VIESSMANN

VITOCELL

DHW cylinders

Technical guide

File in: Vitotec technical guide folder, register 5

Central DHW heating with Viessmann DHW cylinders

Vitocell-H 100
Horizontal DHW cylinder constructed from steel, with Ceraprotect enamel finish and internal indirect coil,
130, 160 and 200 litres capacity

Vitocell-V 100
Vertical DHW cylinder constructed from steel, with Ceraprotect enamel finish and internal indirect coil,
160 and 200 litres capacity: without flanged port
300, 500, 750 and 1000 litres capacity: with flanged port

Vitocell-H 300
Horizontal stainless steel DHW cylinder with internal indirect coil,
160, 200, 350 and 500 litres capacity

Vitocell-V 300
Vertical stainless steel domestic hot water cylinder
130, 160 and 200 litres capacity: external indirect coils, without flanged port
200, 300 and 500 litres capacity: internal indirect coils, with flanged port

5822 184-2 GB 4/2003

Contents

5822 184 GB

1.1 Vitocell-H 100 (type CHA)

130, 160 and 200 litres capacity
(with internal indirect coil)
Horizontal DHW cylinder with internal indirect coil(s).
Cylinder and heating surfaces made from steel, with Ceraprotect enamel finish and sacrificial magnesium anode.

The DHW cylinders feature wrap-around rigid expanded polyurethane foam insulation enclosed within an epoxy resin coated sheet steel casing in Vitosilver.

1.2 Vitocell-V 100 (type CVA)

160, 200 and 300 litres capacity
(with internal indirect coil)
Vertical DHW cylinder with internal indirect coil(s).
Cylinder and heating surfaces made from steel, with Ceraprotect enamel finish and sacrificial magnesium anode.
The DHW cylinders feature wrap-around rigid expanded polyurethane foam insulation enclosed within an epoxy resin coated sheet steel casing in Vitosilver or white.

500, 750 and 1000 litres capacity
(with internal indirect coil)
Vertical DHW cylinder with internal indirect coil(s).
Cylinder and heating surfaces made from steel, with Ceraprotect enamel finish and sacrificial magnesium anode.
The cylinders feature wrap-around plastic-coated soft polyurethane foam insulation in Vitosilver.

Cylinder banks
Vitocell-V 100, 300 to 1000 litres capacity can be combined
- for 300 and 500 litres capacity through ready to assemble and
- for 750 and 1000 litres capacity through on-site primary and secondary headers into cylinder banks.

The DHW cylinders are supplied as individual units for easy handling and installation.

1.3 Vitocell-H 300 (type EHA)

160, 200, 350 and 500 litres capacity
(with internal indirect coil)
Horizontal DHW cylinder made from high-alloy stainless steel with internal indirect coil(s).

The DHW cylinders feature wrap-around rigid expanded polyurethane foam insulation enclosed within an epoxy resin coated sheet steel casing in Vitosilver.

Cylinder banks
Vitocell-H 300, 350 and 500 litres capacity can be combined into cylinder banks through on-site primary and secondary headers.
The DHW cylinders are supplied as individual units for easy handling and installation.

1.4 Vitocell-V 300 (type EVA)

130, 160 and 200 litres capacity
(with external indirect coil)
Vertical DHW cylinder constructed on the secondary side from high-alloy stainless steel with external indirect coil.

The DHW cylinders feature wrap-around rigid expanded polyurethane foam insulation enclosed within an epoxy resin coated sheet steel casing in Vitosilver.
Vitocell-V 300 with 160 and 200 litres capacity, also available in white.

1.5 Vitocell-V 300 (type EVI)

200, 300 and 500 litres capacity
(with internal indirect coil)
Vertical DHW cylinder made from high-alloy stainless steel with internal indirect coil.

- Vitocell-V 300, 200 and 300 litres capacity feature all-round thermal insulation covered by an epoxy coated sheet steel casing in Vitosilver.
- Vitocell-V 300, 500 litres capacity feature all-round soft polyurethane foam thermal insulation covered by an epoxy coated sheet steel casing in Vitosilver.

Cylinder banks
Vitocell-V 300 with 300 and 500 litres capacity can be combined into cylinder banks through ready to assemble primary and secondary headers.
The DHW cylinders are supplied as individual units for easy handling and installation.

1.6 Heat transfer surface

The corrosion-resistant, protected heat transfer surface of the Vitocell DHW cylinders (DHW/heat transfer medium) corresponds to type C acc. to DIN 1988-2.

1.7 Warranty

Our DHW cylinder warranty requires that
- the water heated must be of drinking water quality,
- any water treatment equipment in use functions properly.

2.1 Specification Vitocell-H 100

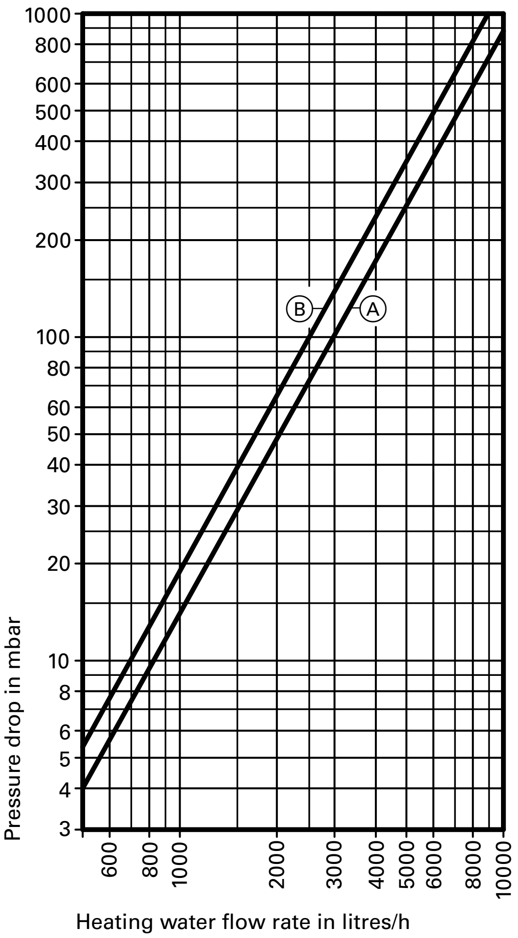
For DHW applications in conjunction with boilers

Suitable for heating systems to DIN 4753 with
- max. heating water flow temperature **110 °C**
- DHW up to **95 °C**
- **primary circuit** operating pressure up to **10 bar**
- **secondary circuit** operating pressure up to **10 bar**

Capacity		litres	130	160	200
Continuous output*1 for DHW temperature rise from **10 to 45 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW l/h	28 688	33 810	42 1032
	80 °C	kW l/h	23 565	28 688	32 786
	70 °C	kW l/h	19 466	22 540	26 638
	60 °C	kW l/h	14 344	16 393	18 442
Continuous output*1 for DHW temperature rise from **10 to 60 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW l/h	27 464	32 550	38 653
	80 °C	kW l/h	20 344	24 412	29 498
	70 °C	kW l/h	14 241	17 292	19 326
Heating water throughput for continuous output stated		m^3/h	3.0	3.0	3.0
Standby loss q_{BS} at 45 K temp. difference		kWh/24 h	1.20	1.30	1.50
Performance factor N_L*2 acc. to DIN 4708 Without return temperature limit Cylinder storage temperature*2 = Cold water flow temperature +50 K $^{+5\,K}_{0\,K}$ at **heating water flow temperature**	90 °C		1.3	2.2	3.5
	80 °C		1.3	2.2	3.5
	70 °C		1.1	1.6	2.5
Max. DHW draw-off rate (over 10 min. period) Based on performance factor N_L With re-heating Raising DHW temperature from 10 to 45 °C at **heating water flow temperature**	90 °C	litres/min	16	20	24
	80 °C	litres/min	16	20	24
	70 °C	litres/min	15	17	21
Draw-off rate Cylinder contents heated to 60 °C Without re-heating		litres/min	10	10	10
Drawable water volume Cylinder contents heated to 60 °C Without re-heating Water at t = 60 °C (constant)		litres	100	145	180
Short-term draw-off rate (over a 10minute period) Based on performance factor N_L DHW temperature rise from 10 to 45 °C Without return temperature limit at **heating water flow temperature**	90 °C	litres/10 minutes	159	199	246
	80 °C	litres/10 minutes	159	199	246
	70 °C	litres/10 minutes	148	173	210

**1 For constant output at alternative heating water flow rates, see diagrams on page 7. When planning for the constant output as stated or calculated, allow for the corresponding circulation pump. The stated continuous output is only achieved when the rated output of the boiler is equal to or greater than the continuous output.*
**2 The performance factor N_L varies according to the cylinder storage temperature Tsp.*
Guide values: Tsp = 60 °C → 1.0 × N_L Tsp = 55 °C → 0.75 × N_L Tsp = 50 °C → 0.55 × N_L Tsp = 45 °C → 0.3 × N_L.

Primary circuit pressure drop



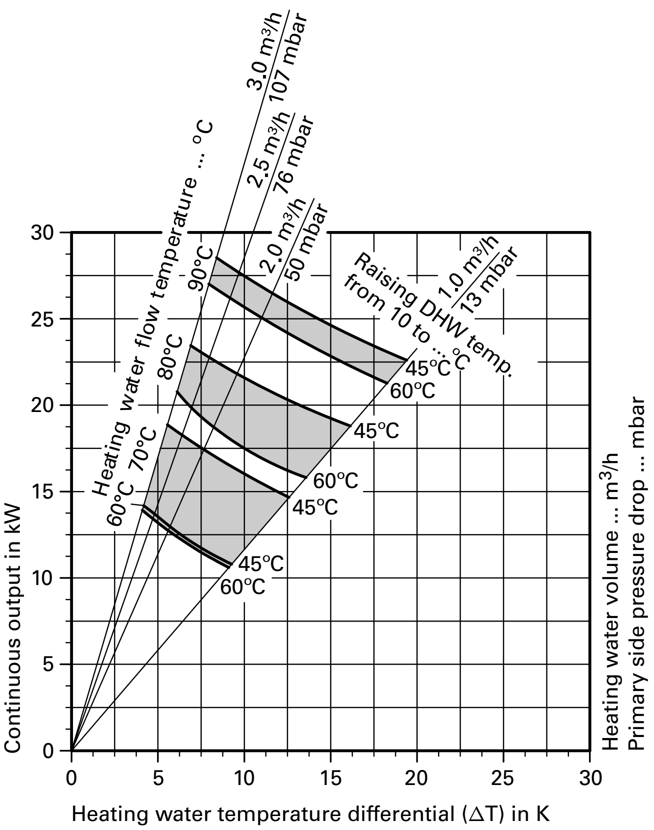
Ⓐ 130 litres capacity
Ⓑ 160 and 200 litres capacity

5822 184 GB

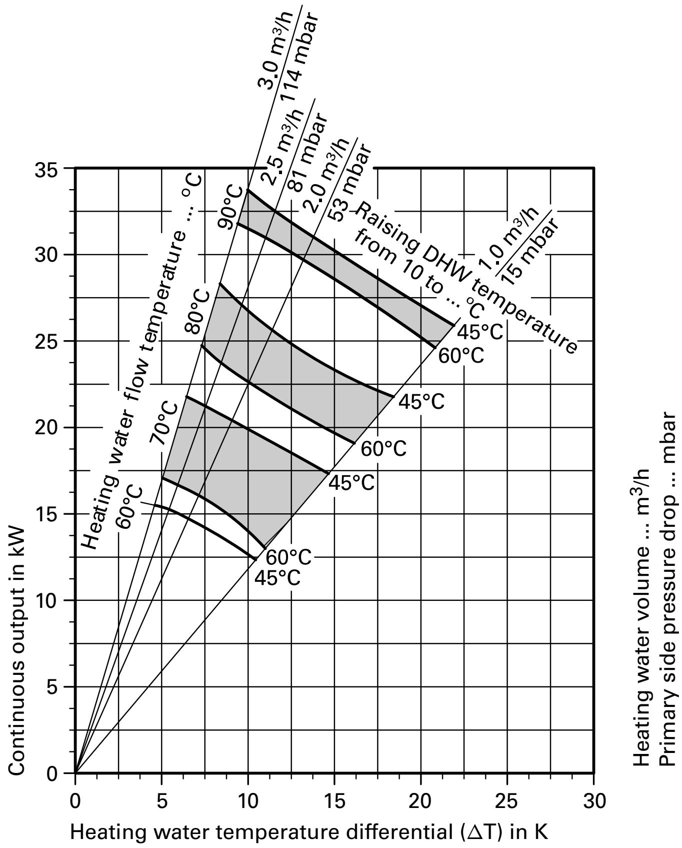
Continuous output

When planning for the max. continuous output, allow for the corresponding circulation pump.

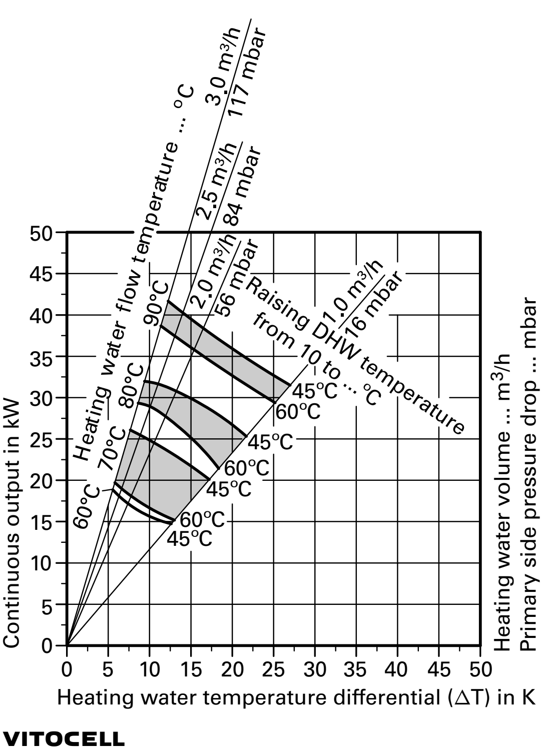
Vitocell-H 100 with 130 litres capacity



Vitocell-H 100 with 160 litres capacity



Vitocell-H 100 with 200 litres capacity



5822 184 GB

2.2 Specification Vitocell-V 100

For DHW applications in conjunction with boilers, district and low temperature heating systems, available with electric immersion heater as accessory for DHW cylinders with 300 and 500 litres capacity

Suitable for heating systems to DIN 4753 with
- heating water flow temperature up to **160 °C**
- **primary circuit** operating pressure up to **25 bar**
- **secondary circuit** operating pressure up to **10 bar**

Capacity		litres	160	200	300	500	750	1000
Continuous output*1 for DHW temperature rise from **10 to 45 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW	40	40	53	70	123	136
		l/h	982	982	1302	1720	3022	3341
	80 °C	kW	32	32	44	58	99	111
		l/h	786	786	1081	1425	2432	2725
	70 °C	kW	25	25	33	45	75	86
		l/h	614	614	811	1106	1843	2113
	60 °C	kW	17	17	23	32	53	59
		l/h	417	417	565	786	1302	1450
	50 °C	kW	9	9	18	24	28	33
		l/h	221	221	442	589	688	810
Continuous output*1 for DHW temperature rise from **10 to 60 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW	36	36	45	53	102	121
		l/h	619	619	774	911	1754	2081
	80 °C	kW	28	28	34	44	77	91
		l/h	482	482	584	756	1324	1565
	70 °C	kW	19	19	23	33	53	61
		l/h	327	327	395	567	912	1050
Heating water throughput for continuous output stated		m^3/h	3.0	3.0	3.0	3.0	5.0	5.0
Standby loss q_{BS} at 45 K temp. difference		kWh/24 h	1.50	1.70	2.20	3.10	3.23*2	3.57*2
Performance factor N_L*3 acc. to DIN 4708 Without return temperature limit Cylinder storage temperature*3 = Cold water flow temperature +50 K $^{+5\,K}_{0\,K}$ at **heating water flow temperature**	90 °C		2.5	4.0	9.7	21.0	34.0	43.0
	80 °C		2.4	3.7	9.3	19.0	31.0	42.0
	70 °C		2.2	3.5	8.7	16.5	24.5	38.0
Max. DHW draw-off rate (over 10 min. period) Based on performance factor N_L With re-heating for DHW temperature rise from 10 to 45 °C at **heating water flow temperature**	90 °C	litres/min	21	26	41	62	81	94
	80 °C	litres/min	21	25	40	58	77	92
	70 °C	litres/min	20	25	39	54	67	87
Draw-off rate Cylinder contents heated to 60 °C Without re-heating		litres/min	10	10	15	15	20	20
Drawable water volume Cylinder contents heated to 60 °C Without re-heating Water at t = 60 °C (constant)		litres	120	145	240	420	500	600
Short-term draw-off rate (over 10 min. period) Based on performance factor N_L DHW temperature rise from 10 to 45 °C Without return temperature limit at **heating water flow temperature**	90 °C	litres/10 minutes	210	262	407	618	814	939
	80 °C	litres/10 minutes	207	252	399	583	769	923
	70 °C	litres/10 minutes	199	246	385	540	672	870

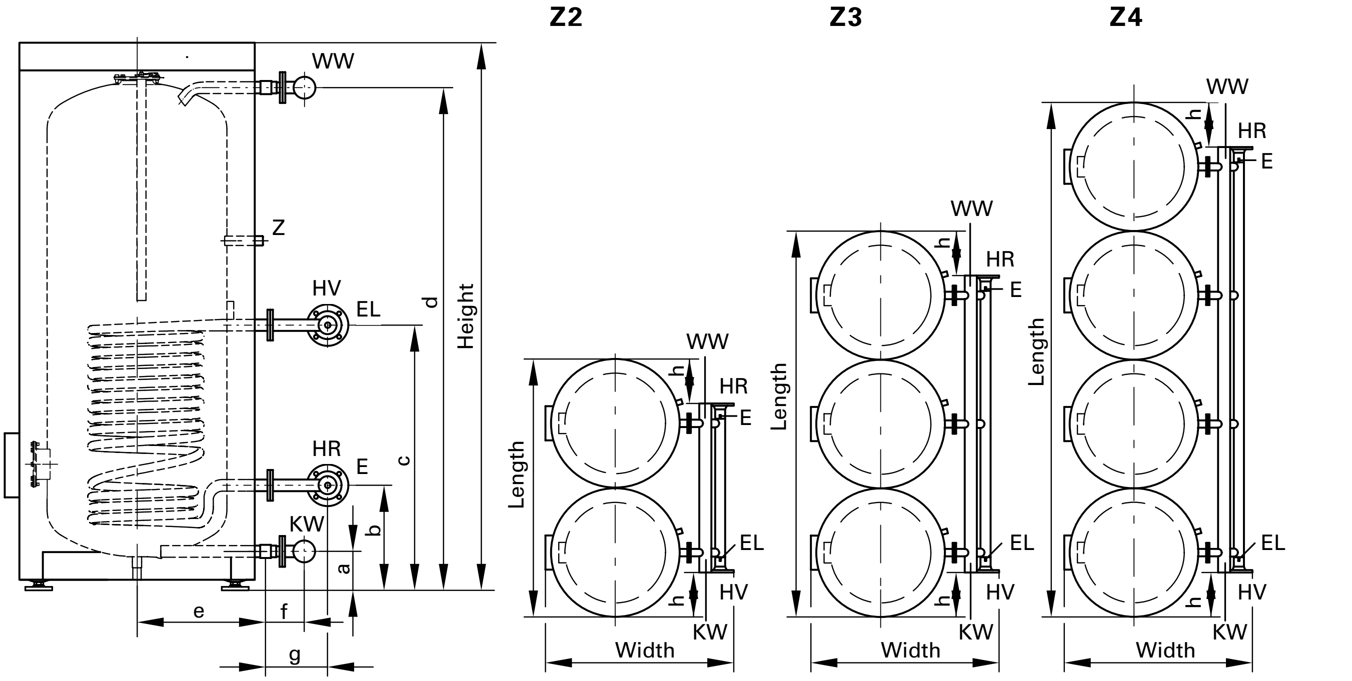
*1 *For continuous output at an alternative heating water throughput, see diagrams on pages 13 and 14. When planning for the continuous output as stated or calculated, allow for the corresponding circulation pump. The stated continuous output is only achieved when the rated output of the boiler is equal to or greater than the continuous output.*
*2 *Standard characteristics.*
*3 *The performance factor N_L varies according to the cylinder storage temperature Tsp.*
Guide values: Tsp = 60 °C → 1.0 × N_L Tsp = 55 °C → 0.75 × N_L Tsp = 50 °C → 0.55 × N_L Tsp = 45 °C → 0.3 × N_L.

Vitocell-V 100 as a cylinder bank

Cylinder bank with Vitocell-V 100 with 300 and 500 litres capacity

DHW cylinders with capacities of 300 and 500 litres can be combined into batteries of up to 2 or 4 cylinders. The primary and secondary headers are available ex works and must be ordered separately. Batteries consisting of more than 4 cylinders are possible by combining several sub-batteries of up to 4 cylinders each. The connection of these cylinder banks on the primary and secondary side forms part of the installation work for which the customer is responsible.

Example: 500 litres capacity



Side view

Plan view

Key

E Drain (female thread R ½″)
EL Air vent valve (female thread R ½″)
HR Heating water return
HV Heating water flow
KW Cold water
WW Hot water
Z Circulation

Dimensions

Capacity	litres	300	500		
Total capacity of cylinder bank	litres	600	1000	1500	2000
Number of cylinders		2	2	3	4
Length	mm	1461	1838	2826	3814
Width	mm	1109	1218	1218	1237
Height	mm	1748	1955	1955	1955
a	mm	76	107	107	107
b	mm	260	349	349	349
c	mm	875	924	924	924
d	mm	1600	1784	1784	1784
e	mm	343	455	455	455
f	mm	127	130	135	139
g	mm	237	237	237	246
h	mm	206	315	315	315

2.2 Specification
Vitocell-V 100

Capacity		litres	300	500		
Total capacity of cylinder bank		litres	600	1000	1500	2000
Number of cylinders Layout			2 ●●	2 ●●	3 ●●●	4 ●●●●
Continuous output*1 for DHW temperature rise from **10 to 45 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW l/h	106 2604	140 3440	210 5160	280 6880
	80 °C	kW l/h	88 2162	116 2850	174 4275	232 5700
	70 °C	kW l/h	66 1622	90 2212	135 3318	180 4424
	60 °C	kW l/h	46 1130	64 1572	96 2358	128 3144
	50 °C	kW l/h	36 884	48 1178	72 1767	96 2356
Continuous output*1 for DHW temperature rise from **10 to 60 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW l/h	90 1548	106 1822	159 2733	212 3644
	80 °C	kW l/h	68 1168	88 1512	132 2268	176 3024
	70 °C	kW l/h	46 790	66 1134	99 1701	132 2268
Heating water throughput for continuous output stated		m^3/h	6	6	9	12
Performance factor N_L*2 acc. to DIN 4708 Without return temperature limit Cylinder storage temperature*2 = Cold water flow temperature +50 K $^{+5\,K}_{0\,K}$ at **heating water flow temperature**	90 °C		30	60	101	134
	80 °C		29	55	93	124
	70 °C		28	49	82	111
Max. DHW draw-off rate (over 10 min. period) Based on performance factor N_L With re-heating for DHW temperature rise from 10 to 45 °C at **heating water flow temperature**	90 °C	litres/min	76	115	161	195
	80 °C	litres/min	74	109	152	184
	70 °C	litres/min	73	102	140	171
Draw-off rate Cylinder contents heated to 60 °C Without re-heating		litres/min	30	30	30	45
Drawable water volume Cylinder contents heated to 60 °C Without re-heating Water at t = 60 °C (constant)		litres	480	840	1260	1680
Short-term draw-off rate (over 10 min. period) Based on performance factor N_L DHW temperature rise from 10 to 45 °C Without return temperature limit at **heating water flow temperature**	90 °C	litres/10 minutes	759	1150	1610	1948
	80 °C	litres/10 minutes	745	1088	1520	1840
	70 °C	litres/10 minutes	728	1016	1400	1710

**1 When planning for the continuous output as stated or calculated, allow for the corresponding circulation pump. The stated continuous output is only achieved when the rated output of the boiler is equal to or greater than the continuous output.*

**2 The performance factor N_L varies according to the cylinder storage temperature Tsp.*
Guide values: Tsp = 60 °C → 1.0 × N_L Tsp = 55 °C → 0.75 × N_L Tsp = 50 °C → 0.55 × N_L Tsp = 45 °C → 0.3 × N_L.

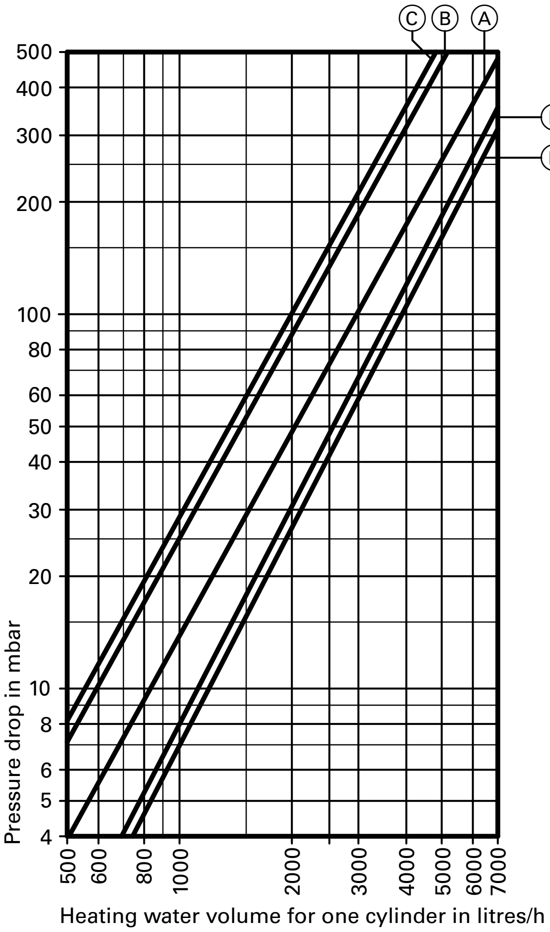
Cylinder bank with Vitocell-V 100 with 750 and 1000 litres capacity

DHW cylinders with capacities of 750 and 1000 litres can be combined into batteries of up to 2 or 4 cylinders. The connection of these cylinder banks through primary and secondary headers must be made on site. DHW cylinder banks comprising more than 4 cylinders can be constructed from several DHW cylinder banks, each comprising up to 4 cylinders. The connection of these cylinder banks on the primary and secondary side forms part of the installation work for which the customer is responsible.

Capacity		litres	750	1000		
Total capacity of cylinder bank		litres	1500	2000	3000	4000
Number of cylinders			2	2	3	4
Layout			●●	●●	●●●	●●●●
Continuous output*1 for DHW temperature rise from **10 to 45 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW	246	272	408	544
		l/h	6044	6682	10023	13364
	80 °C	kW	198	222	333	444
		l/h	4864	5450	8175	10900
	70 °C	kW	150	172	258	344
		l/h	3686	4226	6339	8452
	60 °C	kW	106	118	177	236
		l/h	2604	2900	4350	5800
	50 °C	kW	56	66	99	132
		l/h	1376	1620	2430	3240
Continuous output*1 for DHW temperature rise from **10 to 60 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW	204	242	363	484
		l/h	3508	4162	6243	8324
	80 °C	kW	154	182	273	364
		l/h	2648	3130	4695	6260
	70 °C	kW	106	122	183	244
		l/h	1824	2100	3150	4200
Heating water throughput for continuous output stated		m^3/h	10	10	15	20
Performance factor N_L*2 acc. to DIN 4708 Without return temperature limit	90 °C		90	115	178	240
	80 °C		85	113	174	220
	70 °C		68	103	162	205
Cylinder storage temperature*2 = Cold water flow temperature +50 K $^{+5\,K}_{0\,K}$ at **heating water flow temperature**						
Max. DHW draw-off rate (over 10 min. period) Based on performance factor N_L	90 °C	litres/min	149	175	240	302
	80 °C	litres/min	143	173	236	282
	70 °C	litres/min	124	163	224	267
With re-heating for DHW temperature rise from 10 to 45 °C at **heating water flow temperature**						
Draw-off rate Cylinder contents heated to 60 °C Without re-heating		litres/min	40	40	60	80
Drawable water volume Cylinder contents heated to 60 °C Without re-heating Water at t = 60 °C (constant)		litres	1000	1200	1800	2400
Short-term draw-off rate (over 10 min. period) Based on performance factor N_L	90 °C	litres/10 minutes	1485	1750	2400	3020
	80 °C	litres/10 minutes	1430	1730	2360	2820
	70 °C	litres/10 minutes	1240	1630	2240	2670
DHW temperature rise from 10 to 45 °C Without return temperature limit at **heating water flow temperature**						

**1When planning for the continuous output as stated or calculated, allow for the corresponding circulation pump. The stated continuous output is only achieved when the rated output of the boiler is equal to or greater than the continuous output.*
**2The performance factor N_L varies according to the cylinder storage temperature Tsp.*
Guide values: Tsp = 60 °C → 1.0 × N_L Tsp = 55 °C → 0.75 × N_L Tsp = 50 °C → 0.55 × N_L Tsp = 45 °C → 0.3 × N_L.

Primary circuit pressure drop



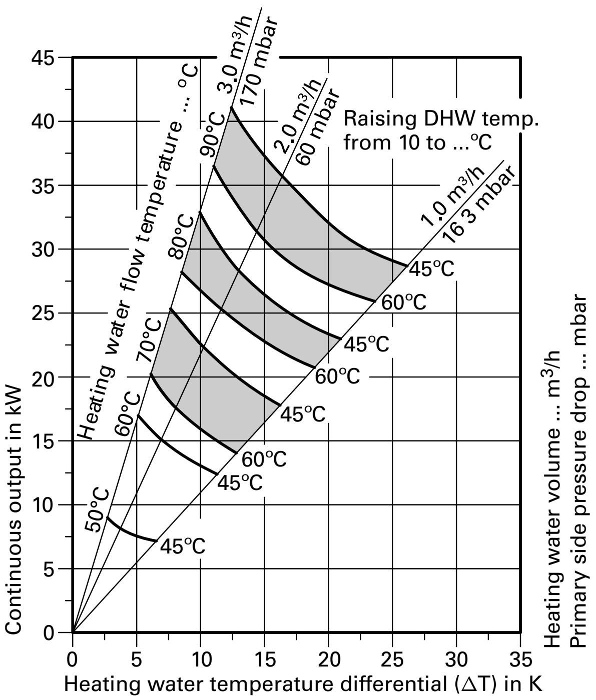
Ⓐ 160 and 200 litres capacity
Ⓑ 300 litres capacity
Ⓒ 500 litres capacity
Ⓓ 750 litres capacity
Ⓔ 1000 litres capacity

5822 184 GB

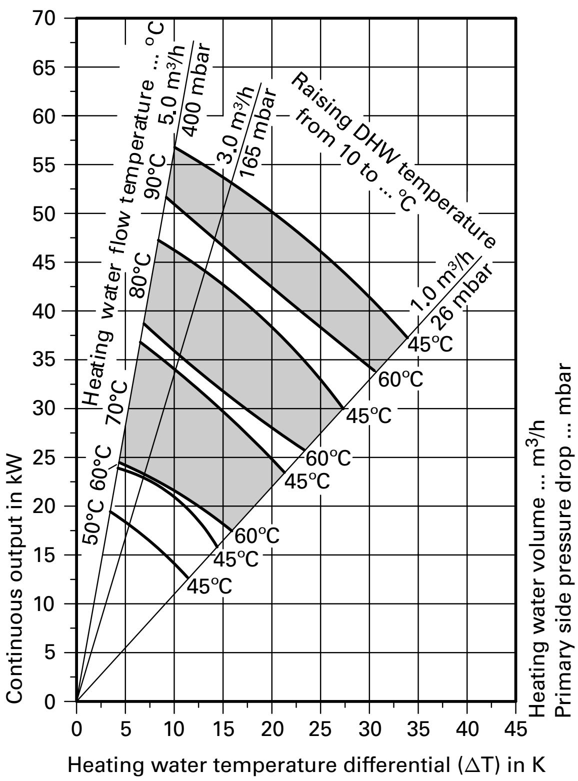
Continuous output

When planning for the max. continuous output, allow for the corresponding circulation pump.

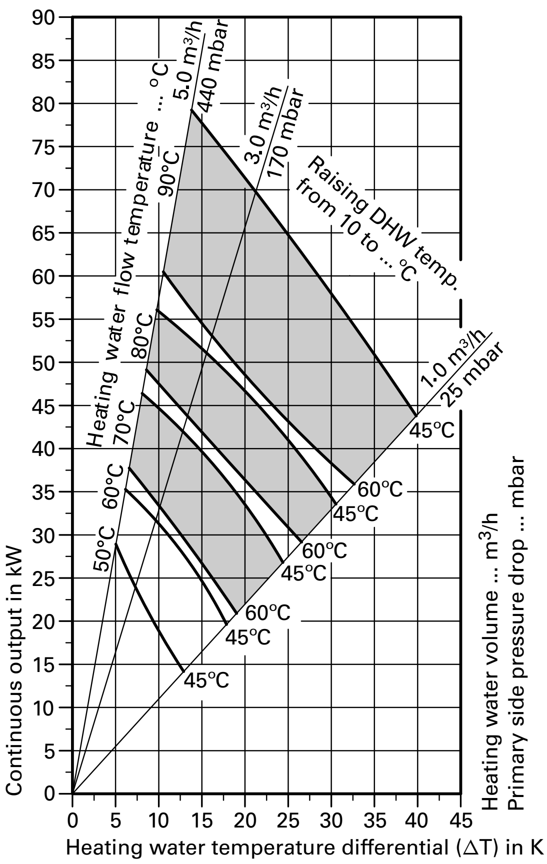
Vitocell-V 100 with 160 and 200 litres capacity



Vitocell-V 100 with 300 litres capacity



Vitocell-V 100 with 500 litres capacity



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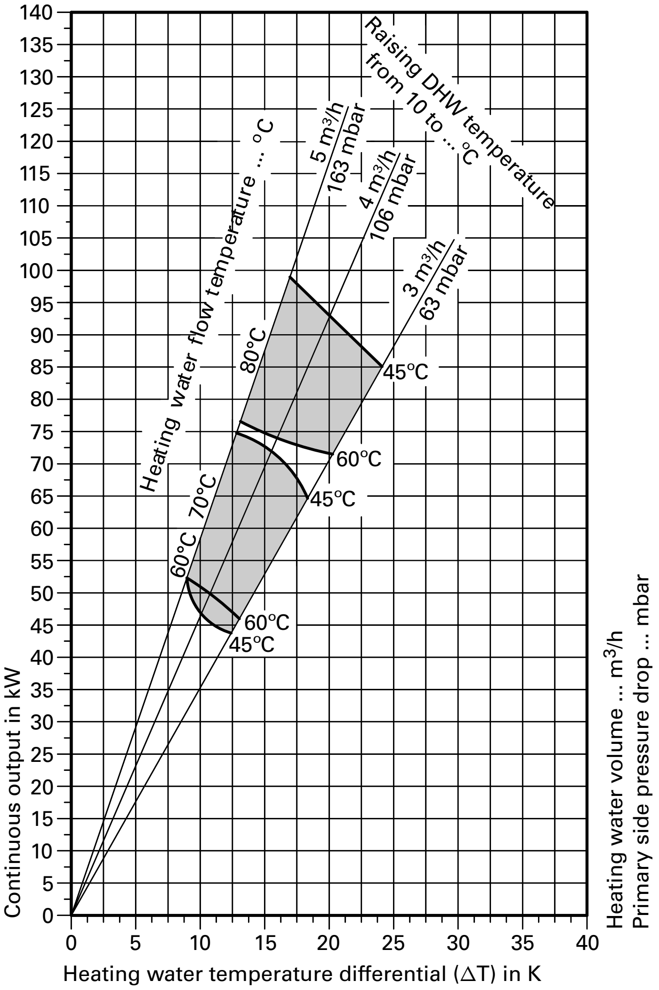
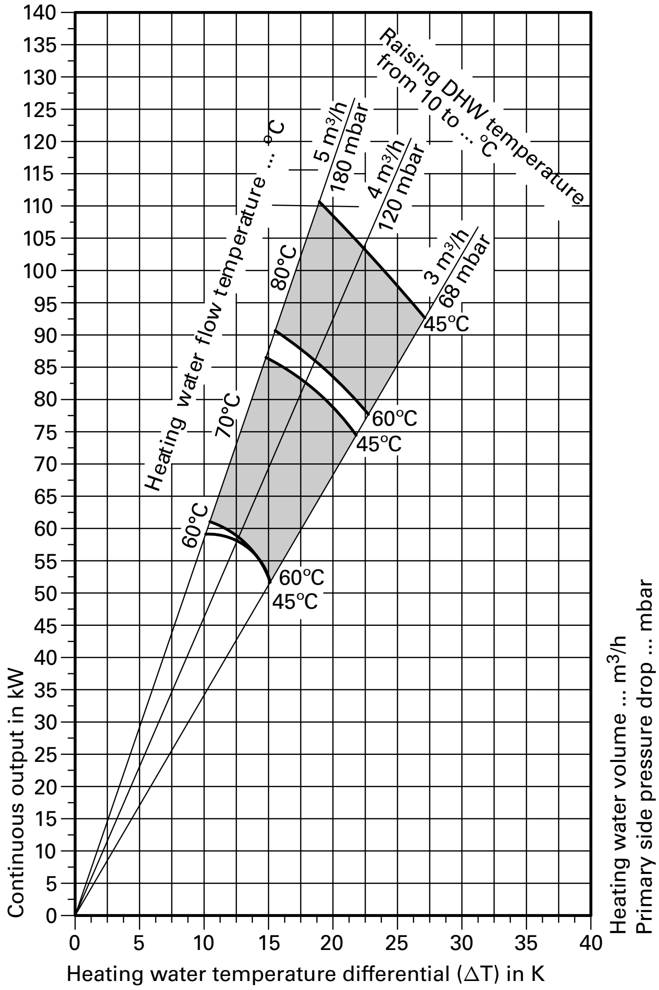
Vitocell-V 100 with 750 litres capacity



Vitocell-V 100 with 1000 litres capacity



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2.3 Specification Vitocell-H 300

For DHW applications in conjunction with boilers, district and low temperature heating systems

Suitable for heating systems to DIN 4753 with
- heating water flow temperature up to **200 °C**
- **primary circuit** operating pressure up to **25 bar** or **saturated steam** with **1 bar** pressure
- **secondary circuit** operating pressure up to **10 bar**

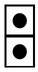
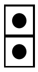
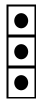
Capacity		litres	160	200	350	500
Continuous output[*1] for DHW temperature rise from **10 to 45 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW l/h	32 786	41 1007	80 1966	97 2383
	80 °C	kW l/h	28 688	30 737	64 1573	76 1867
	70 °C	kW l/h	20 490	23 565	47 1155	55 1351
	65 °C	kW l/h	17 417	19 467	40 983	46 1130
	60 °C	kW l/h	14 344	16 393	33 811	38 934
Continuous output[*1] for DHW temperature rise from **10 to 60 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW l/h	28 482	33 568	70 1204	82 1410
	80 °C	kW l/h	23 396	25 430	51 877	62 1066
	70 °C	kW l/h	15 258	17 292	34 585	39 671
Heating water throughput for continuous output stated		m^3/h	3.0	5.0	5.0	5.0
Standby loss q_{BS} at 45 K temp. difference		kWh/24 h	1.30	1.50	1.90	2.40
Performance factor N_L[*2] acc. to DIN 4708 Without return temperature limit Cylinder storage temperature[*2] = Cold water flow temperature +50 K $^{+5\,K}_{0\,K}$ at **heating water flow temperature**	90 °C		2.3	6.6	12.0	23.5
	80 °C		2.2	5.0	12.0	21.5
	70 °C		1.8	3.4	10.5	19.0
Max. DHW draw-off rate (over 10 min. period) Based on performance factor N_L With re-heating for DHW temperature rise from 10 to 45 °C at **heating water flow temperature**	90 °C	litres/min	20	33	45	66
	80 °C	litres/min	20	29	45	62
	70 °C	litres/min	18	24	42	58
Draw-off rate Cylinder contents heated to 60 °C Without re-heating		litres/min	10	10	15	15
Drawable water volume Cylinder contents heated to 60 °C Without re-heating Water at t = 60 °C (constant)		litres	150	185	315	440
Short-term draw-off rate (over 10 min. period) Based on performance factor N_L DHW temperature rise from 10 to 45 °C Without return temperature limit at **heating water flow temperature**	90 °C	litres/10 minutes	203	335	455	660
	80 °C	litres/10 minutes	199	290	455	627
	70 °C	litres/10 minutes	182	240	424	583

*1 *For continuous output at an alternative heating water throughput, see diagrams on pages 18 to 20. When planning for the continuous output as stated or calculated, allow for the corresponding circulation pump. The stated continuous output is only achieved when the rated output of the boiler is equal to or greater than the continuous output. Details of the permanent output with saturated steam upon request.*

*2 *The performance factor N_L varies according to the cylinder storage temperature Tsp. Guide values: Tsp = 60 °C → 1.0 × N_L Tsp = 55 °C → 0.75 × N_L Tsp = 50 °C → 0.55 × N_L Tsp = 45 °C → 0.3 × N_L.*

Vitocell-H 300 with 350 and 500 litres as a cylinder bank

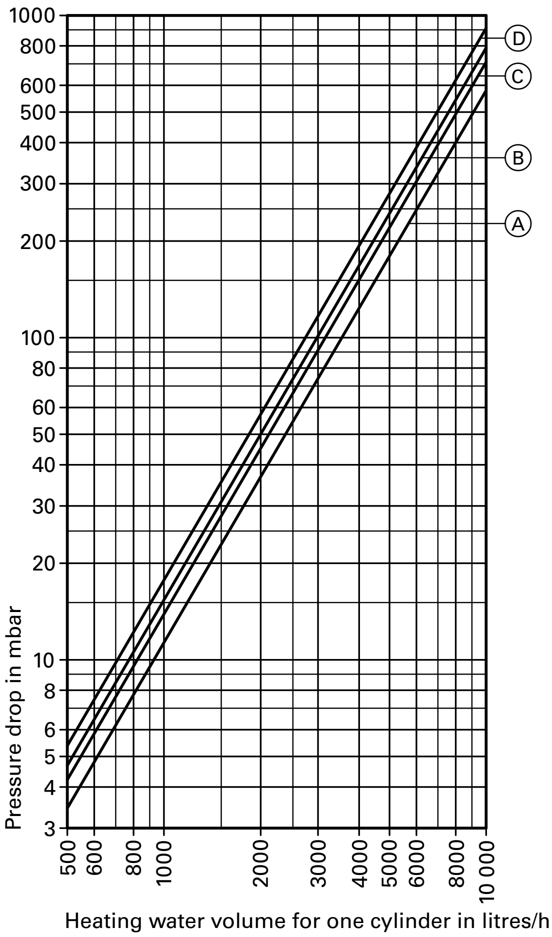
Three possible combinations are recommended below. Please observe max. no. of cylinder units stackable on top of each other.

Total capacity of cylinder bank		litres	700	1000	1500
Number of storage cylinders			2	2	3
Capacity of the individual cylinders		litres	350	500	500
Layout			max. cylinder stack 		max. cylinder stack 
Continuous output[*1] for a DHW temperature rise from **10 to 45 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW	160	194	291
		l/h	3932	4766	7149
	80 °C	kW	128	152	228
		l/h	3146	3734	5601
	70 °C	kW	94	110	165
		l/h	2310	2702	4053
	65 °C	kW	80	92	138
		l/h	1966	2260	3390
	60 °C	kW	66	76	114
		l/h	1622	1868	2802
Continuous output[*1] for DHW temperature rise from **10 to 60 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW	140	164	246
		l/h	2408	2820	4230
	80 °C	kW	102	124	186
		l/h	1754	2132	3198
	70 °C	kW	68	78	117
		l/h	1170	1342	2013
Heating water throughput for continuous output stated		m^3/h	10	10	15
Performance factor N_L[*2] acc. to DIN 4708 Without return temperature limit Cylinder storage temperature[*2] = Cold water flow temperature +50 K $^{+5\,K}_{0\,K}$ at **heating water flow temperature**	90 °C		35	64	104
	80 °C		35	59	95
	70 °C		31	52	85
Max. DHW draw-off rate (over 10 min. period) Based on performance factor N_L With re-heating for DHW temperature rise from 10 to 45 °C at **heating water flow temperature**	90 °C	litres/min	83	120	164
	80 °C	litres/min	83	114	154
	70 °C	litres/min	77	105	143
Draw-off rate Cylinder contents heated to 60 °C Without re-heating		litres/min	30	30	30
Drawable water volume Cylinder contents heated to 60 °C Without re-heating Water at t = 60 °C (constant)		litres	630	880	1320
Short-term draw-off rate (over 10 min. period) Based on performance factor N_L DHW temperature rise from 10 to 45 °C Without return temperature limit at **heating water flow temperature**	90 °C	litres/10 minutes	830	1200	1640
	80 °C	litres/10 minutes	830	1137	1545
	70 °C	litres/10 minutes	769	1050	1430

*[*1] When planning for the continuous output as stated or calculated, allow for the corresponding circulation pump. The stated continuous output is only achieved when the rated output of the boiler is equal to or greater than the continuous output. Details of the permanent output with saturated steam upon request.*
*[*2] The performance factor N_L varies according to the cylinder storage temperature Tsp.*
Guide values: Tsp = 60 °C → 1.0 × N_L Tsp = 55 °C → 0.75 × N_L Tsp = 50 °C → 0.55 × N_L Tsp = 45 °C → 0.3 × N_L.

5822 184 GB

Primary circuit pressure drop

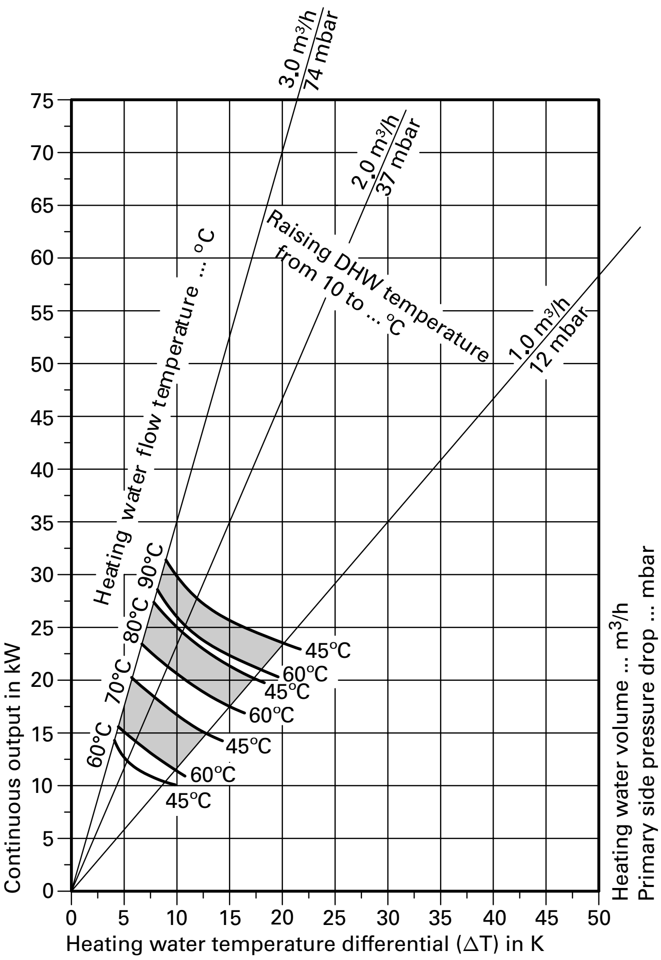


Ⓐ 160 litres capacity
Ⓑ 200 litres capacity
Ⓒ 350 litres capacity
Ⓓ 500 litres capacity

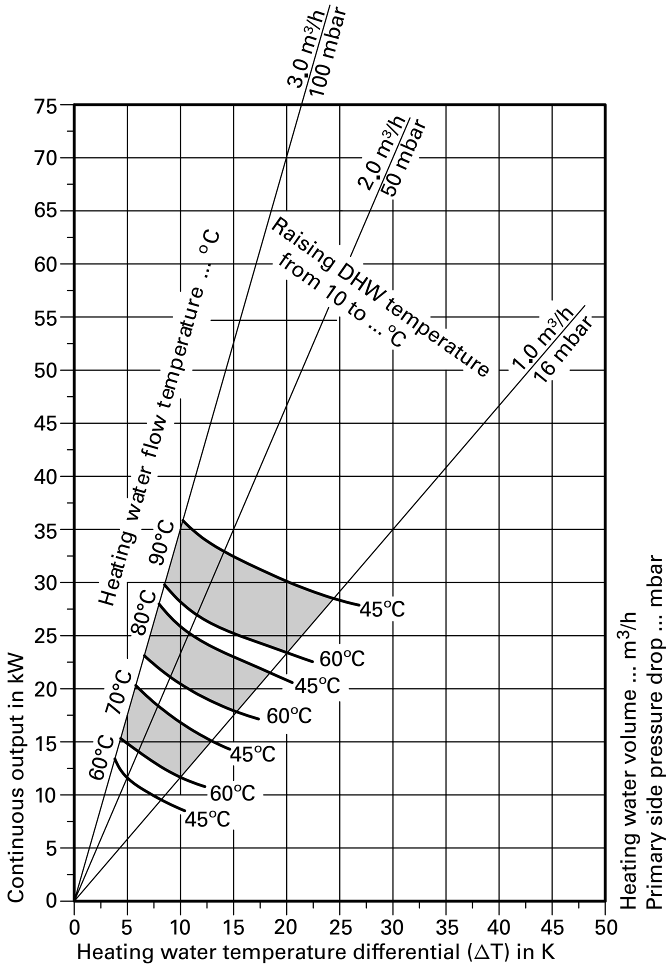
Continuous output

When planning for the max. continuous output, allow for the corresponding circulation pump.

Vitocell-H 300 with 160 litres capacity

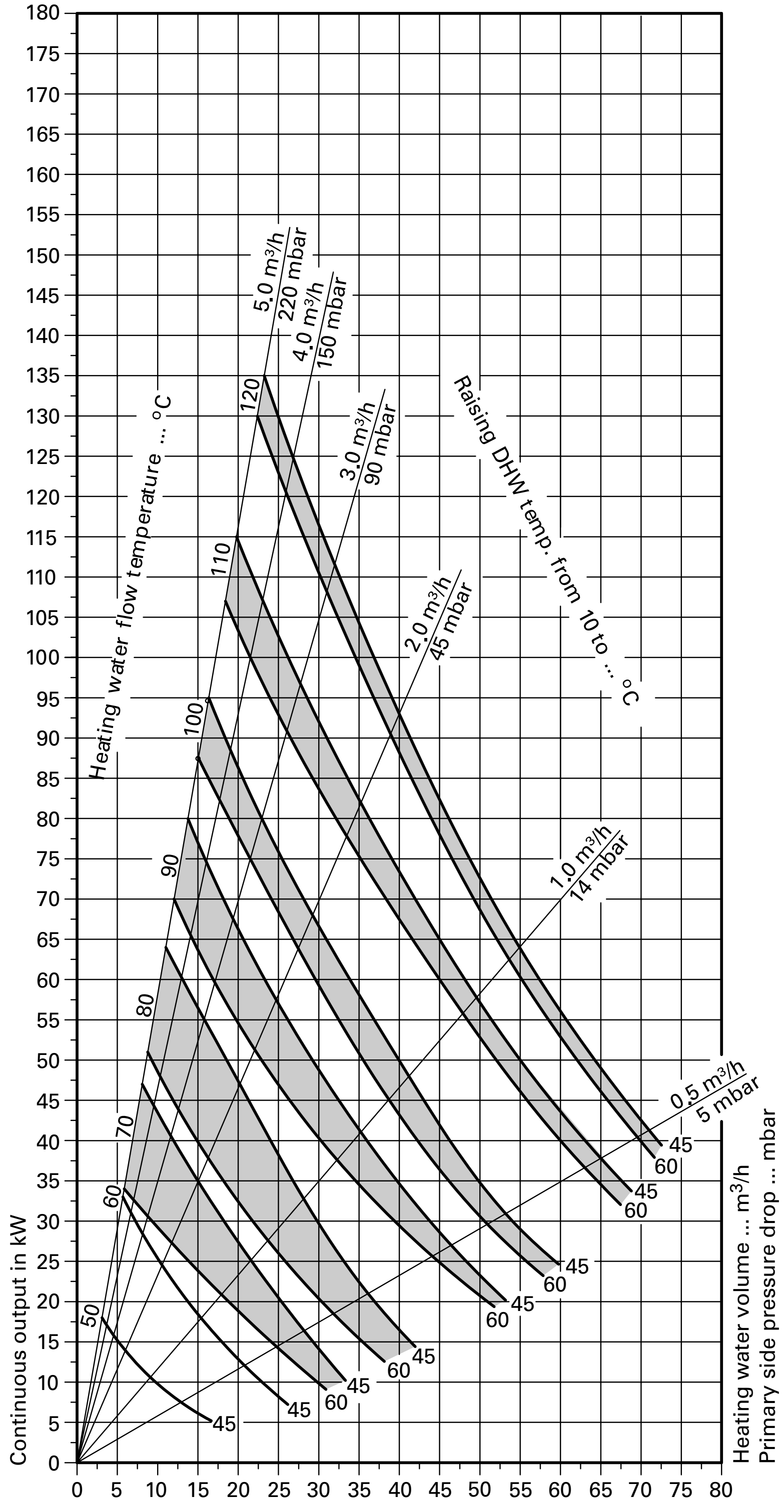


Vitocell-H 300 with 200 litres capacity

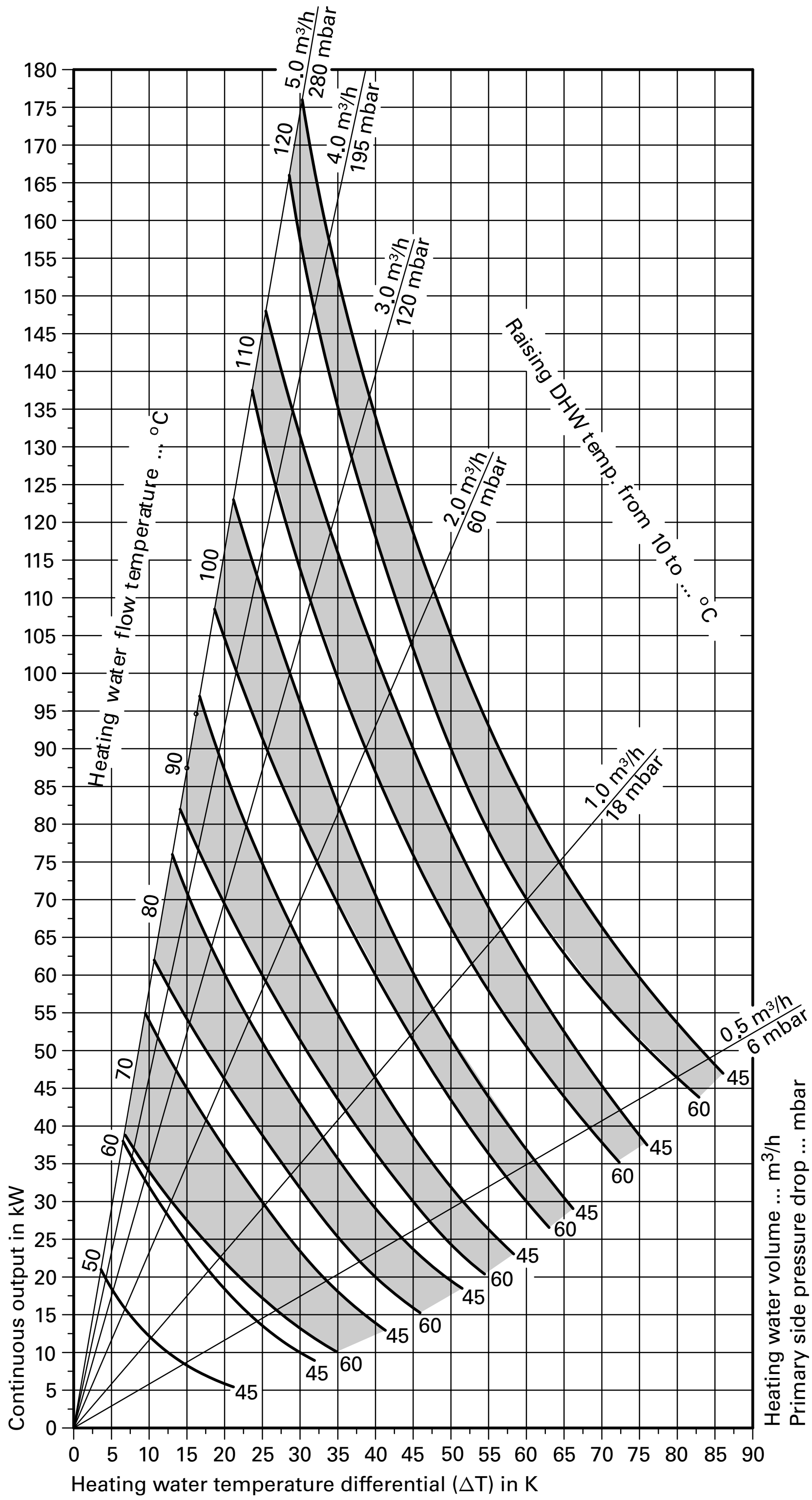


5822 184 GB

Vitocell-H 300 with 350 litres capacity



Vitocell-H 300 with 500 litres capacity



2.4 Specification Vitocell-V 300

Vitocell-V 300 (type EVA), with external indirect coil (peripheral heating)

For DHW applications in conjunction with boilers

Suitable for heating systems to DIN 4753 with
- max. heating water flow temperature **110 °C**
- **primary circuit** operating pressure up to **3 bar**
- **secondary circuit** operating pressure up to **10 bar**

Capacity		litres	130	160	200
Continuous output[*1] when raising DHW temp. from **10 to 45 °C** and **heating water** flow temperature from .... at heating water throughput stated below	90 °C	kW l/h	37 909	40 982	62 1523
	80 °C	kW l/h	30 737	32 786	49 1024
	70 °C	kW l/h	22 540	24 589	38 933
	60 °C	kW l/h	13 319	15 368	25 614
	50 °C	kW l/h	9 221	10 245	12 294
Continuous output[*1] for DHW temperature rise from **10 to 60 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW l/h	32 550	36 619	57 980
	80 °C	kW l/h	25 430	28 481	43 739
	70 °C	kW l/h	16 275	19 326	25 430
Heating water throughput for continuous output stated		m^3/h	3.0	3.0	3.0
Standby loss q_{BS} at 45 K temp. difference		kWh/24 h	1.30	1.40	1.60
Performance factor N_L[*2] acc. to DIN 4708 Without return temperature limit Cylinder storage temperature[*2] = Cold water flow temperature +50 K $^{+5\,K}_{0\,K}$ at **heating water flow temperature**	90 °C		2.4	3.3	6.8
	80 °C		1.9	2.9	5.2
	70 °C		1.4	2.0	3.2
Max. draw-off rate (over 10 min. period) Based on performance factor N_L With re-heating for DHW temperature rise from 10 to 45 °C at **heating water flow temperature**	90 °C	litres/min	21	24	34
	80 °C	litres/min	19	23	30
	70 °C	litres/min	16	19	24
Draw-off rate Cylinder contents heated to 60 °C Without re-heating		litres/min	10	10	10
Drawable water volume Cylinder contents heated to 60 °C Without re-heating Water at t = 60 °C (constant)		litres	103	120	150
Short-term draw-off rate (over 10 min. period) Based on performance factor N_L DHW temperature rise from 10 to 45 °C Without return temperature limit at **heating water flow temperature**	90 °C	litres/10 minutes	207	240	340
	80 °C	litres/10 minutes	186	226	298
	70 °C	litres/10 minutes	164	190	236

*[*1] For continuous output at an alternative heating water throughput, see diagrams on pages 26 and 27. When planning for the continuous output as stated or calculated, allow for the corresponding circulation pump. The stated continuous output is only achieved when the rated output of the boiler is equal to or greater than the continuous output.*
*[*2] The performance factor N_L varies according to the cylinder storage temperature Tsp.*
Guide values: Tsp = 60 °C → 1.0 × N_L Tsp = 55 °C → 0.75 × N_L Tsp = 50 °C → 0.55 × N_L Tsp = 45 °C → 0.3 × N_L.

5822 184 GB

Vitocell-V 300 (type EVI), internal indirect coil

For heating DHW in conjunction with boilers, district and low temperature heating systems, with optional electric immersion heater

Suitable for heating systems to DIN 4753 with
- heating water flow temperature up to **200 °C**
- **primary circuit** operating pressure up to **25 bar**
- **secondary circuit** operating pressure up to **10 bar**

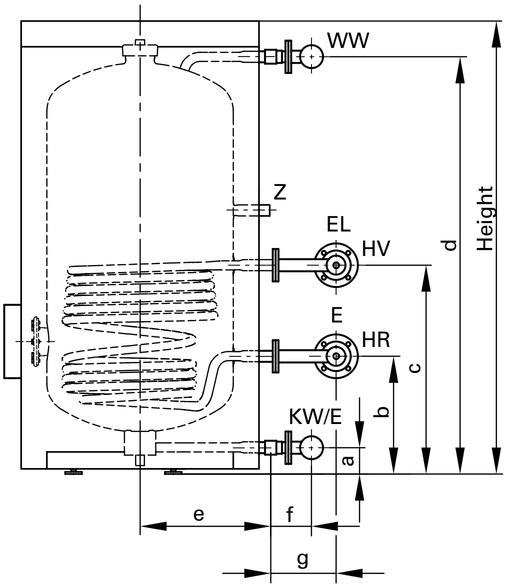
Capacity		litres	200	300	500
Continuous output[*1] for DHW temperature rise from **10 to 45 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW l/h	71 1745	93 2285	96 2358
	80 °C	kW l/h	56 1376	72 1769	73 1793
	70 °C	kW l/h	44 1081	52 1277	56 1376
	60 °C	kW l/h	24 590	30 737	37 909
	50 °C	kW l/h	13 319	15 368	18 442
Continuous output[*1] for DHW temperature rise from **10 to 60 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW l/h	63 1084	82 1410	81 1393
	80 °C	kW l/h	48 826	59 1014	62 1066
	70 °C	kW l/h	29 499	41 705	43 739
Heating water throughput for continuous output stated		m^3/h	5.0	5.0	6.5
Standby loss q_{BS} at 45 K temp. difference		kWh/24 h	1.60	2.00	2.70
Performance factor N_L[*2] acc. to DIN 4708 Without return temperature limit Cylinder storage temperature[*2] = Cold water flow temperature +50 K $^{+5\,K}_{0\,K}$ at **heating water flow temperature**	90 °C		6.8	13.0	21.5
	80 °C		6.0	10.0	21.5
	70 °C		3.1	8.3	18.0
Max. draw-off rate (over 10 min. period) Based on performance factor N_L With re-heating for DHW temperature rise from 10 to 45 °C at **heating water flow temperature**	90 °C	litres/min	34	48	63
	80 °C	litres/min	32	42	63
	70 °C	litres/min	23	38	57
Draw-off rate Cylinder contents heated to 60 °C Without re-heating		litres/min	10	15	15
Drawable water volume Cylinder contents heated to 60 °C Without re-heating Water at t = 60 °C (constant)		litres	139	272	460
Short-term draw-off rate (over a 10 minute period) Based on performance factor N_L DHW temperature rise from 10 to 45 °C Without return temperature limit at **heating water flow temperature**	90 °C	litres/10 minutes	340	475	627
	80 °C	litres/10 minutes	319	414	627
	70 °C	litres/10 minutes	233	375	566

*[*1]For continuous output at an alternative heating water throughput, see diagrams on pages 27 to 28. When planning for the continuous output as stated or calculated, allow for the corresponding circulation pump. The stated continuous output is only achieved when the rated output of the boiler is equal to or greater than the continuous output.*
*[*2]The performance factor N_L varies according to the cylinder storage temperature Tsp.*
Guide values: Tsp = 60 °C → 1.0 × N_L Tsp = 55 °C → 0.75 × N_L Tsp = 50 °C → 0.55 × N_L Tsp = 45 °C → 0.3 × N_L.

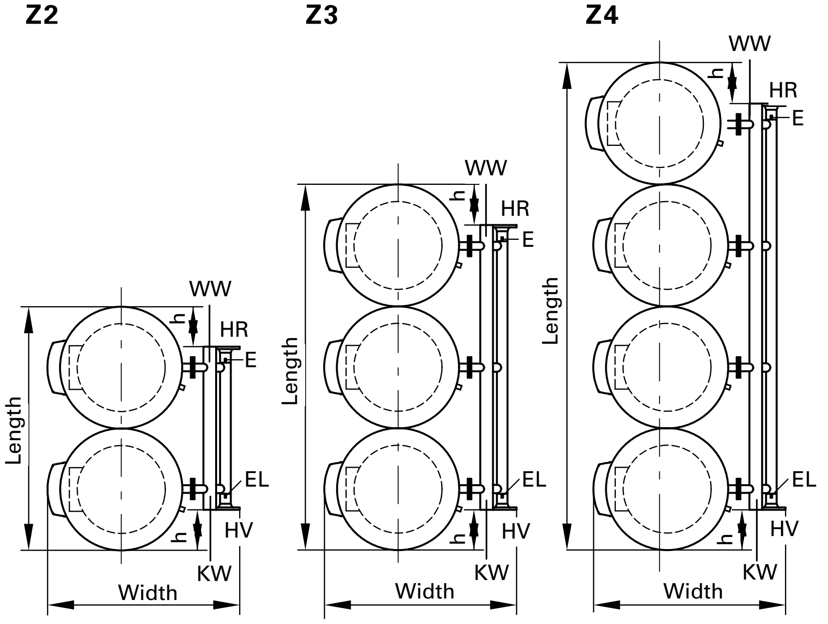
Vitocell-V 300 (type EVI) as a cylinder bank

DHW cylinders with capacities of 300 and 500 litres can be combined into batteries of up to 2 or 4 cylinders. The primary and secondary headers are available ex works. They should be ordered separately. Batteries consisting of more than 4 cylinders are possible by combining several sub-batteries of up to 4 cylinders each. The connection of these cylinder banks on the primary and secondary side forms part of the installation work for which the customer is responsible.

Example: 500 litres capacity



Side view



Plan view

Key

E	Drain (female thread R ½")	HV	Heating water flow	WW	Hot water
EL	Air vent valve (female thread R ½")	KW	Cold water	Z	Circulation
HR	Heating water return				

Dimensions

Capacity	litres	300	500		
Total capacity of cylinder bank	litres	600	1000	1500	2000
Number of cylinders		2	2	3	4
Length	mm	1461	1926	2914	3902
Width	mm	1109	1278	1278	1298
Height	mm	1779	1767	1767	1767
a	mm	87	102	102	102
b	mm	301	453	453	453
c	mm	751	802	802	802
d	mm	1640	1601	1601	1601
e	mm	343	498	498	498
f	mm	127	130	135	139
g	mm	237	217	217	226
h	mm	206	359	359	359

5822 184 GB

2.4 Specification
Vitocell-V 300

Capacity		litres	300	500		
Total capacity of cylinder bank		litres	600	1000	1500	2000
Number of cylinders Layout			2 ●●	2 ●●	3 ●●●	4 ●●●●
Continuous output[*1] for DHW temperature rise from **10 to 45 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW l/h	186 4570	192 4716	288 7074	384 9432
	80 °C	kW l/h	144 3538	146 3586	219 5379	292 7172
	70 °C	kW l/h	104 2554	112 2752	168 4128	224 5504
	60 °C	kW l/h	60 1474	74 1818	111 2727	148 3636
	50 °C	kW l/h	30 736	36 884	54 1326	72 1768
Continuous output[*1] for DHW temperature rise from **10 to 60 °C** and **heating water** flow temperature of .... at heating water throughput stated below	90 °C	kW l/h	Line ① 164 2820	162 2786	243 4179	324 5572
	80 °C	kW l/h	118 2028	124 2132	186 3198	248 4264
	70 °C	kW l/h	82 1410	86 1478	129 2217	172 2956
Heating water throughput for continuous output stated		m^3/h	Line ② 10	13	19.5	26
Performance factor N_L[*2] acc. to DIN 4708 Without return temperature limit Cylinder storage temperature[*2] = Cold water flow temperature +50 K $^{+5\,K}_{0\,K}$ at **heating water flow temperature**	90 °C		40	63	105	138
	80 °C		38	63	105	138
	70 °C		26	52	89	120
Max. draw-off rate (over 10 min. period) Based on performance factor N_L With re-heating DHW temperature rise from 10 to 45 °C at **heating water flow temperature**	90 °C	litres/min	90	120	160	200
	80 °C	litres/min	87	120	160	200
	70 °C	litres/min	70	105	148	180
Draw-off rate Cylinder contents heated to 60 °C Without re-heating		litres/min	30	30	45	60
Drawable water volume Cylinder contents heated to 60 °C Without re-heating Water at t = 60 °C (constant)		litres	544	920	1380	1840
Short-term draw-off rate (over 10 min. period) Based on performance factor N_L DHW temperature rise from 10 to 45 °C Without return temperature limit at **heating water flow temperature**	90 °C	litres/10 min	898	1190	1600	2000
	80 °C	litres/10 min	870	1190	1600	2000
	70 °C	litres/10 min	698	1050	1470	1800

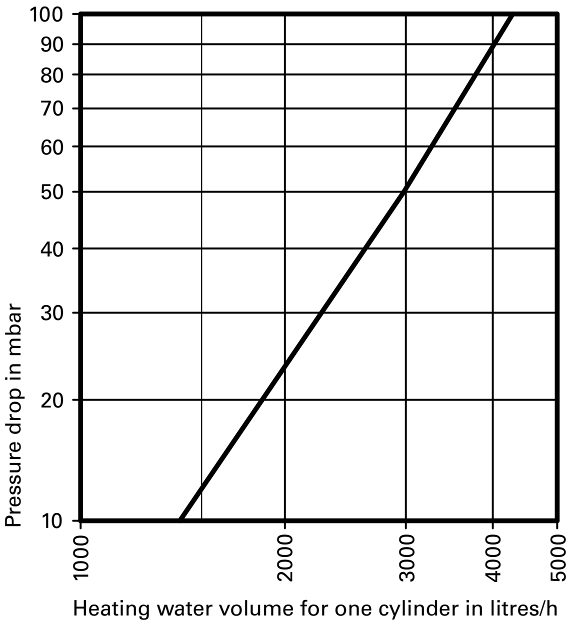
*[*1] When planning for the continuous output as stated or calculated, allow for the corresponding circulation pump. The stated continuous output is only achieved when the rated output of the boiler is equal to or greater than the continuous output.*
*[*2] The performance factor N_L varies according to the cylinder storage temperature Tsp.*
Guide values: Tsp = 60 °C → 1.0 × N_L
Tsp = 55 °C → 0.75 × N_L
Tsp = 50 °C → 0.55 × N_L
Tsp = 45 °C → 0.3 × N_L

①, ② see calculation example in section 3 "Sizing".

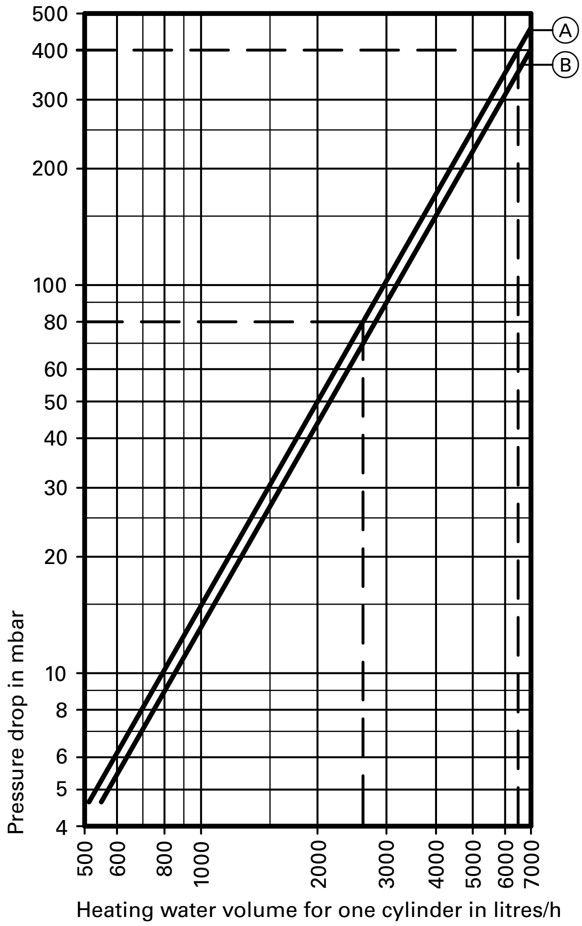
5822 184 GB

Primary circuit pressure drop

Vitocell-V 300 (type EVA)



Vitocell-V 300 (type EVI)



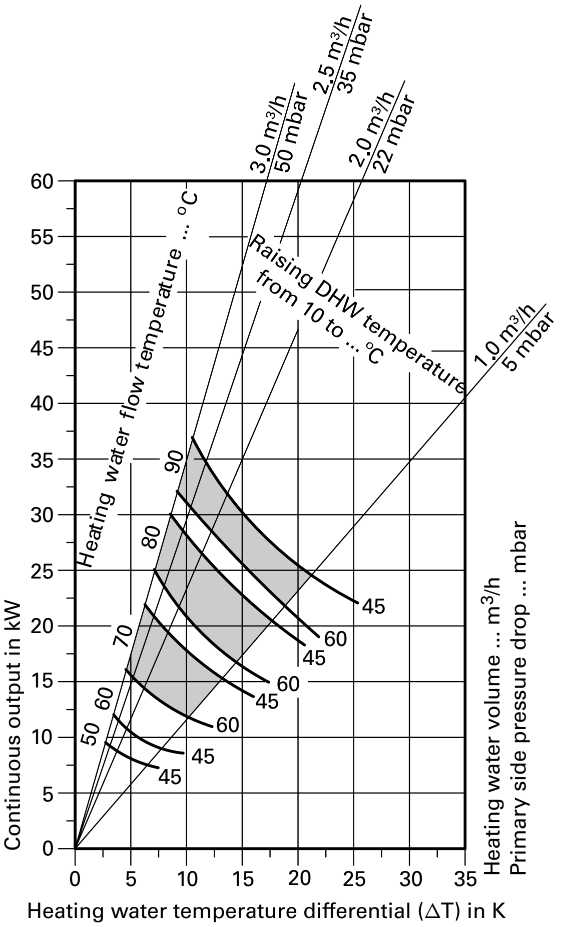
Ⓐ 300 and 500 litres capacity
Ⓑ 200 litres capacity

5822 184 GB

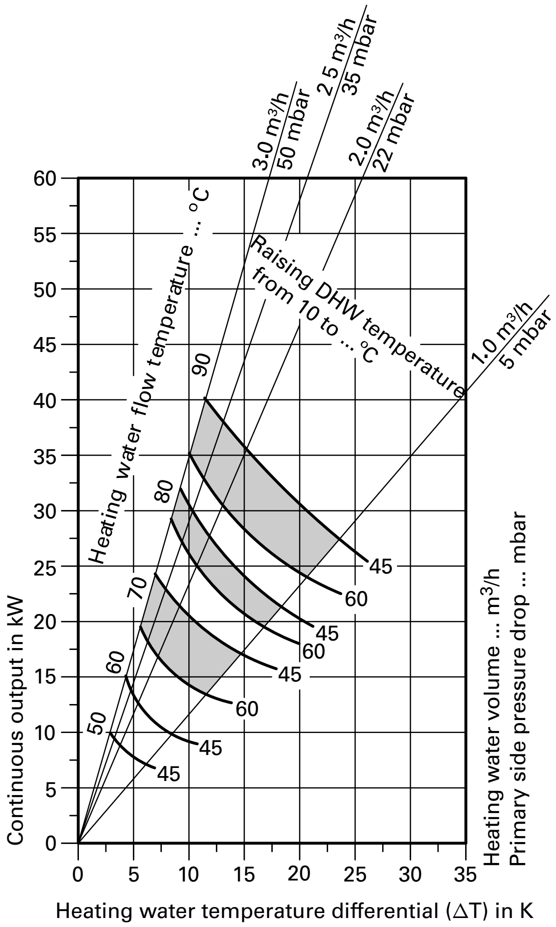
Continuous output

When planning for the max. continuous output, allow for the corresponding circulation pump.

Vitocell-V 300 (type EVA) with 130 litres capacity

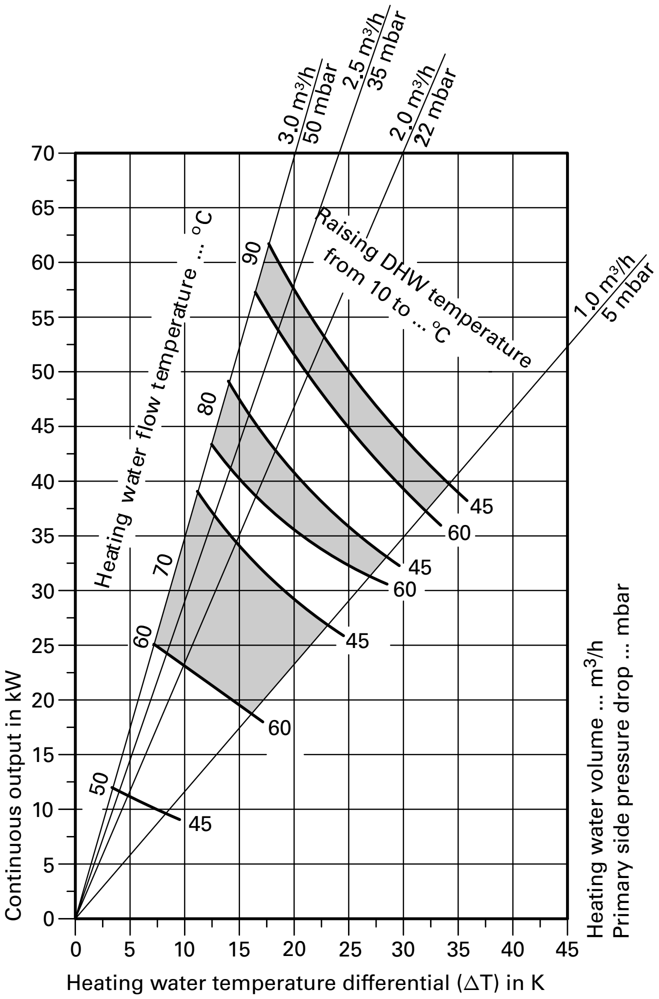


Vitocell-V 300 (type EVA) with 160 litres capacity

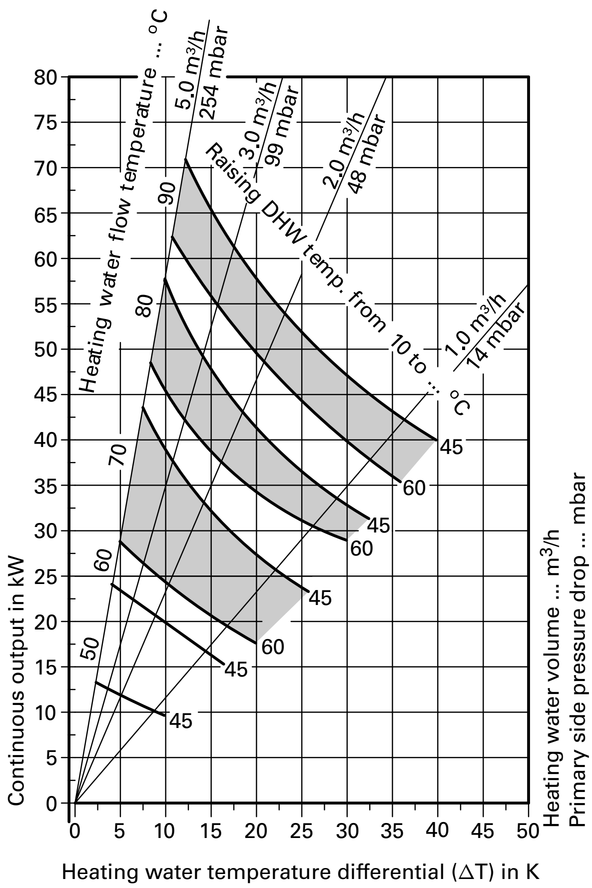


5822 184 GB

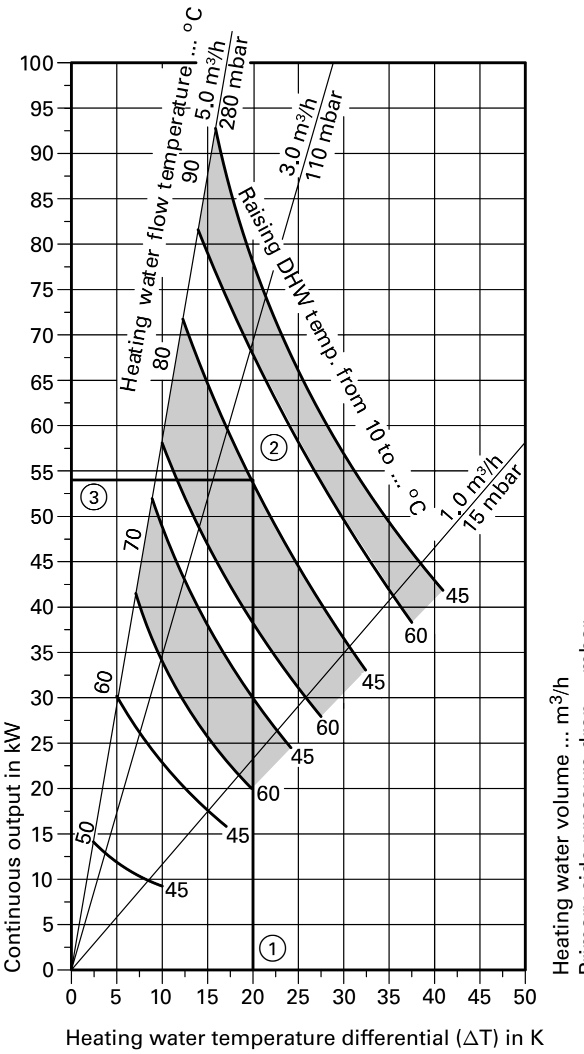
Vitocell-V 300 (type EVA) with 200 litres capacity



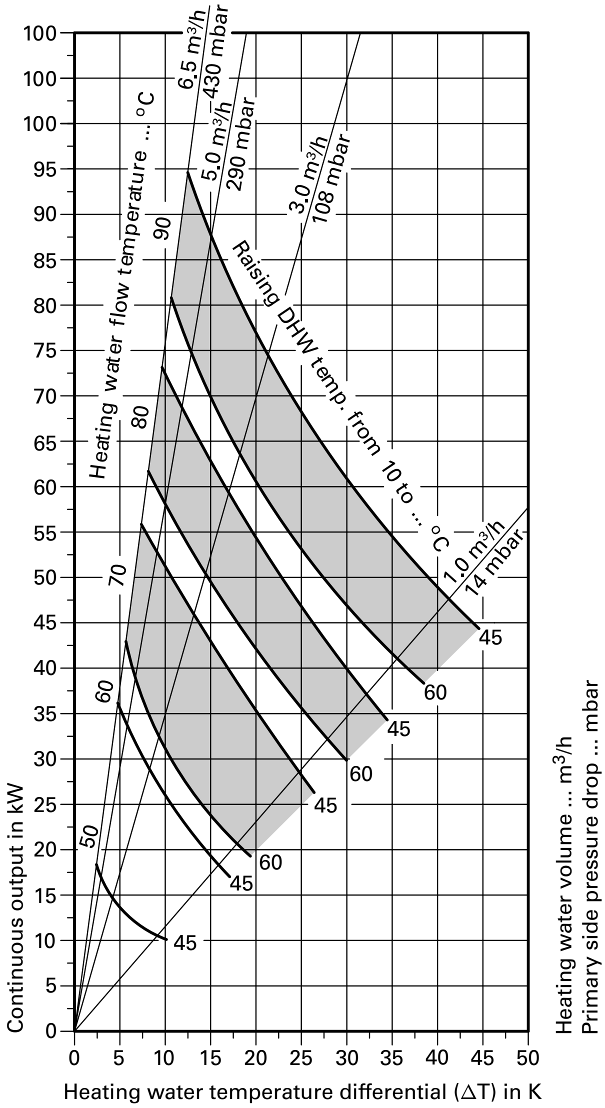
Vitocell-V 300 (type EVI) with 200 litres capacity



Vitocell-V 300 (type EVI) with 300 litres capacity



Vitocell-V 300 (type EVI) with 500 litres capacity



①, ②, ③ see calculation example in section 3 "Sizing"

3.1 Sizing according to continuous output

Sizing according to continuous output is employed in cases where hot water is to be continuously drawn off from the DHW cylinder. This calculation method is thus used for most commercial applications.

Please note:
The sizing of DHW cylinders can also be carried out using the EDIS calculation program. The EDIS program sizes DHW cylinders on the basis of DIN 4708 for flats/apartments, hotels, restaurants, hospitals, residential care homes, camping sites, leisure/sports centres and so on.
You can obtain the Viessmann "EDIS" calculation program on request through our sales offices.

a) Calculating DHW cylinders required on basis of following known data:
- Continuous output in litres/h or kW
- Hot water outlet temperature in °C
- Cold water inlet temperature in °C
- Heating water flow temperature in °C

The number and capacity of the required DHW cylinders and throughput on the primary side plus the head of the DHW circulation pump are calculated using the DHW cylinder specification.
The sizing of the DHW cylinders is carried out in the same way.
The following example illustrates the calculating procedure.

Example:
For production purposes, a factory requires 4100 litres/h hot water at a temperature of 60 °C. A heating water flow temperature of 90 °C is available from the boilers. The cold water inlet temperature is 10 °C.

Continuous output	= 4100 litres/h
Hot water outlet temp.	= 60 °C
Cold water inlet temp.	= 10 °C
Heating water flow temp.	= 90 °C

Calculating number and size of DHW cylinders

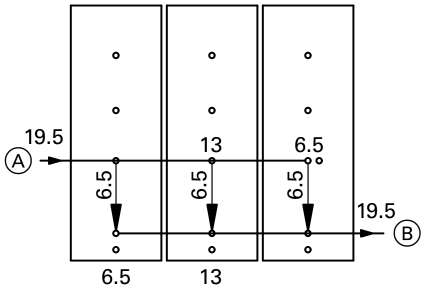
Turn to the Vitocell-V 300 DHW cylinder specification on page 24. Find line ①, continuous output at a DHW temperature rise from 10 to 60 °C and heating water flow temperature of 90 °C. Move along the line to the column for capacity = 500 litres and number of cylinders = 3, and you will find a continuous output of 4179 litres/h.
DHW cylinders selected are thus:
3 × Vitocell-V 300 (type EVI) each with 500 litres capacity.
The continuous output of the selected DHW cylinders must be at least equal to the specified continuous output.

Calculating heating water throughput

An output of 243 kW must be made available for the calculated continuous output (see specification, page 24). The required heating water throughput can be read off in line ② in selected DHW cylinders column – heating water throughput = 19.5 m^3/h; i.e. the DHW circulation pump must be sized for a heating water throughput of 19.5 m^3/h.

Calculating primary side pressure drop

The total volume flow of 19.5 m^3/h must be taken into account for the heating water flow and return lines (valves, elbows etc.) as well as the boiler, when calculating the complete system pressure drop.
Where several cylinders are connected in parallel, the total pressure drop is equal to the pressure drop of an individual cylinder.
The pressure drop of the DHW cylinder on the primary side for the delivery head of the DHW circulation pump is calculated as follows:
As the 3 DHW cylinders are joined in parallel, each cylinder has a heating water throughput of 6.5 m^3/h (see following illustration). Turn to the diagram on page 25 regarding the primary side pressure drop for Vitocell-V 300 (type EVI). For a heating water volume of 6500 litres/h, the corresponding pressure drop can be read off the 500 capacity cylinder line as 400 mbar.



Ⓐ Heating water flow
Ⓑ Heating water return

Result:

Total heating water throughput	= 19.5 m^3/h
Heating water throughput/cyl.	= 6.5 m^3/h
Primary side pressure drop of DHW cylinder	= 400 mbar

Sizing DHW circulation pump

The DHW circulation pump must therefore deliver a heating water throughput of 19.5 m^3/h and overcome the pressure drop on the primary side of the 3 cylinders of 400 mbar, plus the pressure drop of the boiler, the pipework between the cylinders and the boiler, as well as the individual pressure drop values of fittings and valves.

General rule: If available boiler output $\dot{Q}_K$ is lower than continuous output $\dot{Q}_{Sp.}$, it is sufficient to size the DHW circulation pump to suit the transfer of the boiler output. If, on the other hand, the boiler output is greater than continuous output $\dot{Q}_{Sp.}$, the DHW circulation pump can be sized to suit the continuous output as maximum rating.

b) Calculating DHW cylinders required on basis of following known data:

- Required continuous output in kW
  or
  Required continuous output in litres/h (conversion necessary)
- Hot water outlet temperature in °C
- Cold water inlet temperature in °C
- Heating water flow temperature in °C
- Heating water return temperature in °C

Conversion of continuous output from litres/h to kW

$\dot{Q}_{req.}$ = continuous output in kW
$\dot{m}_{WW}$ = continuous output in litres/h
c = spec. heat capacity $\left(\frac{1\ kWh}{860\ l \cdot K}\right)$
ΔT_{WW} = temp. difference between hot water outlet temp. and cold water inlet temp. in K
$\dot{Q}_{req.} = \dot{m}_{WW} \cdot c \cdot \Delta T_{WW}$

The size and number of DHW cylinders required can be calculated using the diagrams for the continuous output of the DHW cylinders concerned.

Example:

Required continuous output	= 3000 litres/h
Heating water flow temperature	= 80 °C
Heating water return temperature	= 60 °C
Heating water temp. differential	= 80 °C – 60 °C = 20 K
Cold water inlet temperature	= 10 °C
DHW outlet temperature	= 45 °C

A vertical DHW cylinder has to be used on account of the structural characteristics of the building.

Conversion of continuous output from litres/h to kW

$\dot{Q}_{req.} = \dot{m}_{WW} \cdot c \cdot \Delta T_{WW}$

$= 3000 \cdot \frac{1}{860} \cdot (45 - 10) = 122\ kW$

Calculating continuous output of various cylinder sizes

As the calculation method is the same for all cylinder sizes, the procedure for calculating continuous output for Vitocell-V 300 with 300 litres capacity is used here as a representative example for all cylinder sizes (see also page 28, Vitocell-V 300 with 300 litres capacity).
Starting from the horizontal axis at 20 K (point ①), draw a vertical line upwards.
The point at which the line intersects with the curve for the desired DHW temperature rise (from 10 °C to 45 °C) at the given heating water flow temperature of 80 °C is point ②.
From point ②, draw a horizontal line towards the vertical axis.
The point of intersection with the vertical axis is point ③. At point ③, the continuous output of the DHW cylinder can be read off as 54 kW.
The continuous output of the various cylinder sizes based on the given data is listed in the table below:

DHW cylinders	Cont. output ($\dot{Q}_{cyl.}$)
Vitocell-V 100 with	
160 litres	23 kW
200 litres	23 kW
300 litres	38 kW
500 litres	47 kW
750 litres	93 kW
1000 litres	108 kW
Vitocell-V 300 with	
130 litres (type EVA)	19 kW
160 litres (type EVA)	20 kW
200 litres (type EVA)	41 kW
200 litres (type EVI)	43 kW
300 litres (type EVI)	**54 kW**
500 litres (type EVI)	55 kW

Calculating required number of DHW cylinders of a given size

n = required number of DHW cylinders
$\dot{Q}_{req.}$ = continuous output in kW
$\dot{Q}_{cyl.}$ = continuous output of selected DHW cylinders in kW

$n = \frac{\dot{Q}_{req.}}{\dot{Q}_{cyl.}}$

$= \frac{122\ kW}{54\ kW} = 2.26$

Required number of DHW cylinders = 2.

Calculating required throughput on primary side

$\dot{m}_{HW}$ = primary side throughput in litres/h
$\dot{Q}_{req.}$ = required continuous output in kW
ΔT_{HW} = heating water temperature difference in K
c = spec. heat capacity $\left(\frac{1\ kWh}{860\ l \cdot K}\right)$

$\dot{m}_{HW} = \frac{\dot{Q}_{req.}}{c \cdot \Delta T_{HW}} = \frac{860 \cdot \dot{Q}_{req.}}{\Delta T_{HW}}$

$= \frac{860 \cdot 122}{20} = 5246$ litres/h (total)

= 2623 litres/h (per DHW cylinder)

On the basis of the calculated heating water throughput, the pressure drop on the primary side can now be calculated as described in the example on page 29 and with the aid of diagram Vitocell-V 300 (type EVI) page 25.

Result:
Pressure drop of the DHW cylinder on the primary side = 80 mbar.

5822 184 GB

3.2 Sizing according to short-term draw-off rate and continuous output

Sizing according to the short-term draw-off (10 minutes output) is applied, if a certain volume of DHW must be made available for a short period, followed by a fairly long time during which the water may be heated up again, e.g. in commercial operations, schools or households for washing and showering (intermittent operation).
The so-called 10 minutes output is determined almost exclusively by the volume of water stored (cylinder capacity).

Please note:
The sizing of DHW cylinders can also be carried out using the EDIS calculation program. The EDIS program sizes DHW cylinders on the basis of DIN 4708 for flats/apartments, hotels, restaurants, hospitals, residential care homes, camping sites, leisure/sports centres etc. You can obtain the Viessmann "EDIS" calculation program on request through our sales offices.

Calculating heat demand for DHW in living accommodation

DIN 4708 (central water heating systems)

DIN 4708 is the basis for the standard calculation of the heat demand for central DHW heating systems in residential buildings.
For the purposes of calculating heat demand, a standard apartment is defined as follows:
The standard apartment is based on statistical values, whereby
- no. of rooms "r" = 4 rooms,
- no. of occupants "p" = 3.5 persons and
- draw-off rate "w_V" = 5820 Wh/for a bath have been agreed, whose demand factor is "N" = 1.

The following information is required to calculate the requirement

a) The sanitary facilities on all floors
   - from building design drawings or details supplied by architect or client

b) number of rooms excluding ancilliary rooms, such as kitchen, entrance, hall, bathroom and storage area
   - from building design drawings or details supplied by architect or client

c) number of persons per dwelling (occupancy rate)
   - if number of persons per dwelling cannot be ascertained, a statistical occupancy rate "p" can be calculated on basis of number of rooms "r" for dwelling concerned, using table 3.

Calculating occupancy rate "p"

The following table can be used for calculating occupancy rate "p", if insufficient information is available concerning the number of persons per household.

Table 3

No. of rooms "r"	Occupancy rate "p"
1.0	2.0*1
1.5	2.0*1
2.0	2.0*1
2.5	2.3
3.0	2.7
3.5	3.1
4.0	3.5
4.5	3.9
5.0	4.3
5.5	4.6
6.0	5.0
6.5	5.4
7.0	5.6

**1 If residential building concerned mainly comprises apartments with 1 and/or 2 main rooms, occupancy rate "p" for these apartments must be increased by a factor of 0.5.*

Establishing number of draw-off points to be taken into account when calculating requirements

The number of draw-off points must be taken into account when calculating overall requirements. This varies according to the specifications of apartments (basic or deluxe) and can be derived from tables 44 or 5.

Table 4 Apartment with basic specification

Existing amenities per apartment		To take into account for calculating requirements
Room	Amenities	
Bath	1 bath 140 litres (acc. to table 6 no. 1, page 32) or 1 shower cubicle with/without mixer tap and standard shower head	1 bath 140 litres (acc. to table 6 no. 1, page 32)
	1 washbasin	Not to be taken into account
Kitchen	1 kitchen sink	Not to be taken into account

3.2 Sizing according to short-term draw-off rate and continuous output

Table 5 Apartment with deluxe specification

Existing amenities per apartment: Room	Amenities	To be taken into account for calculating requirements
Bath	Bath*1	as existing acc. to table 6, no. 2 to 4
	Shower cublicle*1	as existing, incl. any additional facilities acc. to table 6, no. 6 or 7, if arranged to permit **simultaneous use***2
	Washbasin*1	Not to be taken into account
	Bidet	Not to be taken into account
Kitchen	1 kitchen sink	Not to be taken into account
Guest room	Bath	per guest room: as existing acc. to table 6, no. 1 to 4, with 50% of draw-off demand "w_V"
	or Shower	as existing acc. to table 6, no. 5 to 7, with 100% of draw-off demand "w_V"
	Washbasin	at 100% of draw-off demand "w_V" acc. to table 6*3
	Bidet	at 100% of draw-off demand "w_V" acc. to table 6*3

**1Size different from standard specification.*
**2If no bath is installed, a bath is assumed instead of a shower cubicle as with standard specification (see table 6, no. 1) unless draw-off rate of shower cubicle exceeds that of bath (e.g. deluxe shower).*
If several different shower cubicles are installed, at least one bath is assumed for the shower cubicle with the highest draw-off rate.
**3If no bath or shower cubicle is assigned to guest room.*

Calculating draw-off rate per relevant draw-off point

Draw-off rate "w_V" for the draw-off points included in the calculation of demand factor "N" can be taken from table 6.

Table 6 Draw-off rate "w_V"

No.	of sanitary facilities or draw-off point	DIN code	Draw-off volume per use or useful capacity in litres	Draw-off rate "w_V" per use in Wh
1	Bath	NB1	140	5820
2	Bath	NB2	160	6510
3	Small and step-type bath	KB	120	4890
4	Large bath (1800 mm × 750 mm)	GB	200	8720
5	Shower cubicle*4 with mixer tap and economy shower head	BRS	40*5	1630
6	Shower cubicle*4 with mixer tap and standard shower head*6	BRN	90*5	3660
7	Shower cubicle*4 with mixer tap and de luxe shower head*7	BRL	180*5	7320
8	Washbasin	WT	17	700
9	Bidet	BD	20	810
10	Washbasin	HT	9	350
11	Kitchen sink	SP	30	1160

For baths whose useful capacities vary considerably, draw-off rate "w_V" should be calculated in Wh acc. to the formula $w_V = c \times V \times \Delta T$ and be used in the calculation ($\Delta T = 35$ K).

**4To be included in calculation only if bathroom and shower cubicle are in separate rooms, i.e. simultaneous use is possible.*
**5Based on 6 minutes' use.*
**6Fitting flow class A to DIN EN 200.*
**7Fitting flow class C to DIN EN 200.*

5822 184 GB

Calculating demand factor "N"

In order to establish the heat demand for hot water supplied to all apartments, it is first necessary to convert the data to the heat demand for hot water in the standard apartment.
The following characteristics of the standard apartment are agreed:
1. No. of rooms "r" = 4 rooms
2. Occupancy rate "p" = 3.5 persons
3. Draw-off rate "w_v" = 5820 Wh (for one bath)

The heat demand for hot water in a standard apartment of 3.5 persons × 5820 Wh = 20370 Wh corresponds to the demand factor of N = 1

$$N = \frac{\text{Total heat demand for domestic hot water for all apartments to be supplied}}{\text{Heat demand for DHW for a standard apartment}}$$

$$= \frac{\sum (n \cdot p \cdot v \cdot w_v)}{3.5 \cdot 5820}$$

$$= \frac{\sum (n \cdot p \cdot v \cdot w_v)}{20370}$$

n = number of similar apartments
p = occupancy rate per similar apartment
v = number of similar draw-off points per similar apartment
w_v = draw-off rate in Wh

$(n \cdot p \cdot v \cdot w_v)$ must be calculated for each relevant draw-off point per similar apartment.

Having calculated demand factor "N", and using the table on page
- 5 for Vitocell-H 100
- 8 to 11 for Vitocell-V 100
- 15 to 16 for Vitocell-H 300
- 21 to 24 for Vitocell-V 300

it is now possible to select the necessary DHW cylinder for the available heating water flow temperature.
Select a DHW cylinder whose N_L factor is at least "N".
Demand factor "N" is identical to the number of standard apartments in the building project.
It does not necessarily correspond to the number of apartments.

Example:
For a residential building project, the DHW system should be designed on the basis of demand factor "N".

The numbers of similar apartments, the number of rooms and the specification details listed in table 7 have been taken from the building plans.
The occupancy rate "p" was calculated using number of rooms "r" and table 3 on page 31.
The applied number of draw-off points was calculated using table 4 on page 31 and table 5 on page 32.

Table 7

Number of apartments n	Number of rooms r	Occupancy rate p	Amenities of the apartment Quantity/description	To allow for in calculating requirements No. of draw-off points/description
4	1.5	2.0	1 shower cubicle with standard shower head 1 washbasin in bathroom 1 sink in kitchen	acc. to table 4 on page 31 1 shower cubicle (BRN)
10	3	2.7	1 bath 140 litres 1 washbasin in bathroom 1 sink in kitchen	acc. to table 4 on page 31 1 bath (NB1)
2	4	3.5	1 shower cubicle with mixer tap and deluxe shower 1 shower cubicle with standard shower head (physically separated) 1 washbasin in bathroom 1 sink in kitchen	acc. to table 5 on page 32 1 shower cubicle (BRL)
4	4	3.5	1 bath 160 litres 1 shower cubicle with deluxe shower head in a separate room 1 washbasin in bathroom 1 bidet 1 sink in kitchen	acc. to table 5 on page 32 1 bath (NB2) 1 shower cubicle (BRL)
5	5	4.3	1 bath 160 litres 1 washbasin in bathroom 1 bidet 1 bath 140 litres in guest bath room 1 washbasin in guest room 1 sink in kitchen	acc. to table 5 on page 32 1 bath (NB2) 1 bath (NB1) at 50% of draw-off rate "w_v" 1 washbasin (WT) 1 bidet (BD)

3.2 Sizing according to short-term draw-off rate and continuous output

Form for calculating heat demand for DHW heating in residential buildings

Calculating requirements of apartments with centralised supply systems	Project no.: ______ Sheet no.: ______

Calculating demand factor ”N” to determine required DHW cylinder size

Project ______

Occupancy factor ”p” based on statistical values as per table 7 on page 33

1	2	3	4	5	6	7	8	9	10	11
Sequential number of apartment groups	No. of rooms r	No. of apartments n	Occupancy rate p	$n \cdot p$	No. of draw-off points to consider (per apartment)					Comments
					No. of draw-off points v	Abbreviation	Draw-off rate w_v in Wh	$v \cdot w_v$ in Wh	$n \cdot p \cdot v \cdot w_v$ in Wh	
1	1.5	4	2.0	8.0	1	NB1	5820	5820	46560	NB1 for BRN
2	3.0	10	2.7	27.0	1	NB1	5820	5820	157140	
3	4.0	2	3.5	7.0	1	BRL	7320	7320	51240	
					1	BRN	3660	3660	25620	
4	4.0	4	3.5	4.0	1	NB2	6510	6510	91140	
					1	BRL	7320	7320	102480	
5	5.0	5	4.3	21.5	1	NB2	6510	6510	139965	
					(0.5)	NB1	5820	5820	62565	50% ”w_v” acc. to tab. 5 on page 32

$\sum n_i = 25$ $\qquad$ $\sum (n \cdot p \cdot v \cdot w_v) = 676710$ Wh

$$N = \frac{\sum (n \cdot p \cdot v \cdot w_v)}{3.5 \cdot 5820} = \frac{676710}{20370} = 33.2$$

Having calculated demand factor N = 33.2, and using the table on page
- 5 for Vitocell-H 100
- 8 to 11 for Vitocell-V 100
- 15 to 16 for Vitocell-H 300
- 21 to 24 for Vitocell-V 300

it is now possible to select the necessary DHW cylinder for the existing heating water flow temperature (e.g. 80 °C) and a cylinder storage temperature of 60 °C. Select a DHW cylinder with an N_L factor of at least ”N”.

Note: The performance factor N_L varies according to the
- flow temperature,
- cylinder storage temperature,
- available or transferable output.

For deviating operating conditions, modify performance factor N_L from the values shown in the table on page
- 5 for Vitocell-H 100
- 8 to 11 for Vitocell-V 100
- 15 to 16 for Vitocell-H 300
- 21 to 24 for Vitocell-V 300.

Possible DHW cylinders:
- From the table on page 16: Vitocell-H 300 with 700 litres capacity (N_L = 35) as a cylinder bank comprising 2 × Vitocell-H 300 of 350 litres capacity each
- From the table on page 24: Vitocell V 300 with 600 litres capacity (N_L = 38) as a cylinder bank comprising 2 × Vitocell-V 300 of 300 litres capacity each

Selected DHW cylinder:
2 × Vitocell-V 300 with 300 litres capacity each.

Boiler supplement "Z_K"

According to DIN 4708-2 or VDI 3815, the rated output of a boiler must be increased by boiler supplement "Z_K" to cover domestic hot water generation (see table 8).
Observe the explanations in DIN/VDI or local regulations.

DIN 4708 lays down three essential requirements for the rated output of the heating supply:

Requirement 1
The performance factor must be at least equal to or greater than the demand factor:
$\mathbf{N_L \geqq N}$

Requirement 2
The DHW cylinder is only capable of achieving performance factor N_L stated by the manufacturer, if the rated output of the boiler $\dot{Q}_K$ is greater than or at least equal to the continuous output:
$\dot{Q}_K \geqq \dot{Q}_D$

Requirement 3
Heat generating systems which are used for central heating and hot water supply must cover the standard building heat demand $\dot{Q}_{N\ bldg.}$ calculated acc. to DIN 4701-2 as well as additional output Z_K:
$\dot{Q}_K \geqq \dot{Q}_{N\ bldg.} + Z_K$

On the basis of DIN 4708-2, VDI 3815 (calculation as per second alternative) is used to calculate a supplement to the rated boiler output subject to demand factor N plus a minimum storage capacity (see table 8).
It has proved successful in practice to take the boiler supplement into account acc. to the following relationship:
$\dot{Q}_K \geqq \dot{Q}_{N\ bldg.} \cdot \varphi + Z_K$

φ = central heating utilisation factor (heating of all rooms)

Number of apartments per building	φ
up to 20	1
21 to 50	0.9
> 50	0.8

Table 8 Boiler supplement "Z_K"

Demand factor N	Boiler supplement Z_K in kW
1	3.1
2	4.7
3	6.2
4	7.7
5	8.9
6	10.2
7	11.4
8	12.6
9	13.8
10	15.1
12	17.3
14	19.5
16	21.7
18	23.9
20	26.1
22	28.2
24	30.4
26	32.4
28	34.6
30	36.6
40	46.7
50	56.7
60	66.6
80	85.9
100	104.9
120	124.0
150	152.0
200	198.4
240	235.2
300	290.0

Calculating heat demand for DHW heating in industrial/commercial enterprises

1. Calculating requirements

Allow for a suitable number of washroom facilities (washing/shower units) for the type of business concerned (see the earlier DIN 18228, sheet 3, page 4).
For every 100 users (employed during the largest shift), the cleaning facilities listed in table 9 are required.

Table 9 Normal working conditions[*1]

Activity	Number of washroom facilities per 100 users	Ratio of washing facilities basins/ shower units
Slightly dirty	15	—/—
Moderately dirty	20	2/1
Very dirty	25	1/1

*[*1]In plants with exceptionally dirty working conditions, 25 washroom facilities are required per 100 users.*

2. Sizing the DHW system

The following example is used to illustrate how to size the DHW heating system.

Example:

Number of employees during largest shift:	150 persons
Working time:	2 shift operation
Type of activity:	moderately dirty
Required hot water outlet temperature:	35 to 37 °C
Cylinder storage temperature:	60 °C
Cold water inlet temperature:	10 °C
Heating water flow temperature:	90 °C

Calculating hot water requirement

Table 9 shows that for moderately dirty work, 20 washroom facilities are required per 100 employees. The ratio of washing and shower units is 2:1.
Therefore, 20 washbasins and 10 shower units are required for 150 employees.

Table 10 Consumption figures for washing and shower units with a hot water outlet temperature of 35 to 37 °C

Consumers	Water consumption in l/min	Time in use in mins	DHW consumption per use in litres
Washbasins with tap	5 to 12	3 to 5	30
Washbasins with hand shower	3 to 6	3 to 5	15
Circular communal basin for 6 persons	approx. 20	3 to 5	75
Circular communal basin for 10 persons	approx. 25	3 to 5	75
Shower unit without changing cubicle	7 to 12	5 to 6[*2]	50
Shower unit with changing cubicle	7 to 12	10 to 15[*3]	80

*[*2]Showering time excluding changing.*
*[*3]Showering time 5 to 8 minutes; rest of time for changing.*

Assumptions:
The washing units (washbasins with hand shower) are used by 120 employees (6 times in succession) and the shower units (showers without changing cubicles) are used by 30 employees (3 times in succession).
Using table 10, the following DHW capacity is required:
a) Washing unit hot water requirement:
120 × 3.5 litres/min × 3.5 min = 1470 litres
a) Shower hot water requirement:
30 × 10 litres/min × 5 min = 1500 litres

Together, a) and b) give a total hot water requirement of 2970 litres at approx. 36 °C water temperature for a period of approx. 25 minutes.

Converted to an outlet temperature of 45 °C we arrive at:

$$V_{(45\,°C)} = V_{(36\,°C)} \cdot \frac{\Delta T_{(36\,°C\,-\,10\,°C)}}{\Delta T_{(45\,°C\,-\,10\,°C)}} =$$

$$= 2970 \cdot \frac{26}{35} = 2206 \text{ litres}$$

As 8 hours are available between shifts for DHW cylinder reheating, the cylinder capacity should be sized for storage purposes.

For this, reference is made to the details of the short-term draw-off rate (10 minute output) from the table on page
- 5 for Vitocell-H 100
- 8 for Vitocell-V 100
- 15 for Vitocell-H 300
- 21 and 22 for Vitocell-V 300

of the relevant DHW cylinder.

The short-time draw-off rate of 10/45 °C at 627 litres/10 minutes can be found in the Vitocell-V 300 table on page 22 under heating water flow temperature = 90 °C, and 500 litres capacity.

Number of DHW cylinders n = calculated total volume/selected short-time draw-off rate (10 minute period) of individual cylinder cells

$$n = \frac{2206}{627} = 3.5 \text{ cylinders}$$

Selected DHW cylinder:
4 × Vitocell-V 300 with 500 litres capacity each.

Calculating required heating output

For heating the DHW, 7.5 hours are available; this results in a minimum connection rating (boiler output) of:

$$\dot{Q}_A = \frac{c \cdot V \cdot \Delta T_A}{Z_A} =$$

$$\frac{1 \cdot 2000 \cdot 50}{860 \cdot 7.5} = 15.5 \text{ kW}$$

$\dot{Q}_A$ = minimum connected output for heating the DHW cylinder in kW
V = selected cylinder capacity in litres
c = spec. heat capacity $\left(\frac{1 \text{ kWh}}{860 \text{ l} \cdot \text{K}}\right)$
ΔT_A = temperature difference between cylinder storage temperature and cold water inlet temperature (60 °C – 10 °C) = 50 K
Z_A = heat-up time in h

As an empirical value, a heating time of approx. 2 hours is selected.
In the above example, this would mean that the boiler and the DHW circulation pump (required heating water volume) should be sized for a heat-up rating of approx. 60 kW.

5822 184 GB

Calculating heat demand for DHW heating in hotels, guest houses and residential homes

In order to calculate the DHW demand, it is necessary to establish details of the consumers in every room.
Only the largest consumption point is taken into account for each single/double room.

Table 11 Draw-off rate per consumer at a DHW temperature of 45 °C

Consumption point	Volume of drawn hot water per use in litres	Draw-off rate "$Q_{h\ max.}$" per single room in kWh	per double room in kWh
Bath	170	7.0	10.5
Shower cubicle	70	3.0	4.5
Washbasin	20	0.8	1.2

Calculating required cylinder capacity

$Q_{h\ max.}$ = draw-off rate per draw-off point in kWh

n = no. of rooms with identical drawing requirements

φ_n = usage factor (simultaneity) can be used in certain cases:

No. of rooms	1 to 15	16 to 36	35 to 75	76 to 300
φ_n *1	1	0.9 to 0.7	0.7 to 0.6	0.6 to 0.5

*1 *A usage factor of $\varphi_n = 1$ should be selected for health resort hotels, trade fair hotels or similar.*

φ_2 = grading factor
The following factors can be used to reflect the category of hotel:

Hotel category	Standard	Good	High
φ_2	1.0	1.1	1.2

Z_A = heat-up time in h
The heating-up time depends on rated output available for DHW heating. Depending on the rated output of the boiler, the selected Z_A value can be less than 2 hours.

Z_B = duration of peak DHW demand in h, assuming 1 to 1.5 h

V = DHW cylinder capacity in litres

T_a = DHW storage temperature in °C

T_e = cold water inlet temperature in °C

a = 0.8; taking into account DHW cylinder loading condition

Example:
50 room hotel (30 double and 20 single)
- Amenities of single rooms:
  5 singles with bath, shower and basin
  10 singles with shower and basin
  5 singles with washbasin
- Amenities of double rooms:
  5 doubles with bath and basin
  20 doubles with shower and basin
  5 doubles with washbasin
- Heating water flow temperature = 80 °C
- Desired DHW cylinder heat-up time 1.5 hours
- Duration of peak demand 1.5 hours

Heat demand for DHW heating

Type of room	Facilities (draw-off point)	n	$Q_{h\ max}$ in kWh	(n × $Q_{h\ max.}$) in kWh
Single:	Bath	5	7.0	35.00
	Shower	10	3.0	30.00
	Washbasin	5	0.8	4.00
Double:	Bath	5	10.5	52.50
	Shower	20	4.5	90.00
	Washbasin	5	1.2	6.00
				$\Sigma (n \cdot Q_{h\ max.}) = 217.50$

$$V = \frac{860 \cdot \sum(n \cdot Q_{h\ max.}) \cdot \varphi_n \cdot \varphi_2 \cdot Z_A}{(Z_A + Z_B) \cdot (T_a - T_e) \cdot a}$$

$$= \frac{860 \cdot 217.5 \cdot 0.65 \cdot 1 \cdot 1.5}{(1.5 + 1.5) \cdot (60 - 10) \cdot 0.8}$$

= 1520 litres

Selected DHW cylinders:
3 × Vitocell-H 300 with 500 litres capacity each
or
3 × Vitocell-V 300 with 500 litres capacity each

Calculating required heat-up output

$$\dot{Q} = \frac{V \cdot c \cdot (T_a - T_e)}{Z_A}$$

$$= \frac{1500 \cdot (60 - 10)}{860 \cdot 1.5} = 58 \text{ kW}$$

$\dot{Q}$ = heat-up output in kW

V = selected cylinder capacity in litres

c = spec. heat capacity $\left(\frac{1 \text{ kWh}}{860 \text{ l} \cdot \text{K}}\right)$

T_a = cylinder storage temperature in °C

T_e = cold water inlet temperature in °C

Z_a = heat-up time in h

Size boiler and DHW circulation pump according to the required heat-up rating. In order to guarantee adequate central heating of the building during winter too, this rated output must be added to the heat demand.

Calculating heat demand for DHW heating in apartment blocks with integrated, commercial sauna operation

Assumptions: The sauna is used by 15 persons/h.
5 showers with 12 litres/min are available, i.e. the showers are utilised three times in a row. Based on a showering time of 5 minutes, the volume of hot water required amounts to 60 litres per use.

The heat demand of the building amounts to $\dot{Q}_N$ = 25 kW.
Two points must be observed in order to guarantee adequate hot water generation:

a) Sufficient storage capacity (sized acc. to short-term draw-off rate).

b) The boiler must be large enough to cover the hot water generation and $\dot{Q}_N$.

to a) Calculating storage capacity:

15 users per 60 litres = 900 litres at 40 °C at the hot water outlet.
The DHW cylinder temperature is 60 °C.
As a low temperature boiler is to be installed, the short-term draw-off rate at a heating water flow temperature of 70 °C must be established; see tables on page

- 5 for Vitocell-H 100
- 8 for Vitocell-V 100
- 15 for Vitocell-H 300
- 21 and 22 for Vitocell-V 300

Converted to an outlet temperature of 45 °C we arrive at:

$$V_{(45\,°C)} = V_{(40\,°C)} \cdot \frac{\Delta T_{(40\,°C\,-\,10\,°C)}}{\Delta T_{(45\,°C\,-\,10\,°C)}}$$

$$= 900 \cdot \frac{30}{35} = 771 \text{ litres}$$

Proposal: 2 Vitocell-V 300 with 300 litres capacity each with a short-term draw-off rate of 375 litres per cylinder cell and 698 litres capacity for the cylinder bank (DHW temperature 45 °C).

to b) Required boiler size

As the showering procedure is repeated hourly, the selected storage capacity must be heated up in 1 hour. The necessary rated output is calculated as follows:

$$\dot{Q}_A = \frac{V_{cyl.} \cdot \Delta T \cdot c}{Z_A}$$

$$= \frac{600 \cdot 1 \cdot (60 - 10)}{860 \cdot 1}$$

$$= 34.9 \text{ kW}$$

$\dot{Q}_A$ = minimum connected output for heating the DHW cylinder in kW
$V_{Sp.}$ = cylinder capacity in litres
ΔT = temperature difference between cylinder storage temp.erature and cold water inlet temperatre
c = spec. heat capacity $\left(\frac{1\text{ kWh}}{860\text{ l} \cdot \text{K}}\right)$
Z_A = heat-up time in h

In order to guarantee adequate central heating of the building during winter too, this heat volume must be added to the heating demand. This supplement is permissible in accordance with current regulations (HeizAnlV) because

1. it involves commercial use and
2. there is no output restriction in the case of a low temperature boiler.

Calculating DHW heat demand in sports/leisure centres

DIN 18032-1, April 1989 for sports centres, gymnasia and indoor recreation centres should be consulted as a guideline for the design and installation of the DHW supply system.
The consumption of hot water in sports centres is of a short-term nature. Therefore, when it comes to selecting suitable DHW cylinders, the main criterion is the short-term draw-off rate (10 minutes output).
The hot water supply system must be capable of guaranteeing hot water supplies over the full period of use (throughout the year).

The following values are assumed for sizing the DHW system:

DHW draw-off temperature:	max. 40 °C
Water consumption per user "$\dot{m}$":	8 litres/min
Shower time per user "t":	4 min
Heat-up time "Z_A":	50 min
Users per heat-up time and training unit "n":	min. 25 users
DHW cylinder storage temperature "T_a":	generally 50 °C, recomm'd 55-60 °C

Example for a simple gymnasium:

1. Calculating required volume of hot water:

$m_{MW} = t \cdot \dot{m} \cdot n$
$= 4$ min/person · 8 litres/min · 25 users
$= 800$ litres hot water at 40 °C

Selected capacity: 700 litres
(selected capacity should roughly correspond to required DHW volume).
Short-term draw-off rate from tables on page
- 5 for Vitocell-H 100
- 8 for Vitocell-V 100
- 15 for Vitocell-H 300
- 21 and 22 for Vitocell-V 300

Conversion to hot water outlet temperature of 40 °C at

$m_{(40\,°C)}$ = short-term draw-off rate at DHW outlet temp. 40 °C
$m_{(45\,°C)}$ = short-term draw-off rate at DHW outlet temp. 45 °C

$$m_{(40\,°C)} = m_{(45\,°C)} \cdot \frac{45 - 10}{40 - 10}$$

$= 2 \cdot 424$ litres/10 minutes (acc. to table on page 15)

$$= 848 \cdot \frac{35}{30}$$

$= 989$ litres/10 minutes

Selected DHW cylinders:
2 × Vitocell-H 300 with 350 litres capacity each,
short-term draw-off rate at 70 °C
Heating water flow temperature = 989 litres at 40 °C

1. Calculating required heat-up output for the established cylinder capacity:

$$\dot{Q}_A = \frac{V \cdot c \cdot (T_a - T_e)}{Z_A}$$

$$= \frac{700 \cdot (60 - 10)}{860 \cdot 0.833} = 49 \text{ kW}$$

$\dot{Q}_A$ = heat-up output in kW
V = cylinder capacity in litres
c = spec. heat capacity $\left(\frac{1 \text{ kWh}}{860 \text{ l} \cdot \text{K}}\right)$
T_a = cylinder storage temperature in °C
T_e = cold water inlet temperature in °C

The boiler and circulation pump for heating up the cylinder must be sized accordingly for the required heat-up output.

To safeguard adequate central heating of the building during winter too, this heat volume must be added to the heat demand. This supplement is permissible in accordance with current regulations (HeizAnlV) because
1. it involves commercial use and
2. there is no output restriction in the case of a low temperature boiler.

Calculating the DHW heat demand in connection with district heating systems

DHW heating systems which are to be heated by district heating systems instead of boilers cannot be sized according to the values contained in the DHW cylinder tables because of different heating water flow and return temperatures in winter and summer.

The following example illustrates one method which can be used for sizing purposes.

Example:

Building heat demand "$\dot{Q}_{NW}$":	20 kW
DHW demand factor "N":	1.5
Heating water flow/return temperature	
■ in winter:	110/50 °C
■ in summer:	65/40 °C
Selected DHW cylinder:	1 Vitocell-V 300 (type EVI) with 200 litres capacity

1. Calculating required district heating water flow rate

$\dot{m}_W$ = district heating water flow rate in winter in litres/hour
$\dot{Q}_{NW}$ = connected output in winter in kW
c = spec. heat capacity $\left(\frac{1\ kWh}{860\ l \cdot K}\right)$
ΔT_W = temperature difference in winter between district heating water flow and return temperature in K

$$\dot{m}_W = \frac{\dot{Q}_{NW}}{c \cdot \Delta T_W}$$

$$= \frac{860 \cdot 20}{110 - 50} = 287 \text{ litres/h}$$

2. Calculating connected output in summer with a constant district heating water flow rate ($\dot{m}_S = \dot{m}_W$)

$\dot{m}_S$ = district heating water flow rate in summer in litres/hour
$\dot{Q}_{NS}$ = connected output in summer in kW
ΔT_S = temperature difference in summer between district heating water flow and return temperature in K

$$\dot{Q}_{NS} = \dot{m}_S \cdot c \cdot \Delta T_S \text{ mit } (\dot{m}_S = \dot{m}_W)$$

$$= 287 \cdot \frac{1}{860} \cdot (65 - 40)$$

$$= 8.33 \text{ kW}$$

To ensure that the required hot water volume can be made available by the DHW cylinder throughout the year, it must be sized on the basis of the summertime conditions (i.e. the least favourable operating conditions).

Table 12 Performance data with limitation of the return temperature

Vitocell-V 100
on request

Vitocell-V 300 (type EVI)

Capacity	litres	200	300	500
Continuous output at heating water flow and return temp. 65/40 °C and raising DHW temp. from 10 to 45 °C	kW l/h	15 375	16 393	19 467
Performance factor N_L[*1] at heating water flow and return temp. 65/40 °C and DHW cylinder temp. T_{sp} = 50 °C		1.4	3.0	6.0
10 minutes output	litres	164	230	319

*[*1]With return temperature limitation.*

5822 184 GB

4.1 DHW (secondary) connection

Please see fig. 2 on page 43 or fig. 6 on page 48 regarding DHW connections for DHW cylinders installed as a cylinder bank.

Please note:
Dishwashers and washing machines can be connected to the central DHW supply. Washing machines must be equipped with separate connections for hot and cold water. By feeding hot water directly from the DHW cylinder, the electrical heating of the water in the dishwasher or washing machine is reduced, thereby saving time, energy and money. Please follow the manufacturer's recommendations.

The DHW temperature in the piping downstream must be limited to 60 °C through the installation of a suitable mixing device, e.g. a thermostatic mixing valve (acc. to. paragraph 8 section 2 HeizAnlV or local regulations). This does not apply to heating systems for which higher temperatures are essential for their usual application or which require a pipe length of less than 5 m.
Warning:
Consult the manufacturer's instructions when installing thermostatic mixing valves. The mixing equipment does not prevent the risk of scalding at the tap. The installation of a mixer tap is required.

Only for cylinder banks Vitocell-H 300:
With DHW outlet temperatures above 60 °C, the connecting pipework on the secondary side can, in multi-cylinder banks, also be connected in series. The connecting pipework on the primary side is connected as shown in fig. 4 on page 46.

Fittings which are installed in the connecting pipework must conform to DIN 1988 (see fig. 1 on page 42) and DIN 4753 or local regulations.

These fittings comprise the following:

- **Shut-off valves**

- **Drain valve**

- **Pressure reducer**
  This device should be installed, if the pressure at the connection point in the pipework is higher than 80% of the safety valve response pressure.
  It is advisable to install the pressure reducer immediately after the water meter. This creates nearly the same pressures in the entire DHW system, which is thereby protected from overpressure and water hammer.
  According to DIN 4109, the static pressure of the water supply system after distribution in the floors upstream of the fittings should not be higher than 5 bar (0.5 MPa).

- **Safety valve**
  The system must be equipped with a type-tested diaphragm safety valve as protection against overpressure.
  Max. operating pressure: 10 bar.
  The connection diameter of the safety valve must be as follows:
  – up to 200 litres capacity
    min. R ½" (DN 15),
    max. heating output 75 kW,
  – above 200 to 1000 litres capacity
    min. R ¾" (DN 20),
    max. heating output 150 kW,
  – above 1000 to 5000 litres capacity
    min. R 1" (DN 25),
    max. heating output 250 kW.

  Install the safety valve in the cold water pipe. It must not be able to be isolated from the DHW cylinder (or the cylinder bank). The pipework between the safety valve and the cylinder must not be restricted in any way. The safety valve blow off line must not be closed. Expelled water must be safely and visibly routed into a drainage system.
  It is advisable to arrange a sign close to the blow off line of the safety valve or on the safety valve itself stating:
  "For safety reasons, water may be discharged from the blow off line during heating. Do not seal off."
  The safety valve should be installed above the top edge of the cylinder.

- **Non-return valve**
  Prevents system water and heated water from flowing back into the cold water pipe or into the mains water supply.

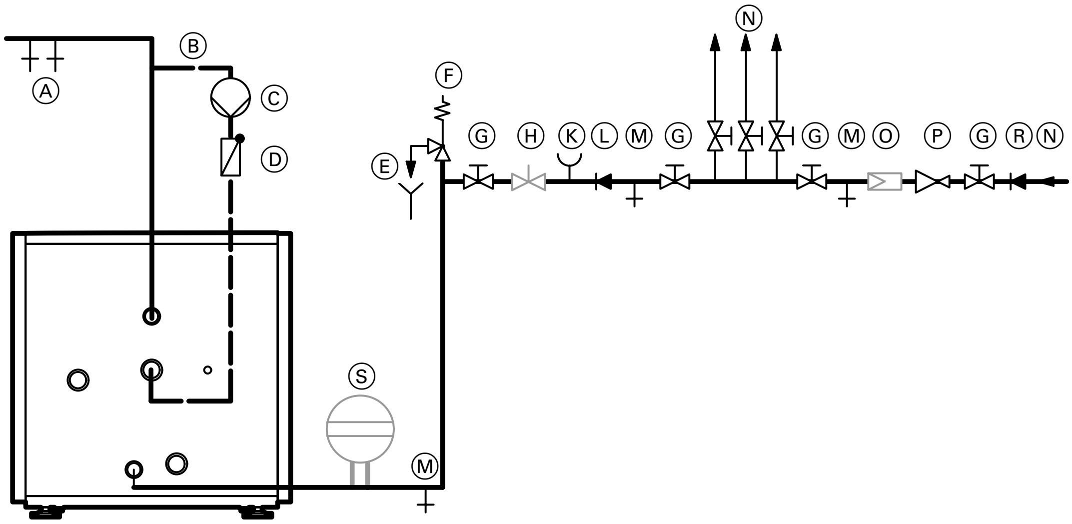
- **Pressure gauge (pressure gauge)**
  Provide a connection for a pressure gauge.

- **Flow regulating valve**
  We recommend that a flow regulating valve is installed and the maximum water flow is adjusted in accordance with the short-term draw-off rate (10 minutes output) of the DHW cylinder.

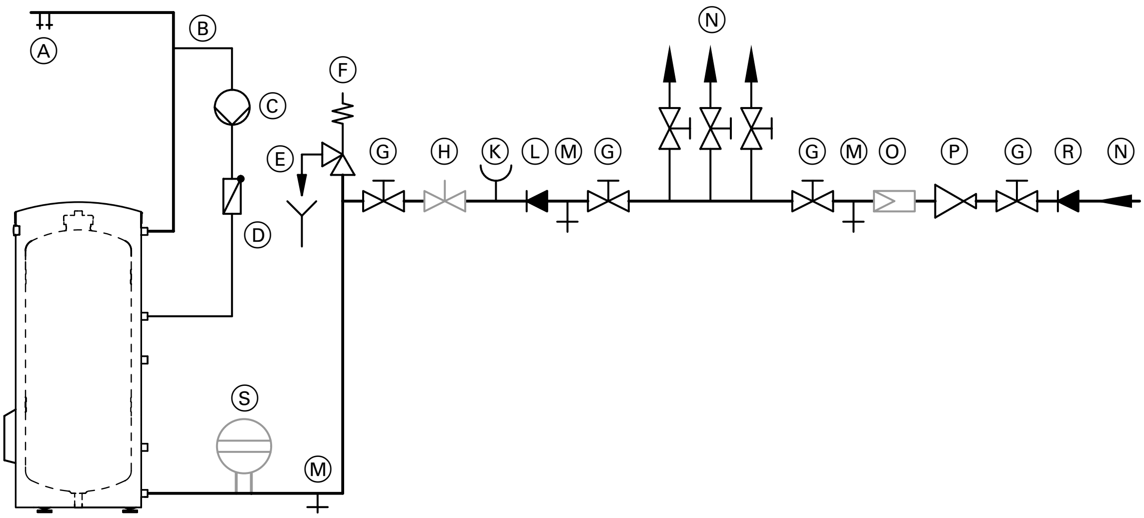
- **Drinking water filter**
  to DIN 1988-2, a drinking water filter should be installed in systems with metal pipework. A drinking water filter should also be installed into plastic pipework. The installation of a drinking water filter prevents dirt from being introduced into the domestic water system.

5822 184 GB

Vitocell-H 100 and 300



Vitocell-V 100 and 300



Ⓐ Hot water
Ⓑ DHW circulation pipe
Ⓒ DHW circulation pump
Ⓓ Spring-loaded check valve
Ⓔ Visible blow off pipe outlet
Ⓕ Safety valve
Ⓖ Shut-off valve
Ⓗ Flow regulating valve
Ⓚ Pressure gauge connection
Ⓛ Non-return valve
Ⓜ Drain
Ⓝ Cold water
Ⓞ Drinking water filter
Ⓟ Pressure reducer
Ⓡ Non-return valve/pipe separator
Ⓢ Diaphragm expansion vessel, suitable for drinking water

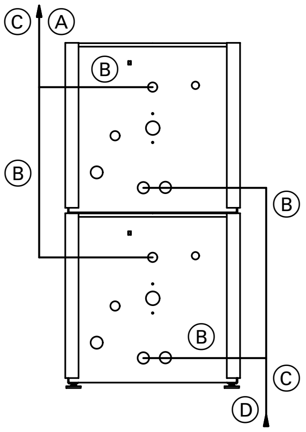
Fig. 1
DHW connection acc. to DIN 1988

5822 184 GB

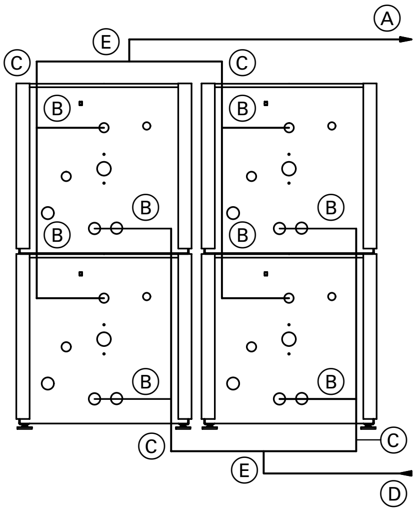
DHW connection of cylinder banks with Vitocell-H 300

Please note:
Observe the cross-sections of the DHW connecting pipes (see below).

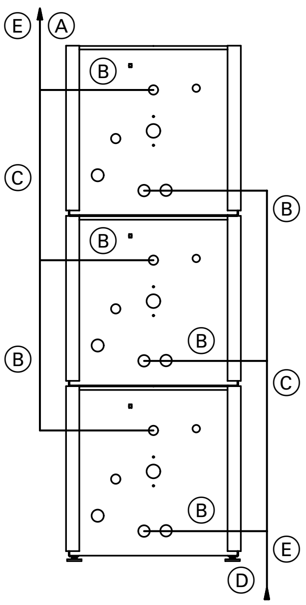
Vitocell-H 300 with 700 or 1000 litres capacity (two cells)



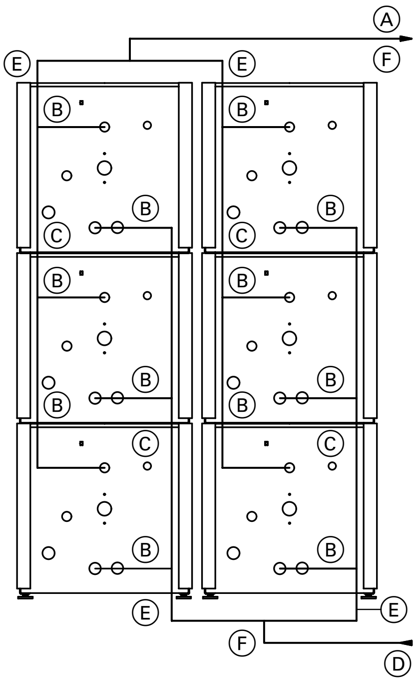
Vitocell-H 300 with 2 × 700 or 2 × 1000 litres capacity (2 × two cells)



Vitocell-H 300 with 1500 litres capacity (three cells)



Vitocell-H 300 with 2 × 1500 litres capacity (2 × three cells)



Ⓐ Hot water
Ⓑ 35 × 1.5 or R ¼″*1
Ⓒ 42 × 1.5 or R 1½″*1

Ⓓ Cold water
Ⓔ 54 × 1.5 or R 2″*1
Ⓕ 70 × 2.0 or R 2½″*1

*1 *Cross sections of DHW connection pipes.*

5822 184 GB

Fig. 2
DHW connection when installing Vitocell-H 300 as a cylinder bank

4.2 Heating water (primary) connection

Heating water (primary) connection

According to DIN 4753, the water in the DHW cylinder may generally be heated to approx. 95 °C.
To ensure that the DHW temperature does not exceed 95 °C, a control unit for regulating the heat supply must be installed in accordance with the following wiring diagrams.

In the case of installation as per fig. 3 on page 45 or fig. 5 on page 47, the DHW circulation pump is switched by the control thermostat. The spring-loaded check valve prevents continued heating of the DHW cylinder from taking place due to natural circulation.

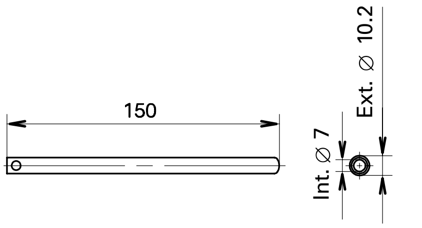
A water temperature regulator may also be used instead of the control thermostat (see fig. 5 on page 47).

With heating water flow temperatures above 110 °C, a type-tested high limit safety cut-out must also be fitted. The dual thermostat with 2 separate thermostatic systems (limit thermostat and high limit safety cut-out) is used for this purpose (see fig. 5 on page 47).
In heating systems which already incorporate a high limit safety cut-out for limiting the temperature of the heating medium to 110 °C (e.g. in the boiler), no additional high limit safety cut-out is required in the DHW cylinder.

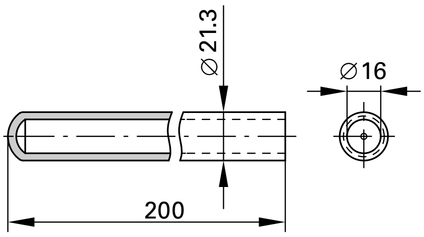
Welded-in sensor wells

The following sensor wells are welded into the DHW cylinder.

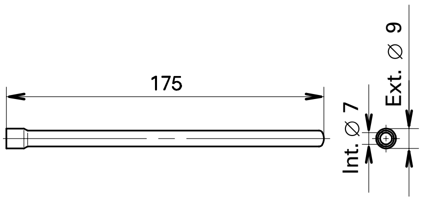
For Vitocell-H 100:



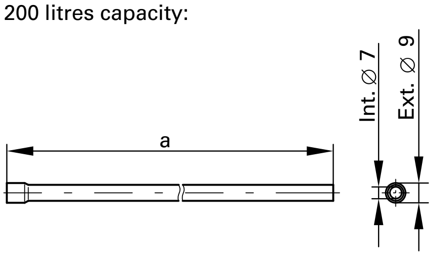
For Vitocell-V 100 with 160 to 500 litres capacity:



For Vitocell-H 300 with 160 and 200 litres capacity:



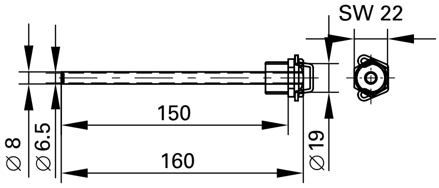
For Vitocell-V 300 (type EVA) with 130 to 200 litres capacity:



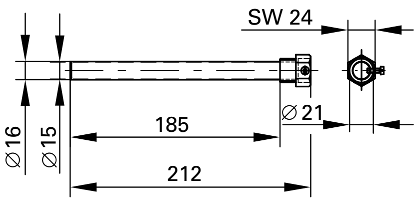
Capacity	litres	130	160	200
a	mm	550	650	650

Included sensor wells

For Vitocell-V 100 with 750 and 1000 litres capacity:
For thermometer

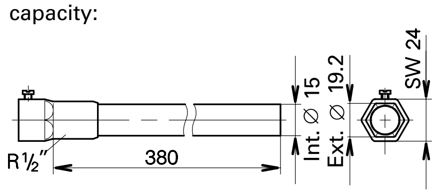


For control thermostat

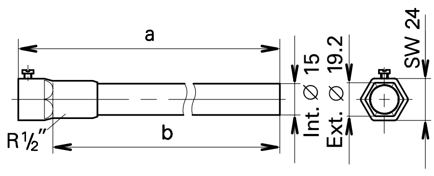


For Vitocell-H 300 with 350 and 500 litres capacity,
and
for Vitocell-V 300 (type EVI) with 200 to 500 litres capacity:
For maximum operational reliability, the stainless steel sensor well provided should be used for the sensor or probe of the regulating device.
If the sensor well supplied is too large or too small for the sensor or probe, use a different sensor well made from stainless steel (1,4571 or 1,4435).

Vitocell-H 300 with 350 and 500 litres capacity:



Vitocell-V 300 (Typ EVI) mit 200 bis 500 Liter Inhalt:



Capacity	litres	200	300	500
a	mm	220	220	330
b	mm	200	200	310

Cylinder banks

Vitocell-H 300:
With cylinder banks, implement the primary connections and the arrangement of the control thermostat as well as that of the high limit safety cut-out (if required) as shown in fig. 4 on page 46.

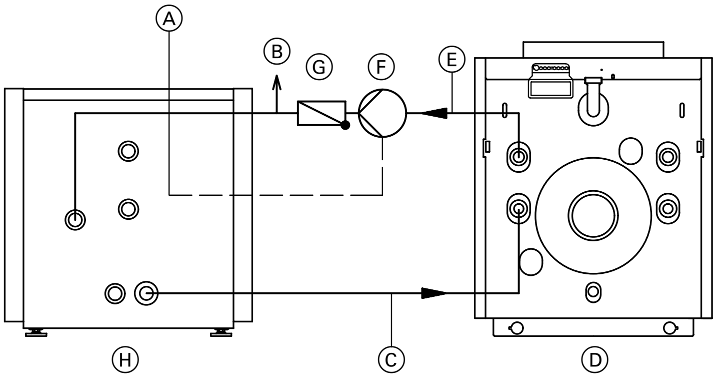
In the case of cylinder banks, it is sufficient to install a control thermostat in only one of the cylinders.

Vitocell-V 100 and 300:
The cylinder bank is controlled by one control thermostat. Therefore, separate control of the individual cylinders within a bank is not possible. Install the control thermostat in the last cylinder as seen from the heating water flow (see fig. 6 on page 48).
Please note:
If, contrary to the arrangement in fig. 6, the heating water flow is connected on the r.h. side, install the sensor well for the control thermostat **before installation** of the header into the last cylinder as seen from the heating water flow.

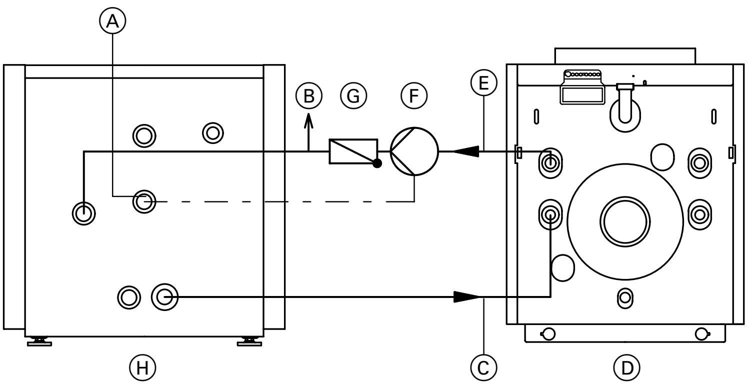
Group the cylinders into several banks or install them as individual cylinders, if separate control of individual cylinders within a cylinder bank is required.

Vitocell-H 100 and 300

130, 160 and 200 litres capacity)



350 and 500 litres capacity



Ⓐ Control thermostat and high limit safety cut-out (if required)
Ⓑ Air vent valve
Ⓒ Heating water return
Ⓓ Boiler
Ⓔ Heating water flow
Ⓕ Circulation pump
Ⓖ Spring-loaded check valve
Ⓗ Vitocell-H 100 or 300

Control by actuating the circulation pump

Fig. 3
Heating water (primary) connection with one boiler

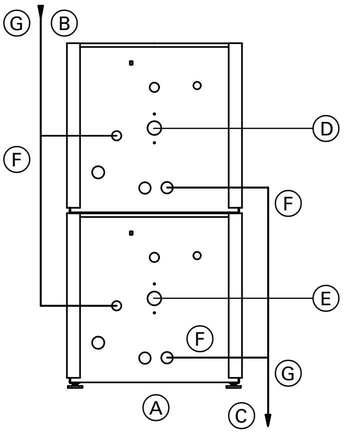
5822 184 GB

4.2 Heating water (primary) connection

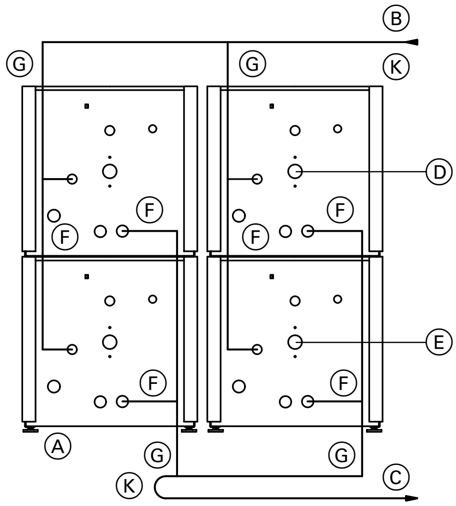
Vitocell-H 300 as a cylinder bank

Please note:
Observe the cross-sections of the primary connecting pipes (see below).

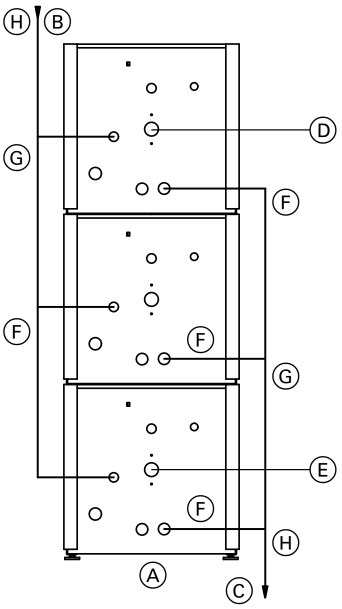
with 700 or 1000 litres capacity (two cells)



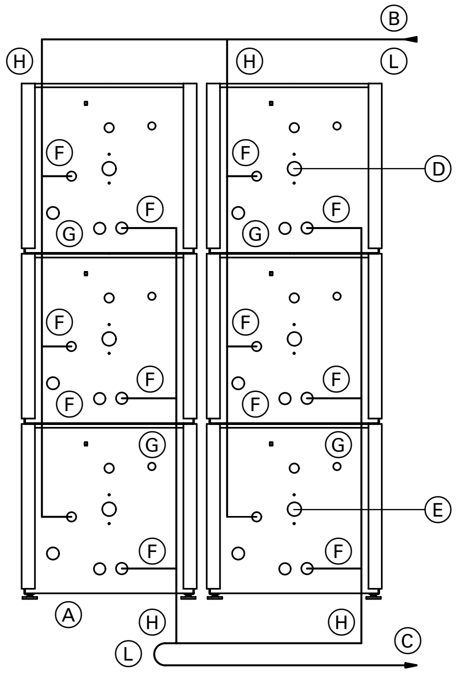
with 2 × 700 or 2 × 1000 litres capacity (2 × two cells)



with 1500 litres capacity (three cells)



with 2 × 1500 litres capacity (2 × three cells)



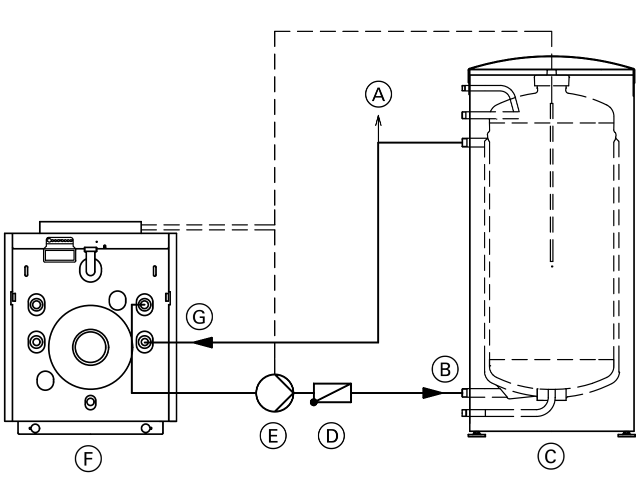
Ⓐ Vitocell-H 300
Ⓑ Heating water flow
Ⓒ Heating water return
Ⓓ High limit safety cut-out (if required)
Ⓔ Control thermostat

Ⓕ DN 32 or R 1¼″*1
Ⓖ DN 50 or R 2″*1
Ⓗ DN 80*1
Ⓚ DN 100*1
Ⓛ DN 125*1

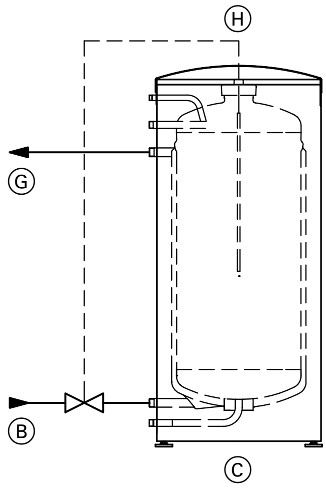
*1 *Cross sections of primary connection pipes.*

Fig. 4
Primary connections and control thermostat arrangement when installing Vitocell-H 300 as a cylinder bank

Vitocell-V 300 (type EVA)

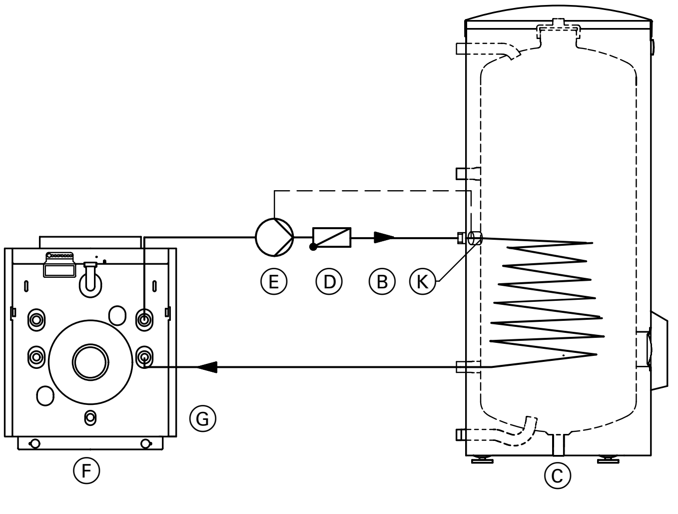


Control by actuating the circulation pump

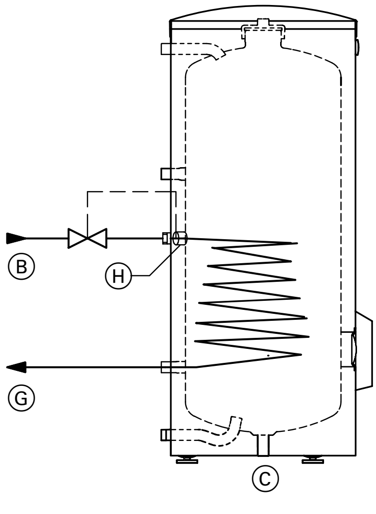


Control by control valve

Vitocell-V 100 and Vitocell-V 300 (type EVI)



Control by actuating the circulation pump



Control by control valve

Ⓐ Air vent valve
Ⓑ Heating water flow
Ⓒ Vitocell-V 100 or 300
Ⓓ Spring-loaded check valve

Ⓔ Circulation pump
Ⓕ Boiler
Ⓖ Heating water return

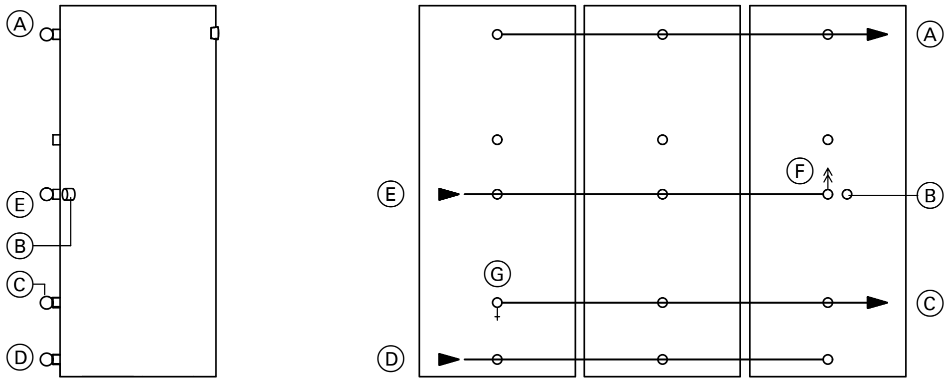
Ⓗ Sensor for DHW thermostat
Ⓚ Control thermostat and high limit safety cut-out (if required)

Fig. 5
Heating water (primary) connection

5822 184 GB

4.2 Heating water (primary) connection

Vitocell-V 100 and 300 as a cylinder bank



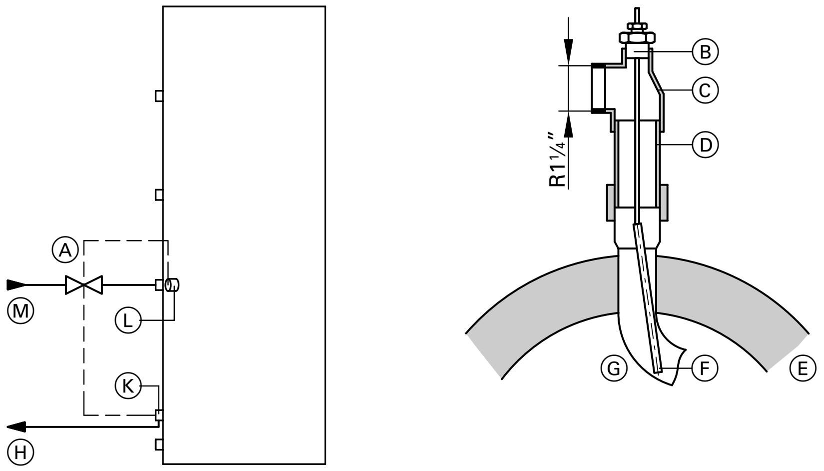
Ⓐ Hot water
Ⓑ Control thermostat
Ⓒ Heating water return
Ⓓ Cold water
Ⓔ Heating water flow
Ⓕ Air vent
Ⓖ Drain

Fig. 6
Primary connections when installing Vitocell-V 100 or 300 as a cylinder bank

5822 184 GB

Primary connection with return temperature limit

Vitocell-V 100 and Vitocell-V 300 (type EVI)



Ⓐ DHW thermostat
Ⓑ Threaded gland
Ⓒ Tee
Ⓓ Threaded joint
Ⓔ Thermal insulation
Ⓕ Sensor for return temperature limit thermostat
Ⓖ Indirect coil
Ⓗ Heating water return
Ⓚ Sensor for return temperature limit thermostat
Ⓛ Sensor for DHW thermostat
Ⓜ Heating water flow

Fig. 7
Installation of the sensor for the return temperature thermostat into the heating water return in the case of individual DHW cylinders

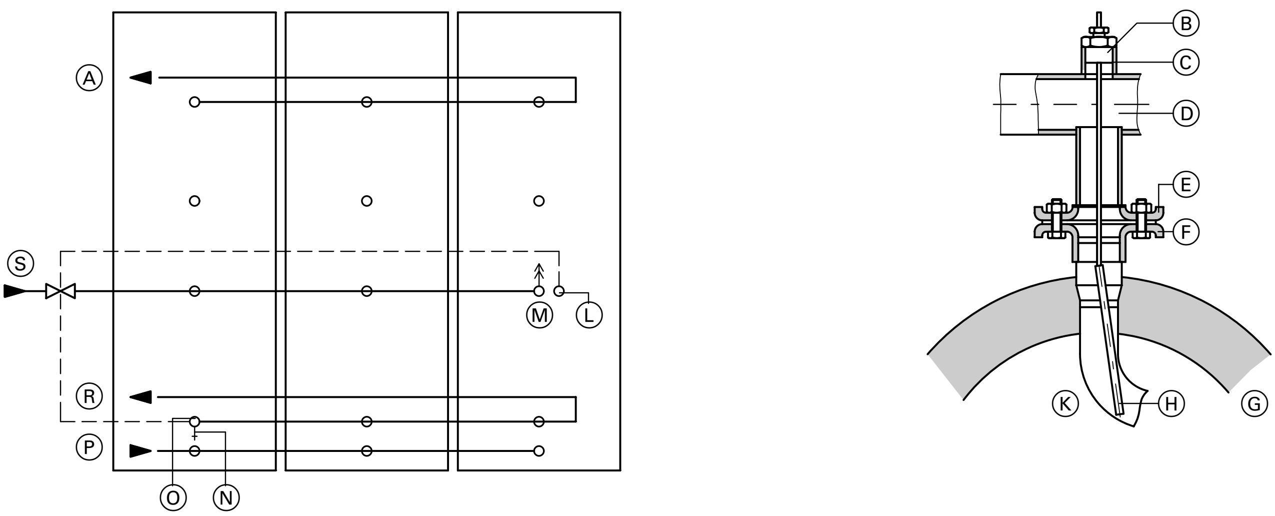
Install the return temperature limit thermostat, if this is a requirement stipulated by the relevant district heating supplier.

To ensure that the heating water return temperature does not fall below a mandatory value, install a return temperature limit thermostat with control valve (e.g. as offered by Samson, type 43-1, control range 25 to 70 °C).

For individual cylinder units, install the sensor as shown in fig. 7 and for cylinder banks as shown in fig. 8. The customer is responsible for installing the necessary pipework.

The control valve is sized acc. to the required heating water flow rate and the pressure drop of the system.

Vitocell-V 100 and 300 as a cylinder bank



Ⓐ Hot water
Ⓑ Threaded gland
Ⓒ Coupling R ½″ DIN 2986 (on site)
Ⓓ Header
Ⓔ Flange
Ⓕ Threaded flange
Ⓖ Thermal insulation
Ⓗ Sensor for return temperature limit thermostat
Ⓚ Indirect coil
Ⓛ Sensor for DHW thermostat
Ⓜ Air vent
Ⓝ Drain
Ⓝ Sensor for return temperature limit thermostat
Ⓟ Cold water
Ⓡ Heating water return
Ⓢ Heating water flow

Fig. 8
Installation of the sensor for the return temperature limit thermostat into the heating water return when installing Vitocell-V 100 and 300 as a cylinder bank

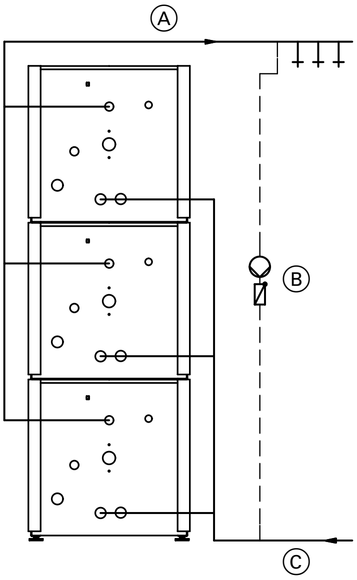
4.3 DHW circulation pipe connection for cylinder battery

Connect the circulation pipes with detachable fittings.
Install the cylinder banks with connected DHW circulation acc. to fig. 11 or 12 on page 51, to ensure that all cylinders are evenly heated up.

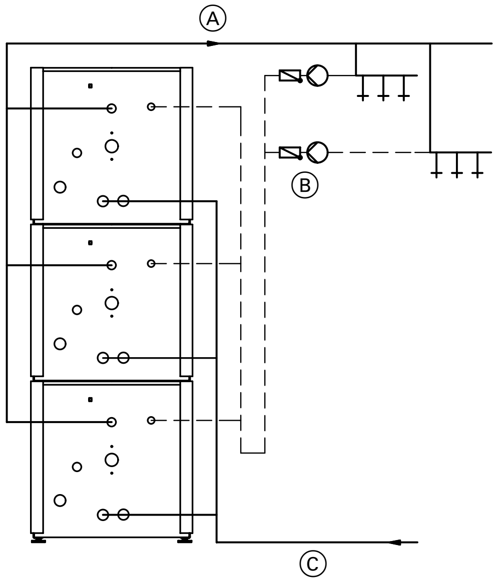
Only for cylinder bank Vitocell-H 300:
Gravity operation of the DHW circulation pipe is only possible to a limited extent, as the hot water outlet is implemented in the form of a heat insulating loop.

Preferably, equip the circulation pipe with a circulation pump, check valve and timer (to prevent night circulation).
See also the relevant heating systems orders or local regulations.

Connection without return temperature limit and with single DHW circulation pipe



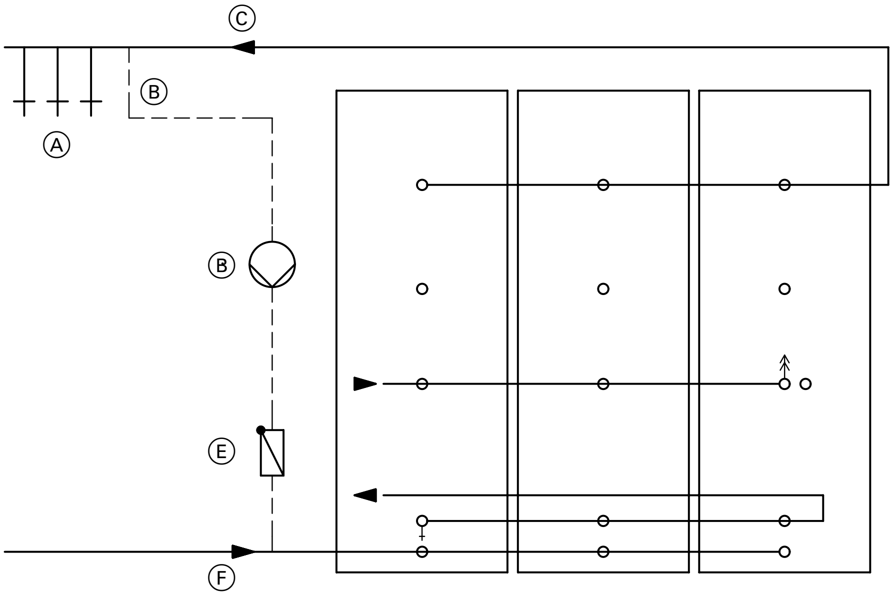
Connection with return temperature limit and/or branched DHW circulation networks



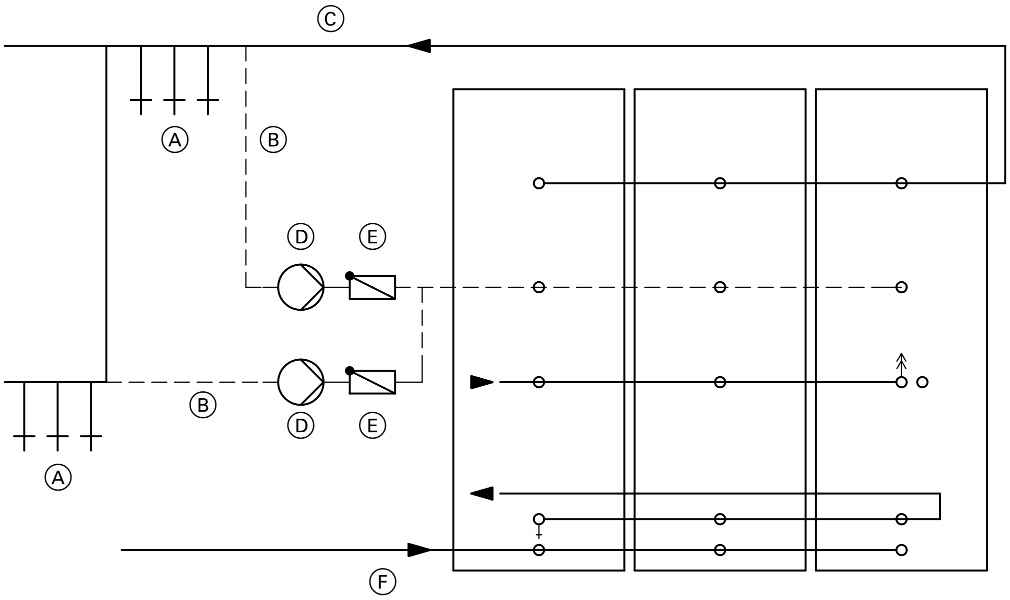
Ⓐ Hot water
Ⓑ DHW circulation
Ⓒ Cold water

Fig. 11
DHW circulation pipe connection when installing Vitocell-H 300 as a cylinder bank

Connection in conjunction with district heating systems without return temperature limit or in conjunction with boilers (low temperature operation) and simple DHW circulation pipe



Connection in conjunction with condensing boilers or district heating system with return temperature limit and systems with branched DHW circulation networks



Ⓐ Draw-off points
Ⓑ DHW circulation pipe
Ⓒ Hot water
Ⓓ Circulation pump
Ⓔ Check valve
Ⓕ Cold water

Fig. 12
DHW circulation pipe connection when installing Vitocell-V 100 and 300 as a cylinder bank

5822 184 GB

5.1 Keyword index

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