	1512	1585	1656	1706	–	–
	10 bar		mm	1308	1356	–	–	–	–	–	–	–
– Corrugated pipe, internal Ø	6 bar	d1	mm	–	–	–	–	–	–	–	1775	1800
	10 bar		mm	–	–	1400	1500	1575	1650	1700	1775	1800
	16 bar		mm	1300	1350	1400	1500	1575	1650	1700	1775	1800
Flame tube length		a	mm	4800	5050	5325	5825	6225	6625	7050	7450	7700
Reversing chamber depth		b	mm	500								
Burner connections												
– Max. flame head Ø (optional wear-resistant burner entry point)		c	mm	910	910	910	910	1010	1110	1110	1210	1210
– Max. flame head Ø (standard version)		c	mm	Can be adjusted subject to burner							–	–
– Flame head length		e	mm	360								
Combustion chamber volume (min. values)												
– Flame tube		m ³		6.37	7.23	8.20	10.29	12.13	14.17	16.00	18.43	19.59
– Flame tube and reversing chamber		m ³		7.03	7.94	8.97	11.18	13.10	15.24	17.14	19.67	20.87
Max. pressure drop on the flue gas side												
– For natural gas		mbar		11.5	12.9	12.3	14.5	13.6	14.2	16.1	17.9	18.0
– For EL fuel oil		mbar		10.1	11.4	10.8	12.8	11.9	10.7	11.2	10.7	9.3

Calculation of pressure drop on the flue gas side with reference to deviating heating output

Pressure drop on the flue gas side = resistance value in table x load^{2,1}

Example:

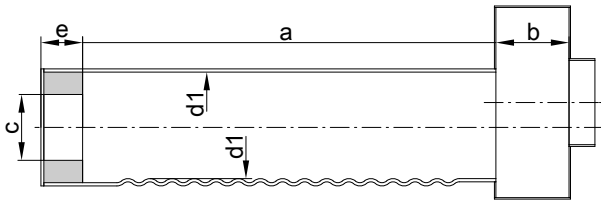
100 % load: 14.2 mbar

60 % load: 14.2 mbar x 0.6^{2,1} = 4.9 mbar

*1 In accordance with EN 12953, the internal diameter of the flame tube limits the maximum combustion heating output for oil operation.

*2 According to EN 12953, flame tube temperature monitoring is required for a combustion heating output above 14 MW for oil combustion and above 18.2 MW for gas combustion.

Specification for burner selection (cont.)



Flame tube dimensions

Note

Dimensions *c* and *e* apply to all versions of the burner entry point.

The pressure stage used determines the type of flame tube. Tolerances related to production factors are not taken into consideration.

Flame tube temperature monitoring (FTM)

In line with the requirements of EN 12953-3, flame tube temperature monitoring (FTM) is necessary under the following conditions:

- Internal flame tube diameter for smooth pipes or average flame tube diameter for corrugated pipes > 1800 mm
- Combustion heating output for fuel oil > 14 MW or for natural gas > 18.2 MW

Engineering information for burner selection

Burner selection

Criteria for burner selection:

- Select burner in accordance with the combustion heating output and the pressure drop on the flue gas side.
- The burner must meet the requirements of EN 12953-7.
- The boiler/burner combination must comply with country-specific regulations (statutes, standards, guidelines, ordinances, etc.).
- The burner head must be suitable for operating temperatures of at least 500 °C.
- The flame head length must be guaranteed.

Recommendation

Certain types of burner can hinder the opening of the cleaning doors. Check with the factory prior to delivery.

Burner type	Requirements
Pressure-jet gas burner	Test and identification to EN 676
Pressure-jet oil burner	Test and identification to EN 267



Burner specification
Manufacturer's datasheets

Fuels

Gas

- Natural gas, town gas and LPG to DVGW Code of Practice G 260/I and II, and local regulations

Oil

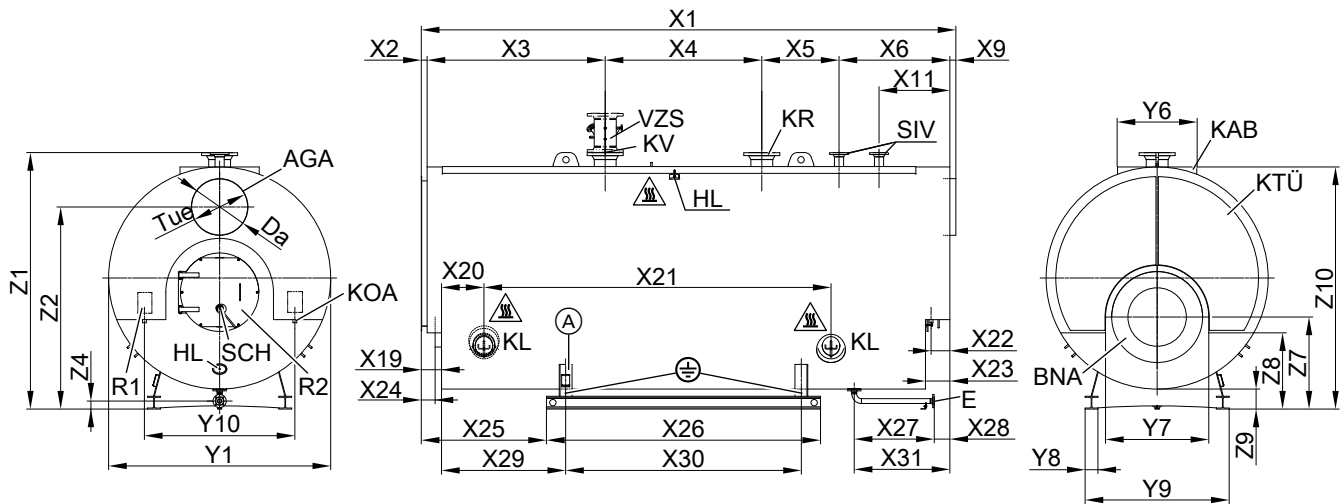
- EL fuel oil to DIN 51603 Part 1
 - S fuel oil to DIN 51603 Part 3
- If using S fuel oil, different output data for the rated heating output, flue gas temperature and efficiency may result.
Never use heat exchangers if using S fuel oil.

Biodiesel

- To EN 51603-6, EN 14213, EN 14214 (or equivalent)

Alternative fuels on request

Boiler geometry



Boiler sizes 1 - 2 cross plate design with I-beams; boiler size 3 I-beam design with longitudinal I-beam supports

- | | | | |
|-----|--|-----|---|
| | Caution – hot surface. No thermal insulation fitted. | KR | Boiler return connector |
| | Type plate | KTÜ | Boiler door |
| AGA | Flue outlet | KV | Boiler flow connector |
| BNA | Burner connection | R1 | Flue gas collector inspection port |
| E | Drain connector DN 50 PN 40 | R2 | Combustion chamber inspection port |
| HL | Handhole 100 mm x 150 mm | SCH | Sight tube |
| KAB | Boiler cover (optional) | SIV | Safety valve connector (2nd safety valve optional) |
| KL | Headhole 220 mm x 320 mm ^{*3} | VZS | Intermediate flow piece as accessory (required for ≥120 °C) |
| KOA | Condensate drain - R 1 ½ connector | ⊕ | Equipotential bonding connection |

Boiler size		1	2	3	4	5	6	7	8	9
x1	mm	6430	6680	6995	7545	8035	8525	8970	9410	9710
x2	mm	73	73	73	73	73	73	73	73	73
x3	mm	2140	2225	2355	2525	2695	2870	3030	2990	2990
x4	mm	1877	1957	2052	2212	2352	2482	2627	3187	3437
x5	mm	880	965	1055	1225	1355	1490	1630	1550	1550
x6	mm	1385	1385	1385	1435	1485	1535	1535	1535	1585
x9	mm	75	75	75	75	75	75	75	75	75
x11	mm	885	885	885	935	985	1035	1035	1035	1085
x19	mm	253	253	293	293	333	373	393	433	433
x20	mm	530	530	530	530	530	530	530	530	530
x21	mm	4087	4337	4612	5112	5512	5912	6337	6737	6987
x22	mm	235	235	235	260	285	310	310	310	335
x23	mm	305	305	305	355	405	455	455	455	505
x24	mm	173	173	213	213	253	293	313	353	353
x25	mm	1502	1564	1604	1729	1819	1959	2017	2157	2232
x26	mm	3300	3425	3700	3950	4250	4450	4800	5000	5100
x27	mm	1000	1000	1000	1000	1000	1000	1200	1200	1200
x28	mm	195	195	195	245	295	345	345	345	395
x29	mm	1489	1551	1611	1736	1846	1946	1971	2144	2214
x30	mm	2820	2945	3100	3350	3530	3730	3960	4160	4260
x31	mm	1195	1195	1195	1245	1295	1345	1545	1545	1595
y1	mm	2850	2925	3025	3175	3300	3450	3525	3625	3675
y6	mm	1000	1000	1100	1100	1100	1200	1200	1200	1200
y7	mm	1460	1510	1610	1710	1785	1860	1910	1985	2010
y8	mm	160	160	200	200	240	240	280	280	280
y9	mm	1840	1890	2300	2350	2550	2600	2750	2800	2850
y10	mm	1950	2000	2080	2190	2280	2390	2440	2520	2550
z1	mm	3280	3355	3455	3605	3730	3880	3995	4095	4145
z2	mm	2605	2665	2750	2880	2985	3120	3220	3305	3345
z4	mm	100	100	100	100	100	100	100	100	100
z7	mm	1235	1260	1285	1340	1378	1420	1485	1523	1535
z8	mm	1090	1098	1098	1103	1100	1110	1163	1173	1173
z9	mm	250	250	250	250	250	250	290	290	290
z10	mm	3105	3180	3280	3430	3555	3705	3820	3920	3970

*3 At the front of the boiler casing there is a handhole on the right and a headhole on the left.

Boiler geometry (cont.)

Boiler size		1	2	3	4	5	6	7	8	9
∅ Di – internal diameter	mm	700	700	790	790	890	990	990	1110	1110
∅ Da – external diameter	mm	710	710	800	800	900	1000	1000	1120	1120

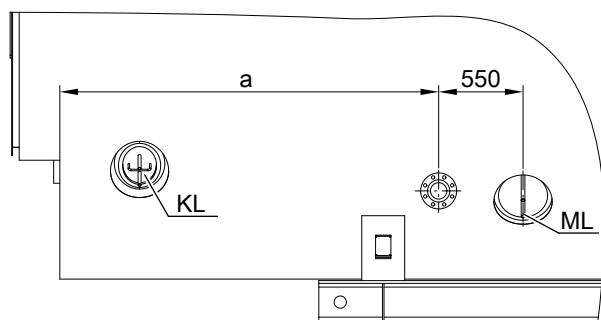
Transport information

Boiler size		1	2	3	4	5	6	7	8	9
Shipping dimensions										
– Total length	m	6.58	6.83	7.15	7.70	8.19	8.68	9.12	9.56	9.86
– Total width	m	2.88	2.95	3.05	3.20	3.33	3.48	3.55	3.65	3.70
– Total height	m	3.31	3.38	3.48	3.63	3.76	3.91	4.02	4.12	4.17
Dry weight^{*4} Boiler incl. thermal insulation										
For perm. operating pressure		t								
6 bar	t	15.8	17.4	22.0	25.7	29.4	35.6	39.4	41.0	44.0
10 bar	t	19.0	20.8	22.5	26.3	30.2	36.2	40.8	45.8	49.5
16 bar	t	23.0	25.5	28.9	34.0	39.3	45.1	50.0	55.9	60.0

Boiler connections

Boiler size		1	2	3	4	5	6	7	8	9
Boiler flow and return										
For perm. operating pressure 6, 10 bar										
Temperature spread	40 K	PN 16 DN	200	200	200	250	250	250	300	300
	30 K	PN 16 DN	200	250	250	250	300	300	350	350
	20 K	PN 16 DN	250	250	300	300	350	400	400	450
For perm. operating pressure 16 bar										
Temperature spread	40 K	PN 25 DN	200	200	200	250	250	250	300	300
	30 K	PN 25 DN	200	250	250	250	300	300	350	350
	20 K	PN 25 DN	250	250	300	350	350	400	400	450
Safety valve connector										
For perm. operating pressure										
6 bar	PN 40 DN	100	100	100	100	125	125	150	150	150
10 bar	PN 40 DN	65	80	80	80	100	100	100	125	125
16 bar	PN 40 DN	65	65	65	65	80	80	80	100	100

Flame tube temperature monitoring (FTM)



Detailed drawing – flame tube temperature monitoring (FTM) for boiler sizes 7 - 9

KL Headhole
ML Manhole

Boiler size		1	2	3	4	5	6	7	8	9
a	mm	–	–	–	–	–	–	2060	2740	2830

Note

Dimension a is approximate.

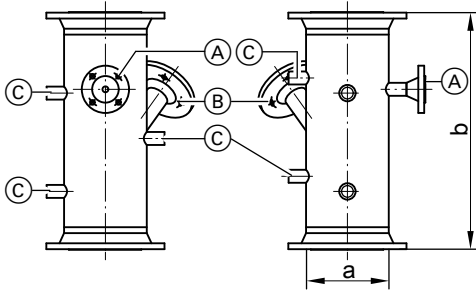
^{*4} Deviations of ±10 % are possible, subject to order.

Boiler geometry (cont.)



Installation and service instructions for flame tube temperature monitoring (FTM)

Intermediate flow piece (order separately)

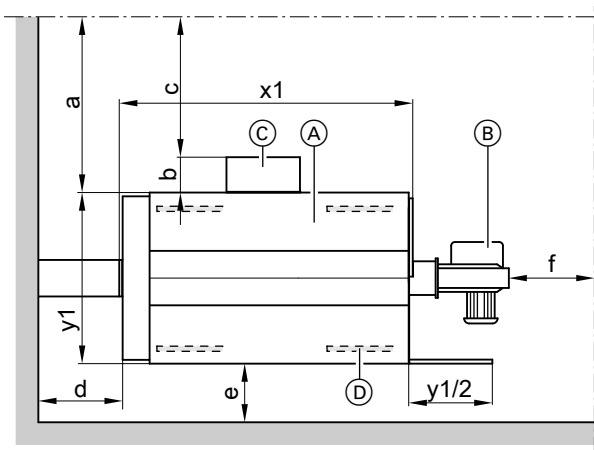


Intermediate flow piece (VZS) for boilers with permissible flow temperature > 110 °C

- Ⓐ Connector for fitting assembly (pressure regulator, pressure limiter and pressure gauge) DN 20 PN 40
- Ⓑ Connector for electrode water level limiter DN 50 PN 40
- Ⓒ Thermometer, sampling valve and other control equipment, female connections 5 x R 1/2

a	DN	125	150	200	250	300	350	400	450
b	mm	500	500	500	550	550	600	600	600

Recommended minimum clearances



a	mm	≥1000
b	mm	Subject to the selected control panel
c	mm	≥800
d	mm	≥500
e	mm	≥300
f	mm	≥500

Recommendation for dimension f

Leave one boiler length (x1) of space in front of the boiler door to extract the turbulators (if fitted) and for cleaning.

Observe the stated dimensions to ensure straightforward installation and maintenance.

Observe the clearances with regard to the regulations applicable at the installation site. Allow for equipment and accessories.

The installation surface must be level. Level the boiler horizontally.

- Ⓐ Boiler
- Ⓑ Burner
- Ⓒ Control system and control panel
- Ⓓ Anti-vibration boiler supports
- a Control panel not fitted
- b Control panel depth
- c Control panel fitted
- d, e, f Other clearances
- x1, y1 See tables of dimensions: Max. length, max. width

Boiler geometry (cont.)

Siting conditions

- Contamination of the combustion air from halogenated hydrocarbons is not permissible. Halogenated hydrocarbons can be found in sprays, paints, solvents and cleaning agents, for example.
 - Provide an adequate supply of uncontaminated combustion air if there is a risk of air contamination from halogenated hydrocarbons where the boiler is sited.
 - Avoid high incidence of dust exposure.
 - Avoid high levels of humidity.
 - Prevent frost and ensure good ventilation.
 - Site on a level surface.
 - Align the boiler horizontally.
- Failure to observe these instructions can cause system faults and damage.

Reducing noise

We recommend positioning anti-vibration supports (accessories) underneath the boiler support.

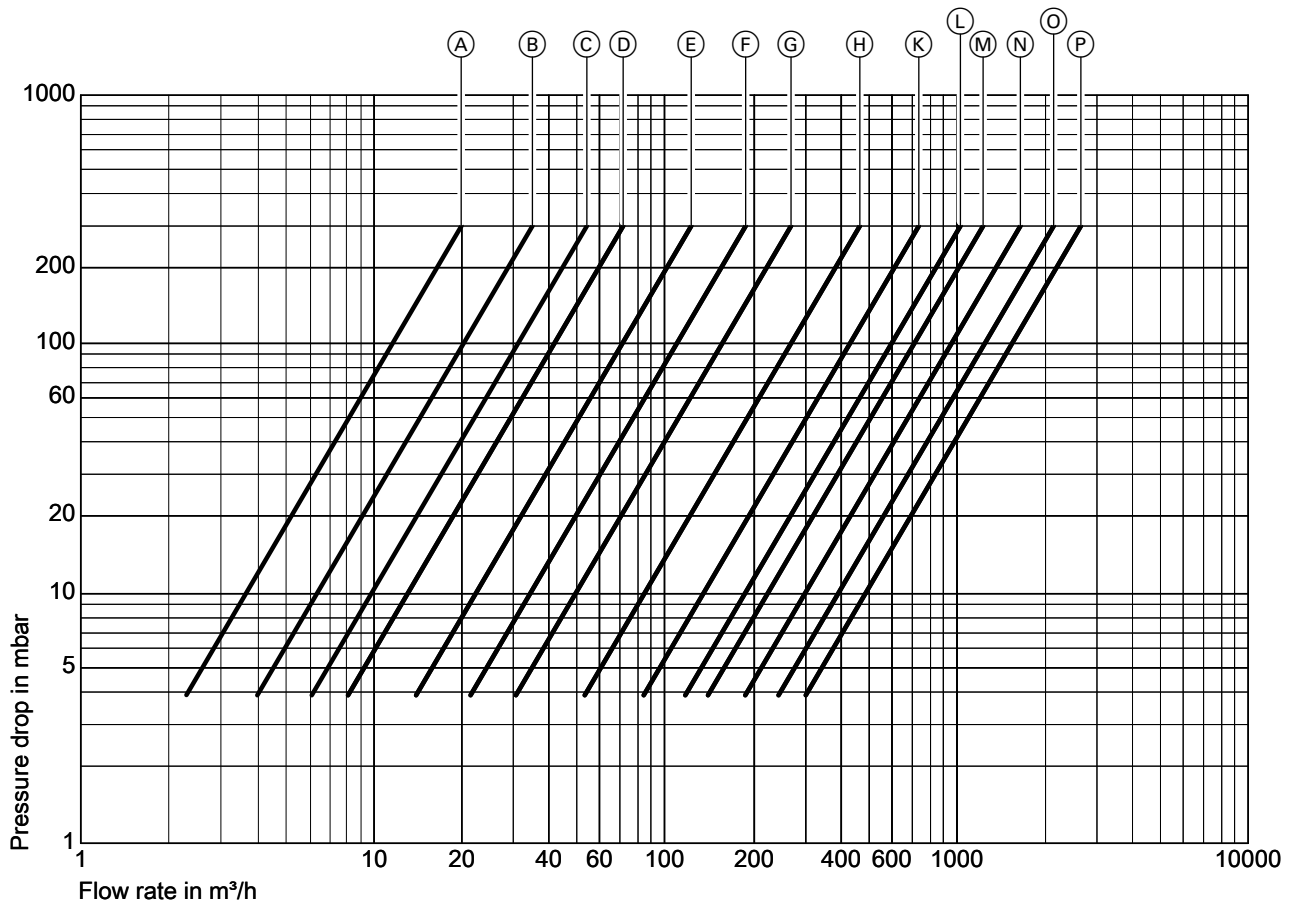
Boiler performance data

Boiler size		1	2	3	4	5	6	7	8	9
Boiler water capacity	m ³	17.2	18.9	20.5	24.3	27.3	31.1	34.2	37.7	39.8
Boiler size		1	2	3	4	5	6	7	8	9
Flue gas mass flow rate ^{*5}		1.5225 x combustion heating output in MW								
damp		1.5 x combustion heating output in MW								
– For natural gas	t/h									
– For EL fuel oil	t/h									
Heating surface										
– Flue gas side	m ²	224	254	286	340	395	453	507	562	579
– Water side	m ²	247	275	308	367	424	488	545	605	625
Flue gas volume	m ³	12.8	14.3	16.7	20.2	24.5	29.2	34.6	39.0	41.8

^{*5} Calculation of values for sizing the flue system to EN 13384 with the following CO₂ contents: 13 % for EL fuel oil; 10 % for natural gas. The significant factor for sizing the flue system is the flue gas temperature at 120 °C boiler water temperature. It is used to determine the application range of flue pipes with maximum permissible operating temperatures.

Boiler performance data (cont.)

Pressure drop on the heating water side

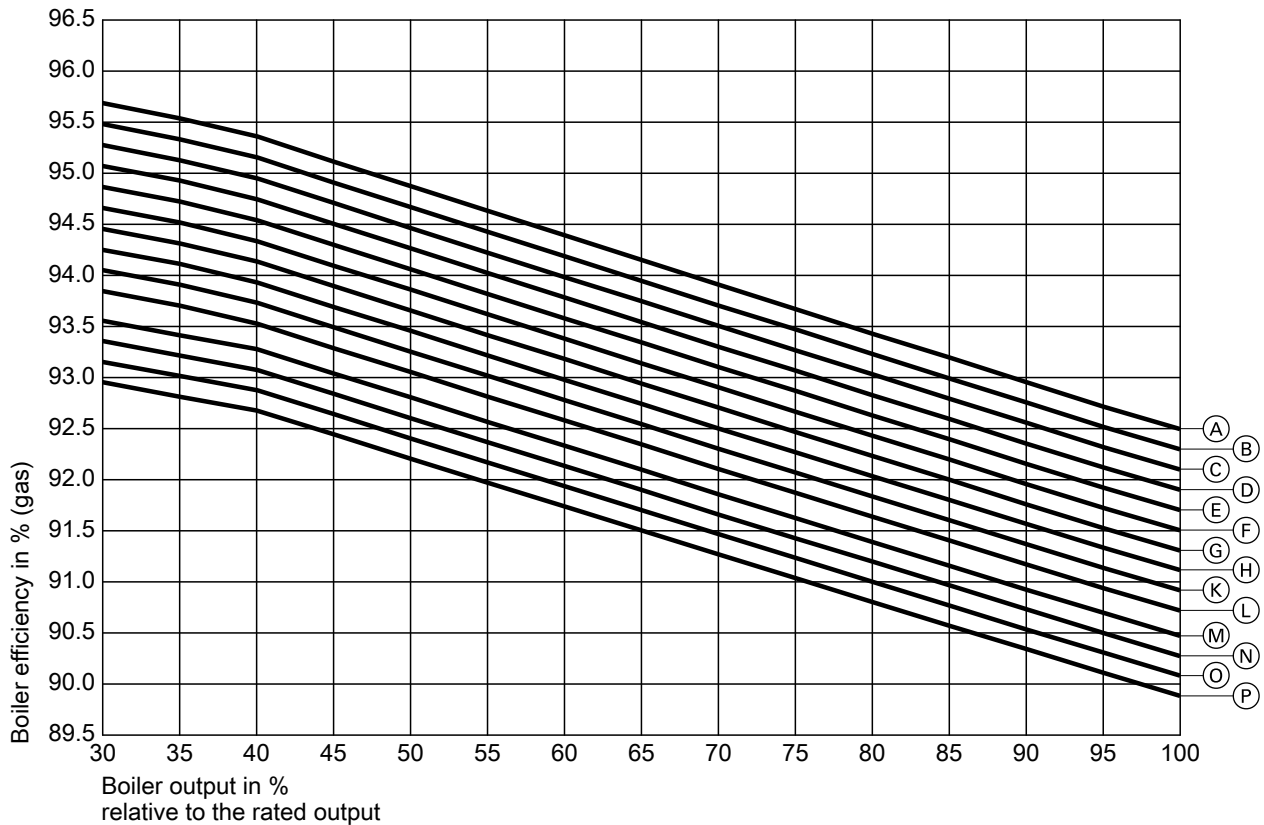


Nominal diameter of boiler flow and return connectors

- (A) DN 40
- (B) DN 50
- (C) DN 65
- (D) DN 80
- (E) DN 100
- (F) DN 125
- (G) DN 150
- (H) DN 200
- (K) DN 250
- (L) DN 300
- (M) DN 350
- (N) DN 400
- (O) DN 450
- (P) DN 500

Boiler performance data (cont.)

Boiler efficiency



Boiler efficiency with a spread of 20 K and with natural gas O₂ content 3.0 %

Ⓐ 70 °C	Ⓗ 105 °C
Ⓑ 75 °C	Ⓚ 110 °C
Ⓒ 80 °C	Ⓛ 115 °C
Ⓓ 85 °C	Ⓜ 120 °C
Ⓔ 90 °C	Ⓝ 125 °C
Ⓕ 95 °C	Ⓓ 130 °C
Ⓖ 100 °C	Ⓟ 135 °C

Boiler efficiency calculation

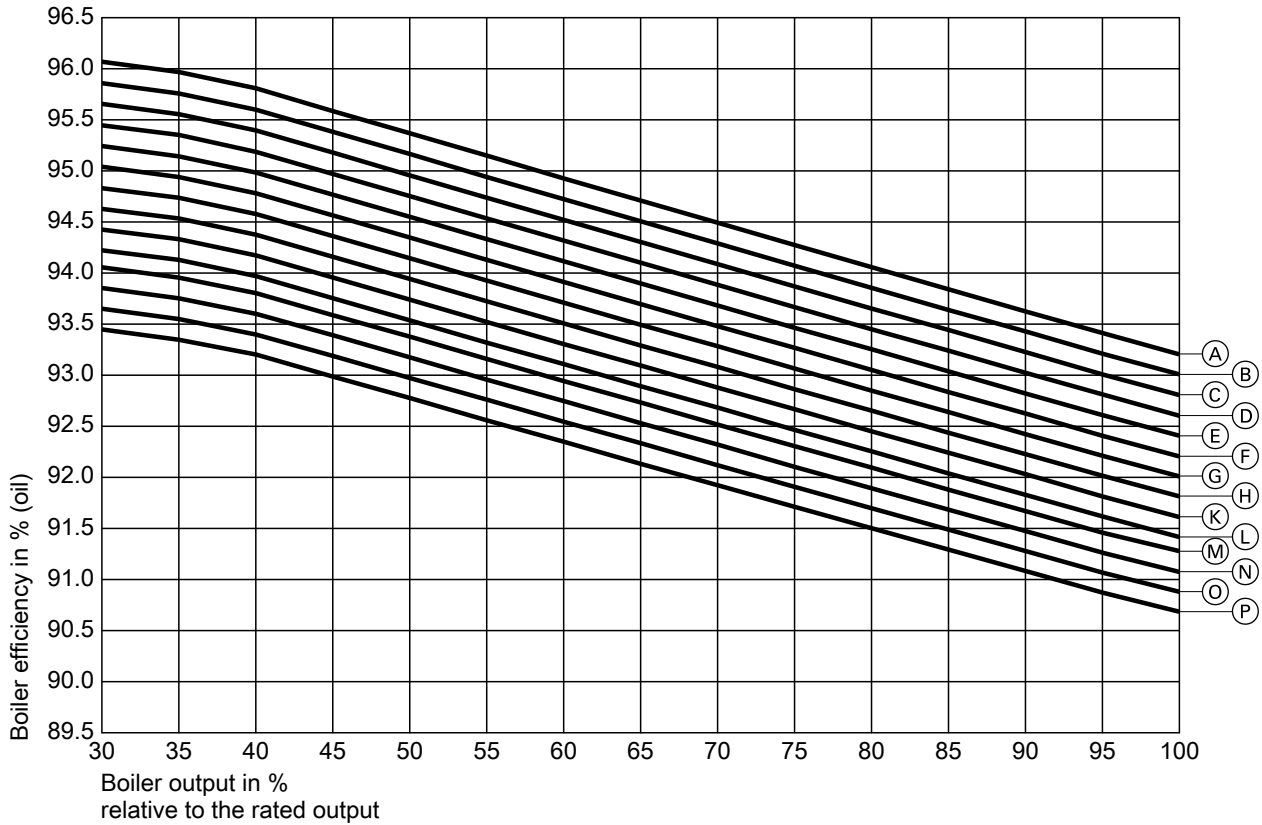
The boiler efficiency levels given are calculated as follows: Boiler efficiency = 100 % - flue gas loss (%) - radiation loss (%)

The radiation losses are calculated according to EN 12953-11.

Efficiency increase

- With 40 K spread while maintaining the flow temperature and 100 % load: + 0.4 %
- With 30 K spread while maintaining the flow temperature and 100 % load: + 0.2 %

Boiler performance data (cont.)



Boiler efficiency with a spread of 20 K and with EI fuel oil O₂ content 3.0 %

- | | |
|----------|----------|
| Ⓐ 70 °C | Ⓗ 105 °C |
| Ⓑ 75 °C | Ⓚ 110 °C |
| Ⓒ 80 °C | Ⓛ 115 °C |
| Ⓓ 85 °C | Ⓜ 120 °C |
| Ⓔ 90 °C | Ⓝ 125 °C |
| Ⓕ 95 °C | Ⓓ 130 °C |
| Ⓖ 100 °C | Ⓟ 135 °C |

Boiler efficiency calculation

The boiler efficiency levels given are calculated as follows: Boiler efficiency = 100 % - flue gas loss (%) - radiation loss (%)

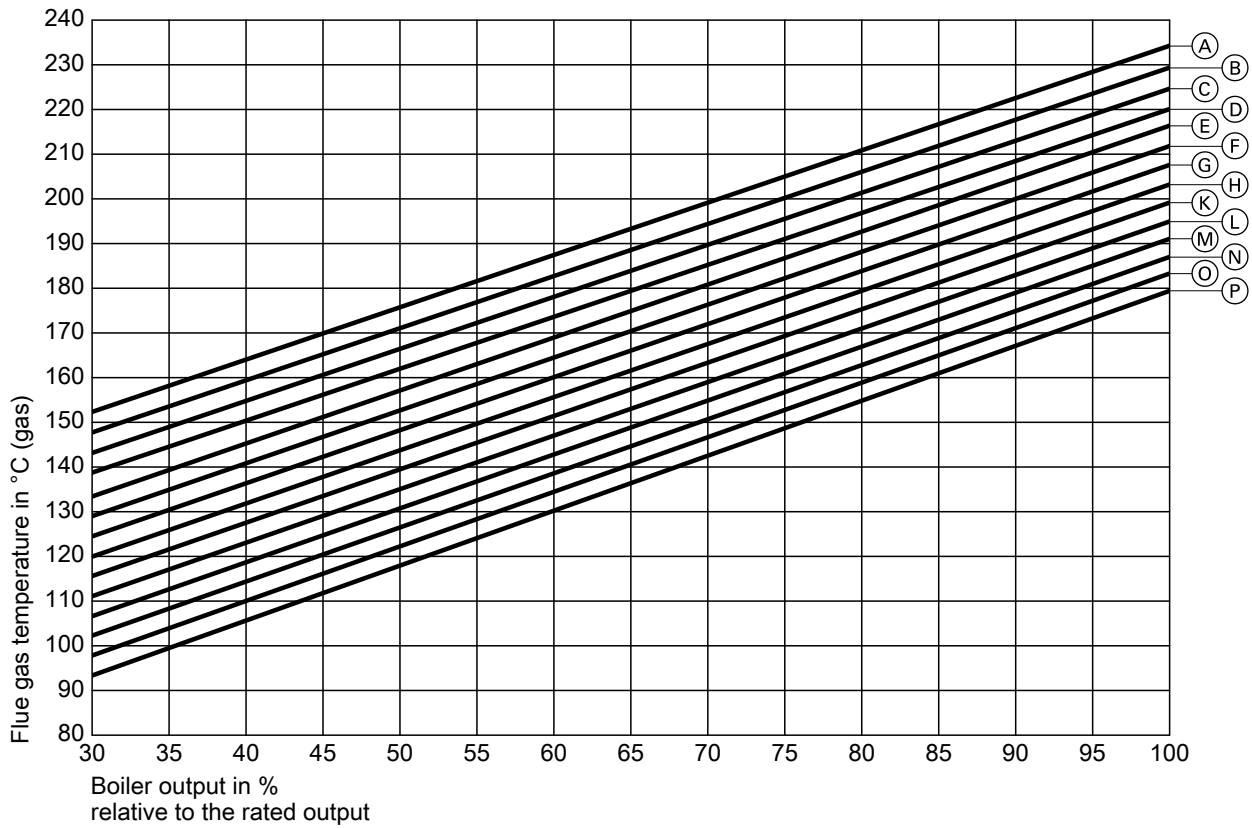
The radiation losses are calculated according to EN 12953-11.

Efficiency increase

- With 40 K spread while maintaining the flow temperature and 100 % load: + 0.4 %
- With 30 K spread while maintaining the flow temperature and 100 % load: + 0.2 %

Boiler performance data (cont.)

Flue gas temperature



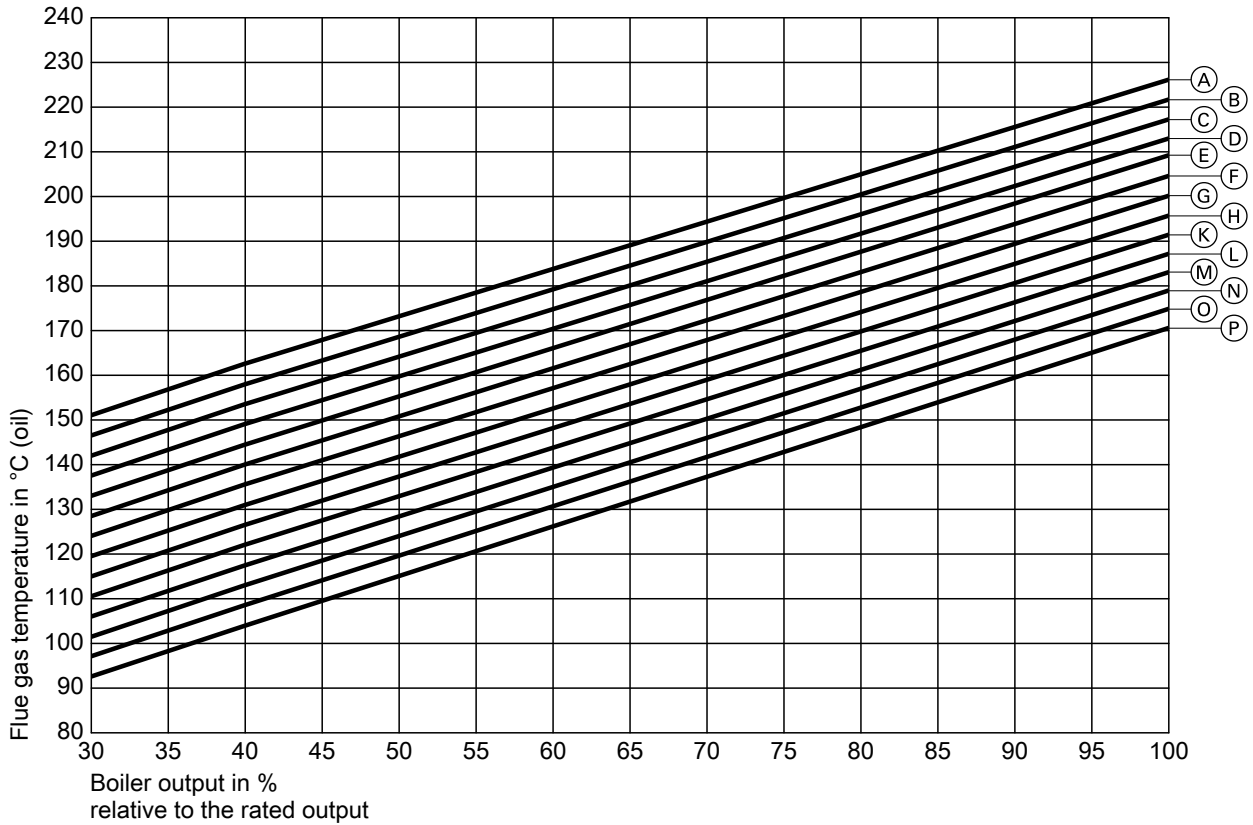
Flue gas temperature with a spread of 20 K and with natural gas O₂ content 3.0 %

Ⓐ 135 °C	Ⓗ 100 °C
Ⓑ 130 °C	Ⓚ 95 °C
Ⓒ 125 °C	Ⓛ 90 °C
Ⓓ 120 °C	Ⓜ 85 °C
Ⓔ 115 °C	Ⓝ 80 °C
Ⓕ 110 °C	Ⓓ 75 °C
Ⓖ 105 °C	Ⓟ 70 °C

Reduction in flue gas temperature

- With 40 K spread while maintaining the flow temperature and 100 % load: - 8.5 °C
- With 30 K spread while maintaining the flow temperature and 100 % load: - 4.0 °C

Boiler performance data (cont.)



Flue gas temperature with a spread of 20 K and with EL fuel oil O₂ content 3.0 %

Ⓐ 135 °C	Ⓗ 100 °C
Ⓑ 130 °C	Ⓚ 95 °C
Ⓒ 125 °C	Ⓛ 90 °C
Ⓓ 120 °C	Ⓜ 85 °C
Ⓔ 115 °C	Ⓝ 80 °C
Ⓕ 110 °C	Ⓓ 75 °C
Ⓖ 105 °C	Ⓟ 70 °C

Reduction in flue gas temperature

- With 40 K spread while maintaining the flow temperature and 100 % load: - 8.5 °C
- With 30 K spread while maintaining the flow temperature and 100 % load: - 4.0 °C

Operating conditions

Operating conditions		Requirements/notes
1.	Heating water flow rate	No minimum heating water flow rate required
2.	Boiler return temperature For gas and oil operation	65 °C
3.	Lower boiler water temperature	70 °C
4.	Max. temperature spread For gas and oil operation	50 K
5.	Multi stage burner operation	None
6.	Modulating burner operation	None
7.	Reduced mode	
	Single boiler system	Operation with lower boiler water temperature
	Multi boiler system	
	– Lead boiler	Operation with lower boiler water temperature
	– Lag boiler	Lag boilers can be shut down
	Weekend setback	See reduced mode

Operating conditions (cont.)

Note

The achievable flow temperature is approx. 15 K below the permissible flow temperature (= safety temperature).

Note

For combustion of heavy fuel oil S to DIN 51603-5, the average boiler water temperature must be at least 90 °C.



See chapter "Requirements and standard values for water quality" in the technical guide

Permissible flow temperatures

Hot water boiler for permissible flow temperatures (= safety temperatures)

- **Up to 150 °C**
 - Identification: In accordance with the Pressure Equipment Directive (EU)



Further information on design/engineering
See the technical guide to this boiler

Tested quality

CE CE designation according to the Pressure Equipment Directive.

Standard delivery

Standard delivery in accordance with order confirmation.

For further information on this product type, speak to your Viessmann contact.

Subject to technical modifications.

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