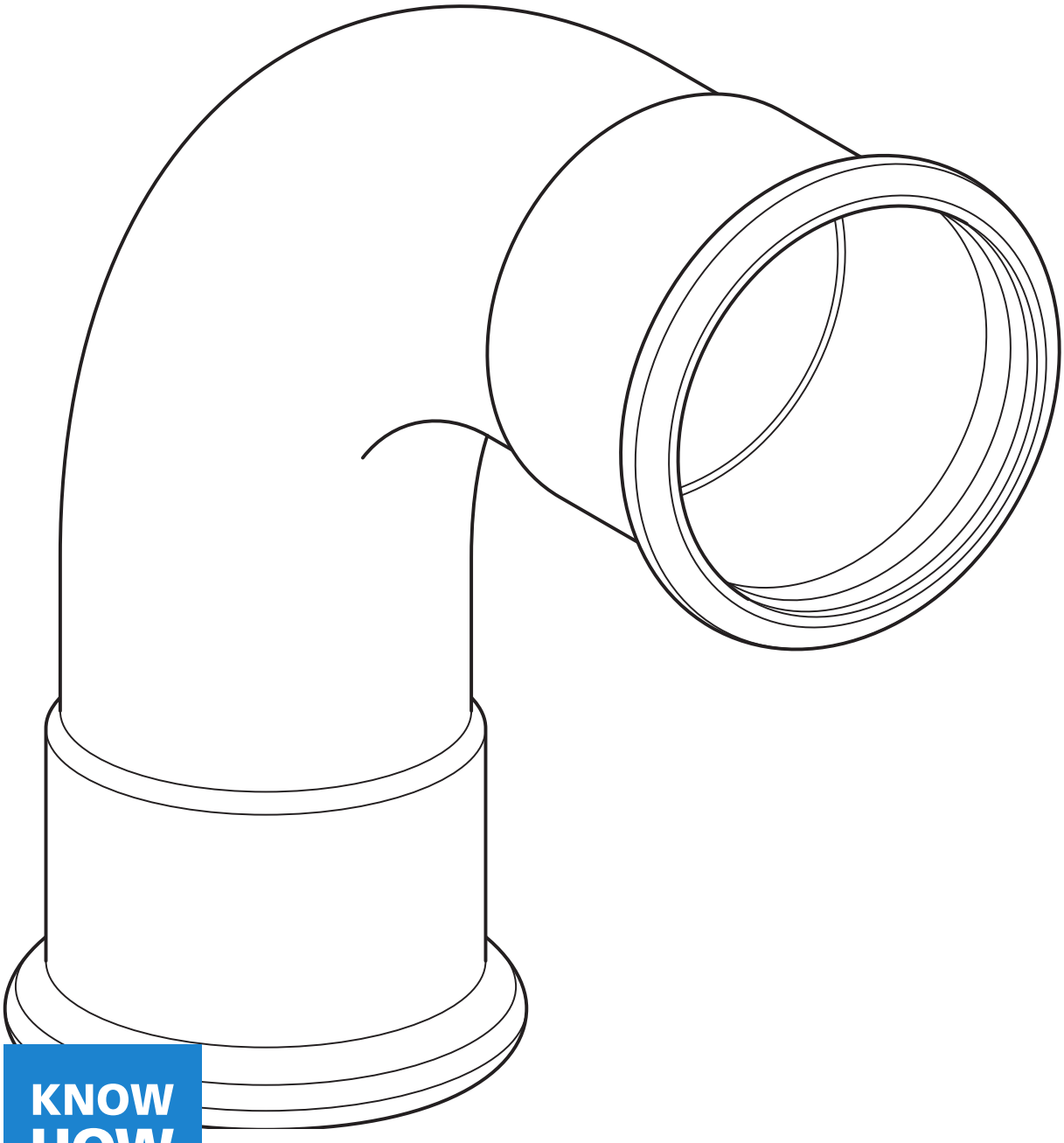
GEBERIT

GEBERIT MAPRESS CARBON STEEL
PRESSURE LOSS

VALID FROM 1 JANUARY 2026



KNOW HOW INSTALLED

1 TOTAL PRESSURE LOSS IN AN INSTALLATION

The total pressure loss in an installation is derived from the sum of the

- pressure losses through pipe friction in pipes
- pressure losses from the individual resistances of fittings

$$\Delta p_{tot} = \Delta p_R + \Delta p_E$$

Δp_{tot}	Total pressure loss
Δp_R	Pressure loss through pipe friction [Pa]
Δp_E	Pressure loss from individual resistances [Pa]

100,000 PA = 100 kPa = 1 bar = 1000 mbar

1.1 PRESSURE LOSS FROM INDIVIDUAL RESISTANCES

Changes in direction and/or velocity that occur in fittings such as bends and T-pieces cause pressure losses due to individual resistances.

The essential size for determining pressure losses from individual resistances is the pressure loss coefficient ζ (Zeta value), a dimensionless size which represents the resistance against the dynamic pressure of the water.

Since a theoretical determination of the flow losses of these individual resistances is only possible in certain cases, the pressure loss coefficients are determined in accordance with the procedures outlined in the Technical Test Specification W 575 of the DVGW.

The pressure loss from individual resistances Δp_E is derived from the sum of the pressure loss coefficients ζ (Zeta values) multiplied by the dynamic pressure:

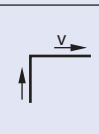
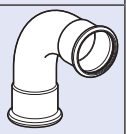
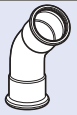
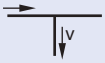
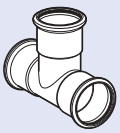
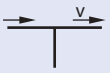
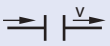
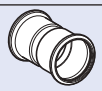
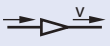
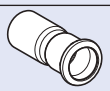
$$\Delta p_E = Z = \sum \zeta \cdot \frac{\rho}{2} \cdot v^2 \qquad \left[\frac{kg \cdot m^2}{m^3 \cdot s^2} = \frac{N}{m^2} = Pa \right]$$

Δp_E	Pressure loss from individual resistances [Pa]
$\sum \zeta$	Sum of the pressure loss coefficients [factor]
ρ	Density [kg/m^3]
v	Velocity in the pipe with the reference diameter [m/s]

1.1.1 Pressure loss coefficients

The pressure loss coefficients were calculated based on SVGW (SN EN 1267) and DVGW (W 575) specifications.

Table 1: Pressure loss coefficients ζ (Zeta values) for Geberit Mapress Carbon Steel fittings, d12–35 mm

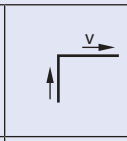
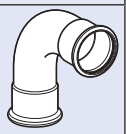
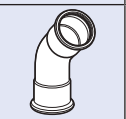
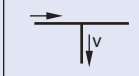
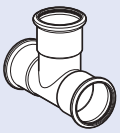
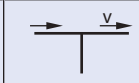
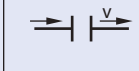
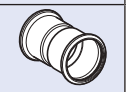
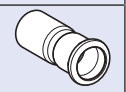
			d [mm]					
			12	**15**	**18**	**22**	**28**	**35**
Bend 90° (W90)			0.44	0.45	0.42	0.39	0.34	0.34
Bend 45° (W45)			0.35	0.34	0.3	0.29	0.26	0.21
T-piece[1] Branch fitting (TA)			1.07	1.17	1.19	1.15	1.18	1.15
T-piece[1] Through-flow (TD)			0.22	0.20	0.16	0.16	0.12	0.13
Threaded socket (K)			0.20	0.17	0.14	0.14	0.10	0.11
Reducer (RED)			18/12 0.19	22/15 0.13	22/18 0.12	35/22 0.11	42/28 0.09	54/35 0.09

v The symbol v marks the reference cross-section.

→ The arrow marks the cross-sections flowed through during the measurement.

1) In the case of reduced T-pieces, the resistance value of the equal T-piece is set to the smallest dimension of the reduced T-piece for the flow path to be calculated.

Table 2: Pressure loss coefficients ζ (Zeta values) for Geberit Mapress Carbon Steel fittings, d42–108 mm

			d [mm]				
			42	**54**	**76.1**	**88.9**	**108**
Bend 90° (W90)			0.33	0.31	0.29	0.28	0.26
Bend 45° (W45)			0.20	0.19	0.18	0.17	0.16
T-piece[1)] Branch fitting (TA)			1.17	1.2	1.35	1.35	1.35
T-piece[1)] Through-flow (TD)			0.11	0.09	0.05	0.05	0.05
Threaded socket (K)			0.09	0.07	0.03	0.03	0.03
Reducer (RED)			54/42 0.08	76.1/54 0.07	88.9/76.1 0.03	108/88.9 0.03	–

v The symbol v marks the reference cross-section.

→ The arrow marks the cross-sections flowed through during the measurement.

– Flow situation does not apply to any application.

1) In the case of reduced T-pieces, the resistance value of the equal T-piece is set to the smallest dimension of the reduced T-piece for the flow path to be calculated.

1.2 EQUIVALENT PIPE LENGTH

The individual resistances can be taken into account in a simplified manner with the equivalent pipe length instead of the pressure loss coefficient (Zeta value). The equivalent pipe length indicates which length of a straight pipe corresponds to the pressure loss of a fitting or valve with a known individual resistance number.

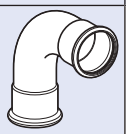
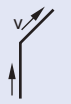
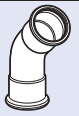
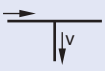
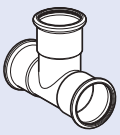
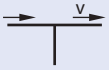
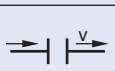
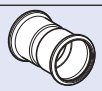
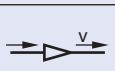
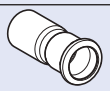
The equivalent pipe length must be added to the pipe length and multiplied by the corresponding pipe friction pressure drop.

The equivalent pipe lengths corresponding to the individual resistances can be found in the tables entitled "Equivalent pipe lengths".

1.2.1 Equivalent pipe lengths

The equivalent pipe lengths were determined based on the guidelines of the SVGW (SN EN 1267) and DVGW (W 575).

Table 3: Equivalent pipe lengths [m] for Geberit Mapress Carbon Steel fittings, d12–35 mm

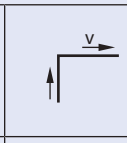
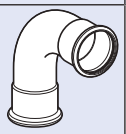
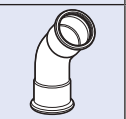
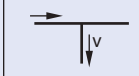
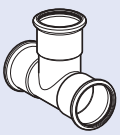
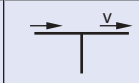
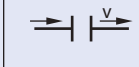
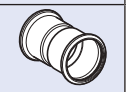
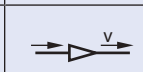
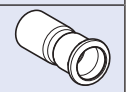
			d [mm]					
			12	**15**	**18**	**22**	**28**	**35**
Bend 90° (W90)			0.18	0.22	0.26	0.33	0.42	0.54
Bend 45° (W45)			0.14	0.17	0.19	0.25	0.30	0.40
T-piece[1)] Branch fitting (TA)			0.44	0.65	0.83	1.03	1.45	1.86
T-piece[1)] Through-flow (TD)			0.09	0.11	0.12	0.16	0.19	0.26
Threaded socket (K)			0.08	0.09	0.09	0.12	0.12	0.17
Reducer (RED)			18/12 0.10	22/15 0.07	22/18 0.08	35/22 0.09	54/28 0.12	54/35 0.14

v The symbol v marks the reference cross-section.

→ The arrow marks the cross-sections flowed through during the measurement.

1) In the case of reduced T-pieces, the equivalent pipe length of the equal T-piece is set to the smallest dimension of the reduced T-piece for the flow path to be calculated.

Table 4: Equivalent pipe lengths [m] for Geberit Mapress Carbon Steel fittings, d42–108 mm

			d [mm]				
			42	**54**	**76.1**	**88.9**	**108**
Bend 90° (W90)			0.66	0.86	1.11	1.33	1.68
Bend 45° (W45)			0.47	0.60	0.66	0.78	0.99
T-piece[1)] Branch fitting (TA)			2.43	3.47	5.74	7.06	9.14
T-piece[1)] Through-flow (TD)			0.30	0.37	0.33	0.39	0.47
Threaded socket (K)			0.18	0.19	0.12	0.15	0.19
Reducer (RED)			54/42 0.16	76.1/54 0.19	88.9/76.1 0.12	108/88.9 0.15	–

v The symbol v marks the reference cross-section.

→ The arrow marks the cross-sections flowed through during the measurement.

– Flow situation does not apply to any application.

1) In the case of reduced T-pieces, the equivalent pipe length of the equal T-piece is set to the smallest dimension of the reduced T-piece for the flow path to be calculated.

2 PRESSURE LOSS COOLING

2.1 RECOMMENDED FLOW VELOCITIES

The following recommendations apply for the cooling pressure loss tables:

- Heat sink connection lines: Flow velocity ≤ 0.3 m/s
- Distribution pipes: Flow velocity ≤ 0.5 m/s
- Riser pipes and cellar pipes: Flow velocity ≤ 0.8 m/s

2.2 COOLING, INLET FLOW 10 °C / RETURN FLOW 11 °C

Medium:	Water	Density:	999.7 kg/m^3
Inlet flow temperature:	10 °C	Viscosity:	0.0012891 Pa•s
Return temperature:	11 °C	Specific thermal capacity:	4 187.6 J/(kg•K)
Range:	1 K	Surface roughness:	0.01 mm
Average temperature:	10.5 °C		

Table 5: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 10 °C / return flow 11 °C, d12–22 mm

d [mm]		**12**		**15**		**18**		**22**	
$\dot{Q}$ [W]	**$\dot{m}$ [kg/h]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**
50	43.0	0.17	0.739	0.10	0.249	0.06	0.106	–	–
100	86.0	0.33	2.679	0.19	0.498	0.12	0.212	0.08	0.096
150	129.0	0.50	5.354	0.29	1.480	0.19	0.318	0.13	0.144
200	171.9	0.66	8.794	0.38	2.419	0.25	0.882	0.17	0.349
250	214.9	0.83	12.961	0.48	3.551	0.31	1.291	0.21	0.509
300	257.9	0.99	17.828	0.57	4.867	0.37	1.766	0.25	0.695
350	300.9	1.16	23.375	0.67	6.362	0.44	2.303	0.29	0.905
400	343.9	1.32	29.587	0.77	8.032	0.50	2.902	0.34	1.138
450	386.9	1.49	36.451	0.86	9.871	0.56	3.561	0.38	1.395
500	429.8	1.65	43.960	0.96	11.877	0.62	4.278	0.42	1.674
550	472.8	1.82	52.104	1.05	14.048	0.69	5.053	0.46	1.975
600	515.8	1.98	60.876	1.15	16.380	0.75	5.885	0.51	2.298
700	601.8	2.31	80.284	1.34	21.524	0.87	7.715	0.59	3.006
800	687.7	2.64	102.143	1.53	27.295	1.00	9.762	0.67	3.798
900	773.7	2.97	126.428	1.72	33.683	1.12	12.023	0.76	4.670
1,000	859.7	–	–	1.92	40.681	1.25	14.495	0.84	5.622

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1,100	945.6	–	–	2.11	48.279	1.37	17.173	0.93	6.652
1,200	1,031.6	–	–	2.30	56.474	1.50	20.056	1.01	7.759
1,300	1,117.6	–	–	2.49	65.258	1.62	23.142	1.10	8.942
1,400	1,203.6	–	–	2.68	74.630	1.75	26.427	1.18	10.201
1,500	1,289.5	–	–	2.87	84.583	1.87	29.912	1.26	11.533
1,600	1,375.5	–	–	3.07	95.117	2.00	33.594	1.35	12.940
1,700	1,461.5	–	–	–	–	2.12	37.472	1.43	14.420
1,800	1,547.4	–	–	–	–	2.25	41.545	1.52	15.972
1,900	1,633.4	–	–	–	–	2.37	45.811	1.60	17.597
2,000	1,719.4	–	–	–	–	2.50	50.270	1.69	19.293
2,500	2,149.2	–	–	–	–	–	–	2.11	28.835
3,000	2,579.0	–	–	–	–	–	–	2.53	40.118
3,500	3,008.9	–	–	–	–	–	–	2.95	53.111

Table 6: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 10 °C / return flow 11 °C, d28–54 mm

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
150	129.0	0.07	0.048	–	–	–	–	–	–
200	171.9	0.10	0.064	0.06	0.024	–	–	–	–
250	214.9	0.12	0.140	0.07	0.030	–	–	–	–
300	257.9	0.15	0.191	0.09	0.036	0.06	0.016	–	–
350	300.9	0.17	0.248	0.10	0.078	0.07	0.019	–	–
400	343.9	0.19	0.311	0.12	0.097	0.08	0.038	–	–
450	386.9	0.22	0.380	0.13	0.119	0.09	0.047	0.05	0.008
500	429.8	0.24	0.456	0.15	0.142	0.10	0.056	0.06	0.016
550	472.8	0.27	0.537	0.16	0.167	0.11	0.066	0.06	0.019
600	515.8	0.29	0.624	0.18	0.194	0.12	0.076	0.07	0.022
700	601.8	0.34	0.815	0.21	0.253	0.14	0.099	0.08	0.028
800	687.7	0.39	1.027	0.24	0.318	0.16	0.125	0.09	0.035
900	773.7	0.44	1.261	0.27	0.390	0.18	0.153	0.11	0.043
1,000	859.7	0.49	1.515	0.30	0.468	0.20	0.183	0.12	0.052
1,100	945.6	0.54	1.790	0.33	0.553	0.22	0.216	0.13	0.061
1,200	1,031.6	0.58	2.085	0.36	0.643	0.24	0.251	0.14	0.071
1,300	1,117.6	0.63	2.399	0.39	0.739	0.26	0.289	0.15	0.081
1,400	1,203.6	0.68	2.733	0.42	0.841	0.28	0.328	0.16	0.092
1,500	1,289.5	0.73	3.087	0.45	0.949	0.30	0.370	0.18	0.104
1,600	1,375.5	0.78	3.459	0.48	1.063	0.32	0.414	0.19	0.116
1,700	1,461.5	0.83	3.851	0.50	1.182	0.34	0.461	0.20	0.129
1,800	1,547.4	0.88	4.261	0.53	1.307	0.36	0.509	0.21	0.142
1,900	1,633.4	0.92	4.689	0.56	1.437	0.38	0.559	0.22	0.156
2,000	1,719.4	0.97	5.136	0.59	1.573	0.40	0.612	0.23	0.171
2,500	2,149.2	1.22	7.641	0.74	2.333	0.50	0.905	0.29	0.252
3,000	2,579.0	1.46	10.590	0.89	3.224	0.60	1.249	0.35	0.347
3,500	3,008.9	1.70	13.970	1.04	4.242	0.70	1.640	0.41	0.455
4,000	3,438.7	1.95	17.776	1.19	5.385	0.80	2.079	0.47	0.575
4,500	3,868.6	2.19	22.000	1.34	6.650	0.90	2.564	0.53	0.708
5,000	4,298.4	2.43	26.637	1.49	8.036	1.00	3.094	0.58	0.853

d [mm]		28		35		42		54	
$\dot{Q}$ [W]	$\dot{m}$ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
5,500	4,728.2	2.68	31.684	1.63	9.542	1.10	3.669	0.64	1.011
6,000	5,158.1	2.92	37.138	1.78	11.164	1.20	4.288	0.70	1.180
6,500	5,587.9	–	–	1.93	12.904	1.30	4.951	0.76	1.360
7,000	6,017.8	–	–	2.08	14.759	1.40	5.657	0.82	1.552
7,500	6,447.6	–	–	2.23	16.729	1.50	6.405	0.88	1.756
8,000	6,877.4	–	–	2.38	18.813	1.60	7.196	0.94	1.971
8,500	7,307.3	–	–	2.52	21.011	1.70	8.030	0.99	2.197
9,000	7,737.1	–	–	2.67	23.321	1.80	8.905	1.05	2.434
9,500	8,167.0	–	–	2.82	25.743	1.90	9.821	1.11	2.682
10,000	8,596.8	–	–	2.97	28.277	2.00	10.779	1.17	2.940
10,500	9,026.7	–	–	–	–	2.10	11.778	1.23	3.210
11,000	9,456.5	–	–	–	–	2.20	12.818	1.29	3.491
11,500	9,886.3	–	–	–	–	2.30	13.899	1.34	3.782
12,000	10,316.2	–	–	–	–	2.40	15.021	1.40	4.084
12,500	10,746.0	–	–	–	–	2.50	16.182	1.46	4.396
13,000	11,175.9	–	–	–	–	2.60	17.384	1.52	4.719
13,500	11,605.7	–	–	–	–	2.70	18.626	1.58	5.052
14,000	12,035.5	–	–	–	–	2.80	19.909	1.64	5.396
14,500	12,465.4	–	–	–	–	2.90	21.230	1.70	5.750
15,000	12,895.2	–	–	–	–	3.00	22.592	1.75	6.115
15,500	13,325.1	–	–	–	–	3.10	23.993	1.81	6.490
16,000	13,754.9	–	–	–	–	–	–	1.87	6.875
16,500	14,184.7	–	–	–	–	–	–	1.93	7.271
17,000	14,614.6	–	–	–	–	–	–	1.99	7.676
17,500	15,044.4	–	–	–	–	–	–	2.05	8.092
18,000	15,474.3	–	–	–	–	–	–	2.10	8.518
18,500	15,904.1	–	–	–	–	–	–	2.16	8.954
19,000	16,333.9	–	–	–	–	–	–	2.22	9.401
19,500	16,763.8	–	–	–	–	–	–	2.28	9.857
20,000	17,193.6	–	–	–	–	–	–	2.34	10.323
20,500	17,623.5	–	–	–	–	–	–	2.40	10.800
21,000	18,053.3	–	–	–	–	–	–	2.46	11.286
21,500	18,483.1	–	–	–	–	–	–	2.51	11.782
22,000	18,913.0	–	–	–	–	–	–	2.57	12.289
22,500	19,342.8	–	–	–	–	–	–	2.63	12.805
23,000	19,772.7	–	–	–	–	–	–	2.69	13.331
23,500	20,202.5	–	–	–	–	–	–	2.75	13.868
24,000	20,632.3	–	–	–	–	–	–	2.81	14.414
24,500	21,062.2	–	–	–	–	–	–	2.86	14.969
25,000	21,492.0	–	–	–	–	–	–	2.92	15.535
25,500	21,921.9	–	–	–	–	–	–	2.98	16.111
26,000	22,351.7	–	–	–	–	–	–	3.04	16.696
26,500	22,781.5	–	–	–	–	–	–	3.10	17.291

Table 7: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 10 °C / return flow 11 °C, d66.7–108 mm

d [mm]		66.7		76.1		88.9		108	
$\dot{Q}$ [W]	$\dot{m}$ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
700	601.8	0.05	0.010	–	–	–	–	–	–
800	687.7	0.06	0.012	–	–	–	–	–	–
900	773.7	0.07	0.015	0.05	0.008	–	–	–	–
1,000	859.7	0.07	0.018	0.06	0.010	–	–	–	–
1,100	945.6	0.08	0.021	0.06	0.012	–	–	–	–
1,200	1,031.6	0.09	0.025	0.07	0.014	0.05	0.006	–	–
1,300	1,117.6	0.10	0.028	0.08	0.016	0.05	0.007	–	–
1,400	1,203.6	0.10	0.032	0.08	0.018	0.06	0.008	–	–
1,500	1,289.5	0.11	0.036	0.09	0.020	0.06	0.009	–	–
1,600	1,375.5	0.12	0.040	0.09	0.023	0.07	0.010	–	–
1,700	1,461.5	0.13	0.045	0.10	0.025	0.07	0.012	–	–
1,800	1,547.4	0.13	0.050	0.11	0.028	0.08	0.013	0.05	0.005
1,900	1,633.4	0.14	0.054	0.11	0.030	0.08	0.014	0.05	0.005
2,000	1,719.4	0.15	0.060	0.12	0.033	0.08	0.015	0.06	0.006
2,500	2,149.2	0.19	0.088	0.15	0.049	0.11	0.022	0.07	0.009
3,000	2,579.0	0.22	0.120	0.18	0.067	0.13	0.031	0.08	0.012
3,500	3,008.9	0.26	0.158	0.20	0.087	0.15	0.040	0.10	0.015
4,000	3,438.7	0.30	0.199	0.23	0.110	0.17	0.051	0.11	0.019
4,500	3,868.6	0.34	0.245	0.26	0.136	0.19	0.062	0.13	0.024
5,000	4,298.4	0.37	0.295	0.29	0.163	0.21	0.075	0.14	0.029
5,500	4,728.2	0.41	0.349	0.32	0.193	0.23	0.089	0.15	0.034
6,000	5,158.1	0.45	0.407	0.35	0.225	0.25	0.103	0.17	0.039
6,500	5,587.9	0.49	0.468	0.38	0.259	0.27	0.119	0.18	0.045
7,000	6,017.8	0.52	0.534	0.41	0.295	0.30	0.135	0.20	0.051
7,500	6,447.6	0.56	0.604	0.44	0.334	0.32	0.153	0.21	0.058
8,000	6,877.4	0.60	0.677	0.47	0.374	0.34	0.171	0.22	0.065
8,500	7,307.3	0.64	0.754	0.50	0.417	0.36	0.191	0.24	0.072
9,000	7,737.1	0.67	0.835	0.53	0.461	0.38	0.211	0.25	0.080
9,500	8,167.0	0.71	0.920	0.56	0.508	0.40	0.232	0.27	0.088
10,000	8,596.8	0.75	1.008	0.59	0.556	0.42	0.254	0.28	0.096
10,500	9,026.7	0.79	1.099	0.61	0.606	0.44	0.277	0.30	0.105
11,000	9,456.5	0.82	1.195	0.64	0.659	0.46	0.301	0.31	0.114
11,500	9,886.3	0.86	1.294	0.67	0.713	0.49	0.326	0.32	0.123
12,000	10,316.2	0.90	1.396	0.70	0.770	0.51	0.351	0.34	0.133
12,500	10,746.0	0.94	1.502	0.73	0.828	0.53	0.378	0.35	0.143
13,000	11,175.9	0.97	1.612	0.76	0.888	0.55	0.405	0.37	0.153
13,500	11,605.7	1.01	1.725	0.79	0.950	0.57	0.433	0.38	0.164
14,000	12,035.5	1.05	1.841	0.82	1.014	0.59	0.462	0.39	0.175
14,500	12,465.4	1.09	1.961	0.85	1.080	0.61	0.492	0.41	0.186
15,000	12,895.2	1.12	2.085	0.88	1.147	0.63	0.523	0.42	0.198
15,500	13,325.1	1.16	2.212	0.91	1.217	0.65	0.554	0.44	0.209
16,000	13,754.9	1.20	2.342	0.94	1.288	0.68	0.587	0.45	0.222
16,500	14,184.7	1.24	2.475	0.97	1.361	0.70	0.620	0.46	0.234
17,000	14,614.6	1.27	2.612	0.99	1.437	0.72	0.654	0.48	0.247
17,500	15,044.4	1.31	2.753	1.02	1.513	0.74	0.689	0.49	0.260
18,000	15,474.3	1.35	2.897	1.05	1.592	0.76	0.724	0.51	0.273
18,500	15,904.1	1.39	3.044	1.08	1.673	0.78	0.761	0.52	0.287
19,000	16,333.9	1.42	3.194	1.11	1.755	0.80	0.798	0.53	0.301

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
19,500	16,763.8	1.46	3.348	1.14	1.839	0.82	0.836	0.55	0.315
20,000	17,193.6	1.50	3.505	1.17	1.925	0.84	0.875	0.56	0.330
20,500	17,623.5	1.54	3.665	1.20	2.013	0.87	0.915	0.58	0.345
21,000	18,053.3	1.57	3.829	1.23	2.102	0.89	0.955	0.59	0.360
21,500	18,483.1	1.61	3.996	1.26	2.193	0.91	0.997	0.60	0.375
22,000	18,913.0	1.65	4.166	1.29	2.286	0.93	1.039	0.62	0.391
22,500	19,342.8	1.69	4.339	1.32	2.381	0.95	1.082	0.63	0.407
23,000	19,772.7	1.72	4.516	1.35	2.478	0.97	1.125	0.65	0.424
23,500	20,202.5	1.76	4.696	1.37	2.576	0.99	1.170	0.66	0.440
24,000	20,632.3	1.80	4.879	1.40	2.676	1.01	1.215	0.67	0.457
24,500	21,062.2	1.84	5.066	1.43	2.778	1.03	1.261	0.69	0.474
25,000	21,492.0	1.87	5.256	1.46	2.882	1.05	1.308	0.70	0.492
25,500	21,921.9	1.91	5.449	1.49	2.987	1.08	1.355	0.72	0.510
26,000	22,351.7	1.95	5.645	1.52	3.094	1.10	1.403	0.73	0.528
26,500	22,781.5	1.99	5.844	1.55	3.203	1.12	1.452	0.75	0.546
27,000	23,211.4	2.02	6.047	1.58	3.313	1.14	1.502	0.76	0.565
27,500	23,641.2	2.06	6.252	1.61	3.426	1.16	1.553	0.77	0.584
28,000	24,071.1	2.10	6.461	1.64	3.540	1.18	1.604	0.79	0.603
28,500	24,500.9	2.14	6.674	1.67	3.655	1.20	1.657	0.80	0.622
29,000	24,930.7	2.17	6.889	1.70	3.773	1.22	1.709	0.82	0.642
29,500	25,360.6	2.21	7.107	1.73	3.892	1.24	1.763	0.83	0.662
30,000	25,790.4	2.25	7.329	1.76	4.013	1.27	1.818	0.84	0.682
32,500	27,939.6	2.44	8.485	1.90	4.642	1.37	2.101	0.91	0.788
35,000	30,088.8	2.62	9.719	2.05	5.314	1.48	2.403	0.98	0.901
37,500	32,238.0	2.81	11.032	2.19	6.028	1.58	2.724	1.05	1.020
40,000	34,387.2	3.00	12.422	2.34	6.784	1.69	3.064	1.12	1.147
42,500	36,536.4	–	–	2.49	7.581	1.79	3.421	1.20	1.280
45,000	38,685.6	–	–	2.63	8.419	1.90	3.797	1.27	1.419
47,500	40,834.8	–	–	2.78	9.298	2.00	4.191	1.34	1.565
50,000	42,984.0	–	–	2.93	10.219	2.11	4.603	1.41	1.718
52,500	45,133.3	–	–	3.07	11.180	2.22	5.033	1.48	1.878
55,000	47,282.5	–	–	–	–	2.32	5.481	1.55	2.043
57,500	49,431.7	–	–	–	–	2.43	5.946	1.62	2.216
60,000	51,580.9	–	–	–	–	2.53	6.430	1.69	2.394
62,500	53,730.1	–	–	–	–	2.64	6.930	1.76	2.579
65,000	55,879.3	–	–	–	–	2.74	7.449	1.83	2.771
67,500	58,028.5	–	–	–	–	2.85	7.985	1.90	2.969
70,000	60,177.7	–	–	–	–	2.95	8.538	1.97	3.173
72,500	62,326.9	–	–	–	–	3.06	9.109	2.04	3.383
75,000	64,476.1	–	–	–	–	–	–	2.11	3.600
77,500	66,625.3	–	–	–	–	–	–	2.18	3.823
80,000	68,774.5	–	–	–	–	–	–	2.25	4.052
82,500	70,923.7	–	–	–	–	–	–	2.32	4.287
85,000	73,072.9	–	–	–	–	–	–	2.39	4.529
87,500	75,222.1	–	–	–	–	–	–	2.46	4.776
90,000	77,371.3	–	–	–	–	–	–	2.53	5.030
92,500	79,520.5	–	–	–	–	–	–	2.60	5.290
95,000	81,669.7	–	–	–	–	–	–	2.67	5.557
97,500	83,818.9	–	–	–	–	–	–	2.74	5.829

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
100,000	85,968.1	–	–	–	–	–	–	2.81	6.107
102,500	88,117.3	–	–	–	–	–	–	2.88	6.392
105,000	90,266.5	–	–	–	–	–	–	2.95	6.682
107,500	92,415.7	–	–	–	–	–	–	3.02	6.979
110,000	94,564.9	–	–	–	–	–	–	3.09	7.282

2.3 COOLING, INLET FLOW 8 °C / RETURN FLOW 12 °C

Medium:	Water	Density:	999.7 kg/m^3
Inlet flow temperature:	8 °C	Viscosity:	0.001306 Pa•s
Return temperature:	12 °C	Specific thermal capacity:	4,188 J/(kg•K)
Range:	4 K	Surface roughness:	0.01 mm
Average temperature:	10 °C		

Table 8: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 8 °C / return flow 12 °C, d12–22 mm

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
100	21.5	0.08	0.374	–	–	–	–	–	–
150	32.2	0.12	0.561	0.07	0.189	–	–	–	–
200	43.0	0.16	0.748	0.10	0.252	0.06	0.107	–	–
250	53.7	0.21	0.935	0.12	0.315	0.08	0.134	0.05	0.061
300	64.5	0.25	1.122	0.14	0.378	0.09	0.161	0.06	0.073
350	75.2	0.29	1.309	0.17	0.441	0.11	0.188	0.07	0.085
400	86.0	0.33	2.689	0.19	0.504	0.12	0.215	0.08	0.098
450	96.7	0.37	3.285	0.22	0.567	0.14	0.241	0.09	0.110
500	107.4	0.41	3.931	0.24	1.090	0.16	0.268	0.11	0.122
550	118.2	0.45	4.627	0.26	1.281	0.17	0.295	0.12	0.134
600	128.9	0.49	5.372	0.29	1.485	0.19	0.322	0.13	0.146
700	150.4	0.58	7.005	0.34	1.932	0.22	0.706	0.15	0.171
800	171.9	0.66	8.823	0.38	2.427	0.25	0.885	0.17	0.350
900	193.4	0.74	10.823	0.43	2.971	0.28	1.082	0.19	0.427
1,000	214.9	0.82	13.002	0.48	3.563	0.31	1.296	0.21	0.511
1,100	236.4	0.91	15.356	0.53	4.200	0.34	1.526	0.23	0.601
1,200	257.9	0.99	17.882	0.57	4.883	0.37	1.772	0.25	0.697
1,300	279.4	1.07	20.578	0.62	5.611	0.41	2.033	0.27	0.800
1,400	300.9	1.15	23.443	0.67	6.383	0.44	2.311	0.29	0.908
1,500	322.3	1.24	26.474	0.72	7.198	0.47	2.604	0.32	1.022
1,600	343.8	1.32	29.670	0.77	8.056	0.50	2.912	0.34	1.142
1,700	365.3	1.40	33.029	0.81	8.957	0.53	3.235	0.36	1.268
1,800	386.8	1.48	36.551	0.86	9.900	0.56	3.572	0.38	1.400

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1,900	408.3	1.57	40.234	0.91	10.886	0.59	3.925	0.40	1.537
2,000	429.8	1.65	44.077	0.96	11.912	0.62	4.292	0.42	1.679
2,500	537.2	2.06	65.658	1.20	17.656	0.78	6.340	0.53	2.475
3,000	644.7	2.47	91.122	1.44	24.397	0.94	8.736	0.63	3.402
3,500	752.1	2.89	120.398	1.68	32.111	1.09	11.470	0.74	4.458
4,000	859.6	–	–	1.92	40.781	1.25	14.534	0.84	5.638
4,500	967.0	–	–	2.15	50.392	1.41	17.922	0.95	6.941
5,000	1,074.5	–	–	2.39	60.932	1.56	21.629	1.05	8.364
5,500	1,181.9	–	–	2.63	72.394	1.72	25.651	1.16	9.906
6,000	1,289.4	–	–	2.87	84.768	1.87	29.985	1.26	11.564
6,500	1,396.8	–	–	–	–	2.03	34.628	1.37	13.338
7,000	1,504.3	–	–	–	–	2.19	39.576	1.47	15.226
7,500	1,611.7	–	–	–	–	2.34	44.829	1.58	17.227
8,000	1,719.2	–	–	–	–	2.50	50.383	1.68	19.340
8,500	1,826.6	–	–	–	–	2.66	56.236	1.79	21.565
9,000	1,934.1	–	–	–	–	2.81	62.389	1.90	23.901
9,500	2,041.5	–	–	–	–	2.97	68.838	2.00	26.347
10,000	2,149.0	–	–	–	–	–	–	2.11	28.902
10,500	2,256.4	–	–	–	–	–	–	2.21	31.566
11,000	2,363.9	–	–	–	–	–	–	2.32	34.338
11,500	2,471.3	–	–	–	–	–	–	2.42	37.218
12,000	2,578.8	–	–	–	–	–	–	2.53	40.205
12,500	2,686.2	–	–	–	–	–	–	2.63	43.300
13,000	2,793.7	–	–	–	–	–	–	2.74	46.501
13,500	2,901.1	–	–	–	–	–	–	2.84	49.808
14,000	3,008.6	–	–	–	–	–	–	2.95	53.221
14,500	3,116.0	–	–	–	–	–	–	3.05	56.740

2 / 2

Table 9: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 8 °C / return flow 12 °C, d28–54 mm

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
450	96.7	0.05	0.037	–	–	–	–	–	–
500	107.4	0.06	0.041	–	–	–	–	–	–
550	118.2	0.07	0.045	–	–	–	–	–	–
600	128.9	0.07	0.049	–	–	–	–	–	–
700	150.4	0.09	0.057	0.05	0.021	–	–	–	–
800	171.9	0.10	0.065	0.06	0.024	–	–	–	–
900	193.4	0.11	0.073	0.07	0.027	–	–	–	–
1,000	214.9	0.12	0.141	0.07	0.030	–	–	–	–
1,100	236.4	0.13	0.165	0.08	0.033	0.05	0.015	–	–
1,200	257.9	0.15	0.191	0.09	0.036	0.06	0.016	–	–
1,300	279.4	0.16	0.219	0.10	0.069	0.06	0.018	–	–
1,400	300.9	0.17	0.249	0.10	0.078	0.07	0.019	–	–
1,500	322.3	0.18	0.280	0.11	0.087	0.07	0.021	–	–
1,600	343.8	0.19	0.312	0.12	0.098	0.08	0.039	–	–
1,700	365.3	0.21	0.346	0.13	0.108	0.08	0.043	–	–
1,800	386.8	0.22	0.382	0.13	0.119	0.09	0.047	0.05	0.008

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1,900	408.3	0.23	0.419	0.14	0.131	0.09	0.052	0.06	0.009
2,000	429.8	0.24	0.457	0.15	0.143	0.10	0.056	0.06	0.009
2,500	537.2	0.30	0.672	0.19	0.209	0.12	0.082	0.07	0.023
3,000	644.7	0.36	0.921	0.22	0.286	0.15	0.112	0.09	0.032
3,500	752.1	0.43	1.204	0.26	0.373	0.17	0.146	0.10	0.041
4,000	859.6	0.49	1.520	0.30	0.470	0.20	0.184	0.12	0.052
4,500	967.0	0.55	1.867	0.33	0.577	0.22	0.226	0.13	0.063
5,000	1,074.5	0.61	2.246	0.37	0.693	0.25	0.271	0.15	0.076
5,500	1,181.9	0.67	2.656	0.41	0.818	0.27	0.319	0.16	0.090
6,000	1,289.4	0.73	3.096	0.45	0.952	0.30	0.371	0.18	0.104
6,500	1,396.8	0.79	3.565	0.48	1.095	0.32	0.427	0.19	0.120
7,000	1,504.3	0.85	4.065	0.52	1.248	0.35	0.486	0.20	0.136
7,500	1,611.7	0.91	4.593	0.56	1.408	0.37	0.548	0.22	0.153
8,000	1,719.2	0.97	5.150	0.59	1.578	0.40	0.614	0.23	0.171
8,500	1,826.6	1.03	5.735	0.63	1.756	0.42	0.683	0.25	0.190
9,000	1,934.1	1.09	6.349	0.67	1.942	0.45	0.755	0.26	0.210
9,500	2,041.5	1.16	6.991	0.71	2.136	0.47	0.830	0.28	0.231
10,000	2,149.0	1.22	7.661	0.74	2.339	0.50	0.908	0.29	0.253
10,500	2,256.4	1.28	8.359	0.78	2.550	0.52	0.989	0.31	0.275
11,000	2,363.9	1.34	9.084	0.82	2.770	0.55	1.074	0.32	0.299
11,500	2,471.3	1.40	9.836	0.85	2.997	0.57	1.162	0.34	0.323
12,000	2,578.8	1.46	10.616	0.89	3.232	0.60	1.252	0.35	0.348
12,500	2,686.2	1.52	11.423	0.93	3.476	0.62	1.346	0.37	0.374
13,000	2,793.7	1.58	12.256	0.97	3.727	0.65	1.442	0.38	0.400
13,500	2,901.1	1.64	13.117	1.00	3.986	0.67	1.542	0.39	0.428
14,000	3,008.6	1.70	14.004	1.04	4.253	0.70	1.645	0.41	0.456
14,500	3,116.0	1.76	14.917	1.08	4.528	0.72	1.750	0.42	0.485
15,000	3,223.5	1.82	15.857	1.11	4.810	0.75	1.859	0.44	0.515
15,500	3,330.9	1.89	16.824	1.15	5.101	0.77	1.970	0.45	0.545
16,000	3,438.4	1.95	17.817	1.19	5.398	0.80	2.084	0.47	0.577
16,500	3,545.8	2.01	18.836	1.23	5.704	0.82	2.202	0.48	0.609
17,000	3,653.3	2.07	19.881	1.26	6.017	0.85	2.322	0.50	0.642
17,500	3,760.7	2.13	20.951	1.30	6.338	0.87	2.445	0.51	0.676
18,000	3,868.2	2.19	22.049	1.34	6.667	0.90	2.570	0.53	0.710
18,500	3,975.6	2.25	23.171	1.37	7.003	0.92	2.699	0.54	0.745
19,000	4,083.1	2.31	24.320	1.41	7.346	0.95	2.831	0.56	0.781
19,500	4,190.5	2.37	25.494	1.45	7.697	0.97	2.965	0.57	0.818
20,000	4,298.0	2.43	26.695	1.48	8.056	1.00	3.102	0.58	0.856
20,500	4,405.4	2.49	27.921	1.52	8.422	1.02	3.242	0.60	0.894
21,000	4,512.9	2.55	29.172	1.56	8.795	1.05	3.385	0.61	0.933
21,500	4,620.3	2.62	30.448	1.60	9.176	1.07	3.530	0.63	0.973
22,000	4,727.8	2.68	31.751	1.63	9.564	1.10	3.678	0.64	1.013
22,500	4,835.2	2.74	33.079	1.67	9.959	1.12	3.829	0.66	1.055
23,000	4,942.7	2.80	34.431	1.71	10.362	1.15	3.983	0.67	1.097
23,500	5,050.1	2.86	35.810	1.74	10.773	1.17	4.139	0.69	1.139
24,000	5,157.6	2.92	37.213	1.78	11.190	1.20	4.299	0.70	1.183
24,500	5,265.0	2.98	38.642	1.82	11.615	1.22	4.461	0.72	1.227
25,000	5,372.5	3.04	40.096	1.86	12.047	1.25	4.625	0.73	1.272
25,500	5,479.9	–	–	1.89	12.486	1.27	4.793	0.75	1.317

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
26,000	5,587.4	–	–	1.93	12.933	1.30	4.963	0.76	1.364
26,500	5,694.8	–	–	1.97	13.387	1.32	5.136	0.77	1.411
27,000	5,802.3	–	–	2.00	13.848	1.35	5.311	0.79	1.459
27,500	5,909.7	–	–	2.04	14.316	1.37	5.489	0.80	1.507
28,000	6,017.2	–	–	2.08	14.792	1.40	5.670	0.82	1.556
28,500	6,124.6	–	–	2.12	15.274	1.42	5.854	0.83	1.606
29,000	6,232.1	–	–	2.15	15.764	1.45	6.040	0.85	1.657
29,500	6,339.5	–	–	2.19	16.261	1.47	6.229	0.86	1.708
30,000	6,447.0	–	–	2.23	16.765	1.50	6.420	0.88	1.760
32,500	6,984.2	–	–	2.41	19.393	1.62	7.418	0.95	2.031
35,000	7,521.5	–	–	2.60	22.197	1.75	8.481	1.02	2.319
37,500	8,058.7	–	–	2.78	25.178	1.87	9.610	1.10	2.625
40,000	8,596.0	–	–	2.97	28.332	2.00	10.803	1.17	2.948
42,500	9,133.2	–	–	–	–	2.12	12.061	1.24	3.287
45,000	9,670.5	–	–	–	–	2.25	13.382	1.32	3.643
47,500	10,207.7	–	–	–	–	2.37	14.767	1.39	4.016
50,000	10,745.0	–	–	–	–	2.50	16.216	1.46	4.406
52,500	11,282.2	–	–	–	–	2.62	17.727	1.53	4.812
55,000	11,819.5	–	–	–	–	2.75	19.301	1.61	5.235
57,500	12,356.7	–	–	–	–	2.87	20.937	1.68	5.673
60,000	12,894.0	–	–	–	–	3.00	22.636	1.75	6.128
62,500	13,431.2	–	–	–	–	–	–	1.83	6.600
65,000	13,968.5	–	–	–	–	–	–	1.90	7.087
67,500	14,505.7	–	–	–	–	–	–	1.97	7.590
70,000	15,043.0	–	–	–	–	–	–	2.05	8.109
72,500	15,580.2	–	–	–	–	–	–	2.12	8.644
75,000	16,117.5	–	–	–	–	–	–	2.19	9.195
77,500	16,654.7	–	–	–	–	–	–	2.27	9.762
80,000	17,192.0	–	–	–	–	–	–	2.34	10.344
82,500	17,729.2	–	–	–	–	–	–	2.41	10.943
85,000	18,266.5	–	–	–	–	–	–	2.48	11.556
87,500	18,803.7	–	–	–	–	–	–	2.56	12.186
90,000	19,341.0	–	–	–	–	–	–	2.63	12.830
92,500	19,878.2	–	–	–	–	–	–	2.70	13.491
95,000	20,415.5	–	–	–	–	–	–	2.78	14.167
97,500	20,952.7	–	–	–	–	–	–	2.85	14.858
100,000	21,490.0	–	–	–	–	–	–	2.92	15.565
105,000	22,564.5	–	–	–	–	–	–	3.07	17.024

3 / 3

Table 10: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 8 °C / return flow 12 °C, d66.7–108 mm

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
3,000	644.7	0.06	0.011	–	–	–	–	–	–
3,500	752.1	0.07	0.014	0.05	0.008	–	–	–	–
4,000	859.6	0.07	0.018	0.06	0.010	–	–	–	–
4,500	967.0	0.08	0.022	0.07	0.012	–	–	–	–
5,000	1,074.5	0.09	0.027	0.07	0.015	0.05	0.007	–	–

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
5,500	1,181.9	0.10	0.031	0.08	0.017	0.06	0.008	–	–
6,000	1,289.4	0.11	0.036	0.09	0.020	0.06	0.009	–	–
6,500	1,396.8	0.12	0.042	0.10	0.023	0.07	0.011	–	–
7,000	1,504.3	0.13	0.047	0.10	0.026	0.07	0.012	–	–
7,500	1,611.7	0.14	0.053	0.11	0.030	0.08	0.014	0.05	0.005
8,000	1,719.2	0.15	0.060	0.12	0.033	0.08	0.015	0.06	0.006
8,500	1,826.6	0.16	0.066	0.12	0.037	0.09	0.017	0.06	0.007
9,000	1,934.1	0.17	0.073	0.13	0.041	0.09	0.019	0.06	0.007
9,500	2,041.5	0.18	0.080	0.14	0.045	0.10	0.021	0.07	0.008
10,000	2,149.0	0.19	0.088	0.15	0.049	0.11	0.023	0.07	0.009
10,500	2,256.4	0.20	0.096	0.15	0.053	0.11	0.025	0.07	0.009
11,000	2,363.9	0.21	0.104	0.16	0.058	0.12	0.027	0.08	0.010
11,500	2,471.3	0.22	0.112	0.17	0.062	0.12	0.029	0.08	0.011
12,000	2,578.8	0.22	0.121	0.18	0.067	0.13	0.031	0.08	0.012
12,500	2,686.2	0.23	0.130	0.18	0.072	0.13	0.033	0.09	0.013
13,000	2,793.7	0.24	0.139	0.19	0.077	0.14	0.035	0.09	0.014
13,500	2,901.1	0.25	0.148	0.20	0.082	0.14	0.038	0.09	0.014
14,000	3,008.6	0.26	0.158	0.20	0.088	0.15	0.040	0.10	0.015
14,500	3,116.0	0.27	0.168	0.21	0.093	0.15	0.043	0.10	0.016
15,000	3,223.5	0.28	0.178	0.22	0.099	0.16	0.046	0.11	0.017
15,500	3,330.9	0.29	0.189	0.23	0.105	0.16	0.048	0.11	0.018
16,000	3,438.4	0.30	0.200	0.23	0.111	0.17	0.051	0.11	0.019
16,500	3,545.8	0.31	0.211	0.24	0.117	0.17	0.054	0.12	0.021
17,000	3,653.3	0.32	0.222	0.25	0.123	0.18	0.057	0.12	0.022
17,500	3,760.7	0.33	0.234	0.26	0.130	0.18	0.060	0.12	0.023
18,000	3,868.2	0.34	0.246	0.26	0.136	0.19	0.063	0.13	0.024
18,500	3,975.6	0.35	0.258	0.27	0.143	0.20	0.066	0.13	0.025
19,000	4,083.1	0.36	0.270	0.28	0.150	0.20	0.069	0.13	0.026
19,500	4,190.5	0.37	0.283	0.29	0.157	0.21	0.072	0.14	0.027
20,000	4,298.0	0.37	0.296	0.29	0.164	0.21	0.075	0.14	0.029
20,500	4,405.4	0.38	0.309	0.30	0.171	0.22	0.079	0.14	0.030
21,000	4,512.9	0.39	0.322	0.31	0.178	0.22	0.082	0.15	0.031
21,500	4,620.3	0.40	0.336	0.31	0.186	0.23	0.085	0.15	0.033
22,000	4,727.8	0.41	0.350	0.32	0.194	0.23	0.089	0.15	0.034
22,500	4,835.2	0.42	0.364	0.33	0.201	0.24	0.092	0.16	0.035
23,000	4,942.7	0.43	0.378	0.34	0.209	0.24	0.096	0.16	0.037
23,500	5,050.1	0.44	0.393	0.34	0.217	0.25	0.100	0.17	0.038
24,000	5,157.6	0.45	0.408	0.35	0.226	0.25	0.103	0.17	0.039
24,500	5,265.0	0.46	0.423	0.36	0.234	0.26	0.107	0.17	0.041
25,000	5,372.5	0.47	0.438	0.37	0.242	0.26	0.111	0.18	0.042
25,500	5,479.9	0.48	0.454	0.37	0.251	0.27	0.115	0.18	0.044
26,000	5,587.4	0.49	0.470	0.38	0.260	0.27	0.119	0.18	0.045
26,500	5,694.8	0.50	0.486	0.39	0.269	0.28	0.123	0.19	0.047
27,000	5,802.3	0.51	0.502	0.39	0.278	0.28	0.127	0.19	0.048
27,500	5,909.7	0.52	0.519	0.40	0.287	0.29	0.131	0.19	0.050
28,000	6,017.2	0.52	0.536	0.41	0.296	0.30	0.136	0.20	0.052
28,500	6,124.6	0.53	0.553	0.42	0.306	0.30	0.140	0.20	0.053
29,000	6,232.1	0.54	0.570	0.42	0.315	0.31	0.144	0.20	0.055
29,500	6,339.5	0.55	0.588	0.43	0.325	0.31	0.149	0.21	0.057

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
30,000	6,447.0	0.56	0.605	0.44	0.335	0.32	0.153	0.21	0.058
32,500	6,984.2	0.61	0.698	0.48	0.386	0.34	0.177	0.23	0.067
35,000	7,521.5	0.66	0.796	0.51	0.440	0.37	0.201	0.25	0.076
37,500	8,058.7	0.70	0.900	0.55	0.497	0.40	0.227	0.26	0.086
40,000	8,596.0	0.75	1.010	0.59	0.557	0.42	0.255	0.28	0.097
42,500	9,133.2	0.80	1.126	0.62	0.621	0.45	0.284	0.30	0.108
45,000	9,670.5	0.84	1.247	0.66	0.688	0.47	0.314	0.32	0.119
47,500	10,207.7	0.89	1.374	0.69	0.757	0.50	0.346	0.33	0.131
50,000	10,745.0	0.94	1.506	0.73	0.830	0.53	0.379	0.35	0.143
52,500	11,282.2	0.98	1.644	0.77	0.906	0.55	0.413	0.37	0.156
55,000	11,819.5	1.03	1.787	0.80	0.984	0.58	0.449	0.39	0.170
57,500	12,356.7	1.08	1.936	0.84	1.066	0.61	0.486	0.40	0.184
60,000	12,894.0	1.12	2.090	0.88	1.150	0.63	0.524	0.42	0.198
62,500	13,431.2	1.17	2.249	0.91	1.238	0.66	0.564	0.44	0.213
65,000	13,968.5	1.22	2.414	0.95	1.328	0.69	0.605	0.46	0.228
67,500	14,505.7	1.26	2.584	0.99	1.421	0.71	0.647	0.47	0.244
70,000	15,043.0	1.31	2.759	1.02	1.517	0.74	0.691	0.49	0.261
72,500	15,580.2	1.36	2.940	1.06	1.616	0.76	0.735	0.51	0.277
75,000	16,117.5	1.41	3.125	1.10	1.718	0.79	0.781	0.53	0.295
77,500	16,654.7	1.45	3.316	1.13	1.822	0.82	0.829	0.54	0.313
80,000	17,192.0	1.50	3.513	1.17	1.929	0.84	0.877	0.56	0.331
82,500	17,729.2	1.55	3.714	1.21	2.040	0.87	0.927	0.58	0.349
85,000	18,266.5	1.59	3.920	1.24	2.153	0.90	0.978	0.60	0.369
87,500	18,803.7	1.64	4.132	1.28	2.268	0.92	1.031	0.62	0.388
90,000	19,341.0	1.69	4.349	1.32	2.387	0.95	1.084	0.63	0.408
92,500	19,878.2	1.73	4.571	1.35	2.508	0.98	1.139	0.65	0.429
95,000	20,415.5	1.78	4.798	1.39	2.632	1.00	1.195	0.67	0.450
97,500	20,952.7	1.83	5.030	1.43	2.759	1.03	1.252	0.69	0.471
100,000	21,490.0	1.87	5.267	1.46	2.888	1.05	1.311	0.70	0.493
105,000	22,564.5	1.97	5.756	1.54	3.155	1.11	1.431	0.74	0.538
110,000	23,639.0	2.06	6.265	1.61	3.433	1.16	1.557	0.77	0.585
115,000	24,713.5	2.15	6.795	1.68	3.722	1.21	1.687	0.81	0.634
120,000	25,788.0	2.25	7.344	1.76	4.021	1.27	1.822	0.84	0.684
130,000	27,937.0	2.44	8.502	1.90	4.652	1.37	2.106	0.91	0.790
140,000	30,086.0	2.62	9.738	2.05	5.325	1.48	2.409	0.98	0.903
150,000	32,235.0	2.81	11.053	2.19	6.040	1.58	2.730	1.05	1.023
175,000	37,607.4	–	–	2.56	8.010	1.85	3.614	1.23	1.352
200,000	42,979.9	–	–	2.93	10.238	2.11	4.613	1.41	1.722
225,000	48,352.4	–	–	–	–	2.37	5.723	1.58	2.133
250,000	53,724.9	–	–	–	–	2.64	6.944	1.76	2.585
275,000	59,097.4	–	–	–	–	2.90	8.274	1.93	3.076
300,000	64,469.9	–	–	–	–	–	–	2.11	3.607
325,000	69,842.4	–	–	–	–	–	–	2.28	4.177

2.4 COOLING, INLET FLOW 16 °C / RETURN FLOW 19 °C

Medium:	Water	Density:	998.7 kg/m^3
Inlet flow temperature:	16 °C	Viscosity:	0.001069 Pa•s
Return temperature:	19 °C	Specific thermal capacity:	4,183.5 J/(kg•K)
Range:	3 K	Surface roughness:	0.01 mm
Average temperature:	17.5 °C		

Table 11: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 16 °C / return flow 19 °C, d12–22 mm

d [mm]		**12**		**15**		**18**		**22**	
Q̇ [W]	**ṁ [kg/h]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**
100	28.7	0.11	0.409	0.06	0.138	–	–	–	–
150	43.0	0.17	0.614	0.10	0.207	0.06	0.088	–	–
200	57.4	0.22	0.818	0.13	0.276	0.08	0.117	0.06	0.053
250	71.7	0.28	1.862	0.16	0.345	0.10	0.147	0.07	0.067
300	86.1	0.33	2.540	0.19	0.414	0.13	0.176	0.08	0.080
350	100.4	0.39	3.307	0.22	0.915	0.15	0.205	0.10	0.093
400	114.7	0.44	4.160	0.26	1.148	0.17	0.420	0.11	0.107
450	129.1	0.50	5.096	0.29	1.404	0.19	0.513	0.13	0.120
500	143.4	0.55	6.115	0.32	1.682	0.21	0.613	0.14	0.242
550	157.8	0.61	7.215	0.35	1.981	0.23	0.721	0.15	0.285
600	172.1	0.66	8.395	0.38	2.301	0.25	0.837	0.17	0.330
700	200.8	0.77	10.987	0.45	3.003	0.29	1.090	0.20	0.429
800	229.5	0.88	13.886	0.51	3.786	0.33	1.372	0.23	0.539
900	258.2	0.99	17.085	0.58	4.647	0.38	1.682	0.25	0.660
1,000	286.8	1.10	20.579	0.64	5.586	0.42	2.018	0.28	0.792
1,100	315.5	1.21	24.363	0.70	6.600	0.46	2.381	0.31	0.933
1,200	344.2	1.32	28.435	0.77	7.688	0.50	2.771	0.34	1.085
1,300	372.9	1.43	32.791	0.83	8.851	0.54	3.186	0.37	1.246
1,400	401.6	1.54	37.429	0.90	10.086	0.58	3.627	0.39	1.417
1,500	430.3	1.65	42.347	0.96	11.393	0.63	4.093	0.42	1.598
1,600	458.9	1.76	47.542	1.02	12.771	0.67	4.583	0.45	1.788
1,700	487.6	1.87	53.012	1.09	14.221	0.71	5.099	0.48	1.987
1,800	516.3	1.98	58.757	1.15	15.740	0.75	5.638	0.51	2.196
1,900	545.0	2.09	64.772	1.22	17.329	0.79	6.202	0.53	2.414
2,000	573.7	2.20	71.061	1.28	18.986	0.83	6.790	0.56	2.641
2,500	717.1	2.76	106.528	1.60	28.299	1.04	10.082	0.70	3.910
3,000	860.5	–	–	1.92	39.288	1.25	13.951	0.84	5.397
3,500	1,003.9	–	–	2.24	51.921	1.46	18.384	0.98	7.095
4,000	1,147.4	–	–	2.56	66.177	1.67	23.370	1.13	9.001
4,500	1,290.8	–	–	2.88	82.038	1.88	28.902	1.27	11.111
5,000	1,434.2	–	–	–	–	2.09	34.973	1.41	13.421
5,500	1,577.6	–	–	–	–	2.30	41.579	1.55	15.930
6,000	1,721.0	–	–	–	–	2.50	48.714	1.69	18.635
6,500	1,864.5	–	–	–	–	2.71	56.376	1.83	21.535
7,000	2,007.9	–	–	–	–	2.92	64.559	1.97	24.627
7,500	2,151.3	–	–	–	–	–	–	2.11	27.911

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
8,000	2,294.7	–	–	–	–	–	–	2.25	31.386
8,500	2,438.1	–	–	–	–	–	–	2.39	35.050
9,000	2,581.6	–	–	–	–	–	–	2.53	38.902
9,500	2,725.0	–	–	–	–	–	–	2.67	42.942
10,000	2,868.4	–	–	–	–	–	–	2.81	47.169
10,500	3,011.8	–	–	–	–	–	–	2.95	51.582
11,000	3,155.3	–	–	–	–	–	–	3.10	56.180

Table 12: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 16 °C / return flow 19 °C, d28–54 mm

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
350	100.4	0.06	0.031	–	–	–	–	–	–
400	114.7	0.07	0.036	–	–	–	–	–	–
450	129.1	0.07	0.040	–	–	–	–	–	–
500	143.4	0.08	0.044	–	–	–	–	–	–
550	157.8	0.09	0.049	0.05	0.018	–	–	–	–
600	172.1	0.10	0.053	0.06	0.020	–	–	–	–
700	200.8	0.11	0.118	0.07	0.023	–	–	–	–
800	229.5	0.13	0.148	0.08	0.046	0.05	0.012	–	–
900	258.2	0.15	0.181	0.09	0.057	0.06	0.014	–	–
1,000	286.8	0.16	0.216	0.10	0.068	0.07	0.027	–	–
1,100	315.5	0.18	0.255	0.11	0.079	0.07	0.031	–	–
1,200	344.2	0.20	0.296	0.12	0.092	0.08	0.036	–	–
1,300	372.9	0.21	0.339	0.13	0.106	0.09	0.042	0.05	0.012
1,400	401.6	0.23	0.385	0.14	0.120	0.09	0.047	0.05	0.013
1,500	430.3	0.24	0.434	0.15	0.135	0.10	0.053	0.06	0.015
1,600	458.9	0.26	0.485	0.16	0.151	0.11	0.059	0.06	0.017
1,700	487.6	0.28	0.539	0.17	0.167	0.11	0.066	0.07	0.019
1,800	516.3	0.29	0.595	0.18	0.185	0.12	0.073	0.07	0.020
1,900	545.0	0.31	0.653	0.19	0.203	0.13	0.080	0.07	0.022
2,000	573.7	0.33	0.714	0.20	0.221	0.13	0.087	0.08	0.025
2,500	717.1	0.41	1.054	0.25	0.326	0.17	0.128	0.10	0.036
3,000	860.5	0.49	1.450	0.30	0.447	0.20	0.175	0.12	0.049
3,500	1,003.9	0.57	1.901	0.35	0.585	0.23	0.228	0.14	0.064
4,000	1,147.4	0.65	2.406	0.40	0.739	0.27	0.288	0.16	0.081
4,500	1,290.8	0.73	2.963	0.45	0.909	0.30	0.354	0.18	0.099
5,000	1,434.2	0.81	3.572	0.50	1.094	0.33	0.426	0.20	0.119
5,500	1,577.6	0.89	4.232	0.55	1.294	0.37	0.503	0.21	0.140
6,000	1,721.0	0.98	4.942	0.60	1.510	0.40	0.586	0.23	0.163
6,500	1,864.5	1.06	5.701	0.64	1.739	0.43	0.675	0.25	0.188
7,000	2,007.9	1.14	6.510	0.69	1.984	0.47	0.769	0.27	0.214
7,500	2,151.3	1.22	7.367	0.74	2.242	0.50	0.868	0.29	0.241
8,000	2,294.7	1.30	8.272	0.79	2.515	0.53	0.973	0.31	0.270
8,500	2,438.1	1.38	9.224	0.84	2.802	0.57	1.084	0.33	0.300
9,000	2,581.6	1.46	10.225	0.89	3.103	0.60	1.199	0.35	0.332
9,500	2,725.0	1.54	11.272	0.94	3.417	0.63	1.320	0.37	0.365
10,000	2,868.4	1.63	12.366	0.99	3.746	0.67	1.446	0.39	0.400

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
10,500	3,011.8	1.71	13.507	1.04	4.088	0.70	1.577	0.41	0.436
11,000	3,155.3	1.79	14.695	1.09	4.443	0.73	1.713	0.43	0.473
11,500	3,298.7	1.87	15.928	1.14	4.812	0.77	1.855	0.45	0.512
12,000	3,442.1	1.95	17.207	1.19	5.195	0.80	2.001	0.47	0.552
12,500	3,585.5	2.03	18.533	1.24	5.591	0.83	2.152	0.49	0.594
13,000	3,728.9	2.11	19.903	1.29	6.000	0.87	2.309	0.51	0.636
13,500	3,872.4	2.19	21.320	1.34	6.422	0.90	2.470	0.53	0.680
14,000	4,015.8	2.28	22.781	1.39	6.857	0.94	2.636	0.55	0.726
14,500	4,159.2	2.36	24.288	1.44	7.306	0.97	2.807	0.57	0.772
15,000	4,302.6	2.44	25.840	1.49	7.767	1.00	2.983	0.59	0.820
15,500	4,446.0	2.52	27.436	1.54	8.242	1.04	3.164	0.61	0.870
16,000	4,589.5	2.60	29.078	1.59	8.729	1.07	3.349	0.62	0.920
16,500	4,732.9	2.68	30.764	1.64	9.229	1.10	3.540	0.64	0.972
17,000	4,876.3	2.76	32.495	1.69	9.742	1.14	3.735	0.66	1.025
17,500	5,019.7	2.84	34.270	1.74	10.268	1.17	3.935	0.68	1.080
18,000	5,163.1	2.93	36.090	1.79	10.807	1.20	4.140	0.70	1.135
18,500	5,306.6	3.01	37.954	1.84	11.359	1.24	4.349	0.72	1.192
19,000	5,450.0	3.09	39.862	1.88	11.923	1.27	4.564	0.74	1.251
19,500	5,593.4	–	–	1.93	12.500	1.30	4.783	0.76	1.310
20,000	5,736.8	–	–	1.98	13.089	1.34	5.006	0.78	1.371
20,500	5,880.2	–	–	2.03	13.691	1.37	5.235	0.80	1.433
21,000	6,023.7	–	–	2.08	14.306	1.40	5.468	0.82	1.496
21,500	6,167.1	–	–	2.13	14.933	1.44	5.706	0.84	1.560
22,000	6,310.5	–	–	2.18	15.573	1.47	5.948	0.86	1.626
22,500	6,453.9	–	–	2.23	16.226	1.50	6.195	0.88	1.693
23,000	6,597.3	–	–	2.28	16.891	1.54	6.447	0.90	1.761
23,500	6,740.8	–	–	2.33	17.568	1.57	6.703	0.92	1.830
24,000	6,884.2	–	–	2.38	18.258	1.60	6.964	0.94	1.901
24,500	7,027.6	–	–	2.43	18.960	1.64	7.229	0.96	1.973
25,000	7,171.0	–	–	2.48	19.675	1.67	7.500	0.98	2.045
25,500	7,314.4	–	–	2.53	20.402	1.70	7.774	1.00	2.120
26,000	7,457.9	–	–	2.58	21.141	1.74	8.053	1.02	2.195
26,500	7,601.3	–	–	2.63	21.893	1.77	8.337	1.03	2.272
27,000	7,744.7	–	–	2.68	22.657	1.80	8.626	1.05	2.349
27,500	7,888.1	–	–	2.73	23.433	1.84	8.918	1.07	2.428
28,000	8,031.6	–	–	2.78	24.222	1.87	9.216	1.09	2.508
28,500	8,175.0	–	–	2.83	25.023	1.90	9.518	1.11	2.590
29,000	8,318.4	–	–	2.88	25.836	1.94	9.824	1.13	2.672
29,500	8,461.8	–	–	2.93	26.661	1.97	10.135	1.15	2.756
30,000	8,605.2	–	–	2.98	27.499	2.00	10.451	1.17	2.841
32,500	9,322.3	–	–	–	–	2.17	12.096	1.27	3.283
35,000	10,039.4	–	–	–	–	2.34	13.852	1.37	3.754
37,500	10,756.5	–	–	–	–	2.50	15.720	1.46	4.254
40,000	11,473.6	–	–	–	–	2.67	17.698	1.56	4.783
42,500	12,190.7	–	–	–	–	2.84	19.786	1.66	5.341
45,000	12,907.9	–	–	–	–	3.01	21.983	1.76	5.927
47,500	13,625.0	–	–	–	–	–	–	1.86	6.541
50,000	14,342.1	–	–	–	–	–	–	1.95	7.183
52,500	15,059.2	–	–	–	–	–	–	2.05	7.853

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
55,000	15,776.3	–	–	–	–	–	–	2.15	8.550
57,500	16,493.4	–	–	–	–	–	–	2.25	9.276
60,000	17,210.5	–	–	–	–	–	–	2.34	10.029
62,500	17,927.6	–	–	–	–	–	–	2.44	10.810
65,000	18,644.7	–	–	–	–	–	–	2.54	11.617
67,500	19,361.8	–	–	–	–	–	–	2.64	12.453
70,000	20,078.9	–	–	–	–	–	–	2.73	13.315
72,500	20,796.0	–	–	–	–	–	–	2.83	14.205
75,000	21,513.1	–	–	–	–	–	–	2.93	15.122
77,500	22,230.2	–	–	–	–	–	–	3.03	16.065

Table 13: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 16 °C / return flow 19 °C, d66.7–108 mm

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
2,000	573.7	0.05	0.009	–	–	–	–	–	–
2,500	717.1	0.06	0.013	–	–	–	–	–	–
3,000	860.5	0.08	0.017	0.06	0.010	–	–	–	–
3,500	1,003.9	0.09	0.022	0.07	0.012	–	–	–	–
4,000	1,147.4	0.10	0.028	0.08	0.016	0.06	0.007	–	–
4,500	1,290.8	0.11	0.034	0.09	0.019	0.06	0.009	–	–
5,000	1,434.2	0.13	0.041	0.10	0.023	0.07	0.011	–	–
5,500	1,577.6	0.14	0.049	0.11	0.027	0.08	0.013	0.05	0.005
6,000	1,721.0	0.15	0.057	0.12	0.032	0.08	0.015	0.06	0.006
6,500	1,864.5	0.16	0.065	0.13	0.036	0.09	0.017	0.06	0.006
7,000	2,007.9	0.18	0.074	0.14	0.041	0.10	0.019	0.07	0.007
7,500	2,151.3	0.19	0.084	0.15	0.046	0.11	0.021	0.07	0.008
8,000	2,294.7	0.20	0.094	0.16	0.052	0.11	0.024	0.08	0.009
8,500	2,438.1	0.21	0.104	0.17	0.058	0.12	0.027	0.08	0.010
9,000	2,581.6	0.23	0.115	0.18	0.064	0.13	0.029	0.08	0.011
9,500	2,725.0	0.24	0.127	0.19	0.070	0.13	0.032	0.09	0.012
10,000	2,868.4	0.25	0.138	0.20	0.077	0.14	0.035	0.09	0.013
10,500	3,011.8	0.26	0.151	0.21	0.084	0.15	0.038	0.10	0.015
11,000	3,155.3	0.28	0.164	0.21	0.091	0.16	0.042	0.10	0.016
11,500	3,298.7	0.29	0.177	0.22	0.098	0.16	0.045	0.11	0.017
12,000	3,442.1	0.30	0.191	0.23	0.106	0.17	0.049	0.11	0.019
12,500	3,585.5	0.31	0.205	0.24	0.114	0.18	0.052	0.12	0.020
13,000	3,728.9	0.33	0.220	0.25	0.122	0.18	0.056	0.12	0.021
13,500	3,872.4	0.34	0.235	0.26	0.130	0.19	0.060	0.13	0.023
14,000	4,015.8	0.35	0.250	0.27	0.139	0.20	0.064	0.13	0.024
14,500	4,159.2	0.36	0.266	0.28	0.147	0.20	0.068	0.14	0.026
15,000	4,302.6	0.38	0.283	0.29	0.156	0.21	0.072	0.14	0.027
15,500	4,446.0	0.39	0.300	0.30	0.166	0.22	0.076	0.15	0.029
16,000	4,589.5	0.40	0.317	0.31	0.175	0.23	0.080	0.15	0.031
16,500	4,732.9	0.41	0.335	0.32	0.185	0.23	0.085	0.15	0.032
17,000	4,876.3	0.43	0.353	0.33	0.195	0.24	0.089	0.16	0.034
17,500	5,019.7	0.44	0.372	0.34	0.205	0.25	0.094	0.16	0.036
18,000	5,163.1	0.45	0.391	0.35	0.216	0.25	0.099	0.17	0.038

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
18,500	5,306.6	0.46	0.410	0.36	0.227	0.26	0.104	0.17	0.039
19,000	5,450.0	0.48	0.430	0.37	0.238	0.27	0.109	0.18	0.041
19,500	5,593.4	0.49	0.450	0.38	0.249	0.27	0.114	0.18	0.043
20,000	5,736.8	0.50	0.471	0.39	0.260	0.28	0.119	0.19	0.045
20,500	5,880.2	0.51	0.492	0.40	0.272	0.29	0.124	0.19	0.047
21,000	6,023.7	0.53	0.514	0.41	0.284	0.30	0.130	0.20	0.049
21,500	6,167.1	0.54	0.536	0.42	0.296	0.30	0.135	0.20	0.051
22,000	6,310.5	0.55	0.558	0.43	0.308	0.31	0.141	0.21	0.054
22,500	6,453.9	0.56	0.581	0.44	0.321	0.32	0.147	0.21	0.056
23,000	6,597.3	0.58	0.604	0.45	0.333	0.32	0.152	0.22	0.058
23,500	6,740.8	0.59	0.628	0.46	0.346	0.33	0.158	0.22	0.060
24,000	6,884.2	0.60	0.652	0.47	0.360	0.34	0.164	0.23	0.062
24,500	7,027.6	0.61	0.676	0.48	0.373	0.35	0.171	0.23	0.065
25,000	7,171.0	0.63	0.701	0.49	0.387	0.35	0.177	0.23	0.067
25,500	7,314.4	0.64	0.726	0.50	0.401	0.36	0.183	0.24	0.069
26,000	7,457.9	0.65	0.752	0.51	0.415	0.37	0.190	0.24	0.072
26,500	7,601.3	0.66	0.778	0.52	0.429	0.37	0.196	0.25	0.074
27,000	7,744.7	0.68	0.804	0.53	0.444	0.38	0.203	0.25	0.077
27,500	7,888.1	0.69	0.831	0.54	0.458	0.39	0.209	0.26	0.079
28,000	8,031.6	0.70	0.858	0.55	0.473	0.39	0.216	0.26	0.082
28,500	8,175.0	0.71	0.886	0.56	0.488	0.40	0.223	0.27	0.084
29,000	8,318.4	0.73	0.914	0.57	0.504	0.41	0.230	0.27	0.087
29,500	8,461.8	0.74	0.943	0.58	0.519	0.42	0.237	0.28	0.090
30,000	8,605.2	0.75	0.971	0.59	0.535	0.42	0.244	0.28	0.093
32,500	9,322.3	0.81	1.121	0.64	0.618	0.46	0.282	0.31	0.107
35,000	10,039.4	0.88	1.281	0.68	0.705	0.49	0.322	0.33	0.122
37,500	10,756.5	0.94	1.450	0.73	0.798	0.53	0.364	0.35	0.137
40,000	11,473.6	1.00	1.629	0.78	0.896	0.56	0.408	0.38	0.154
42,500	12,190.7	1.06	1.817	0.83	0.999	0.60	0.455	0.40	0.172
45,000	12,907.9	1.13	2.015	0.88	1.108	0.63	0.504	0.42	0.190
47,500	13,625.0	1.19	2.222	0.93	1.221	0.67	0.555	0.45	0.209
50,000	14,342.1	1.25	2.438	0.98	1.339	0.70	0.609	0.47	0.229
52,500	15,059.2	1.31	2.664	1.03	1.462	0.74	0.665	0.49	0.250
55,000	15,776.3	1.38	2.898	1.07	1.591	0.78	0.723	0.52	0.272
57,500	16,493.4	1.44	3.142	1.12	1.724	0.81	0.783	0.54	0.295
60,000	17,210.5	1.50	3.395	1.17	1.862	0.85	0.845	0.56	0.318
62,500	17,927.6	1.56	3.657	1.22	2.005	0.88	0.910	0.59	0.342
65,000	18,644.7	1.63	3.927	1.27	2.153	0.92	0.976	0.61	0.367
67,500	19,361.8	1.69	4.207	1.32	2.305	0.95	1.045	0.63	0.393
70,000	20,078.9	1.75	4.496	1.37	2.463	0.99	1.116	0.66	0.419
72,500	20,796.0	1.82	4.793	1.42	2.625	1.02	1.189	0.68	0.447
75,000	21,513.1	1.88	5.099	1.47	2.792	1.06	1.264	0.70	0.475
77,500	22,230.2	1.94	5.415	1.51	2.963	1.09	1.342	0.73	0.504
80,000	22,947.3	2.00	5.739	1.56	3.140	1.13	1.421	0.75	0.533
82,500	23,664.4	2.07	6.071	1.61	3.321	1.16	1.503	0.77	0.564
85,000	24,381.5	2.13	6.413	1.66	3.507	1.20	1.586	0.80	0.595
87,500	25,098.6	2.19	6.763	1.71	3.697	1.23	1.672	0.82	0.627
90,000	25,815.7	2.25	7.122	1.76	3.893	1.27	1.760	0.85	0.659
92,500	26,532.8	2.32	7.489	1.81	4.093	1.30	1.850	0.87	0.693

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
95,000	27,249.9	2.38	7.865	1.86	4.297	1.34	1.942	0.89	0.727
97,500	27,967.0	2.44	8.250	1.91	4.506	1.37	2.036	0.92	0.762
100,000	28,684.1	2.50	8.644	1.95	4.720	1.41	2.132	0.94	0.798
105,000	30,118.3	2.63	9.457	2.05	5.162	1.48	2.330	0.99	0.871
110,000	31,552.5	2.75	10.304	2.15	5.621	1.55	2.536	1.03	0.948
115,000	32,986.7	2.88	11.185	2.25	6.099	1.62	2.750	1.08	1.027
120,000	34,420.9	3.00	12.100	2.34	6.596	1.69	2.972	1.13	1.110
130,000	37,289.4	–	–	2.54	7.643	1.83	3.441	1.22	1.284
140,000	40,157.8	–	–	2.74	8.763	1.97	3.942	1.31	1.469
150,000	43,026.2	–	–	2.93	9.954	2.11	4.474	1.41	1.666
175,000	50,197.2	–	–	–	–	2.47	5.941	1.64	2.207
200,000	57,368.2	–	–	–	–	2.82	7.602	1.88	2.819
225,000	64,539.3	–	–	–	–	–	–	2.11	3.500
250,000	71,710.3	–	–	–	–	–	–	2.35	4.250
275,000	78,881.3	–	–	–	–	–	–	2.58	5.067
300,000	86,052.3	–	–	–	–	–	–	2.82	5.952
325,000	93,223.4	–	–	–	–	–	–	3.05	6.903

2.5 COOLING, INLET FLOW 18 °C / RETURN FLOW 22 °C

Medium:	Water	Density:	998.2 kg/m^3
Inlet flow temperature:	18 °C	Viscosity:	0.001001 Pa•s
Return temperature:	22 °C	Specific thermal capacity:	4,183 J/(kg•K)
Range:	4 K	Surface roughness:	0.01 mm
Average temperature:	20 °C		

Table 14: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 18 °C / return flow 22 °C, d12–22 mm

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
100	21.5	0.08	0.288	–	–	–	–	–	–
150	32.3	0.12	0.431	0.07	0.145	–	–	–	–
200	43.0	0.17	0.575	0.10	0.194	0.06	0.082	–	–
250	53.8	0.21	0.719	0.12	0.242	0.08	0.103	0.05	0.047
300	64.5	0.25	1.528	0.14	0.291	0.09	0.124	0.06	0.056
350	75.3	0.29	1.985	0.17	0.339	0.11	0.144	0.07	0.066
400	86.1	0.33	2.494	0.19	0.691	0.13	0.165	0.08	0.075

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
450	96.8	0.37	3.051	0.22	0.844	0.14	0.186	0.10	0.084
500	107.6	0.41	3.657	0.24	1.010	0.16	0.369	0.11	0.094
550	118.3	0.45	4.310	0.26	1.188	0.17	0.434	0.12	0.103
600	129.1	0.50	5.010	0.29	1.379	0.19	0.503	0.13	0.199
700	150.6	0.58	6.546	0.34	1.797	0.22	0.654	0.15	0.258
800	172.1	0.66	8.260	0.38	2.262	0.25	0.822	0.17	0.324
900	193.6	0.74	10.149	0.43	2.773	0.28	1.006	0.19	0.396
1,000	215.2	0.83	12.210	0.48	3.329	0.31	1.206	0.21	0.474
1,100	236.7	0.91	14.439	0.53	3.929	0.34	1.422	0.23	0.559
1,200	258.2	0.99	16.834	0.58	4.573	0.38	1.653	0.25	0.649
1,300	279.7	1.08	19.395	0.62	5.260	0.41	1.899	0.27	0.745
1,400	301.2	1.16	22.118	0.67	5.989	0.44	2.161	0.30	0.846
1,500	322.7	1.24	25.003	0.72	6.760	0.47	2.436	0.32	0.954
1,600	344.3	1.32	28.047	0.77	7.573	0.50	2.727	0.34	1.066
1,700	365.8	1.41	31.251	0.82	8.426	0.53	3.031	0.36	1.185
1,800	387.3	1.49	34.612	0.86	9.320	0.56	3.350	0.38	1.308
1,900	408.8	1.57	38.130	0.91	10.255	0.60	3.683	0.40	1.438
2,000	430.3	1.65	41.804	0.96	11.230	0.63	4.030	0.42	1.572
2,500	537.9	2.07	62.485	1.20	16.694	0.78	5.970	0.53	2.322
3,000	645.5	2.48	86.967	1.44	23.127	0.94	8.245	0.63	3.199
3,500	753.0	2.90	115.193	1.68	30.506	1.10	10.846	0.74	4.200
4,000	860.6	–	–	1.92	38.818	1.25	13.767	0.84	5.321
4,500	968.2	–	–	2.16	48.049	1.41	17.003	0.95	6.559
5,000	1,075.8	–	–	2.40	58.192	1.57	20.550	1.06	7.915
5,500	1,183.4	–	–	2.64	69.237	1.72	24.403	1.16	9.384
6,000	1,290.9	–	–	2.88	81.181	1.88	28.561	1.27	10.968
6,500	1,398.5	–	–	–	–	2.04	33.021	1.37	12.663
7,000	1,506.1	–	–	–	–	2.19	37.780	1.48	14.469
7,500	1,613.7	–	–	–	–	2.35	42.837	1.58	16.386
8,000	1,721.3	–	–	–	–	2.51	48.189	1.69	18.412
8,500	1,828.8	–	–	–	–	2.66	53.837	1.79	20.547
9,000	1,936.4	–	–	–	–	2.82	59.777	1.90	22.790
9,500	2,044.0	–	–	–	–	2.98	66.010	2.01	25.141
10,000	2,151.6	–	–	–	–	–	–	2.11	27.599
10,500	2,259.1	–	–	–	–	–	–	2.22	30.163
11,000	2,366.7	–	–	–	–	–	–	2.32	32.833
11,500	2,474.3	–	–	–	–	–	–	2.43	35.610
12,000	2,581.9	–	–	–	–	–	–	2.53	38.491
12,500	2,689.5	–	–	–	–	–	–	2.64	41.478
13,000	2,797.0	–	–	–	–	–	–	2.75	44.569
13,500	2,904.6	–	–	–	–	–	–	2.85	47.765
14,000	3,012.2	–	–	–	–	–	–	2.96	51.065
14,500	3,119.8	–	–	–	–	–	–	3.06	54.469

Table 15: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 18 °C / return flow 22 °C, d28–54 mm

d [mm]		28		35		42		54	
$\dot{Q}$ [W]	$\dot{m}$ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
450	96.8	0.05	0.028	–	–	–	–	–	–
500	107.6	0.06	0.031	–	–	–	–	–	–
550	118.3	0.07	0.034	–	–	–	–	–	–
600	129.1	0.07	0.038	–	–	–	–	–	–
700	150.6	0.09	0.044	0.05	0.016	–	–	–	–
800	172.1	0.10	0.089	0.06	0.019	–	–	–	–
900	193.6	0.11	0.109	0.07	0.021	–	–	–	–
1,000	215.2	0.12	0.130	0.07	0.041	0.05	0.011	–	–
1,100	236.7	0.13	0.153	0.08	0.048	0.06	0.012	–	–
1,200	258.2	0.15	0.177	0.09	0.055	0.06	0.022	–	–
1,300	279.7	0.16	0.203	0.10	0.064	0.07	0.025	–	–
1,400	301.2	0.17	0.231	0.10	0.072	0.07	0.028	–	–
1,500	322.7	0.18	0.260	0.11	0.081	0.08	0.032	–	–
1,600	344.3	0.20	0.290	0.12	0.090	0.08	0.036	–	–
1,700	365.8	0.21	0.322	0.13	0.100	0.09	0.040	–	–
1,800	387.3	0.22	0.356	0.13	0.111	0.09	0.044	0.05	0.012
1,900	408.8	0.23	0.390	0.14	0.121	0.10	0.048	0.06	0.014
2,000	430.3	0.24	0.427	0.15	0.133	0.10	0.052	0.06	0.015
2,500	537.9	0.30	0.628	0.19	0.195	0.13	0.076	0.07	0.022
3,000	645.5	0.37	0.863	0.22	0.267	0.15	0.104	0.09	0.029
3,500	753.0	0.43	1.130	0.26	0.349	0.18	0.136	0.10	0.038
4,000	860.6	0.49	1.428	0.30	0.440	0.20	0.172	0.12	0.048
4,500	968.2	0.55	1.757	0.34	0.540	0.23	0.211	0.13	0.059
5,000	1,075.8	0.61	2.116	0.37	0.650	0.25	0.253	0.15	0.071
5,500	1,183.4	0.67	2.504	0.41	0.768	0.28	0.299	0.16	0.084
6,000	1,290.9	0.73	2.922	0.45	0.895	0.30	0.348	0.18	0.097
6,500	1,398.5	0.79	3.368	0.48	1.031	0.33	0.401	0.19	0.112
7,000	1,506.1	0.85	3.843	0.52	1.175	0.35	0.456	0.21	0.127
7,500	1,613.7	0.91	4.345	0.56	1.327	0.38	0.515	0.22	0.143
8,000	1,721.3	0.98	4.876	0.60	1.488	0.40	0.577	0.23	0.161
8,500	1,828.8	1.04	5.434	0.63	1.657	0.43	0.642	0.25	0.179
9,000	1,936.4	1.10	6.020	0.67	1.834	0.45	0.710	0.26	0.197
9,500	2,044.0	1.16	6.633	0.71	2.019	0.48	0.782	0.28	0.217
10,000	2,151.6	1.22	7.273	0.74	2.212	0.50	0.856	0.29	0.237
10,500	2,259.1	1.28	7.940	0.78	2.412	0.53	0.933	0.31	0.259
11,000	2,366.7	1.34	8.634	0.82	2.621	0.55	1.013	0.32	0.281
11,500	2,474.3	1.40	9.354	0.86	2.838	0.58	1.096	0.34	0.304
12,000	2,581.9	1.46	10.101	0.89	3.062	0.60	1.182	0.35	0.327
12,500	2,689.5	1.52	10.874	0.93	3.294	0.63	1.271	0.37	0.352
13,000	2,797.0	1.59	11.673	0.97	3.533	0.65	1.363	0.38	0.377
13,500	2,904.6	1.65	12.499	1.01	3.781	0.68	1.458	0.40	0.403
14,000	3,012.2	1.71	13.350	1.04	4.036	0.70	1.556	0.41	0.430
14,500	3,119.8	1.77	14.228	1.08	4.298	0.73	1.656	0.42	0.457
15,000	3,227.3	1.83	15.131	1.12	4.568	0.75	1.759	0.44	0.486
15,500	3,334.9	1.89	16.060	1.15	4.845	0.78	1.865	0.45	0.515
16,000	3,442.5	1.95	17.015	1.19	5.130	0.80	1.974	0.47	0.544
16,500	3,550.1	2.01	17.995	1.23	5.423	0.83	2.086	0.48	0.575
17,000	3,657.7	2.07	19.001	1.27	5.722	0.85	2.201	0.50	0.606

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
17,500	3,765.2	2.13	20.032	1.30	6.030	0.88	2.318	0.51	0.638
18,000	3,872.8	2.20	21.089	1.34	6.344	0.90	2.438	0.53	0.671
18,500	3,980.4	2.26	22.171	1.38	6.666	0.93	2.561	0.54	0.704
19,000	4,088.0	2.32	23.279	1.41	6.995	0.95	2.686	0.56	0.739
19,500	4,195.6	2.38	24.412	1.45	7.332	0.98	2.814	0.57	0.774
20,000	4,303.1	2.44	25.569	1.49	7.675	1.00	2.945	0.59	0.809
20,500	4,410.7	2.50	26.753	1.53	8.027	1.03	3.079	0.60	0.846
21,000	4,518.3	2.56	27.961	1.56	8.385	1.05	3.215	0.62	0.883
21,500	4,625.9	2.62	29.194	1.60	8.750	1.08	3.354	0.63	0.921
22,000	4,733.4	2.68	30.452	1.64	9.123	1.10	3.496	0.64	0.959
22,500	4,841.0	2.74	31.736	1.68	9.503	1.13	3.640	0.66	0.998
23,000	4,948.6	2.81	33.044	1.71	9.890	1.15	3.787	0.67	1.038
23,500	5,056.2	2.87	34.377	1.75	10.284	1.18	3.937	0.69	1.079
24,000	5,163.8	2.93	35.735	1.79	10.686	1.20	4.090	0.70	1.120
24,500	5,271.3	2.99	37.118	1.82	11.094	1.23	4.245	0.72	1.163
25,000	5,378.9	3.05	38.525	1.86	11.510	1.25	4.402	0.73	1.205
25,500	5,486.5	–	–	1.90	11.933	1.28	4.563	0.75	1.249
26,000	5,594.1	–	–	1.94	12.362	1.30	4.726	0.76	1.293
26,500	5,701.6	–	–	1.97	12.799	1.33	4.891	0.78	1.338
27,000	5,809.2	–	–	2.01	13.243	1.35	5.059	0.79	1.383
27,500	5,916.8	–	–	2.05	13.694	1.38	5.230	0.81	1.430
28,000	6,024.4	–	–	2.08	14.152	1.40	5.404	0.82	1.477
28,500	6,132.0	–	–	2.12	14.617	1.43	5.580	0.84	1.524
29,000	6,239.5	–	–	2.16	15.090	1.45	5.758	0.85	1.573
29,500	6,347.1	–	–	2.20	15.569	1.48	5.940	0.86	1.622
30,000	6,454.7	–	–	2.23	16.055	1.50	6.124	0.88	1.671
32,500	6,992.6	–	–	2.42	18.590	1.63	7.082	0.95	1.930
35,000	7,530.5	–	–	2.61	21.300	1.75	8.104	1.03	2.206
37,500	8,068.4	–	–	2.79	24.182	1.88	9.190	1.10	2.498
40,000	8,606.3	–	–	2.98	27.236	2.00	10.339	1.17	2.807
42,500	9,144.2	–	–	–	–	2.13	11.551	1.25	3.132
45,000	9,682.0	–	–	–	–	2.26	12.826	1.32	3.474
47,500	10,219.9	–	–	–	–	2.38	14.163	1.39	3.832
50,000	10,757.8	–	–	–	–	2.51	15.562	1.47	4.206
52,500	11,295.7	–	–	–	–	2.63	17.024	1.54	4.596
55,000	11,833.6	–	–	–	–	2.76	18.547	1.61	5.002
57,500	12,371.5	–	–	–	–	2.88	20.130	1.69	5.424
60,000	12,909.4	–	–	–	–	3.01	21.776	1.76	5.862
62,500	13,447.3	–	–	–	–	–	–	1.83	6.316
65,000	13,985.2	–	–	–	–	–	–	1.91	6.785
67,500	14,523.1	–	–	–	–	–	–	1.98	7.270
70,000	15,061.0	–	–	–	–	–	–	2.05	7.771
72,500	15,598.9	–	–	–	–	–	–	2.12	8.287
75,000	16,136.7	–	–	–	–	–	–	2.20	8.819
77,500	16,674.6	–	–	–	–	–	–	2.27	9.366
80,000	17,212.5	–	–	–	–	–	–	2.34	9.929
82,500	17,750.4	–	–	–	–	–	–	2.42	10.507
85,000	18,288.3	–	–	–	–	–	–	2.49	11.100
87,500	18,826.2	–	–	–	–	–	–	2.56	11.709

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
90,000	19,364.1	–	–	–	–	–	–	2.64	12.333
92,500	19,902.0	–	–	–	–	–	–	2.71	12.972
95,000	20,439.9	–	–	–	–	–	–	2.78	13.626
97,500	20,977.8	–	–	–	–	–	–	2.86	14.296
100,000	21,515.7	–	–	–	–	–	–	2.93	14.981
105,000	22,591.4	–	–	–	–	–	–	3.08	16.396

Table 16: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, inlet flow 18 °C / return flow 22 °C, d66.7–108 mm

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
3,000	645.5	0.06	0.010	–	–	–	–	–	–
3,500	753.0	0.07	0.013	0.05	0.007	–	–	–	–
4,000	860.6	0.08	0.017	0.06	0.009	–	–	–	–
4,500	968.2	0.08	0.021	0.07	0.012	–	–	–	–
5,000	1,075.8	0.09	0.025	0.07	0.014	0.05	0.006	–	–
5,500	1,183.4	0.10	0.029	0.08	0.016	0.06	0.008	–	–
6,000	1,290.9	0.11	0.034	0.09	0.019	0.06	0.009	–	–
6,500	1,398.5	0.12	0.039	0.10	0.022	0.07	0.010	–	–
7,000	1,506.1	0.13	0.044	0.10	0.025	0.07	0.011	–	–
7,500	1,613.7	0.14	0.050	0.11	0.028	0.08	0.013	0.05	0.005
8,000	1,721.3	0.15	0.056	0.12	0.031	0.08	0.014	0.06	0.005
8,500	1,828.8	0.16	0.062	0.12	0.034	0.09	0.016	0.06	0.006
9,000	1,936.4	0.17	0.069	0.13	0.038	0.10	0.018	0.06	0.007
9,500	2,044.0	0.18	0.075	0.14	0.042	0.10	0.019	0.07	0.007
10,000	2,151.6	0.19	0.082	0.15	0.046	0.11	0.021	0.07	0.008
10,500	2,259.1	0.20	0.090	0.15	0.050	0.11	0.023	0.07	0.009
11,000	2,366.7	0.21	0.097	0.16	0.054	0.12	0.025	0.08	0.009
11,500	2,474.3	0.22	0.105	0.17	0.058	0.12	0.027	0.08	0.010
12,000	2,581.9	0.23	0.113	0.18	0.063	0.13	0.029	0.08	0.011
12,500	2,689.5	0.23	0.122	0.18	0.067	0.13	0.031	0.09	0.012
13,000	2,797.0	0.24	0.130	0.19	0.072	0.14	0.033	0.09	0.013
13,500	2,904.6	0.25	0.139	0.20	0.077	0.14	0.035	0.10	0.014
14,000	3,012.2	0.26	0.149	0.21	0.082	0.15	0.038	0.10	0.014
14,500	3,119.8	0.27	0.158	0.21	0.088	0.15	0.040	0.10	0.015
15,000	3,227.3	0.28	0.168	0.22	0.093	0.16	0.043	0.11	0.016
15,500	3,334.9	0.29	0.178	0.23	0.098	0.16	0.045	0.11	0.017
16,000	3,442.5	0.30	0.188	0.23	0.104	0.17	0.048	0.11	0.018
16,500	3,550.1	0.31	0.198	0.24	0.110	0.17	0.050	0.12	0.019
17,000	3,657.7	0.32	0.209	0.25	0.116	0.18	0.053	0.12	0.020
17,500	3,765.2	0.33	0.220	0.26	0.122	0.19	0.056	0.12	0.021
18,000	3,872.8	0.34	0.231	0.26	0.128	0.19	0.059	0.13	0.022
18,500	3,980.4	0.35	0.243	0.27	0.134	0.20	0.062	0.13	0.023
19,000	4,088.0	0.36	0.255	0.28	0.141	0.20	0.065	0.13	0.025
19,500	4,195.6	0.37	0.267	0.29	0.147	0.21	0.068	0.14	0.026
20,000	4,303.1	0.38	0.279	0.29	0.154	0.21	0.071	0.14	0.027
20,500	4,410.7	0.39	0.291	0.30	0.161	0.22	0.074	0.14	0.028
21,000	4,518.3	0.39	0.304	0.31	0.168	0.22	0.077	0.15	0.029

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
21,500	4,625.9	0.40	0.317	0.32	0.175	0.23	0.080	0.15	0.031
22,000	4,733.4	0.41	0.330	0.32	0.182	0.23	0.084	0.16	0.032
22,500	4,841.0	0.42	0.343	0.33	0.190	0.24	0.087	0.16	0.033
23,000	4,948.6	0.43	0.357	0.34	0.197	0.24	0.090	0.16	0.034
23,500	5,056.2	0.44	0.371	0.34	0.205	0.25	0.094	0.17	0.036
24,000	5,163.8	0.45	0.385	0.35	0.213	0.25	0.097	0.17	0.037
24,500	5,271.3	0.46	0.400	0.36	0.221	0.26	0.101	0.17	0.038
25,000	5,378.9	0.47	0.414	0.37	0.229	0.26	0.105	0.18	0.040
25,500	5,486.5	0.48	0.429	0.37	0.237	0.27	0.108	0.18	0.041
26,000	5,594.1	0.49	0.444	0.38	0.245	0.27	0.112	0.18	0.043
26,500	5,701.6	0.50	0.459	0.39	0.254	0.28	0.116	0.19	0.044
27,000	5,809.2	0.51	0.475	0.40	0.262	0.29	0.120	0.19	0.046
27,500	5,916.8	0.52	0.491	0.40	0.271	0.29	0.124	0.19	0.047
28,000	6,024.4	0.53	0.507	0.41	0.280	0.30	0.128	0.20	0.049
28,500	6,132.0	0.54	0.523	0.42	0.289	0.30	0.132	0.20	0.050
29,000	6,239.5	0.54	0.539	0.43	0.298	0.31	0.136	0.20	0.052
29,500	6,347.1	0.55	0.556	0.43	0.307	0.31	0.140	0.21	0.053
30,000	6,454.7	0.56	0.573	0.44	0.316	0.32	0.145	0.21	0.055
32,500	6,992.6	0.61	0.661	0.48	0.365	0.34	0.167	0.23	0.063
35,000	7,530.5	0.66	0.755	0.51	0.416	0.37	0.190	0.25	0.072
37,500	8,068.4	0.70	0.854	0.55	0.471	0.40	0.215	0.26	0.081
40,000	8,606.3	0.75	0.959	0.59	0.528	0.42	0.241	0.28	0.091
42,500	9,144.2	0.80	1.069	0.62	0.589	0.45	0.269	0.30	0.102
45,000	9,682.0	0.85	1.185	0.66	0.652	0.48	0.297	0.32	0.112
47,500	10,219.9	0.89	1.306	0.70	0.719	0.50	0.327	0.33	0.124
50,000	10,757.8	0.94	1.433	0.73	0.788	0.53	0.359	0.35	0.136
52,500	11,295.7	0.99	1.564	0.77	0.860	0.56	0.392	0.37	0.148
55,000	11,833.6	1.03	1.701	0.81	0.935	0.58	0.426	0.39	0.161
57,500	12,371.5	1.08	1.844	0.84	1.013	0.61	0.461	0.41	0.174
60,000	12,909.4	1.13	1.991	0.88	1.094	0.63	0.498	0.42	0.188
62,500	13,447.3	1.17	2.144	0.92	1.178	0.66	0.535	0.44	0.202
65,000	13,985.2	1.22	2.302	0.95	1.264	0.69	0.574	0.46	0.216
67,500	14,523.1	1.27	2.465	0.99	1.353	0.71	0.615	0.48	0.232
70,000	15,061.0	1.32	2.633	1.03	1.445	0.74	0.656	0.49	0.247
72,500	15,598.9	1.36	2.807	1.06	1.540	0.77	0.699	0.51	0.263
75,000	16,136.7	1.41	2.985	1.10	1.637	0.79	0.743	0.53	0.280
77,500	16,674.6	1.46	3.169	1.14	1.737	0.82	0.788	0.55	0.297
80,000	17,212.5	1.50	3.357	1.17	1.840	0.85	0.835	0.56	0.314
82,500	17,750.4	1.55	3.551	1.21	1.946	0.87	0.882	0.58	0.332
85,000	18,288.3	1.60	3.750	1.25	2.054	0.90	0.931	0.60	0.350
87,500	18,826.2	1.64	3.953	1.28	2.165	0.93	0.981	0.62	0.369
90,000	19,364.1	1.69	4.162	1.32	2.279	0.95	1.033	0.63	0.388
92,500	19,902.0	1.74	4.375	1.36	2.396	0.98	1.085	0.65	0.407
95,000	20,439.9	1.78	4.594	1.39	2.515	1.00	1.139	0.67	0.427
97,500	20,977.8	1.83	4.818	1.43	2.637	1.03	1.194	0.69	0.448
100,000	21,515.7	1.88	5.046	1.47	2.761	1.06	1.250	0.70	0.469
105,000	22,591.4	1.97	5.518	1.54	3.018	1.11	1.365	0.74	0.512
110,000	23,667.2	2.07	6.009	1.61	3.285	1.16	1.486	0.78	0.557
115,000	24,743.0	2.16	6.520	1.69	3.563	1.22	1.611	0.81	0.603

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
120,000	25,818.8	2.25	7.051	1.76	3.852	1.27	1.740	0.85	0.652
130,000	27,970.4	2.44	8.170	1.91	4.460	1.37	2.013	0.92	0.753
140,000	30,121.9	2.63	9.367	2.05	5.109	1.48	2.304	0.99	0.861
150,000	32,273.5	2.82	10.641	2.20	5.800	1.59	2.614	1.06	0.976
175,000	37,652.4	–	–	2.57	7.706	1.85	3.466	1.23	1.292
200,000	43,031.3	–	–	2.93	9.864	2.12	4.430	1.41	1.648
225,000	48,410.2	–	–	–	–	2.38	5.503	1.59	2.044
250,000	53,789.1	–	–	–	–	2.64	6.685	1.76	2.479
275,000	59,168.1	–	–	–	–	2.91	7.975	1.94	2.953
300,000	64,547.0	–	–	–	–	–	–	2.11	3.466
325,000	69,925.9	–	–	–	–	–	–	2.29	4.017

3 HEATING PRESSURE LOSS

3.1 RECOMMENDED FLOW VELOCITIES

The following recommendations apply for the heating pressure loss tables:

- Radiator connection pipes: flow velocity ≤ 0.3 m/s
- Distribution pipes: flow velocity ≤ 0.5 m/s
- Riser pipes and cellar pipes: flow velocity ≤ 0.8 m/s

3.2 HEATING, INLET FLOW 61 °C / RETURN FLOW 60 °C

Medium:	Water	Density:	982.9 kg/m^3
Inlet flow temperature:	61 °C	Viscosity:	0.000463475 Pa•s
Return temperature:	60 °C	Specific thermal capacity:	4,183.2 J/(kg•K)
Range:	1 K	Surface roughness:	0.01 mm
Average temperature:	60.5 °C		

Table 17: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 61 °C / return flow 60 °C, d12–22 mm

d [mm]		**12**		**15**		**18**		**22**	
Q̇ [W]	**ṁ [kg/h]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**
50	43.0	0.17	0.619	0.10	0.171	0.06	0.039	–	–
100	86.1	0.34	2.057	0.20	0.562	0.13	0.204	0.09	0.080
150	129.1	0.50	4.198	0.29	1.139	0.19	0.411	0.13	0.161
200	172.1	0.67	7.003	0.39	1.888	0.25	0.679	0.17	0.265
250	215.1	0.84	10.448	0.49	2.802	0.32	1.004	0.21	0.391
300	258.2	1.01	14.519	0.59	3.876	0.38	1.385	0.26	0.539
350	301.2	1.18	19.205	0.68	5.106	0.45	1.820	0.30	0.706
400	344.2	1.34	24.498	0.78	6.490	0.51	2.308	0.34	0.894
450	387.3	1.51	30.395	0.88	8.026	0.57	2.848	0.39	1.101
500	430.3	1.68	36.889	0.98	9.712	0.64	3.439	0.43	1.328
550	473.3	1.85	43.977	1.07	11.546	0.70	4.081	0.47	1.573
600	516.4	2.02	51.658	1.17	13.527	0.76	4.774	0.51	1.837
700	602.4	2.35	68.783	1.37	17.929	0.89	6.307	0.60	2.421
800	688.5	2.69	88.254	1.56	22.909	1.02	8.036	0.69	3.078
900	774.5	3.02	110.056	1.76	28.465	1.15	9.958	0.77	3.807
1,000	860.6	–	–	1.95	34.591	1.27	12.073	0.86	4.606

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1,100	946.6	–	–	2.15	41.286	1.40	14.378	0.94	5.476
1,200	1,032.7	–	–	2.34	48.545	1.53	16.872	1.03	6.415
1,300	1,118.8	–	–	2.54	56.370	1.65	19.555	1.12	7.424
1,400	1,204.8	–	–	2.73	64.756	1.78	22.425	1.20	8.501
1,500	1,290.9	–	–	2.93	73.704	1.91	25.482	1.29	9.646
1,600	1,376.9	–	–	–	–	2.04	28.724	1.37	10.859
1,700	1,463.0	–	–	–	–	2.16	32.153	1.46	12.140
1,800	1,549.1	–	–	–	–	2.29	35.766	1.54	13.488
1,900	1,635.1	–	–	–	–	2.42	39.564	1.63	14.903
2,000	1,721.2	–	–	–	–	2.54	43.546	1.72	16.385
2,500	2,151.5	–	–	–	–	–	–	2.14	24.794
3,000	2,581.8	–	–	–	–	–	–	2.57	34.855
3,500	3,012.0	–	–	–	–	–	–	3.00	46.556

Table 18: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 61 °C / return flow 60 °C, d28–54 mm

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
150	129.1	0.07	0.044	–	–	–	–	–	–
200	172.1	0.10	0.072	0.06	0.022	–	–	–	–
250	215.1	0.12	0.106	0.08	0.033	0.05	0.013	–	–
300	258.2	0.15	0.146	0.09	0.045	0.06	0.018	–	–
350	301.2	0.17	0.190	0.11	0.059	0.07	0.023	–	–
400	344.2	0.20	0.240	0.12	0.074	0.08	0.029	–	–
450	387.3	0.22	0.296	0.14	0.091	0.09	0.036	0.05	0.010
500	430.3	0.25	0.356	0.15	0.110	0.10	0.043	0.06	0.012
550	473.3	0.27	0.421	0.17	0.129	0.11	0.050	0.07	0.014
600	516.4	0.30	0.491	0.18	0.151	0.12	0.059	0.07	0.016
700	602.4	0.35	0.645	0.21	0.198	0.14	0.077	0.08	0.021
800	688.5	0.40	0.818	0.24	0.250	0.16	0.097	0.10	0.027
900	774.5	0.45	1.009	0.27	0.308	0.18	0.120	0.11	0.033
1,000	860.6	0.50	1.218	0.30	0.371	0.20	0.144	0.12	0.040
1,100	946.6	0.54	1.445	0.33	0.440	0.22	0.170	0.13	0.047
1,200	1,032.7	0.59	1.689	0.36	0.513	0.24	0.199	0.14	0.055
1,300	1,118.8	0.64	1.951	0.39	0.592	0.26	0.229	0.15	0.063
1,400	1,204.8	0.69	2.230	0.42	0.676	0.29	0.261	0.17	0.072
1,500	1,290.9	0.74	2.527	0.45	0.765	0.31	0.295	0.18	0.082
1,600	1,376.9	0.79	2.840	0.48	0.859	0.33	0.331	0.19	0.091
1,700	1,463.0	0.84	3.170	0.51	0.957	0.35	0.369	0.20	0.102
1,800	1,549.1	0.89	3.517	0.54	1.061	0.37	0.408	0.21	0.113
1,900	1,635.1	0.94	3.880	0.57	1.169	0.39	0.450	0.23	0.124
2,000	1,721.2	0.99	4.261	0.60	1.283	0.41	0.493	0.24	0.136
2,500	2,151.5	1.24	6.408	0.76	1.921	0.51	0.736	0.30	0.202
3,000	2,581.8	1.49	8.963	0.91	2.676	0.61	1.023	0.36	0.280

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
3,500	3,012.0	1.73	11.919	1.06	3.546	0.71	1.352	0.42	0.369
4,000	3,442.3	1.98	15.273	1.21	4.529	0.81	1.724	0.48	0.469
4,500	3,872.6	2.23	19.023	1.36	5.625	0.92	2.137	0.54	0.580
5,000	4,302.9	2.48	23.166	1.51	6.833	1.02	2.590	0.60	0.702
5,500	4,733.2	2.72	27.702	1.66	8.151	1.12	3.085	0.65	0.835
6,000	5,163.5	2.97	32.628	1.81	9.580	1.22	3.620	0.71	0.978
6,500	5,593.8	–	–	1.97	11.118	1.32	4.195	0.77	1.131
7,000	6,024.1	–	–	2.12	12.765	1.43	4.810	0.83	1.295
7,500	6,454.4	–	–	2.27	14.522	1.53	5.464	0.89	1.469
8,000	6,884.7	–	–	2.42	16.386	1.63	6.158	0.95	1.653
8,500	7,315.0	–	–	2.57	18.360	1.73	6.892	1.01	1.847
9,000	7,745.3	–	–	2.72	20.441	1.83	7.664	1.07	2.051
9,500	8,175.6	–	–	2.87	22.630	1.93	8.476	1.13	2.265
10,000	8,605.9	–	–	3.02	24.927	2.04	9.327	1.19	2.490
10,500	9,036.1	–	–	–	–	2.14	10.217	1.25	2.724
11,000	9,466.4	–	–	–	–	2.24	11.145	1.31	2.968
11,500	9,896.7	–	–	–	–	2.34	12.112	1.37	3.222
12,000	10,327.0	–	–	–	–	2.44	13.118	1.43	3.486
12,500	10,757.3	–	–	–	–	2.54	14.163	1.49	3.760
13,000	11,187.6	–	–	–	–	2.65	15.246	1.55	4.043
13,500	11,617.9	–	–	–	–	2.75	16.368	1.61	4.336
14,000	12,048.2	–	–	–	–	2.85	17.528	1.67	4.639
14,500	12,478.5	–	–	–	–	2.95	18.727	1.73	4.952
15,000	12,908.8	–	–	–	–	3.05	19.964	1.79	5.275
15,500	13,339.1	–	–	–	–	–	–	1.85	5.607
16,000	13,769.4	–	–	–	–	–	–	1.90	5.949
16,500	14,199.7	–	–	–	–	–	–	1.96	6.300
17,000	14,629.9	–	–	–	–	–	–	2.02	6.661
17,500	15,060.2	–	–	–	–	–	–	2.08	7.032
18,000	15,490.5	–	–	–	–	–	–	2.14	7.413
18,500	15,920.8	–	–	–	–	–	–	2.20	7.802
19,000	16,351.1	–	–	–	–	–	–	2.26	8.202
19,500	16,781.4	–	–	–	–	–	–	2.32	8.611
20,000	17,211.7	–	–	–	–	–	–	2.38	9.030
20,500	17,642.0	–	–	–	–	–	–	2.44	9.459
21,000	18,072.3	–	–	–	–	–	–	2.50	9.897
21,500	18,502.6	–	–	–	–	–	–	2.56	10.344
22,000	18,932.9	–	–	–	–	–	–	2.62	10.801
22,500	19,363.2	–	–	–	–	–	–	2.68	11.268
23,000	19,793.5	–	–	–	–	–	–	2.74	11.744
23,500	20,223.8	–	–	–	–	–	–	2.80	12.229
24,000	20,654.0	–	–	–	–	–	–	2.86	12.725
24,500	21,084.3	–	–	–	–	–	–	2.92	13.229
25,000	21,514.6	–	–	–	–	–	–	2.98	13.743
25,500	21,944.9	–	–	–	–	–	–	3.04	14.267
26,000	22,375.2	–	–	–	–	–	–	3.10	14.800

Table 19: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 61 °C / return flow 60 °C, d66.7–108 mm

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
700	602.4	0.05	0.007	–	–	–	–	–	–
800	688.5	0.06	0.009	–	–	–	–	–	–
900	774.5	0.07	0.012	0.05	0.006	–	–	–	–
1,000	860.6	0.08	0.014	0.06	0.008	–	–	–	–
1,100	946.6	0.08	0.016	0.07	0.009	–	–	–	–
1,200	1,032.7	0.09	0.019	0.07	0.011	0.05	0.005	–	–
1,300	1,118.8	0.10	0.022	0.08	0.012	0.06	0.006	–	–
1,400	1,204.8	0.11	0.025	0.08	0.014	0.06	0.006	–	–
1,500	1,290.9	0.11	0.028	0.09	0.016	0.06	0.007	–	–
1,600	1,376.9	0.12	0.032	0.10	0.018	0.07	0.008	–	–
1,700	1,463.0	0.13	0.035	0.10	0.019	0.07	0.009	–	–
1,800	1,549.1	0.14	0.039	0.11	0.022	0.08	0.010	0.05	0.004
1,900	1,635.1	0.14	0.043	0.11	0.024	0.08	0.011	0.05	0.004
2,000	1,721.2	0.15	0.047	0.12	0.026	0.09	0.012	0.06	0.005
2,500	2,151.5	0.19	0.070	0.15	0.038	0.11	0.018	0.07	0.007
3,000	2,581.8	0.23	0.096	0.18	0.053	0.13	0.024	0.09	0.009
3,500	3,012.0	0.27	0.127	0.21	0.070	0.15	0.032	0.10	0.012
4,000	3,442.3	0.31	0.161	0.24	0.089	0.17	0.040	0.11	0.015
4,500	3,872.6	0.34	0.198	0.27	0.109	0.19	0.050	0.13	0.019
5,000	4,302.9	0.38	0.240	0.30	0.132	0.21	0.060	0.14	0.023
5,500	4,733.2	0.42	0.284	0.33	0.157	0.24	0.071	0.16	0.027
6,000	5,163.5	0.46	0.333	0.36	0.183	0.26	0.083	0.17	0.031
6,500	5,593.8	0.50	0.385	0.39	0.211	0.28	0.096	0.19	0.036
7,000	6,024.1	0.53	0.440	0.42	0.242	0.30	0.110	0.20	0.041
7,500	6,454.4	0.57	0.498	0.45	0.274	0.32	0.124	0.21	0.047
8,000	6,884.7	0.61	0.560	0.48	0.307	0.34	0.140	0.23	0.053
8,500	7,315.0	0.65	0.625	0.51	0.343	0.37	0.156	0.24	0.059
9,000	7,745.3	0.69	0.694	0.54	0.380	0.39	0.173	0.26	0.065
9,500	8,175.6	0.72	0.766	0.57	0.420	0.41	0.190	0.27	0.072
10,000	8,605.9	0.76	0.841	0.60	0.461	0.43	0.209	0.29	0.078
10,500	9,036.1	0.80	0.919	0.63	0.503	0.45	0.228	0.30	0.086
11,000	9,466.4	0.84	1.001	0.66	0.548	0.47	0.248	0.31	0.093
11,500	9,896.7	0.88	1.085	0.69	0.594	0.49	0.269	0.33	0.101
12,000	10,327.0	0.92	1.173	0.71	0.642	0.52	0.290	0.34	0.109
12,500	10,757.3	0.95	1.265	0.74	0.691	0.54	0.313	0.36	0.117
13,000	11,187.6	0.99	1.359	0.77	0.743	0.56	0.336	0.37	0.126
13,500	11,617.9	1.03	1.457	0.80	0.796	0.58	0.360	0.39	0.135
14,000	12,048.2	1.07	1.557	0.83	0.851	0.60	0.384	0.40	0.144
14,500	12,478.5	1.11	1.661	0.86	0.907	0.62	0.410	0.42	0.153
15,000	12,908.8	1.14	1.768	0.89	0.965	0.64	0.436	0.43	0.163
15,500	13,339.1	1.18	1.878	0.92	1.025	0.67	0.463	0.44	0.173
16,000	13,769.4	1.22	1.992	0.95	1.087	0.69	0.490	0.46	0.183
16,500	14,199.7	1.26	2.108	0.98	1.150	0.71	0.518	0.47	0.194
17,000	14,629.9	1.30	2.228	1.01	1.215	0.73	0.547	0.49	0.204
17,500	15,060.2	1.34	2.350	1.04	1.281	0.75	0.577	0.50	0.216
18,000	15,490.5	1.37	2.476	1.07	1.349	0.77	0.608	0.52	0.227
18,500	15,920.8	1.41	2.605	1.10	1.419	0.79	0.639	0.53	0.238
19,000	16,351.1	1.45	2.737	1.13	1.490	0.82	0.671	0.54	0.250

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
19,500	16,781.4	1.49	2.872	1.16	1.564	0.84	0.704	0.56	0.262
20,000	17,211.7	1.53	3.010	1.19	1.638	0.86	0.737	0.57	0.275
20,500	17,642.0	1.56	3.151	1.22	1.715	0.88	0.771	0.59	0.287
21,000	18,072.3	1.60	3.295	1.25	1.793	0.90	0.806	0.60	0.300
21,500	18,502.6	1.64	3.443	1.28	1.873	0.92	0.842	0.62	0.313
22,000	18,932.9	1.68	3.593	1.31	1.954	0.95	0.878	0.63	0.327
22,500	19,363.2	1.72	3.747	1.34	2.037	0.97	0.915	0.64	0.341
23,000	19,793.5	1.76	3.903	1.37	2.122	0.99	0.953	0.66	0.354
23,500	20,223.8	1.79	4.063	1.40	2.208	1.01	0.991	0.67	0.369
24,000	20,654.0	1.83	4.225	1.43	2.296	1.03	1.030	0.69	0.383
24,500	21,084.3	1.87	4.391	1.46	2.385	1.05	1.070	0.70	0.398
25,000	21,514.6	1.91	4.560	1.49	2.476	1.07	1.111	0.72	0.413
25,500	21,944.9	1.95	4.732	1.52	2.569	1.10	1.152	0.73	0.428
26,000	22,375.2	1.98	4.906	1.55	2.663	1.12	1.194	0.74	0.444
26,500	22,805.5	2.02	5.084	1.58	2.759	1.14	1.237	0.76	0.459
27,000	23,235.8	2.06	5.265	1.61	2.857	1.16	1.280	0.77	0.475
27,500	23,666.1	2.10	5.449	1.64	2.956	1.18	1.324	0.79	0.492
28,000	24,096.4	2.14	5.636	1.67	3.057	1.20	1.369	0.80	0.508
28,500	24,526.7	2.17	5.826	1.70	3.159	1.22	1.415	0.82	0.525
29,000	24,957.0	2.21	6.019	1.73	3.263	1.25	1.461	0.83	0.542
29,500	25,387.3	2.25	6.215	1.76	3.369	1.27	1.508	0.84	0.559
30,000	25,817.6	2.29	6.414	1.79	3.476	1.29	1.556	0.86	0.577
32,500	27,969.0	2.48	7.454	1.94	4.036	1.40	1.804	0.93	0.668
35,000	30,120.5	2.67	8.570	2.08	4.636	1.50	2.070	1.00	0.766
37,500	32,271.9	2.86	9.760	2.23	5.276	1.61	2.354	1.07	0.869
40,000	34,423.4	3.05	11.026	2.38	5.956	1.72	2.654	1.15	0.979
42,500	36,574.9	–	–	2.53	6.675	1.83	2.972	1.22	1.096
45,000	38,726.3	–	–	2.68	7.433	1.93	3.307	1.29	1.218
47,500	40,877.8	–	–	2.83	8.231	2.04	3.659	1.36	1.346
50,000	43,029.3	–	–	2.98	9.069	2.15	4.029	1.43	1.481
52,500	45,180.7	–	–	–	–	2.26	4.415	1.50	1.621
55,000	47,332.2	–	–	–	–	2.36	4.818	1.57	1.768
57,500	49,483.6	–	–	–	–	2.47	5.238	1.65	1.921
60,000	51,635.1	–	–	–	–	2.58	5.675	1.72	2.079
62,500	53,786.6	–	–	–	–	2.68	6.129	1.79	2.244
65,000	55,938.0	–	–	–	–	2.79	6.600	1.86	2.415
67,500	58,089.5	–	–	–	–	2.90	7.087	1.93	2.591
70,000	60,241.0	–	–	–	–	3.01	7.591	2.00	2.774
72,500	62,392.4	–	–	–	–	–	–	2.08	2.962
75,000	64,543.9	–	–	–	–	–	–	2.15	3.157
77,500	66,695.4	–	–	–	–	–	–	2.22	3.357
80,000	68,846.8	–	–	–	–	–	–	2.29	3.564
82,500	70,998.3	–	–	–	–	–	–	2.36	3.776
85,000	73,149.7	–	–	–	–	–	–	2.43	3.994
87,500	75,301.2	–	–	–	–	–	–	2.51	4.218
90,000	77,452.7	–	–	–	–	–	–	2.58	4.448
92,500	79,604.1	–	–	–	–	–	–	2.65	4.684
95,000	81,755.6	–	–	–	–	–	–	2.72	4.926
97,500	83,907.1	–	–	–	–	–	–	2.79	5.173

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
100,000	86,058.5	–	–	–	–	–	–	2.86	5.427
102,500	88,210.0	–	–	–	–	–	–	2.93	5.686
105,000	90,361.4	–	–	–	–	–	–	3.01	5.952
107,500	92,512.9	–	–	–	–	–	–	3.08	6.223

3.3 HEATING, INLET FLOW 70 °C / RETURN FLOW 55 °C

Medium:	Water	Density:	981.9 kg/m^3
Inlet flow temperature:	70 °C	Viscosity:	0.000450975 Pa•s
Return temperature:	55 °C	Specific thermal capacity:	4,184 J/(kg•K)
Range:	15 K	Surface roughness:	0.01 mm
Average temperature:	32.5 °C		

Table 20: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 70 °C / return flow 55 °C, d12–22 mm

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
300	17.2	0.07	0.105	–	–	–	–	–	–
400	22.9	0.09	0.140	0.05	0.047	–	–	–	–
500	28.7	0.11	0.308	0.07	0.059	–	–	–	–
600	34.4	0.13	0.420	0.08	0.071	0.05	0.030	–	–
700	40.2	0.16	0.546	0.09	0.151	0.06	0.035	–	–
800	45.9	0.18	0.687	0.10	0.190	0.07	0.069	–	–
900	51.6	0.20	0.841	0.12	0.232	0.08	0.085	0.05	0.021
1,000	57.4	0.22	1.009	0.13	0.278	0.08	0.101	0.06	0.040
1,100	63.1	0.25	1.191	0.14	0.327	0.09	0.119	0.06	0.047
1,200	68.8	0.27	1.385	0.16	0.380	0.10	0.138	0.07	0.055
1,300	74.6	0.29	1.592	0.17	0.436	0.11	0.159	0.07	0.063
1,400	80.3	0.31	1.812	0.18	0.496	0.12	0.180	0.08	0.071
1,500	86.0	0.34	2.044	0.20	0.559	0.13	0.203	0.09	0.080
1,600	91.8	0.36	2.289	0.21	0.625	0.14	0.227	0.09	0.089
1,700	97.5	0.38	2.546	0.22	0.694	0.14	0.251	0.10	0.099
1,800	103.3	0.40	2.815	0.23	0.767	0.15	0.278	0.10	0.109
1,900	109.0	0.43	3.097	0.25	0.842	0.16	0.305	0.11	0.120
2,000	114.7	0.45	3.390	0.26	0.921	0.17	0.333	0.11	0.131
2,500	143.4	0.56	5.034	0.33	1.361	0.21	0.491	0.14	0.192
3,000	172.1	0.67	6.968	0.39	1.877	0.25	0.675	0.17	0.264
3,500	200.8	0.78	9.185	0.46	2.465	0.30	0.884	0.20	0.345
4,000	229.4	0.90	11.682	0.52	3.125	0.34	1.119	0.23	0.435
4,500	258.1	1.01	14.454	0.59	3.856	0.38	1.377	0.26	0.535
5,000	286.8	1.12	17.500	0.65	4.655	0.42	1.660	0.29	0.644

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
5,500	315.5	1.23	20.816	0.72	5.523	0.47	1.966	0.31	0.762
6,000	344.2	1.35	24.401	0.78	6.460	0.51	2.296	0.34	0.889
6,500	372.8	1.46	28.254	0.85	7.463	0.55	2.649	0.37	1.024
7,000	401.5	1.57	32.373	0.91	8.533	0.59	3.024	0.40	1.168
7,500	430.2	1.68	36.756	0.98	9.669	0.64	3.423	0.43	1.321
8,000	458.9	1.79	41.404	1.04	10.871	0.68	3.843	0.46	1.481
8,500	487.6	1.91	46.314	1.11	12.139	0.72	4.286	0.49	1.651
9,000	516.3	2.02	51.488	1.17	13.472	0.76	4.751	0.52	1.828
9,500	544.9	2.13	56.923	1.24	14.870	0.81	5.239	0.54	2.014
10,000	573.6	2.24	62.619	1.30	16.333	0.85	5.748	0.57	2.208
10,500	602.3	2.35	68.576	1.37	17.860	0.89	6.279	0.60	2.410
11,000	631.0	2.47	74.793	1.43	19.451	0.93	6.831	0.63	2.620
11,500	659.7	2.58	81.270	1.50	21.107	0.98	7.406	0.66	2.838
12,000	688.3	2.69	88.007	1.56	22.826	1.02	8.002	0.69	3.064
12,500	717.0	2.80	95.002	1.63	24.610	1.06	8.619	0.72	3.298
13,000	745.7	2.91	102.256	1.69	26.456	1.10	9.258	0.74	3.540
13,500	774.4	3.03	109.769	1.76	28.367	1.15	9.918	0.77	3.790
14,000	803.1	–	–	1.82	30.341	1.19	10.600	0.80	4.047
14,500	831.7	–	–	1.89	32.378	1.23	11.302	0.83	4.313
15,000	860.4	–	–	1.95	34.478	1.27	12.026	0.86	4.586
15,500	889.1	–	–	2.02	36.641	1.32	12.771	0.89	4.867
16,000	917.8	–	–	2.08	38.868	1.36	13.537	0.92	5.156
16,500	946.5	–	–	2.15	41.157	1.40	14.324	0.94	5.453
17,000	975.1	–	–	2.21	43.509	1.44	15.133	0.97	5.757
17,500	1,003.8	–	–	2.28	45.924	1.49	15.962	1.00	6.069
18,000	1,032.5	–	–	2.34	48.401	1.53	16.812	1.03	6.389
18,500	1,061.2	–	–	2.41	50.942	1.57	17.683	1.06	6.716
19,000	1,089.9	–	–	2.47	53.544	1.61	18.574	1.09	7.051
19,500	1,118.5	–	–	2.54	56.209	1.66	19.487	1.12	7.394
20,000	1,147.2	–	–	2.60	58.938	1.70	20.421	1.14	7.744
20,500	1,175.9	–	–	2.67	61.728	1.74	21.375	1.17	8.102
21,000	1,204.6	–	–	2.73	64.580	1.78	22.350	1.20	8.467
21,500	1,233.3	–	–	2.80	67.495	1.83	23.345	1.23	8.840
22,000	1,262.0	–	–	2.86	70.472	1.87	24.362	1.26	9.221
22,500	1,290.6	–	–	2.93	73.511	1.91	25.399	1.29	9.609
23,000	1,319.3	–	–	2.99	76.613	1.95	26.457	1.32	10.005
23,500	1,348.0	–	–	3.06	79.777	2.00	27.535	1.35	10.408
24,000	1,376.7	–	–	–	–	2.04	28.634	1.37	10.819
24,500	1,405.4	–	–	–	–	2.08	29.753	1.40	11.237
25,000	1,434.0	–	–	–	–	2.12	30.894	1.43	11.663
25,500	1,462.7	–	–	–	–	2.16	32.055	1.46	12.096
26,000	1,491.4	–	–	–	–	2.21	33.236	1.49	12.536
26,500	1,520.1	–	–	–	–	2.25	34.438	1.52	12.985
27,000	1,548.8	–	–	–	–	2.29	35.660	1.55	13.440
27,500	1,577.4	–	–	–	–	2.33	36.903	1.57	13.903
28,000	1,606.1	–	–	–	–	2.38	38.166	1.60	14.374
28,500	1,634.8	–	–	–	–	2.42	39.450	1.63	14.852
29,000	1,663.5	–	–	–	–	2.46	40.754	1.66	15.337
29,500	1,692.2	–	–	–	–	2.50	42.079	1.69	15.830

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
30,000	1,720.8	–	–	–	–	2.55	43.424	1.72	16.330
32,500	1,864.2	–	–	–	–	2.76	50.457	1.86	18.942
35,000	2,007.6	–	–	–	–	2.97	57.998	2.00	21.739
37,500	2,151.1	–	–	–	–	–	–	2.15	24.719
40,000	2,294.5	–	–	–	–	–	–	2.29	27.883
42,500	2,437.9	–	–	–	–	–	–	2.43	31.230
45,000	2,581.3	–	–	–	–	–	–	2.58	34.759
47,500	2,724.7	–	–	–	–	–	–	2.72	38.471
50,000	2,868.1	–	–	–	–	–	–	2.86	42.365
52,500	3,011.5	–	–	–	–	–	–	3.00	46.440

3 / 3

Table 21: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 70 °C / return flow 55 °C, d28–54 mm

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1,600	91.8	0.05	0.024	–	–	–	–	–	–
1,700	97.5	0.06	0.027	–	–	–	–	–	–
1,800	103.3	0.06	0.030	–	–	–	–	–	–
1,900	109.0	0.06	0.033	–	–	–	–	–	–
2,000	114.7	0.07	0.036	–	–	–	–	–	–
2,500	143.4	0.08	0.052	0.05	0.016	–	–	–	–
3,000	172.1	0.10	0.072	0.06	0.022	–	–	–	–
3,500	200.8	0.12	0.093	0.07	0.029	–	–	–	–
4,000	229.4	0.13	0.118	0.08	0.037	0.05	0.014	–	–
4,500	258.1	0.15	0.145	0.09	0.045	0.06	0.018	–	–
5,000	286.8	0.17	0.174	0.10	0.054	0.07	0.021	–	–
5,500	315.5	0.18	0.205	0.11	0.063	0.07	0.025	–	–
6,000	344.2	0.20	0.239	0.12	0.074	0.08	0.029	–	–
6,500	372.8	0.21	0.275	0.13	0.085	0.09	0.033	0.05	0.009
7,000	401.5	0.23	0.313	0.14	0.096	0.10	0.038	0.06	0.011
7,500	430.2	0.25	0.354	0.15	0.109	0.10	0.042	0.06	0.012
8,000	458.9	0.26	0.396	0.16	0.122	0.11	0.048	0.06	0.013
8,500	487.6	0.28	0.441	0.17	0.136	0.12	0.053	0.07	0.015
9,000	516.3	0.30	0.488	0.18	0.150	0.12	0.058	0.07	0.016
9,500	544.9	0.31	0.537	0.19	0.165	0.13	0.064	0.08	0.018
10,000	573.6	0.33	0.588	0.20	0.180	0.14	0.070	0.08	0.020
10,500	602.3	0.35	0.641	0.21	0.196	0.14	0.076	0.08	0.021
11,000	631.0	0.36	0.697	0.22	0.213	0.15	0.083	0.09	0.023
11,500	659.7	0.38	0.754	0.23	0.231	0.16	0.090	0.09	0.025
12,000	688.3	0.40	0.813	0.24	0.249	0.16	0.097	0.10	0.027
12,500	717.0	0.41	0.875	0.25	0.267	0.17	0.104	0.10	0.029
13,000	745.7	0.43	0.938	0.26	0.286	0.18	0.111	0.10	0.031
13,500	774.4	0.45	1.004	0.27	0.306	0.18	0.119	0.11	0.033
14,000	803.1	0.46	1.071	0.28	0.327	0.19	0.127	0.11	0.035
14,500	831.7	0.48	1.140	0.29	0.348	0.20	0.135	0.12	0.037
15,000	860.4	0.50	1.212	0.30	0.369	0.20	0.143	0.12	0.040
15,500	889.1	0.51	1.285	0.31	0.391	0.21	0.152	0.12	0.042
16,000	917.8	0.53	1.361	0.32	0.414	0.22	0.160	0.13	0.045

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
16,500	946.5	0.55	1.438	0.33	0.437	0.22	0.169	0.13	0.047
17,000	975.1	0.56	1.517	0.34	0.461	0.23	0.178	0.14	0.050
17,500	1,003.8	0.58	1.598	0.35	0.486	0.24	0.188	0.14	0.052
18,000	1,032.5	0.60	1.681	0.36	0.511	0.24	0.197	0.14	0.055
18,500	1,061.2	0.61	1.766	0.37	0.536	0.25	0.207	0.15	0.057
19,000	1,089.9	0.63	1.853	0.38	0.562	0.26	0.217	0.15	0.060
19,500	1,118.5	0.64	1.942	0.39	0.589	0.26	0.228	0.15	0.063
20,000	1,147.2	0.66	2.033	0.40	0.616	0.27	0.238	0.16	0.066
20,500	1,175.9	0.68	2.126	0.41	0.644	0.28	0.249	0.16	0.069
21,000	1,204.6	0.69	2.220	0.42	0.673	0.29	0.260	0.17	0.072
21,500	1,233.3	0.71	2.317	0.43	0.701	0.29	0.271	0.17	0.075
22,000	1,262.0	0.73	2.415	0.44	0.731	0.30	0.282	0.17	0.078
22,500	1,290.6	0.74	2.515	0.45	0.761	0.31	0.294	0.18	0.081
23,000	1,319.3	0.76	2.617	0.46	0.792	0.31	0.305	0.18	0.084
23,500	1,348.0	0.78	2.721	0.47	0.823	0.32	0.317	0.19	0.088
24,000	1,376.7	0.79	2.827	0.48	0.854	0.33	0.329	0.19	0.091
24,500	1,405.4	0.81	2.935	0.49	0.887	0.33	0.342	0.19	0.094
25,000	1,434.0	0.83	3.045	0.50	0.919	0.34	0.354	0.20	0.098
25,500	1,462.7	0.84	3.156	0.51	0.953	0.35	0.367	0.20	0.101
26,000	1,491.4	0.86	3.270	0.52	0.987	0.35	0.380	0.21	0.105
26,500	1,520.1	0.88	3.385	0.53	1.021	0.36	0.393	0.21	0.108
27,000	1,548.8	0.89	3.502	0.54	1.056	0.37	0.406	0.21	0.112
27,500	1,577.4	0.91	3.621	0.55	1.091	0.37	0.420	0.22	0.116
28,000	1,606.1	0.93	3.742	0.56	1.127	0.38	0.434	0.22	0.120
28,500	1,634.8	0.94	3.864	0.58	1.164	0.39	0.448	0.23	0.123
29,000	1,663.5	0.96	3.989	0.59	1.201	0.39	0.462	0.23	0.127
29,500	1,692.2	0.98	4.115	0.60	1.239	0.40	0.476	0.23	0.131
30,000	1,720.8	0.99	4.243	0.61	1.277	0.41	0.491	0.24	0.135
32,500	1,864.2	1.07	4.911	0.66	1.475	0.44	0.566	0.26	0.156
35,000	2,007.6	1.16	5.625	0.71	1.687	0.48	0.647	0.28	0.178
37,500	2,151.1	1.24	6.384	0.76	1.912	0.51	0.733	0.30	0.201
40,000	2,294.5	1.32	7.188	0.81	2.150	0.54	0.823	0.32	0.226
42,500	2,437.9	1.40	8.038	0.86	2.401	0.58	0.918	0.34	0.251
45,000	2,581.3	1.49	8.931	0.91	2.665	0.61	1.018	0.36	0.278
47,500	2,724.7	1.57	9.870	0.96	2.941	0.65	1.123	0.38	0.307
50,000	2,868.1	1.65	10.853	1.01	3.230	0.68	1.232	0.40	0.336
52,500	3,011.5	1.74	11.880	1.06	3.532	0.71	1.346	0.42	0.367
55,000	3,154.9	1.82	12.951	1.11	3.846	0.75	1.465	0.44	0.399
57,500	3,298.3	1.90	14.067	1.16	4.173	0.78	1.588	0.46	0.433
60,000	3,441.7	1.98	15.226	1.21	4.512	0.82	1.716	0.48	0.467
62,500	3,585.1	2.07	16.430	1.26	4.864	0.85	1.849	0.50	0.503
65,000	3,728.5	2.15	17.677	1.31	5.229	0.88	1.986	0.52	0.540
67,500	3,871.9	2.23	18.968	1.36	5.605	0.92	2.128	0.54	0.578
70,000	4,015.3	2.31	20.303	1.41	5.995	0.95	2.274	0.56	0.617
72,500	4,158.7	2.40	21.681	1.46	6.396	0.98	2.425	0.58	0.657
75,000	4,302.1	2.48	23.103	1.51	6.810	1.02	2.580	0.60	0.699
77,500	4,445.5	2.56	24.569	1.56	7.236	1.05	2.740	0.62	0.742
80,000	4,588.9	2.64	26.078	1.61	7.674	1.09	2.905	0.64	0.786
82,500	4,732.3	2.73	27.630	1.66	8.125	1.12	3.073	0.66	0.831

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
85,000	4,875.7	2.81	29.226	1.72	8.588	1.15	3.247	0.68	0.877
87,500	5,019.1	2.89	30.865	1.77	9.062	1.19	3.424	0.70	0.925
90,000	5,162.5	2.98	32.548	1.82	9.550	1.22	3.607	0.71	0.973
92,500	5,305.9	3.06	34.273	1.87	10.049	1.26	3.793	0.73	1.023
95,000	5,449.3	–	–	1.92	10.561	1.29	3.985	0.75	1.074
97,500	5,592.7	–	–	1.97	11.084	1.32	4.180	0.77	1.126
100,000	5,736.1	–	–	2.02	11.620	1.36	4.380	0.79	1.180
105,000	6,022.9	–	–	2.12	12.728	1.43	4.793	0.83	1.289
110,000	6,309.8	–	–	2.22	13.885	1.49	5.224	0.87	1.404
115,000	6,596.6	–	–	2.32	15.089	1.56	5.672	0.91	1.523
120,000	6,883.4	–	–	2.42	16.342	1.63	6.138	0.95	1.646
125,000	7,170.2	–	–	2.52	17.643	1.70	6.622	0.99	1.774
130,000	7,457.0	–	–	2.62	18.992	1.77	7.123	1.03	1.907
135,000	7,743.8	–	–	2.72	20.389	1.83	7.641	1.07	2.043
140,000	8,030.6	–	–	2.82	21.834	1.90	8.177	1.11	2.185
145,000	8,317.4	–	–	2.93	23.326	1.97	8.729	1.15	2.331
150,000	8,604.2	–	–	3.03	24.867	2.04	9.300	1.19	2.481
155,000	8,891.0	–	–	–	–	2.11	9.887	1.23	2.635
160,000	9,177.8	–	–	–	–	2.17	10.492	1.27	2.794
165,000	9,464.6	–	–	–	–	2.24	11.114	1.31	2.958
170,000	9,751.4	–	–	–	–	2.31	11.753	1.35	3.126
175,000	10,038.2	–	–	–	–	2.38	12.410	1.39	3.298
180,000	10,325.0	–	–	–	–	2.45	13.083	1.43	3.474
185,000	10,611.9	–	–	–	–	2.51	13.774	1.47	3.655
190,000	10,898.7	–	–	–	–	2.58	14.482	1.51	3.840
195,000	11,185.5	–	–	–	–	2.65	15.207	1.55	4.030
200,000	11,472.3	–	–	–	–	2.72	15.949	1.59	4.224
205,000	11,759.1	–	–	–	–	2.78	16.709	1.63	4.422
210,000	12,045.9	–	–	–	–	2.85	17.485	1.67	4.625
215,000	12,332.7	–	–	–	–	2.92	18.279	1.71	4.832
220,000	12,619.5	–	–	–	–	2.99	19.089	1.75	5.043
225,000	12,906.3	–	–	–	–	3.06	19.917	1.79	5.259
230,000	13,193.1	–	–	–	–	–	–	1.83	5.478
235,000	13,479.9	–	–	–	–	–	–	1.87	5.703
240,000	13,766.7	–	–	–	–	–	–	1.91	5.931
245,000	14,053.5	–	–	–	–	–	–	1.95	6.164
250,000	14,340.3	–	–	–	–	–	–	1.99	6.401
255,000	14,627.2	–	–	–	–	–	–	2.03	6.642
260,000	14,914.0	–	–	–	–	–	–	2.07	6.888
265,000	15,200.8	–	–	–	–	–	–	2.11	7.138
270,000	15,487.6	–	–	–	–	–	–	2.14	7.392
275,000	15,774.4	–	–	–	–	–	–	2.18	7.650
280,000	16,061.2	–	–	–	–	–	–	2.22	7.913
285,000	16,348.0	–	–	–	–	–	–	2.26	8.180
290,000	16,634.8	–	–	–	–	–	–	2.30	8.451
295,000	16,921.6	–	–	–	–	–	–	2.34	8.726
300,000	17,208.4	–	–	–	–	–	–	2.38	9.006
310,000	17,782.0	–	–	–	–	–	–	2.46	9.578
320,000	18,355.6	–	–	–	–	–	–	2.54	10.168

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
330,000	18,929.3	–	–	–	–	–	–	2.62	10.774
340,000	19,502.9	–	–	–	–	–	–	2.70	11.397
350,000	20,076.5	–	–	–	–	–	–	2.78	12.037
360,000	20,650.1	–	–	–	–	–	–	2.86	12.694
370,000	21,223.7	–	–	–	–	–	–	2.94	13.368
380,000	21,797.3	–	–	–	–	–	–	3.02	14.059
390,000	22,370.9	–	–	–	–	–	–	3.10	14.766

Table 22: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 70 °C / return flow 55 °C, d66.7–108 mm

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
10,000	573.6	0.05	0.007	–	–	–	–	–	–
10,500	602.3	0.05	0.007	–	–	–	–	–	–
11,000	631.0	0.06	0.008	–	–	–	–	–	–
11,500	659.7	0.06	0.009	–	–	–	–	–	–
12,000	688.3	0.06	0.009	–	–	–	–	–	–
12,500	717.0	0.06	0.010	–	–	–	–	–	–
13,000	745.7	0.07	0.011	0.05	0.006	–	–	–	–
13,500	774.4	0.07	0.011	0.05	0.006	–	–	–	–
14,000	803.1	0.07	0.012	0.06	0.007	–	–	–	–
14,500	831.7	0.07	0.013	0.06	0.007	–	–	–	–
15,000	860.4	0.08	0.014	0.06	0.008	–	–	–	–
15,500	889.1	0.08	0.015	0.06	0.008	–	–	–	–
16,000	917.8	0.08	0.015	0.06	0.009	–	–	–	–
16,500	946.5	0.08	0.016	0.07	0.009	–	–	–	–
17,000	975.1	0.09	0.017	0.07	0.010	–	–	–	–
17,500	1,003.8	0.09	0.018	0.07	0.010	0.05	0.005	–	–
18,000	1,032.5	0.09	0.019	0.07	0.011	0.05	0.005	–	–
18,500	1,061.2	0.09	0.020	0.07	0.011	0.05	0.005	–	–
19,000	1,089.9	0.10	0.021	0.08	0.012	0.05	0.005	–	–
19,500	1,118.5	0.10	0.022	0.08	0.012	0.06	0.006	–	–
20,000	1,147.2	0.10	0.023	0.08	0.013	0.06	0.006	–	–
20,500	1,175.9	0.10	0.024	0.08	0.013	0.06	0.006	–	–
21,000	1,204.6	0.11	0.025	0.08	0.014	0.06	0.006	–	–
21,500	1,233.3	0.11	0.026	0.09	0.014	0.06	0.007	–	–
22,000	1,262.0	0.11	0.027	0.09	0.015	0.06	0.007	–	–
22,500	1,290.6	0.11	0.028	0.09	0.016	0.06	0.007	–	–
23,000	1,319.3	0.12	0.029	0.09	0.016	0.07	0.007	–	–
23,500	1,348.0	0.12	0.030	0.09	0.017	0.07	0.008	–	–
24,000	1,376.7	0.12	0.031	0.10	0.017	0.07	0.008	–	–
24,500	1,405.4	0.12	0.033	0.10	0.018	0.07	0.008	–	–
25,000	1,434.0	0.13	0.034	0.10	0.019	0.07	0.009	–	–
25,500	1,462.7	0.13	0.035	0.10	0.019	0.07	0.009	–	–
26,000	1,491.4	0.13	0.036	0.10	0.020	0.07	0.009	–	–
26,500	1,520.1	0.13	0.037	0.11	0.021	0.08	0.010	0.05	0.004
27,000	1,548.8	0.14	0.039	0.11	0.021	0.08	0.010	0.05	0.004
27,500	1,577.4	0.14	0.040	0.11	0.022	0.08	0.010	0.05	0.004

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
28,000	1,606.1	0.14	0.041	0.11	0.023	0.08	0.010	0.05	0.004
28,500	1,634.8	0.15	0.043	0.11	0.024	0.08	0.011	0.05	0.004
29,000	1,663.5	0.15	0.044	0.12	0.024	0.08	0.011	0.06	0.004
29,500	1,692.2	0.15	0.045	0.12	0.025	0.08	0.011	0.06	0.004
30,000	1,720.8	0.15	0.047	0.12	0.026	0.09	0.012	0.06	0.005
32,500	1,864.2	0.17	0.054	0.13	0.030	0.09	0.014	0.06	0.005
35,000	2,007.6	0.18	0.061	0.14	0.034	0.10	0.016	0.07	0.006
37,500	2,151.1	0.19	0.069	0.15	0.038	0.11	0.018	0.07	0.007
40,000	2,294.5	0.20	0.078	0.16	0.043	0.11	0.020	0.08	0.007
42,500	2,437.9	0.22	0.086	0.17	0.048	0.12	0.022	0.08	0.008
45,000	2,581.3	0.23	0.096	0.18	0.053	0.13	0.024	0.09	0.009
47,500	2,724.7	0.24	0.105	0.19	0.058	0.14	0.027	0.09	0.010
50,000	2,868.1	0.25	0.115	0.20	0.064	0.14	0.029	0.10	0.011
52,500	3,011.5	0.27	0.126	0.21	0.069	0.15	0.032	0.10	0.012
55,000	3,154.9	0.28	0.137	0.22	0.075	0.16	0.034	0.11	0.013
57,500	3,298.3	0.29	0.148	0.23	0.082	0.16	0.037	0.11	0.014
60,000	3,441.7	0.31	0.160	0.24	0.088	0.17	0.040	0.11	0.015
62,500	3,585.1	0.32	0.172	0.25	0.095	0.18	0.043	0.12	0.016
65,000	3,728.5	0.33	0.184	0.26	0.102	0.19	0.046	0.12	0.018
67,500	3,871.9	0.34	0.197	0.27	0.109	0.19	0.050	0.13	0.019
70,000	4,015.3	0.36	0.211	0.28	0.116	0.20	0.053	0.13	0.020
72,500	4,158.7	0.37	0.224	0.29	0.124	0.21	0.056	0.14	0.021
75,000	4,302.1	0.38	0.238	0.30	0.131	0.21	0.060	0.14	0.023
77,500	4,445.5	0.39	0.253	0.31	0.139	0.22	0.063	0.15	0.024
80,000	4,588.9	0.41	0.268	0.32	0.147	0.23	0.067	0.15	0.025
82,500	4,732.3	0.42	0.283	0.33	0.156	0.24	0.071	0.16	0.027
85,000	4,875.7	0.43	0.299	0.34	0.164	0.24	0.075	0.16	0.028
87,500	5,019.1	0.45	0.315	0.35	0.173	0.25	0.079	0.17	0.030
90,000	5,162.5	0.46	0.331	0.36	0.182	0.26	0.083	0.17	0.031
92,500	5,305.9	0.47	0.348	0.37	0.191	0.27	0.087	0.18	0.033
95,000	5,449.3	0.48	0.365	0.38	0.201	0.27	0.091	0.18	0.034
97,500	5,592.7	0.50	0.383	0.39	0.210	0.28	0.096	0.19	0.036
100,000	5,736.1	0.51	0.401	0.40	0.220	0.29	0.100	0.19	0.038
105,000	6,022.9	0.53	0.438	0.42	0.240	0.30	0.109	0.20	0.041
110,000	6,309.8	0.56	0.476	0.44	0.261	0.32	0.119	0.21	0.045
115,000	6,596.6	0.59	0.516	0.46	0.283	0.33	0.129	0.22	0.048
120,000	6,883.4	0.61	0.558	0.48	0.306	0.34	0.139	0.23	0.052
125,000	7,170.2	0.64	0.601	0.50	0.329	0.36	0.150	0.24	0.056
130,000	7,457.0	0.66	0.645	0.52	0.354	0.37	0.161	0.25	0.060
135,000	7,743.8	0.69	0.691	0.54	0.379	0.39	0.172	0.26	0.065
140,000	8,030.6	0.71	0.738	0.56	0.405	0.40	0.183	0.27	0.069
145,000	8,317.4	0.74	0.787	0.58	0.431	0.42	0.195	0.28	0.073
150,000	8,604.2	0.76	0.837	0.60	0.459	0.43	0.208	0.29	0.078
155,000	8,891.0	0.79	0.889	0.62	0.487	0.44	0.221	0.30	0.083
160,000	9,177.8	0.81	0.942	0.64	0.516	0.46	0.234	0.31	0.088
165,000	9,464.6	0.84	0.997	0.66	0.545	0.47	0.247	0.32	0.093
170,000	9,751.4	0.87	1.053	0.68	0.576	0.49	0.261	0.32	0.098
175,000	10,038.2	0.89	1.110	0.70	0.607	0.50	0.275	0.33	0.103
180,000	10,325.0	0.92	1.169	0.72	0.639	0.52	0.289	0.34	0.108

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
185,000	10,611.9	0.94	1.229	0.74	0.672	0.53	0.304	0.35	0.114
190,000	10,898.7	0.97	1.291	0.76	0.706	0.54	0.319	0.36	0.120
195,000	11,185.5	0.99	1.354	0.78	0.740	0.56	0.334	0.37	0.125
200,000	11,472.3	1.02	1.418	0.79	0.775	0.57	0.350	0.38	0.131
205,000	11,759.1	1.04	1.484	0.81	0.811	0.59	0.366	0.39	0.137
210,000	12,045.9	1.07	1.552	0.83	0.847	0.60	0.383	0.40	0.143
215,000	12,332.7	1.09	1.620	0.85	0.885	0.62	0.399	0.41	0.149
220,000	12,619.5	1.12	1.690	0.87	0.923	0.63	0.416	0.42	0.156
225,000	12,906.3	1.15	1.762	0.89	0.962	0.64	0.434	0.43	0.162
230,000	13,193.1	1.17	1.835	0.91	1.001	0.66	0.452	0.44	0.169
235,000	13,479.9	1.20	1.909	0.93	1.041	0.67	0.470	0.45	0.176
240,000	13,766.7	1.22	1.985	0.95	1.082	0.69	0.488	0.46	0.182
245,000	14,053.5	1.25	2.062	0.97	1.124	0.70	0.507	0.47	0.189
250,000	14,340.3	1.27	2.140	0.99	1.167	0.72	0.526	0.48	0.196
255,000	14,627.2	1.30	2.220	1.01	1.210	0.73	0.545	0.49	0.204
260,000	14,914.0	1.32	2.301	1.03	1.254	0.75	0.565	0.50	0.211
265,000	15,200.8	1.35	2.384	1.05	1.299	0.76	0.585	0.51	0.218
270,000	15,487.6	1.37	2.468	1.07	1.344	0.77	0.605	0.52	0.226
275,000	15,774.4	1.40	2.553	1.09	1.391	0.79	0.626	0.53	0.234
280,000	16,061.2	1.43	2.640	1.11	1.438	0.80	0.647	0.53	0.241
285,000	16,348.0	1.45	2.728	1.13	1.485	0.82	0.668	0.54	0.249
290,000	16,634.8	1.48	2.817	1.15	1.534	0.83	0.690	0.55	0.257
295,000	16,921.6	1.50	2.908	1.17	1.583	0.85	0.712	0.56	0.265
300,000	17,208.4	1.53	3.000	1.19	1.633	0.86	0.734	0.57	0.274
310,000	17,782.0	1.58	3.189	1.23	1.735	0.89	0.780	0.59	0.290
320,000	18,355.6	1.63	3.383	1.27	1.840	0.92	0.827	0.61	0.308
330,000	18,929.3	1.68	3.582	1.31	1.947	0.95	0.875	0.63	0.326
340,000	19,502.9	1.73	3.787	1.35	2.058	0.97	0.924	0.65	0.344
350,000	20,076.5	1.78	3.997	1.39	2.172	1.00	0.975	0.67	0.362
360,000	20,650.1	1.83	4.213	1.43	2.288	1.03	1.027	0.69	0.382
370,000	21,223.7	1.88	4.434	1.47	2.407	1.06	1.080	0.71	0.401
380,000	21,797.3	1.93	4.660	1.51	2.530	1.09	1.134	0.73	0.421
390,000	22,370.9	1.99	4.892	1.55	2.655	1.12	1.190	0.75	0.442
400,000	22,944.6	2.04	5.130	1.59	2.783	1.15	1.247	0.76	0.463
410,000	23,518.2	2.09	5.372	1.63	2.914	1.18	1.305	0.78	0.484
420,000	24,091.8	2.14	5.620	1.67	3.047	1.20	1.365	0.80	0.506
430,000	24,665.4	2.19	5.874	1.71	3.184	1.23	1.425	0.82	0.528
440,000	25,239.0	2.24	6.133	1.75	3.323	1.26	1.487	0.84	0.551
450,000	25,812.6	2.29	6.397	1.79	3.466	1.29	1.550	0.86	0.574
460,000	26,386.2	2.34	6.666	1.83	3.611	1.32	1.615	0.88	0.598
470,000	26,959.8	2.39	6.941	1.87	3.759	1.35	1.681	0.90	0.622
480,000	27,533.5	2.44	7.221	1.91	3.910	1.38	1.747	0.92	0.647
490,000	28,107.1	2.50	7.507	1.95	4.063	1.40	1.816	0.94	0.672
500,000	28,680.7	2.55	7.798	1.99	4.220	1.43	1.885	0.96	0.697
550,000	31,548.8	2.80	9.333	2.19	5.045	1.58	2.250	1.05	0.831
600,000	34,416.8	3.06	11.001	2.38	5.940	1.72	2.647	1.15	0.976
650,000	37,284.9	–	–	2.58	6.906	1.86	3.073	1.24	1.132
700,000	40,153.0	–	–	2.78	7.942	2.01	3.530	1.34	1.299
750,000	43,021.0	–	–	2.98	9.048	2.15	4.018	1.43	1.476

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
800,000	45,889.1	–	–	–	–	2.29	4.535	1.53	1.665
850,000	48,757.2	–	–	–	–	2.44	5.083	1.62	1.864
900,000	51,625.2	–	–	–	–	2.58	5.661	1.72	2.073
950,000	54,493.3	–	–	–	–	2.72	6.269	1.81	2.294
1,000,000	57,361.4	–	–	–	–	2.87	6.907	1.91	2.525
1,050,000	60,229.4	–	–	–	–	3.01	7.574	2.01	2.766
1,100,000	63,097.5	–	–	–	–	–	–	2.10	3.019
1,150,000	65,965.6	–	–	–	–	–	–	2.20	3.281
1,200,000	68,833.7	–	–	–	–	–	–	2.29	3.555
1,250,000	71,701.7	–	–	–	–	–	–	2.39	3.838
1,300,000	74,569.8	–	–	–	–	–	–	2.48	4.133
1,350,000	77,437.9	–	–	–	–	–	–	2.58	4.437
1,400,000	80,305.9	–	–	–	–	–	–	2.67	4.753
1,450,000	83,174.0	–	–	–	–	–	–	2.77	5.078
1,500,000	86,042.1	–	–	–	–	–	–	2.87	5.415
1,550,000	88,910.1	–	–	–	–	–	–	2.96	5.761
1,600,000	91,778.2	–	–	–	–	–	–	3.06	6.118

3.4 HEATING, INLET FLOW 35 °C / RETURN FLOW 30 °C

Medium:	Water	Density:	994.9 kg/m^3
Inlet flow temperature:	35 °C	Viscosity:	0.00075865 Pa•s
Return temperature:	30 °C	Specific thermal capacity:	4,183 J/(kg•K)
Range:	5 K	Surface roughness:	0.01 mm
Average temperature:	32.5 °C		

Table 23: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 35 °C / return flow 30 °C, d12–22 mm

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
200	34.4	0.13	0.350	0.08	0.118	0.05	0.050	–	–
300	51.6	0.20	0.965	0.12	0.177	0.08	0.075	0.05	0.034
400	68.9	0.27	1.577	0.15	0.437	0.10	0.100	0.07	0.046
500	86.1	0.33	2.314	0.19	0.638	0.13	0.233	0.08	0.057
600	103.3	0.40	3.171	0.23	0.872	0.15	0.318	0.10	0.126
700	120.5	0.46	4.145	0.27	1.136	0.18	0.413	0.12	0.163
800	137.7	0.53	5.232	0.31	1.431	0.20	0.520	0.14	0.205
900	154.9	0.60	6.431	0.35	1.755	0.23	0.636	0.15	0.250
1,000	172.1	0.66	7.739	0.39	2.108	0.25	0.763	0.17	0.300
1,100	189.3	0.73	9.154	0.42	2.488	0.28	0.900	0.19	0.353
1,200	206.6	0.80	10.676	0.46	2.897	0.30	1.046	0.20	0.410

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1,300	223.8	0.86	12.302	0.50	3.333	0.33	1.203	0.22	0.471
1,400	241.0	0.93	14.032	0.54	3.795	0.35	1.368	0.24	0.536
1,500	258.2	1.00	15.866	0.58	4.285	0.38	1.543	0.25	0.604
1,600	275.4	1.06	17.801	0.62	4.800	0.40	1.727	0.27	0.675
1,700	292.6	1.13	19.838	0.66	5.342	0.43	1.920	0.29	0.750
1,800	309.8	1.20	21.975	0.69	5.910	0.45	2.123	0.31	0.829
1,900	327.0	1.26	24.213	0.73	6.504	0.48	2.334	0.32	0.910
2,000	344.3	1.33	26.550	0.77	7.123	0.50	2.554	0.34	0.996
2,500	430.3	1.66	39.714	0.96	10.596	0.63	3.786	0.42	1.472
3,000	516.4	1.99	55.306	1.16	14.686	0.75	5.231	0.51	2.028
3,500	602.4	2.32	73.293	1.35	19.381	0.88	6.884	0.59	2.664
4,000	688.5	2.66	93.650	1.54	24.671	1.01	8.741	0.68	3.375
4,500	774.6	2.99	116.360	1.73	30.549	1.13	10.799	0.76	4.163
5,000	860.6	–	–	1.93	37.011	1.26	13.056	0.85	5.024
5,500	946.7	–	–	2.12	44.049	1.38	15.508	0.93	5.958
6,000	1,032.8	–	–	2.31	51.661	1.51	18.155	1.02	6.965
6,500	1,118.8	–	–	2.51	59.845	1.63	20.994	1.10	8.044
7,000	1,204.9	–	–	2.70	68.596	1.76	24.026	1.19	9.193
7,500	1,290.9	–	–	2.89	77.913	1.89	27.247	1.27	10.412
8,000	1,377.0	–	–	3.08	87.794	2.01	30.658	1.36	11.702
8,500	1,463.1	–	–	–	–	2.14	34.257	1.44	13.061
9,000	1,549.1	–	–	–	–	2.26	38.044	1.53	14.489
9,500	1,635.2	–	–	–	–	2.39	42.018	1.61	15.986
10,000	1,721.3	–	–	–	–	2.51	46.178	1.70	17.552
10,500	1,807.3	–	–	–	–	2.64	50.524	1.78	19.185
11,000	1,893.4	–	–	–	–	2.77	55.055	1.86	20.887
11,500	1,979.4	–	–	–	–	2.89	59.771	1.95	22.656
12,000	2,065.5	–	–	–	–	3.02	64.672	2.03	24.492
12,500	2,151.6	–	–	–	–	–	–	2.12	26.396
13,000	2,237.6	–	–	–	–	–	–	2.20	28.367
13,500	2,323.7	–	–	–	–	–	–	2.29	30.404
14,000	2,409.8	–	–	–	–	–	–	2.37	32.508
14,500	2,495.8	–	–	–	–	–	–	2.46	34.679
15,000	2,581.9	–	–	–	–	–	–	2.54	36.916
15,500	2,667.9	–	–	–	–	–	–	2.63	39.220
16,000	2,754.0	–	–	–	–	–	–	2.71	41.589
16,500	2,840.1	–	–	–	–	–	–	2.80	44.025
17,000	2,926.1	–	–	–	–	–	–	2.88	46.526
17,500	3,012.2	–	–	–	–	–	–	2.97	49.094
18,000	3,098.3	–	–	–	–	–	–	3.05	51.727

2 / 2

Table 24: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, cooling, heating 35 °C / return flow 30 °C, d28–54 mm

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
600	103.3	0.06	0.023	–	–	–	–	–	–
700	120.5	0.07	0.027	–	–	–	–	–	–
800	137.7	0.08	0.056	–	–	–	–	–	–

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
900	154.9	0.09	0.069	0.05	0.013	–	–	–	–
1,000	172.1	0.10	0.082	0.06	0.026	–	–	–	–
1,100	189.3	0.11	0.097	0.07	0.030	–	–	–	–
1,200	206.6	0.12	0.112	0.07	0.035	–	–	–	–
1,300	223.8	0.13	0.129	0.08	0.040	0.05	0.016	–	–
1,400	241.0	0.14	0.146	0.08	0.046	0.06	0.018	–	–
1,500	258.2	0.15	0.164	0.09	0.051	0.06	0.020	–	–
1,600	275.4	0.16	0.184	0.10	0.057	0.06	0.023	–	–
1,700	292.6	0.17	0.204	0.10	0.063	0.07	0.025	–	–
1,800	309.8	0.18	0.225	0.11	0.070	0.07	0.028	–	–
1,900	327.0	0.19	0.247	0.11	0.077	0.08	0.030	–	–
2,000	344.3	0.20	0.270	0.12	0.084	0.08	0.033	–	–
2,500	430.3	0.24	0.398	0.15	0.123	0.10	0.048	0.06	0.014
3,000	516.4	0.29	0.546	0.18	0.169	0.12	0.066	0.07	0.019
3,500	602.4	0.34	0.716	0.21	0.221	0.14	0.086	0.08	0.024
4,000	688.5	0.39	0.905	0.24	0.279	0.16	0.109	0.09	0.031
4,500	774.6	0.44	1.114	0.27	0.342	0.18	0.134	0.11	0.037
5,000	860.6	0.49	1.342	0.30	0.412	0.20	0.160	0.12	0.045
5,500	946.7	0.54	1.588	0.33	0.487	0.22	0.190	0.13	0.053
6,000	1,032.8	0.59	1.853	0.36	0.568	0.24	0.221	0.14	0.062
6,500	1,118.8	0.64	2.137	0.39	0.654	0.26	0.254	0.15	0.071
7,000	1,204.9	0.69	2.439	0.42	0.745	0.28	0.289	0.16	0.081
7,500	1,290.9	0.73	2.758	0.45	0.842	0.30	0.327	0.18	0.091
8,000	1,377.0	0.78	3.096	0.48	0.944	0.32	0.366	0.19	0.102
8,500	1,463.1	0.83	3.451	0.51	1.051	0.34	0.407	0.20	0.113
9,000	1,549.1	0.88	3.823	0.54	1.163	0.36	0.451	0.21	0.125
9,500	1,635.2	0.93	4.213	0.57	1.281	0.38	0.496	0.22	0.138
10,000	1,721.3	0.98	4.620	0.60	1.403	0.40	0.543	0.24	0.151
10,500	1,807.3	1.03	5.044	0.63	1.531	0.42	0.592	0.25	0.164
11,000	1,893.4	1.08	5.485	0.66	1.664	0.44	0.643	0.26	0.178
11,500	1,979.4	1.13	5.944	0.69	1.801	0.46	0.696	0.27	0.193
12,000	2,065.5	1.17	6.419	0.72	1.944	0.48	0.750	0.28	0.208
12,500	2,151.6	1.22	6.911	0.75	2.091	0.50	0.807	0.29	0.223
13,000	2,237.6	1.27	7.420	0.78	2.244	0.52	0.865	0.31	0.239
13,500	2,323.7	1.32	7.945	0.81	2.401	0.54	0.925	0.32	0.256
14,000	2,409.8	1.37	8.487	0.84	2.563	0.56	0.987	0.33	0.273
14,500	2,495.8	1.42	9.046	0.87	2.730	0.58	1.051	0.34	0.290
15,000	2,581.9	1.47	9.621	0.90	2.902	0.60	1.117	0.35	0.308
15,500	2,667.9	1.52	10.213	0.93	3.078	0.62	1.184	0.36	0.326
16,000	2,754.0	1.57	10.821	0.96	3.259	0.64	1.253	0.38	0.345
16,500	2,840.1	1.62	11.445	0.99	3.445	0.66	1.324	0.39	0.365
17,000	2,926.1	1.66	12.086	1.02	3.636	0.68	1.397	0.40	0.385
17,500	3,012.2	1.71	12.743	1.05	3.831	0.70	1.472	0.41	0.405
18,000	3,098.3	1.76	13.416	1.08	4.032	0.72	1.548	0.42	0.426
18,500	3,184.3	1.81	14.106	1.11	4.236	0.74	1.626	0.44	0.447
19,000	3,270.4	1.86	14.812	1.14	4.446	0.76	1.706	0.45	0.469
19,500	3,356.4	1.91	15.533	1.17	4.660	0.78	1.787	0.46	0.491
20,000	3,442.5	1.96	16.272	1.20	4.879	0.80	1.871	0.47	0.514
20,500	3,528.6	2.01	17.026	1.23	5.102	0.82	1.956	0.48	0.537

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
21,000	3,614.6	2.06	17.796	1.25	5.330	0.84	2.042	0.49	0.560
21,500	3,700.7	2.10	18.582	1.28	5.563	0.86	2.131	0.51	0.584
22,000	3,786.8	2.15	19.384	1.31	5.800	0.89	2.221	0.52	0.609
22,500	3,872.8	2.20	20.202	1.34	6.042	0.91	2.313	0.53	0.634
23,000	3,958.9	2.25	21.036	1.37	6.289	0.93	2.406	0.54	0.659
23,500	4,044.9	2.30	21.886	1.40	6.540	0.95	2.502	0.55	0.685
24,000	4,131.0	2.35	22.752	1.43	6.795	0.97	2.599	0.56	0.711
24,500	4,217.1	2.40	23.634	1.46	7.056	0.99	2.697	0.58	0.738
25,000	4,303.1	2.45	24.532	1.49	7.320	1.01	2.798	0.59	0.765
25,500	4,389.2	2.50	25.445	1.52	7.590	1.03	2.900	0.60	0.793
26,000	4,475.3	2.55	26.375	1.55	7.863	1.05	3.003	0.61	0.821
26,500	4,561.3	2.59	27.320	1.58	8.142	1.07	3.109	0.62	0.850
27,000	4,647.4	2.64	28.281	1.61	8.425	1.09	3.216	0.64	0.879
27,500	4,733.4	2.69	29.258	1.64	8.712	1.11	3.325	0.65	0.908
28,000	4,819.5	2.74	30.250	1.67	9.004	1.13	3.435	0.66	0.938
28,500	4,905.6	2.79	31.259	1.70	9.300	1.15	3.547	0.67	0.968
29,000	4,991.6	2.84	32.283	1.73	9.601	1.17	3.661	0.68	0.999
29,500	5,077.7	2.89	33.323	1.76	9.906	1.19	3.776	0.69	1.030
30,000	5,163.8	2.94	34.378	1.79	10.216	1.21	3.893	0.71	1.062
32,500	5,594.1	–	–	1.94	11.832	1.31	4.503	0.76	1.226
35,000	6,024.4	–	–	2.09	13.559	1.41	5.154	0.82	1.401
37,500	6,454.7	–	–	2.24	15.397	1.51	5.846	0.88	1.587
40,000	6,885.0	–	–	2.39	17.344	1.61	6.578	0.94	1.784
42,500	7,315.3	–	–	2.54	19.401	1.71	7.350	1.00	1.991
45,000	7,745.6	–	–	2.69	21.568	1.81	8.163	1.06	2.208
47,500	8,176.0	–	–	2.84	23.843	1.91	9.015	1.12	2.436
50,000	8,606.3	–	–	2.99	26.227	2.01	9.907	1.18	2.675
52,500	9,036.6	–	–	–	–	2.11	10.839	1.24	2.923
55,000	9,466.9	–	–	–	–	2.21	11.810	1.29	3.182
57,500	9,897.2	–	–	–	–	2.31	12.820	1.35	3.450
60,000	10,327.5	–	–	–	–	2.41	13.869	1.41	3.729
62,500	10,757.8	–	–	–	–	2.51	14.958	1.47	4.018
65,000	11,188.1	–	–	–	–	2.62	16.086	1.53	4.317
67,500	11,618.5	–	–	–	–	2.72	17.252	1.59	4.626
70,000	12,048.8	–	–	–	–	2.82	18.457	1.65	4.945
72,500	12,479.1	–	–	–	–	2.92	19.701	1.71	5.274
75,000	12,909.4	–	–	–	–	3.02	20.984	1.76	5.613
77,500	13,339.7	–	–	–	–	–	–	1.82	5.962
80,000	13,770.0	–	–	–	–	–	–	1.88	6.321
82,500	14,200.3	–	–	–	–	–	–	1.94	6.689
85,000	14,630.6	–	–	–	–	–	–	2.00	7.067
87,500	15,061.0	–	–	–	–	–	–	2.06	7.456
90,000	15,491.3	–	–	–	–	–	–	2.12	7.853
92,500	15,921.6	–	–	–	–	–	–	2.18	8.261
95,000	16,351.9	–	–	–	–	–	–	2.23	8.678
97,500	16,782.2	–	–	–	–	–	–	2.29	9.105
100,000	17,212.5	–	–	–	–	–	–	2.35	9.542
105,000	18,073.2	–	–	–	–	–	–	2.47	10.445
110,000	18,933.8	–	–	–	–	–	–	2.59	11.386

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
115,000	19,794.4	–	–	–	–	–	–	2.71	12.366
120,000	20,655.0	–	–	–	–	–	–	2.82	13.385
125,000	21,515.7	–	–	–	–	–	–	2.94	14.441
130,000	22,376.3	–	–	–	–	–	–	3.06	15.537

Table 25: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 35 °C / return flow 30 °C, d66.7–108 mm

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
3,500	602.4	0.05	0.008	–	–	–	–	–	–
4,000	688.5	0.06	0.011	–	–	–	–	–	–
4,500	774.6	0.07	0.013	0.05	0.007	–	–	–	–
5,000	860.6	0.08	0.016	0.06	0.009	–	–	–	–
5,500	946.7	0.08	0.018	0.06	0.010	–	–	–	–
6,000	1,032.8	0.09	0.021	0.07	0.012	0.05	0.006	–	–
6,500	1,118.8	0.10	0.025	0.08	0.014	0.06	0.006	–	–
7,000	1,204.9	0.11	0.028	0.08	0.016	0.06	0.007	–	–
7,500	1,290.9	0.11	0.032	0.09	0.018	0.06	0.008	–	–
8,000	1,377.0	0.12	0.035	0.09	0.020	0.07	0.009	–	–
8,500	1,463.1	0.13	0.039	0.10	0.022	0.07	0.010	–	–
9,000	1,549.1	0.14	0.043	0.11	0.024	0.08	0.011	0.05	0.004
9,500	1,635.2	0.14	0.048	0.11	0.026	0.08	0.012	0.05	0.005
10,000	1,721.3	0.15	0.052	0.12	0.029	0.08	0.013	0.06	0.005
10,500	1,807.3	0.16	0.057	0.12	0.032	0.09	0.015	0.06	0.006
11,000	1,893.4	0.17	0.062	0.13	0.034	0.09	0.016	0.06	0.006
11,500	1,979.4	0.17	0.067	0.14	0.037	0.10	0.017	0.07	0.006
12,000	2,065.5	0.18	0.072	0.14	0.040	0.10	0.018	0.07	0.007
12,500	2,151.6	0.19	0.077	0.15	0.043	0.11	0.020	0.07	0.008
13,000	2,237.6	0.20	0.083	0.15	0.046	0.11	0.021	0.07	0.008
13,500	2,323.7	0.20	0.088	0.16	0.049	0.11	0.022	0.08	0.009
14,000	2,409.8	0.21	0.094	0.16	0.052	0.12	0.024	0.08	0.009
14,500	2,495.8	0.22	0.100	0.17	0.055	0.12	0.025	0.08	0.010
15,000	2,581.9	0.23	0.106	0.18	0.059	0.13	0.027	0.08	0.010
15,500	2,667.9	0.23	0.113	0.18	0.062	0.13	0.029	0.09	0.011
16,000	2,754.0	0.24	0.119	0.19	0.066	0.14	0.030	0.09	0.012
16,500	2,840.1	0.25	0.126	0.19	0.070	0.14	0.032	0.09	0.012
17,000	2,926.1	0.26	0.133	0.20	0.073	0.14	0.034	0.10	0.013
17,500	3,012.2	0.26	0.140	0.21	0.077	0.15	0.035	0.10	0.013
18,000	3,098.3	0.27	0.147	0.21	0.081	0.15	0.037	0.10	0.014
18,500	3,184.3	0.28	0.154	0.22	0.085	0.16	0.039	0.10	0.015
19,000	3,270.4	0.29	0.161	0.22	0.089	0.16	0.041	0.11	0.016
19,500	3,356.4	0.29	0.169	0.23	0.093	0.17	0.043	0.11	0.016
20,000	3,442.5	0.30	0.177	0.24	0.098	0.17	0.045	0.11	0.017
20,500	3,528.6	0.31	0.185	0.24	0.102	0.17	0.047	0.12	0.018
21,000	3,614.6	0.32	0.193	0.25	0.107	0.18	0.049	0.12	0.019
21,500	3,700.7	0.32	0.201	0.25	0.111	0.18	0.051	0.12	0.019
22,000	3,786.8	0.33	0.209	0.26	0.116	0.19	0.053	0.12	0.020
22,500	3,872.8	0.34	0.218	0.26	0.120	0.19	0.055	0.13	0.021

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
23,000	3,958.9	0.35	0.227	0.27	0.125	0.20	0.057	0.13	0.022
23,500	4,044.9	0.35	0.235	0.28	0.130	0.20	0.060	0.13	0.023
24,000	4,131.0	0.36	0.244	0.28	0.135	0.20	0.062	0.14	0.023
24,500	4,217.1	0.37	0.253	0.29	0.140	0.21	0.064	0.14	0.024
25,000	4,303.1	0.38	0.263	0.29	0.145	0.21	0.066	0.14	0.025
25,500	4,389.2	0.38	0.272	0.30	0.150	0.22	0.069	0.14	0.026
26,000	4,475.3	0.39	0.282	0.31	0.156	0.22	0.071	0.15	0.027
26,500	4,561.3	0.40	0.292	0.31	0.161	0.22	0.074	0.15	0.028
27,000	4,647.4	0.41	0.301	0.32	0.166	0.23	0.076	0.15	0.029
27,500	4,733.4	0.41	0.311	0.32	0.172	0.23	0.079	0.16	0.030
28,000	4,819.5	0.42	0.322	0.33	0.177	0.24	0.081	0.16	0.031
28,500	4,905.6	0.43	0.332	0.34	0.183	0.24	0.084	0.16	0.032
29,000	4,991.6	0.44	0.342	0.34	0.189	0.25	0.086	0.16	0.033
29,500	5,077.7	0.44	0.353	0.35	0.195	0.25	0.089	0.17	0.034
30,000	5,163.8	0.45	0.364	0.35	0.201	0.25	0.092	0.17	0.035
32,500	5,594.1	0.49	0.420	0.38	0.231	0.28	0.106	0.18	0.040
35,000	6,024.4	0.53	0.479	0.41	0.264	0.30	0.121	0.20	0.046
37,500	6,454.7	0.57	0.542	0.44	0.299	0.32	0.136	0.21	0.052
40,000	6,885.0	0.60	0.609	0.47	0.335	0.34	0.153	0.23	0.058
42,500	7,315.3	0.64	0.679	0.50	0.374	0.36	0.170	0.24	0.064
45,000	7,745.6	0.68	0.753	0.53	0.414	0.38	0.189	0.25	0.071
47,500	8,176.0	0.72	0.830	0.56	0.456	0.40	0.208	0.27	0.079
50,000	8,606.3	0.75	0.910	0.59	0.500	0.42	0.228	0.28	0.086
52,500	9,036.6	0.79	0.994	0.62	0.546	0.45	0.249	0.30	0.094
55,000	9,466.9	0.83	1.081	0.65	0.594	0.47	0.270	0.31	0.102
57,500	9,897.2	0.87	1.172	0.68	0.644	0.49	0.293	0.33	0.110
60,000	10,327.5	0.90	1.266	0.71	0.695	0.51	0.316	0.34	0.119
62,500	10,757.8	0.94	1.363	0.74	0.748	0.53	0.340	0.35	0.128
65,000	11,188.1	0.98	1.463	0.77	0.803	0.55	0.365	0.37	0.137
67,500	11,618.5	1.02	1.567	0.79	0.860	0.57	0.390	0.38	0.147
70,000	12,048.8	1.06	1.674	0.82	0.918	0.59	0.417	0.40	0.157
72,500	12,479.1	1.09	1.785	0.85	0.979	0.62	0.444	0.41	0.167
75,000	12,909.4	1.13	1.898	0.88	1.041	0.64	0.472	0.42	0.178
77,500	13,339.7	1.17	2.015	0.91	1.104	0.66	0.501	0.44	0.188
80,000	13,770.0	1.21	2.135	0.94	1.170	0.68	0.530	0.45	0.199
82,500	14,200.3	1.24	2.259	0.97	1.237	0.70	0.561	0.47	0.211
85,000	14,630.6	1.28	2.385	1.00	1.306	0.72	0.592	0.48	0.222
87,500	15,061.0	1.32	2.515	1.03	1.377	0.74	0.624	0.50	0.234
90,000	15,491.3	1.36	2.648	1.06	1.449	0.76	0.656	0.51	0.246
92,500	15,921.6	1.39	2.784	1.09	1.523	0.79	0.690	0.52	0.259
95,000	16,351.9	1.43	2.923	1.12	1.599	0.81	0.724	0.54	0.272
97,500	16,782.2	1.47	3.065	1.15	1.677	0.83	0.759	0.55	0.285
100,000	17,212.5	1.51	3.211	1.18	1.756	0.85	0.794	0.57	0.298
105,000	18,073.2	1.58	3.512	1.24	1.920	0.89	0.868	0.59	0.325
110,000	18,933.8	1.66	3.825	1.29	2.090	0.93	0.945	0.62	0.354
115,000	19,794.4	1.73	4.151	1.35	2.267	0.98	1.024	0.65	0.383
120,000	20,655.0	1.81	4.489	1.41	2.451	1.02	1.107	0.68	0.414
125,000	21,515.7	1.89	4.839	1.47	2.641	1.06	1.192	0.71	0.446
130,000	22,376.3	1.96	5.202	1.53	2.838	1.10	1.280	0.74	0.479

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
135,000	23,236.9	2.04	5.578	1.59	3.042	1.15	1.372	0.76	0.513
140,000	24,097.5	2.11	5.965	1.65	3.252	1.19	1.466	0.79	0.547
145,000	24,958.2	2.19	6.365	1.71	3.469	1.23	1.563	0.82	0.584
150,000	25,818.8	2.26	6.778	1.77	3.693	1.27	1.663	0.85	0.621
155,000	26,679.4	2.34	7.202	1.82	3.923	1.32	1.766	0.88	0.659
160,000	27,540.0	2.41	7.639	1.88	4.159	1.36	1.872	0.91	0.698
165,000	28,400.7	2.49	8.088	1.94	4.402	1.40	1.980	0.93	0.738
170,000	29,261.3	2.56	8.549	2.00	4.652	1.44	2.092	0.96	0.779
175,000	30,121.9	2.64	9.022	2.06	4.907	1.49	2.206	0.99	0.822
180,000	30,982.5	2.71	9.507	2.12	5.170	1.53	2.323	1.02	0.865
185,000	31,843.2	2.79	10.005	2.18	5.439	1.57	2.443	1.05	0.909
190,000	32,703.8	2.87	10.514	2.24	5.714	1.61	2.566	1.07	0.955
195,000	33,564.4	2.94	11.036	2.30	5.996	1.66	2.692	1.10	1.001
200,000	34,425.1	3.02	11.569	2.35	6.284	1.70	2.820	1.13	1.048
205,000	35,285.7	3.09	12.115	2.41	6.579	1.74	2.951	1.16	1.097
210,000	36,146.3	–	–	2.47	6.880	1.78	3.085	1.19	1.146
215,000	37,006.9	–	–	2.53	7.187	1.83	3.222	1.22	1.197
220,000	37,867.6	–	–	2.59	7.501	1.87	3.362	1.24	1.248
225,000	38,728.2	–	–	2.65	7.821	1.91	3.504	1.27	1.301
230,000	39,588.8	–	–	2.71	8.148	1.95	3.650	1.30	1.354
235,000	40,449.4	–	–	2.77	8.481	1.99	3.798	1.33	1.408
240,000	41,310.1	–	–	2.83	8.820	2.04	3.948	1.36	1.464
245,000	42,170.7	–	–	2.88	9.165	2.08	4.102	1.39	1.520
250,000	43,031.3	–	–	2.94	9.517	2.12	4.258	1.41	1.578
255,000	43,891.9	–	–	3.00	9.876	2.16	4.417	1.44	1.636
260,000	44,752.6	–	–	3.06	10.240	2.21	4.579	1.47	1.696
265,000	45,613.2	–	–	–	–	2.25	4.744	1.50	1.756
270,000	46,473.8	–	–	–	–	2.29	4.911	1.53	1.818
275,000	47,334.4	–	–	–	–	2.33	5.081	1.56	1.880
280,000	48,195.1	–	–	–	–	2.38	5.254	1.58	1.943
285,000	49,055.7	–	–	–	–	2.42	5.430	1.61	2.008
290,000	49,916.3	–	–	–	–	2.46	5.608	1.64	2.073
295,000	50,777.0	–	–	–	–	2.50	5.789	1.67	2.140
300,000	51,637.6	–	–	–	–	2.55	5.973	1.70	2.207
310,000	53,358.8	–	–	–	–	2.63	6.349	1.75	2.345
320,000	55,080.1	–	–	–	–	2.72	6.735	1.81	2.486
330,000	56,801.3	–	–	–	–	2.80	7.133	1.87	2.632
340,000	58,522.6	–	–	–	–	2.89	7.541	1.92	2.781
350,000	60,243.8	–	–	–	–	2.97	7.961	1.98	2.934
360,000	61,965.1	–	–	–	–	3.06	8.391	2.04	3.091
370,000	63,686.3	–	–	–	–	–	–	2.09	3.252
380,000	65,407.6	–	–	–	–	–	–	2.15	3.417
390,000	67,128.9	–	–	–	–	–	–	2.21	3.586
400,000	68,850.1	–	–	–	–	–	–	2.26	3.758
410,000	70,571.4	–	–	–	–	–	–	2.32	3.935
420,000	72,292.6	–	–	–	–	–	–	2.38	4.115
430,000	74,013.9	–	–	–	–	–	–	2.43	4.299
440,000	75,735.1	–	–	–	–	–	–	2.49	4.487
450,000	77,456.4	–	–	–	–	–	–	2.55	4.678

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
460,000	79,177.6	–	–	–	–	–	–	2.60	4.874
470,000	80,898.9	–	–	–	–	–	–	2.66	5.073
480,000	82,620.1	–	–	–	–	–	–	2.72	5.276
490,000	84,341.4	–	–	–	–	–	–	2.77	5.483
500,000	86,062.6	–	–	–	–	–	–	2.83	5.694

3.5 HEATING, INLET FLOW 45 °C / RETURN FLOW 35 °C

Medium:	Water	Density:	992.2 kg/m^3
Inlet flow temperature:	45 °C	Viscosity:	0.0006533 Pa•s
Return temperature:	35 °C	Specific thermal capacity:	4,182 J/(kg•K)
Range:	10 K	Surface roughness:	0.01 mm
Average temperature:	30 °C		

Table 26: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 45 °C / return flow 35 °C, d12–22 mm

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
200	17.2	0.07	0.151	–	–	–	–	–	–
300	25.8	0.10	0.227	0.06	0.076	–	–	–	–
400	34.4	0.13	0.302	0.08	0.102	0.05	0.043	–	–
500	43.0	0.17	0.679	0.10	0.127	0.06	0.054	–	–
600	51.6	0.20	0.926	0.12	0.153	0.08	0.065	0.05	0.030
700	60.3	0.23	1.205	0.14	0.334	0.09	0.076	0.06	0.034
800	68.9	0.27	1.516	0.15	0.419	0.10	0.153	0.07	0.039
900	77.5	0.30	1.857	0.17	0.512	0.11	0.187	0.08	0.044
1,000	86.1	0.33	2.228	0.19	0.613	0.13	0.224	0.08	0.088
1,100	94.7	0.37	2.629	0.21	0.722	0.14	0.263	0.09	0.104
1,200	103.3	0.40	3.058	0.23	0.839	0.15	0.305	0.10	0.120
1,300	111.9	0.43	3.516	0.25	0.963	0.16	0.350	0.11	0.138
1,400	120.5	0.47	4.002	0.27	1.094	0.18	0.397	0.12	0.157
1,500	129.1	0.50	4.516	0.29	1.233	0.19	0.447	0.13	0.176
1,600	137.7	0.53	5.057	0.31	1.379	0.20	0.500	0.14	0.197
1,700	146.3	0.57	5.626	0.33	1.533	0.21	0.555	0.14	0.218
1,800	154.9	0.60	6.222	0.35	1.693	0.23	0.613	0.15	0.241
1,900	163.6	0.63	6.844	0.37	1.860	0.24	0.673	0.16	0.264
2,000	172.2	0.67	7.493	0.39	2.035	0.25	0.735	0.17	0.288
2,500	215.2	0.83	11.132	0.48	3.008	0.32	1.084	0.21	0.424
3,000	258.2	1.00	15.413	0.58	4.149	0.38	1.491	0.25	0.582
3,500	301.3	1.17	20.325	0.68	5.451	0.44	1.954	0.30	0.762
4,000	344.3	1.33	25.857	0.77	6.912	0.50	2.472	0.34	0.962

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
4,500	387.4	1.50	32.002	0.87	8.529	0.57	3.045	0.38	1.183
5,000	430.4	1.66	38.753	0.97	10.300	0.63	3.671	0.42	1.424
5,500	473.5	1.83	46.106	1.06	12.223	0.69	4.349	0.47	1.685
6,000	516.5	2.00	54.058	1.16	14.296	0.76	5.078	0.51	1.965
6,500	559.5	2.16	62.604	1.26	16.520	0.82	5.859	0.55	2.265
7,000	602.6	2.33	71.741	1.35	18.891	0.88	6.691	0.59	2.583
7,500	645.6	2.50	81.469	1.45	21.409	0.95	7.573	0.64	2.921
8,000	688.7	2.66	91.783	1.55	24.074	1.01	8.505	0.68	3.277
8,500	731.7	2.83	102.683	1.64	26.885	1.07	9.486	0.72	3.651
9,000	774.7	3.00	114.167	1.74	29.841	1.13	10.517	0.76	4.044
9,500	817.8	–	–	1.84	32.941	1.20	11.596	0.81	4.455
10,000	860.8	–	–	1.93	36.185	1.26	12.725	0.85	4.885
10,500	903.9	–	–	2.03	39.572	1.32	13.901	0.89	5.332
11,000	946.9	–	–	2.13	43.103	1.39	15.127	0.93	5.797
11,500	990.0	–	–	2.22	46.776	1.45	16.400	0.98	6.280
12,000	1,033.0	–	–	2.32	50.591	1.51	17.721	1.02	6.781
12,500	1,076.0	–	–	2.42	54.548	1.58	19.090	1.06	7.299
13,000	1,119.1	–	–	2.51	58.646	1.64	20.506	1.10	7.836
13,500	1,162.1	–	–	2.61	62.886	1.70	21.970	1.15	8.389
14,000	1,205.2	–	–	2.71	67.267	1.77	23.481	1.19	8.960
14,500	1,248.2	–	–	2.80	71.789	1.83	25.040	1.23	9.549
15,000	1,291.2	–	–	2.90	76.452	1.89	26.645	1.27	10.154
15,500	1,334.3	–	–	3.00	81.254	1.95	28.298	1.32	10.778
16,000	1,377.3	–	–	3.09	86.198	2.02	29.997	1.36	11.418
16,500	1,420.4	–	–	–	–	2.08	31.744	1.40	12.075
17,000	1,463.4	–	–	–	–	2.14	33.536	1.44	12.750
17,500	1,506.5	–	–	–	–	2.21	35.376	1.49	13.442
18,000	1,549.5	–	–	–	–	2.27	37.262	1.53	14.151
18,500	1,592.5	–	–	–	–	2.33	39.195	1.57	14.877
19,000	1,635.6	–	–	–	–	2.40	41.174	1.61	15.619
19,500	1,678.6	–	–	–	–	2.46	43.199	1.66	16.379
20,000	1,721.7	–	–	–	–	2.52	45.271	1.70	17.156
20,500	1,764.7	–	–	–	–	2.58	47.389	1.74	17.950
21,000	1,807.7	–	–	–	–	2.65	49.553	1.78	18.760
21,500	1,850.8	–	–	–	–	2.71	51.763	1.83	19.587
22,000	1,893.8	–	–	–	–	2.77	54.019	1.87	20.431
22,500	1,936.9	–	–	–	–	2.84	56.321	1.91	21.292
23,000	1,979.9	–	–	–	–	2.90	58.670	1.95	22.170
23,500	2,023.0	–	–	–	–	2.96	61.063	2.00	23.065
24,000	2,066.0	–	–	–	–	3.03	63.503	2.04	23.976
24,500	2,109.0	–	–	–	–	3.09	65.989	2.08	24.904
25,000	2,152.1	–	–	–	–	–	–	2.12	25.848
25,500	2,195.1	–	–	–	–	–	–	2.17	26.809
26,000	2,238.2	–	–	–	–	–	–	2.21	27.787
26,500	2,281.2	–	–	–	–	–	–	2.25	28.781
27,000	2,324.2	–	–	–	–	–	–	2.29	29.792
27,500	2,367.3	–	–	–	–	–	–	2.34	30.820
28,000	2,410.3	–	–	–	–	–	–	2.38	31.864
28,500	2,453.4	–	–	–	–	–	–	2.42	32.925

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
29,000	2,496.4	–	–	–	–	–	–	2.46	34.002
29,500	2,539.5	–	–	–	–	–	–	2.51	35.096
30,000	2,582.5	–	–	–	–	–	–	2.55	36.206
32,500	2,797.7	–	–	–	–	–	–	2.76	42.004
35,000	3,012.9	–	–	–	–	–	–	2.97	48.213

Table 27: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 45 °C / return flow 35 °C, d28–54 mm

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1,100	94.7	0.05	0.018	–	–	–	–	–	–
1,200	103.3	0.06	0.020	–	–	–	–	–	–
1,300	111.9	0.06	0.038	–	–	–	–	–	–
1,400	120.5	0.07	0.043	–	–	–	–	–	–
1,500	129.1	0.07	0.048	–	–	–	–	–	–
1,600	137.7	0.08	0.054	–	–	–	–	–	–
1,700	146.3	0.08	0.060	0.05	0.019	–	–	–	–
1,800	154.9	0.09	0.066	0.05	0.021	–	–	–	–
1,900	163.6	0.09	0.072	0.06	0.023	–	–	–	–
2,000	172.2	0.10	0.079	0.06	0.025	–	–	–	–
2,500	215.2	0.12	0.116	0.07	0.036	0.05	0.014	–	–
3,000	258.2	0.15	0.158	0.09	0.049	0.06	0.019	–	–
3,500	301.3	0.17	0.206	0.10	0.064	0.07	0.025	–	–
4,000	344.3	0.20	0.260	0.12	0.081	0.08	0.032	–	–
4,500	387.4	0.22	0.319	0.13	0.099	0.09	0.039	0.05	0.011
5,000	430.4	0.25	0.384	0.15	0.119	0.10	0.046	0.06	0.013
5,500	473.5	0.27	0.453	0.16	0.140	0.11	0.055	0.06	0.015
6,000	516.5	0.29	0.528	0.18	0.163	0.12	0.064	0.07	0.018
6,500	559.5	0.32	0.608	0.19	0.187	0.13	0.073	0.08	0.021
7,000	602.6	0.34	0.692	0.21	0.213	0.14	0.083	0.08	0.023
7,500	645.6	0.37	0.782	0.22	0.240	0.15	0.094	0.09	0.026
8,000	688.7	0.39	0.876	0.24	0.269	0.16	0.105	0.09	0.029
8,500	731.7	0.42	0.975	0.25	0.299	0.17	0.117	0.10	0.033
9,000	774.7	0.44	1.079	0.27	0.331	0.18	0.129	0.11	0.036
9,500	817.8	0.47	1.187	0.28	0.364	0.19	0.142	0.11	0.040
10,000	860.8	0.49	1.301	0.30	0.398	0.20	0.155	0.12	0.043
10,500	903.9	0.52	1.418	0.31	0.434	0.21	0.169	0.12	0.047
11,000	946.9	0.54	1.541	0.33	0.471	0.22	0.183	0.13	0.051
11,500	990.0	0.56	1.668	0.34	0.510	0.23	0.198	0.14	0.055
12,000	1,033.0	0.59	1.799	0.36	0.550	0.24	0.213	0.14	0.059
12,500	1,076.0	0.61	1.935	0.37	0.591	0.25	0.229	0.15	0.064
13,000	1,119.1	0.64	2.075	0.39	0.633	0.26	0.246	0.15	0.068
13,500	1,162.1	0.66	2.220	0.40	0.677	0.27	0.263	0.16	0.073
14,000	1,205.2	0.69	2.369	0.42	0.722	0.28	0.280	0.17	0.078
14,500	1,248.2	0.71	2.523	0.43	0.769	0.29	0.298	0.17	0.083
15,000	1,291.2	0.74	2.681	0.45	0.816	0.30	0.316	0.18	0.088
15,500	1,334.3	0.76	2.844	0.46	0.865	0.31	0.335	0.18	0.093
16,000	1,377.3	0.79	3.010	0.48	0.916	0.32	0.354	0.19	0.098

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
16,500	1,420.4	0.81	3.182	0.49	0.967	0.33	0.374	0.19	0.104
17,000	1,463.4	0.83	3.357	0.51	1.020	0.34	0.395	0.20	0.109
17,500	1,506.5	0.86	3.537	0.52	1.074	0.35	0.415	0.21	0.115
18,000	1,549.5	0.88	3.721	0.54	1.129	0.36	0.437	0.21	0.121
18,500	1,592.5	0.91	3.909	0.55	1.186	0.37	0.458	0.22	0.127
19,000	1,635.6	0.93	4.102	0.57	1.244	0.38	0.481	0.22	0.133
19,500	1,678.6	0.96	4.299	0.58	1.303	0.39	0.503	0.23	0.139
20,000	1,721.7	0.98	4.500	0.60	1.363	0.40	0.526	0.24	0.146
20,500	1,764.7	1.01	4.705	0.61	1.425	0.41	0.550	0.24	0.152
21,000	1,807.7	1.03	4.915	0.63	1.488	0.42	0.574	0.25	0.159
21,500	1,850.8	1.06	5.129	0.64	1.552	0.43	0.599	0.25	0.166
22,000	1,893.8	1.08	5.346	0.66	1.617	0.44	0.624	0.26	0.172
22,500	1,936.9	1.10	5.569	0.67	1.684	0.45	0.649	0.27	0.179
23,000	1,979.9	1.13	5.795	0.69	1.751	0.46	0.675	0.27	0.186
23,500	2,023.0	1.15	6.026	0.70	1.820	0.47	0.702	0.28	0.194
24,000	2,066.0	1.18	6.260	0.72	1.891	0.48	0.728	0.28	0.201
24,500	2,109.0	1.20	6.499	0.73	1.962	0.49	0.756	0.29	0.209
25,000	2,152.1	1.23	6.742	0.75	2.035	0.50	0.783	0.29	0.216
25,500	2,195.1	1.25	6.989	0.76	2.108	0.51	0.812	0.30	0.224
26,000	2,238.2	1.28	7.241	0.78	2.183	0.52	0.840	0.31	0.232
26,500	2,281.2	1.30	7.496	0.79	2.260	0.53	0.869	0.31	0.240
27,000	2,324.2	1.33	7.756	0.81	2.337	0.54	0.899	0.32	0.248
27,500	2,367.3	1.35	8.019	0.82	2.415	0.55	0.929	0.32	0.256
28,000	2,410.3	1.37	8.287	0.84	2.495	0.56	0.959	0.33	0.264
28,500	2,453.4	1.40	8.559	0.85	2.576	0.57	0.990	0.34	0.273
29,000	2,496.4	1.42	8.835	0.87	2.658	0.59	1.022	0.34	0.281
29,500	2,539.5	1.45	9.115	0.88	2.742	0.60	1.053	0.35	0.290
30,000	2,582.5	1.47	9.399	0.90	2.826	0.61	1.086	0.35	0.299
32,500	2,797.7	1.60	10.881	0.97	3.266	0.66	1.253	0.38	0.344
35,000	3,012.9	1.72	12.464	1.05	3.736	0.71	1.432	0.41	0.393
37,500	3,228.1	1.84	14.147	1.12	4.234	0.76	1.622	0.44	0.445
40,000	3,443.3	1.96	15.931	1.20	4.762	0.81	1.822	0.47	0.499
42,500	3,658.5	2.09	17.815	1.27	5.318	0.86	2.033	0.50	0.556
45,000	3,873.7	2.21	19.799	1.35	5.902	0.91	2.254	0.53	0.616
47,500	4,089.0	2.33	21.881	1.42	6.515	0.96	2.486	0.56	0.679
50,000	4,304.2	2.45	24.062	1.50	7.156	1.01	2.728	0.59	0.744
52,500	4,519.4	2.58	26.342	1.57	7.825	1.06	2.981	0.62	0.813
55,000	4,734.6	2.70	28.721	1.65	8.522	1.11	3.244	0.65	0.884
57,500	4,949.8	2.82	31.197	1.72	9.247	1.16	3.518	0.68	0.957
60,000	5,165.0	2.95	33.771	1.80	10.000	1.21	3.802	0.71	1.034
62,500	5,380.2	3.07	36.444	1.87	10.781	1.26	4.095	0.74	1.113
65,000	5,595.4	–	–	1.95	11.589	1.31	4.400	0.77	1.195
67,500	5,810.6	–	–	2.02	12.425	1.36	4.714	0.80	1.279
70,000	6,025.8	–	–	2.10	13.288	1.41	5.038	0.83	1.366
72,500	6,241.0	–	–	2.17	14.179	1.46	5.373	0.86	1.456
75,000	6,456.2	–	–	2.25	15.097	1.51	5.717	0.88	1.548
77,500	6,671.4	–	–	2.32	16.043	1.56	6.072	0.91	1.643
80,000	6,886.7	–	–	2.40	17.016	1.61	6.436	0.94	1.740
82,500	7,101.9	–	–	2.47	18.016	1.66	6.811	0.97	1.840

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
85,000	7,317.1	–	–	2.55	19.043	1.71	7.195	1.00	1.943
87,500	7,532.3	–	–	2.62	20.098	1.77	7.589	1.03	2.048
90,000	7,747.5	–	–	2.70	21.179	1.82	7.994	1.06	2.156
92,500	7,962.7	–	–	2.77	22.288	1.87	8.408	1.09	2.266
95,000	8,177.9	–	–	2.85	23.424	1.92	8.832	1.12	2.379
97,500	8,393.1	–	–	2.92	24.586	1.97	9.266	1.15	2.495
100,000	8,608.3	–	–	3.00	25.776	2.02	9.710	1.18	2.613
105,000	9,038.7	–	–	–	–	2.12	10.626	1.24	2.856
110,000	9,469.2	–	–	–	–	2.22	11.582	1.30	3.110
115,000	9,899.6	–	–	–	–	2.32	12.578	1.36	3.374
120,000	10,330.0	–	–	–	–	2.42	13.612	1.42	3.647
125,000	10,760.4	–	–	–	–	2.52	14.685	1.47	3.931
130,000	11,190.8	–	–	–	–	2.62	15.796	1.53	4.225
135,000	11,621.2	–	–	–	–	2.72	16.947	1.59	4.529
140,000	12,051.6	–	–	–	–	2.82	18.136	1.65	4.842
145,000	12,482.1	–	–	–	–	2.93	19.364	1.71	5.165
150,000	12,912.5	–	–	–	–	3.03	20.630	1.77	5.499
155,000	13,342.9	–	–	–	–	–	–	1.83	5.842
160,000	13,773.3	–	–	–	–	–	–	1.89	6.194
165,000	14,203.7	–	–	–	–	–	–	1.95	6.557
170,000	14,634.1	–	–	–	–	–	–	2.01	6.929
175,000	15,064.6	–	–	–	–	–	–	2.06	7.311
180,000	15,495.0	–	–	–	–	–	–	2.12	7.703
185,000	15,925.4	–	–	–	–	–	–	2.18	8.104
190,000	16,355.8	–	–	–	–	–	–	2.24	8.516
195,000	16,786.2	–	–	–	–	–	–	2.30	8.936
200,000	17,216.6	–	–	–	–	–	–	2.36	9.367
205,000	17,647.1	–	–	–	–	–	–	2.42	9.807
210,000	18,077.5	–	–	–	–	–	–	2.48	10.257
215,000	18,507.9	–	–	–	–	–	–	2.54	10.716
220,000	18,938.3	–	–	–	–	–	–	2.60	11.185
225,000	19,368.7	–	–	–	–	–	–	2.65	11.664
230,000	19,799.1	–	–	–	–	–	–	2.71	12.152
235,000	20,229.6	–	–	–	–	–	–	2.77	12.649
240,000	20,660.0	–	–	–	–	–	–	2.83	13.157
245,000	21,090.4	–	–	–	–	–	–	2.89	13.674
250,000	21,520.8	–	–	–	–	–	–	2.95	14.200
255,000	21,951.2	–	–	–	–	–	–	3.01	14.736
260,000	22,381.6	–	–	–	–	–	–	3.07	15.281

Table 28: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 45 °C / eturn flow 35 °C, d66.7–108 mm

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
7,000	602.6	0.05	0.008	–	–	–	–	–	–
7,500	645.6	0.06	0.009	–	–	–	–	–	–
8,000	688.7	0.06	0.010	–	–	–	–	–	–
8,500	731.7	0.06	0.011	0.05	0.006	–	–	–	–

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
9,000	774.7	0.07	0.013	0.05	0.007	–	–	–	–
9,500	817.8	0.07	0.014	0.06	0.008	–	–	–	–
10,000	860.8	0.08	0.015	0.06	0.008	–	–	–	–
10,500	903.9	0.08	0.016	0.06	0.009	–	–	–	–
11,000	946.9	0.08	0.018	0.06	0.010	–	–	–	–
11,500	990.0	0.09	0.019	0.07	0.011	–	–	–	–
12,000	1,033.0	0.09	0.021	0.07	0.011	0.05	0.005	–	–
12,500	1,076.0	0.09	0.022	0.07	0.012	0.05	0.006	–	–
13,000	1,119.1	0.10	0.024	0.08	0.013	0.06	0.006	–	–
13,500	1,162.1	0.10	0.025	0.08	0.014	0.06	0.007	–	–
14,000	1,205.2	0.11	0.027	0.08	0.015	0.06	0.007	–	–
14,500	1,248.2	0.11	0.029	0.09	0.016	0.06	0.007	–	–
15,000	1,291.2	0.11	0.030	0.09	0.017	0.06	0.008	–	–
15,500	1,334.3	0.12	0.032	0.09	0.018	0.07	0.008	–	–
16,000	1,377.3	0.12	0.034	0.09	0.019	0.07	0.009	–	–
16,500	1,420.4	0.12	0.036	0.10	0.020	0.07	0.009	–	–
17,000	1,463.4	0.13	0.038	0.10	0.021	0.07	0.010	–	–
17,500	1,506.5	0.13	0.040	0.10	0.022	0.07	0.010	–	–
18,000	1,549.5	0.14	0.042	0.11	0.023	0.08	0.011	0.05	0.004
18,500	1,592.5	0.14	0.044	0.11	0.024	0.08	0.011	0.05	0.004
19,000	1,635.6	0.14	0.046	0.11	0.026	0.08	0.012	0.05	0.004
19,500	1,678.6	0.15	0.048	0.12	0.027	0.08	0.012	0.06	0.005
20,000	1,721.7	0.15	0.050	0.12	0.028	0.09	0.013	0.06	0.005
20,500	1,764.7	0.16	0.053	0.12	0.029	0.09	0.013	0.06	0.005
21,000	1,807.7	0.16	0.055	0.12	0.030	0.09	0.014	0.06	0.005
21,500	1,850.8	0.16	0.057	0.13	0.032	0.09	0.015	0.06	0.006
22,000	1,893.8	0.17	0.060	0.13	0.033	0.09	0.015	0.06	0.006
22,500	1,936.9	0.17	0.062	0.13	0.034	0.10	0.016	0.06	0.006
23,000	1,979.9	0.17	0.064	0.14	0.036	0.10	0.016	0.07	0.006
23,500	2,023.0	0.18	0.067	0.14	0.037	0.10	0.017	0.07	0.006
24,000	2,066.0	0.18	0.069	0.14	0.038	0.10	0.018	0.07	0.007
24,500	2,109.0	0.19	0.072	0.14	0.040	0.10	0.018	0.07	0.007
25,000	2,152.1	0.19	0.075	0.15	0.041	0.11	0.019	0.07	0.007
25,500	2,195.1	0.19	0.077	0.15	0.043	0.11	0.020	0.07	0.007
26,000	2,238.2	0.20	0.080	0.15	0.044	0.11	0.020	0.07	0.008
26,500	2,281.2	0.20	0.083	0.16	0.046	0.11	0.021	0.08	0.008
27,000	2,324.2	0.20	0.085	0.16	0.047	0.11	0.022	0.08	0.008
27,500	2,367.3	0.21	0.088	0.16	0.049	0.12	0.022	0.08	0.009
28,000	2,410.3	0.21	0.091	0.17	0.050	0.12	0.023	0.08	0.009
28,500	2,453.4	0.22	0.094	0.17	0.052	0.12	0.024	0.08	0.009
29,000	2,496.4	0.22	0.097	0.17	0.054	0.12	0.025	0.08	0.009
29,500	2,539.5	0.22	0.100	0.17	0.055	0.13	0.025	0.08	0.010
30,000	2,582.5	0.23	0.103	0.18	0.057	0.13	0.026	0.09	0.010
32,500	2,797.7	0.25	0.119	0.19	0.066	0.14	0.030	0.09	0.011
35,000	3,012.9	0.26	0.135	0.21	0.075	0.15	0.034	0.10	0.013
37,500	3,228.1	0.28	0.153	0.22	0.085	0.16	0.039	0.11	0.015
40,000	3,443.3	0.30	0.171	0.24	0.095	0.17	0.043	0.11	0.016
42,500	3,658.5	0.32	0.191	0.25	0.105	0.18	0.048	0.12	0.018
45,000	3,873.7	0.34	0.211	0.27	0.117	0.19	0.053	0.13	0.020

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
47,500	4,089.0	0.36	0.233	0.28	0.129	0.20	0.059	0.13	0.022
50,000	4,304.2	0.38	0.255	0.30	0.141	0.21	0.064	0.14	0.024
52,500	4,519.4	0.40	0.278	0.31	0.154	0.22	0.070	0.15	0.027
55,000	4,734.6	0.42	0.303	0.32	0.167	0.23	0.076	0.16	0.029
57,500	4,949.8	0.43	0.328	0.34	0.181	0.24	0.082	0.16	0.031
60,000	5,165.0	0.45	0.354	0.35	0.195	0.26	0.089	0.17	0.034
62,500	5,380.2	0.47	0.380	0.37	0.210	0.27	0.096	0.18	0.036
65,000	5,595.4	0.49	0.408	0.38	0.225	0.28	0.103	0.18	0.039
67,500	5,810.6	0.51	0.437	0.40	0.241	0.29	0.110	0.19	0.042
70,000	6,025.8	0.53	0.466	0.41	0.257	0.30	0.117	0.20	0.044
72,500	6,241.0	0.55	0.497	0.43	0.273	0.31	0.125	0.21	0.047
75,000	6,456.2	0.57	0.528	0.44	0.290	0.32	0.132	0.21	0.050
77,500	6,671.4	0.59	0.560	0.46	0.308	0.33	0.140	0.22	0.053
80,000	6,886.7	0.60	0.593	0.47	0.326	0.34	0.149	0.23	0.056
82,500	7,101.9	0.62	0.627	0.49	0.345	0.35	0.157	0.23	0.059
85,000	7,317.1	0.64	0.661	0.50	0.364	0.36	0.166	0.24	0.063
87,500	7,532.3	0.66	0.697	0.52	0.383	0.37	0.174	0.25	0.066
90,000	7,747.5	0.68	0.733	0.53	0.403	0.38	0.183	0.26	0.069
92,500	7,962.7	0.70	0.770	0.55	0.423	0.39	0.193	0.26	0.073
95,000	8,177.9	0.72	0.809	0.56	0.444	0.40	0.202	0.27	0.076
97,500	8,393.1	0.74	0.847	0.58	0.466	0.42	0.212	0.28	0.080
100,000	8,608.3	0.76	0.887	0.59	0.487	0.43	0.222	0.28	0.084
105,000	9,038.7	0.79	0.969	0.62	0.532	0.45	0.242	0.30	0.091
110,000	9,469.2	0.83	1.054	0.65	0.579	0.47	0.263	0.31	0.099
115,000	9,899.6	0.87	1.143	0.68	0.627	0.49	0.285	0.33	0.107
120,000	10,330.0	0.91	1.235	0.71	0.677	0.51	0.308	0.34	0.116
125,000	10,760.4	0.95	1.330	0.74	0.729	0.53	0.331	0.35	0.125
130,000	11,190.8	0.98	1.429	0.77	0.783	0.55	0.355	0.37	0.134
135,000	11,621.2	1.02	1.530	0.80	0.839	0.57	0.380	0.38	0.143
140,000	12,051.6	1.06	1.635	0.83	0.896	0.60	0.406	0.40	0.153
145,000	12,482.1	1.10	1.743	0.86	0.955	0.62	0.433	0.41	0.163
150,000	12,912.5	1.13	1.855	0.89	1.016	0.64	0.460	0.43	0.173
155,000	13,342.9	1.17	1.969	0.91	1.078	0.66	0.488	0.44	0.183
160,000	13,773.3	1.21	2.087	0.94	1.142	0.68	0.517	0.45	0.194
165,000	14,203.7	1.25	2.208	0.97	1.208	0.70	0.547	0.47	0.205
170,000	14,634.1	1.29	2.332	1.00	1.276	0.72	0.577	0.48	0.216
175,000	15,064.6	1.32	2.460	1.03	1.345	0.74	0.608	0.50	0.228
180,000	15,495.0	1.36	2.590	1.06	1.416	0.77	0.640	0.51	0.240
185,000	15,925.4	1.40	2.724	1.09	1.489	0.79	0.673	0.52	0.252
190,000	16,355.8	1.44	2.860	1.12	1.563	0.81	0.706	0.54	0.265
195,000	16,786.2	1.47	3.000	1.15	1.639	0.83	0.741	0.55	0.277
200,000	17,216.6	1.51	3.143	1.18	1.717	0.85	0.775	0.57	0.290
205,000	17,647.1	1.55	3.290	1.21	1.796	0.87	0.811	0.58	0.304
210,000	18,077.5	1.59	3.439	1.24	1.877	0.89	0.847	0.60	0.317
215,000	18,507.9	1.63	3.591	1.27	1.960	0.92	0.885	0.61	0.331
220,000	18,938.3	1.66	3.747	1.30	2.044	0.94	0.922	0.62	0.345
225,000	19,368.7	1.70	3.905	1.33	2.131	0.96	0.961	0.64	0.359
230,000	19,799.1	1.74	4.067	1.36	2.218	0.98	1.000	0.65	0.374
235,000	20,229.6	1.78	4.232	1.39	2.308	1.00	1.040	0.67	0.389

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
240,000	20,660.0	1.81	4.400	1.42	2.399	1.02	1.081	0.68	0.404
245,000	21,090.4	1.85	4.571	1.45	2.491	1.04	1.123	0.70	0.419
250,000	21,520.8	1.89	4.745	1.48	2.586	1.06	1.165	0.71	0.435
255,000	21,951.2	1.93	4.922	1.51	2.682	1.09	1.208	0.72	0.451
260,000	22,381.6	1.97	5.102	1.53	2.779	1.11	1.252	0.74	0.467
265,000	22,812.1	2.00	5.285	1.56	2.879	1.13	1.296	0.75	0.483
270,000	23,242.5	2.04	5.471	1.59	2.980	1.15	1.341	0.77	0.500
275,000	23,672.9	2.08	5.661	1.62	3.082	1.17	1.387	0.78	0.517
280,000	24,103.3	2.12	5.853	1.65	3.186	1.19	1.434	0.79	0.534
285,000	24,533.7	2.16	6.049	1.68	3.292	1.21	1.481	0.81	0.552
290,000	24,964.1	2.19	6.247	1.71	3.400	1.23	1.529	0.82	0.570
295,000	25,394.5	2.23	6.449	1.74	3.509	1.26	1.578	0.84	0.588
300,000	25,825.0	2.27	6.653	1.77	3.619	1.28	1.627	0.85	0.606
310,000	26,685.8	2.34	7.072	1.83	3.846	1.32	1.728	0.88	0.643
320,000	27,546.6	2.42	7.502	1.89	4.078	1.36	1.832	0.91	0.682
330,000	28,407.5	2.50	7.945	1.95	4.317	1.40	1.939	0.94	0.721
340,000	29,268.3	2.57	8.400	2.01	4.563	1.45	2.048	0.96	0.761
350,000	30,129.1	2.65	8.866	2.07	4.815	1.49	2.160	0.99	0.803
360,000	30,990.0	2.72	9.345	2.12	5.074	1.53	2.276	1.02	0.845
370,000	31,850.8	2.80	9.836	2.18	5.339	1.58	2.394	1.05	0.889
380,000	32,711.6	2.87	10.339	2.24	5.610	1.62	2.514	1.08	0.933
390,000	33,572.5	2.95	10.854	2.30	5.888	1.66	2.638	1.11	0.979
400,000	34,433.3	3.02	11.381	2.36	6.172	1.70	2.764	1.13	1.025
410,000	35,294.1	–	–	2.42	6.462	1.75	2.893	1.16	1.073
420,000	36,154.9	–	–	2.48	6.759	1.79	3.025	1.19	1.121
430,000	37,015.8	–	–	2.54	7.062	1.83	3.160	1.22	1.171
440,000	37,876.6	–	–	2.60	7.372	1.87	3.297	1.25	1.221
450,000	38,737.4	–	–	2.66	7.688	1.92	3.438	1.28	1.273
460,000	39,598.3	–	–	2.72	8.010	1.96	3.581	1.31	1.325
470,000	40,459.1	–	–	2.77	8.339	2.00	3.726	1.33	1.379
480,000	41,319.9	–	–	2.83	8.673	2.04	3.875	1.36	1.433
490,000	42,180.8	–	–	2.89	9.015	2.09	4.026	1.39	1.489
500,000	43,041.6	–	–	2.95	9.362	2.13	4.180	1.42	1.545
550,000	47,345.8	–	–	–	–	2.34	4.991	1.56	1.842
600,000	51,649.9	–	–	–	–	2.55	5.871	1.70	2.164
650,000	55,954.1	–	–	–	–	2.77	6.818	1.84	2.510
700,000	60,258.2	–	–	–	–	2.98	7.833	1.99	2.880
750,000	64,562.4	–	–	–	–	–	–	2.13	3.274
800,000	68,866.6	–	–	–	–	–	–	2.27	3.692
850,000	73,170.7	–	–	–	–	–	–	2.41	4.134
900,000	77,474.9	–	–	–	–	–	–	2.55	4.599
950,000	81,779.1	–	–	–	–	–	–	2.70	5.089
1,000,000	86,083.2	–	–	–	–	–	–	2.84	5.602
1,050,000	90,387.4	–	–	–	–	–	–	2.98	6.138

3.6 HEATING, INLET FLOW 55 °C / RETURN FLOW 45 °C

Medium:	Water	Density:	988.0 kg/m^3
Inlet flow temperature:	55 °C	Viscosity:	0.0005477 Pa•s
Return temperature:	45 °C	Specific thermal capacity:	4,181 J/(kg•K)
Range:	10 K	Surface roughness:	0.01 mm
Average temperature:	40 °C		

Table 29: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 55 °C / return flow 45 °C, d12–22 mm

d [mm]		**12**		**15**		**18**		**22**	
$\dot{Q}$ [W]	**$\dot{m}$ [kg/h]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**
200	17.2	0.07	0.127	–	–	–	–	–	–
300	25.8	0.10	0.191	0.06	0.064	–	–	–	–
400	34.4	0.13	0.443	0.08	0.086	0.05	0.036	–	–
500	43.1	0.17	0.647	0.10	0.107	0.06	0.046	–	–
600	51.7	0.20	0.884	0.12	0.245	0.08	0.055	0.05	0.025
700	60.3	0.23	1.152	0.14	0.318	0.09	0.116	0.06	0.029
800	68.9	0.27	1.451	0.16	0.399	0.10	0.146	0.07	0.058
900	77.5	0.30	1.779	0.17	0.489	0.11	0.178	0.08	0.070
1,000	86.1	0.33	2.137	0.19	0.586	0.13	0.213	0.09	0.084
1,100	94.7	0.37	2.523	0.21	0.691	0.14	0.251	0.09	0.099
1,200	103.3	0.40	2.938	0.23	0.803	0.15	0.291	0.10	0.115
1,300	111.9	0.43	3.380	0.25	0.922	0.16	0.335	0.11	0.132
1,400	120.5	0.47	3.850	0.27	1.049	0.18	0.380	0.12	0.149
1,500	129.2	0.50	4.347	0.29	1.183	0.19	0.428	0.13	0.168
1,600	137.8	0.54	4.871	0.31	1.324	0.20	0.479	0.14	0.188
1,700	146.4	0.57	5.422	0.33	1.472	0.22	0.532	0.15	0.209
1,800	155.0	0.60	5.999	0.35	1.626	0.23	0.587	0.15	0.230
1,900	163.6	0.64	6.602	0.37	1.788	0.24	0.645	0.16	0.253
2,000	172.2	0.67	7.232	0.39	1.956	0.25	0.705	0.17	0.276
2,500	215.3	0.84	10.767	0.49	2.898	0.32	1.042	0.21	0.407
3,000	258.3	1.00	14.936	0.58	4.003	0.38	1.435	0.26	0.559
3,500	301.4	1.17	19.726	0.68	5.267	0.44	1.883	0.30	0.732
4,000	344.4	1.34	25.130	0.78	6.687	0.51	2.385	0.34	0.926
4,500	387.5	1.50	31.141	0.87	8.261	0.57	2.940	0.38	1.140
5,000	430.5	1.67	37.753	0.97	9.986	0.63	3.548	0.43	1.373
5,500	473.6	1.84	44.964	1.07	11.862	0.70	4.207	0.47	1.626
6,000	516.6	2.01	52.768	1.16	13.886	0.76	4.916	0.51	1.897
6,500	559.7	2.17	61.164	1.26	16.058	0.82	5.676	0.55	2.188
7,000	602.7	2.34	70.149	1.36	18.377	0.89	6.486	0.60	2.497
7,500	645.8	2.51	79.723	1.46	20.841	0.95	7.346	0.64	2.825
8,000	688.8	2.68	89.879	1.55	23.451	1.01	8.255	0.68	3.171

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
8,500	731.9	2.84	100.623	1.65	26.205	1.08	9.213	0.73	3.536
9,000	774.9	3.01	111.946	1.75	29.104	1.14	10.219	0.77	3.918
9,500	818.0	–	–	1.84	32.145	1.20	11.274	0.81	4.318
10,000	861.0	–	–	1.94	35.330	1.27	12.377	0.85	4.737
10,500	904.1	–	–	2.04	38.657	1.33	13.528	0.90	5.173
11,000	947.1	–	–	2.14	42.127	1.39	14.727	0.94	5.626
11,500	990.2	–	–	2.23	45.738	1.46	15.973	0.98	6.098
12,000	1,033.2	–	–	2.33	49.491	1.52	17.267	1.02	6.586
12,500	1,076.3	–	–	2.43	53.386	1.58	18.609	1.07	7.093
13,000	1,119.3	–	–	2.52	57.421	1.65	19.997	1.11	7.616
13,500	1,162.4	–	–	2.62	61.597	1.71	21.433	1.15	8.157
14,000	1,205.5	–	–	2.72	65.914	1.77	22.916	1.20	8.715
14,500	1,248.5	–	–	2.82	70.372	1.84	24.445	1.24	9.291
15,000	1,291.6	–	–	2.91	74.970	1.90	26.022	1.28	9.883
15,500	1,334.6	–	–	3.01	79.707	1.96	27.645	1.32	10.493
16,000	1,377.7	–	–	–	–	2.03	29.315	1.37	11.120
16,500	1,420.7	–	–	–	–	2.09	31.031	1.41	11.763
17,000	1,463.8	–	–	–	–	2.15	32.794	1.45	12.424
17,500	1,506.8	–	–	–	–	2.22	34.603	1.49	13.102
18,000	1,549.9	–	–	–	–	2.28	36.459	1.54	13.796
18,500	1,592.9	–	–	–	–	2.34	38.360	1.58	14.508
19,000	1,636.0	–	–	–	–	2.41	40.308	1.62	15.236
19,500	1,679.0	–	–	–	–	2.47	42.302	1.66	15.982
20,000	1,722.1	–	–	–	–	2.53	44.343	1.71	16.744
20,500	1,765.1	–	–	–	–	2.60	46.429	1.75	17.523
21,000	1,808.2	–	–	–	–	2.66	48.562	1.79	18.318
21,500	1,851.2	–	–	–	–	2.72	50.740	1.84	19.130
22,000	1,894.3	–	–	–	–	2.79	52.965	1.88	19.959
22,500	1,937.3	–	–	–	–	2.85	55.235	1.92	20.805
23,000	1,980.4	–	–	–	–	2.91	57.551	1.96	21.667
23,500	2,023.4	–	–	–	–	2.98	59.913	2.01	22.546
24,000	2,066.5	–	–	–	–	3.04	62.321	2.05	23.442
24,500	2,109.5	–	–	–	–	–	–	2.09	24.354
25,000	2,152.6	–	–	–	–	–	–	2.13	25.283
25,500	2,195.6	–	–	–	–	–	–	2.18	26.228
26,000	2,238.7	–	–	–	–	–	–	2.22	27.190
26,500	2,281.8	–	–	–	–	–	–	2.26	28.168
27,000	2,324.8	–	–	–	–	–	–	2.31	29.163
27,500	2,367.9	–	–	–	–	–	–	2.35	30.175
28,000	2,410.9	–	–	–	–	–	–	2.39	31.203
28,500	2,454.0	–	–	–	–	–	–	2.43	32.247
29,000	2,497.0	–	–	–	–	–	–	2.48	33.308
29,500	2,540.1	–	–	–	–	–	–	2.52	34.386
30,000	2,583.1	–	–	–	–	–	–	2.56	35.479
32,500	2,798.4	–	–	–	–	–	–	2.77	41.195
35,000	3,013.6	–	–	–	–	–	–	2.99	47.320

Table 30: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 55 °C / return flow 45 °C, d28–54 mm

d [mm]		28		35		42		54	
$\dot{Q}$ [W]	$\dot{m}$ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1,100	94.7	0.05	0.027	–	–	–	–	–	–
1,200	103.3	0.06	0.032	–	–	–	–	–	–
1,300	111.9	0.06	0.036	–	–	–	–	–	–
1,400	120.5	0.07	0.041	–	–	–	–	–	–
1,500	129.2	0.07	0.046	–	–	–	–	–	–
1,600	137.8	0.08	0.051	–	–	–	–	–	–
1,700	146.4	0.08	0.057	0.05	0.018	–	–	–	–
1,800	155.0	0.09	0.063	0.05	0.020	–	–	–	–
1,900	163.6	0.09	0.069	0.06	0.022	–	–	–	–
2,000	172.2	0.10	0.075	0.06	0.023	–	–	–	–
2,500	215.3	0.12	0.111	0.08	0.034	0.05	0.014	–	–
3,000	258.3	0.15	0.151	0.09	0.047	0.06	0.018	–	–
3,500	301.4	0.17	0.198	0.11	0.061	0.07	0.024	–	–
4,000	344.4	0.20	0.250	0.12	0.077	0.08	0.030	–	–
4,500	387.5	0.22	0.307	0.14	0.095	0.09	0.037	0.05	0.010
5,000	430.5	0.25	0.369	0.15	0.114	0.10	0.045	0.06	0.012
5,500	473.6	0.27	0.436	0.17	0.134	0.11	0.052	0.07	0.015
6,000	516.6	0.30	0.508	0.18	0.156	0.12	0.061	0.07	0.017
6,500	559.7	0.32	0.585	0.20	0.180	0.13	0.070	0.08	0.020
7,000	602.7	0.35	0.667	0.21	0.205	0.14	0.080	0.08	0.022
7,500	645.8	0.37	0.754	0.23	0.231	0.15	0.090	0.09	0.025
8,000	688.8	0.39	0.845	0.24	0.259	0.16	0.101	0.09	0.028
8,500	731.9	0.42	0.941	0.26	0.288	0.17	0.112	0.10	0.031
9,000	774.9	0.44	1.042	0.27	0.319	0.18	0.124	0.11	0.035
9,500	818.0	0.47	1.147	0.29	0.351	0.19	0.136	0.11	0.038
10,000	861.0	0.49	1.257	0.30	0.384	0.20	0.149	0.12	0.042
10,500	904.1	0.52	1.371	0.32	0.419	0.21	0.162	0.12	0.045
11,000	947.1	0.54	1.490	0.33	0.455	0.22	0.176	0.13	0.049
11,500	990.2	0.57	1.613	0.35	0.492	0.23	0.191	0.14	0.053
12,000	1,033.2	0.59	1.741	0.36	0.530	0.24	0.206	0.14	0.057
12,500	1,076.3	0.62	1.873	0.38	0.570	0.25	0.221	0.15	0.061
13,000	1,119.3	0.64	2.009	0.39	0.611	0.26	0.237	0.15	0.066
13,500	1,162.4	0.67	2.150	0.41	0.654	0.27	0.253	0.16	0.070
14,000	1,205.5	0.69	2.296	0.42	0.698	0.28	0.270	0.17	0.075
14,500	1,248.5	0.72	2.445	0.44	0.743	0.29	0.287	0.17	0.080
15,000	1,291.6	0.74	2.599	0.45	0.789	0.30	0.305	0.18	0.085
15,500	1,334.6	0.76	2.757	0.47	0.837	0.31	0.323	0.18	0.090
16,000	1,377.7	0.79	2.920	0.48	0.885	0.32	0.342	0.19	0.095
16,500	1,420.7	0.81	3.087	0.50	0.935	0.33	0.361	0.20	0.100
17,000	1,463.8	0.84	3.258	0.51	0.987	0.34	0.381	0.20	0.105
17,500	1,506.8	0.86	3.433	0.53	1.039	0.35	0.401	0.21	0.111
18,000	1,549.9	0.89	3.612	0.54	1.093	0.36	0.422	0.21	0.117
18,500	1,592.9	0.91	3.796	0.56	1.148	0.37	0.443	0.22	0.122
19,000	1,636.0	0.94	3.984	0.57	1.204	0.39	0.464	0.23	0.128
19,500	1,679.0	0.96	4.176	0.59	1.262	0.40	0.486	0.23	0.134
20,000	1,722.1	0.99	4.373	0.60	1.321	0.41	0.509	0.24	0.140
20,500	1,765.1	1.01	4.573	0.62	1.381	0.42	0.532	0.24	0.147
21,000	1,808.2	1.04	4.778	0.63	1.442	0.43	0.555	0.25	0.153

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
21,500	1,851.2	1.06	4.987	0.65	1.504	0.44	0.579	0.25	0.160
22,000	1,894.3	1.08	5.200	0.66	1.568	0.45	0.603	0.26	0.166
22,500	1,937.3	1.11	5.417	0.68	1.632	0.46	0.628	0.27	0.173
23,000	1,980.4	1.13	5.638	0.69	1.698	0.47	0.653	0.27	0.180
23,500	2,023.4	1.16	5.863	0.71	1.765	0.48	0.679	0.28	0.187
24,000	2,066.5	1.18	6.093	0.72	1.834	0.49	0.705	0.28	0.194
24,500	2,109.5	1.21	6.327	0.74	1.903	0.50	0.731	0.29	0.201
25,000	2,152.6	1.23	6.564	0.75	1.974	0.51	0.758	0.30	0.209
25,500	2,195.6	1.26	6.806	0.77	2.046	0.52	0.786	0.30	0.216
26,000	2,238.7	1.28	7.052	0.78	2.119	0.53	0.814	0.31	0.224
26,500	2,281.8	1.31	7.302	0.80	2.193	0.54	0.842	0.31	0.231
27,000	2,324.8	1.33	7.556	0.81	2.269	0.55	0.871	0.32	0.239
27,500	2,367.9	1.36	7.814	0.83	2.345	0.56	0.900	0.33	0.247
28,000	2,410.9	1.38	8.077	0.84	2.423	0.57	0.930	0.33	0.255
28,500	2,454.0	1.41	8.343	0.86	2.502	0.58	0.960	0.34	0.264
29,000	2,497.0	1.43	8.613	0.87	2.582	0.59	0.990	0.34	0.272
29,500	2,540.1	1.45	8.888	0.89	2.664	0.60	1.021	0.35	0.280
30,000	2,583.1	1.48	9.166	0.90	2.746	0.61	1.052	0.36	0.289
32,500	2,798.4	1.60	10.619	0.98	3.176	0.66	1.216	0.39	0.333
35,000	3,013.6	1.73	12.172	1.05	3.635	0.71	1.390	0.41	0.380
37,500	3,228.9	1.85	13.826	1.13	4.122	0.76	1.574	0.44	0.430
40,000	3,444.2	1.97	15.579	1.20	4.638	0.81	1.770	0.47	0.483
42,500	3,659.4	2.10	17.431	1.28	5.182	0.86	1.975	0.50	0.539
45,000	3,874.7	2.22	19.383	1.35	5.755	0.91	2.192	0.53	0.597
47,500	4,089.9	2.34	21.433	1.43	6.355	0.96	2.418	0.56	0.658
50,000	4,305.2	2.47	23.581	1.50	6.984	1.01	2.655	0.59	0.722
52,500	4,520.4	2.59	25.828	1.58	7.640	1.06	2.902	0.62	0.789
55,000	4,735.7	2.71	28.173	1.66	8.324	1.11	3.160	0.65	0.858
57,500	4,951.0	2.84	30.615	1.73	9.036	1.17	3.427	0.68	0.930
60,000	5,166.2	2.96	33.156	1.81	9.776	1.22	3.705	0.71	1.004
62,500	5,381.5	3.08	35.794	1.88	10.543	1.27	3.993	0.74	1.081
65,000	5,596.7	–	–	1.96	11.337	1.32	4.291	0.77	1.161
67,500	5,812.0	–	–	2.03	12.159	1.37	4.599	0.80	1.243
70,000	6,027.3	–	–	2.11	13.008	1.42	4.917	0.83	1.328
72,500	6,242.5	–	–	2.18	13.885	1.47	5.244	0.86	1.416
75,000	6,457.8	–	–	2.26	14.789	1.52	5.582	0.89	1.506
77,500	6,673.0	–	–	2.33	15.720	1.57	5.930	0.92	1.598
80,000	6,888.3	–	–	2.41	16.678	1.62	6.288	0.95	1.694
82,500	7,103.6	–	–	2.48	17.664	1.67	6.656	0.98	1.792
85,000	7,318.8	–	–	2.56	18.676	1.72	7.033	1.01	1.892
87,500	7,534.1	–	–	2.63	19.716	1.77	7.421	1.04	1.995
90,000	7,749.3	–	–	2.71	20.782	1.82	7.818	1.07	2.100
92,500	7,964.6	–	–	2.78	21.876	1.87	8.225	1.10	2.208
95,000	8,179.9	–	–	2.86	22.997	1.93	8.642	1.13	2.319
97,500	8,395.1	–	–	2.93	24.144	1.98	9.068	1.16	2.432
100,000	8,610.4	–	–	3.01	25.319	2.03	9.505	1.19	2.547
105,000	9,040.9	–	–	–	–	2.13	10.407	1.24	2.786
110,000	9,471.4	–	–	–	–	2.23	11.348	1.30	3.035
115,000	9,901.9	–	–	–	–	2.33	12.328	1.36	3.293

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
120,000	10,332.5	–	–	–	–	2.43	13.347	1.42	3.562
125,000	10,763.0	–	–	–	–	2.53	14.405	1.48	3.840
130,000	11,193.5	–	–	–	–	2.63	15.501	1.54	4.128
135,000	11,624.0	–	–	–	–	2.74	16.636	1.60	4.426
140,000	12,054.5	–	–	–	–	2.84	17.809	1.66	4.734
145,000	12,485.1	–	–	–	–	2.94	19.021	1.72	5.052
150,000	12,915.6	–	–	–	–	3.04	20.272	1.78	5.379
155,000	13,346.1	–	–	–	–	–	–	1.84	5.716
160,000	13,776.6	–	–	–	–	–	–	1.90	6.063
165,000	14,207.1	–	–	–	–	–	–	1.96	6.420
170,000	14,637.6	–	–	–	–	–	–	2.01	6.786
175,000	15,068.2	–	–	–	–	–	–	2.07	7.162
180,000	15,498.7	–	–	–	–	–	–	2.13	7.548
185,000	15,929.2	–	–	–	–	–	–	2.19	7.943
190,000	16,359.7	–	–	–	–	–	–	2.25	8.348
195,000	16,790.2	–	–	–	–	–	–	2.31	8.763
200,000	17,220.8	–	–	–	–	–	–	2.37	9.187
205,000	17,651.3	–	–	–	–	–	–	2.43	9.620
210,000	18,081.8	–	–	–	–	–	–	2.49	10.064
215,000	18,512.3	–	–	–	–	–	–	2.55	10.517
220,000	18,942.8	–	–	–	–	–	–	2.61	10.979
225,000	19,373.4	–	–	–	–	–	–	2.67	11.451
230,000	19,803.9	–	–	–	–	–	–	2.73	11.933
235,000	20,234.4	–	–	–	–	–	–	2.78	12.424
240,000	20,664.9	–	–	–	–	–	–	2.84	12.925
245,000	21,095.4	–	–	–	–	–	–	2.90	13.435
250,000	21,526.0	–	–	–	–	–	–	2.96	13.955
255,000	21,956.5	–	–	–	–	–	–	3.02	14.484
260,000	22,387.0	–	–	–	–	–	–	3.08	15.023

Table 31: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 55 °C / return flow 45 °C, d66.7–108 mm

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
7,000	602.7	0.05	0.008	–	–	–	–	–	–
7,500	645.8	0.06	0.009	–	–	–	–	–	–
8,000	688.8	0.06	0.010	–	–	–	–	–	–
8,500	731.9	0.06	0.011	0.05	0.006	–	–	–	–
9,000	774.9	0.07	0.012	0.05	0.007	–	–	–	–
9,500	818.0	0.07	0.013	0.06	0.007	–	–	–	–
10,000	861.0	0.08	0.014	0.06	0.008	–	–	–	–
10,500	904.1	0.08	0.016	0.06	0.009	–	–	–	–
11,000	947.1	0.08	0.017	0.07	0.009	–	–	–	–
11,500	990.2	0.09	0.018	0.07	0.010	–	–	–	–
12,000	1,033.2	0.09	0.020	0.07	0.011	0.05	0.005	–	–
12,500	1,076.3	0.09	0.021	0.07	0.012	0.05	0.005	–	–
13,000	1,119.3	0.10	0.023	0.08	0.013	0.06	0.006	–	–
13,500	1,162.4	0.10	0.024	0.08	0.014	0.06	0.006	–	–

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
14,000	1,205.5	0.11	0.026	0.08	0.014	0.06	0.007	–	–
14,500	1,248.5	0.11	0.028	0.09	0.015	0.06	0.007	–	–
15,000	1,291.6	0.11	0.029	0.09	0.016	0.06	0.007	–	–
15,500	1,334.6	0.12	0.031	0.09	0.017	0.07	0.008	–	–
16,000	1,377.7	0.12	0.033	0.09	0.018	0.07	0.008	–	–
16,500	1,420.7	0.13	0.035	0.10	0.019	0.07	0.009	–	–
17,000	1,463.8	0.13	0.036	0.10	0.020	0.07	0.009	–	–
17,500	1,506.8	0.13	0.038	0.10	0.021	0.07	0.010	–	–
18,000	1,549.9	0.14	0.040	0.11	0.022	0.08	0.010	0.05	0.004
18,500	1,592.9	0.14	0.042	0.11	0.023	0.08	0.011	0.05	0.004
19,000	1,636.0	0.14	0.044	0.11	0.025	0.08	0.011	0.05	0.004
19,500	1,679.0	0.15	0.046	0.12	0.026	0.08	0.012	0.06	0.005
20,000	1,722.1	0.15	0.049	0.12	0.027	0.09	0.012	0.06	0.005
20,500	1,765.1	0.16	0.051	0.12	0.028	0.09	0.013	0.06	0.005
21,000	1,808.2	0.16	0.053	0.12	0.029	0.09	0.013	0.06	0.005
21,500	1,851.2	0.16	0.055	0.13	0.031	0.09	0.014	0.06	0.005
22,000	1,894.3	0.17	0.057	0.13	0.032	0.09	0.015	0.06	0.006
22,500	1,937.3	0.17	0.060	0.13	0.033	0.10	0.015	0.06	0.006
23,000	1,980.4	0.17	0.062	0.14	0.034	0.10	0.016	0.07	0.006
23,500	2,023.4	0.18	0.064	0.14	0.036	0.10	0.016	0.07	0.006
24,000	2,066.5	0.18	0.067	0.14	0.037	0.10	0.017	0.07	0.006
24,500	2,109.5	0.19	0.069	0.15	0.038	0.10	0.018	0.07	0.007
25,000	2,152.6	0.19	0.072	0.15	0.040	0.11	0.018	0.07	0.007
25,500	2,195.6	0.19	0.075	0.15	0.041	0.11	0.019	0.07	0.007
26,000	2,238.7	0.20	0.077	0.15	0.043	0.11	0.020	0.07	0.007
26,500	2,281.8	0.20	0.080	0.16	0.044	0.11	0.020	0.08	0.008
27,000	2,324.8	0.21	0.082	0.16	0.046	0.12	0.021	0.08	0.008
27,500	2,367.9	0.21	0.085	0.16	0.047	0.12	0.022	0.08	0.008
28,000	2,410.9	0.21	0.088	0.17	0.049	0.12	0.022	0.08	0.008
28,500	2,454.0	0.22	0.091	0.17	0.050	0.12	0.023	0.08	0.009
29,000	2,497.0	0.22	0.094	0.17	0.052	0.12	0.024	0.08	0.009
29,500	2,540.1	0.22	0.096	0.17	0.053	0.13	0.024	0.08	0.009
30,000	2,583.1	0.23	0.099	0.18	0.055	0.13	0.025	0.09	0.010
32,500	2,798.4	0.25	0.115	0.19	0.063	0.14	0.029	0.09	0.011
35,000	3,013.6	0.27	0.131	0.21	0.072	0.15	0.033	0.10	0.013
37,500	3,228.9	0.28	0.148	0.22	0.082	0.16	0.037	0.11	0.014
40,000	3,444.2	0.30	0.166	0.24	0.091	0.17	0.042	0.11	0.016
42,500	3,659.4	0.32	0.185	0.25	0.102	0.18	0.047	0.12	0.018
45,000	3,874.7	0.34	0.205	0.27	0.113	0.19	0.052	0.13	0.020
47,500	4,089.9	0.36	0.225	0.28	0.124	0.20	0.057	0.14	0.021
50,000	4,305.2	0.38	0.247	0.30	0.136	0.21	0.062	0.14	0.024
52,500	4,520.4	0.40	0.270	0.31	0.149	0.22	0.068	0.15	0.026
55,000	4,735.7	0.42	0.293	0.33	0.161	0.24	0.074	0.16	0.028
57,500	4,951.0	0.44	0.317	0.34	0.175	0.25	0.080	0.16	0.030
60,000	5,166.2	0.46	0.343	0.36	0.189	0.26	0.086	0.17	0.033
62,500	5,381.5	0.47	0.369	0.37	0.203	0.27	0.092	0.18	0.035
65,000	5,596.7	0.49	0.396	0.39	0.218	0.28	0.099	0.19	0.037
67,500	5,812.0	0.51	0.423	0.40	0.233	0.29	0.106	0.19	0.040
70,000	6,027.3	0.53	0.452	0.42	0.249	0.30	0.113	0.20	0.043

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
72,500	6,242.5	0.55	0.482	0.43	0.265	0.31	0.121	0.21	0.046
75,000	6,457.8	0.57	0.512	0.44	0.282	0.32	0.128	0.21	0.048
77,500	6,673.0	0.59	0.543	0.46	0.299	0.33	0.136	0.22	0.051
80,000	6,888.3	0.61	0.576	0.47	0.316	0.34	0.144	0.23	0.054
82,500	7,103.6	0.63	0.608	0.49	0.334	0.35	0.152	0.24	0.057
85,000	7,318.8	0.65	0.642	0.50	0.353	0.36	0.160	0.24	0.060
87,500	7,534.1	0.66	0.677	0.52	0.372	0.37	0.169	0.25	0.064
90,000	7,749.3	0.68	0.712	0.53	0.391	0.38	0.178	0.26	0.067
92,500	7,964.6	0.70	0.749	0.55	0.411	0.40	0.187	0.26	0.070
95,000	8,179.9	0.72	0.786	0.56	0.431	0.41	0.196	0.27	0.074
97,500	8,395.1	0.74	0.824	0.58	0.452	0.42	0.205	0.28	0.077
100,000	8,610.4	0.76	0.863	0.59	0.473	0.43	0.215	0.28	0.081
105,000	9,040.9	0.80	0.943	0.62	0.517	0.45	0.235	0.30	0.088
110,000	9,471.4	0.84	1.026	0.65	0.562	0.47	0.255	0.31	0.096
115,000	9,901.9	0.87	1.113	0.68	0.610	0.49	0.276	0.33	0.104
120,000	10,332.5	0.91	1.202	0.71	0.659	0.51	0.298	0.34	0.112
125,000	10,763.0	0.95	1.295	0.74	0.709	0.53	0.321	0.36	0.121
130,000	11,193.5	0.99	1.392	0.77	0.762	0.56	0.345	0.37	0.130
135,000	11,624.0	1.03	1.491	0.80	0.816	0.58	0.369	0.38	0.139
140,000	12,054.5	1.06	1.594	0.83	0.872	0.60	0.395	0.40	0.148
145,000	12,485.1	1.10	1.700	0.86	0.930	0.62	0.421	0.41	0.158
150,000	12,915.6	1.14	1.809	0.89	0.989	0.64	0.447	0.43	0.168
155,000	13,346.1	1.18	1.921	0.92	1.050	0.66	0.475	0.44	0.178
160,000	13,776.6	1.22	2.036	0.95	1.113	0.68	0.503	0.46	0.188
165,000	14,207.1	1.25	2.155	0.98	1.177	0.71	0.532	0.47	0.199
170,000	14,637.6	1.29	2.277	1.01	1.243	0.73	0.561	0.48	0.210
175,000	15,068.2	1.33	2.401	1.04	1.311	0.75	0.592	0.50	0.221
180,000	15,498.7	1.37	2.529	1.07	1.381	0.77	0.623	0.51	0.233
185,000	15,929.2	1.41	2.660	1.10	1.452	0.79	0.655	0.53	0.245
190,000	16,359.7	1.44	2.795	1.13	1.525	0.81	0.688	0.54	0.257
195,000	16,790.2	1.48	2.932	1.16	1.599	0.83	0.721	0.56	0.269
200,000	17,220.8	1.52	3.072	1.19	1.675	0.86	0.755	0.57	0.282
205,000	17,651.3	1.56	3.216	1.22	1.753	0.88	0.790	0.58	0.295
210,000	18,081.8	1.60	3.362	1.25	1.832	0.90	0.826	0.60	0.308
215,000	18,512.3	1.63	3.512	1.27	1.914	0.92	0.862	0.61	0.322
220,000	18,942.8	1.67	3.665	1.30	1.996	0.94	0.899	0.63	0.335
225,000	19,373.4	1.71	3.821	1.33	2.081	0.96	0.937	0.64	0.349
230,000	19,803.9	1.75	3.980	1.36	2.167	0.98	0.975	0.66	0.364
235,000	20,234.4	1.79	4.142	1.39	2.255	1.00	1.014	0.67	0.378
240,000	20,664.9	1.82	4.307	1.42	2.344	1.03	1.054	0.68	0.393
245,000	21,095.4	1.86	4.475	1.45	2.435	1.05	1.095	0.70	0.408
250,000	21,526.0	1.90	4.646	1.48	2.527	1.07	1.136	0.71	0.423
255,000	21,956.5	1.94	4.820	1.51	2.622	1.09	1.178	0.73	0.439
260,000	22,387.0	1.97	4.998	1.54	2.718	1.11	1.221	0.74	0.455
265,000	22,817.5	2.01	5.178	1.57	2.815	1.13	1.265	0.76	0.471
270,000	23,248.0	2.05	5.361	1.60	2.914	1.15	1.309	0.77	0.487
275,000	23,678.5	2.09	5.548	1.63	3.015	1.18	1.354	0.78	0.504
280,000	24,109.1	2.13	5.737	1.66	3.117	1.20	1.399	0.80	0.520
285,000	24,539.6	2.16	5.930	1.69	3.221	1.22	1.446	0.81	0.538

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
290,000	24,970.1	2.20	6.125	1.72	3.327	1.24	1.493	0.83	0.555
295,000	25,400.6	2.24	6.324	1.75	3.434	1.26	1.541	0.84	0.573
300,000	25,831.1	2.28	6.525	1.78	3.543	1.28	1.589	0.85	0.590
310,000	26,692.2	2.35	6.938	1.84	3.765	1.33	1.688	0.88	0.627
320,000	27,553.2	2.43	7.362	1.90	3.994	1.37	1.790	0.91	0.664
330,000	28,414.3	2.51	7.798	1.96	4.230	1.41	1.895	0.94	0.703
340,000	29,275.3	2.58	8.247	2.02	4.471	1.45	2.002	0.97	0.743
350,000	30,136.3	2.66	8.707	2.08	4.720	1.50	2.113	1.00	0.783
360,000	30,997.4	2.73	9.180	2.13	4.974	1.54	2.226	1.03	0.825
370,000	31,858.4	2.81	9.664	2.19	5.235	1.58	2.341	1.05	0.867
380,000	32,719.4	2.89	10.161	2.25	5.502	1.62	2.460	1.08	0.911
390,000	33,580.5	2.96	10.670	2.31	5.776	1.67	2.582	1.11	0.955
400,000	34,441.5	3.04	11.190	2.37	6.056	1.71	2.706	1.14	1.001
410,000	35,302.6	–	–	2.43	6.343	1.75	2.833	1.17	1.048
420,000	36,163.6	–	–	2.49	6.635	1.80	2.962	1.20	1.095
430,000	37,024.6	–	–	2.55	6.934	1.84	3.095	1.23	1.144
440,000	37,885.7	–	–	2.61	7.240	1.88	3.230	1.25	1.193
450,000	38,746.7	–	–	2.67	7.551	1.92	3.368	1.28	1.244
460,000	39,607.7	–	–	2.73	7.869	1.97	3.509	1.31	1.295
470,000	40,468.8	–	–	2.79	8.194	2.01	3.652	1.34	1.348
480,000	41,329.8	–	–	2.85	8.524	2.05	3.799	1.37	1.401
490,000	42,190.9	–	–	2.91	8.861	2.10	3.947	1.40	1.456
500,000	43,051.9	–	–	2.96	9.205	2.14	4.099	1.42	1.511
550,000	47,357.1	–	–	–	–	2.35	4.899	1.57	1.803
600,000	51,662.3	–	–	–	–	2.57	5.766	1.71	2.119
650,000	55,967.5	–	–	–	–	2.78	6.701	1.85	2.459
700,000	60,272.7	–	–	–	–	2.99	7.703	1.99	2.823
750,000	64,577.9	–	–	–	–	–	–	2.14	3.211
800,000	68,883.0	–	–	–	–	–	–	2.28	3.623
850,000	73,188.2	–	–	–	–	–	–	2.42	4.059
900,000	77,493.4	–	–	–	–	–	–	2.56	4.518
950,000	81,798.6	–	–	–	–	–	–	2.71	5.002
1,000,000	86,103.8	–	–	–	–	–	–	2.85	5.508
1,050,000	90,409.0	–	–	–	–	–	–	2.99	6.038

3.7 HEATING, INLET FLOW 50 °C / RETURN FLOW 40 °C

Medium:	Water	Density:	990.2 kg/m^3
Inlet flow temperature:	50 °C	Viscosity:	0.0005963 Pa•s
Return temperature:	40 °C	Specific thermal capacity:	4,182 J/(kg•K)
Range:	10 K	Surface roughness:	0.01 mm
Average temperature:	45 °C		

Table 32: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 50 °C / return flow 40 °C, d12–22 mm

d [mm]		**12**		**15**		**18**		**22**	
Q̇ [W]	**ṁ [kg/h]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**
200	17.2	0.07	0.138	–	–	–	–	–	–
300	25.8	0.10	0.207	0.06	0.070	–	–	–	–
400	34.4	0.13	0.276	0.08	0.093	0.05	0.040	–	–
500	43.0	0.17	0.662	0.10	0.116	0.06	0.050	–	–
600	51.6	0.20	0.903	0.12	0.250	0.08	0.059	0.05	0.027
700	60.3	0.23	1.177	0.14	0.325	0.09	0.069	0.06	0.032
800	68.9	0.27	1.481	0.15	0.408	0.10	0.149	0.07	0.036
900	77.5	0.30	1.815	0.17	0.500	0.11	0.182	0.08	0.072
1,000	86.1	0.33	2.179	0.19	0.599	0.13	0.218	0.09	0.086
1,100	94.7	0.37	2.572	0.21	0.705	0.14	0.257	0.09	0.101
1,200	103.3	0.40	2.993	0.23	0.819	0.15	0.298	0.10	0.117
1,300	111.9	0.43	3.443	0.25	0.941	0.16	0.342	0.11	0.135
1,400	120.5	0.47	3.920	0.27	1.070	0.18	0.388	0.12	0.153
1,500	129.1	0.50	4.425	0.29	1.206	0.19	0.437	0.13	0.172
1,600	137.7	0.53	4.957	0.31	1.350	0.20	0.489	0.14	0.192
1,700	146.3	0.57	5.516	0.33	1.500	0.21	0.543	0.14	0.213
1,800	154.9	0.60	6.102	0.35	1.657	0.23	0.599	0.15	0.235
1,900	163.6	0.63	6.714	0.37	1.822	0.24	0.658	0.16	0.258
2,000	172.2	0.67	7.352	0.39	1.993	0.25	0.719	0.17	0.282
2,500	215.2	0.83	10.935	0.48	2.949	0.32	1.061	0.21	0.415
3,000	258.2	1.00	15.155	0.58	4.070	0.38	1.461	0.26	0.570
3,500	301.3	1.17	20.000	0.68	5.352	0.44	1.916	0.30	0.746
4,000	344.3	1.33	25.462	0.77	6.791	0.51	2.425	0.34	0.943
4,500	387.4	1.50	31.533	0.87	8.384	0.57	2.989	0.38	1.160
5,000	430.4	1.67	38.208	0.97	10.130	0.63	3.604	0.43	1.396
5,500	473.5	1.83	45.482	1.07	12.027	0.69	4.272	0.47	1.653
6,000	516.5	2.00	53.352	1.16	14.074	0.76	4.991	0.51	1.929
6,500	559.5	2.17	61.815	1.26	16.269	0.82	5.761	0.55	2.223
7,000	602.6	2.34	70.868	1.36	18.611	0.88	6.580	0.60	2.537
7,500	645.6	2.50	80.508	1.45	21.100	0.95	7.450	0.64	2.869
8,000	688.7	2.67	90.735	1.55	23.735	1.01	8.370	0.68	3.220
8,500	731.7	2.84	101.546	1.65	26.514	1.07	9.338	0.72	3.589
9,000	774.7	3.00	112.939	1.74	29.438	1.14	10.355	0.77	3.976

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
9,500	817.8	–	–	1.84	32.506	1.20	11.421	0.81	4.381
10,000	860.8	–	–	1.94	35.718	1.26	12.536	0.85	4.805
10,500	903.9	–	–	2.03	39.071	1.33	13.698	0.89	5.246
11,000	946.9	–	–	2.13	42.568	1.39	14.909	0.94	5.705
11,500	990.0	–	–	2.23	46.206	1.45	16.168	0.98	6.181
12,000	1,033.0	–	–	2.32	49.987	1.52	17.474	1.02	6.676
12,500	1,076.0	–	–	2.42	53.909	1.58	18.828	1.06	7.187
13,000	1,119.1	–	–	2.52	57.972	1.64	20.229	1.11	7.717
13,500	1,162.1	–	–	2.61	62.177	1.71	21.677	1.15	8.263
14,000	1,205.2	–	–	2.71	66.521	1.77	23.173	1.19	8.827
14,500	1,248.2	–	–	2.81	71.007	1.83	24.715	1.23	9.409
15,000	1,291.2	–	–	2.91	75.633	1.90	26.304	1.28	10.007
15,500	1,334.3	–	–	3.00	80.399	1.96	27.941	1.32	10.623
16,000	1,377.3	–	–	3.10	85.304	2.02	29.624	1.36	11.256
16,500	1,420.4	–	–	–	–	2.08	31.353	1.41	11.906
17,000	1,463.4	–	–	–	–	2.15	33.129	1.45	12.573
17,500	1,506.5	–	–	–	–	2.21	34.952	1.49	13.257
18,000	1,549.5	–	–	–	–	2.27	36.821	1.53	13.958
18,500	1,592.5	–	–	–	–	2.34	38.736	1.58	14.676
19,000	1,635.6	–	–	–	–	2.40	40.698	1.62	15.411
19,500	1,678.6	–	–	–	–	2.46	42.706	1.66	16.162
20,000	1,721.7	–	–	–	–	2.53	44.760	1.70	16.931
20,500	1,764.7	–	–	–	–	2.59	46.860	1.75	17.716
21,000	1,807.7	–	–	–	–	2.65	49.006	1.79	18.519
21,500	1,850.8	–	–	–	–	2.72	51.198	1.83	19.338
22,000	1,893.8	–	–	–	–	2.78	53.437	1.87	20.173
22,500	1,936.9	–	–	–	–	2.84	55.721	1.92	21.026
23,000	1,979.9	–	–	–	–	2.91	58.051	1.96	21.895
23,500	2,023.0	–	–	–	–	2.97	60.427	2.00	22.781
24,000	2,066.0	–	–	–	–	3.03	62.849	2.04	23.683
24,500	2,109.0	–	–	–	–	3.10	65.317	2.09	24.602
25,000	2,152.1	–	–	–	–	–	–	2.13	25.538
25,500	2,195.1	–	–	–	–	–	–	2.17	26.490
26,000	2,238.2	–	–	–	–	–	–	2.21	27.459
26,500	2,281.2	–	–	–	–	–	–	2.26	28.445
27,000	2,324.2	–	–	–	–	–	–	2.30	29.447
27,500	2,367.3	–	–	–	–	–	–	2.34	30.465
28,000	2,410.3	–	–	–	–	–	–	2.38	31.500
28,500	2,453.4	–	–	–	–	–	–	2.43	32.552
29,000	2,496.4	–	–	–	–	–	–	2.47	33.620
29,500	2,539.5	–	–	–	–	–	–	2.51	34.705
30,000	2,582.5	–	–	–	–	–	–	2.56	35.806
32,500	2,797.7	–	–	–	–	–	–	2.77	41.557
35,000	3,012.9	–	–	–	–	–	–	2.98	47.719

Table 33: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 50 °C / return flow 40 °C, d28–54 mm

d [mm]		28		35		42		54	
$\dot{Q}$ [W]	$\dot{m}$ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1,100	94.7	0.05	0.017	–	–	–	–	–	–
1,200	103.3	0.06	0.032	–	–	–	–	–	–
1,300	111.9	0.06	0.037	–	–	–	–	–	–
1,400	120.5	0.07	0.042	–	–	–	–	–	–
1,500	129.1	0.07	0.047	–	–	–	–	–	–
1,600	137.7	0.08	0.053	–	–	–	–	–	–
1,700	146.3	0.08	0.058	0.05	0.018	–	–	–	–
1,800	154.9	0.09	0.064	0.05	0.020	–	–	–	–
1,900	163.6	0.09	0.070	0.06	0.022	–	–	–	–
2,000	172.2	0.10	0.077	0.06	0.024	–	–	–	–
2,500	215.2	0.12	0.113	0.08	0.035	0.05	0.014	–	–
3,000	258.2	0.15	0.155	0.09	0.048	0.06	0.019	–	–
3,500	301.3	0.17	0.202	0.11	0.063	0.07	0.025	–	–
4,000	344.3	0.20	0.255	0.12	0.079	0.08	0.031	–	–
4,500	387.4	0.22	0.313	0.14	0.097	0.09	0.038	0.05	0.011
5,000	430.4	0.25	0.376	0.15	0.116	0.10	0.045	0.06	0.013
5,500	473.5	0.27	0.444	0.17	0.137	0.11	0.054	0.07	0.015
6,000	516.5	0.30	0.517	0.18	0.159	0.12	0.062	0.07	0.017
6,500	559.5	0.32	0.596	0.20	0.183	0.13	0.072	0.08	0.020
7,000	602.6	0.34	0.679	0.21	0.209	0.14	0.081	0.08	0.023
7,500	645.6	0.37	0.767	0.23	0.236	0.15	0.092	0.09	0.026
8,000	688.7	0.39	0.859	0.24	0.264	0.16	0.103	0.09	0.029
8,500	731.7	0.42	0.957	0.26	0.293	0.17	0.114	0.10	0.032
9,000	774.7	0.44	1.059	0.27	0.324	0.18	0.126	0.11	0.035
9,500	817.8	0.47	1.166	0.29	0.357	0.19	0.139	0.11	0.039
10,000	860.8	0.49	1.277	0.30	0.391	0.20	0.152	0.12	0.042
10,500	903.9	0.52	1.393	0.32	0.426	0.21	0.165	0.12	0.046
11,000	946.9	0.54	1.513	0.33	0.462	0.22	0.180	0.13	0.050
11,500	990.0	0.57	1.638	0.35	0.500	0.23	0.194	0.14	0.054
12,000	1,033.0	0.59	1.768	0.36	0.539	0.24	0.209	0.14	0.058
12,500	1,076.0	0.61	1.901	0.38	0.580	0.25	0.225	0.15	0.063
13,000	1,119.1	0.64	2.040	0.39	0.622	0.26	0.241	0.15	0.067
13,500	1,162.1	0.66	2.182	0.41	0.665	0.27	0.258	0.16	0.072
14,000	1,205.2	0.69	2.330	0.42	0.709	0.28	0.275	0.17	0.076
14,500	1,248.2	0.71	2.481	0.44	0.755	0.29	0.292	0.17	0.081
15,000	1,291.2	0.74	2.637	0.45	0.802	0.30	0.310	0.18	0.086
15,500	1,334.3	0.76	2.797	0.47	0.850	0.31	0.329	0.18	0.091
16,000	1,377.3	0.79	2.961	0.48	0.899	0.32	0.348	0.19	0.096
16,500	1,420.4	0.81	3.130	0.50	0.950	0.33	0.367	0.20	0.102
17,000	1,463.4	0.84	3.303	0.51	1.002	0.34	0.387	0.20	0.107
17,500	1,506.5	0.86	3.481	0.53	1.055	0.35	0.408	0.21	0.113
18,000	1,549.5	0.89	3.662	0.54	1.110	0.36	0.429	0.21	0.119
18,500	1,592.5	0.91	3.848	0.56	1.166	0.37	0.450	0.22	0.125
19,000	1,635.6	0.93	4.038	0.57	1.223	0.38	0.472	0.22	0.131
19,500	1,678.6	0.96	4.232	0.59	1.281	0.39	0.494	0.23	0.137
20,000	1,721.7	0.98	4.431	0.60	1.340	0.40	0.517	0.24	0.143
20,500	1,764.7	1.01	4.634	0.62	1.401	0.41	0.540	0.24	0.149
21,000	1,807.7	1.03	4.841	0.63	1.463	0.42	0.564	0.25	0.156

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
21,500	1,850.8	1.06	5.052	0.65	1.526	0.43	0.588	0.25	0.162
22,000	1,893.8	1.08	5.267	0.66	1.590	0.44	0.613	0.26	0.169
22,500	1,936.9	1.11	5.486	0.68	1.656	0.45	0.638	0.27	0.176
23,000	1,979.9	1.13	5.710	0.69	1.723	0.46	0.663	0.27	0.183
23,500	2,023.0	1.16	5.938	0.71	1.791	0.48	0.689	0.28	0.190
24,000	2,066.0	1.18	6.169	0.72	1.860	0.49	0.716	0.28	0.197
24,500	2,109.0	1.21	6.405	0.74	1.930	0.50	0.743	0.29	0.205
25,000	2,152.1	1.23	6.646	0.75	2.002	0.51	0.770	0.30	0.212
25,500	2,195.1	1.25	6.890	0.77	2.075	0.52	0.798	0.30	0.220
26,000	2,238.2	1.28	7.138	0.78	2.149	0.53	0.826	0.31	0.227
26,500	2,281.2	1.30	7.391	0.80	2.224	0.54	0.855	0.31	0.235
27,000	2,324.2	1.33	7.647	0.81	2.300	0.55	0.884	0.32	0.243
27,500	2,367.3	1.35	7.908	0.83	2.378	0.56	0.913	0.33	0.251
28,000	2,410.3	1.38	8.173	0.84	2.456	0.57	0.943	0.33	0.259
28,500	2,453.4	1.40	8.441	0.86	2.536	0.58	0.974	0.34	0.268
29,000	2,496.4	1.43	8.714	0.87	2.617	0.59	1.005	0.34	0.276
29,500	2,539.5	1.45	8.991	0.89	2.699	0.60	1.036	0.35	0.285
30,000	2,582.5	1.48	9.272	0.90	2.783	0.61	1.068	0.35	0.293
32,500	2,797.7	1.60	10.738	0.98	3.217	0.66	1.233	0.38	0.338
35,000	3,012.9	1.72	12.305	1.05	3.681	0.71	1.409	0.41	0.386
37,500	3,228.1	1.84	13.972	1.13	4.173	0.76	1.596	0.44	0.437
40,000	3,443.3	1.97	15.738	1.20	4.695	0.81	1.794	0.47	0.490
42,500	3,658.5	2.09	17.605	1.28	5.244	0.86	2.002	0.50	0.547
45,000	3,873.7	2.21	19.570	1.35	5.822	0.91	2.220	0.53	0.606
47,500	4,089.0	2.34	21.635	1.43	6.428	0.96	2.449	0.56	0.668
50,000	4,304.2	2.46	23.798	1.50	7.062	1.01	2.689	0.59	0.732
52,500	4,519.4	2.58	26.059	1.58	7.724	1.06	2.938	0.62	0.800
55,000	4,734.6	2.71	28.418	1.65	8.414	1.11	3.198	0.65	0.870
57,500	4,949.8	2.83	30.875	1.73	9.132	1.16	3.469	0.68	0.942
60,000	5,165.0	2.95	33.431	1.80	9.877	1.21	3.749	0.71	1.018
62,500	5,380.2	3.07	36.083	1.88	10.650	1.26	4.040	0.74	1.096
65,000	5,595.4	–	–	1.95	11.451	1.31	4.340	0.77	1.176
67,500	5,810.6	–	–	2.03	12.279	1.36	4.651	0.80	1.260
70,000	6,025.8	–	–	2.10	13.135	1.42	4.972	0.83	1.345
72,500	6,241.0	–	–	2.18	14.017	1.47	5.303	0.86	1.434
75,000	6,456.2	–	–	2.25	14.928	1.52	5.644	0.89	1.525
77,500	6,671.4	–	–	2.33	15.865	1.57	5.995	0.92	1.619
80,000	6,886.7	–	–	2.40	16.830	1.62	6.355	0.95	1.715
82,500	7,101.9	–	–	2.48	17.822	1.67	6.726	0.98	1.814
85,000	7,317.1	–	–	2.55	18.841	1.72	7.107	1.00	1.915
87,500	7,532.3	–	–	2.63	19.887	1.77	7.497	1.03	2.019
90,000	7,747.5	–	–	2.70	20.960	1.82	7.897	1.06	2.126
92,500	7,962.7	–	–	2.78	22.060	1.87	8.308	1.09	2.235
95,000	8,177.9	–	–	2.85	23.187	1.92	8.728	1.12	2.346
97,500	8,393.1	–	–	2.93	24.342	1.97	9.158	1.15	2.460
100,000	8,608.3	–	–	3.00	25.523	2.02	9.597	1.18	2.577
105,000	9,038.7	–	–	–	–	2.12	10.506	1.24	2.818
110,000	9,469.2	–	–	–	–	2.22	11.454	1.30	3.069
115,000	9,899.6	–	–	–	–	2.32	12.441	1.36	3.330

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
120,000	10,330.0	–	–	–	–	2.43	13.466	1.42	3.601
125,000	10,760.4	–	–	–	–	2.53	14.530	1.48	3.881
130,000	11,190.8	–	–	–	–	2.63	15.633	1.54	4.172
135,000	11,621.2	–	–	–	–	2.73	16.775	1.60	4.473
140,000	12,051.6	–	–	–	–	2.83	17.955	1.65	4.783
145,000	12,482.1	–	–	–	–	2.93	19.174	1.71	5.103
150,000	12,912.5	–	–	–	–	3.03	20.431	1.77	5.433
155,000	13,342.9	–	–	–	–	–	–	1.83	5.773
160,000	13,773.3	–	–	–	–	–	–	1.89	6.123
165,000	14,203.7	–	–	–	–	–	–	1.95	6.482
170,000	14,634.1	–	–	–	–	–	–	2.01	6.851
175,000	15,064.6	–	–	–	–	–	–	2.07	7.229
180,000	15,495.0	–	–	–	–	–	–	2.13	7.618
185,000	15,925.4	–	–	–	–	–	–	2.19	8.016
190,000	16,355.8	–	–	–	–	–	–	2.25	8.423
195,000	16,786.2	–	–	–	–	–	–	2.31	8.841
200,000	17,216.6	–	–	–	–	–	–	2.36	9.268
205,000	17,647.1	–	–	–	–	–	–	2.42	9.704
210,000	18,077.5	–	–	–	–	–	–	2.48	10.150
215,000	18,507.9	–	–	–	–	–	–	2.54	10.606
220,000	18,938.3	–	–	–	–	–	–	2.60	11.071
225,000	19,368.7	–	–	–	–	–	–	2.66	11.546
230,000	19,799.1	–	–	–	–	–	–	2.72	12.031
235,000	20,229.6	–	–	–	–	–	–	2.78	12.525
240,000	20,660.0	–	–	–	–	–	–	2.84	13.028
245,000	21,090.4	–	–	–	–	–	–	2.90	13.541
250,000	21,520.8	–	–	–	–	–	–	2.96	14.064
255,000	21,951.2	–	–	–	–	–	–	3.01	14.596
260,000	22,381.6	–	–	–	–	–	–	3.07	15.138

3 / 3

Table 34: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 50 °C / return flow 40 °C, d66.7–108 mm

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
7,000	602.6	0.05	0.008	–	–	–	–	–	–
7,500	645.6	0.06	0.009	–	–	–	–	–	–
8,000	688.7	0.06	0.010	–	–	–	–	–	–
8,500	731.7	0.06	0.011	0.05	0.006	–	–	–	–
9,000	774.7	0.07	0.012	0.05	0.007	–	–	–	–
9,500	817.8	0.07	0.013	0.06	0.008	–	–	–	–
10,000	860.8	0.08	0.015	0.06	0.008	–	–	–	–
10,500	903.9	0.08	0.016	0.06	0.009	–	–	–	–
11,000	946.9	0.08	0.017	0.07	0.010	–	–	–	–
11,500	990.0	0.09	0.019	0.07	0.010	–	–	–	–
12,000	1,033.0	0.09	0.020	0.07	0.011	0.05	0.005	–	–
12,500	1,076.0	0.09	0.022	0.07	0.012	0.05	0.006	–	–
13,000	1,119.1	0.10	0.023	0.08	0.013	0.06	0.006	–	–
13,500	1,162.1	0.10	0.025	0.08	0.014	0.06	0.006	–	–

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
14,000	1,205.2	0.11	0.026	0.08	0.015	0.06	0.007	–	–
14,500	1,248.2	0.11	0.028	0.09	0.016	0.06	0.007	–	–
15,000	1,291.2	0.11	0.030	0.09	0.017	0.06	0.008	–	–
15,500	1,334.3	0.12	0.032	0.09	0.018	0.07	0.008	–	–
16,000	1,377.3	0.12	0.033	0.09	0.019	0.07	0.009	–	–
16,500	1,420.4	0.13	0.035	0.10	0.020	0.07	0.009	–	–
17,000	1,463.4	0.13	0.037	0.10	0.021	0.07	0.009	–	–
17,500	1,506.5	0.13	0.039	0.10	0.022	0.07	0.010	–	–
18,000	1,549.5	0.14	0.041	0.11	0.023	0.08	0.010	0.05	0.004
18,500	1,592.5	0.14	0.043	0.11	0.024	0.08	0.011	0.05	0.004
19,000	1,635.6	0.14	0.045	0.11	0.025	0.08	0.012	0.05	0.004
19,500	1,678.6	0.15	0.047	0.12	0.026	0.08	0.012	0.06	0.005
20,000	1,721.7	0.15	0.049	0.12	0.027	0.09	0.013	0.06	0.005
20,500	1,764.7	0.16	0.052	0.12	0.029	0.09	0.013	0.06	0.005
21,000	1,807.7	0.16	0.054	0.12	0.030	0.09	0.014	0.06	0.005
21,500	1,850.8	0.16	0.056	0.13	0.031	0.09	0.014	0.06	0.005
22,000	1,893.8	0.17	0.058	0.13	0.032	0.09	0.015	0.06	0.006
22,500	1,936.9	0.17	0.061	0.13	0.034	0.10	0.015	0.06	0.006
23,000	1,979.9	0.17	0.063	0.14	0.035	0.10	0.016	0.07	0.006
23,500	2,023.0	0.18	0.066	0.14	0.036	0.10	0.017	0.07	0.006
24,000	2,066.0	0.18	0.068	0.14	0.038	0.10	0.017	0.07	0.007
24,500	2,109.0	0.19	0.071	0.14	0.039	0.10	0.018	0.07	0.007
25,000	2,152.1	0.19	0.073	0.15	0.041	0.11	0.019	0.07	0.007
25,500	2,195.1	0.19	0.076	0.15	0.042	0.11	0.019	0.07	0.007
26,000	2,238.2	0.20	0.078	0.15	0.043	0.11	0.020	0.07	0.008
26,500	2,281.2	0.20	0.081	0.16	0.045	0.11	0.021	0.08	0.008
27,000	2,324.2	0.20	0.084	0.16	0.046	0.12	0.021	0.08	0.008
27,500	2,367.3	0.21	0.087	0.16	0.048	0.12	0.022	0.08	0.008
28,000	2,410.3	0.21	0.089	0.17	0.049	0.12	0.023	0.08	0.009
28,500	2,453.4	0.22	0.092	0.17	0.051	0.12	0.023	0.08	0.009
29,000	2,496.4	0.22	0.095	0.17	0.053	0.12	0.024	0.08	0.009
29,500	2,539.5	0.22	0.098	0.17	0.054	0.13	0.025	0.08	0.009
30,000	2,582.5	0.23	0.101	0.18	0.056	0.13	0.026	0.09	0.010
32,500	2,797.7	0.25	0.116	0.19	0.064	0.14	0.029	0.09	0.011
35,000	3,012.9	0.27	0.133	0.21	0.073	0.15	0.034	0.10	0.013
37,500	3,228.1	0.28	0.150	0.22	0.083	0.16	0.038	0.11	0.014
40,000	3,443.3	0.30	0.168	0.24	0.093	0.17	0.043	0.11	0.016
42,500	3,658.5	0.32	0.188	0.25	0.104	0.18	0.047	0.12	0.018
45,000	3,873.7	0.34	0.208	0.27	0.115	0.19	0.052	0.13	0.020
47,500	4,089.0	0.36	0.229	0.28	0.126	0.20	0.058	0.14	0.022
50,000	4,304.2	0.38	0.251	0.30	0.138	0.21	0.063	0.14	0.024
52,500	4,519.4	0.40	0.274	0.31	0.151	0.22	0.069	0.15	0.026
55,000	4,734.6	0.42	0.297	0.33	0.164	0.23	0.075	0.16	0.028
57,500	4,949.8	0.44	0.322	0.34	0.177	0.25	0.081	0.16	0.031
60,000	5,165.0	0.45	0.348	0.35	0.191	0.26	0.087	0.17	0.033
62,500	5,380.2	0.47	0.374	0.37	0.206	0.27	0.094	0.18	0.036
65,000	5,595.4	0.49	0.401	0.38	0.221	0.28	0.101	0.18	0.038
67,500	5,810.6	0.51	0.430	0.40	0.236	0.29	0.108	0.19	0.041
70,000	6,025.8	0.53	0.459	0.41	0.252	0.30	0.115	0.20	0.043

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
72,500	6,241.0	0.55	0.489	0.43	0.269	0.31	0.122	0.21	0.046
75,000	6,456.2	0.57	0.519	0.44	0.286	0.32	0.130	0.21	0.049
77,500	6,671.4	0.59	0.551	0.46	0.303	0.33	0.138	0.22	0.052
80,000	6,886.7	0.61	0.584	0.47	0.321	0.34	0.146	0.23	0.055
82,500	7,101.9	0.63	0.617	0.49	0.339	0.35	0.154	0.23	0.058
85,000	7,317.1	0.64	0.651	0.50	0.358	0.36	0.163	0.24	0.061
87,500	7,532.3	0.66	0.686	0.52	0.377	0.37	0.171	0.25	0.065
90,000	7,747.5	0.68	0.722	0.53	0.397	0.38	0.180	0.26	0.068
92,500	7,962.7	0.70	0.759	0.55	0.417	0.39	0.189	0.26	0.071
95,000	8,177.9	0.72	0.796	0.56	0.437	0.41	0.199	0.27	0.075
97,500	8,393.1	0.74	0.835	0.58	0.458	0.42	0.208	0.28	0.078
100,000	8,608.3	0.76	0.874	0.59	0.480	0.43	0.218	0.28	0.082
105,000	9,038.7	0.80	0.955	0.62	0.524	0.45	0.238	0.30	0.090
110,000	9,469.2	0.83	1.039	0.65	0.570	0.47	0.259	0.31	0.097
115,000	9,899.6	0.87	1.127	0.68	0.618	0.49	0.280	0.33	0.105
120,000	10,330.0	0.91	1.217	0.71	0.667	0.51	0.303	0.34	0.114
125,000	10,760.4	0.95	1.311	0.74	0.719	0.53	0.326	0.36	0.122
130,000	11,190.8	0.99	1.409	0.77	0.772	0.55	0.350	0.37	0.131
135,000	11,621.2	1.02	1.509	0.80	0.826	0.58	0.374	0.38	0.141
140,000	12,051.6	1.06	1.613	0.83	0.883	0.60	0.400	0.40	0.150
145,000	12,482.1	1.10	1.720	0.86	0.941	0.62	0.426	0.41	0.160
150,000	12,912.5	1.14	1.830	0.89	1.001	0.64	0.453	0.43	0.170
155,000	13,342.9	1.17	1.943	0.92	1.063	0.66	0.481	0.44	0.180
160,000	13,773.3	1.21	2.060	0.95	1.126	0.68	0.509	0.45	0.191
165,000	14,203.7	1.25	2.179	0.98	1.191	0.70	0.539	0.47	0.202
170,000	14,634.1	1.29	2.302	1.01	1.258	0.73	0.569	0.48	0.213
175,000	15,064.6	1.33	2.428	1.04	1.327	0.75	0.599	0.50	0.224
180,000	15,495.0	1.36	2.557	1.06	1.397	0.77	0.631	0.51	0.236
185,000	15,925.4	1.40	2.689	1.09	1.469	0.79	0.663	0.53	0.248
190,000	16,355.8	1.44	2.825	1.12	1.542	0.81	0.696	0.54	0.260
195,000	16,786.2	1.48	2.963	1.15	1.617	0.83	0.730	0.55	0.273
200,000	17,216.6	1.52	3.105	1.18	1.694	0.85	0.764	0.57	0.286
205,000	17,647.1	1.55	3.249	1.21	1.773	0.87	0.800	0.58	0.299
210,000	18,077.5	1.59	3.397	1.24	1.853	0.90	0.836	0.60	0.312
215,000	18,507.9	1.63	3.548	1.27	1.935	0.92	0.872	0.61	0.326
220,000	18,938.3	1.67	3.702	1.30	2.018	0.94	0.910	0.63	0.340
225,000	19,368.7	1.70	3.859	1.33	2.103	0.96	0.948	0.64	0.354
230,000	19,799.1	1.74	4.019	1.36	2.190	0.98	0.987	0.65	0.368
235,000	20,229.6	1.78	4.182	1.39	2.279	1.00	1.026	0.67	0.383
240,000	20,660.0	1.82	4.349	1.42	2.369	1.02	1.067	0.68	0.398
245,000	21,090.4	1.86	4.518	1.45	2.461	1.05	1.108	0.70	0.413
250,000	21,520.8	1.89	4.691	1.48	2.554	1.07	1.149	0.71	0.429
255,000	21,951.2	1.93	4.866	1.51	2.649	1.09	1.192	0.72	0.444
260,000	22,381.6	1.97	5.045	1.54	2.746	1.11	1.235	0.74	0.460
265,000	22,812.1	2.01	5.226	1.57	2.844	1.13	1.279	0.75	0.477
270,000	23,242.5	2.05	5.411	1.60	2.944	1.15	1.324	0.77	0.493
275,000	23,672.9	2.08	5.599	1.63	3.045	1.17	1.369	0.78	0.510
280,000	24,103.3	2.12	5.789	1.66	3.149	1.19	1.415	0.80	0.527
285,000	24,533.7	2.16	5.983	1.69	3.253	1.22	1.462	0.81	0.544

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
290,000	24,964.1	2.20	6.180	1.72	3.360	1.24	1.509	0.82	0.562
295,000	25,394.5	2.24	6.380	1.74	3.468	1.26	1.557	0.84	0.579
300,000	25,825.0	2.27	6.583	1.77	3.577	1.28	1.606	0.85	0.598
310,000	26,685.8	2.35	6.998	1.83	3.802	1.32	1.706	0.88	0.634
320,000	27,546.6	2.42	7.425	1.89	4.032	1.37	1.809	0.91	0.672
330,000	28,407.5	2.50	7.864	1.95	4.269	1.41	1.915	0.94	0.711
340,000	29,268.3	2.58	8.315	2.01	4.513	1.45	2.023	0.97	0.751
350,000	30,129.1	2.65	8.779	2.07	4.763	1.49	2.134	0.99	0.792
360,000	30,990.0	2.73	9.254	2.13	5.019	1.54	2.248	1.02	0.834
370,000	31,850.8	2.80	9.741	2.19	5.282	1.58	2.365	1.05	0.877
380,000	32,711.6	2.88	10.240	2.25	5.551	1.62	2.485	1.08	0.921
390,000	33,572.5	2.96	10.752	2.31	5.826	1.66	2.607	1.11	0.966
400,000	34,433.3	3.03	11.275	2.37	6.108	1.71	2.732	1.14	1.012
410,000	35,294.1	–	–	2.43	6.396	1.75	2.860	1.17	1.059
420,000	36,154.9	–	–	2.48	6.691	1.79	2.991	1.19	1.107
430,000	37,015.8	–	–	2.54	6.992	1.83	3.124	1.22	1.156
440,000	37,876.6	–	–	2.60	7.299	1.88	3.261	1.25	1.206
450,000	38,737.4	–	–	2.66	7.612	1.92	3.399	1.28	1.257
460,000	39,598.3	–	–	2.72	7.932	1.96	3.541	1.31	1.309
470,000	40,459.1	–	–	2.78	8.258	2.00	3.686	1.34	1.362
480,000	41,319.9	–	–	2.84	8.591	2.05	3.833	1.36	1.416
490,000	42,180.8	–	–	2.90	8.930	2.09	3.983	1.39	1.471
500,000	43,041.6	–	–	2.96	9.275	2.13	4.136	1.42	1.527
550,000	47,345.8	–	–	–	–	2.35	4.940	1.56	1.821
600,000	51,649.9	–	–	–	–	2.56	5.813	1.71	2.139
650,000	55,954.1	–	–	–	–	2.77	6.753	1.85	2.482
700,000	60,258.2	–	–	–	–	2.99	7.761	1.99	2.849
750,000	64,562.4	–	–	–	–	–	–	2.13	3.240
800,000	68,866.6	–	–	–	–	–	–	2.27	3.654
850,000	73,170.7	–	–	–	–	–	–	2.42	4.093
900,000	77,474.9	–	–	–	–	–	–	2.56	4.555
950,000	81,779.1	–	–	–	–	–	–	2.70	5.040
1,000,000	86,083.2	–	–	–	–	–	–	2.84	5.550
1,050,000	90,387.4	–	–	–	–	–	–	2.98	6.083

3.8 HEATING, INLET FLOW 60 °C / RETURN FLOW 50 °C

Medium:	Water	Density:	985.7 kg/m^3
Inlet flow temperature:	60 °C	Viscosity:	0.00050715 Pa•s
Return temperature:	50 °C	Specific thermal capacity:	4,182 J/(kg•K)
Range:	10 K	Surface roughness:	0.01 mm
Average temperature:	55 °C		

Table 35: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 60 °C / return flow 50 °C, d12–22 mm

d [mm]		**12**		**15**		**18**		**22**	
Q̇ [W]	**ṁ [kg/h]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**
200	17.2	0.07	0.118	–	–	–	–	–	–
300	25.8	0.10	0.177	0.06	0.060	–	–	–	–
400	34.4	0.13	0.433	0.08	0.080	0.05	0.034	–	–
500	43.0	0.17	0.634	0.10	0.176	0.06	0.042	–	–
600	51.6	0.20	0.867	0.12	0.239	0.08	0.088	0.05	0.023
700	60.3	0.23	1.130	0.14	0.312	0.09	0.114	0.06	0.027
800	68.9	0.27	1.424	0.16	0.392	0.10	0.143	0.07	0.056
900	77.5	0.30	1.747	0.18	0.479	0.11	0.174	0.08	0.069
1,000	86.1	0.34	2.099	0.19	0.575	0.13	0.209	0.09	0.082
1,100	94.7	0.37	2.480	0.21	0.678	0.14	0.246	0.09	0.097
1,200	103.3	0.40	2.888	0.23	0.788	0.15	0.286	0.10	0.112
1,300	111.9	0.44	3.324	0.25	0.906	0.16	0.328	0.11	0.129
1,400	120.5	0.47	3.787	0.27	1.030	0.18	0.373	0.12	0.146
1,500	129.1	0.50	4.277	0.29	1.162	0.19	0.420	0.13	0.165
1,600	137.7	0.54	4.794	0.31	1.301	0.20	0.470	0.14	0.184
1,700	146.3	0.57	5.337	0.33	1.446	0.22	0.522	0.15	0.205
1,800	154.9	0.60	5.907	0.35	1.599	0.23	0.577	0.15	0.226
1,900	163.6	0.64	6.503	0.37	1.758	0.24	0.634	0.16	0.248
2,000	172.2	0.67	7.124	0.39	1.924	0.25	0.693	0.17	0.271
2,500	215.2	0.84	10.617	0.49	2.853	0.32	1.024	0.21	0.400
3,000	258.2	1.01	14.739	0.58	3.943	0.38	1.411	0.26	0.549
3,500	301.3	1.17	19.480	0.68	5.191	0.44	1.853	0.30	0.720
4,000	344.3	1.34	24.832	0.78	6.595	0.51	2.349	0.34	0.911
4,500	387.4	1.51	30.788	0.88	8.150	0.57	2.897	0.39	1.121
5,000	430.4	1.68	37.345	0.97	9.857	0.63	3.497	0.43	1.352
5,500	473.5	1.84	44.497	1.07	11.713	0.70	4.148	0.47	1.601
6,000	516.5	2.01	52.243	1.17	13.717	0.76	4.849	0.51	1.869
6,500	559.5	2.18	60.578	1.26	15.868	0.82	5.601	0.56	2.156
7,000	602.6	2.35	69.502	1.36	18.165	0.89	6.402	0.60	2.462
7,500	645.6	2.51	79.012	1.46	20.608	0.95	7.252	0.64	2.785
8,000	688.7	2.68	89.107	1.56	23.195	1.02	8.152	0.68	3.128
8,500	731.7	2.85	99.786	1.65	25.926	1.08	9.100	0.73	3.488
9,000	774.7	3.02	111.048	1.75	28.801	1.14	10.096	0.77	3.866

d [mm]		12		15		18		22	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
9,500	817.8	–	–	1.85	31.819	1.21	11.141	0.81	4.262
10,000	860.8	–	–	1.95	34.980	1.27	12.234	0.86	4.675
10,500	903.9	–	–	2.04	38.283	1.33	13.374	0.90	5.107
11,000	946.9	–	–	2.14	41.728	1.40	14.562	0.94	5.556
11,500	990.0	–	–	2.24	45.315	1.46	15.798	0.98	6.022
12,000	1,033.0	–	–	2.33	49.043	1.52	17.081	1.03	6.506
12,500	1,076.0	–	–	2.43	52.912	1.59	18.411	1.07	7.007
13,000	1,119.1	–	–	2.53	56.922	1.65	19.788	1.11	7.525
13,500	1,162.1	–	–	2.63	61.073	1.71	21.213	1.16	8.061
14,000	1,205.2	–	–	2.72	65.364	1.78	22.684	1.20	8.614
14,500	1,248.2	–	–	2.82	69.796	1.84	24.202	1.24	9.184
15,000	1,291.2	–	–	2.92	74.368	1.90	25.766	1.28	9.771
15,500	1,334.3	–	–	3.02	79.080	1.97	27.378	1.33	10.375
16,000	1,377.3	–	–	–	–	2.03	29.035	1.37	10.997
16,500	1,420.4	–	–	–	–	2.09	30.739	1.41	11.635
17,000	1,463.4	–	–	–	–	2.16	32.490	1.45	12.290
17,500	1,506.5	–	–	–	–	2.22	34.287	1.50	12.962
18,000	1,549.5	–	–	–	–	2.28	36.130	1.54	13.651
18,500	1,592.5	–	–	–	–	2.35	38.020	1.58	14.356
19,000	1,635.6	–	–	–	–	2.41	39.955	1.63	15.079
19,500	1,678.6	–	–	–	–	2.47	41.937	1.67	15.818
20,000	1,721.7	–	–	–	–	2.54	43.965	1.71	16.574
20,500	1,764.7	–	–	–	–	2.60	46.038	1.75	17.347
21,000	1,807.7	–	–	–	–	2.67	48.159	1.80	18.136
21,500	1,850.8	–	–	–	–	2.73	50.324	1.84	18.943
22,000	1,893.8	–	–	–	–	2.79	52.535	1.88	19.766
22,500	1,936.9	–	–	–	–	2.86	54.793	1.93	20.605
23,000	1,979.9	–	–	–	–	2.92	57.096	1.97	21.461
23,500	2,023.0	–	–	–	–	2.98	59.446	2.01	22.334
24,000	2,066.0	–	–	–	–	3.05	61.841	2.05	23.223
24,500	2,109.0	–	–	–	–	–	–	2.10	24.129
25,000	2,152.1	–	–	–	–	–	–	2.14	25.051
25,500	2,195.1	–	–	–	–	–	–	2.18	25.990
26,000	2,238.2	–	–	–	–	–	–	2.22	26.946
26,500	2,281.2	–	–	–	–	–	–	2.27	27.918
27,000	2,324.2	–	–	–	–	–	–	2.31	28.906
27,500	2,367.3	–	–	–	–	–	–	2.35	29.911
28,000	2,410.3	–	–	–	–	–	–	2.40	30.933
28,500	2,453.4	–	–	–	–	–	–	2.44	31.971
29,000	2,496.4	–	–	–	–	–	–	2.48	33.025
29,500	2,539.5	–	–	–	–	–	–	2.52	34.096
30,000	2,582.5	–	–	–	–	–	–	2.57	35.183
32,500	2,797.7	–	–	–	–	–	–	2.78	40.865
35,000	3,012.9	–	–	–	–	–	–	2.99	46.957

Table 36: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 60 °C / return flow 50 °C, d28–54 mm

d [mm]		28		35		42		54	
$\dot{Q}$ [W]	$\dot{m}$ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1,100	94.7	0.05	0.027	–	–	–	–	–	–
1,200	103.3	0.06	0.031	–	–	–	–	–	–
1,300	111.9	0.06	0.035	–	–	–	–	–	–
1,400	120.5	0.07	0.040	–	–	–	–	–	–
1,500	129.1	0.07	0.045	–	–	–	–	–	–
1,600	137.7	0.08	0.050	–	–	–	–	–	–
1,700	146.3	0.08	0.056	0.05	0.017	–	–	–	–
1,800	154.9	0.09	0.062	0.05	0.019	–	–	–	–
1,900	163.6	0.09	0.068	0.06	0.021	–	–	–	–
2,000	172.2	0.10	0.074	0.06	0.023	–	–	–	–
2,500	215.2	0.12	0.108	0.08	0.034	0.05	0.013	–	–
3,000	258.2	0.15	0.149	0.09	0.046	0.06	0.018	–	–
3,500	301.3	0.17	0.194	0.11	0.060	0.07	0.024	–	–
4,000	344.3	0.20	0.245	0.12	0.076	0.08	0.030	–	–
4,500	387.4	0.22	0.302	0.14	0.093	0.09	0.036	0.05	0.010
5,000	430.4	0.25	0.363	0.15	0.112	0.10	0.044	0.06	0.012
5,500	473.5	0.27	0.429	0.17	0.132	0.11	0.052	0.07	0.014
6,000	516.5	0.30	0.500	0.18	0.154	0.12	0.060	0.07	0.017
6,500	559.5	0.32	0.576	0.20	0.177	0.13	0.069	0.08	0.019
7,000	602.6	0.35	0.657	0.21	0.201	0.14	0.078	0.08	0.022
7,500	645.6	0.37	0.742	0.23	0.227	0.15	0.089	0.09	0.025
8,000	688.7	0.40	0.832	0.24	0.255	0.16	0.099	0.10	0.028
8,500	731.7	0.42	0.927	0.26	0.284	0.17	0.110	0.10	0.031
9,000	774.7	0.44	1.026	0.27	0.314	0.18	0.122	0.11	0.034
9,500	817.8	0.47	1.130	0.29	0.345	0.19	0.134	0.11	0.037
10,000	860.8	0.49	1.239	0.30	0.378	0.20	0.147	0.12	0.041
10,500	903.9	0.52	1.351	0.32	0.412	0.21	0.160	0.12	0.044
11,000	946.9	0.54	1.469	0.33	0.448	0.22	0.173	0.13	0.048
11,500	990.0	0.57	1.590	0.35	0.484	0.23	0.188	0.14	0.052
12,000	1,033.0	0.59	1.717	0.36	0.522	0.24	0.202	0.14	0.056
12,500	1,076.0	0.62	1.847	0.38	0.562	0.25	0.217	0.15	0.060
13,000	1,119.1	0.64	1.982	0.39	0.602	0.26	0.233	0.15	0.065
13,500	1,162.1	0.67	2.121	0.41	0.644	0.27	0.249	0.16	0.069
14,000	1,205.2	0.69	2.265	0.42	0.688	0.28	0.266	0.17	0.074
14,500	1,248.2	0.72	2.413	0.44	0.732	0.29	0.283	0.17	0.078
15,000	1,291.2	0.74	2.565	0.45	0.778	0.30	0.300	0.18	0.083
15,500	1,334.3	0.77	2.721	0.47	0.825	0.31	0.318	0.18	0.088
16,000	1,377.3	0.79	2.882	0.48	0.873	0.32	0.337	0.19	0.093
16,500	1,420.4	0.82	3.047	0.50	0.922	0.34	0.356	0.20	0.098
17,000	1,463.4	0.84	3.216	0.51	0.973	0.35	0.375	0.20	0.104
17,500	1,506.5	0.86	3.390	0.53	1.025	0.36	0.395	0.21	0.109
18,000	1,549.5	0.89	3.567	0.54	1.078	0.37	0.416	0.21	0.115
18,500	1,592.5	0.91	3.749	0.56	1.132	0.38	0.436	0.22	0.120
19,000	1,635.6	0.94	3.935	0.57	1.188	0.39	0.458	0.23	0.126
19,500	1,678.6	0.96	4.125	0.59	1.245	0.40	0.479	0.23	0.132
20,000	1,721.7	0.99	4.320	0.60	1.303	0.41	0.501	0.24	0.138
20,500	1,764.7	1.01	4.518	0.62	1.362	0.42	0.524	0.24	0.144
21,000	1,807.7	1.04	4.721	0.63	1.422	0.43	0.547	0.25	0.151

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
21,500	1,850.8	1.06	4.928	0.65	1.484	0.44	0.571	0.26	0.157
22,000	1,893.8	1.09	5.139	0.66	1.547	0.45	0.595	0.26	0.164
22,500	1,936.9	1.11	5.354	0.68	1.611	0.46	0.619	0.27	0.170
23,000	1,979.9	1.14	5.573	0.69	1.676	0.47	0.644	0.27	0.177
23,500	2,023.0	1.16	5.796	0.71	1.743	0.48	0.669	0.28	0.184
24,000	2,066.0	1.19	6.024	0.72	1.810	0.49	0.695	0.29	0.191
24,500	2,109.0	1.21	6.255	0.74	1.879	0.50	0.721	0.29	0.198
25,000	2,152.1	1.24	6.491	0.75	1.949	0.51	0.748	0.30	0.206
25,500	2,195.1	1.26	6.731	0.77	2.020	0.52	0.775	0.30	0.213
26,000	2,238.2	1.28	6.974	0.78	2.092	0.53	0.803	0.31	0.220
26,500	2,281.2	1.31	7.222	0.80	2.166	0.54	0.831	0.31	0.228
27,000	2,324.2	1.33	7.474	0.81	2.241	0.55	0.859	0.32	0.236
27,500	2,367.3	1.36	7.730	0.83	2.316	0.56	0.888	0.33	0.244
28,000	2,410.3	1.38	7.990	0.84	2.393	0.57	0.917	0.33	0.252
28,500	2,453.4	1.41	8.254	0.86	2.472	0.58	0.947	0.34	0.260
29,000	2,496.4	1.43	8.522	0.87	2.551	0.59	0.977	0.34	0.268
29,500	2,539.5	1.46	8.794	0.89	2.631	0.60	1.007	0.35	0.276
30,000	2,582.5	1.48	9.070	0.90	2.713	0.61	1.038	0.36	0.285
32,500	2,797.7	1.61	10.511	0.98	3.139	0.66	1.200	0.39	0.328
35,000	3,012.9	1.73	12.053	1.06	3.593	0.71	1.372	0.42	0.375
37,500	3,228.1	1.85	13.694	1.13	4.076	0.76	1.555	0.45	0.424
40,000	3,443.3	1.98	15.434	1.21	4.587	0.81	1.748	0.48	0.477
42,500	3,658.5	2.10	17.274	1.28	5.126	0.86	1.952	0.50	0.532
45,000	3,873.7	2.22	19.212	1.36	5.694	0.91	2.166	0.53	0.589
47,500	4,089.0	2.35	21.250	1.43	6.289	0.96	2.390	0.56	0.650
50,000	4,304.2	2.47	23.385	1.51	6.913	1.02	2.625	0.59	0.713
52,500	4,519.4	2.59	25.618	1.58	7.564	1.07	2.870	0.62	0.778
55,000	4,734.6	2.72	27.949	1.66	8.243	1.12	3.125	0.65	0.847
57,500	4,949.8	2.84	30.378	1.73	8.949	1.17	3.390	0.68	0.918
60,000	5,165.0	2.97	32.905	1.81	9.683	1.22	3.665	0.71	0.992
62,500	5,380.2	3.09	35.529	1.89	10.445	1.27	3.950	0.74	1.068
65,000	5,595.4	–	–	1.96	11.234	1.32	4.246	0.77	1.147
67,500	5,810.6	–	–	2.04	12.050	1.37	4.551	0.80	1.228
70,000	6,025.8	–	–	2.11	12.893	1.42	4.866	0.83	1.312
72,500	6,241.0	–	–	2.19	13.764	1.47	5.191	0.86	1.399
75,000	6,456.2	–	–	2.26	14.662	1.52	5.527	0.89	1.488
77,500	6,671.4	–	–	2.34	15.588	1.57	5.872	0.92	1.580
80,000	6,886.7	–	–	2.41	16.540	1.62	6.227	0.95	1.674
82,500	7,101.9	–	–	2.49	17.520	1.68	6.592	0.98	1.771
85,000	7,317.1	–	–	2.56	18.526	1.73	6.966	1.01	1.871
87,500	7,532.3	–	–	2.64	19.560	1.78	7.351	1.04	1.973
90,000	7,747.5	–	–	2.71	20.620	1.83	7.745	1.07	2.077
92,500	7,962.7	–	–	2.79	21.708	1.88	8.150	1.10	2.184
95,000	8,177.9	–	–	2.87	22.823	1.93	8.564	1.13	2.294
97,500	8,393.1	–	–	2.94	23.964	1.98	8.987	1.16	2.406
100,000	8,608.3	–	–	3.02	25.133	2.03	9.421	1.19	2.520
105,000	9,038.7	–	–	–	–	2.13	10.317	1.25	2.757
110,000	9,469.2	–	–	–	–	2.23	11.252	1.31	3.003
115,000	9,899.6	–	–	–	–	2.34	12.226	1.37	3.260

d [mm]		28		35		42		54	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
120,000	10,330.0	–	–	–	–	2.44	13.239	1.43	3.526
125,000	10,760.4	–	–	–	–	2.54	14.290	1.48	3.802
130,000	11,190.8	–	–	–	–	2.64	15.380	1.54	4.088
135,000	11,621.2	–	–	–	–	2.74	16.509	1.60	4.384
140,000	12,051.6	–	–	–	–	2.84	17.676	1.66	4.689
145,000	12,482.1	–	–	–	–	2.94	18.881	1.72	5.005
150,000	12,912.5	–	–	–	–	3.05	20.125	1.78	5.330
155,000	13,342.9	–	–	–	–	–	–	1.84	5.665
160,000	13,773.3	–	–	–	–	–	–	1.90	6.009
165,000	14,203.7	–	–	–	–	–	–	1.96	6.363
170,000	14,634.1	–	–	–	–	–	–	2.02	6.727
175,000	15,064.6	–	–	–	–	–	–	2.08	7.101
180,000	15,495.0	–	–	–	–	–	–	2.14	7.484
185,000	15,925.4	–	–	–	–	–	–	2.20	7.877
190,000	16,355.8	–	–	–	–	–	–	2.26	8.279
195,000	16,786.2	–	–	–	–	–	–	2.32	8.691
200,000	17,216.6	–	–	–	–	–	–	2.38	9.113
205,000	17,647.1	–	–	–	–	–	–	2.43	9.544
210,000	18,077.5	–	–	–	–	–	–	2.49	9.985
215,000	18,507.9	–	–	–	–	–	–	2.55	10.435
220,000	18,938.3	–	–	–	–	–	–	2.61	10.895
225,000	19,368.7	–	–	–	–	–	–	2.67	11.364
230,000	19,799.1	–	–	–	–	–	–	2.73	11.843
235,000	20,229.6	–	–	–	–	–	–	2.79	12.332
240,000	20,660.0	–	–	–	–	–	–	2.85	12.830
245,000	21,090.4	–	–	–	–	–	–	2.91	13.337
250,000	21,520.8	–	–	–	–	–	–	2.97	13.854
255,000	21,951.2	–	–	–	–	–	–	3.03	14.381
260,000	22,381.6	–	–	–	–	–	–	3.09	14.917

3 / 3

Table 37: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating, inlet flow 60 °C / return flow 50 °C, d66.7–108 mm

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
7,000	602.6	0.05	0.008	–	–	–	–	–	–
7,500	645.6	0.06	0.009	–	–	–	–	–	–
8,000	688.7	0.06	0.010	–	–	–	–	–	–
8,500	731.7	0.06	0.011	0.05	0.006	–	–	–	–
9,000	774.7	0.07	0.012	0.05	0.007	–	–	–	–
9,500	817.8	0.07	0.013	0.06	0.007	–	–	–	–
10,000	860.8	0.08	0.014	0.06	0.008	–	–	–	–
10,500	903.9	0.08	0.015	0.06	0.009	–	–	–	–
11,000	946.9	0.08	0.017	0.07	0.009	–	–	–	–
11,500	990.0	0.09	0.018	0.07	0.010	–	–	–	–
12,000	1,033.0	0.09	0.019	0.07	0.011	0.05	0.005	–	–
12,500	1,076.0	0.10	0.021	0.07	0.012	0.05	0.005	–	–
13,000	1,119.1	0.10	0.022	0.08	0.012	0.06	0.006	–	–
13,500	1,162.1	0.10	0.024	0.08	0.013	0.06	0.006	–	–

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
14,000	1,205.2	0.11	0.026	0.08	0.014	0.06	0.007	–	–
14,500	1,248.2	0.11	0.027	0.09	0.015	0.06	0.007	–	–
15,000	1,291.2	0.11	0.029	0.09	0.016	0.06	0.007	–	–
15,500	1,334.3	0.12	0.031	0.09	0.017	0.07	0.008	–	–
16,000	1,377.3	0.12	0.032	0.10	0.018	0.07	0.008	–	–
16,500	1,420.4	0.13	0.034	0.10	0.019	0.07	0.009	–	–
17,000	1,463.4	0.13	0.036	0.10	0.020	0.07	0.009	–	–
17,500	1,506.5	0.13	0.038	0.10	0.021	0.07	0.010	–	–
18,000	1,549.5	0.14	0.040	0.11	0.022	0.08	0.010	0.05	0.004
18,500	1,592.5	0.14	0.042	0.11	0.023	0.08	0.011	0.05	0.004
19,000	1,635.6	0.14	0.044	0.11	0.024	0.08	0.011	0.05	0.004
19,500	1,678.6	0.15	0.046	0.12	0.025	0.08	0.012	0.06	0.004
20,000	1,721.7	0.15	0.048	0.12	0.026	0.09	0.012	0.06	0.005
20,500	1,764.7	0.16	0.050	0.12	0.028	0.09	0.013	0.06	0.005
21,000	1,807.7	0.16	0.052	0.12	0.029	0.09	0.013	0.06	0.005
21,500	1,850.8	0.16	0.054	0.13	0.030	0.09	0.014	0.06	0.005
22,000	1,893.8	0.17	0.056	0.13	0.031	0.09	0.014	0.06	0.005
22,500	1,936.9	0.17	0.059	0.13	0.033	0.10	0.015	0.06	0.006
23,000	1,979.9	0.18	0.061	0.14	0.034	0.10	0.016	0.07	0.006
23,500	2,023.0	0.18	0.063	0.14	0.035	0.10	0.016	0.07	0.006
24,000	2,066.0	0.18	0.066	0.14	0.036	0.10	0.017	0.07	0.006
24,500	2,109.0	0.19	0.068	0.15	0.038	0.10	0.017	0.07	0.007
25,000	2,152.1	0.19	0.071	0.15	0.039	0.11	0.018	0.07	0.007
25,500	2,195.1	0.19	0.073	0.15	0.041	0.11	0.019	0.07	0.007
26,000	2,238.2	0.20	0.076	0.15	0.042	0.11	0.019	0.07	0.007
26,500	2,281.2	0.20	0.079	0.16	0.043	0.11	0.020	0.08	0.008
27,000	2,324.2	0.21	0.081	0.16	0.045	0.12	0.021	0.08	0.008
27,500	2,367.3	0.21	0.084	0.16	0.046	0.12	0.021	0.08	0.008
28,000	2,410.3	0.21	0.087	0.17	0.048	0.12	0.022	0.08	0.008
28,500	2,453.4	0.22	0.089	0.17	0.049	0.12	0.023	0.08	0.009
29,000	2,496.4	0.22	0.092	0.17	0.051	0.12	0.023	0.08	0.009
29,500	2,539.5	0.22	0.095	0.18	0.052	0.13	0.024	0.08	0.009
30,000	2,582.5	0.23	0.098	0.18	0.054	0.13	0.025	0.09	0.009
32,500	2,797.7	0.25	0.113	0.19	0.062	0.14	0.029	0.09	0.011
35,000	3,012.9	0.27	0.129	0.21	0.071	0.15	0.033	0.10	0.012
37,500	3,228.1	0.29	0.146	0.22	0.080	0.16	0.037	0.11	0.014
40,000	3,443.3	0.30	0.163	0.24	0.090	0.17	0.041	0.11	0.016
42,500	3,658.5	0.32	0.182	0.25	0.100	0.18	0.046	0.12	0.017
45,000	3,873.7	0.34	0.202	0.27	0.111	0.19	0.051	0.13	0.019
47,500	4,089.0	0.36	0.222	0.28	0.122	0.20	0.056	0.14	0.021
50,000	4,304.2	0.38	0.244	0.30	0.134	0.21	0.061	0.14	0.023
52,500	4,519.4	0.40	0.266	0.31	0.146	0.22	0.067	0.15	0.025
55,000	4,734.6	0.42	0.289	0.33	0.159	0.24	0.073	0.16	0.027
57,500	4,949.8	0.44	0.313	0.34	0.172	0.25	0.079	0.16	0.030
60,000	5,165.0	0.46	0.338	0.36	0.186	0.26	0.085	0.17	0.032
62,500	5,380.2	0.48	0.364	0.37	0.200	0.27	0.091	0.18	0.034
65,000	5,595.4	0.49	0.390	0.39	0.215	0.28	0.098	0.19	0.037
67,500	5,810.6	0.51	0.418	0.40	0.230	0.29	0.105	0.19	0.039
70,000	6,025.8	0.53	0.446	0.42	0.245	0.30	0.112	0.20	0.042

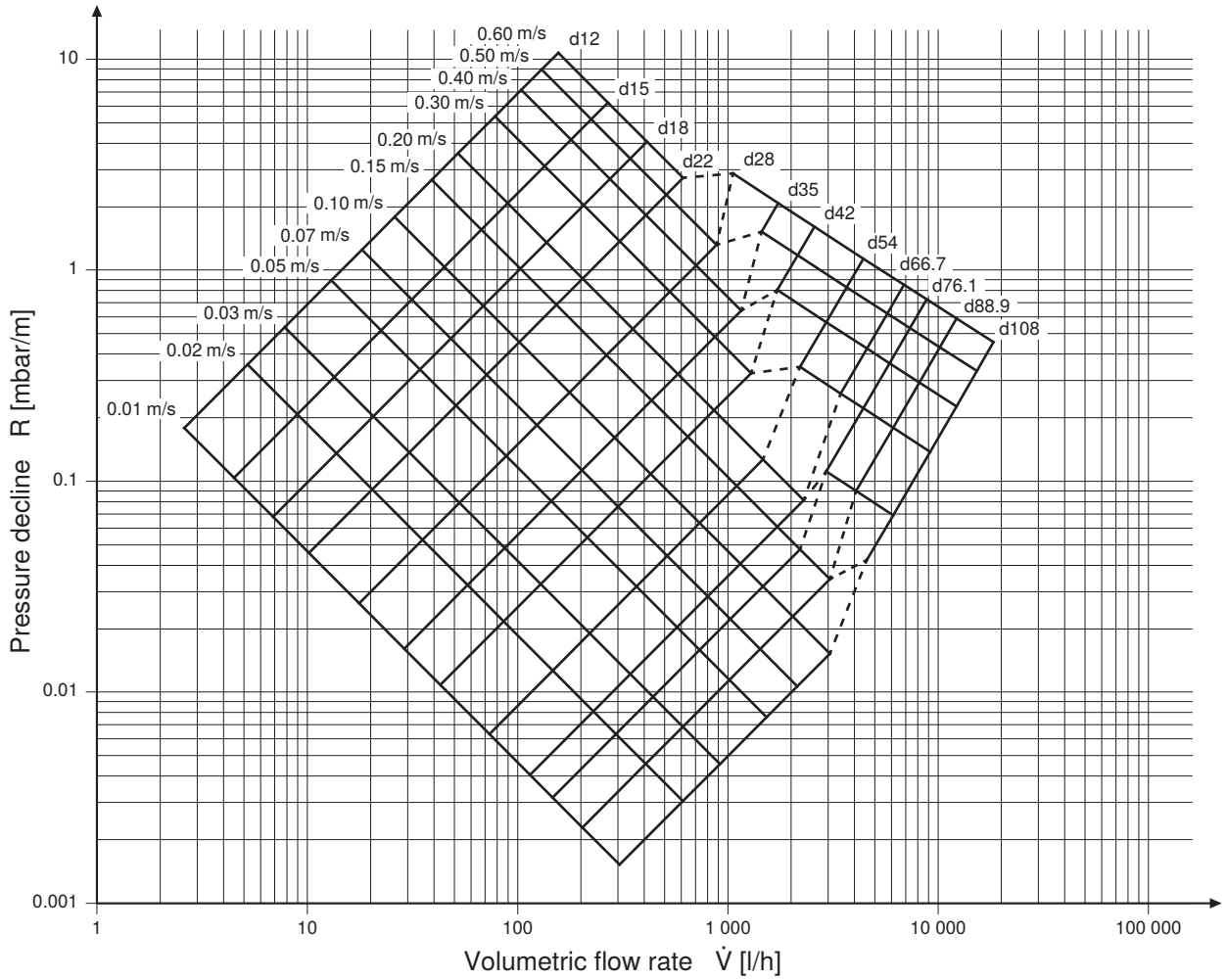
d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
72,500	6,241.0	0.55	0.476	0.43	0.261	0.31	0.119	0.21	0.045
75,000	6,456.2	0.57	0.506	0.45	0.278	0.32	0.126	0.21	0.048
77,500	6,671.4	0.59	0.537	0.46	0.295	0.33	0.134	0.22	0.051
80,000	6,886.7	0.61	0.568	0.48	0.312	0.34	0.142	0.23	0.053
82,500	7,101.9	0.63	0.601	0.49	0.330	0.35	0.150	0.24	0.056
85,000	7,317.1	0.65	0.634	0.51	0.348	0.36	0.158	0.24	0.060
87,500	7,532.3	0.67	0.669	0.52	0.367	0.37	0.167	0.25	0.063
90,000	7,747.5	0.69	0.704	0.53	0.386	0.39	0.175	0.26	0.066
92,500	7,962.7	0.70	0.740	0.55	0.406	0.40	0.184	0.26	0.069
95,000	8,177.9	0.72	0.776	0.56	0.426	0.41	0.193	0.27	0.073
97,500	8,393.1	0.74	0.814	0.58	0.446	0.42	0.203	0.28	0.076
100,000	8,608.3	0.76	0.852	0.59	0.467	0.43	0.212	0.29	0.080
105,000	9,038.7	0.80	0.932	0.62	0.511	0.45	0.232	0.30	0.087
110,000	9,469.2	0.84	1.014	0.65	0.556	0.47	0.252	0.31	0.095
115,000	9,899.6	0.88	1.100	0.68	0.602	0.49	0.273	0.33	0.102
120,000	10,330.0	0.91	1.189	0.71	0.651	0.51	0.295	0.34	0.111
125,000	10,760.4	0.95	1.281	0.74	0.701	0.54	0.317	0.36	0.119
130,000	11,190.8	0.99	1.376	0.77	0.753	0.56	0.341	0.37	0.128
135,000	11,621.2	1.03	1.475	0.80	0.807	0.58	0.365	0.39	0.137
140,000	12,051.6	1.07	1.577	0.83	0.862	0.60	0.390	0.40	0.146
145,000	12,482.1	1.10	1.682	0.86	0.919	0.62	0.415	0.41	0.156
150,000	12,912.5	1.14	1.790	0.89	0.978	0.64	0.442	0.43	0.165
155,000	13,342.9	1.18	1.901	0.92	1.038	0.66	0.469	0.44	0.176
160,000	13,773.3	1.22	2.015	0.95	1.100	0.69	0.497	0.46	0.186
165,000	14,203.7	1.26	2.133	0.98	1.164	0.71	0.526	0.47	0.197
170,000	14,634.1	1.29	2.254	1.01	1.230	0.73	0.555	0.49	0.207
175,000	15,064.6	1.33	2.377	1.04	1.297	0.75	0.585	0.50	0.219
180,000	15,495.0	1.37	2.504	1.07	1.366	0.77	0.616	0.51	0.230
185,000	15,925.4	1.41	2.634	1.10	1.436	0.79	0.647	0.53	0.242
190,000	16,355.8	1.45	2.767	1.13	1.509	0.81	0.680	0.54	0.254
195,000	16,786.2	1.48	2.904	1.16	1.582	0.84	0.713	0.56	0.266
200,000	17,216.6	1.52	3.043	1.19	1.658	0.86	0.747	0.57	0.279
205,000	17,647.1	1.56	3.185	1.22	1.735	0.88	0.781	0.59	0.291
210,000	18,077.5	1.60	3.331	1.25	1.814	0.90	0.816	0.60	0.304
215,000	18,507.9	1.64	3.479	1.28	1.894	0.92	0.852	0.61	0.318
220,000	18,938.3	1.67	3.631	1.31	1.976	0.94	0.889	0.63	0.331
225,000	19,368.7	1.71	3.786	1.34	2.060	0.96	0.927	0.64	0.345
230,000	19,799.1	1.75	3.944	1.37	2.145	0.99	0.965	0.66	0.359
235,000	20,229.6	1.79	4.104	1.40	2.232	1.01	1.003	0.67	0.374
240,000	20,660.0	1.83	4.268	1.43	2.321	1.03	1.043	0.69	0.388
245,000	21,090.4	1.86	4.435	1.46	2.411	1.05	1.083	0.70	0.403
250,000	21,520.8	1.90	4.605	1.49	2.503	1.07	1.124	0.71	0.418
255,000	21,951.2	1.94	4.778	1.52	2.597	1.09	1.166	0.73	0.434
260,000	22,381.6	1.98	4.954	1.54	2.692	1.11	1.208	0.74	0.449
265,000	22,812.1	2.02	5.134	1.57	2.789	1.14	1.252	0.76	0.465
270,000	23,242.5	2.06	5.316	1.60	2.887	1.16	1.295	0.77	0.482
275,000	23,672.9	2.09	5.501	1.63	2.987	1.18	1.340	0.79	0.498
280,000	24,103.3	2.13	5.689	1.66	3.089	1.20	1.385	0.80	0.515
285,000	24,533.7	2.17	5.881	1.69	3.192	1.22	1.431	0.81	0.532

d [mm]		66.7		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
290,000	24,964.1	2.21	6.075	1.72	3.297	1.24	1.478	0.83	0.549
295,000	25,394.5	2.25	6.272	1.75	3.403	1.26	1.525	0.84	0.566
300,000	25,825.0	2.28	6.473	1.78	3.511	1.29	1.573	0.86	0.584
310,000	26,685.8	2.36	6.882	1.84	3.732	1.33	1.672	0.89	0.620
320,000	27,546.6	2.44	7.304	1.90	3.960	1.37	1.773	0.91	0.657
330,000	28,407.5	2.51	7.738	1.96	4.193	1.41	1.877	0.94	0.695
340,000	29,268.3	2.59	8.184	2.02	4.434	1.46	1.983	0.97	0.735
350,000	30,129.1	2.66	8.642	2.08	4.680	1.50	2.093	1.00	0.775
360,000	30,990.0	2.74	9.112	2.14	4.933	1.54	2.205	1.03	0.816
370,000	31,850.8	2.82	9.594	2.20	5.193	1.59	2.320	1.06	0.858
380,000	32,711.6	2.89	10.088	2.26	5.458	1.63	2.438	1.09	0.901
390,000	33,572.5	2.97	10.594	2.32	5.730	1.67	2.558	1.11	0.946
400,000	34,433.3	3.04	11.112	2.38	6.009	1.71	2.682	1.14	0.991
410,000	35,294.1	–	–	2.44	6.293	1.76	2.808	1.17	1.037
420,000	36,154.9	–	–	2.50	6.584	1.80	2.936	1.20	1.084
430,000	37,015.8	–	–	2.55	6.882	1.84	3.068	1.23	1.132
440,000	37,876.6	–	–	2.61	7.185	1.89	3.202	1.26	1.182
450,000	38,737.4	–	–	2.67	7.495	1.93	3.339	1.29	1.232
460,000	39,598.3	–	–	2.73	7.812	1.97	3.479	1.31	1.283
470,000	40,459.1	–	–	2.79	8.134	2.01	3.622	1.34	1.335
480,000	41,319.9	–	–	2.85	8.463	2.06	3.767	1.37	1.388
490,000	42,180.8	–	–	2.91	8.799	2.10	3.915	1.40	1.442
500,000	43,041.6	–	–	2.97	9.140	2.14	4.066	1.43	1.497
550,000	47,345.8	–	–	–	–	2.36	4.860	1.57	1.787
600,000	51,649.9	–	–	–	–	2.57	5.723	1.71	2.100
650,000	55,954.1	–	–	–	–	2.79	6.653	1.86	2.438
700,000	60,258.2	–	–	–	–	3.00	7.650	2.00	2.800
750,000	64,562.4	–	–	–	–	–	–	2.14	3.186
800,000	68,866.6	–	–	–	–	–	–	2.28	3.595
850,000	73,170.7	–	–	–	–	–	–	2.43	4.028
900,000	77,474.9	–	–	–	–	–	–	2.57	4.485
950,000	81,779.1	–	–	–	–	–	–	2.71	4.966
1,000,000	86,083.2	–	–	–	–	–	–	2.86	5.470
1,050,000	90,387.4	–	–	–	–	–	–	3.00	5.997

4 PRESSURE LOSS HEATING OIL EL

4.1 HEATING OIL EL, 20 °C

Medium:	Heating oil EL	Viscosity:	0.00516 Pa•s
Temperature:	20 °C	Kinematic viscosity:	0.000006 m^2/s
Density:	860 kg/m^3	Surface roughness:	0.01 mm



——— Pure turbulent or laminar flow

- - - - - Transition between turbulent and laminar flow

Table 38: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating oil EL 20 °C, d12–22 mm

d [mm]		12		15		18		22	
ṁ [kg/h]	V̇ [l/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
0.25	0.3	0.001	0.0200	–	–	–	–	–	–
0.50	0.6	0.002	0.0400	0.001	0.0135	–	–	–	–
0.75	0.9	0.003	0.0600	0.002	0.0202	0.001	0.0086	–	–
1.00	1.2	0.004	0.0800	0.003	0.0269	0.002	0.0115	0.001	0.0052
1.25	1.5	0.006	0.0999	0.003	0.0337	0.002	0.0143	0.001	0.0065
1.50	1.7	0.007	0.1199	0.004	0.0404	0.003	0.0172	0.002	0.0078
1.75	2.0	0.008	0.1399	0.005	0.0471	0.003	0.0201	0.002	0.0091
2.00	2.3	0.009	0.1599	0.005	0.0539	0.003	0.0229	0.002	0.0104
2.25	2.6	0.010	0.1799	0.006	0.0606	0.004	0.0258	0.003	0.0117
2.50	2.9	0.011	0.1999	0.006	0.0674	0.004	0.0287	0.003	0.0130
2.75	3.2	0.012	0.2199	0.007	0.0741	0.005	0.0315	0.003	0.0143
3.00	3.5	0.013	0.2399	0.008	0.0808	0.005	0.0344	0.003	0.0156
3.25	3.8	0.015	0.2598	0.008	0.0876	0.005	0.0373	0.004	0.0169
3.50	4.1	0.016	0.2798	0.009	0.0943	0.006	0.0401	0.004	0.0182
3.75	4.4	0.017	0.2998	0.010	0.1010	0.006	0.0430	0.004	0.0195
4.00	4.7	0.018	0.3198	0.010	0.1078	0.007	0.0459	0.005	0.0208
4.25	4.9	0.019	0.3398	0.011	0.1145	0.007	0.0487	0.005	0.0221
4.50	5.2	0.020	0.3598	0.012	0.1212	0.008	0.0516	0.005	0.0234
4.75	5.5	0.021	0.3798	0.012	0.1280	0.008	0.0545	0.005	0.0248
5.00	5.8	0.022	0.3998	0.013	0.1347	0.008	0.0573	0.006	0.0261
5.50	6.4	0.025	0.4397	0.014	0.1482	0.009	0.0631	0.006	0.0287
6.00	7.0	0.027	0.4797	0.016	0.1617	0.010	0.0688	0.007	0.0313
6.50	7.6	0.029	0.5197	0.017	0.1751	0.011	0.0745	0.007	0.0339
7.00	8.1	0.031	0.5597	0.018	0.1886	0.012	0.0803	0.008	0.0365
7.50	8.7	0.033	0.5996	0.019	0.2021	0.013	0.0860	0.009	0.0391
8.00	9.3	0.036	0.6396	0.021	0.2155	0.014	0.0917	0.009	0.0417
8.50	9.9	0.038	0.6796	0.022	0.2290	0.014	0.0975	0.010	0.0443
9.00	10.5	0.040	0.7196	0.023	0.2425	0.015	0.1032	0.010	0.0469
9.50	11.0	0.042	0.7595	0.025	0.2559	0.016	0.1089	0.011	0.0495
10	11.6	0.045	0.7995	0.026	0.2694	0.017	0.1147	0.011	0.0521
15	17.4	0.067	1.1993	0.039	0.4041	0.025	0.1720	0.017	0.0782
20	23.3	0.089	1.5990	0.052	0.5388	0.034	0.2293	0.023	0.1042
25	29.1	0.112	1.9988	0.065	0.6735	0.042	0.2866	0.028	0.1303
30	34.9	0.134	2.3985	0.078	0.8083	0.051	0.3440	0.034	0.1563
35	40.7	0.156	2.7983	0.091	0.9430	0.059	0.4013	0.040	0.1824
40	46.5	0.178	3.1980	0.104	1.0777	0.068	0.4586	0.046	0.2084
45	52.3	0.201	3.5978	0.117	1.2124	0.076	0.5160	0.051	0.2345
50	58.1	0.223	3.9976	0.130	1.3471	0.084	0.5733	0.057	0.2605
55	64.0	0.245	4.3973	0.142	1.4818	0.093	0.6306	0.063	0.2866
60	69.8	0.268	4.7971	0.155	1.6165	0.101	0.6880	0.068	0.3126
65	75.6	0.290	5.1968	0.168	1.7512	0.110	0.7453	0.074	0.3387
70	81.4	0.312	5.5966	0.181	1.8859	0.118	0.8026	0.080	0.3647
75	87.2	0.335	5.9963	0.194	2.0206	0.127	0.8599	0.085	0.3908
80	93.0	0.357	6.3961	0.207	2.1553	0.135	0.9173	0.091	0.4169
85	98.8	0.379	6.7958	0.220	2.2901	0.144	0.9746	0.097	0.4429
90	104.7	0.402	7.1956	0.233	2.4248	0.152	1.0319	0.103	0.4690
95	110.5	0.424	7.5953	0.246	2.5595	0.161	1.0893	0.108	0.4950
100	116.3	0.446	7.9951	0.259	2.6942	0.169	1.1466	0.114	0.5211

d [mm]		12		15		18		22	
ṁ [kg/h]	V̇ [l/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
125	145.3	–	–	0.324	3.3677	0.211	1.4332	0.142	0.6513
150	174.4	–	–	0.389	4.0413	0.253	1.7199	0.171	0.7816
175	203.5	–	–	0.453	4.7148	0.296	2.0065	0.199	0.9119
200	232.6	–	–	0.518	5.3884	0.338	2.2932	0.228	1.0421
250	290.7	–	–	–	–	0.422	2.8665	0.285	1.3027
300	348.8	–	–	–	–	0.507	3.4398	0.342	1.5632
350	407.0	–	–	–	–	–	–	0.399	1.8237
400	465.1	–	–	–	–	–	–	0.456	2.0843
450	523.3	–	–	–	–	–	–	0.513	2.3448

Table 39: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating oil EL 20 °C, d28–54 mm

d [mm]		28		35		42		54	
ṁ [kg/h]	V̇ [l/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1.75	2.0	0.001	0.0030	–	–	–	–	–	–
2.00	2.3	0.001	0.0035	–	–	–	–	–	–
2.25	2.6	0.001	0.0039	–	–	–	–	–	–
2.50	2.9	0.002	0.0043	–	–	–	–	–	–
2.75	3.2	0.002	0.0048	0.001	0.0018	–	–	–	–
3.00	3.5	0.002	0.0052	0.001	0.0019	–	–	–	–
3.25	3.8	0.002	0.0056	0.001	0.0021	–	–	–	–
3.50	4.1	0.002	0.0061	0.001	0.0023	–	–	–	–
3.75	4.4	0.002	0.0065	0.002	0.0024	–	–	–	–
4.00	4.7	0.003	0.0070	0.002	0.0026	–	–	–	–
4.25	4.9	0.003	0.0074	0.002	0.0028	0.001	0.0012	–	–
4.50	5.2	0.003	0.0078	0.002	0.0029	0.001	0.0013	–	–
4.75	5.5	0.003	0.0083	0.002	0.0031	0.001	0.0014	–	–
5.00	5.8	0.003	0.0087	0.002	0.0032	0.001	0.0015	–	–
5.50	6.4	0.004	0.0096	0.002	0.0036	0.001	0.0016	–	–
6.00	7.0	0.004	0.0104	0.002	0.0039	0.002	0.0018	–	–
6.50	7.6	0.004	0.0113	0.003	0.0042	0.002	0.0019	–	–
7.00	8.1	0.005	0.0122	0.003	0.0045	0.002	0.0021	0.001	0.0007
7.50	8.7	0.005	0.0130	0.003	0.0049	0.002	0.0022	0.001	0.0008
8.00	9.3	0.005	0.0139	0.003	0.0052	0.002	0.0023	0.001	0.0008
8.50	9.9	0.006	0.0148	0.003	0.0055	0.002	0.0025	0.001	0.0009
9.00	10.5	0.006	0.0156	0.004	0.0058	0.002	0.0026	0.001	0.0009
9.50	11.0	0.006	0.0165	0.004	0.0062	0.003	0.0028	0.002	0.0010
10	11.6	0.007	0.0174	0.004	0.0065	0.003	0.0029	0.002	0.0010
15	17.4	0.010	0.0261	0.006	0.0097	0.004	0.0044	0.002	0.0015
20	23.3	0.013	0.0348	0.008	0.0130	0.005	0.0059	0.003	0.0020
25	29.1	0.016	0.0435	0.010	0.0162	0.007	0.0073	0.004	0.0025
30	34.9	0.020	0.0522	0.012	0.0194	0.008	0.0088	0.005	0.0030
35	40.7	0.023	0.0608	0.014	0.0227	0.009	0.0103	0.006	0.0035
40	46.5	0.026	0.0695	0.016	0.0259	0.011	0.0117	0.006	0.0040
45	52.3	0.030	0.0782	0.018	0.0291	0.012	0.0132	0.007	0.0045
50	58.1	0.033	0.0869	0.020	0.0324	0.014	0.0147	0.008	0.0050
55	64.0	0.036	0.0956	0.022	0.0356	0.015	0.0161	0.009	0.0055
60	69.8	0.039	0.1043	0.024	0.0389	0.016	0.0176	0.009	0.0060

d [mm]		28		35		42		54	
ṁ [kg/h]	V̇ [l/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
65	75.6	0.043	0.1130	0.026	0.0421	0.018	0.0191	0.010	0.0065
70	81.4	0.046	0.1217	0.028	0.0453	0.019	0.0205	0.011	0.0070
75	87.2	0.049	0.1304	0.030	0.0486	0.020	0.0220	0.012	0.0075
80	93.0	0.053	0.1391	0.032	0.0518	0.022	0.0235	0.013	0.0080
85	98.8	0.056	0.1478	0.034	0.0550	0.023	0.0249	0.013	0.0085
90	104.7	0.059	0.1565	0.036	0.0583	0.024	0.0264	0.014	0.0090
95	110.5	0.063	0.1651	0.038	0.0615	0.026	0.0279	0.015	0.0095
100	116.3	0.066	0.1738	0.040	0.0648	0.027	0.0294	0.016	0.0100
125	145.3	0.082	0.2173	0.050	0.0810	0.034	0.0367	0.020	0.0125
150	174.4	0.099	0.2608	0.060	0.0971	0.041	0.0440	0.024	0.0151
175	203.5	0.115	0.3042	0.070	0.1133	0.047	0.0514	0.028	0.0176
200	232.6	0.132	0.3477	0.080	0.1295	0.054	0.0587	0.032	0.0201
250	290.7	0.165	0.4346	0.100	0.1619	0.068	0.0734	0.040	0.0251
300	348.8	0.197	0.5215	0.120	0.1943	0.081	0.0881	0.047	0.0301
350	407.0	0.230	0.6084	0.141	0.2267	0.095	0.1027	0.055	0.0351
400	465.1	0.263	0.6954	0.161	0.2590	0.108	0.1174	0.063	0.0402
450	523.3	0.296	0.7823	0.181	0.2914	0.122	0.1321	0.071	0.0452
500	581.4	0.329	0.8692	0.201	0.3238	0.135	0.1468	0.079	0.0502
550	639.5	0.362	0.9561	0.221	0.3562	0.149	0.1614	0.087	0.0552
600	697.7	0.395	1.0430	0.241	0.3886	0.162	0.1761	0.095	0.0602
650	755.8	0.428	1.1300	0.261	0.4209	0.176	0.1908	0.103	0.0652
700	814.0	0.461	1.2169	0.281	0.4533	0.189	0.2055	0.111	0.0703
750	872.1	0.494	1.3038	0.301	0.4857	0.203	0.2201	0.119	0.0753
800	930.2	–	–	0.321	0.5181	0.216	0.2348	0.126	0.0803
850	988.4	–	–	0.341	0.5505	0.230	0.2495	0.134	0.0853
900	1,046.5	–	–	0.361	0.5828	0.243	0.2642	0.142	0.0903
950	1,104.7	–	–	0.382	0.6152	0.257	0.2789	0.150	0.0954
1,000	1,162.8	–	–	0.402	0.6476	0.270	0.2935	0.158	0.1004
1,050	1,220.9	–	–	0.422	0.6800	0.284	0.3082	0.166	0.1054
1,100	1,279.1	–	–	0.442	1.2392	0.297	0.3229	0.174	0.1104
1,150	1,337.2	–	–	0.462	1.3357	0.311	0.3376	0.182	0.1154
1,200	1,395.3	–	–	0.482	1.4353	0.324	0.3522	0.190	0.1205
1,250	1,453.5	–	–	0.502	1.5380	0.338	0.3669	0.198	0.1255
1,300	1,511.6	–	–	–	–	0.351	0.3816	0.206	0.1305
1,350	1,569.8	–	–	–	–	0.365	0.6920	0.213	0.1355
1,400	1,627.9	–	–	–	–	0.379	0.7357	0.221	0.1405
1,450	1,686.0	–	–	–	–	0.392	0.7807	0.229	0.1455
1,500	1,744.2	–	–	–	–	0.406	0.8267	0.237	0.1506
1,550	1,802.3	–	–	–	–	0.419	0.8739	0.245	0.1556
1,600	1,860.5	–	–	–	–	0.433	0.9221	0.253	0.1606
1,650	1,918.6	–	–	–	–	0.446	0.9715	0.261	0.1656
1,700	1,976.7	–	–	–	–	0.460	1.0219	0.269	0.1706
1,750	2,034.9	–	–	–	–	0.473	1.0735	0.277	0.3046
1,800	2,093.0	–	–	–	–	0.487	1.1261	0.285	0.3194
1,850	2,151.2	–	–	–	–	0.500	1.1798	0.293	0.3345
1,900	2,209.3	–	–	–	–	0.514	1.2345	0.300	0.3499
1,950	2,267.4	–	–	–	–	–	–	0.308	0.3656
2,000	2,325.6	–	–	–	–	–	–	0.316	0.3816
2,050	2,383.7	–	–	–	–	–	–	0.324	0.3979

d [mm]		28		35		42		54	
ṁ [kg/h]	V̇ [l/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
2,100	2,441.9	–	–	–	–	–	–	0.332	0.4144
2,150	2,500.0	–	–	–	–	–	–	0.340	0.4313
2,200	2,558.1	–	–	–	–	–	–	0.348	0.4484
2,250	2,616.3	–	–	–	–	–	–	0.356	0.4658
2,300	2,674.4	–	–	–	–	–	–	0.364	0.4835
2,350	2,732.6	–	–	–	–	–	–	0.372	0.5015
2,400	2,790.7	–	–	–	–	–	–	0.379	0.5198
2,450	2,848.8	–	–	–	–	–	–	0.387	0.5383
2,500	2,907.0	–	–	–	–	–	–	0.395	0.5571
2,550	2,965.1	–	–	–	–	–	–	0.403	0.5762
2,600	3,023.3	–	–	–	–	–	–	0.411	0.5956
2,650	3,081.4	–	–	–	–	–	–	0.419	0.6152
2,700	3,139.5	–	–	–	–	–	–	0.427	0.6351
2,750	3,197.7	–	–	–	–	–	–	0.435	0.6553
2,800	3,255.8	–	–	–	–	–	–	0.443	0.6757
2,850	3,314.0	–	–	–	–	–	–	0.451	0.6964
2,900	3,372.1	–	–	–	–	–	–	0.459	0.7174
2,950	3,430.2	–	–	–	–	–	–	0.466	0.7387
3,000	3,488.4	–	–	–	–	–	–	0.474	0.7602
3,100	3,604.7	–	–	–	–	–	–	0.490	0.8040
3,200	3,720.9	–	–	–	–	–	–	0.506	0.8488

Table 40: Pressure loss for Geberit Mapress carbon steel system pipes 1.0034, heating oil EL 20 °C, d66.7–108 mm

d [mm]		66.7		77.1		88.9		108	
ṁ [kg/h]	V̇ [l/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
15	17.4	0.002	0.0006	0.001	0.0004	–	–	–	–
20	23.3	0.002	0.0008	0.002	0.0005	0.001	0.0003	–	–
25	29.1	0.003	0.0010	0.002	0.0006	0.001	0.0003	–	–
30	34.9	0.003	0.0012	0.002	0.0008	0.002	0.0004	0.001	0.0002
35	40.7	0.004	0.0014	0.003	0.0009	0.002	0.0005	0.001	0.0002
40	46.5	0.004	0.0016	0.003	0.0010	0.002	0.0005	0.002	0.0002
45	52.3	0.005	0.0019	0.004	0.0011	0.003	0.0006	0.002	0.0003
50	58.1	0.005	0.0021	0.004	0.0013	0.003	0.0007	0.002	0.0003
55	64.0	0.006	0.0023	0.004	0.0014	0.003	0.0007	0.002	0.0003
60	69.8	0.006	0.0025	0.005	0.0015	0.003	0.0008	0.002	0.0003
65	75.6	0.007	0.0027	0.005	0.0016	0.004	0.0008	0.002	0.0004
70	81.4	0.007	0.0029	0.006	0.0018	0.004	0.0009	0.003	0.0004
75	87.2	0.008	0.0031	0.006	0.0019	0.004	0.0010	0.003	0.0004
80	93.0	0.008	0.0033	0.006	0.0020	0.005	0.0010	0.003	0.0005
85	98.8	0.009	0.0035	0.007	0.0021	0.005	0.0011	0.003	0.0005
90	104.7	0.009	0.0037	0.007	0.0023	0.005	0.0012	0.003	0.0005
95	110.5	0.010	0.0039	0.008	0.0024	0.005	0.0012	0.004	0.0006
100	116.3	0.010	0.0041	0.008	0.0025	0.006	0.0013	0.004	0.0006
125	145.3	0.013	0.0052	0.010	0.0031	0.007	0.0016	0.005	0.0007
150	174.4	0.015	0.0062	0.012	0.0038	0.009	0.0020	0.006	0.0009
175	203.5	0.018	0.0072	0.014	0.0044	0.010	0.0023	0.007	0.0010
200	232.6	0.020	0.0082	0.016	0.0050	0.011	0.0026	0.008	0.0012

d [mm]		66.7		77.1		88.9		108	
ṁ [kg/h]	V̇ [l/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
250	290.7	0.025	0.0103	0.020	0.0063	0.014	0.0033	0.010	0.0015
300	348.8	0.030	0.0124	0.024	0.0075	0.017	0.0039	0.011	0.0017
350	407.0	0.035	0.0144	0.028	0.0088	0.020	0.0046	0.013	0.0020
400	465.1	0.041	0.0165	0.032	0.0101	0.023	0.0052	0.015	0.0023
450	523.3	0.046	0.0186	0.036	0.0113	0.026	0.0059	0.017	0.0026
500	581.4	0.051	0.0206	0.040	0.0126	0.029	0.0065	0.019	0.0029
550	639.5	0.056	0.0227	0.044	0.0138	0.031	0.0072	0.021	0.0032
600	697.7	0.061	0.0247	0.047	0.0151	0.034	0.0078	0.023	0.0035
650	755.8	0.066	0.0268	0.051	0.0163	0.037	0.0085	0.025	0.0038
700	814.0	0.071	0.0289	0.055	0.0176	0.040	0.0091	0.027	0.0041
750	872.1	0.076	0.0309	0.059	0.0188	0.043	0.0098	0.029	0.0044
800	930.2	0.081	0.0330	0.063	0.0201	0.046	0.0105	0.030	0.0046
850	988.4	0.086	0.0351	0.067	0.0214	0.048	0.0111	0.032	0.0049
900	1,046.5	0.091	0.0371	0.071	0.0226	0.051	0.0118	0.034	0.0052
950	1,104.7	0.096	0.0392	0.075	0.0239	0.054	0.0124	0.036	0.0055
1,000	1,162.8	0.101	0.0412	0.079	0.0251	0.057	0.0131	0.038	0.0058
1,050	1,220.9	0.106	0.0433	0.083	0.0264	0.060	0.0137	0.040	0.0061
1,100	1,279.1	0.111	0.0454	0.087	0.0276	0.063	0.0144	0.042	0.0064
1,150	1,337.2	0.117	0.0474	0.091	0.0289	0.066	0.0150	0.044	0.0067
1,200	1,395.3	0.122	0.0495	0.095	0.0302	0.068	0.0157	0.046	0.0070
1,250	1,453.5	0.127	0.0516	0.099	0.0314	0.071	0.0163	0.048	0.0073
1,300	1,511.6	0.132	0.0536	0.103	0.0327	0.074	0.0170	0.049	0.0075
1,350	1,569.8	0.137	0.0557	0.107	0.0339	0.077	0.0176	0.051	0.0078
1,400	1,627.9	0.142	0.0577	0.111	0.0352	0.080	0.0183	0.053	0.0081
1,450	1,686.0	0.147	0.0598	0.115	0.0364	0.083	0.0190	0.055	0.0084
1,500	1,744.2	0.152	0.0619	0.119	0.0377	0.086	0.0196	0.057	0.0087
1,550	1,802.3	0.157	0.0639	0.123	0.0389	0.088	0.0203	0.059	0.0090
1,600	1,860.5	0.162	0.0660	0.127	0.0402	0.091	0.0209	0.061	0.0093
1,650	1,918.6	0.167	0.0681	0.131	0.0415	0.094	0.0216	0.063	0.0096
1,700	1,976.7	0.172	0.0701	0.134	0.0427	0.097	0.0222	0.065	0.0099
1,750	2,034.9	0.177	0.0722	0.138	0.0440	0.100	0.0229	0.067	0.0102
1,800	2,093.0	0.182	0.0742	0.142	0.0452	0.103	0.0235	0.068	0.0104
1,850	2,151.2	0.188	0.0763	0.146	0.0465	0.106	0.0242	0.070	0.0107
1,900	2,209.3	0.193	0.0784	0.150	0.0477	0.108	0.0248	0.072	0.0110
1,950	2,267.4	0.198	0.0804	0.154	0.0490	0.111	0.0255	0.074	0.0113
2,000	2,325.6	0.203	0.0825	0.158	0.0503	0.114	0.0261	0.076	0.0116
2,050	2,383.7	0.208	0.0845	0.162	0.0515	0.117	0.0268	0.078	0.0119
2,100	2,441.9	0.213	0.0866	0.166	0.0528	0.120	0.0274	0.080	0.0122
2,150	2,500.0	0.218	0.1519	0.170	0.0540	0.123	0.0281	0.082	0.0125
2,200	2,558.1	0.223	0.1579	0.174	0.0553	0.126	0.0288	0.084	0.0128
2,250	2,616.3	0.228	0.1640	0.178	0.0565	0.128	0.0294	0.086	0.0131
2,300	2,674.4	0.233	0.1702	0.182	0.0578	0.131	0.0301	0.087	0.0134
2,350	2,732.6	0.238	0.1765	0.186	0.0591	0.134	0.0307	0.089	0.0136
2,400	2,790.7	0.243	0.1829	0.190	0.0603	0.137	0.0314	0.091	0.0139
2,450	2,848.8	0.248	0.1894	0.194	0.1059	0.140	0.0320	0.093	0.0142
2,500	2,907.0	0.253	0.1960	0.198	0.1096	0.143	0.0327	0.095	0.0145
2,550	2,965.1	0.258	0.2026	0.202	0.1133	0.145	0.0333	0.097	0.0148
2,600	3,023.3	0.264	0.2094	0.206	0.1171	0.148	0.0340	0.099	0.0151
2,650	3,081.4	0.269	0.2163	0.210	0.1209	0.151	0.0346	0.101	0.0154

d [mm]		66.7		77.1		88.9		108	
ṁ [kg/h]	V̇ [l/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
2,700	3,139.5	0.274	0.2232	0.214	0.1248	0.154	0.0353	0.103	0.0157
2,750	3,197.7	0.279	0.2303	0.218	0.1287	0.157	0.0359	0.105	0.0160
2,800	3,255.8	0.284	0.2374	0.222	0.1327	0.160	0.0366	0.106	0.0163
2,850	3,314.0	0.289	0.2446	0.225	0.1367	0.163	0.0635	0.108	0.0165
2,900	3,372.1	0.294	0.2520	0.229	0.1408	0.165	0.0654	0.110	0.0168
2,950	3,430.2	0.299	0.2594	0.233	0.1449	0.168	0.0673	0.112	0.0171
3,000	3,488.4	0.304	0.2669	0.237	0.1491	0.171	0.0693	0.114	0.0174
3,100	3,604.7	0.314	0.2822	0.245	0.1576	0.177	0.0732	0.118	0.0180
3,200	3,720.9	0.324	0.2978	0.253	0.1664	0.183	0.0772	0.122	0.0186
3,300	3,837.2	0.334	0.3138	0.261	0.1753	0.188	0.0814	0.125	0.0192
3,400	3,953.5	0.345	0.3302	0.269	0.1844	0.194	0.0856	0.129	0.0197
3,500	4,069.8	0.355	0.3469	0.277	0.1937	0.200	0.0899	0.133	0.0347
3,600	4,186.0	0.365	0.3640	0.285	0.2032	0.205	0.0943	0.137	0.0364
3,700	4,302.3	0.375	0.3814	0.293	0.2129	0.211	0.0987	0.141	0.0381
3,800	4,418.6	0.385	0.3992	0.301	0.2228	0.217	0.1033	0.144	0.0399
3,900	4,534.9	0.395	0.4173	0.309	0.2328	0.223	0.1080	0.148	0.0416
4,000	4,651.2	0.405	0.4358	0.316	0.2431	0.228	0.1127	0.152	0.0435
4,100	4,767.4	0.416	0.4546	0.324	0.2536	0.234	0.1175	0.156	0.0453
4,200	4,883.7	0.426	0.4737	0.332	0.2642	0.240	0.1224	0.160	0.0472
4,300	5,000.0	0.436	0.4932	0.340	0.2750	0.245	0.1274	0.163	0.0491
4,400	5,116.3	0.446	0.5130	0.348	0.2861	0.251	0.1325	0.167	0.0511
4,500	5,232.6	0.456	0.5331	0.356	0.2973	0.257	0.1377	0.171	0.0530
4,600	5,348.8	0.466	0.5536	0.364	0.3086	0.262	0.1429	0.175	0.0551
4,700	5,465.1	0.476	0.5744	0.372	0.3202	0.268	0.1483	0.179	0.0571
4,800	5,581.4	0.486	0.5955	0.380	0.3319	0.274	0.1537	0.183	0.0592
4,900	5,697.7	0.497	0.6170	0.388	0.3439	0.280	0.1592	0.186	0.0613
5,000	5,814.0	0.507	0.6388	0.396	0.3560	0.285	0.1648	0.190	0.0634
5,100	5,930.2	0.517	0.6609	0.403	0.3683	0.291	0.1704	0.194	0.0656
5,200	6,046.5	–	–	0.411	0.3807	0.297	0.1762	0.198	0.0678
5,300	6,162.8	–	–	0.419	0.3934	0.302	0.1820	0.202	0.0700
5,400	6,279.1	–	–	0.427	0.4062	0.308	0.1879	0.205	0.0723
5,500	6,395.3	–	–	0.435	0.4192	0.314	0.1939	0.209	0.0746
5,600	6,511.6	–	–	0.443	0.4324	0.320	0.2000	0.213	0.0769
5,700	6,627.9	–	–	0.451	0.4457	0.325	0.2061	0.217	0.0793
5,800	6,744.2	–	–	0.459	0.4592	0.331	0.2124	0.221	0.0816
5,900	6,860.5	–	–	0.467	0.4729	0.337	0.2187	0.224	0.0841
6,000	6,976.7	–	–	0.475	0.4868	0.342	0.2251	0.228	0.0865
6,100	7,093.0	–	–	0.483	0.5009	0.348	0.2315	0.232	0.0890
6,200	7,209.3	–	–	0.490	0.5151	0.354	0.2381	0.236	0.0915
6,300	7,325.6	–	–	0.498	0.5295	0.359	0.2447	0.240	0.0940
6,400	7,441.9	–	–	0.506	0.5440	0.365	0.2514	0.243	0.0966
6,500	7,558.1	–	–	0.514	0.5587	0.371	0.2582	0.247	0.0992
7,000	8,139.5	–	–	–	–	0.399	0.2932	0.266	0.1126
7,500	8,720.9	–	–	–	–	0.428	0.3302	0.285	0.1267
8,000	9,302.3	–	–	–	–	0.456	0.3690	0.304	0.1415
8,500	9,883.7	–	–	–	–	0.485	0.4097	0.323	0.1570
9,000	10,465.1	–	–	–	–	0.513	0.4522	0.342	0.1733
9,500	11,046.5	–	–	–	–	–	–	0.361	0.1902
10,000	11,627.9	–	–	–	–	–	–	0.380	0.2077

d [mm]		66.7		77.1		88.9		108	
ṁ [kg/h]	V̇ [l/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
10,500	12,209.3	–	–	–	–	–	–	0.399	0.2260
11,000	12,790.7	–	–	–	–	–	–	0.418	0.2449
11,500	13,372.1	–	–	–	–	–	–	0.437	0.2644
12,000	13,953.5	–	–	–	–	–	–	0.456	0.2846
12,500	14,534.9	–	–	–	–	–	–	0.475	0.3055
13,000	15,116.3	–	–	–	–	–	–	0.494	0.3270
13,500	15,697.7	–	–	–	–	–	–	0.513	0.3491

5 GENERAL INFORMATION

5.1 DISCLAIMER

All information contained in this document, which is based on standards, ordinances or regulations, etc., has been thoroughly researched and compiled with the greatest possible care. However, no guarantee is given that such information is accurate, complete or up to date. Geberit is not liable for damage resulting from the use of this information.

Geberit A/S
Lægårdsvej 26
DK-8520 Lystrup

T +45 (0)86 74 10 86
kundeservice.dk@geberit.com

www.geberit.dk

Geberit AS
Luhrtoppen 2
NO-1470 Lørenskog

T +47 (0)67 97 82 00
marketing.no@geberit.com

www.geberit.no

Geberit AB
Folkets Husgatan 1
SE-295 32 Bromölla

T +46 (0)456 48 000
order.se@geberit.com

www.geberit.se

Geberit Oy
Lumijälki 2
FI-01740 Vantaa

Puh. +358 (0)10 662 300 – Keskus
Puh. +358 (0)10 662 304 – Tekninen tuki

www.geberit.fi

973.346.00.0(00) © 01.01.2026 Geberit A/S