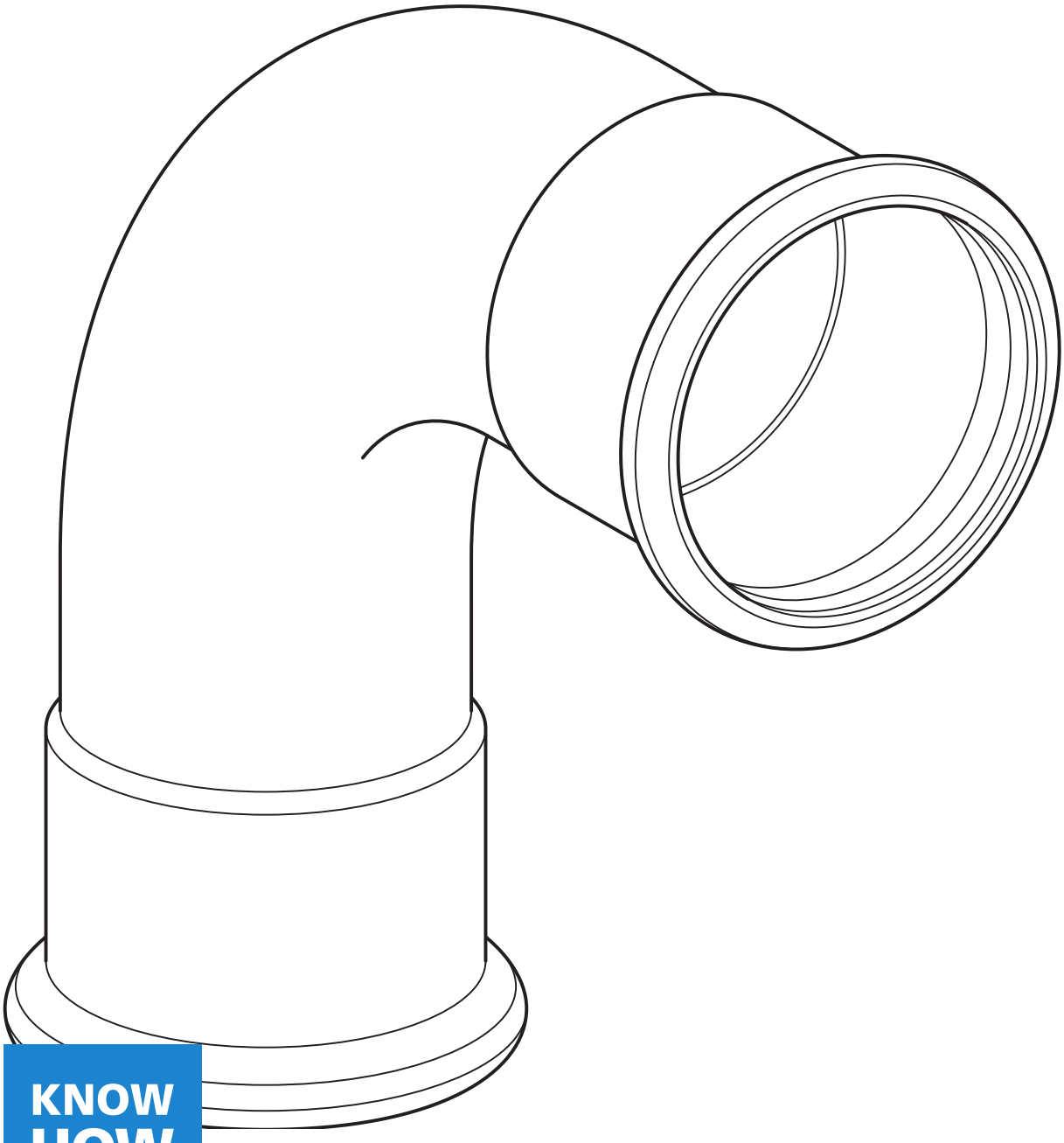
GEBERIT

GEBERIT MAPRESS STAINLESS STEEL 1.4401

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:

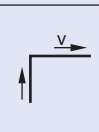
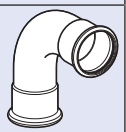
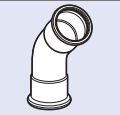
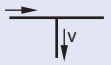
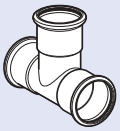
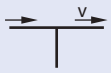
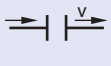
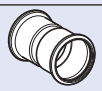
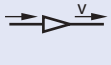
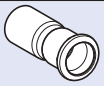
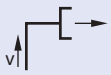
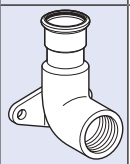
$$\Delta p_E = Z = \sum \zeta \cdot \frac{\rho}{2} \cdot v^2 \qquad \left[\frac{kg \cdot m^2}{m^3 \cdot s^2} = \frac{N}{m^2} = Pa \right]$$

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 Stainless 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	0.2	0.16	0.16	0.12	0.13
Threaded socket (K)			0.2	0.17	0.14	0.14	0.1	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
Elbow tap connector 90° (WS)			0.93	1.1	1.18	1.07	–	–

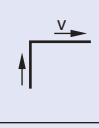
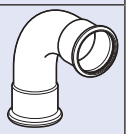
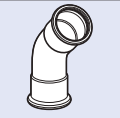
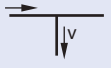
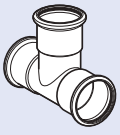
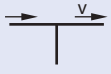
v The symbol v marks the reference cross-section.

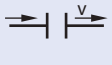
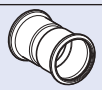
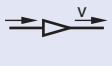
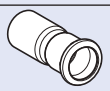
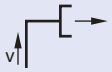
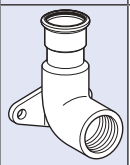
→ The arrow marks the cross-sections flowed through during the measurement.

– 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.

Table 2: Pressure loss coefficients ζ (Zeta values) for Geberit Mapress Stainless 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)			0.2	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

			d [mm]				
			42	**54**	**76.1**	**88.9**	**108**
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	–
Elbow tap connector 90° (WS)			–	–	–	–	–

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

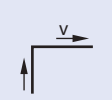
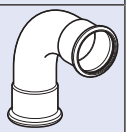
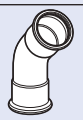
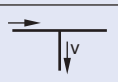
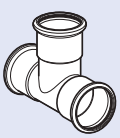
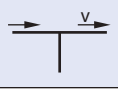
The individual resistances can be taken into account in a simplified manner with the equivalent pipe length instead of the pressure loss coefficient (Zeta value). The equivalent pipe length indicates which length of a straight pipe corresponds to the pressure loss of a fitting or valve with a known individual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

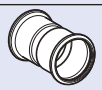
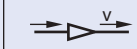
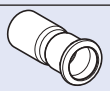
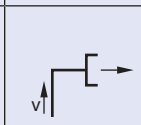
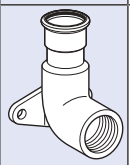
The equivalent pipe length must be added to the pipe length and multiplied by the corresponding pipe friction pressure drop.

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 Stainless 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	0.3	0.4
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

			d [mm]					
			12	**15**	**18**	**22**	**28**	**35**
Threaded socket (K)			0.08	0.09	0.09	0.12	0.12	0.17
Reducer (RED)			18/12 0.1	22/15 0.07	22/18 0.08	35/22 0.09	42/28 0.11	54/35 0.14
Elbow tap connector 90° (WS)			0.36	0.56	0.78	0.9	–	–

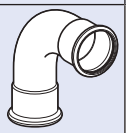
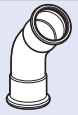
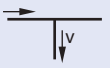
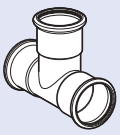
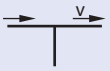
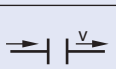
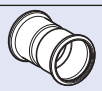
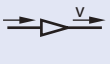
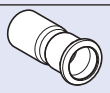
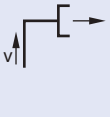
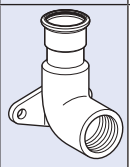
v The symbol v marks the reference cross-section.

→ 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.

Table 4: Equivalent pipe lengths [m] for Geberit Mapress Stainless 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	0.6	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)			0.3	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	–
Elbow tap connector 90° (WS)			–	–	–	–	–

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 POTABLE WATER PRESSURE LOSS

2.1 POTABLE WATER 10 °C

Medium:	Water	Density:	999.7 kg/m^3
Temperature:	10 °C	Viscosity:	0.001306 Pa•s
		Surface roughness:	0.0015 mm

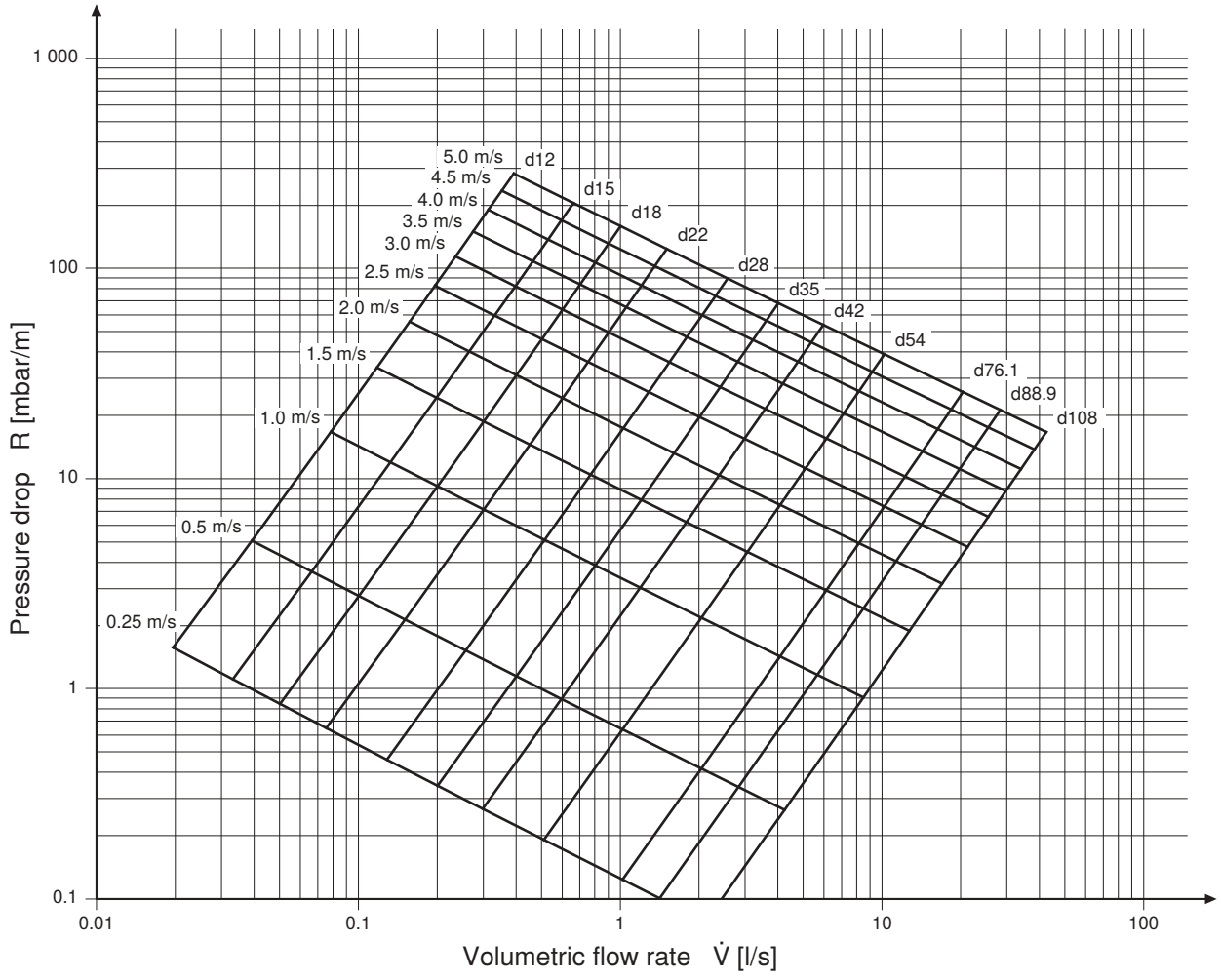


Table 5: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, drinking water 10 °C, d12–22 mm

d [mm]	**12**		**15**		**18**		**22**	
V̇ [l/s]	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**	**v [m/s]**	**R [mbar/m]**
0.01	0.13	0.53	–	–	–	–	–	–
0.02	0.25	1.06	0.15	0.37	0.10	0.16	–	–
0.03	0.38	3.21	0.23	0.56	0.15	0.24	0.10	0.11
0.04	0.51	5.24	0.30	1.53	0.20	0.58	0.13	0.14
0.05	0.64	7.68	0.38	2.23	0.25	0.84	0.17	0.32
0.06	0.76	10.50	0.45	3.04	0.30	1.14	0.20	0.44
0.07	0.89	13.70	0.53	3.96	0.35	1.49	0.23	0.57
0.08	1.02	17.25	0.60	4.99	0.40	1.87	0.27	0.72
0.09	1.15	21.16	0.68	6.11	0.45	2.29	0.30	0.88
0.10	1.27	25.41	0.75	7.33	0.50	2.74	0.33	1.05
0.15	1.91	51.60	1.13	14.82	0.75	5.53	0.50	2.12
0.20	2.55	85.57	1.51	24.50	0.99	9.13	0.66	3.48
0.25	3.18	126.93	1.88	36.25	1.24	13.48	0.83	5.14
0.30	3.82	175.39	2.26	49.99	1.49	18.56	0.99	7.07
0.35	4.46	230.75	2.64	65.65	1.74	24.35	1.16	9.26
0.40	–	–	3.01	83.19	1.99	30.82	1.33	11.71
0.45	–	–	3.39	102.55	2.24	37.96	1.49	14.40
0.50	–	–	3.77	123.71	2.49	45.75	1.66	17.35
0.55	–	–	4.14	146.63	2.74	54.19	1.82	20.53
0.60	–	–	4.52	171.30	2.98	63.25	1.99	23.95
0.65	–	–	4.90	197.68	3.23	72.94	2.15	27.60
0.70	–	–	–	–	3.48	83.24	2.32	31.48
0.75	–	–	–	–	3.73	94.15	2.49	35.59
0.80	–	–	–	–	3.98	105.66	2.65	39.92
0.85	–	–	–	–	4.23	117.77	2.82	44.47
0.90	–	–	–	–	4.48	130.46	2.98	49.24
0.95	–	–	–	–	4.72	143.74	3.15	54.22
1.00	–	–	–	–	4.97	157.59	3.31	59.42
1.05	–	–	–	–	–	–	3.48	64.84
1.10	–	–	–	–	–	–	3.65	70.47
1.15	–	–	–	–	–	–	3.81	76.30
1.20	–	–	–	–	–	–	3.98	82.35
1.25	–	–	–	–	–	–	4.14	88.60
1.30	–	–	–	–	–	–	4.31	95.06
1.40	–	–	–	–	–	–	4.64	108.59
1.50	–	–	–	–	–	–	4.97	122.93

As a rule, the values highlighted in blue do not occur in drinking water installations.

Table 6: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, drinking water 10 °C, d28–54 mm

d [mm]	28		35		42		54	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
0.05	0.10	0.06	–	–	–	–	–	–
0.06	0.12	0.07	–	–	–	–	–	–
0.07	0.14	0.16	0.09	0.04	–	–	–	–
0.08	0.16	0.20	0.10	0.07	–	–	–	–
0.09	0.17	0.25	0.11	0.09	–	–	–	–
0.10	0.19	0.30	0.12	0.10	0.08	0.04	–	–
0.15	0.29	0.60	0.19	0.21	0.13	0.08	–	–
0.20	0.39	0.98	0.25	0.34	0.17	0.13	0.10	0.04
0.25	0.49	1.45	0.31	0.50	0.21	0.20	0.12	0.06
0.30	0.58	1.99	0.37	0.69	0.25	0.27	0.15	0.08
0.35	0.68	2.60	0.44	0.90	0.29	0.35	0.17	0.10
0.40	0.78	3.28	0.50	1.14	0.33	0.45	0.20	0.13
0.45	0.87	4.04	0.56	1.40	0.38	0.55	0.22	0.15
0.50	0.97	4.86	0.62	1.68	0.42	0.66	0.24	0.18
0.55	1.07	5.74	0.68	1.98	0.46	0.78	0.27	0.22
0.60	1.17	6.69	0.75	2.31	0.50	0.90	0.29	0.25
0.65	1.26	7.71	0.81	2.66	0.54	1.04	0.32	0.29
0.70	1.36	8.78	0.87	3.03	0.59	1.18	0.34	0.33
0.75	1.46	9.92	0.93	3.42	0.63	1.33	0.37	0.37
0.80	1.55	11.13	0.99	3.84	0.67	1.49	0.39	0.42
0.85	1.65	12.39	1.06	4.27	0.71	1.66	0.42	0.46
0.90	1.75	13.71	1.12	4.72	0.75	1.84	0.44	0.51
0.95	1.85	15.09	1.18	5.20	0.80	2.02	0.47	0.56
1.00	1.94	16.53	1.24	5.69	0.84	2.21	0.49	0.62
1.05	2.04	18.02	1.31	6.20	0.88	2.41	0.51	0.67
1.10	2.14	19.58	1.37	6.73	0.92	2.62	0.54	0.73
1.15	2.23	21.19	1.43	7.29	0.96	2.83	0.56	0.79
1.20	2.33	22.86	1.49	7.86	1.00	3.05	0.59	0.85
1.25	2.43	24.59	1.55	8.45	1.05	3.28	0.61	0.91
1.30	2.53	26.37	1.62	9.06	1.09	3.52	0.64	0.98
1.40	2.72	30.10	1.74	10.33	1.17	4.01	0.69	1.12
1.50	2.91	34.05	1.87	11.68	1.26	4.54	0.73	1.26
1.60	3.11	38.22	1.99	13.11	1.34	5.09	0.78	1.41
1.70	3.30	42.60	2.11	14.60	1.42	5.66	0.83	1.57
1.80	3.50	47.20	2.24	16.17	1.51	6.27	0.88	1.74
1.90	3.69	52.00	2.36	17.81	1.59	6.90	0.93	1.91
2.00	3.89	57.02	2.49	19.52	1.67	7.56	0.98	2.10
2.10	4.08	62.25	2.61	21.30	1.76	8.25	1.03	2.29
2.20	4.27	67.68	2.74	23.15	1.84	8.97	1.08	2.48
2.30	4.47	73.32	2.86	25.07	1.93	9.71	1.13	2.69
2.40	4.66	79.16	2.98	27.06	2.01	10.47	1.17	2.90
2.50	4.86	85.20	3.11	29.12	2.09	11.26	1.22	3.12
2.60	–	–	3.23	31.24	2.18	12.08	1.27	3.34
2.70	–	–	3.36	33.43	2.26	12.93	1.32	3.57
2.80	–	–	3.48	35.69	2.34	13.80	1.37	3.81
2.90	–	–	3.61	38.01	2.43	14.69	1.42	4.06
3.00	–	–	3.73	40.40	2.51	15.61	1.47	4.31
3.10	–	–	3.85	42.86	2.60	16.56	1.52	4.57

d [mm]	28		35		42		54	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
3.20	–	–	3.98	45.38	2.68	17.53	1.57	4.84
3.30	–	–	4.10	47.97	2.76	18.52	1.62	5.11
3.40	–	–	4.23	50.62	2.85	19.54	1.66	5.39
3.50	–	–	4.35	53.34	2.93	20.59	1.71	5.68
3.60	–	–	4.48	56.12	3.01	21.66	1.76	5.97
3.70	–	–	4.60	58.96	3.10	22.75	1.81	6.27
3.80	–	–	4.72	61.87	3.18	23.87	1.86	6.58
3.90	–	–	4.85	64.84	3.26	25.01	1.91	6.89
4.00	–	–	4.97	67.88	3.35	26.17	1.96	7.21
4.10	–	–	–	–	3.43	27.36	2.01	7.54
4.20	–	–	–	–	3.52	28.58	2.06	7.87
4.30	–	–	–	–	3.60	29.82	2.10	8.21
4.40	–	–	–	–	3.68	31.08	2.15	8.56
4.50	–	–	–	–	3.77	32.36	2.20	8.91
4.60	–	–	–	–	3.85	33.67	2.25	9.27
4.70	–	–	–	–	3.93	35.00	2.30	9.63
4.80	–	–	–	–	4.02	36.36	2.35	10.00
4.90	–	–	–	–	4.10	37.74	2.40	10.38
5.00	–	–	–	–	4.19	39.14	2.45	10.76
5.50	–	–	–	–	4.60	46.50	2.69	12.78
6.00	–	–	–	–	5.02	54.43	2.94	14.94
6.50	–	–	–	–	–	–	3.18	17.26
7.00	–	–	–	–	–	–	3.43	19.73
7.50	–	–	–	–	–	–	3.67	22.35
8.00	–	–	–	–	–	–	3.92	25.12
8.50	–	–	–	–	–	–	4.16	28.03
9.00	–	–	–	–	–	–	4.41	31.09
9.50	–	–	–	–	–	–	4.65	34.29
10.00	–	–	–	–	–	–	4.90	37.63

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As a rule, the values highlighted in blue do not occur in drinking water installations.

Table 7: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, drinking water 10 °C, d76.1–108 mm

d [mm]	76.1		88.9		108	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
0.35	0.09	0.02	–	–	–	–
0.40	0.10	0.02	–	–	–	–
0.45	0.11	0.03	–	–	–	–
0.50	0.12	0.04	0.09	0.02	–	–
0.55	0.13	0.04	0.10	0.02	–	–
0.60	0.15	0.05	0.11	0.02	–	–
0.65	0.16	0.06	0.11	0.03	–	–
0.70	0.17	0.06	0.12	0.03	0.08	0.01
0.75	0.18	0.07	0.13	0.03	0.09	0.01
0.80	0.20	0.08	0.14	0.04	0.09	0.01
0.85	0.21	0.09	0.15	0.04	0.10	0.02
0.90	0.22	0.10	0.16	0.05	0.11	0.02
0.95	0.23	0.11	0.17	0.05	0.11	0.02

d [mm]	76.1		88.9		108	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1.00	0.24	0.12	0.18	0.05	0.12	0.02
1.05	0.26	0.13	0.19	0.06	0.12	0.02
1.10	0.27	0.14	0.19	0.06	0.13	0.02
1.15	0.28	0.15	0.20	0.07	0.14	0.03
1.20	0.29	0.16	0.21	0.08	0.14	0.03
1.25	0.31	0.18	0.22	0.08	0.15	0.03
1.30	0.32	0.19	0.23	0.09	0.15	0.03
1.40	0.34	0.21	0.25	0.10	0.16	0.04
1.50	0.37	0.24	0.26	0.11	0.18	0.04
1.60	0.39	0.27	0.28	0.12	0.19	0.05
1.70	0.42	0.30	0.30	0.14	0.20	0.05
1.80	0.44	0.33	0.32	0.15	0.21	0.06
1.90	0.47	0.37	0.34	0.17	0.22	0.06
2.00	0.49	0.40	0.35	0.18	0.24	0.07
2.10	0.51	0.44	0.37	0.20	0.25	0.08
2.20	0.54	0.48	0.39	0.22	0.26	0.08
2.30	0.56	0.51	0.41	0.24	0.27	0.09
2.40	0.59	0.55	0.42	0.25	0.28	0.10
2.50	0.61	0.60	0.44	0.27	0.29	0.10
2.60	0.64	0.64	0.46	0.29	0.31	0.11
2.70	0.66	0.68	0.48	0.31	0.32	0.12
2.80	0.69	0.73	0.49	0.33	0.33	0.13
2.90	0.71	0.78	0.51	0.36	0.34	0.14
3.00	0.73	0.82	0.53	0.38	0.35	0.14
3.10	0.76	0.87	0.55	0.40	0.36	0.15
3.20	0.78	0.92	0.57	0.42	0.38	0.16
3.30	0.81	0.97	0.58	0.45	0.39	0.17
3.40	0.83	1.03	0.60	0.47	0.40	0.18
3.50	0.86	1.08	0.62	0.50	0.41	0.19
3.60	0.88	1.14	0.64	0.52	0.42	0.20
3.70	0.91	1.19	0.65	0.55	0.44	0.21
3.80	0.93	1.25	0.67	0.57	0.45	0.22
3.90	0.96	1.31	0.69	0.60	0.46	0.23
4.00	0.98	1.37	0.71	0.63	0.47	0.24
4.10	1.00	1.43	0.72	0.66	0.48	0.25
4.20	1.03	1.50	0.74	0.69	0.49	0.26
4.30	1.05	1.56	0.76	0.71	0.51	0.27
4.40	1.08	1.63	0.78	0.74	0.52	0.28
4.50	1.10	1.69	0.79	0.77	0.53	0.29
4.60	1.13	1.76	0.81	0.81	0.54	0.31
4.70	1.15	1.83	0.83	0.84	0.55	0.32
4.80	1.18	1.90	0.85	0.87	0.57	0.33
4.90	1.20	1.97	0.87	0.90	0.58	0.34
5.00	1.22	2.04	0.88	0.93	0.59	0.35
5.50	1.35	2.42	0.97	1.11	0.65	0.42
6.00	1.47	2.83	1.06	1.29	0.71	0.49
6.50	1.59	3.27	1.15	1.49	0.77	0.57
7.00	1.71	3.73	1.24	1.71	0.82	0.64
7.50	1.84	4.23	1.32	1.93	0.88	0.73

d [mm]	76.1		88.9		108	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
8.00	1.96	4.75	1.41	2.17	0.94	0.82
8.50	2.08	5.29	1.50	2.41	1.00	0.91
9.00	2.20	5.87	1.59	2.68	1.06	1.01
9.50	2.33	6.47	1.68	2.95	1.12	1.11
10.00	2.45	7.09	1.77	3.23	1.18	1.22
10.50	2.57	7.75	1.85	3.53	1.24	1.33
11.00	2.69	8.43	1.94	3.84	1.29	1.45
11.50	2.82	9.13	2.03	4.16	1.35	1.57
12.00	2.94	9.86	2.12	4.49	1.41	1.69
12.50	3.06	10.61	2.21	4.83	1.47	1.82
13.00	3.18	11.40	2.30	5.19	1.53	1.96
13.50	3.31	12.20	2.38	5.55	1.59	2.09
14.00	3.43	13.03	2.47	5.93	1.65	2.23
14.50	3.55	13.89	2.56	6.32	1.71	2.38
15.00	3.67	14.77	2.65	6.72	1.77	2.53
15.50	3.80	15.67	2.74	7.13	1.82	2.68
16.00	3.92	16.60	2.83	7.55	1.88	2.84
16.50	4.04	17.55	2.91	7.98	1.94	3.00
17.00	4.16	18.53	3.00	8.43	2.00	3.17
17.50	4.29	19.53	3.09	8.88	2.06	3.34
18.00	4.41	20.56	3.18	9.34	2.12	3.52
18.50	4.53	21.61	3.27	9.82	2.18	3.69
19.00	4.65	22.68	3.36	10.31	2.24	3.88
19.50	4.78	23.78	3.44	10.80	2.30	4.06
20.00	4.90	24.90	3.53	11.31	2.35	4.25
20.50	5.02	26.05	3.62	11.83	2.41	4.45
21.00	–	–	3.71	12.36	2.47	4.65
21.50	–	–	3.80	12.90	2.53	4.85
22.00	–	–	3.89	13.45	2.59	5.05
22.50	–	–	3.97	14.01	2.65	5.26
23.00	–	–	4.06	14.58	2.71	5.48
23.50	–	–	4.15	15.16	2.77	5.70
24.00	–	–	4.24	15.75	2.83	5.92
24.50	–	–	4.33	16.35	2.88	6.14
25.00	–	–	4.42	16.97	2.94	6.37
25.50	–	–	4.50	17.59	3.00	6.60
26.00	–	–	4.59	18.22	3.06	6.84
26.50	–	–	4.68	18.87	3.12	7.08
27.00	–	–	4.77	19.52	3.18	7.33
27.50	–	–	4.86	20.18	3.24	7.57
28.00	–	–	4.95	20.86	3.30	7.83
28.50	–	–	5.03	21.54	3.35	8.08
29.00	–	–	–	–	3.41	8.34
29.50	–	–	–	–	3.47	8.60
30.00	–	–	–	–	3.53	8.87
30.50	–	–	–	–	3.59	9.14
31.00	–	–	–	–	3.65	9.42
31.50	–	–	–	–	3.71	9.69
32.00	–	–	–	–	3.77	9.98

d [mm]	76.1		88.9		108	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
32.50	–	–	–	–	3.83	10.26
33.00	–	–	–	–	3.88	10.55
33.50	–	–	–	–	3.94	10.84
34.00	–	–	–	–	4.00	11.14
34.50	–	–	–	–	4.06	11.44
35.00	–	–	–	–	4.12	11.74
35.50	–	–	–	–	4.18	12.05
36.00	–	–	–	–	4.24	12.36
36.50	–	–	–	–	4.30	12.68
37.00	–	–	–	–	4.36	13.00
37.50	–	–	–	–	4.41	13.32
38.00	–	–	–	–	4.47	13.64
38.50	–	–	–	–	4.53	13.97
39.00	–	–	–	–	4.59	14.30
39.50	–	–	–	–	4.65	14.64
40.00	–	–	–	–	4.71	14.98
40.50	–	–	–	–	4.77	15.32
41.00	–	–	–	–	4.83	15.67
41.50	–	–	–	–	4.89	16.02
42.00	–	–	–	–	4.94	16.37
42.50	–	–	–	–	5.00	16.73

As a rule, the values highlighted in blue do not occur in drinking water installations.

2.2 DRINKING WATER 60 °C

Medium:	Water	Density:	983.2 kg/m^3
Temperature:	60 °C	Viscosity:	0.000467 Pa•s
		Surface roughness:	0.0015 mm

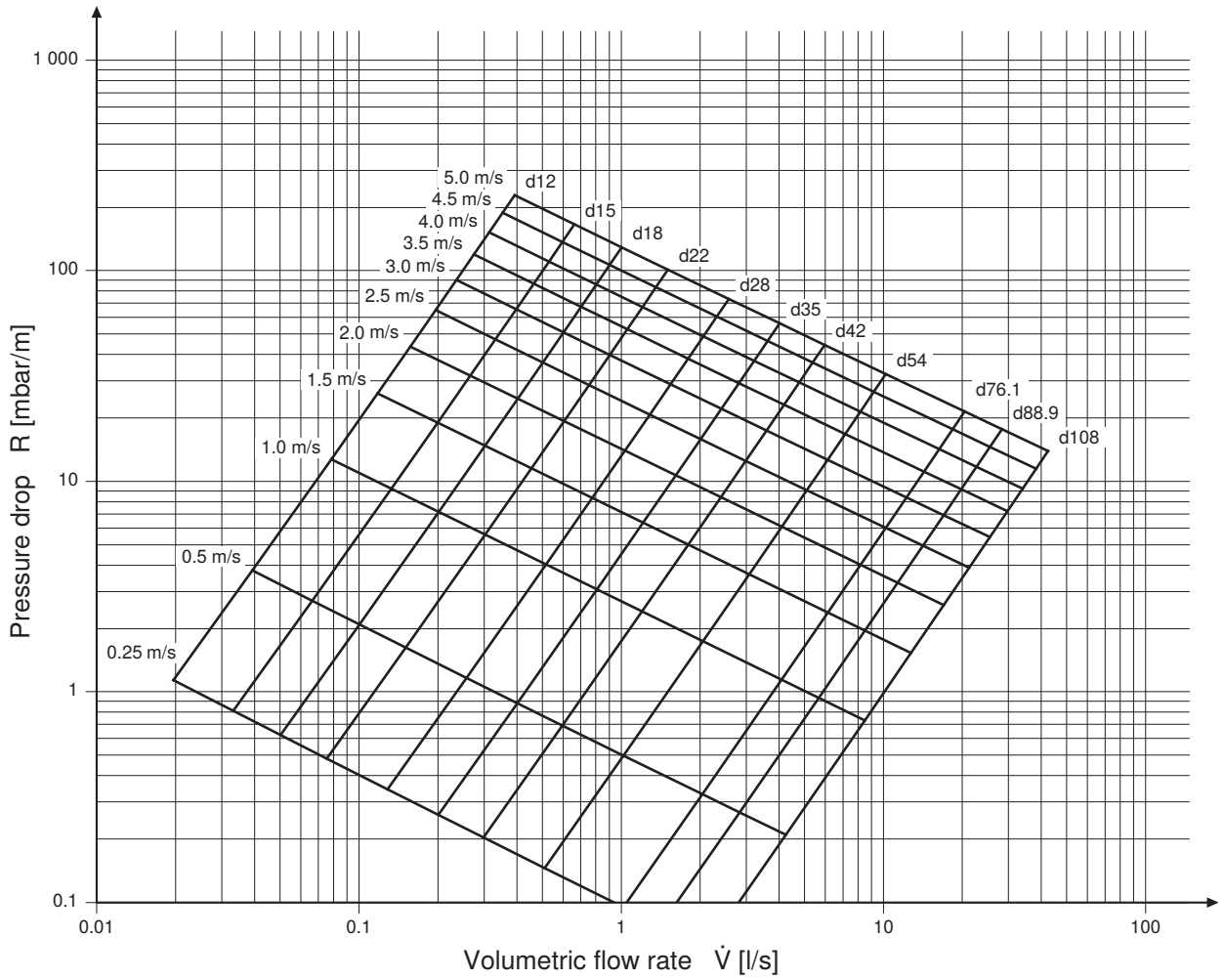

Table 8: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, drinking water 60 °C, d12–22 mm

d [mm]	12		15		18		22	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
0.01	0.13	0.36	–	–	–	–	–	–
0.02	0.25	1.18	0.15	0.34	0.10	0.13	–	–
0.03	0.38	2.37	0.23	0.68	0.15	0.26	0.10	0.10
0.04	0.51	3.90	0.30	1.12	0.20	0.42	0.13	0.16
0.05	0.64	5.76	0.38	1.66	0.25	0.62	0.17	0.24
0.06	0.76	7.93	0.45	2.27	0.30	0.85	0.20	0.32
0.07	0.89	10.40	0.53	2.98	0.35	1.11	0.23	0.42
0.08	1.02	13.16	0.60	3.76	0.40	1.40	0.27	0.53
0.09	1.15	16.21	0.68	4.63	0.45	1.72	0.30	0.66
0.10	1.27	19.54	0.75	5.57	0.50	2.07	0.33	0.79
0.15	1.91	40.23	1.13	11.42	0.75	4.23	0.50	1.61
0.20	2.55	67.38	1.51	19.07	0.99	7.05	0.66	2.67
0.25	3.18	100.74	1.88	28.42	1.24	10.48	0.83	3.96
0.30	3.82	140.13	2.26	39.43	1.49	14.52	0.99	5.48
0.35	4.46	185.41	2.64	52.05	1.74	19.13	1.16	7.22
0.40	–	–	3.01	66.24	1.99	24.32	1.33	9.16
0.45	–	–	3.39	82.00	2.24	30.06	1.49	11.31
0.50	–	–	3.77	99.28	2.49	36.35	1.66	13.67
0.55	–	–	4.14	118.07	2.74	43.19	1.82	16.22
0.60	–	–	4.52	138.35	2.98	50.56	1.99	18.98
0.65	–	–	4.90	160.12	3.23	58.45	2.15	21.92
0.70	–	–	–	–	3.48	66.87	2.32	25.06
0.75	–	–	–	–	3.73	75.81	2.49	28.39
0.80	–	–	–	–	3.98	85.27	2.65	31.91
0.85	–	–	–	–	4.23	95.23	2.82	35.61
0.90	–	–	–	–	4.48	105.71	2.98	39.50
0.95	–	–	–	–	4.72	116.68	3.15	43.58
1.00	–	–	–	–	4.97	128.17	3.31	47.84
1.05	–	–	–	–	–	–	3.48	52.28
1.10	–	–	–	–	–	–	3.65	56.90
1.15	–	–	–	–	–	–	3.81	61.70
1.20	–	–	–	–	–	–	3.98	66.68
1.25	–	–	–	–	–	–	4.14	71.84
1.30	–	–	–	–	–	–	4.31	77.18
1.40	–	–	–	–	–	–	4.64	88.39
1.50	–	–	–	–	–	–	4.97	100.29

As a rule, the values highlighted in blue do not occur in drinking water installations.

Table 9: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, drinking water 60 °C, d28–54 mm

d [mm]	28		35		42		54	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
0.05	0.10	0.07	–	–	–	–	–	–
0.06	0.12	0.09	–	–	–	–	–	–
0.07	0.14	0.12	0.09	0.04	–	–	–	–
0.08	0.16	0.15	0.10	0.05	–	–	–	–
0.09	0.17	0.18	0.11	0.06	–	–	–	–

d [mm]	28		35		42		54	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
0.10	0.19	0.22	0.12	0.08	0.08	0.03	–	–
0.15	0.29	0.45	0.19	0.16	0.13	0.06	–	–
0.20	0.39	0.75	0.25	0.26	0.17	0.10	0.10	0.03
0.25	0.49	1.11	0.31	0.38	0.21	0.15	0.12	0.04
0.30	0.58	1.53	0.37	0.53	0.25	0.21	0.15	0.06
0.35	0.68	2.01	0.44	0.69	0.29	0.27	0.17	0.08
0.40	0.78	2.55	0.50	0.88	0.33	0.34	0.20	0.09
0.45	0.87	3.14	0.56	1.08	0.38	0.42	0.22	0.12
0.50	0.97	3.79	0.62	1.30	0.42	0.51	0.24	0.14
0.55	1.07	4.49	0.68	1.54	0.46	0.60	0.27	0.17
0.60	1.17	5.25	0.75	1.80	0.50	0.70	0.29	0.19
0.65	1.26	6.06	0.81	2.08	0.54	0.81	0.32	0.22
0.70	1.36	6.92	0.87	2.37	0.59	0.92	0.34	0.25
0.75	1.46	7.84	0.93	2.68	0.63	1.04	0.37	0.29
0.80	1.55	8.80	0.99	3.01	0.67	1.17	0.39	0.32
0.85	1.65	9.81	1.06	3.36	0.71	1.30	0.42	0.36
0.90	1.75	10.88	1.12	3.72	0.75	1.44	0.44	0.40
0.95	1.85	11.99	1.18	4.10	0.80	1.58	0.47	0.44
1.00	1.94	13.16	1.24	4.49	0.84	1.74	0.49	0.48
1.05	2.04	14.37	1.31	4.90	0.88	1.90	0.51	0.52
1.10	2.14	15.63	1.37	5.33	0.92	2.06	0.54	0.57
1.15	2.23	16.94	1.43	5.78	0.96	2.23	0.56	0.62
1.20	2.33	18.30	1.49	6.24	1.00	2.41	0.59	0.66
1.25	2.43	19.70	1.55	6.71	1.05	2.59	0.61	0.72
1.30	2.53	21.15	1.62	7.21	1.09	2.78	0.64	0.77
1.40	2.72	24.20	1.74	8.24	1.17	3.18	0.69	0.88
1.50	2.91	27.43	1.87	9.33	1.26	3.60	0.73	0.99
1.60	3.11	30.85	1.99	10.49	1.34	4.04	0.78	1.11
1.70	3.30	34.45	2.11	11.70	1.42	4.51	0.83	1.24
1.80	3.50	38.23	2.24	12.98	1.51	5.00	0.88	1.37
1.90	3.69	42.20	2.36	14.32	1.59	5.51	0.93	1.51
2.00	3.89	46.35	2.49	15.72	1.67	6.05	0.98	1.66
2.10	4.08	50.67	2.61	17.17	1.76	6.60	1.03	1.81
2.20	4.27	55.17	2.74	18.69	1.84	7.18	1.08	1.97
2.30	4.47	59.85	2.86	20.27	1.93	7.79	1.13	2.14
2.40	4.66	64.71	2.98	21.90	2.01	8.41	1.17	2.31
2.50	4.86	69.75	3.11	23.59	2.09	9.06	1.22	2.48
2.60	–	–	3.23	25.34	2.18	9.73	1.27	2.67
2.70	–	–	3.36	27.15	2.26	10.42	1.32	2.85
2.80	–	–	3.48	29.01	2.34	11.13	1.37	3.05
2.90	–	–	3.61	30.94	2.43	11.86	1.42	3.25
3.00	–	–	3.73	32.91	2.51	12.62	1.47	3.45
3.10	–	–	3.85	34.95	2.60	13.39	1.52	3.66
3.20	–	–	3.98	37.04	2.68	14.19	1.57	3.88
3.30	–	–	4.10	39.19	2.76	15.01	1.62	4.10
3.40	–	–	4.23	41.40	2.85	15.85	1.66	4.33
3.50	–	–	4.35	43.66	2.93	16.71	1.71	4.57
3.60	–	–	4.48	45.97	3.01	17.59	1.76	4.80
3.70	–	–	4.60	48.34	3.10	18.49	1.81	5.05

d [mm]	28		35		42		54	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
3.80	–	–	4.72	50.77	3.18	19.42	1.86	5.30
3.90	–	–	4.85	53.25	3.26	20.36	1.91	5.56
4.00	–	–	4.97	55.79	3.35	21.32	1.96	5.82
4.10	–	–	–	–	3.43	22.31	2.01	6.08
4.20	–	–	–	–	3.52	23.31	2.06	6.36
4.30	–	–	–	–	3.60	24.34	2.10	6.64
4.40	–	–	–	–	3.68	25.39	2.15	6.92
4.50	–	–	–	–	3.77	26.45	2.20	7.21
4.60	–	–	–	–	3.85	27.54	2.25	7.50
4.70	–	–	–	–	3.93	28.65	2.30	7.80
4.80	–	–	–	–	4.02	29.78	2.35	8.11
4.90	–	–	–	–	4.10	30.93	2.40	8.42
5.00	–	–	–	–	4.19	32.09	2.45	8.73
5.50	–	–	–	–	4.60	38.24	2.69	10.39
6.00	–	–	–	–	5.02	44.88	2.94	12.18
6.50	–	–	–	–	–	–	3.18	14.10
7.00	–	–	–	–	–	–	3.43	16.15
7.50	–	–	–	–	–	–	3.67	18.33
8.00	–	–	–	–	–	–	3.92	20.64
8.50	–	–	–	–	–	–	4.16	23.07
9.00	–	–	–	–	–	–	4.41	25.63
9.50	–	–	–	–	–	–	4.65	28.31
10.00	–	–	–	–	–	–	4.90	31.12

As a rule, the values highlighted in blue do not occur in drinking water installations.

Table 10: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, drinking water 60 °C, d76.1–108 mm

d [mm]	76.1		88.9		108	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
0.35	0.09	0.01	–	–	–	–
0.40	0.10	0.02	–	–	–	–
0.45	0.11	0.02	–	–	–	–
0.50	0.12	0.03	0.09	0.01	–	–
0.55	0.13	0.03	0.10	0.01	–	–
0.60	0.15	0.04	0.11	0.02	–	–
0.65	0.16	0.04	0.11	0.02	–	–
0.70	0.17	0.05	0.12	0.02	0.08	0.01
0.75	0.18	0.06	0.13	0.03	0.09	0.01
0.80	0.20	0.06	0.14	0.03	0.09	0.01
0.85	0.21	0.07	0.15	0.03	0.10	0.01
0.90	0.22	0.08	0.16	0.03	0.11	0.01
0.95	0.23	0.08	0.17	0.04	0.11	0.01
1.00	0.24	0.09	0.18	0.04	0.12	0.02
1.05	0.26	0.10	0.19	0.05	0.12	0.02
1.10	0.27	0.11	0.19	0.05	0.13	0.02
1.15	0.28	0.12	0.20	0.05	0.14	0.02
1.20	0.29	0.13	0.21	0.06	0.14	0.02
1.25	0.31	0.14	0.22	0.06	0.15	0.02

d [mm]	76.1		88.9		108	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
1.30	0.32	0.15	0.23	0.07	0.15	0.03
1.40	0.34	0.17	0.25	0.08	0.16	0.03
1.50	0.37	0.19	0.26	0.09	0.18	0.03
1.60	0.39	0.21	0.28	0.10	0.19	0.04
1.70	0.42	0.24	0.30	0.11	0.20	0.04
1.80	0.44	0.26	0.32	0.12	0.21	0.05
1.90	0.47	0.29	0.34	0.13	0.22	0.05
2.00	0.49	0.32	0.35	0.14	0.24	0.05
2.10	0.51	0.34	0.37	0.16	0.25	0.06
2.20	0.54	0.37	0.39	0.17	0.26	0.06
2.30	0.56	0.40	0.41	0.18	0.27	0.07
2.40	0.59	0.44	0.42	0.20	0.28	0.08
2.50	0.61	0.47	0.44	0.21	0.29	0.08
2.60	0.64	0.50	0.46	0.23	0.31	0.09
2.70	0.66	0.54	0.48	0.25	0.32	0.09
2.80	0.69	0.58	0.49	0.26	0.33	0.10
2.90	0.71	0.61	0.51	0.28	0.34	0.11
3.00	0.73	0.65	0.53	0.30	0.35	0.11
3.10	0.76	0.69	0.55	0.32	0.36	0.12
3.20	0.78	0.73	0.57	0.33	0.38	0.13
3.30	0.81	0.77	0.58	0.35	0.39	0.13
3.40	0.83	0.82	0.60	0.37	0.40	0.14
3.50	0.86	0.86	0.62	0.39	0.41	0.15
3.60	0.88	0.91	0.64	0.41	0.42	0.16
3.70	0.91	0.95	0.65	0.43	0.44	0.16
3.80	0.93	1.00	0.67	0.46	0.45	0.17
3.90	0.96	1.05	0.69	0.48	0.46	0.18
4.00	0.98	1.10	0.71	0.50	0.47	0.19
4.10	1.00	1.15	0.72	0.52	0.48	0.20
4.20	1.03	1.20	0.74	0.54	0.49	0.21
4.30	1.05	1.25	0.76	0.57	0.51	0.21
4.40	1.08	1.30	0.78	0.59	0.52	0.22
4.50	1.10	1.36	0.79	0.62	0.53	0.23
4.60	1.13	1.41	0.81	0.64	0.54	0.24
4.70	1.15	1.47	0.83	0.67	0.55	0.25
4.80	1.18	1.52	0.85	0.69	0.57	0.26
4.90	1.20	1.58	0.87	0.72	0.58	0.27
5.00	1.22	1.64	0.88	0.75	0.59	0.28
5.50	1.35	1.95	0.97	0.89	0.65	0.33
6.00	1.47	2.28	1.06	1.04	0.71	0.39
6.50	1.59	2.64	1.15	1.20	0.77	0.45
7.00	1.71	3.02	1.24	1.37	0.82	0.52
7.50	1.84	3.42	1.32	1.56	0.88	0.58
8.00	1.96	3.85	1.41	1.75	0.94	0.66
8.50	2.08	4.30	1.50	1.95	1.00	0.73
9.00	2.20	4.77	1.59	2.17	1.06	0.81
9.50	2.33	5.27	1.68	2.39	1.12	0.90
10.00	2.45	5.79	1.77	2.62	1.18	0.98
10.50	2.57	6.33	1.85	2.87	1.24	1.08

d [mm]	76.1		88.9		108	
V̇ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
11.00	2.69	6.89	1.94	3.12	1.29	1.17
11.50	2.82	7.47	2.03	3.39	1.35	1.27
12.00	2.94	8.08	2.12	3.66	1.41	1.37
12.50	3.06	8.71	2.21	3.94	1.47	1.48
13.00	3.18	9.36	2.30	4.24	1.53	1.59
13.50	3.31	10.03	2.38	4.54	1.59	1.70
14.00	3.43	10.72	2.47	4.85	1.65	1.82
14.50	3.55	11.44	2.56	5.17	1.71	1.94
15.00	3.67	12.17	2.65	5.50	1.77	2.06
15.50	3.80	12.93	2.74	5.85	1.82	2.19
16.00	3.92	13.71	2.83	6.20	1.88	2.32
16.50	4.04	14.51	2.91	6.56	1.94	2.45
17.00	4.16	15.33	3.00	6.93	2.00	2.59
17.50	4.29	16.17	3.09	7.30	2.06	2.73
18.00	4.41	17.03	3.18	7.69	2.12	2.87
18.50	4.53	17.91	3.27	8.09	2.18	3.02
19.00	4.65	18.82	3.36	8.50	2.24	3.17
19.50	4.78	19.74	3.44	8.91	2.30	3.33
20.00	4.90	20.69	3.53	9.34	2.35	3.49
20.50	5.02	21.65	3.62	9.77	2.41	3.65
21.00	–	–	3.71	10.21	2.47	3.81
21.50	–	–	3.80	10.67	2.53	3.98
22.00	–	–	3.89	11.13	2.59	4.15
22.50	–	–	3.97	11.60	2.65	4.33
23.00	–	–	4.06	12.08	2.71	4.50
23.50	–	–	4.15	12.57	2.77	4.69
24.00	–	–	4.24	13.06	2.83	4.87
24.50	–	–	4.33	13.57	2.88	5.06
25.00	–	–	4.42	14.09	2.94	5.25
25.50	–	–	4.50	14.61	3.00	5.44
26.00	–	–	4.59	15.14	3.06	5.64
26.50	–	–	4.68	15.69	3.12	5.84
27.00	–	–	4.77	16.24	3.18	6.05
27.50	–	–	4.86	16.80	3.24	6.26
28.00	–	–	4.95	17.37	3.30	6.47
28.50	–	–	5.03	17.95	3.35	6.68
29.00	–	–	–	–	3.41	6.90
29.50	–	–	–	–	3.47	7.12
30.00	–	–	–	–	3.53	7.34
30.50	–	–	–	–	3.59	7.57
31.00	–	–	–	–	3.65	7.80
31.50	–	–	–	–	3.71	8.03
32.00	–	–	–	–	3.77	8.27
32.50	–	–	–	–	3.83	8.51
33.00	–	–	–	–	3.88	8.75
33.50	–	–	–	–	3.94	9.00
34.00	–	–	–	–	4.00	9.25
34.50	–	–	–	–	4.06	9.50
35.00	–	–	–	–	4.12	9.76

d [mm]	76.1		88.9		108	
$\dot{V}$ [l/s]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
35.50	–	–	–	–	4.18	10.02
36.00	–	–	–	–	4.24	10.28
36.50	–	–	–	–	4.30	10.54
37.00	–	–	–	–	4.36	10.81
37.50	–	–	–	–	4.41	11.08
38.00	–	–	–	–	4.47	11.36
38.50	–	–	–	–	4.53	11.64
39.00	–	–	–	–	4.59	11.92
39.50	–	–	–	–	4.65	12.20
40.00	–	–	–	–	4.71	12.49
40.50	–	–	–	–	4.77	12.78
41.00	–	–	–	–	4.83	13.07
41.50	–	–	–	–	4.89	13.37
42.00	–	–	–	–	4.94	13.67
42.50	–	–	–	–	5.00	13.97

As a rule, the values highlighted in blue do not occur in drinking water installations.

3 PRESSURE LOSS COOLING

3.1 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

3.2 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:	0.0015 mm
Average temperature:	10.5 °C		

Table 11: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, cooling, inlet flow 10 °C / return flow 11 °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	0.15	0.627	0.09	0.220	0.06	0.096	–	–
100	86.0	0.30	2.178	0.18	0.439	0.12	0.191	0.08	0.085
150	129.0	0.46	4.328	0.27	1.261	0.18	0.287	0.12	0.128
200	171.9	0.61	7.074	0.36	2.055	0.24	0.774	0.16	0.299
250	214.9	0.76	10.377	0.45	3.008	0.30	1.131	0.20	0.436
300	257.9	0.91	14.212	0.54	4.111	0.36	1.544	0.24	0.594
350	300.9	1.06	18.559	0.63	5.360	0.42	2.010	0.28	0.772
400	343.9	1.22	23.401	0.72	6.749	0.48	2.529	0.32	0.970
450	386.9	1.37	28.725	0.81	8.275	0.53	3.097	0.36	1.188
500	429.8	1.52	34.521	0.90	9.934	0.59	3.715	0.40	1.423
550	472.8	1.67	40.778	0.99	11.723	0.65	4.381	0.44	1.677
600	515.8	1.82	47.489	1.08	13.640	0.71	5.094	0.48	1.949
700	601.8	2.13	62.242	1.26	17.849	0.83	6.658	0.55	2.545
800	687.7	2.43	78.730	1.44	22.546	0.95	8.402	0.63	3.208
900	773.7	2.74	96.912	1.62	27.718	1.07	10.320	0.71	3.937
1,000	859.7	3.04	116.754	1.80	33.355	1.19	12.408	0.79	4.730
1,100	945.6	–	–	1.98	39.448	1.31	14.664	0.87	5.586
1,200	1,031.6	–	–	2.16	45.989	1.43	17.084	0.95	6.503
1,300	1,117.6	–	–	2.34	52.972	1.54	19.665	1.03	7.482

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]
1,400	1,203.6	–	–	2.52	60.389	1.66	22.406	1.11	8.520
1,500	1,289.5	–	–	2.70	68.237	1.78	25.303	1.19	9.617
1,600	1,375.5	–	–	2.88	76.508	1.90	28.356	1.27	10.772
1,700	1,461.5	–	–	3.06	85.200	2.02	31.561	1.35	11.984
1,800	1,547.4	–	–	–	–	2.14	34.918	1.43	13.253
1,900	1,633.4	–	–	–	–	2.26	38.425	1.50	14.578
2,000	1,719.4	–	–	–	–	2.38	42.081	1.58	15.959
2,500	2,149.2	–	–	–	–	2.97	62.546	1.98	23.680
3,000	2,579.0	–	–	–	–	–	–	2.38	32.726
3,500	3,008.9	–	–	–	–	–	–	2.77	43.055

Table 12: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 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	0.044	–	–	–	–	–	–
200	171.9	0.09	0.058	0.06	0.024	–	–	–	–
250	214.9	0.12	0.125	0.07	0.030	–	–	–	–
300	257.9	0.14	0.169	0.09	0.036	0.06	0.016	–	–
350	300.9	0.16	0.220	0.10	0.077	0.07	0.019	–	–
400	343.9	0.19	0.276	0.12	0.097	0.08	0.038	–	–
450	386.9	0.21	0.337	0.13	0.118	0.09	0.047	0.05	0.008
500	429.8	0.23	0.404	0.15	0.141	0.10	0.056	0.06	0.016
550	472.8	0.26	0.475	0.16	0.166	0.11	0.066	0.06	0.019
600	515.8	0.28	0.552	0.18	0.193	0.12	0.076	0.07	0.022
700	601.8	0.32	0.719	0.21	0.251	0.14	0.099	0.08	0.028
800	687.7	0.37	0.906	0.24	0.316	0.16	0.124	0.09	0.035
900	773.7	0.42	1.110	0.27	0.387	0.18	0.152	0.11	0.043
1,000	859.7	0.46	1.333	0.30	0.464	0.20	0.182	0.12	0.051
1,100	945.6	0.51	1.573	0.33	0.547	0.22	0.214	0.13	0.060
1,200	1,031.6	0.56	1.830	0.36	0.635	0.24	0.249	0.14	0.070
1,300	1,117.6	0.60	2.103	0.39	0.730	0.26	0.286	0.15	0.081
1,400	1,203.6	0.65	2.393	0.42	0.830	0.28	0.325	0.16	0.092
1,500	1,289.5	0.70	2.700	0.45	0.936	0.30	0.367	0.18	0.103
1,600	1,375.5	0.74	3.022	0.48	1.047	0.32	0.410	0.19	0.115
1,700	1,461.5	0.79	3.361	0.50	1.164	0.34	0.456	0.20	0.128
1,800	1,547.4	0.84	3.715	0.53	1.286	0.36	0.503	0.21	0.141
1,900	1,633.4	0.88	4.084	0.56	1.414	0.38	0.553	0.22	0.155
2,000	1,719.4	0.93	4.469	0.59	1.546	0.40	0.604	0.23	0.169
2,500	2,149.2	1.16	6.617	0.74	2.286	0.50	0.892	0.29	0.250
3,000	2,579.0	1.39	9.130	0.89	3.150	0.60	1.228	0.35	0.343
3,500	3,008.9	1.62	11.994	1.04	4.133	0.70	1.610	0.41	0.449
4,000	3,438.7	1.86	15.199	1.19	5.233	0.80	2.037	0.47	0.568
4,500	3,868.6	2.09	18.739	1.34	6.446	0.90	2.507	0.53	0.698
5,000	4,298.4	2.32	22.607	1.49	7.770	1.00	3.020	0.58	0.840
5,500	4,728.2	2.55	26.796	1.63	9.203	1.10	3.575	0.64	0.994
6,000	5,158.1	2.78	31.301	1.78	10.743	1.20	4.171	0.70	1.159
6,500	5,587.9	3.02	36.119	1.93	12.389	1.30	4.808	0.76	1.335

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]
7,000	6,017.8	–	–	2.08	14.139	1.40	5.484	0.82	1.522
7,500	6,447.6	–	–	2.23	15.992	1.50	6.200	0.88	1.720
8,000	6,877.4	–	–	2.38	17.947	1.60	6.955	0.94	1.928
8,500	7,307.3	–	–	2.52	20.002	1.70	7.748	0.99	2.147
9,000	7,737.1	–	–	2.67	22.156	1.80	8.580	1.05	2.376
9,500	8,167.0	–	–	2.82	24.410	1.90	9.449	1.11	2.616
10,000	8,596.8	–	–	2.97	26.761	2.00	10.356	1.17	2.866
10,500	9,026.7	–	–	–	–	2.10	11.299	1.23	3.126
11,000	9,456.5	–	–	–	–	2.20	12.280	1.29	3.396
11,500	9,886.3	–	–	–	–	2.30	13.297	1.34	3.676
12,000	10,316.2	–	–	–	–	2.40	14.350	1.40	3.965
12,500	10,746.0	–	–	–	–	2.50	15.439	1.46	4.265
13,000	11,175.9	–	–	–	–	2.60	16.565	1.52	4.574
13,500	11,605.7	–	–	–	–	2.70	17.725	1.58	4.893
14,000	12,035.5	–	–	–	–	2.80	18.921	1.64	5.222
14,500	12,465.4	–	–	–	–	2.90	20.152	1.70	5.560
15,000	12,895.2	–	–	–	–	3.00	21.418	1.75	5.907
15,500	13,325.1	–	–	–	–	3.10	22.718	1.81	6.264
16,000	13,754.9	–	–	–	–	–	–	1.87	6.631
16,500	14,184.7	–	–	–	–	–	–	1.93	7.006
17,000	14,614.6	–	–	–	–	–	–	1.99	7.391
17,500	15,044.4	–	–	–	–	–	–	2.05	7.785
18,000	15,474.3	–	–	–	–	–	–	2.10	8.189
18,500	15,904.1	–	–	–	–	–	–	2.16	8.601
19,000	16,333.9	–	–	–	–	–	–	2.22	9.023
19,500	16,763.8	–	–	–	–	–	–	2.28	9.454
20,000	17,193.6	–	–	–	–	–	–	2.34	9.893
20,500	17,623.5	–	–	–	–	–	–	2.40	10.342
21,000	18,053.3	–	–	–	–	–	–	2.46	10.800
21,500	18,483.1	–	–	–	–	–	–	2.51	11.266
22,000	18,913.0	–	–	–	–	–	–	2.57	11.742
22,500	19,342.8	–	–	–	–	–	–	2.63	12.226
23,000	19,772.7	–	–	–	–	–	–	2.69	12.720
23,500	20,202.5	–	–	–	–	–	–	2.75	13.222
24,000	20,632.3	–	–	–	–	–	–	2.81	13.732
24,500	21,062.2	–	–	–	–	–	–	2.86	14.252
25,000	21,492.0	–	–	–	–	–	–	2.92	14.780
25,500	21,921.9	–	–	–	–	–	–	2.98	15.317
26,000	22,351.7	–	–	–	–	–	–	3.04	15.862
26,500	22,781.5	–	–	–	–	–	–	3.10	16.417

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Table 13: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, cooling, inlet flow 11 °C / return flow 10 °C, d76.1–108 mm

d [mm]		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]
900	773.7	0.05	0.008	–	–	–	–
1,000	859.7	0.06	0.010	–	–	–	–
1,100	945.6	0.06	0.012	–	–	–	–

d [mm]		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]
1,200	1,031.6	0.07	0.014	0.05	0.006	–	–
1,300	1,117.6	0.08	0.016	0.05	0.007	–	–
1,400	1,203.6	0.08	0.018	0.06	0.008	–	–
1,500	1,289.5	0.09	0.020	0.06	0.009	–	–
1,600	1,375.5	0.09	0.022	0.07	0.010	–	–
1,700	1,461.5	0.10	0.025	0.07	0.012	–	–
1,800	1,547.4	0.11	0.028	0.08	0.013	0.05	0.005
1,900	1,633.4	0.11	0.030	0.08	0.014	0.05	0.005
2,000	1,719.4	0.12	0.033	0.08	0.015	0.06	0.006
2,500	2,149.2	0.15	0.048	0.11	0.022	0.07	0.009
3,000	2,579.0	0.18	0.066	0.13	0.031	0.08	0.012
3,500	3,008.9	0.20	0.087	0.15	0.040	0.10	0.015
4,000	3,438.7	0.23	0.110	0.17	0.050	0.11	0.019
4,500	3,868.6	0.26	0.135	0.19	0.062	0.13	0.024
5,000	4,298.4	0.29	0.162	0.21	0.074	0.14	0.028
5,500	4,728.2	0.32	0.191	0.23	0.088	0.15	0.034
6,000	5,158.1	0.35	0.223	0.25	0.102	0.17	0.039
6,500	5,587.9	0.38	0.256	0.27	0.118	0.18	0.045
7,000	6,017.8	0.41	0.292	0.30	0.134	0.20	0.051
7,500	6,447.6	0.44	0.330	0.32	0.152	0.21	0.058
8,000	6,877.4	0.47	0.370	0.34	0.170	0.22	0.065
8,500	7,307.3	0.50	0.411	0.36	0.189	0.24	0.072
9,000	7,737.1	0.53	0.455	0.38	0.209	0.25	0.079
9,500	8,167.0	0.56	0.501	0.40	0.230	0.27	0.087
10,000	8,596.8	0.59	0.548	0.42	0.251	0.28	0.096
10,500	9,026.7	0.61	0.598	0.44	0.274	0.30	0.104
11,000	9,456.5	0.64	0.649	0.46	0.298	0.31	0.113
11,500	9,886.3	0.67	0.702	0.49	0.322	0.32	0.122
12,000	10,316.2	0.70	0.757	0.51	0.347	0.34	0.132
12,500	10,746.0	0.73	0.814	0.53	0.373	0.35	0.142
13,000	11,175.9	0.76	0.873	0.55	0.400	0.37	0.152
13,500	11,605.7	0.79	0.933	0.57	0.427	0.38	0.162
14,000	12,035.5	0.82	0.995	0.59	0.456	0.39	0.173
14,500	12,465.4	0.85	1.060	0.61	0.485	0.41	0.184
15,000	12,895.2	0.88	1.125	0.63	0.515	0.42	0.196
15,500	13,325.1	0.91	1.193	0.65	0.546	0.44	0.207
16,000	13,754.9	0.94	1.262	0.68	0.578	0.45	0.219
16,500	14,184.7	0.97	1.334	0.70	0.610	0.46	0.232
17,000	14,614.6	0.99	1.406	0.72	0.644	0.48	0.244
17,500	15,044.4	1.02	1.481	0.74	0.678	0.49	0.257
18,000	15,474.3	1.05	1.557	0.76	0.712	0.51	0.270
18,500	15,904.1	1.08	1.635	0.78	0.748	0.52	0.284
19,000	16,333.9	1.11	1.715	0.80	0.784	0.53	0.297
19,500	16,763.8	1.14	1.796	0.82	0.822	0.55	0.311
20,000	17,193.6	1.17	1.879	0.84	0.860	0.56	0.326
20,500	17,623.5	1.20	1.964	0.87	0.898	0.58	0.340
21,000	18,053.3	1.23	2.051	0.89	0.938	0.59	0.355
21,500	18,483.1	1.26	2.139	0.91	0.978	0.60	0.370
22,000	18,913.0	1.29	2.229	0.93	1.019	0.62	0.386

d [mm]		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]
22,500	19,342.8	1.32	2.320	0.95	1.060	0.63	0.402
23,000	19,772.7	1.35	2.413	0.97	1.103	0.65	0.418
23,500	20,202.5	1.37	2.508	0.99	1.146	0.66	0.434
24,000	20,632.3	1.40	2.604	1.01	1.190	0.67	0.450
24,500	21,062.2	1.43	2.702	1.03	1.234	0.69	0.467
25,000	21,492.0	1.46	2.801	1.05	1.280	0.70	0.484
25,500	21,921.9	1.49	2.903	1.08	1.326	0.72	0.502
26,000	22,351.7	1.52	3.005	1.10	1.373	0.73	0.520
26,500	22,781.5	1.55	3.110	1.12	1.420	0.75	0.537
27,000	23,211.4	1.58	3.216	1.14	1.469	0.76	0.556
27,500	23,641.2	1.61	3.323	1.16	1.518	0.77	0.574
28,000	24,071.1	1.64	3.433	1.18	1.567	0.79	0.593
28,500	24,500.9	1.67	3.543	1.20	1.618	0.80	0.612
29,000	24,930.7	1.70	3.656	1.22	1.669	0.82	0.631
29,500	25,360.6	1.73	3.770	1.24	1.721	0.83	0.651
30,000	25,790.4	1.76	3.885	1.27	1.773	0.84	0.671
32,500	27,939.6	1.90	4.486	1.37	2.047	0.91	0.774
35,000	30,088.8	2.05	5.125	1.48	2.338	0.98	0.883
37,500	32,238.0	2.19	5.803	1.58	2.646	1.05	1.000
40,000	34,387.2	2.34	6.519	1.69	2.972	1.12	1.122
42,500	36,536.4	2.49	7.272	1.79	3.314	1.20	1.251
45,000	38,685.6	2.63	8.062	1.90	3.673	1.27	1.386
47,500	40,834.8	2.78	8.889	2.00	4.049	1.34	1.527
50,000	42,984.0	2.93	9.752	2.11	4.441	1.41	1.675
52,500	45,133.3	3.07	10.652	2.22	4.850	1.48	1.828
55,000	47,282.5	–	–	2.32	5.274	1.55	1.988
57,500	49,431.7	–	–	2.43	5.715	1.62	2.154
60,000	51,580.9	–	–	2.53	6.172	1.69	2.325
62,500	53,730.1	–	–	2.64	6.644	1.76	2.503
65,000	55,879.3	–	–	2.74	7.133	1.83	2.686
67,500	58,028.5	–	–	2.85	7.637	1.90	2.875
70,000	60,177.7	–	–	2.95	8.157	1.97	3.070
72,500	62,326.9	–	–	3.06	8.692	2.04	3.271
75,000	64,476.1	–	–	–	–	2.11	3.478
77,500	66,625.3	–	–	–	–	2.18	3.690
80,000	68,774.5	–	–	–	–	2.25	3.908
82,500	70,923.7	–	–	–	–	2.32	4.131
85,000	73,072.9	–	–	–	–	2.39	4.361
87,500	75,222.1	–	–	–	–	2.46	4.595
90,000	77,371.3	–	–	–	–	2.53	4.836
92,500	79,520.5	–	–	–	–	2.60	5.082
95,000	81,669.7	–	–	–	–	2.67	5.333
97,500	83,818.9	–	–	–	–	2.74	5.590
100,000	85,968.1	–	–	–	–	2.81	5.853
102,500	88,117.3	–	–	–	–	2.88	6.121
105,000	90,266.5	–	–	–	–	2.95	6.394
107,500	92,415.7	–	–	–	–	3.02	6.673
110,000	94,564.9	–	–	–	–	3.09	6.957

3.3 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:	0.0015 mm
Average temperature:	10 °C		

Table 14: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 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	0.318	–	–	–	–	–	–
150	32.2	0.11	0.477	0.07	0.167	–	–	–	–
200	43.0	0.15	0.635	0.09	0.222	0.06	0.097	–	–
250	53.7	0.19	0.794	0.11	0.278	0.07	0.121	–	–
300	64.5	0.23	0.953	0.13	0.334	0.09	0.145	0.06	0.065
350	75.2	0.27	1.112	0.16	0.389	0.10	0.170	0.07	0.075
400	86.0	0.30	2.187	0.18	0.445	0.12	0.194	0.08	0.086
450	96.7	0.34	2.667	0.20	0.501	0.13	0.218	0.09	0.097
500	107.4	0.38	3.188	0.22	0.556	0.15	0.242	0.10	0.108
550	118.2	0.42	3.747	0.25	1.093	0.16	0.267	0.11	0.118
600	128.9	0.46	4.344	0.27	1.266	0.18	0.291	0.12	0.129
700	150.4	0.53	5.649	0.31	1.644	0.21	0.620	0.14	0.151
800	171.9	0.61	7.099	0.36	2.063	0.24	0.777	0.16	0.300
900	193.4	0.68	8.687	0.40	2.521	0.27	0.949	0.18	0.366
1,000	214.9	0.76	10.413	0.45	3.018	0.30	1.135	0.20	0.437
1,100	236.4	0.84	12.271	0.49	3.553	0.33	1.336	0.22	0.514
1,200	257.9	0.91	14.259	0.54	4.126	0.36	1.549	0.24	0.596
1,300	279.4	0.99	16.376	0.58	4.734	0.39	1.777	0.26	0.683
1,400	300.9	1.06	18.619	0.63	5.378	0.42	2.017	0.28	0.775
1,500	322.3	1.14	20.986	0.67	6.058	0.45	2.271	0.30	0.872
1,600	343.8	1.22	23.476	0.72	6.772	0.48	2.537	0.32	0.974
1,700	365.3	1.29	26.086	0.76	7.520	0.50	2.816	0.34	1.081
1,800	386.8	1.37	28.815	0.81	8.302	0.53	3.108	0.36	1.192
1,900	408.3	1.44	31.663	0.85	9.117	0.56	3.412	0.38	1.308
2,000	429.8	1.52	34.628	0.90	9.966	0.59	3.728	0.40	1.428
2,500	537.2	1.90	51.165	1.12	14.692	0.74	5.486	0.49	2.098
3,000	644.7	2.28	70.477	1.35	20.199	0.89	7.532	0.59	2.877
3,500	752.1	2.66	92.474	1.57	26.460	1.04	9.854	0.69	3.760
4,000	859.6	3.04	117.079	1.80	33.453	1.19	12.446	0.79	4.745
4,500	967.0	–	–	2.02	41.160	1.34	15.299	0.89	5.827
5,000	1,074.5	–	–	2.25	49.567	1.48	18.409	0.99	7.006
5,500	1,181.9	–	–	2.47	58.658	1.63	21.769	1.09	8.280
6,000	1,289.4	–	–	2.70	68.425	1.78	25.376	1.19	9.645
6,500	1,396.8	–	–	2.92	78.856	1.93	29.225	1.29	11.102
7,000	1,504.3	–	–	–	–	2.08	33.314	1.39	12.648
7,500	1,611.7	–	–	–	–	2.23	37.639	1.48	14.283

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	1,719.2	–	–	–	–	2.38	42.197	1.58	16.005
8,500	1,826.6	–	–	–	–	2.52	46.985	1.68	17.813
9,000	1,934.1	–	–	–	–	2.67	52.003	1.78	19.706
9,500	2,041.5	–	–	–	–	2.82	57.246	1.88	21.685
10,000	2,149.0	–	–	–	–	2.97	62.713	1.98	23.746
10,500	2,256.4	–	–	–	–	–	–	2.08	25.890
11,000	2,363.9	–	–	–	–	–	–	2.18	28.117
11,500	2,471.3	–	–	–	–	–	–	2.28	30.425
12,000	2,578.8	–	–	–	–	–	–	2.37	32.814
12,500	2,686.2	–	–	–	–	–	–	2.47	35.283
13,000	2,793.7	–	–	–	–	–	–	2.57	37.832
13,500	2,901.1	–	–	–	–	–	–	2.67	40.461
14,000	3,008.6	–	–	–	–	–	–	2.77	43.168
14,500	3,116.0	–	–	–	–	–	–	2.87	45.953
15,000	3,223.5	–	–	–	–	–	–	2.97	48.816
15,500	3,330.9	–	–	–	–	–	–	3.07	51.756

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Table 15: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 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	0.033	–	–	–	–	–	–
500	107.4	0.06	0.037	–	–	–	–	–	–
550	118.2	0.06	0.041	–	–	–	–	–	–
600	128.9	0.07	0.044	–	–	–	–	–	–
700	150.4	0.08	0.052	0.05	0.021	–	–	–	–
800	171.9	0.09	0.059	0.06	0.024	–	–	–	–
900	193.4	0.10	0.067	0.07	0.027	–	–	–	–
1,000	214.9	0.12	0.074	0.07	0.030	–	–	–	–
1,100	236.4	0.13	0.147	0.08	0.033	0.05	0.015	–	–
1,200	257.9	0.14	0.170	0.09	0.036	0.06	0.016	–	–
1,300	279.4	0.15	0.195	0.10	0.068	0.06	0.018	–	–
1,400	300.9	0.16	0.221	0.10	0.077	0.07	0.019	–	–
1,500	322.3	0.17	0.248	0.11	0.087	0.07	0.021	–	–
1,600	343.8	0.19	0.277	0.12	0.097	0.08	0.038	–	–
1,700	365.3	0.20	0.307	0.13	0.108	0.08	0.043	–	–
1,800	386.8	0.21	0.338	0.13	0.119	0.09	0.047	0.05	0.008
1,900	408.3	0.22	0.371	0.14	0.130	0.09	0.051	0.06	0.009
2,000	429.8	0.23	0.405	0.15	0.142	0.10	0.056	0.06	0.009
2,500	537.2	0.29	0.594	0.19	0.207	0.12	0.082	0.07	0.023
3,000	644.7	0.35	0.813	0.22	0.283	0.15	0.112	0.09	0.032
3,500	752.1	0.41	1.061	0.26	0.369	0.17	0.145	0.10	0.041
4,000	859.6	0.46	1.337	0.30	0.465	0.20	0.183	0.12	0.052
4,500	967.0	0.52	1.641	0.33	0.570	0.22	0.224	0.13	0.063
5,000	1,074.5	0.58	1.970	0.37	0.684	0.25	0.268	0.15	0.076
5,500	1,181.9	0.64	2.327	0.41	0.807	0.27	0.316	0.16	0.089
6,000	1,289.4	0.70	2.708	0.45	0.939	0.30	0.368	0.18	0.103
6,500	1,396.8	0.75	3.115	0.48	1.080	0.32	0.423	0.19	0.119

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]
7,000	1,504.3	0.81	3.546	0.52	1.228	0.35	0.481	0.20	0.135
7,500	1,611.7	0.87	4.002	0.56	1.386	0.37	0.542	0.22	0.152
8,000	1,719.2	0.93	4.482	0.59	1.551	0.40	0.606	0.23	0.170
8,500	1,826.6	0.99	4.986	0.63	1.724	0.42	0.674	0.25	0.189
9,000	1,934.1	1.04	5.513	0.67	1.906	0.45	0.745	0.26	0.209
9,500	2,041.5	1.10	6.063	0.71	2.095	0.47	0.818	0.28	0.229
10,000	2,149.0	1.16	6.636	0.74	2.293	0.50	0.895	0.29	0.251
10,500	2,256.4	1.22	7.232	0.78	2.498	0.52	0.975	0.31	0.273
11,000	2,363.9	1.28	7.851	0.82	2.711	0.55	1.058	0.32	0.296
11,500	2,471.3	1.33	8.492	0.85	2.931	0.57	1.143	0.34	0.320
12,000	2,578.8	1.39	9.155	0.89	3.159	0.60	1.232	0.35	0.344
12,500	2,686.2	1.45	9.840	0.93	3.394	0.62	1.323	0.37	0.370
13,000	2,793.7	1.51	10.548	0.97	3.637	0.65	1.418	0.38	0.396
13,500	2,901.1	1.57	11.276	1.00	3.887	0.67	1.515	0.39	0.423
14,000	3,008.6	1.62	12.027	1.04	4.145	0.70	1.615	0.41	0.451
14,500	3,116.0	1.68	12.798	1.08	4.410	0.72	1.717	0.42	0.479
15,000	3,223.5	1.74	13.591	1.11	4.682	0.75	1.823	0.44	0.509
15,500	3,330.9	1.80	14.405	1.15	4.961	0.77	1.931	0.45	0.539
16,000	3,438.4	1.86	15.241	1.19	5.247	0.80	2.043	0.47	0.569
16,500	3,545.8	1.91	16.097	1.23	5.541	0.82	2.156	0.48	0.601
17,000	3,653.3	1.97	16.973	1.26	5.841	0.85	2.273	0.50	0.633
17,500	3,760.7	2.03	17.871	1.30	6.149	0.87	2.392	0.51	0.666
18,000	3,868.2	2.09	18.789	1.34	6.464	0.90	2.514	0.53	0.700
18,500	3,975.6	2.15	19.728	1.37	6.785	0.92	2.639	0.54	0.735
19,000	4,083.1	2.20	20.687	1.41	7.114	0.95	2.766	0.56	0.770
19,500	4,190.5	2.26	21.666	1.45	7.449	0.97	2.896	0.57	0.806
20,000	4,298.0	2.32	22.666	1.48	7.791	1.00	3.029	0.58	0.843
20,500	4,405.4	2.38	23.686	1.52	8.140	1.02	3.164	0.60	0.880
21,000	4,512.9	2.44	24.726	1.56	8.496	1.05	3.301	0.61	0.919
21,500	4,620.3	2.49	25.785	1.60	8.859	1.07	3.442	0.63	0.957
22,000	4,727.8	2.55	26.865	1.63	9.228	1.10	3.585	0.64	0.997
22,500	4,835.2	2.61	27.964	1.67	9.604	1.12	3.730	0.66	1.037
23,000	4,942.7	2.67	29.084	1.71	9.987	1.15	3.879	0.67	1.078
23,500	5,050.1	2.73	30.223	1.74	10.376	1.17	4.029	0.69	1.120
24,000	5,157.6	2.78	31.381	1.78	10.772	1.20	4.182	0.70	1.162
24,500	5,265.0	2.84	32.559	1.82	11.175	1.22	4.338	0.72	1.205
25,000	5,372.5	2.90	33.757	1.86	11.584	1.25	4.497	0.73	1.249
25,500	5,479.9	2.96	34.974	1.89	12.000	1.27	4.657	0.75	1.294
26,000	5,587.4	3.02	36.210	1.93	12.422	1.30	4.821	0.76	1.339
26,500	5,694.8	3.07	37.466	1.97	12.851	1.32	4.986	0.77	1.385
27,000	5,802.3	–	–	2.00	13.286	1.35	5.155	0.79	1.431
27,500	5,909.7	–	–	2.04	13.728	1.37	5.326	0.80	1.478
28,000	6,017.2	–	–	2.08	14.176	1.40	5.499	0.82	1.526
28,500	6,124.6	–	–	2.12	14.631	1.42	5.675	0.83	1.575
29,000	6,232.1	–	–	2.15	15.092	1.45	5.853	0.85	1.624
29,500	6,339.5	–	–	2.19	15.559	1.47	6.034	0.86	1.674
30,000	6,447.0	–	–	2.23	16.033	1.50	6.217	0.88	1.725
32,500	6,984.2	–	–	2.41	18.498	1.62	7.169	0.95	1.987
35,000	7,521.5	–	–	2.60	21.120	1.75	8.181	1.02	2.267

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]
37,500	8,058.7	–	–	2.78	23.897	1.87	9.252	1.10	2.562
40,000	8,596.0	–	–	2.97	26.827	2.00	10.382	1.17	2.874
42,500	9,133.2	–	–	–	–	2.12	11.571	1.24	3.201
45,000	9,670.5	–	–	–	–	2.25	12.816	1.32	3.544
47,500	10,207.7	–	–	–	–	2.37	14.119	1.39	3.902
50,000	10,745.0	–	–	–	–	2.50	15.478	1.46	4.276
52,500	11,282.2	–	–	–	–	2.62	16.893	1.53	4.665
55,000	11,819.5	–	–	–	–	2.75	18.363	1.61	5.069
57,500	12,356.7	–	–	–	–	2.87	19.889	1.68	5.488
60,000	12,894.0	–	–	–	–	3.00	21.470	1.75	5.922
62,500	13,431.2	–	–	–	–	–	–	1.83	6.371
65,000	13,968.5	–	–	–	–	–	–	1.90	6.834
67,500	14,505.7	–	–	–	–	–	–	1.97	7.312
70,000	15,043.0	–	–	–	–	–	–	2.05	7.805
72,500	15,580.2	–	–	–	–	–	–	2.12	8.312
75,000	16,117.5	–	–	–	–	–	–	2.19	8.833
77,500	16,654.7	–	–	–	–	–	–	2.27	9.368
80,000	17,192.0	–	–	–	–	–	–	2.34	9.918
82,500	17,729.2	–	–	–	–	–	–	2.41	10.481
85,000	18,266.5	–	–	–	–	–	–	2.48	11.059
87,500	18,803.7	–	–	–	–	–	–	2.56	11.650
90,000	19,341.0	–	–	–	–	–	–	2.63	12.256
92,500	19,878.2	–	–	–	–	–	–	2.70	12.875
95,000	20,415.5	–	–	–	–	–	–	2.78	13.508
97,500	20,952.7	–	–	–	–	–	–	2.85	14.155
100,000	21,490.0	–	–	–	–	–	–	2.92	14.815
105,000	22,564.5	–	–	–	–	–	–	3.07	16.177

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Table 16: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, cooling, inlet flow 8 °C / return flow 12 °C, d76.1–108 mm

d [mm]		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]
3,500	752.1	0.05	0.008	–	–	–	–
4,000	859.6	0.06	0.010	–	–	–	–
4,500	967.0	0.07	0.012	–	–	–	–
5,000	1,074.5	0.07	0.015	0.05	0.007	–	–
5,500	1,181.9	0.08	0.017	0.06	0.008	–	–
6,000	1,289.4	0.09	0.020	0.06	0.009	–	–
6,500	1,396.8	0.10	0.023	0.07	0.011	–	–
7,000	1,504.3	0.10	0.026	0.07	0.012	–	–
7,500	1,611.7	0.11	0.030	0.08	0.014	0.05	0.005
8,000	1,719.2	0.12	0.033	0.08	0.015	0.06	0.006
8,500	1,826.6	0.12	0.037	0.09	0.017	0.06	0.007
9,000	1,934.1	0.13	0.041	0.09	0.019	0.06	0.007
9,500	2,041.5	0.14	0.044	0.10	0.021	0.07	0.008
10,000	2,149.0	0.15	0.049	0.11	0.022	0.07	0.009
10,500	2,256.4	0.15	0.053	0.11	0.024	0.07	0.009
11,000	2,363.9	0.16	0.057	0.12	0.026	0.08	0.010

d [mm]		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]
11,500	2,471.3	0.17	0.062	0.12	0.029	0.08	0.011
12,000	2,578.8	0.18	0.067	0.13	0.031	0.08	0.012
12,500	2,686.2	0.18	0.072	0.13	0.033	0.09	0.013
13,000	2,793.7	0.19	0.077	0.14	0.035	0.09	0.014
13,500	2,901.1	0.20	0.082	0.14	0.038	0.09	0.014
14,000	3,008.6	0.20	0.087	0.15	0.040	0.10	0.015
14,500	3,116.0	0.21	0.093	0.15	0.043	0.10	0.016
15,000	3,223.5	0.22	0.098	0.16	0.045	0.11	0.017
15,500	3,330.9	0.23	0.104	0.16	0.048	0.11	0.018
16,000	3,438.4	0.23	0.110	0.17	0.051	0.11	0.019
16,500	3,545.8	0.24	0.116	0.17	0.053	0.12	0.020
17,000	3,653.3	0.25	0.122	0.18	0.056	0.12	0.022
17,500	3,760.7	0.26	0.129	0.18	0.059	0.12	0.023
18,000	3,868.2	0.26	0.135	0.19	0.062	0.13	0.024
18,500	3,975.6	0.27	0.142	0.20	0.065	0.13	0.025
19,000	4,083.1	0.28	0.148	0.20	0.068	0.13	0.026
19,500	4,190.5	0.29	0.155	0.21	0.071	0.14	0.027
20,000	4,298.0	0.29	0.162	0.21	0.075	0.14	0.029
20,500	4,405.4	0.30	0.170	0.22	0.078	0.14	0.030
21,000	4,512.9	0.31	0.177	0.22	0.081	0.15	0.031
21,500	4,620.3	0.31	0.184	0.23	0.085	0.15	0.032
22,000	4,727.8	0.32	0.192	0.23	0.088	0.15	0.034
22,500	4,835.2	0.33	0.200	0.24	0.092	0.16	0.035
23,000	4,942.7	0.34	0.207	0.24	0.095	0.16	0.036
23,500	5,050.1	0.34	0.215	0.25	0.099	0.17	0.038
24,000	5,157.6	0.35	0.223	0.25	0.103	0.17	0.039
24,500	5,265.0	0.36	0.232	0.26	0.107	0.17	0.041
25,000	5,372.5	0.37	0.240	0.26	0.110	0.18	0.042
25,500	5,479.9	0.37	0.249	0.27	0.114	0.18	0.044
26,000	5,587.4	0.38	0.257	0.27	0.118	0.18	0.045
26,500	5,694.8	0.39	0.266	0.28	0.122	0.19	0.047
27,000	5,802.3	0.39	0.275	0.28	0.126	0.19	0.048
27,500	5,909.7	0.40	0.284	0.29	0.130	0.19	0.050
28,000	6,017.2	0.41	0.293	0.30	0.135	0.20	0.051
28,500	6,124.6	0.42	0.302	0.30	0.139	0.20	0.053
29,000	6,232.1	0.42	0.312	0.31	0.143	0.20	0.055
29,500	6,339.5	0.43	0.321	0.31	0.148	0.21	0.056
30,000	6,447.0	0.44	0.331	0.32	0.152	0.21	0.058
32,500	6,984.2	0.48	0.381	0.34	0.175	0.23	0.067
35,000	7,521.5	0.51	0.434	0.37	0.199	0.25	0.076
37,500	8,058.7	0.55	0.490	0.40	0.225	0.26	0.086
40,000	8,596.0	0.59	0.550	0.42	0.252	0.28	0.096
42,500	9,133.2	0.62	0.612	0.45	0.281	0.30	0.107
45,000	9,670.5	0.66	0.677	0.47	0.310	0.32	0.118
47,500	10,207.7	0.69	0.745	0.50	0.342	0.33	0.130
50,000	10,745.0	0.73	0.816	0.53	0.374	0.35	0.142
52,500	11,282.2	0.77	0.890	0.55	0.408	0.37	0.155
55,000	11,819.5	0.80	0.967	0.58	0.443	0.39	0.168
57,500	12,356.7	0.84	1.046	0.61	0.479	0.40	0.182

d [mm]		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]
60,000	12,894.0	0.88	1.128	0.63	0.517	0.42	0.196
62,500	13,431.2	0.91	1.213	0.66	0.556	0.44	0.211
65,000	13,968.5	0.95	1.301	0.69	0.596	0.46	0.226
67,500	14,505.7	0.99	1.392	0.71	0.637	0.47	0.242
70,000	15,043.0	1.02	1.485	0.74	0.679	0.49	0.258
72,500	15,580.2	1.06	1.581	0.76	0.723	0.51	0.274
75,000	16,117.5	1.10	1.679	0.79	0.768	0.53	0.291
77,500	16,654.7	1.13	1.780	0.82	0.814	0.54	0.309
80,000	17,192.0	1.17	1.884	0.84	0.862	0.56	0.327
82,500	17,729.2	1.21	1.991	0.87	0.910	0.58	0.345
85,000	18,266.5	1.24	2.100	0.90	0.960	0.60	0.364
87,500	18,803.7	1.28	2.212	0.92	1.011	0.62	0.383
90,000	19,341.0	1.32	2.326	0.95	1.063	0.63	0.403
92,500	19,878.2	1.35	2.443	0.98	1.116	0.65	0.423
95,000	20,415.5	1.39	2.562	1.00	1.171	0.67	0.443
97,500	20,952.7	1.43	2.684	1.03	1.226	0.69	0.464
100,000	21,490.0	1.46	2.808	1.05	1.283	0.70	0.486
105,000	22,564.5	1.54	3.065	1.11	1.400	0.74	0.530
110,000	23,639.0	1.61	3.332	1.16	1.522	0.77	0.576
115,000	24,713.5	1.68	3.608	1.21	1.647	0.81	0.623
120,000	25,788.0	1.76	3.895	1.27	1.778	0.84	0.672
130,000	27,937.0	1.90	4.497	1.37	2.052	0.91	0.776
140,000	30,086.0	2.05	5.138	1.48	2.344	0.98	0.886
150,000	32,235.0	2.19	5.817	1.58	2.653	1.05	1.002
175,000	37,607.4	2.56	7.680	1.85	3.500	1.23	1.321
200,000	42,979.9	2.93	9.774	2.11	4.452	1.41	1.679
225,000	48,352.4	–	–	2.37	5.506	1.58	2.075
250,000	53,724.9	–	–	2.64	6.660	1.76	2.509
275,000	59,097.4	–	–	2.90	7.913	1.93	2.979
300,000	64,469.9	–	–	–	–	2.11	3.486
325,000	69,842.4	–	–	–	–	2.28	4.028

4 HEATING PRESSURE LOSS

4.1 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

4.2 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:	0.0015 mm
Average temperature:	60.5 °C		

Table 17: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 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	0.15	0.501	0.09	0.146	0.06	0.035	–	–
100	86.1	0.31	1.642	0.18	0.476	0.12	0.179	0.08	0.069
150	129.1	0.46	3.316	0.27	0.956	0.18	0.358	0.12	0.137
200	172.1	0.62	5.478	0.37	1.575	0.24	0.588	0.16	0.225
250	215.1	0.77	8.102	0.46	2.324	0.30	0.867	0.20	0.331
300	258.2	0.93	11.169	0.55	3.197	0.36	1.191	0.24	0.455
350	301.2	1.08	14.663	0.64	4.190	0.42	1.559	0.28	0.594
400	344.2	1.24	18.575	0.73	5.301	0.48	1.970	0.32	0.750
450	387.3	1.39	22.895	0.82	6.525	0.54	2.423	0.36	0.922
500	430.3	1.55	27.615	0.92	7.860	0.60	2.917	0.40	1.109
550	473.3	1.70	32.729	1.01	9.306	0.67	3.450	0.44	1.311
600	516.4	1.86	38.230	1.10	10.859	0.73	4.023	0.48	1.528
700	602.4	2.17	50.378	1.28	14.282	0.85	5.285	0.56	2.005
800	688.5	2.48	64.022	1.47	18.120	0.97	6.697	0.64	2.538
900	774.5	2.79	79.138	1.65	22.364	1.09	8.257	0.73	3.126
1,000	860.6	3.10	95.700	1.83	27.006	1.21	9.961	0.81	3.768
1,100	946.6	–	–	2.02	32.040	1.33	11.808	0.89	4.463
1,200	1,032.7	–	–	2.20	37.461	1.45	13.795	0.97	5.211

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	1,118.8	–	–	2.38	43.265	1.57	15.919	1.05	6.009
1,400	1,204.8	–	–	2.57	49.446	1.69	18.180	1.13	6.859
1,500	1,290.9	–	–	2.75	56.001	1.81	20.576	1.21	7.758
1,600	1,376.9	–	–	2.93	62.929	1.94	23.106	1.29	8.707
1,700	1,463.0	–	–	–	–	2.06	25.768	1.37	9.705
1,800	1,549.1	–	–	–	–	2.18	28.561	1.45	10.751
1,900	1,635.1	–	–	–	–	2.30	31.484	1.53	11.846
2,000	1,721.2	–	–	–	–	2.42	34.537	1.61	12.988
2,500	2,151.5	–	–	–	–	3.02	51.709	2.02	19.404
3,000	2,581.8	–	–	–	–	–	–	2.42	26.969
3,500	3,012.0	–	–	–	–	–	–	2.82	35.652

Table 18: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 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	0.039	–	–	–	–	–	–
200	172.1	0.09	0.064	0.06	0.022	–	–	–	–
250	215.1	0.12	0.094	0.08	0.033	0.05	0.013	–	–
300	258.2	0.14	0.128	0.09	0.045	0.06	0.018	–	–
350	301.2	0.17	0.168	0.11	0.058	0.07	0.023	–	–
400	344.2	0.19	0.211	0.12	0.073	0.08	0.029	–	–
450	387.3	0.21	0.259	0.14	0.090	0.09	0.035	0.05	0.010
500	430.3	0.24	0.312	0.15	0.108	0.10	0.042	0.06	0.012
550	473.3	0.26	0.368	0.17	0.128	0.11	0.050	0.07	0.014
600	516.4	0.28	0.429	0.18	0.148	0.12	0.058	0.07	0.016
700	602.4	0.33	0.561	0.21	0.194	0.14	0.076	0.08	0.021
800	688.5	0.38	0.710	0.24	0.245	0.16	0.096	0.10	0.027
900	774.5	0.43	0.874	0.27	0.302	0.18	0.118	0.11	0.033
1,000	860.6	0.47	1.052	0.30	0.363	0.20	0.142	0.12	0.040
1,100	946.6	0.52	1.245	0.33	0.429	0.22	0.167	0.13	0.047
1,200	1,032.7	0.57	1.452	0.36	0.501	0.24	0.195	0.14	0.054
1,300	1,118.8	0.61	1.673	0.39	0.577	0.26	0.225	0.15	0.063
1,400	1,204.8	0.66	1.909	0.42	0.657	0.29	0.256	0.17	0.071
1,500	1,290.9	0.71	2.157	0.45	0.743	0.31	0.289	0.18	0.081
1,600	1,376.9	0.76	2.420	0.48	0.832	0.33	0.324	0.19	0.090
1,700	1,463.0	0.80	2.695	0.51	0.927	0.35	0.360	0.20	0.100
1,800	1,549.1	0.85	2.984	0.54	1.026	0.37	0.399	0.21	0.111
1,900	1,635.1	0.90	3.286	0.57	1.129	0.39	0.439	0.23	0.122
2,000	1,721.2	0.94	3.601	0.60	1.237	0.41	0.480	0.24	0.134
2,500	2,151.5	1.18	5.368	0.76	1.840	0.51	0.714	0.30	0.198
3,000	2,581.8	1.42	7.445	0.91	2.549	0.61	0.987	0.36	0.274
3,500	3,012.0	1.65	9.824	1.06	3.359	0.71	1.300	0.42	0.360
4,000	3,442.3	1.89	12.499	1.21	4.268	0.81	1.651	0.48	0.456
4,500	3,872.6	2.13	15.463	1.36	5.275	0.92	2.038	0.54	0.563
5,000	4,302.9	2.36	18.713	1.51	6.378	1.02	2.462	0.60	0.680
5,500	4,733.2	2.60	22.244	1.66	7.574	1.12	2.922	0.65	0.806
6,000	5,163.5	2.83	26.052	1.81	8.863	1.22	3.418	0.71	0.942

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]
6,500	5,593.8	3.07	30.135	1.97	10.244	1.32	3.948	0.77	1.087
7,000	6,024.1	–	–	2.12	11.716	1.43	4.512	0.83	1.242
7,500	6,454.4	–	–	2.27	13.277	1.53	5.111	0.89	1.406
8,000	6,884.7	–	–	2.42	14.928	1.63	5.743	0.95	1.578
8,500	7,315.0	–	–	2.57	16.666	1.73	6.409	1.01	1.760
9,000	7,745.3	–	–	2.72	18.492	1.83	7.107	1.07	1.951
9,500	8,175.6	–	–	2.87	20.405	1.93	7.839	1.13	2.151
10,000	8,605.9	–	–	3.02	22.404	2.04	8.603	1.19	2.360
10,500	9,036.1	–	–	–	–	2.14	9.400	1.25	2.577
11,000	9,466.4	–	–	–	–	2.24	10.229	1.31	2.803
11,500	9,896.7	–	–	–	–	2.34	11.089	1.37	3.037
12,000	10,327.0	–	–	–	–	2.44	11.982	1.43	3.280
12,500	10,757.3	–	–	–	–	2.54	12.906	1.49	3.532
13,000	11,187.6	–	–	–	–	2.65	13.862	1.55	3.791
13,500	11,617.9	–	–	–	–	2.75	14.848	1.61	4.060
14,000	12,048.2	–	–	–	–	2.85	15.866	1.67	4.336
14,500	12,478.5	–	–	–	–	2.95	16.916	1.73	4.621
15,000	12,908.8	–	–	–	–	3.05	17.996	1.79	4.915
15,500	13,339.1	–	–	–	–	–	–	1.85	5.216
16,000	13,769.4	–	–	–	–	–	–	1.90	5.526
16,500	14,199.7	–	–	–	–	–	–	1.96	5.843
17,000	14,629.9	–	–	–	–	–	–	2.02	6.169
17,500	15,060.2	–	–	–	–	–	–	2.08	6.503
18,000	15,490.5	–	–	–	–	–	–	2.14	6.845
18,500	15,920.8	–	–	–	–	–	–	2.20	7.195
19,000	16,351.1	–	–	–	–	–	–	2.26	7.553
19,500	16,781.4	–	–	–	–	–	–	2.32	7.919
20,000	17,211.7	–	–	–	–	–	–	2.38	8.293
20,500	17,642.0	–	–	–	–	–	–	2.44	8.675
21,000	18,072.3	–	–	–	–	–	–	2.50	9.064
21,500	18,502.6	–	–	–	–	–	–	2.56	9.462
22,000	18,932.9	–	–	–	–	–	–	2.62	9.868
22,500	19,363.2	–	–	–	–	–	–	2.68	10.281
23,000	19,793.5	–	–	–	–	–	–	2.74	10.702
23,500	20,223.8	–	–	–	–	–	–	2.80	11.131
24,000	20,654.0	–	–	–	–	–	–	2.86	11.567
24,500	21,084.3	–	–	–	–	–	–	2.92	12.012
25,000	21,514.6	–	–	–	–	–	–	2.98	12.464
25,500	21,944.9	–	–	–	–	–	–	3.04	12.923
26,000	22,375.2	–	–	–	–	–	–	3.10	13.391

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Table 19: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, heating, inlet flow 61 °C / return flow 60 °C, d76.1–108 mm

d [mm]		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]
900	774.5	0.05	0.006	–	–	–	–
1,000	860.6	0.06	0.008	–	–	–	–
1,100	946.6	0.07	0.009	–	–	–	–

d [mm]		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]
1,200	1,032.7	0.07	0.011	0.05	0.005	–	–
1,300	1,118.8	0.08	0.012	0.06	0.006	–	–
1,400	1,204.8	0.08	0.014	0.06	0.006	–	–
1,500	1,290.9	0.09	0.016	0.06	0.007	–	–
1,600	1,376.9	0.10	0.017	0.07	0.008	–	–
1,700	1,463.0	0.10	0.019	0.07	0.009	–	–
1,800	1,549.1	0.11	0.021	0.08	0.010	0.05	0.004
1,900	1,635.1	0.11	0.023	0.08	0.011	0.05	0.004
2,000	1,721.2	0.12	0.026	0.09	0.012	0.06	0.005
2,500	2,151.5	0.15	0.038	0.11	0.017	0.07	0.007
3,000	2,581.8	0.18	0.052	0.13	0.024	0.09	0.009
3,500	3,012.0	0.21	0.069	0.15	0.032	0.10	0.012
4,000	3,442.3	0.24	0.087	0.17	0.040	0.11	0.015
4,500	3,872.6	0.27	0.107	0.19	0.049	0.13	0.019
5,000	4,302.9	0.30	0.130	0.21	0.059	0.14	0.023
5,500	4,733.2	0.33	0.154	0.24	0.070	0.16	0.027
6,000	5,163.5	0.36	0.179	0.26	0.082	0.17	0.031
6,500	5,593.8	0.39	0.207	0.28	0.095	0.19	0.036
7,000	6,024.1	0.42	0.236	0.30	0.108	0.20	0.041
7,500	6,454.4	0.45	0.267	0.32	0.122	0.21	0.046
8,000	6,884.7	0.48	0.300	0.34	0.137	0.23	0.052
8,500	7,315.0	0.51	0.334	0.37	0.153	0.24	0.058
9,000	7,745.3	0.54	0.370	0.39	0.169	0.26	0.064
9,500	8,175.6	0.57	0.407	0.41	0.186	0.27	0.070
10,000	8,605.9	0.60	0.447	0.43	0.204	0.29	0.077
10,500	9,036.1	0.63	0.488	0.45	0.223	0.30	0.084
11,000	9,466.4	0.66	0.530	0.47	0.242	0.31	0.091
11,500	9,896.7	0.69	0.574	0.49	0.262	0.33	0.099
12,000	10,327.0	0.71	0.620	0.52	0.283	0.34	0.107
12,500	10,757.3	0.74	0.667	0.54	0.304	0.36	0.115
13,000	11,187.6	0.77	0.716	0.56	0.326	0.37	0.123
13,500	11,617.9	0.80	0.766	0.58	0.349	0.39	0.132
14,000	12,048.2	0.83	0.818	0.60	0.373	0.40	0.141
14,500	12,478.5	0.86	0.871	0.62	0.397	0.42	0.150
15,000	12,908.8	0.89	0.926	0.64	0.422	0.43	0.159
15,500	13,339.1	0.92	0.983	0.67	0.448	0.44	0.169
16,000	13,769.4	0.95	1.041	0.69	0.474	0.46	0.179
16,500	14,199.7	0.98	1.100	0.71	0.501	0.47	0.189
17,000	14,629.9	1.01	1.161	0.73	0.529	0.49	0.200
17,500	15,060.2	1.04	1.224	0.75	0.557	0.50	0.210
18,000	15,490.5	1.07	1.287	0.77	0.586	0.52	0.221
18,500	15,920.8	1.10	1.353	0.79	0.616	0.53	0.232
19,000	16,351.1	1.13	1.420	0.82	0.646	0.54	0.244
19,500	16,781.4	1.16	1.488	0.84	0.677	0.56	0.255
20,000	17,211.7	1.19	1.558	0.86	0.709	0.57	0.267
20,500	17,642.0	1.22	1.629	0.88	0.741	0.59	0.279
21,000	18,072.3	1.25	1.702	0.90	0.774	0.60	0.292
21,500	18,502.6	1.28	1.776	0.92	0.808	0.62	0.304
22,000	18,932.9	1.31	1.851	0.95	0.842	0.63	0.317

d [mm]		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]
22,500	19,363.2	1.34	1.928	0.97	0.877	0.64	0.330
23,000	19,793.5	1.37	2.007	0.99	0.913	0.66	0.344
23,500	20,223.8	1.40	2.087	1.01	0.949	0.67	0.357
24,000	20,654.0	1.43	2.168	1.03	0.986	0.69	0.371
24,500	21,084.3	1.46	2.250	1.05	1.023	0.70	0.385
25,000	21,514.6	1.49	2.335	1.07	1.061	0.72	0.400
25,500	21,944.9	1.52	2.420	1.10	1.100	0.73	0.414
26,000	22,375.2	1.55	2.507	1.12	1.140	0.74	0.429
26,500	22,805.5	1.58	2.595	1.14	1.180	0.76	0.444
27,000	23,235.8	1.61	2.685	1.16	1.220	0.77	0.459
27,500	23,666.1	1.64	2.776	1.18	1.261	0.79	0.475
28,000	24,096.4	1.67	2.868	1.20	1.303	0.80	0.490
28,500	24,526.7	1.70	2.962	1.22	1.346	0.82	0.506
29,000	24,957.0	1.73	3.057	1.25	1.389	0.83	0.522
29,500	25,387.3	1.76	3.154	1.27	1.433	0.84	0.539
30,000	25,817.6	1.79	3.252	1.29	1.477	0.86	0.555
32,500	27,969.0	1.94	3.762	1.40	1.708	0.93	0.642
35,000	30,120.5	2.08	4.307	1.50	1.954	1.00	0.734
37,500	32,271.9	2.23	4.884	1.61	2.216	1.07	0.832
40,000	34,423.4	2.38	5.496	1.72	2.492	1.15	0.935
42,500	36,574.9	2.53	6.140	1.83	2.783	1.22	1.044
45,000	38,726.3	2.68	6.817	1.93	3.089	1.29	1.159
47,500	40,877.8	2.83	7.526	2.04	3.409	1.36	1.278
50,000	43,029.3	2.98	8.268	2.15	3.744	1.43	1.403
52,500	45,180.7	–	–	2.26	4.094	1.50	1.534
55,000	47,332.2	–	–	2.36	4.457	1.57	1.669
57,500	49,483.6	–	–	2.47	4.835	1.65	1.810
60,000	51,635.1	–	–	2.58	5.227	1.72	1.956
62,500	53,786.6	–	–	2.68	5.633	1.79	2.108
65,000	55,938.0	–	–	2.79	6.052	1.86	2.264
67,500	58,089.5	–	–	2.90	6.486	1.93	2.426
70,000	60,241.0	–	–	3.01	6.934	2.00	2.593
72,500	62,392.4	–	–	–	–	2.08	2.764
75,000	64,543.9	–	–	–	–	2.15	2.941
77,500	66,695.4	–	–	–	–	2.22	3.123
80,000	68,846.8	–	–	–	–	2.29	3.310
82,500	70,998.3	–	–	–	–	2.36	3.502
85,000	73,149.7	–	–	–	–	2.43	3.699
87,500	75,301.2	–	–	–	–	2.51	3.901
90,000	77,452.7	–	–	–	–	2.58	4.108
92,500	79,604.1	–	–	–	–	2.65	4.319
95,000	81,755.6	–	–	–	–	2.72	4.536
97,500	83,907.1	–	–	–	–	2.79	4.758
100,000	86,058.5	–	–	–	–	2.86	4.984
102,500	88,210.0	–	–	–	–	2.93	5.216
105,000	90,361.4	–	–	–	–	3.01	5.452
107,500	92,512.9	–	–	–	–	3.08	5.693

4.3 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:	0.0015 mm
Average temperature:	32.5 °C		

Table 20: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, heating, inlet flow 70 °C / return flow 55 °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	11.5	0.04	0.060	–	–	–	–	–	–
300	17.2	0.06	0.089	–	–	–	–	–	–
400	22.9	0.08	0.119	0.05	0.042	–	–	–	–
500	28.7	0.10	0.149	0.06	0.052	0.04	0.023	–	–
600	34.4	0.12	0.341	0.07	0.063	0.05	0.027	–	–
700	40.2	0.14	0.442	0.09	0.129	0.06	0.032	–	–
800	45.9	0.17	0.555	0.10	0.162	0.06	0.036	0.04	0.016
900	51.6	0.19	0.679	0.11	0.197	0.07	0.075	0.05	0.018
1,000	57.4	0.21	0.813	0.12	0.236	0.08	0.089	0.05	0.020
1,100	63.1	0.23	0.957	0.13	0.278	0.09	0.105	0.06	0.040
1,200	68.8	0.25	1.111	0.15	0.322	0.10	0.121	0.06	0.047
1,300	74.6	0.27	1.275	0.16	0.370	0.10	0.139	0.07	0.054
1,400	80.3	0.29	1.448	0.17	0.419	0.11	0.158	0.08	0.061
1,500	86.0	0.31	1.631	0.18	0.472	0.12	0.177	0.08	0.068
1,600	91.8	0.33	1.824	0.20	0.528	0.13	0.198	0.09	0.076
1,700	97.5	0.35	2.026	0.21	0.585	0.14	0.220	0.09	0.084
1,800	103.3	0.37	2.236	0.22	0.646	0.15	0.242	0.10	0.093
1,900	109.0	0.39	2.456	0.23	0.709	0.15	0.266	0.10	0.102
2,000	114.7	0.41	2.685	0.24	0.775	0.16	0.290	0.11	0.111
2,500	143.4	0.52	3.959	0.31	1.140	0.20	0.426	0.13	0.163
3,000	172.1	0.62	5.445	0.37	1.565	0.24	0.585	0.16	0.224
3,500	200.8	0.72	7.135	0.43	2.047	0.28	0.764	0.19	0.292
4,000	229.4	0.83	9.023	0.49	2.585	0.32	0.964	0.22	0.368
4,500	258.1	0.93	11.105	0.55	3.178	0.36	1.184	0.24	0.452
5,000	286.8	1.03	13.376	0.61	3.823	0.40	1.423	0.27	0.543
5,500	315.5	1.14	15.833	0.67	4.521	0.44	1.681	0.30	0.641
6,000	344.2	1.24	18.474	0.73	5.270	0.48	1.958	0.32	0.746
6,500	372.8	1.34	21.295	0.79	6.070	0.52	2.254	0.35	0.858
7,000	401.5	1.45	24.295	0.86	6.919	0.56	2.568	0.38	0.977
7,500	430.2	1.55	27.471	0.92	7.817	0.61	2.900	0.40	1.102
8,000	458.9	1.65	30.821	0.98	8.763	0.65	3.249	0.43	1.235
8,500	487.6	1.76	34.343	1.04	9.758	0.69	3.616	0.46	1.374
9,000	516.3	1.86	38.037	1.10	10.800	0.73	4.001	0.48	1.519
9,500	544.9	1.96	41.900	1.16	11.889	0.77	4.402	0.51	1.671
10,000	573.6	2.07	45.931	1.22	13.025	0.81	4.820	0.54	1.829
10,500	602.3	2.17	50.129	1.28	14.207	0.85	5.256	0.56	1.993
11,000	631.0	2.27	54.494	1.34	15.435	0.89	5.708	0.59	2.164

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]
11,500	659.7	2.38	59.023	1.41	16.708	0.93	6.176	0.62	2.341
12,000	688.3	2.48	63.716	1.47	18.027	0.97	6.661	0.65	2.524
12,500	717.0	2.58	68.572	1.53	19.390	1.01	7.162	0.67	2.713
13,000	745.7	2.69	73.589	1.59	20.798	1.05	7.680	0.70	2.908
13,500	774.4	2.79	78.768	1.65	22.251	1.09	8.213	0.73	3.109
14,000	803.1	2.89	84.107	1.71	23.747	1.13	8.763	0.75	3.316
14,500	831.7	3.00	89.606	1.77	25.288	1.17	9.328	0.78	3.529
15,000	860.4	3.10	95.263	1.83	26.872	1.21	9.910	0.81	3.748
15,500	889.1	–	–	1.90	28.500	1.25	10.507	0.83	3.973
16,000	917.8	–	–	1.96	30.170	1.29	11.119	0.86	4.203
16,500	946.5	–	–	2.02	31.884	1.33	11.748	0.89	4.440
17,000	975.1	–	–	2.08	33.641	1.37	12.391	0.91	4.682
17,500	1,003.8	–	–	2.14	35.440	1.41	13.050	0.94	4.930
18,000	1,032.5	–	–	2.20	37.282	1.45	13.725	0.97	5.183
18,500	1,061.2	–	–	2.26	39.166	1.49	14.415	1.00	5.443
19,000	1,089.9	–	–	2.32	41.093	1.53	15.120	1.02	5.708
19,500	1,118.5	–	–	2.38	43.061	1.57	15.840	1.05	5.978
20,000	1,147.2	–	–	2.45	45.071	1.61	16.575	1.08	6.254
20,500	1,175.9	–	–	2.51	47.123	1.65	17.326	1.10	6.536
21,000	1,204.6	–	–	2.57	49.217	1.69	18.091	1.13	6.823
21,500	1,233.3	–	–	2.63	51.352	1.74	18.871	1.16	7.116
22,000	1,262.0	–	–	2.69	53.528	1.78	19.667	1.18	7.415
22,500	1,290.6	–	–	2.75	55.746	1.82	20.477	1.21	7.719
23,000	1,319.3	–	–	2.81	58.005	1.86	21.301	1.24	8.028
23,500	1,348.0	–	–	2.87	60.304	1.90	22.141	1.26	8.343
24,000	1,376.7	–	–	2.93	62.645	1.94	22.995	1.29	8.663
24,500	1,405.4	–	–	3.00	65.027	1.98	23.864	1.32	8.989
25,000	1,434.0	–	–	3.06	67.449	2.02	24.748	1.34	9.320
25,500	1,462.7	–	–	–	–	2.06	25.646	1.37	9.657
26,000	1,491.4	–	–	–	–	2.10	26.558	1.40	9.998
26,500	1,520.1	–	–	–	–	2.14	27.486	1.43	10.346
27,000	1,548.8	–	–	–	–	2.18	28.427	1.45	10.698
27,500	1,577.4	–	–	–	–	2.22	29.383	1.48	11.056
28,000	1,606.1	–	–	–	–	2.26	30.353	1.51	11.419
28,500	1,634.8	–	–	–	–	2.30	31.338	1.53	11.788
29,000	1,663.5	–	–	–	–	2.34	32.337	1.56	12.162
29,500	1,692.2	–	–	–	–	2.38	33.351	1.59	12.541
30,000	1,720.8	–	–	–	–	2.42	34.378	1.61	12.925
32,500	1,864.2	–	–	–	–	2.62	39.729	1.75	14.926
35,000	2,007.6	–	–	–	–	2.82	45.431	1.88	17.056
37,500	2,151.1	–	–	–	–	3.03	51.482	2.02	19.314
40,000	2,294.5	–	–	–	–	–	–	2.15	21.699
42,500	2,437.9	–	–	–	–	–	–	2.29	24.211
45,000	2,581.3	–	–	–	–	–	–	2.42	26.847
47,500	2,724.7	–	–	–	–	–	–	2.55	29.608
50,000	2,868.1	–	–	–	–	–	–	2.69	32.491
52,500	3,011.5	–	–	–	–	–	–	2.82	35.497
55,000	3,154.9	–	–	–	–	–	–	2.96	38.624
57,500	3,298.3	–	–	–	–	–	–	3.09	41.873

Table 21: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 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]
1,300	74.6	0.04	0.009	–	–	–	–	–	–
1,400	80.3	0.04	0.017	–	–	–	–	–	–
1,500	86.0	0.05	0.019	–	–	–	–	–	–
1,600	91.8	0.05	0.022	–	–	–	–	–	–
1,700	97.5	0.05	0.024	–	–	–	–	–	–
1,800	103.3	0.06	0.027	–	–	–	–	–	–
1,900	109.0	0.06	0.029	–	–	–	–	–	–
2,000	114.7	0.06	0.032	0.04	0.011	–	–	–	–
2,500	143.4	0.08	0.046	0.05	0.016	–	–	–	–
3,000	172.1	0.09	0.063	0.06	0.022	0.04	0.009	–	–
3,500	200.8	0.11	0.083	0.07	0.029	0.05	0.011	–	–
4,000	229.4	0.13	0.104	0.08	0.036	0.05	0.014	–	–
4,500	258.1	0.14	0.127	0.09	0.044	0.06	0.017	–	–
5,000	286.8	0.16	0.153	0.10	0.053	0.07	0.021	–	–
5,500	315.5	0.17	0.180	0.11	0.063	0.07	0.025	0.04	0.007
6,000	344.2	0.19	0.210	0.12	0.073	0.08	0.029	0.05	0.008
6,500	372.8	0.20	0.241	0.13	0.084	0.09	0.033	0.05	0.009
7,000	401.5	0.22	0.275	0.14	0.095	0.10	0.037	0.06	0.011
7,500	430.2	0.24	0.310	0.15	0.107	0.10	0.042	0.06	0.012
8,000	458.9	0.25	0.347	0.16	0.120	0.11	0.047	0.06	0.013
8,500	487.6	0.27	0.385	0.17	0.134	0.12	0.052	0.07	0.015
9,000	516.3	0.28	0.426	0.18	0.148	0.12	0.058	0.07	0.016
9,500	544.9	0.30	0.468	0.19	0.162	0.13	0.063	0.08	0.018
10,000	573.6	0.32	0.512	0.20	0.177	0.14	0.069	0.08	0.019
10,500	602.3	0.33	0.558	0.21	0.193	0.14	0.075	0.08	0.021
11,000	631.0	0.35	0.606	0.22	0.209	0.15	0.082	0.09	0.023
11,500	659.7	0.36	0.655	0.23	0.226	0.16	0.088	0.09	0.025
12,000	688.3	0.38	0.706	0.24	0.244	0.16	0.095	0.10	0.027
12,500	717.0	0.39	0.758	0.25	0.262	0.17	0.102	0.10	0.029
13,000	745.7	0.41	0.813	0.26	0.281	0.18	0.110	0.10	0.031
13,500	774.4	0.43	0.869	0.27	0.300	0.18	0.117	0.11	0.033
14,000	803.1	0.44	0.926	0.28	0.320	0.19	0.125	0.11	0.035
14,500	831.7	0.46	0.985	0.29	0.340	0.20	0.133	0.12	0.037
15,000	860.4	0.47	1.046	0.30	0.361	0.20	0.141	0.12	0.039
15,500	889.1	0.49	1.108	0.31	0.382	0.21	0.149	0.12	0.042
16,000	917.8	0.50	1.172	0.32	0.404	0.22	0.158	0.13	0.044
16,500	946.5	0.52	1.238	0.33	0.427	0.22	0.166	0.13	0.046
17,000	975.1	0.54	1.305	0.34	0.450	0.23	0.175	0.14	0.049
17,500	1,003.8	0.55	1.374	0.35	0.474	0.24	0.185	0.14	0.052
18,000	1,032.5	0.57	1.444	0.36	0.498	0.24	0.194	0.14	0.054
18,500	1,061.2	0.58	1.516	0.37	0.522	0.25	0.203	0.15	0.057
19,000	1,089.9	0.60	1.589	0.38	0.548	0.26	0.213	0.15	0.060
19,500	1,118.5	0.61	1.664	0.39	0.573	0.26	0.223	0.15	0.062
20,000	1,147.2	0.63	1.741	0.40	0.600	0.27	0.233	0.16	0.065
20,500	1,175.9	0.65	1.819	0.41	0.626	0.28	0.244	0.16	0.068
21,000	1,204.6	0.66	1.898	0.42	0.654	0.29	0.254	0.17	0.071
21,500	1,233.3	0.68	1.979	0.43	0.681	0.29	0.265	0.17	0.074
22,000	1,262.0	0.69	2.062	0.44	0.710	0.30	0.276	0.17	0.077

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]
22,500	1,290.6	0.71	2.146	0.45	0.738	0.31	0.287	0.18	0.080
23,000	1,319.3	0.73	2.231	0.46	0.768	0.31	0.299	0.18	0.083
23,500	1,348.0	0.74	2.318	0.47	0.798	0.32	0.310	0.19	0.086
24,000	1,376.7	0.76	2.407	0.48	0.828	0.33	0.322	0.19	0.090
24,500	1,405.4	0.77	2.497	0.49	0.859	0.33	0.334	0.19	0.093
25,000	1,434.0	0.79	2.588	0.50	0.890	0.34	0.346	0.20	0.096
25,500	1,462.7	0.80	2.681	0.51	0.922	0.35	0.358	0.20	0.100
26,000	1,491.4	0.82	2.776	0.52	0.954	0.35	0.371	0.21	0.103
26,500	1,520.1	0.84	2.872	0.53	0.987	0.36	0.384	0.21	0.107
27,000	1,548.8	0.85	2.969	0.54	1.020	0.37	0.396	0.21	0.110
27,500	1,577.4	0.87	3.068	0.55	1.054	0.37	0.410	0.22	0.114
28,000	1,606.1	0.88	3.168	0.56	1.088	0.38	0.423	0.22	0.118
28,500	1,634.8	0.90	3.269	0.58	1.123	0.39	0.436	0.23	0.121
29,000	1,663.5	0.91	3.373	0.59	1.158	0.39	0.450	0.23	0.125
29,500	1,692.2	0.93	3.477	0.60	1.194	0.40	0.464	0.23	0.129
30,000	1,720.8	0.95	3.583	0.61	1.230	0.41	0.478	0.24	0.133
32,500	1,864.2	1.02	4.134	0.66	1.419	0.44	0.551	0.26	0.153
35,000	2,007.6	1.10	4.720	0.71	1.619	0.48	0.628	0.28	0.174
37,500	2,151.1	1.18	5.341	0.76	1.831	0.51	0.710	0.30	0.197
40,000	2,294.5	1.26	5.997	0.81	2.054	0.54	0.796	0.32	0.221
42,500	2,437.9	1.34	6.686	0.86	2.289	0.58	0.887	0.34	0.246
45,000	2,581.3	1.42	7.409	0.91	2.536	0.61	0.982	0.36	0.272
47,500	2,724.7	1.50	8.166	0.96	2.794	0.65	1.082	0.38	0.300
50,000	2,868.1	1.58	8.955	1.01	3.062	0.68	1.185	0.40	0.328
52,500	3,011.5	1.66	9.778	1.06	3.342	0.71	1.293	0.42	0.358
55,000	3,154.9	1.73	10.634	1.11	3.633	0.75	1.406	0.44	0.389
57,500	3,298.3	1.81	11.521	1.16	3.935	0.78	1.522	0.46	0.421
60,000	3,441.7	1.89	12.442	1.21	4.248	0.82	1.642	0.48	0.454
62,500	3,585.1	1.97	13.394	1.26	4.571	0.85	1.767	0.50	0.488
65,000	3,728.5	2.05	14.378	1.31	4.905	0.88	1.896	0.52	0.524
67,500	3,871.9	2.13	15.394	1.36	5.250	0.92	2.028	0.54	0.560
70,000	4,015.3	2.21	16.442	1.41	5.606	0.95	2.165	0.56	0.598
72,500	4,158.7	2.29	17.520	1.46	5.972	0.98	2.306	0.58	0.636
75,000	4,302.1	2.36	18.631	1.51	6.348	1.02	2.450	0.60	0.676
77,500	4,445.5	2.44	19.772	1.56	6.735	1.05	2.599	0.62	0.717
80,000	4,588.9	2.52	20.944	1.61	7.132	1.09	2.752	0.64	0.759
82,500	4,732.3	2.60	22.148	1.66	7.540	1.12	2.908	0.66	0.802
85,000	4,875.7	2.68	23.382	1.72	7.957	1.15	3.069	0.68	0.846
87,500	5,019.1	2.76	24.646	1.77	8.385	1.19	3.233	0.70	0.891
90,000	5,162.5	2.84	25.942	1.82	8.823	1.22	3.402	0.71	0.937
92,500	5,305.9	2.92	27.267	1.87	9.272	1.26	3.574	0.73	0.984
95,000	5,449.3	3.00	28.623	1.92	9.730	1.29	3.750	0.75	1.032
97,500	5,592.7	3.07	30.009	1.97	10.199	1.32	3.929	0.77	1.082
100,000	5,736.1	–	–	2.02	10.677	1.36	4.113	0.79	1.132
105,000	6,022.9	–	–	2.12	11.665	1.43	4.491	0.83	1.236
110,000	6,309.8	–	–	2.22	12.691	1.49	4.885	0.87	1.343
115,000	6,596.6	–	–	2.32	13.758	1.56	5.294	0.91	1.455
120,000	6,883.4	–	–	2.42	14.864	1.63	5.717	0.95	1.571
125,000	7,170.2	–	–	2.52	16.008	1.70	6.155	0.99	1.691

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]
130,000	7,457.0	–	–	2.62	17.192	1.77	6.608	1.03	1.814
135,000	7,743.8	–	–	2.72	18.415	1.83	7.076	1.07	1.942
140,000	8,030.6	–	–	2.82	19.675	1.90	7.558	1.11	2.074
145,000	8,317.4	–	–	2.93	20.975	1.97	8.055	1.15	2.209
150,000	8,604.2	–	–	3.03	22.312	2.04	8.566	1.19	2.349
155,000	8,891.0	–	–	–	–	2.11	9.091	1.23	2.492
160,000	9,177.8	–	–	–	–	2.17	9.631	1.27	2.639
165,000	9,464.6	–	–	–	–	2.24	10.185	1.31	2.790
170,000	9,751.4	–	–	–	–	2.31	10.753	1.35	2.945
175,000	10,038.2	–	–	–	–	2.38	11.335	1.39	3.103
180,000	10,325.0	–	–	–	–	2.45	11.931	1.43	3.265
185,000	10,611.9	–	–	–	–	2.51	12.542	1.47	3.431
190,000	10,898.7	–	–	–	–	2.58	13.166	1.51	3.601
195,000	11,185.5	–	–	–	–	2.65	13.804	1.55	3.775
200,000	11,472.3	–	–	–	–	2.72	14.456	1.59	3.952
205,000	11,759.1	–	–	–	–	2.78	15.122	1.63	4.133
210,000	12,045.9	–	–	–	–	2.85	15.802	1.67	4.317
215,000	12,332.7	–	–	–	–	2.92	16.495	1.71	4.506
220,000	12,619.5	–	–	–	–	2.99	17.202	1.75	4.698
225,000	12,906.3	–	–	–	–	3.06	17.923	1.79	4.893
230,000	13,193.1	–	–	–	–	–	–	1.83	5.093
235,000	13,479.9	–	–	–	–	–	–	1.87	5.295
240,000	13,766.7	–	–	–	–	–	–	1.91	5.502
245,000	14,053.5	–	–	–	–	–	–	1.95	5.712
250,000	14,340.3	–	–	–	–	–	–	1.99	5.926
255,000	14,627.2	–	–	–	–	–	–	2.03	6.143
260,000	14,914.0	–	–	–	–	–	–	2.07	6.364
265,000	15,200.8	–	–	–	–	–	–	2.11	6.588
270,000	15,487.6	–	–	–	–	–	–	2.14	6.816
275,000	15,774.4	–	–	–	–	–	–	2.18	7.048
280,000	16,061.2	–	–	–	–	–	–	2.22	7.283
285,000	16,348.0	–	–	–	–	–	–	2.26	7.522
290,000	16,634.8	–	–	–	–	–	–	2.30	7.764
295,000	16,921.6	–	–	–	–	–	–	2.34	8.010
300,000	17,208.4	–	–	–	–	–	–	2.38	8.259
310,000	17,782.0	–	–	–	–	–	–	2.46	8.768
320,000	18,355.6	–	–	–	–	–	–	2.54	9.291
330,000	18,929.3	–	–	–	–	–	–	2.62	9.828
340,000	19,502.9	–	–	–	–	–	–	2.70	10.378
350,000	20,076.5	–	–	–	–	–	–	2.78	10.943
360,000	20,650.1	–	–	–	–	–	–	2.86	11.521
370,000	21,223.7	–	–	–	–	–	–	2.94	12.113
380,000	21,797.3	–	–	–	–	–	–	3.02	12.719
390,000	22,370.9	–	–	–	–	–	–	3.10	13.339

Table 22: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, heating, inlet flow 70 °C / return flow 55 °C, d76.1–108 mm

d [mm]		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]
10,500	602.3	0.04	0.004	–	–	–	–
11,000	631.0	0.04	0.004	–	–	–	–
11,500	659.7	0.05	0.005	–	–	–	–
12,000	688.3	0.05	0.005	–	–	–	–
12,500	717.0	0.05	0.006	–	–	–	–
13,000	745.7	0.05	0.006	–	–	–	–
13,500	774.4	0.05	0.006	–	–	–	–
14,000	803.1	0.06	0.007	0.04	0.003	–	–
14,500	831.7	0.06	0.007	0.04	0.003	–	–
15,000	860.4	0.06	0.008	0.04	0.004	–	–
15,500	889.1	0.06	0.008	0.04	0.004	–	–
16,000	917.8	0.06	0.009	0.05	0.004	–	–
16,500	946.5	0.07	0.009	0.05	0.004	–	–
17,000	975.1	0.07	0.009	0.05	0.004	–	–
17,500	1,003.8	0.07	0.010	0.05	0.005	–	–
18,000	1,032.5	0.07	0.010	0.05	0.005	–	–
18,500	1,061.2	0.07	0.011	0.05	0.005	–	–
19,000	1,089.9	0.08	0.011	0.05	0.005	–	–
19,500	1,118.5	0.08	0.012	0.06	0.006	–	–
20,000	1,147.2	0.08	0.013	0.06	0.006	–	–
20,500	1,175.9	0.08	0.013	0.06	0.006	–	–
21,000	1,204.6	0.08	0.014	0.06	0.006	0.04	0.002
21,500	1,233.3	0.09	0.014	0.06	0.007	0.04	0.003
22,000	1,262.0	0.09	0.015	0.06	0.007	0.04	0.003
22,500	1,290.6	0.09	0.015	0.06	0.007	0.04	0.003
23,000	1,319.3	0.09	0.016	0.07	0.007	0.04	0.003
23,500	1,348.0	0.09	0.017	0.07	0.008	0.04	0.003
24,000	1,376.7	0.10	0.017	0.07	0.008	0.05	0.003
24,500	1,405.4	0.10	0.018	0.07	0.008	0.05	0.003
25,000	1,434.0	0.10	0.019	0.07	0.009	0.05	0.003
25,500	1,462.7	0.10	0.019	0.07	0.009	0.05	0.003
26,000	1,491.4	0.10	0.020	0.07	0.009	0.05	0.003
26,500	1,520.1	0.11	0.021	0.08	0.009	0.05	0.004
27,000	1,548.8	0.11	0.021	0.08	0.010	0.05	0.004
27,500	1,577.4	0.11	0.022	0.08	0.010	0.05	0.004
28,000	1,606.1	0.11	0.023	0.08	0.010	0.05	0.004
28,500	1,634.8	0.11	0.023	0.08	0.011	0.05	0.004
29,000	1,663.5	0.12	0.024	0.08	0.011	0.06	0.004
29,500	1,692.2	0.12	0.025	0.08	0.011	0.06	0.004
30,000	1,720.8	0.12	0.026	0.09	0.012	0.06	0.004
32,500	1,864.2	0.13	0.029	0.09	0.014	0.06	0.005
35,000	2,007.6	0.14	0.033	0.10	0.015	0.07	0.006
37,500	2,151.1	0.15	0.038	0.11	0.017	0.07	0.007
40,000	2,294.5	0.16	0.042	0.11	0.019	0.08	0.007
42,500	2,437.9	0.17	0.047	0.12	0.022	0.08	0.008
45,000	2,581.3	0.18	0.052	0.13	0.024	0.09	0.009
47,500	2,724.7	0.19	0.057	0.14	0.026	0.09	0.010
50,000	2,868.1	0.20	0.063	0.14	0.029	0.10	0.011

d [mm]		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]
52,500	3,011.5	0.21	0.068	0.15	0.031	0.10	0.012
55,000	3,154.9	0.22	0.074	0.16	0.034	0.11	0.013
57,500	3,298.3	0.23	0.080	0.16	0.037	0.11	0.014
60,000	3,441.7	0.24	0.087	0.17	0.040	0.11	0.015
62,500	3,585.1	0.25	0.093	0.18	0.043	0.12	0.016
65,000	3,728.5	0.26	0.100	0.19	0.046	0.12	0.017
67,500	3,871.9	0.27	0.107	0.19	0.049	0.13	0.019
70,000	4,015.3	0.28	0.114	0.20	0.052	0.13	0.020
72,500	4,158.7	0.29	0.121	0.21	0.056	0.14	0.021
75,000	4,302.1	0.30	0.129	0.21	0.059	0.14	0.022
77,500	4,445.5	0.31	0.137	0.22	0.063	0.15	0.024
80,000	4,588.9	0.32	0.145	0.23	0.066	0.15	0.025
82,500	4,732.3	0.33	0.153	0.24	0.070	0.16	0.027
85,000	4,875.7	0.34	0.161	0.24	0.074	0.16	0.028
87,500	5,019.1	0.35	0.170	0.25	0.078	0.17	0.029
90,000	5,162.5	0.36	0.178	0.26	0.082	0.17	0.031
92,500	5,305.9	0.37	0.187	0.27	0.086	0.18	0.032
95,000	5,449.3	0.38	0.196	0.27	0.090	0.18	0.034
97,500	5,592.7	0.39	0.206	0.28	0.094	0.19	0.036
100,000	5,736.1	0.40	0.215	0.29	0.098	0.19	0.037
105,000	6,022.9	0.42	0.235	0.30	0.107	0.20	0.041
110,000	6,309.8	0.44	0.255	0.32	0.117	0.21	0.044
115,000	6,596.6	0.46	0.276	0.33	0.126	0.22	0.048
120,000	6,883.4	0.48	0.298	0.34	0.136	0.23	0.052
125,000	7,170.2	0.50	0.321	0.36	0.147	0.24	0.055
130,000	7,457.0	0.52	0.344	0.37	0.157	0.25	0.059
135,000	7,743.8	0.54	0.368	0.39	0.168	0.26	0.064
140,000	8,030.6	0.56	0.393	0.40	0.179	0.27	0.068
145,000	8,317.4	0.58	0.418	0.42	0.191	0.28	0.072
150,000	8,604.2	0.60	0.445	0.43	0.203	0.29	0.077
155,000	8,891.0	0.62	0.471	0.44	0.215	0.30	0.081
160,000	9,177.8	0.64	0.499	0.46	0.228	0.31	0.086
165,000	9,464.6	0.66	0.528	0.47	0.241	0.32	0.091
170,000	9,751.4	0.68	0.557	0.49	0.254	0.32	0.096
175,000	10,038.2	0.70	0.586	0.50	0.268	0.33	0.101
180,000	10,325.0	0.72	0.617	0.52	0.281	0.34	0.106
185,000	10,611.9	0.74	0.648	0.53	0.296	0.35	0.112
190,000	10,898.7	0.76	0.680	0.54	0.310	0.36	0.117
195,000	11,185.5	0.78	0.712	0.56	0.325	0.37	0.123
200,000	11,472.3	0.79	0.746	0.57	0.340	0.38	0.128
205,000	11,759.1	0.81	0.780	0.59	0.355	0.39	0.134
210,000	12,045.9	0.83	0.814	0.60	0.371	0.40	0.140
215,000	12,332.7	0.85	0.849	0.62	0.387	0.41	0.146
220,000	12,619.5	0.87	0.885	0.63	0.404	0.42	0.152
225,000	12,906.3	0.89	0.922	0.64	0.420	0.43	0.159
230,000	13,193.1	0.91	0.959	0.66	0.437	0.44	0.165
235,000	13,479.9	0.93	0.997	0.67	0.454	0.45	0.171
240,000	13,766.7	0.95	1.036	0.69	0.472	0.46	0.178
245,000	14,053.5	0.97	1.075	0.70	0.490	0.47	0.185

d [mm]		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]
250,000	14,340.3	0.99	1.115	0.72	0.508	0.48	0.192
255,000	14,627.2	1.01	1.156	0.73	0.526	0.49	0.199
260,000	14,914.0	1.03	1.197	0.75	0.545	0.50	0.206
265,000	15,200.8	1.05	1.239	0.76	0.564	0.51	0.213
270,000	15,487.6	1.07	1.282	0.77	0.584	0.52	0.220
275,000	15,774.4	1.09	1.325	0.79	0.603	0.53	0.227
280,000	16,061.2	1.11	1.369	0.80	0.623	0.53	0.235
285,000	16,348.0	1.13	1.413	0.82	0.643	0.54	0.243
290,000	16,634.8	1.15	1.459	0.83	0.664	0.55	0.250
295,000	16,921.6	1.17	1.504	0.85	0.685	0.56	0.258
300,000	17,208.4	1.19	1.551	0.86	0.706	0.57	0.266
310,000	17,782.0	1.23	1.646	0.89	0.749	0.59	0.282
320,000	18,355.6	1.27	1.743	0.92	0.793	0.61	0.299
330,000	18,929.3	1.31	1.843	0.95	0.838	0.63	0.316
340,000	19,502.9	1.35	1.946	0.97	0.885	0.65	0.333
350,000	20,076.5	1.39	2.051	1.00	0.933	0.67	0.351
360,000	20,650.1	1.43	2.158	1.03	0.981	0.69	0.369
370,000	21,223.7	1.47	2.269	1.06	1.031	0.71	0.388
380,000	21,797.3	1.51	2.381	1.09	1.082	0.73	0.407
390,000	22,370.9	1.55	2.496	1.12	1.135	0.75	0.427
400,000	22,944.6	1.59	2.614	1.15	1.188	0.76	0.447
410,000	23,518.2	1.63	2.734	1.18	1.242	0.78	0.467
420,000	24,091.8	1.67	2.856	1.20	1.298	0.80	0.488
430,000	24,665.4	1.71	2.981	1.23	1.354	0.82	0.509
440,000	25,239.0	1.75	3.109	1.26	1.412	0.84	0.531
450,000	25,812.6	1.79	3.238	1.29	1.471	0.86	0.553
460,000	26,386.2	1.83	3.371	1.32	1.531	0.88	0.575
470,000	26,959.8	1.87	3.505	1.35	1.592	0.90	0.598
480,000	27,533.5	1.91	3.642	1.38	1.654	0.92	0.621
490,000	28,107.1	1.95	3.782	1.40	1.717	0.94	0.645
500,000	28,680.7	1.99	3.924	1.43	1.781	0.96	0.669
550,000	31,548.8	2.19	4.669	1.58	2.118	1.05	0.795
600,000	34,416.8	2.38	5.474	1.72	2.482	1.15	0.931
650,000	37,284.9	2.58	6.337	1.86	2.872	1.24	1.077
700,000	40,153.0	2.78	7.258	2.01	3.288	1.34	1.233
750,000	43,021.0	2.98	8.236	2.15	3.729	1.43	1.398
800,000	45,889.1	–	–	2.29	4.196	1.53	1.572
850,000	48,757.2	–	–	2.44	4.689	1.62	1.756
900,000	51,625.2	–	–	2.58	5.206	1.72	1.948
950,000	54,493.3	–	–	2.72	5.749	1.81	2.151
1,000,000	57,361.4	–	–	2.87	6.316	1.91	2.362
1,050,000	60,229.4	–	–	3.01	6.908	2.01	2.582
1,100,000	63,097.5	–	–	–	–	2.10	2.812
1,150,000	65,965.6	–	–	–	–	2.20	3.050
1,200,000	68,833.7	–	–	–	–	2.29	3.297
1,250,000	71,701.7	–	–	–	–	2.39	3.553
1,300,000	74,569.8	–	–	–	–	2.48	3.818
1,350,000	77,437.9	–	–	–	–	2.58	4.092
1,400,000	80,305.9	–	–	–	–	2.67	4.375

d [mm]		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]
1,450,000	83,174.0	–	–	–	–	2.77	4.666
1,500,000	86,042.1	–	–	–	–	2.87	4.966
1,550,000	88,910.1	–	–	–	–	2.96	5.274
1,600,000	91,778.2	–	–	–	–	3.06	5.591

4.4 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:	0.0015 mm
Average temperature:	32.5 °C		

Table 23: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 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	0.12	0.297	0.07	0.104	0.05	0.045	–	–
300	51.6	0.18	0.785	0.11	0.156	0.07	0.068	0.05	0.030
400	68.9	0.24	1.276	0.14	0.372	0.10	0.091	0.06	0.040
500	86.1	0.31	1.866	0.18	0.543	0.12	0.205	0.08	0.050
600	103.3	0.37	2.549	0.22	0.741	0.14	0.279	0.10	0.108
700	120.5	0.43	3.322	0.25	0.963	0.17	0.362	0.11	0.140
800	137.7	0.49	4.181	0.29	1.211	0.19	0.455	0.13	0.175
900	154.9	0.55	5.124	0.33	1.482	0.22	0.556	0.14	0.214
1,000	172.1	0.61	6.149	0.36	1.776	0.24	0.666	0.16	0.256
1,100	189.3	0.67	7.254	0.40	2.094	0.26	0.785	0.18	0.301
1,200	206.6	0.73	8.438	0.43	2.433	0.29	0.912	0.19	0.350
1,300	223.8	0.80	9.700	0.47	2.795	0.31	1.046	0.21	0.401
1,400	241.0	0.86	11.037	0.51	3.178	0.33	1.189	0.22	0.456
1,500	258.2	0.92	12.450	0.54	3.582	0.36	1.339	0.24	0.513
1,600	275.4	0.98	13.937	0.58	4.007	0.38	1.498	0.25	0.573
1,700	292.6	1.04	15.497	0.62	4.453	0.41	1.663	0.27	0.637
1,800	309.8	1.10	17.129	0.65	4.919	0.43	1.837	0.29	0.703
1,900	327.0	1.16	18.833	0.69	5.405	0.45	2.018	0.30	0.771
2,000	344.3	1.22	20.608	0.72	5.911	0.48	2.206	0.32	0.843
2,500	430.3	1.53	30.524	0.91	8.735	0.60	3.254	0.40	1.242
3,000	516.4	1.84	42.128	1.09	12.033	0.72	4.476	0.48	1.706
3,500	602.4	2.14	55.369	1.27	15.788	0.84	5.865	0.56	2.233
4,000	688.5	2.45	70.204	1.45	19.988	0.96	7.418	0.64	2.821
4,500	774.6	2.75	86.600	1.63	24.623	1.08	9.129	0.72	3.469

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]
5,000	860.6	3.06	104.530	1.81	29.684	1.20	10.996	0.80	4.175
5,500	946.7	–	–	1.99	35.163	1.31	13.016	0.88	4.939
6,000	1,032.8	–	–	2.17	41.055	1.43	15.185	0.96	5.758
6,500	1,118.8	–	–	2.35	47.353	1.55	17.502	1.04	6.633
7,000	1,204.9	–	–	2.53	54.052	1.67	19.966	1.11	7.562
7,500	1,290.9	–	–	2.72	61.148	1.79	22.573	1.19	8.545
8,000	1,377.0	–	–	2.90	68.636	1.91	25.323	1.27	9.581
8,500	1,463.1	–	–	3.08	76.514	2.03	28.213	1.35	10.670
9,000	1,549.1	–	–	–	–	2.15	31.244	1.43	11.810
9,500	1,635.2	–	–	–	–	2.27	34.412	1.51	13.002
10,000	1,721.3	–	–	–	–	2.39	37.718	1.59	14.245
10,500	1,807.3	–	–	–	–	2.51	41.159	1.67	15.539
11,000	1,893.4	–	–	–	–	2.63	44.736	1.75	16.883
11,500	1,979.4	–	–	–	–	2.75	48.447	1.83	18.277
12,000	2,065.5	–	–	–	–	2.87	52.291	1.91	19.720
12,500	2,151.6	–	–	–	–	2.99	56.268	1.99	21.212
13,000	2,237.6	–	–	–	–	–	–	2.07	22.753
13,500	2,323.7	–	–	–	–	–	–	2.15	24.342
14,000	2,409.8	–	–	–	–	–	–	2.23	25.980
14,500	2,495.8	–	–	–	–	–	–	2.31	27.666
15,000	2,581.9	–	–	–	–	–	–	2.39	29.399
15,500	2,667.9	–	–	–	–	–	–	2.47	31.180
16,000	2,754.0	–	–	–	–	–	–	2.55	33.008
16,500	2,840.1	–	–	–	–	–	–	2.63	34.883
17,000	2,926.1	–	–	–	–	–	–	2.71	36.804
17,500	3,012.2	–	–	–	–	–	–	2.79	38.773
18,000	3,098.3	–	–	–	–	–	–	2.87	40.787
18,500	3,184.3	–	–	–	–	–	–	2.95	42.848
19,000	3,270.4	–	–	–	–	–	–	3.03	44.954

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Table 24: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, heating, inlet flow 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]
500	86.1	0.05	0.017	–	–	–	–	–	–
600	103.3	0.06	0.021	–	–	–	–	–	–
700	120.5	0.07	0.024	0.04	0.010	–	–	–	–
800	137.7	0.07	0.050	0.05	0.011	–	–	–	–
900	154.9	0.08	0.061	0.05	0.013	–	–	–	–
1,000	172.1	0.09	0.073	0.06	0.026	0.04	0.006	–	–
1,100	189.3	0.10	0.086	0.07	0.030	0.04	0.007	–	–
1,200	206.6	0.11	0.099	0.07	0.035	0.05	0.014	–	–
1,300	223.8	0.12	0.114	0.08	0.040	0.05	0.016	–	–
1,400	241.0	0.13	0.129	0.08	0.045	0.06	0.018	–	–
1,500	258.2	0.14	0.146	0.09	0.051	0.06	0.020	–	–
1,600	275.4	0.15	0.163	0.10	0.057	0.06	0.022	–	–
1,700	292.6	0.16	0.180	0.10	0.063	0.07	0.025	–	–
1,800	309.8	0.17	0.199	0.11	0.069	0.07	0.027	0.04	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	327.0	0.18	0.218	0.11	0.076	0.08	0.030	0.04	0.009
2,000	344.3	0.19	0.238	0.12	0.083	0.08	0.033	0.05	0.009
2,500	430.3	0.23	0.350	0.15	0.122	0.10	0.048	0.06	0.014
3,000	516.4	0.28	0.481	0.18	0.167	0.12	0.066	0.07	0.019
3,500	602.4	0.33	0.628	0.21	0.218	0.14	0.086	0.08	0.024
4,000	688.5	0.37	0.793	0.24	0.275	0.16	0.108	0.09	0.030
4,500	774.6	0.42	0.974	0.27	0.338	0.18	0.132	0.11	0.037
5,000	860.6	0.47	1.171	0.30	0.406	0.20	0.159	0.12	0.045
5,500	946.7	0.51	1.384	0.33	0.479	0.22	0.187	0.13	0.053
6,000	1,032.8	0.56	1.612	0.36	0.558	0.24	0.218	0.14	0.061
6,500	1,118.8	0.61	1.856	0.39	0.642	0.26	0.251	0.15	0.070
7,000	1,204.9	0.65	2.114	0.42	0.731	0.28	0.285	0.16	0.080
7,500	1,290.9	0.70	2.387	0.45	0.825	0.30	0.322	0.18	0.090
8,000	1,377.0	0.75	2.675	0.48	0.924	0.32	0.360	0.19	0.101
8,500	1,463.1	0.79	2.978	0.51	1.028	0.34	0.401	0.20	0.112
9,000	1,549.1	0.84	3.294	0.54	1.136	0.36	0.443	0.21	0.124
9,500	1,635.2	0.89	3.625	0.57	1.250	0.38	0.487	0.22	0.136
10,000	1,721.3	0.93	3.969	0.60	1.368	0.40	0.533	0.24	0.149
10,500	1,807.3	0.98	4.328	0.63	1.491	0.42	0.581	0.25	0.162
11,000	1,893.4	1.03	4.700	0.66	1.619	0.44	0.630	0.26	0.176
11,500	1,979.4	1.07	5.086	0.69	1.751	0.46	0.682	0.27	0.190
12,000	2,065.5	1.12	5.485	0.72	1.888	0.48	0.735	0.28	0.205
12,500	2,151.6	1.17	5.898	0.75	2.030	0.50	0.790	0.29	0.220
13,000	2,237.6	1.21	6.324	0.78	2.175	0.52	0.846	0.31	0.236
13,500	2,323.7	1.26	6.763	0.81	2.326	0.54	0.905	0.32	0.252
14,000	2,409.8	1.31	7.215	0.84	2.481	0.56	0.965	0.33	0.269
14,500	2,495.8	1.35	7.681	0.87	2.640	0.58	1.026	0.34	0.286
15,000	2,581.9	1.40	8.159	0.90	2.804	0.60	1.090	0.35	0.303
15,500	2,667.9	1.45	8.651	0.93	2.972	0.62	1.155	0.36	0.321
16,000	2,754.0	1.49	9.155	0.96	3.144	0.64	1.222	0.38	0.340
16,500	2,840.1	1.54	9.672	0.99	3.321	0.66	1.290	0.39	0.359
17,000	2,926.1	1.59	10.201	1.02	3.502	0.68	1.360	0.40	0.378
17,500	3,012.2	1.63	10.744	1.05	3.688	0.70	1.432	0.41	0.398
18,000	3,098.3	1.68	11.298	1.08	3.877	0.72	1.505	0.42	0.418
18,500	3,184.3	1.73	11.866	1.11	4.071	0.74	1.580	0.44	0.439
19,000	3,270.4	1.77	12.446	1.14	4.269	0.76	1.657	0.45	0.460
19,500	3,356.4	1.82	13.038	1.17	4.472	0.78	1.735	0.46	0.482
20,000	3,442.5	1.87	13.643	1.20	4.678	0.80	1.815	0.47	0.504
20,500	3,528.6	1.91	14.260	1.23	4.889	0.82	1.896	0.48	0.526
21,000	3,614.6	1.96	14.889	1.25	5.103	0.84	1.979	0.49	0.549
21,500	3,700.7	2.01	15.530	1.28	5.322	0.86	2.064	0.51	0.573
22,000	3,786.8	2.05	16.184	1.31	5.545	0.89	2.150	0.52	0.596
22,500	3,872.8	2.10	16.850	1.34	5.772	0.91	2.238	0.53	0.621
23,000	3,958.9	2.15	17.528	1.37	6.003	0.93	2.327	0.54	0.645
23,500	4,044.9	2.19	18.218	1.40	6.239	0.95	2.418	0.55	0.670
24,000	4,131.0	2.24	18.920	1.43	6.478	0.97	2.510	0.56	0.696
24,500	4,217.1	2.29	19.633	1.46	6.721	0.99	2.604	0.58	0.722
25,000	4,303.1	2.33	20.359	1.49	6.969	1.01	2.700	0.59	0.748
25,500	4,389.2	2.38	21.097	1.52	7.220	1.03	2.797	0.60	0.775

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	4,475.3	2.43	21.847	1.55	7.475	1.05	2.895	0.61	0.802
26,500	4,561.3	2.47	22.608	1.58	7.735	1.07	2.995	0.62	0.830
27,000	4,647.4	2.52	23.382	1.61	7.998	1.09	3.097	0.64	0.858
27,500	4,733.4	2.57	24.167	1.64	8.265	1.11	3.200	0.65	0.886
28,000	4,819.5	2.61	24.964	1.67	8.537	1.13	3.305	0.66	0.915
28,500	4,905.6	2.66	25.772	1.70	8.812	1.15	3.411	0.67	0.944
29,000	4,991.6	2.71	26.592	1.73	9.091	1.17	3.518	0.68	0.974
29,500	5,077.7	2.75	27.424	1.76	9.374	1.19	3.627	0.69	1.004
30,000	5,163.8	2.80	28.267	1.79	9.661	1.21	3.738	0.71	1.034
32,500	5,594.1	3.03	32.658	1.94	11.154	1.31	4.313	0.76	1.193
35,000	6,024.4	–	–	2.09	12.743	1.41	4.925	0.82	1.361
37,500	6,454.7	–	–	2.24	14.427	1.51	5.574	0.88	1.539
40,000	6,885.0	–	–	2.39	16.205	1.61	6.258	0.94	1.727
42,500	7,315.3	–	–	2.54	18.077	1.71	6.978	1.00	1.925
45,000	7,745.6	–	–	2.69	20.041	1.81	7.733	1.06	2.132
47,500	8,176.0	–	–	2.84	22.097	1.91	8.522	1.12	2.349
50,000	8,606.3	–	–	2.99	24.243	2.01	9.347	1.18	2.575
52,500	9,036.6	–	–	–	–	2.11	10.205	1.24	2.811
55,000	9,466.9	–	–	–	–	2.21	11.098	1.29	3.055
57,500	9,897.2	–	–	–	–	2.31	12.025	1.35	3.309
60,000	10,327.5	–	–	–	–	2.41	12.985	1.41	3.572
62,500	10,757.8	–	–	–	–	2.51	13.979	1.47	3.844
65,000	11,188.1	–	–	–	–	2.62	15.006	1.53	4.124
67,500	11,618.5	–	–	–	–	2.72	16.066	1.59	4.414
70,000	12,048.8	–	–	–	–	2.82	17.158	1.65	4.713
72,500	12,479.1	–	–	–	–	2.92	18.284	1.71	5.020
75,000	12,909.4	–	–	–	–	3.02	19.442	1.76	5.337
77,500	13,339.7	–	–	–	–	–	–	1.82	5.662
80,000	13,770.0	–	–	–	–	–	–	1.88	5.995
82,500	14,200.3	–	–	–	–	–	–	1.94	6.337
85,000	14,630.6	–	–	–	–	–	–	2.00	6.688
87,500	15,061.0	–	–	–	–	–	–	2.06	7.048
90,000	15,491.3	–	–	–	–	–	–	2.12	7.416
92,500	15,921.6	–	–	–	–	–	–	2.18	7.792
95,000	16,351.9	–	–	–	–	–	–	2.23	8.177
97,500	16,782.2	–	–	–	–	–	–	2.29	8.570
100,000	17,212.5	–	–	–	–	–	–	2.35	8.972
105,000	18,073.2	–	–	–	–	–	–	2.47	9.800
110,000	18,933.8	–	–	–	–	–	–	2.59	10.662
115,000	19,794.4	–	–	–	–	–	–	2.71	11.556
120,000	20,655.0	–	–	–	–	–	–	2.82	12.484
125,000	21,515.7	–	–	–	–	–	–	2.94	13.444
130,000	22,376.3	–	–	–	–	–	–	3.06	14.436

Table 25: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, heating, inlet flow 35 °C / return flow 30 °C, d76.1–108 mm

d [mm]		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]
3,500	602.4	0.04	0.005	–	–	–	–
4,000	688.5	0.05	0.006	–	–	–	–
4,500	774.6	0.05	0.007	–	–	–	–
5,000	860.6	0.06	0.009	0.04	0.004	–	–
5,500	946.7	0.06	0.010	0.05	0.005	–	–
6,000	1,032.8	0.07	0.012	0.05	0.005	–	–
6,500	1,118.8	0.08	0.014	0.06	0.006	–	–
7,000	1,204.9	0.08	0.016	0.06	0.007	–	–
7,500	1,290.9	0.09	0.017	0.06	0.008	0.04	0.003
8,000	1,377.0	0.09	0.020	0.07	0.009	0.05	0.003
8,500	1,463.1	0.10	0.022	0.07	0.010	0.05	0.004
9,000	1,549.1	0.11	0.024	0.08	0.011	0.05	0.004
9,500	1,635.2	0.11	0.026	0.08	0.012	0.05	0.005
10,000	1,721.3	0.12	0.029	0.08	0.013	0.06	0.005
10,500	1,807.3	0.12	0.031	0.09	0.014	0.06	0.006
11,000	1,893.4	0.13	0.034	0.09	0.016	0.06	0.006
11,500	1,979.4	0.14	0.037	0.10	0.017	0.07	0.006
12,000	2,065.5	0.14	0.040	0.10	0.018	0.07	0.007
12,500	2,151.6	0.15	0.042	0.11	0.020	0.07	0.007
13,000	2,237.6	0.15	0.045	0.11	0.021	0.07	0.008
13,500	2,323.7	0.16	0.049	0.11	0.022	0.08	0.009
14,000	2,409.8	0.16	0.052	0.12	0.024	0.08	0.009
14,500	2,495.8	0.17	0.055	0.12	0.025	0.08	0.010
15,000	2,581.9	0.18	0.058	0.13	0.027	0.08	0.010
15,500	2,667.9	0.18	0.062	0.13	0.028	0.09	0.011
16,000	2,754.0	0.19	0.065	0.14	0.030	0.09	0.011
16,500	2,840.1	0.19	0.069	0.14	0.032	0.09	0.012
17,000	2,926.1	0.20	0.073	0.14	0.033	0.10	0.013
17,500	3,012.2	0.21	0.076	0.15	0.035	0.10	0.013
18,000	3,098.3	0.21	0.080	0.15	0.037	0.10	0.014
18,500	3,184.3	0.22	0.084	0.16	0.039	0.10	0.015
19,000	3,270.4	0.22	0.088	0.16	0.041	0.11	0.015
19,500	3,356.4	0.23	0.093	0.17	0.043	0.11	0.016
20,000	3,442.5	0.24	0.097	0.17	0.044	0.11	0.017
20,500	3,528.6	0.24	0.101	0.17	0.046	0.12	0.018
21,000	3,614.6	0.25	0.105	0.18	0.048	0.12	0.018
21,500	3,700.7	0.25	0.110	0.18	0.050	0.12	0.019
22,000	3,786.8	0.26	0.114	0.19	0.053	0.12	0.020
22,500	3,872.8	0.26	0.119	0.19	0.055	0.13	0.021
23,000	3,958.9	0.27	0.124	0.20	0.057	0.13	0.022
23,500	4,044.9	0.28	0.128	0.20	0.059	0.13	0.022
24,000	4,131.0	0.28	0.133	0.20	0.061	0.14	0.023
24,500	4,217.1	0.29	0.138	0.21	0.063	0.14	0.024
25,000	4,303.1	0.29	0.143	0.21	0.066	0.14	0.025
25,500	4,389.2	0.30	0.148	0.22	0.068	0.14	0.026
26,000	4,475.3	0.31	0.154	0.22	0.070	0.15	0.027
26,500	4,561.3	0.31	0.159	0.22	0.073	0.15	0.028
27,000	4,647.4	0.32	0.164	0.23	0.075	0.15	0.029

d [mm]		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]
27,500	4,733.4	0.32	0.170	0.23	0.078	0.16	0.030
28,000	4,819.5	0.33	0.175	0.24	0.080	0.16	0.031
28,500	4,905.6	0.34	0.181	0.24	0.083	0.16	0.032
29,000	4,991.6	0.34	0.186	0.25	0.085	0.16	0.033
29,500	5,077.7	0.35	0.192	0.25	0.088	0.17	0.033
30,000	5,163.8	0.35	0.198	0.25	0.091	0.17	0.035
32,500	5,594.1	0.38	0.228	0.28	0.104	0.18	0.040
35,000	6,024.4	0.41	0.260	0.30	0.119	0.20	0.045
37,500	6,454.7	0.44	0.294	0.32	0.135	0.21	0.051
40,000	6,885.0	0.47	0.329	0.34	0.151	0.23	0.057
42,500	7,315.3	0.50	0.367	0.36	0.168	0.24	0.064
45,000	7,745.6	0.53	0.406	0.38	0.186	0.25	0.071
47,500	8,176.0	0.56	0.447	0.40	0.205	0.27	0.078
50,000	8,606.3	0.59	0.490	0.42	0.224	0.28	0.085
52,500	9,036.6	0.62	0.535	0.45	0.245	0.30	0.093
55,000	9,466.9	0.65	0.581	0.47	0.266	0.31	0.101
57,500	9,897.2	0.68	0.629	0.49	0.288	0.33	0.109
60,000	10,327.5	0.71	0.678	0.51	0.310	0.34	0.118
62,500	10,757.8	0.74	0.730	0.53	0.334	0.35	0.126
65,000	11,188.1	0.77	0.783	0.55	0.358	0.37	0.136
67,500	11,618.5	0.79	0.837	0.57	0.383	0.38	0.145
70,000	12,048.8	0.82	0.894	0.59	0.408	0.40	0.155
72,500	12,479.1	0.85	0.952	0.62	0.435	0.41	0.165
75,000	12,909.4	0.88	1.011	0.64	0.462	0.42	0.175
77,500	13,339.7	0.91	1.073	0.66	0.490	0.44	0.185
80,000	13,770.0	0.94	1.135	0.68	0.518	0.45	0.196
82,500	14,200.3	0.97	1.200	0.70	0.548	0.47	0.207
85,000	14,630.6	1.00	1.266	0.72	0.578	0.48	0.219
87,500	15,061.0	1.03	1.333	0.74	0.609	0.50	0.230
90,000	15,491.3	1.06	1.403	0.76	0.640	0.51	0.242
92,500	15,921.6	1.09	1.473	0.79	0.672	0.52	0.254
95,000	16,351.9	1.12	1.546	0.81	0.705	0.54	0.267
97,500	16,782.2	1.15	1.620	0.83	0.739	0.55	0.279
100,000	17,212.5	1.18	1.695	0.85	0.773	0.57	0.292
105,000	18,073.2	1.24	1.851	0.89	0.844	0.59	0.319
110,000	18,933.8	1.29	2.012	0.93	0.918	0.62	0.347
115,000	19,794.4	1.35	2.180	0.98	0.994	0.65	0.375
120,000	20,655.0	1.41	2.354	1.02	1.073	0.68	0.405
125,000	21,515.7	1.47	2.534	1.06	1.155	0.71	0.436
130,000	22,376.3	1.53	2.719	1.10	1.239	0.74	0.468
135,000	23,236.9	1.59	2.911	1.15	1.326	0.76	0.500
140,000	24,097.5	1.65	3.109	1.19	1.416	0.79	0.534
145,000	24,958.2	1.71	3.312	1.23	1.509	0.82	0.569
150,000	25,818.8	1.77	3.522	1.27	1.604	0.85	0.605
155,000	26,679.4	1.82	3.737	1.32	1.701	0.88	0.641
160,000	27,540.0	1.88	3.958	1.36	1.802	0.91	0.679
165,000	28,400.7	1.94	4.184	1.40	1.905	0.93	0.718
170,000	29,261.3	2.00	4.417	1.44	2.010	0.96	0.757
175,000	30,121.9	2.06	4.655	1.49	2.118	0.99	0.798

d [mm]		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]
180,000	30,982.5	2.12	4.899	1.53	2.229	1.02	0.840
185,000	31,843.2	2.18	5.148	1.57	2.342	1.05	0.882
190,000	32,703.8	2.24	5.403	1.61	2.458	1.07	0.926
195,000	33,564.4	2.30	5.664	1.66	2.576	1.10	0.970
200,000	34,425.1	2.35	5.930	1.70	2.697	1.13	1.015
205,000	35,285.7	2.41	6.202	1.74	2.820	1.16	1.061
210,000	36,146.3	2.47	6.480	1.78	2.946	1.19	1.109
215,000	37,006.9	2.53	6.763	1.83	3.074	1.22	1.157
220,000	37,867.6	2.59	7.051	1.87	3.205	1.24	1.206
225,000	38,728.2	2.65	7.345	1.91	3.338	1.27	1.256
230,000	39,588.8	2.71	7.644	1.95	3.474	1.30	1.307
235,000	40,449.4	2.77	7.949	1.99	3.612	1.33	1.358
240,000	41,310.1	2.83	8.260	2.04	3.752	1.36	1.411
245,000	42,170.7	2.88	8.576	2.08	3.895	1.39	1.465
250,000	43,031.3	2.94	8.897	2.12	4.041	1.41	1.519
255,000	43,891.9	3.00	9.223	2.16	4.189	1.44	1.575
260,000	44,752.6	3.06	9.556	2.21	4.339	1.47	1.631
265,000	45,613.2	–	–	2.25	4.492	1.50	1.688
270,000	46,473.8	–	–	2.29	4.647	1.53	1.746
275,000	47,334.4	–	–	2.33	4.804	1.56	1.805
280,000	48,195.1	–	–	2.38	4.964	1.58	1.865
285,000	49,055.7	–	–	2.42	5.127	1.61	1.926
290,000	49,916.3	–	–	2.46	5.292	1.64	1.988
295,000	50,777.0	–	–	2.50	5.459	1.67	2.050
300,000	51,637.6	–	–	2.55	5.628	1.70	2.114
310,000	53,358.8	–	–	2.63	5.974	1.75	2.243
320,000	55,080.1	–	–	2.72	6.330	1.81	2.376
330,000	56,801.3	–	–	2.80	6.695	1.87	2.513
340,000	58,522.6	–	–	2.89	7.069	1.92	2.653
350,000	60,243.8	–	–	2.97	7.452	1.98	2.796
360,000	61,965.1	–	–	3.06	7.845	2.04	2.943
370,000	63,686.3	–	–	–	–	2.09	3.093
380,000	65,407.6	–	–	–	–	2.15	3.247
390,000	67,128.9	–	–	–	–	2.21	3.404
400,000	68,850.1	–	–	–	–	2.26	3.564
410,000	70,571.4	–	–	–	–	2.32	3.728
420,000	72,292.6	–	–	–	–	2.38	3.896
430,000	74,013.9	–	–	–	–	2.43	4.066
440,000	75,735.1	–	–	–	–	2.49	4.240
450,000	77,456.4	–	–	–	–	2.55	4.417
460,000	79,177.6	–	–	–	–	2.60	4.598
470,000	80,898.9	–	–	–	–	2.66	4.782
480,000	82,620.1	–	–	–	–	2.72	4.969
490,000	84,341.4	–	–	–	–	2.77	5.159
500,000	86,062.6	–	–	–	–	2.83	5.353

4.5 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:	0.0015 mm
Average temperature:	40 °C		

Table 26: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 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	0.06	0.128	–	–	–	–	–	–
300	25.8	0.09	0.192	0.05	0.067	–	–	–	–
400	34.4	0.12	0.257	0.07	0.090	0.05	0.039	–	–
500	43.0	0.15	0.552	0.09	0.112	0.06	0.049	–	–
600	51.6	0.18	0.751	0.11	0.135	0.07	0.059	0.05	0.026
700	60.3	0.21	0.976	0.13	0.285	0.08	0.069	0.06	0.030
800	68.9	0.25	1.224	0.15	0.357	0.10	0.135	0.06	0.035
900	77.5	0.28	1.497	0.16	0.435	0.11	0.164	0.07	0.039
1,000	86.1	0.31	1.793	0.18	0.521	0.12	0.196	0.08	0.076
1,100	94.7	0.34	2.111	0.20	0.613	0.13	0.231	0.09	0.089
1,200	103.3	0.37	2.451	0.22	0.711	0.14	0.267	0.10	0.103
1,300	111.9	0.40	2.813	0.24	0.815	0.16	0.307	0.10	0.118
1,400	120.5	0.43	3.197	0.25	0.926	0.17	0.348	0.11	0.134
1,500	129.1	0.46	3.601	0.27	1.042	0.18	0.391	0.12	0.151
1,600	137.7	0.49	4.026	0.29	1.164	0.19	0.437	0.13	0.168
1,700	146.3	0.52	4.472	0.31	1.292	0.20	0.485	0.14	0.186
1,800	154.9	0.55	4.938	0.33	1.426	0.22	0.535	0.14	0.205
1,900	163.6	0.58	5.423	0.34	1.565	0.23	0.587	0.15	0.225
2,000	172.2	0.61	5.929	0.36	1.710	0.24	0.641	0.16	0.246
2,500	215.2	0.77	8.745	0.45	2.517	0.30	0.941	0.20	0.361
3,000	258.2	0.92	12.029	0.54	3.456	0.36	1.291	0.24	0.494
3,500	301.3	1.07	15.766	0.64	4.522	0.42	1.687	0.28	0.645
4,000	344.3	1.23	19.941	0.73	5.711	0.48	2.128	0.32	0.813
4,500	387.4	1.38	24.545	0.82	7.021	0.54	2.614	0.36	0.997
5,000	430.4	1.53	29.569	0.91	8.449	0.60	3.143	0.40	1.198
5,500	473.5	1.69	35.005	1.00	9.992	0.66	3.714	0.44	1.415
6,000	516.5	1.84	40.848	1.09	11.648	0.72	4.327	0.48	1.647
6,500	559.5	1.99	47.090	1.18	13.416	0.78	4.981	0.52	1.895
7,000	602.6	2.15	53.728	1.27	15.294	0.84	5.675	0.56	2.158
7,500	645.6	2.30	60.756	1.36	17.281	0.90	6.409	0.60	2.436
8,000	688.7	2.45	68.170	1.45	19.375	0.96	7.182	0.64	2.728
8,500	731.7	2.61	75.967	1.54	21.576	1.02	7.993	0.68	3.035
9,000	774.7	2.76	84.142	1.63	23.882	1.08	8.843	0.72	3.357
9,500	817.8	2.92	92.695	1.72	26.292	1.14	9.731	0.76	3.692
10,000	860.8	3.07	101.620	1.82	28.805	1.20	10.657	0.80	4.042
10,500	903.9	–	–	1.91	31.420	1.26	11.620	0.84	4.406

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]
11,000	946.9	–	–	2.00	34.138	1.32	12.620	0.88	4.783
11,500	990.0	–	–	2.09	36.956	1.38	13.656	0.92	5.174
12,000	1,033.0	–	–	2.18	39.874	1.44	14.729	0.96	5.579
12,500	1,076.0	–	–	2.27	42.892	1.50	15.838	1.00	5.997
13,000	1,119.1	–	–	2.36	46.009	1.56	16.983	1.04	6.429
13,500	1,162.1	–	–	2.45	49.224	1.62	18.164	1.08	6.874
14,000	1,205.2	–	–	2.54	52.537	1.68	19.380	1.12	7.332
14,500	1,248.2	–	–	2.63	55.948	1.74	20.632	1.16	7.803
15,000	1,291.2	–	–	2.72	59.455	1.80	21.918	1.20	8.287
15,500	1,334.3	–	–	2.81	63.058	1.86	23.239	1.24	8.785
16,000	1,377.3	–	–	2.91	66.757	1.92	24.595	1.28	9.295
16,500	1,420.4	–	–	3.00	70.552	1.98	25.986	1.32	9.818
17,000	1,463.4	–	–	3.09	74.442	2.04	27.411	1.36	10.354
17,500	1,506.5	–	–	–	–	2.10	28.870	1.40	10.902
18,000	1,549.5	–	–	–	–	2.16	30.363	1.44	11.463
18,500	1,592.5	–	–	–	–	2.22	31.890	1.48	12.037
19,000	1,635.6	–	–	–	–	2.28	33.451	1.52	12.624
19,500	1,678.6	–	–	–	–	2.34	35.045	1.56	13.222
20,000	1,721.7	–	–	–	–	2.40	36.673	1.60	13.834
20,500	1,764.7	–	–	–	–	2.46	38.334	1.64	14.457
21,000	1,807.7	–	–	–	–	2.52	40.029	1.68	15.093
21,500	1,850.8	–	–	–	–	2.58	41.756	1.72	15.741
22,000	1,893.8	–	–	–	–	2.64	43.517	1.76	16.402
22,500	1,936.9	–	–	–	–	2.70	45.310	1.80	17.075
23,000	1,979.9	–	–	–	–	2.76	47.137	1.84	17.759
23,500	2,023.0	–	–	–	–	2.82	48.996	1.88	18.456
24,000	2,066.0	–	–	–	–	2.88	50.887	1.92	19.165
24,500	2,109.0	–	–	–	–	2.94	52.811	1.96	19.886
25,000	2,152.1	–	–	–	–	3.00	54.768	2.00	20.619
25,500	2,195.1	–	–	–	–	3.06	56.757	2.04	21.364
26,000	2,238.2	–	–	–	–	–	–	2.08	22.121
26,500	2,281.2	–	–	–	–	–	–	2.12	22.890
27,000	2,324.2	–	–	–	–	–	–	2.16	23.670
27,500	2,367.3	–	–	–	–	–	–	2.20	24.463
28,000	2,410.3	–	–	–	–	–	–	2.24	25.267
28,500	2,453.4	–	–	–	–	–	–	2.28	26.083
29,000	2,496.4	–	–	–	–	–	–	2.32	26.911
29,500	2,539.5	–	–	–	–	–	–	2.36	27.750
30,000	2,582.5	–	–	–	–	–	–	2.40	28.601
32,500	2,797.7	–	–	–	–	–	–	2.60	33.031
35,000	3,012.9	–	–	–	–	–	–	2.80	37.747
37,500	3,228.1	–	–	–	–	–	–	3.00	42.749

Table 27: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, heating, inlet flow 45 °C / return flow 35 °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]
900	77.5	0.04	0.013	–	–	–	–	–	–
1,000	86.1	0.05	0.015	–	–	–	–	–	–
1,100	94.7	0.05	0.016	–	–	–	–	–	–
1,200	103.3	0.06	0.018	–	–	–	–	–	–
1,300	111.9	0.06	0.034	–	–	–	–	–	–
1,400	120.5	0.07	0.038	0.04	0.009	–	–	–	–
1,500	129.1	0.07	0.043	0.04	0.009	–	–	–	–
1,600	137.7	0.07	0.048	0.05	0.017	–	–	–	–
1,700	146.3	0.08	0.053	0.05	0.019	–	–	–	–
1,800	154.9	0.08	0.058	0.05	0.021	–	–	–	–
1,900	163.6	0.09	0.064	0.06	0.022	–	–	–	–
2,000	172.2	0.09	0.070	0.06	0.025	0.04	0.010	–	–
2,500	215.2	0.12	0.102	0.07	0.036	0.05	0.014	–	–
3,000	258.2	0.14	0.140	0.09	0.049	0.06	0.019	–	–
3,500	301.3	0.16	0.182	0.10	0.064	0.07	0.025	0.04	0.007
4,000	344.3	0.19	0.230	0.12	0.080	0.08	0.031	0.05	0.009
4,500	387.4	0.21	0.281	0.13	0.098	0.09	0.038	0.05	0.011
5,000	430.4	0.23	0.338	0.15	0.117	0.10	0.046	0.06	0.013
5,500	473.5	0.26	0.398	0.16	0.138	0.11	0.054	0.06	0.015
6,000	516.5	0.28	0.464	0.18	0.161	0.12	0.063	0.07	0.018
6,500	559.5	0.30	0.533	0.19	0.185	0.13	0.073	0.08	0.020
7,000	602.6	0.33	0.606	0.21	0.210	0.14	0.082	0.08	0.023
7,500	645.6	0.35	0.684	0.22	0.237	0.15	0.093	0.09	0.026
8,000	688.7	0.37	0.766	0.24	0.265	0.16	0.104	0.09	0.029
8,500	731.7	0.40	0.851	0.25	0.295	0.17	0.115	0.10	0.032
9,000	774.7	0.42	0.941	0.27	0.326	0.18	0.127	0.11	0.036
9,500	817.8	0.44	1.035	0.28	0.358	0.19	0.140	0.11	0.039
10,000	860.8	0.47	1.132	0.30	0.392	0.20	0.153	0.12	0.043
10,500	903.9	0.49	1.233	0.31	0.427	0.21	0.167	0.12	0.047
11,000	946.9	0.52	1.338	0.33	0.463	0.22	0.181	0.13	0.051
11,500	990.0	0.54	1.447	0.34	0.500	0.23	0.195	0.14	0.055
12,000	1,033.0	0.56	1.560	0.36	0.539	0.24	0.210	0.14	0.059
12,500	1,076.0	0.59	1.676	0.37	0.579	0.25	0.226	0.15	0.063
13,000	1,119.1	0.61	1.796	0.39	0.620	0.26	0.242	0.15	0.068
13,500	1,162.1	0.63	1.920	0.40	0.663	0.27	0.259	0.16	0.072
14,000	1,205.2	0.66	2.047	0.42	0.707	0.28	0.276	0.17	0.077
14,500	1,248.2	0.68	2.178	0.43	0.752	0.29	0.293	0.17	0.082
15,000	1,291.2	0.70	2.312	0.45	0.798	0.30	0.311	0.18	0.087
15,500	1,334.3	0.73	2.450	0.46	0.845	0.31	0.329	0.18	0.092
16,000	1,377.3	0.75	2.592	0.48	0.894	0.32	0.348	0.19	0.097
16,500	1,420.4	0.77	2.737	0.49	0.944	0.33	0.368	0.19	0.103
17,000	1,463.4	0.80	2.885	0.51	0.995	0.34	0.388	0.20	0.108
17,500	1,506.5	0.82	3.037	0.52	1.047	0.35	0.408	0.21	0.114
18,000	1,549.5	0.84	3.193	0.54	1.100	0.36	0.429	0.21	0.120
18,500	1,592.5	0.87	3.352	0.55	1.155	0.37	0.450	0.22	0.125
19,000	1,635.6	0.89	3.514	0.57	1.210	0.38	0.471	0.22	0.131
19,500	1,678.6	0.91	3.680	0.58	1.267	0.39	0.493	0.23	0.138
20,000	1,721.7	0.94	3.849	0.60	1.325	0.40	0.516	0.24	0.144

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]
20,500	1,764.7	0.96	4.022	0.61	1.384	0.41	0.539	0.24	0.150
21,000	1,807.7	0.98	4.198	0.63	1.445	0.42	0.562	0.25	0.157
21,500	1,850.8	1.01	4.377	0.64	1.506	0.43	0.586	0.25	0.163
22,000	1,893.8	1.03	4.559	0.66	1.569	0.44	0.610	0.26	0.170
22,500	1,936.9	1.05	4.745	0.67	1.632	0.45	0.635	0.27	0.177
23,000	1,979.9	1.08	4.935	0.69	1.697	0.46	0.660	0.27	0.184
23,500	2,023.0	1.10	5.127	0.70	1.763	0.47	0.686	0.28	0.191
24,000	2,066.0	1.12	5.323	0.72	1.830	0.48	0.712	0.28	0.198
24,500	2,109.0	1.15	5.522	0.73	1.898	0.49	0.738	0.29	0.205
25,000	2,152.1	1.17	5.724	0.75	1.968	0.50	0.765	0.29	0.213
25,500	2,195.1	1.19	5.930	0.76	2.038	0.51	0.792	0.30	0.220
26,000	2,238.2	1.22	6.139	0.78	2.110	0.52	0.820	0.31	0.228
26,500	2,281.2	1.24	6.351	0.79	2.182	0.53	0.848	0.31	0.236
27,000	2,324.2	1.26	6.566	0.81	2.256	0.54	0.876	0.32	0.244
27,500	2,367.3	1.29	6.785	0.82	2.331	0.55	0.905	0.32	0.252
28,000	2,410.3	1.31	7.007	0.84	2.406	0.56	0.935	0.33	0.260
28,500	2,453.4	1.33	7.232	0.85	2.483	0.57	0.964	0.34	0.268
29,000	2,496.4	1.36	7.460	0.87	2.561	0.59	0.995	0.34	0.277
29,500	2,539.5	1.38	7.691	0.88	2.640	0.60	1.025	0.35	0.285
30,000	2,582.5	1.40	7.926	0.90	2.721	0.61	1.056	0.35	0.294
32,500	2,797.7	1.52	9.145	0.97	3.137	0.66	1.217	0.38	0.338
35,000	3,012.9	1.64	10.443	1.05	3.580	0.71	1.389	0.41	0.385
37,500	3,228.1	1.76	11.817	1.12	4.049	0.76	1.570	0.44	0.436
40,000	3,443.3	1.87	13.268	1.20	4.544	0.81	1.761	0.47	0.488
42,500	3,658.5	1.99	14.794	1.27	5.064	0.86	1.962	0.50	0.544
45,000	3,873.7	2.11	16.395	1.35	5.610	0.91	2.173	0.53	0.602
47,500	4,089.0	2.22	18.071	1.42	6.180	0.96	2.393	0.56	0.662
50,000	4,304.2	2.34	19.819	1.50	6.775	1.01	2.622	0.59	0.726
52,500	4,519.4	2.46	21.641	1.57	7.395	1.06	2.861	0.62	0.792
55,000	4,734.6	2.58	23.536	1.65	8.039	1.11	3.109	0.65	0.860
57,500	4,949.8	2.69	25.502	1.72	8.708	1.16	3.367	0.68	0.931
60,000	5,165.0	2.81	27.540	1.80	9.400	1.21	3.633	0.71	1.004
62,500	5,380.2	2.93	29.649	1.87	10.116	1.26	3.909	0.74	1.080
65,000	5,595.4	3.04	31.829	1.95	10.856	1.31	4.194	0.77	1.158
67,500	5,810.6	–	–	2.02	11.620	1.36	4.488	0.80	1.239
70,000	6,025.8	–	–	2.10	12.406	1.41	4.790	0.83	1.322
72,500	6,241.0	–	–	2.17	13.217	1.46	5.102	0.86	1.408
75,000	6,456.2	–	–	2.25	14.050	1.51	5.422	0.88	1.496
77,500	6,671.4	–	–	2.32	14.907	1.56	5.752	0.91	1.586
80,000	6,886.7	–	–	2.40	15.786	1.61	6.090	0.94	1.679
82,500	7,101.9	–	–	2.47	16.689	1.66	6.436	0.97	1.774
85,000	7,317.1	–	–	2.55	17.614	1.71	6.792	1.00	1.871
87,500	7,532.3	–	–	2.62	18.562	1.77	7.156	1.03	1.971
90,000	7,747.5	–	–	2.70	19.533	1.82	7.528	1.06	2.073
92,500	7,962.7	–	–	2.77	20.526	1.87	7.909	1.09	2.178
95,000	8,177.9	–	–	2.85	21.541	1.92	8.299	1.12	2.284
97,500	8,393.1	–	–	2.92	22.579	1.97	8.697	1.15	2.393
100,000	8,608.3	–	–	3.00	23.640	2.02	9.103	1.18	2.505
105,000	9,038.7	–	–	–	–	2.12	9.942	1.24	2.734

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]
110,000	9,469.2	–	–	–	–	2.22	10.813	1.30	2.973
115,000	9,899.6	–	–	–	–	2.32	11.718	1.36	3.220
120,000	10,330.0	–	–	–	–	2.42	12.656	1.42	3.477
125,000	10,760.4	–	–	–	–	2.52	13.627	1.47	3.742
130,000	11,190.8	–	–	–	–	2.62	14.631	1.53	4.016
135,000	11,621.2	–	–	–	–	2.72	15.666	1.59	4.298
140,000	12,051.6	–	–	–	–	2.82	16.735	1.65	4.590
145,000	12,482.1	–	–	–	–	2.93	17.835	1.71	4.890
150,000	12,912.5	–	–	–	–	3.03	18.967	1.77	5.199
155,000	13,342.9	–	–	–	–	–	–	1.83	5.516
160,000	13,773.3	–	–	–	–	–	–	1.89	5.842
165,000	14,203.7	–	–	–	–	–	–	1.95	6.176
170,000	14,634.1	–	–	–	–	–	–	2.01	6.518
175,000	15,064.6	–	–	–	–	–	–	2.06	6.870
180,000	15,495.0	–	–	–	–	–	–	2.12	7.229
185,000	15,925.4	–	–	–	–	–	–	2.18	7.597
190,000	16,355.8	–	–	–	–	–	–	2.24	7.973
195,000	16,786.2	–	–	–	–	–	–	2.30	8.357
200,000	17,216.6	–	–	–	–	–	–	2.36	8.750
205,000	17,647.1	–	–	–	–	–	–	2.42	9.150
210,000	18,077.5	–	–	–	–	–	–	2.48	9.559
215,000	18,507.9	–	–	–	–	–	–	2.54	9.976
220,000	18,938.3	–	–	–	–	–	–	2.60	10.402
225,000	19,368.7	–	–	–	–	–	–	2.65	10.835
230,000	19,799.1	–	–	–	–	–	–	2.71	11.277
235,000	20,229.6	–	–	–	–	–	–	2.77	11.726
240,000	20,660.0	–	–	–	–	–	–	2.83	12.183
245,000	21,090.4	–	–	–	–	–	–	2.89	12.649
250,000	21,520.8	–	–	–	–	–	–	2.95	13.122
255,000	21,951.2	–	–	–	–	–	–	3.01	13.604
260,000	22,381.6	–	–	–	–	–	–	3.07	14.093

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Table 28: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, heating, inlet flow 45 °C / return flow 35 °C, d76.1–108 mm

d [mm]		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]
7,000	602.6	0.04	0.005	–	–	–	–
7,500	645.6	0.04	0.005	–	–	–	–
8,000	688.7	0.05	0.006	–	–	–	–
8,500	731.7	0.05	0.006	–	–	–	–
9,000	774.7	0.05	0.007	–	–	–	–
9,500	817.8	0.06	0.008	0.04	0.004	–	–
10,000	860.8	0.06	0.008	0.04	0.004	–	–
10,500	903.9	0.06	0.009	0.04	0.004	–	–
11,000	946.9	0.06	0.010	0.05	0.005	–	–
11,500	990.0	0.07	0.011	0.05	0.005	–	–
12,000	1,033.0	0.07	0.011	0.05	0.005	–	–
12,500	1,076.0	0.07	0.012	0.05	0.006	–	–

d [mm]		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]
13,000	1,119.1	0.08	0.013	0.06	0.006	–	–
13,500	1,162.1	0.08	0.014	0.06	0.006	–	–
14,000	1,205.2	0.08	0.015	0.06	0.007	–	–
14,500	1,248.2	0.09	0.016	0.06	0.007	0.04	0.003
15,000	1,291.2	0.09	0.017	0.06	0.008	0.04	0.003
15,500	1,334.3	0.09	0.018	0.07	0.008	0.04	0.003
16,000	1,377.3	0.09	0.019	0.07	0.009	0.05	0.003
16,500	1,420.4	0.10	0.020	0.07	0.009	0.05	0.004
17,000	1,463.4	0.10	0.021	0.07	0.010	0.05	0.004
17,500	1,506.5	0.10	0.022	0.07	0.010	0.05	0.004
18,000	1,549.5	0.11	0.023	0.08	0.011	0.05	0.004
18,500	1,592.5	0.11	0.024	0.08	0.011	0.05	0.004
19,000	1,635.6	0.11	0.025	0.08	0.012	0.05	0.004
19,500	1,678.6	0.12	0.027	0.08	0.012	0.06	0.005
20,000	1,721.7	0.12	0.028	0.09	0.013	0.06	0.005
20,500	1,764.7	0.12	0.029	0.09	0.013	0.06	0.005
21,000	1,807.7	0.12	0.030	0.09	0.014	0.06	0.005
21,500	1,850.8	0.13	0.032	0.09	0.015	0.06	0.006
22,000	1,893.8	0.13	0.033	0.09	0.015	0.06	0.006
22,500	1,936.9	0.13	0.034	0.10	0.016	0.06	0.006
23,000	1,979.9	0.14	0.035	0.10	0.016	0.07	0.006
23,500	2,023.0	0.14	0.037	0.10	0.017	0.07	0.006
24,000	2,066.0	0.14	0.038	0.10	0.018	0.07	0.007
24,500	2,109.0	0.14	0.040	0.10	0.018	0.07	0.007
25,000	2,152.1	0.15	0.041	0.11	0.019	0.07	0.007
25,500	2,195.1	0.15	0.042	0.11	0.020	0.07	0.007
26,000	2,238.2	0.15	0.044	0.11	0.020	0.07	0.008
26,500	2,281.2	0.16	0.045	0.11	0.021	0.08	0.008
27,000	2,324.2	0.16	0.047	0.11	0.022	0.08	0.008
27,500	2,367.3	0.16	0.048	0.12	0.022	0.08	0.009
28,000	2,410.3	0.17	0.050	0.12	0.023	0.08	0.009
28,500	2,453.4	0.17	0.052	0.12	0.024	0.08	0.009
29,000	2,496.4	0.17	0.053	0.12	0.024	0.08	0.009
29,500	2,539.5	0.17	0.055	0.13	0.025	0.08	0.010
30,000	2,582.5	0.18	0.056	0.13	0.026	0.09	0.010
32,500	2,797.7	0.19	0.065	0.14	0.030	0.09	0.011
35,000	3,012.9	0.21	0.074	0.15	0.034	0.10	0.013
37,500	3,228.1	0.22	0.084	0.16	0.038	0.11	0.015
40,000	3,443.3	0.24	0.094	0.17	0.043	0.11	0.016
42,500	3,658.5	0.25	0.104	0.18	0.048	0.12	0.018
45,000	3,873.7	0.27	0.115	0.19	0.053	0.13	0.020
47,500	4,089.0	0.28	0.127	0.20	0.058	0.13	0.022
50,000	4,304.2	0.30	0.139	0.21	0.064	0.14	0.024
52,500	4,519.4	0.31	0.151	0.22	0.069	0.15	0.026
55,000	4,734.6	0.32	0.164	0.23	0.075	0.16	0.029
57,500	4,949.8	0.34	0.178	0.24	0.082	0.16	0.031
60,000	5,165.0	0.35	0.192	0.26	0.088	0.17	0.033
62,500	5,380.2	0.37	0.206	0.27	0.094	0.18	0.036
65,000	5,595.4	0.38	0.221	0.28	0.101	0.18	0.038

d [mm]		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]
67,500	5,810.6	0.40	0.236	0.29	0.108	0.19	0.041
70,000	6,025.8	0.41	0.252	0.30	0.115	0.20	0.044
72,500	6,241.0	0.43	0.268	0.31	0.123	0.21	0.047
75,000	6,456.2	0.44	0.285	0.32	0.130	0.21	0.050
77,500	6,671.4	0.46	0.302	0.33	0.138	0.22	0.052
80,000	6,886.7	0.47	0.320	0.34	0.146	0.23	0.056
82,500	7,101.9	0.49	0.338	0.35	0.155	0.23	0.059
85,000	7,317.1	0.50	0.356	0.36	0.163	0.24	0.062
87,500	7,532.3	0.52	0.375	0.37	0.172	0.25	0.065
90,000	7,747.5	0.53	0.394	0.38	0.180	0.26	0.068
92,500	7,962.7	0.55	0.414	0.39	0.189	0.26	0.072
95,000	8,177.9	0.56	0.434	0.40	0.199	0.27	0.075
97,500	8,393.1	0.58	0.455	0.42	0.208	0.28	0.079
100,000	8,608.3	0.59	0.476	0.43	0.218	0.28	0.082
105,000	9,038.7	0.62	0.519	0.45	0.237	0.30	0.090
110,000	9,469.2	0.65	0.564	0.47	0.258	0.31	0.098
115,000	9,899.6	0.68	0.611	0.49	0.279	0.33	0.106
120,000	10,330.0	0.71	0.659	0.51	0.301	0.34	0.114
125,000	10,760.4	0.74	0.709	0.53	0.324	0.35	0.123
130,000	11,190.8	0.77	0.761	0.55	0.348	0.37	0.132
135,000	11,621.2	0.80	0.814	0.57	0.372	0.38	0.141
140,000	12,051.6	0.83	0.869	0.60	0.397	0.40	0.150
145,000	12,482.1	0.86	0.926	0.62	0.423	0.41	0.160
150,000	12,912.5	0.89	0.984	0.64	0.449	0.43	0.170
155,000	13,342.9	0.91	1.043	0.66	0.476	0.44	0.180
160,000	13,773.3	0.94	1.105	0.68	0.504	0.45	0.191
165,000	14,203.7	0.97	1.167	0.70	0.533	0.47	0.201
170,000	14,634.1	1.00	1.232	0.72	0.562	0.48	0.212
175,000	15,064.6	1.03	1.298	0.74	0.592	0.50	0.224
180,000	15,495.0	1.06	1.365	0.77	0.623	0.51	0.235
185,000	15,925.4	1.09	1.434	0.79	0.654	0.52	0.247
190,000	16,355.8	1.12	1.505	0.81	0.686	0.54	0.259
195,000	16,786.2	1.15	1.577	0.83	0.719	0.55	0.272
200,000	17,216.6	1.18	1.650	0.85	0.752	0.57	0.284
205,000	17,647.1	1.21	1.725	0.87	0.787	0.58	0.297
210,000	18,077.5	1.24	1.802	0.89	0.821	0.60	0.310
215,000	18,507.9	1.27	1.880	0.92	0.857	0.61	0.323
220,000	18,938.3	1.30	1.960	0.94	0.893	0.62	0.337
225,000	19,368.7	1.33	2.041	0.96	0.930	0.64	0.351
230,000	19,799.1	1.36	2.123	0.98	0.967	0.65	0.365
235,000	20,229.6	1.39	2.208	1.00	1.006	0.67	0.379
240,000	20,660.0	1.42	2.293	1.02	1.045	0.68	0.394
245,000	21,090.4	1.45	2.380	1.04	1.084	0.70	0.409
250,000	21,520.8	1.48	2.469	1.06	1.124	0.71	0.424
255,000	21,951.2	1.51	2.559	1.09	1.165	0.72	0.439
260,000	22,381.6	1.53	2.650	1.11	1.207	0.74	0.455
265,000	22,812.1	1.56	2.743	1.13	1.249	0.75	0.471
270,000	23,242.5	1.59	2.837	1.15	1.292	0.77	0.487
275,000	23,672.9	1.62	2.933	1.17	1.335	0.78	0.503

d [mm]		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]
280,000	24,103.3	1.65	3.030	1.19	1.379	0.79	0.520
285,000	24,533.7	1.68	3.129	1.21	1.424	0.81	0.537
290,000	24,964.1	1.71	3.229	1.23	1.470	0.82	0.554
295,000	25,394.5	1.74	3.331	1.26	1.516	0.84	0.571
300,000	25,825.0	1.77	3.434	1.28	1.562	0.85	0.589
310,000	26,685.8	1.83	3.644	1.32	1.658	0.88	0.624
320,000	27,546.6	1.89	3.860	1.36	1.756	0.91	0.661
330,000	28,407.5	1.95	4.081	1.40	1.856	0.94	0.699
340,000	29,268.3	2.01	4.308	1.45	1.959	0.96	0.738
350,000	30,129.1	2.07	4.541	1.49	2.065	0.99	0.777
360,000	30,990.0	2.12	4.779	1.53	2.173	1.02	0.818
370,000	31,850.8	2.18	5.023	1.58	2.283	1.05	0.859
380,000	32,711.6	2.24	5.273	1.62	2.396	1.08	0.902
390,000	33,572.5	2.30	5.528	1.66	2.512	1.11	0.945
400,000	34,433.3	2.36	5.788	1.70	2.630	1.13	0.989
410,000	35,294.1	2.42	6.054	1.75	2.750	1.16	1.034
420,000	36,154.9	2.48	6.325	1.79	2.873	1.19	1.080
430,000	37,015.8	2.54	6.602	1.83	2.999	1.22	1.127
440,000	37,876.6	2.60	6.884	1.87	3.126	1.25	1.175
450,000	38,737.4	2.66	7.172	1.92	3.257	1.28	1.224
460,000	39,598.3	2.72	7.465	1.96	3.389	1.31	1.274
470,000	40,459.1	2.77	7.763	2.00	3.524	1.33	1.324
480,000	41,319.9	2.83	8.067	2.04	3.662	1.36	1.376
490,000	42,180.8	2.89	8.376	2.09	3.802	1.39	1.428
500,000	43,041.6	2.95	8.691	2.13	3.944	1.42	1.482
550,000	47,345.8	–	–	2.34	4.691	1.56	1.761
600,000	51,649.9	–	–	2.55	5.497	1.70	2.062
650,000	55,954.1	–	–	2.77	6.361	1.84	2.385
700,000	60,258.2	–	–	2.98	7.282	1.99	2.730
750,000	64,562.4	–	–	–	–	2.13	3.095
800,000	68,866.6	–	–	–	–	2.27	3.481
850,000	73,170.7	–	–	–	–	2.41	3.888
900,000	77,474.9	–	–	–	–	2.55	4.316
950,000	81,779.1	–	–	–	–	2.70	4.764
1,000,000	86,083.2	–	–	–	–	2.84	5.232
1,050,000	90,387.4	–	–	–	–	2.98	5.721

4.6 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:	0.0015 mm
Average temperature:	40 °C		

Table 29: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, heating, inlet flow 55 °C / return flow 45 °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	0.06	0.108	–	–	–	–	–	–
300	25.8	0.09	0.162	0.05	0.057	–	–	–	–
400	34.4	0.12	0.216	0.07	0.076	0.05	0.033	–	–
500	43.1	0.15	0.525	0.09	0.095	0.06	0.041	0.04	0.018
600	51.7	0.18	0.715	0.11	0.209	0.07	0.049	0.05	0.022
700	60.3	0.22	0.930	0.13	0.271	0.08	0.102	0.06	0.026
800	68.9	0.25	1.168	0.15	0.340	0.10	0.128	0.06	0.029
900	77.5	0.28	1.430	0.16	0.415	0.11	0.156	0.07	0.060
1,000	86.1	0.31	1.713	0.18	0.497	0.12	0.187	0.08	0.072
1,100	94.7	0.34	2.018	0.20	0.585	0.13	0.220	0.09	0.085
1,200	103.3	0.37	2.345	0.22	0.679	0.14	0.255	0.10	0.098
1,300	111.9	0.40	2.693	0.24	0.779	0.16	0.292	0.10	0.112
1,400	120.5	0.43	3.061	0.26	0.885	0.17	0.332	0.11	0.128
1,500	129.2	0.46	3.450	0.27	0.996	0.18	0.374	0.12	0.144
1,600	137.8	0.49	3.859	0.29	1.114	0.19	0.417	0.13	0.160
1,700	146.4	0.52	4.288	0.31	1.237	0.20	0.463	0.14	0.178
1,800	155.0	0.55	4.736	0.33	1.365	0.22	0.511	0.14	0.196
1,900	163.6	0.59	5.204	0.35	1.499	0.23	0.561	0.15	0.215
2,000	172.2	0.62	5.690	0.36	1.638	0.24	0.613	0.16	0.235
2,500	215.3	0.77	8.405	0.46	2.415	0.30	0.902	0.20	0.345
3,000	258.3	0.92	11.574	0.55	3.319	0.36	1.238	0.24	0.473
3,500	301.4	1.08	15.183	0.64	4.347	0.42	1.619	0.28	0.618
4,000	344.4	1.23	19.220	0.73	5.494	0.48	2.045	0.32	0.780
4,500	387.5	1.39	23.674	0.82	6.759	0.54	2.513	0.36	0.958
5,000	430.5	1.54	28.537	0.91	8.138	0.60	3.023	0.40	1.151
5,500	473.6	1.70	33.803	1.00	9.629	0.66	3.575	0.44	1.360
6,000	516.6	1.85	39.465	1.09	11.231	0.72	4.167	0.48	1.584
6,500	559.7	2.00	45.518	1.19	12.942	0.78	4.798	0.52	1.823
7,000	602.7	2.16	51.958	1.28	14.760	0.84	5.469	0.56	2.077
7,500	645.8	2.31	58.779	1.37	16.684	0.90	6.178	0.60	2.345
8,000	688.8	2.47	65.978	1.46	18.713	0.96	6.926	0.64	2.628
8,500	731.9	2.62	73.553	1.55	20.845	1.02	7.711	0.68	2.924
9,000	774.9	2.77	81.498	1.64	23.080	1.08	8.534	0.72	3.235
9,500	818.0	2.93	89.812	1.73	25.417	1.14	9.394	0.76	3.560
10,000	861.0	3.08	98.491	1.82	27.855	1.20	10.290	0.80	3.898
10,500	904.1	–	–	1.91	30.393	1.26	11.223	0.84	4.249

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]
11,000	947.1	–	–	2.01	33.031	1.32	12.192	0.88	4.615
11,500	990.2	–	–	2.10	35.767	1.38	13.196	0.92	4.993
12,000	1,033.2	–	–	2.19	38.601	1.44	14.236	0.96	5.385
12,500	1,076.3	–	–	2.28	41.532	1.50	15.312	1.00	5.790
13,000	1,119.3	–	–	2.37	44.561	1.57	16.422	1.04	6.208
13,500	1,162.4	–	–	2.46	47.685	1.63	17.567	1.08	6.639
14,000	1,205.5	–	–	2.55	50.905	1.69	18.747	1.12	7.082
14,500	1,248.5	–	–	2.64	54.221	1.75	19.962	1.16	7.539
15,000	1,291.6	–	–	2.74	57.632	1.81	21.210	1.20	8.008
15,500	1,334.6	–	–	2.83	61.137	1.87	22.493	1.24	8.490
16,000	1,377.7	–	–	2.92	64.736	1.93	23.810	1.28	8.985
16,500	1,420.7	–	–	3.01	68.428	1.99	25.160	1.32	9.492
17,000	1,463.8	–	–	–	–	2.05	26.544	1.36	10.012
17,500	1,506.8	–	–	–	–	2.11	27.962	1.40	10.544
18,000	1,549.9	–	–	–	–	2.17	29.412	1.44	11.088
18,500	1,592.9	–	–	–	–	2.23	30.896	1.48	11.645
19,000	1,636.0	–	–	–	–	2.29	32.413	1.52	12.214
19,500	1,679.0	–	–	–	–	2.35	33.963	1.56	12.795
20,000	1,722.1	–	–	–	–	2.41	35.546	1.60	13.388
20,500	1,765.1	–	–	–	–	2.47	37.161	1.64	13.993
21,000	1,808.2	–	–	–	–	2.53	38.809	1.68	14.611
21,500	1,851.2	–	–	–	–	2.59	40.490	1.72	15.240
22,000	1,894.3	–	–	–	–	2.65	42.203	1.77	15.881
22,500	1,937.3	–	–	–	–	2.71	43.948	1.81	16.535
23,000	1,980.4	–	–	–	–	2.77	45.725	1.85	17.200
23,500	2,023.4	–	–	–	–	2.83	47.534	1.89	17.877
24,000	2,066.5	–	–	–	–	2.89	49.376	1.93	18.566
24,500	2,109.5	–	–	–	–	2.95	51.249	1.97	19.266
25,000	2,152.6	–	–	–	–	3.01	53.153	2.01	19.979
25,500	2,195.6	–	–	–	–	3.07	55.090	2.05	20.703
26,000	2,238.7	–	–	–	–	–	–	2.09	21.439
26,500	2,281.8	–	–	–	–	–	–	2.13	22.186
27,000	2,324.8	–	–	–	–	–	–	2.17	22.945
27,500	2,367.9	–	–	–	–	–	–	2.21	23.715
28,000	2,410.9	–	–	–	–	–	–	2.25	24.497
28,500	2,454.0	–	–	–	–	–	–	2.29	25.291
29,000	2,497.0	–	–	–	–	–	–	2.33	26.096
29,500	2,540.1	–	–	–	–	–	–	2.37	26.912
30,000	2,583.1	–	–	–	–	–	–	2.41	27.740
32,500	2,798.4	–	–	–	–	–	–	2.61	32.050
35,000	3,013.6	–	–	–	–	–	–	2.81	36.642
37,500	3,228.9	–	–	–	–	–	–	3.01	41.514

Table 30: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 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]
900	77.5	0.04	0.011	–	–	–	–	–	–
1,000	86.1	0.05	0.013	–	–	–	–	–	–
1,100	94.7	0.05	0.024	–	–	–	–	–	–
1,200	103.3	0.06	0.028	–	–	–	–	–	–
1,300	111.9	0.06	0.032	–	–	–	–	–	–
1,400	120.5	0.07	0.036	0.04	0.013	–	–	–	–
1,500	129.2	0.07	0.041	0.05	0.014	–	–	–	–
1,600	137.8	0.08	0.046	0.05	0.016	–	–	–	–
1,700	146.4	0.08	0.051	0.05	0.018	–	–	–	–
1,800	155.0	0.08	0.056	0.05	0.020	–	–	–	–
1,900	163.6	0.09	0.061	0.06	0.021	–	–	–	–
2,000	172.2	0.09	0.067	0.06	0.023	0.04	0.009	–	–
2,500	215.3	0.12	0.098	0.08	0.034	0.05	0.013	–	–
3,000	258.3	0.14	0.134	0.09	0.047	0.06	0.018	–	–
3,500	301.4	0.16	0.174	0.11	0.061	0.07	0.024	0.04	0.007
4,000	344.4	0.19	0.220	0.12	0.077	0.08	0.030	0.05	0.008
4,500	387.5	0.21	0.270	0.14	0.094	0.09	0.037	0.05	0.010
5,000	430.5	0.24	0.324	0.15	0.113	0.10	0.044	0.06	0.012
5,500	473.6	0.26	0.382	0.17	0.133	0.11	0.052	0.07	0.015
6,000	516.6	0.28	0.445	0.18	0.154	0.12	0.060	0.07	0.017
6,500	559.7	0.31	0.512	0.20	0.177	0.13	0.069	0.08	0.020
7,000	602.7	0.33	0.583	0.21	0.202	0.14	0.079	0.08	0.022
7,500	645.8	0.35	0.657	0.23	0.228	0.15	0.089	0.09	0.025
8,000	688.8	0.38	0.736	0.24	0.255	0.16	0.100	0.09	0.028
8,500	731.9	0.40	0.819	0.26	0.283	0.17	0.111	0.10	0.031
9,000	774.9	0.42	0.905	0.27	0.313	0.18	0.122	0.11	0.034
9,500	818.0	0.45	0.996	0.29	0.344	0.19	0.134	0.11	0.038
10,000	861.0	0.47	1.090	0.30	0.377	0.20	0.147	0.12	0.041
10,500	904.1	0.49	1.188	0.32	0.410	0.21	0.160	0.12	0.045
11,000	947.1	0.52	1.289	0.33	0.445	0.22	0.174	0.13	0.049
11,500	990.2	0.54	1.394	0.35	0.481	0.23	0.188	0.14	0.053
12,000	1,033.2	0.56	1.503	0.36	0.519	0.24	0.202	0.14	0.057
12,500	1,076.3	0.59	1.615	0.38	0.557	0.25	0.217	0.15	0.061
13,000	1,119.3	0.61	1.731	0.39	0.597	0.26	0.233	0.15	0.065
13,500	1,162.4	0.63	1.851	0.41	0.638	0.27	0.249	0.16	0.069
14,000	1,205.5	0.66	1.974	0.42	0.681	0.28	0.265	0.17	0.074
14,500	1,248.5	0.68	2.101	0.44	0.724	0.29	0.282	0.17	0.079
15,000	1,291.6	0.71	2.231	0.45	0.769	0.30	0.299	0.18	0.084
15,500	1,334.6	0.73	2.364	0.47	0.814	0.31	0.317	0.18	0.088
16,000	1,377.7	0.75	2.501	0.48	0.861	0.32	0.335	0.19	0.094
16,500	1,420.7	0.78	2.641	0.50	0.910	0.33	0.354	0.20	0.099
17,000	1,463.8	0.80	2.785	0.51	0.959	0.34	0.373	0.20	0.104
17,500	1,506.8	0.82	2.932	0.53	1.009	0.35	0.393	0.21	0.109
18,000	1,549.9	0.85	3.083	0.54	1.061	0.36	0.413	0.21	0.115
18,500	1,592.9	0.87	3.237	0.56	1.114	0.37	0.433	0.22	0.121
19,000	1,636.0	0.89	3.394	0.57	1.168	0.39	0.454	0.23	0.126
19,500	1,679.0	0.92	3.555	0.59	1.223	0.40	0.475	0.23	0.132
20,000	1,722.1	0.94	3.719	0.60	1.279	0.41	0.497	0.24	0.138

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]
20,500	1,765.1	0.96	3.886	0.62	1.336	0.42	0.519	0.24	0.145
21,000	1,808.2	0.99	4.056	0.63	1.394	0.43	0.542	0.25	0.151
21,500	1,851.2	1.01	4.230	0.65	1.454	0.44	0.565	0.25	0.157
22,000	1,894.3	1.03	4.407	0.66	1.514	0.45	0.588	0.26	0.164
22,500	1,937.3	1.06	4.587	0.68	1.576	0.46	0.612	0.27	0.170
23,000	1,980.4	1.08	4.771	0.69	1.639	0.47	0.637	0.27	0.177
23,500	2,023.4	1.11	4.957	0.71	1.703	0.48	0.661	0.28	0.184
24,000	2,066.5	1.13	5.147	0.72	1.767	0.49	0.686	0.28	0.191
24,500	2,109.5	1.15	5.340	0.74	1.833	0.50	0.712	0.29	0.198
25,000	2,152.6	1.18	5.537	0.75	1.901	0.51	0.738	0.30	0.205
25,500	2,195.6	1.20	5.736	0.77	1.969	0.52	0.764	0.30	0.212
26,000	2,238.7	1.22	5.939	0.78	2.038	0.53	0.791	0.31	0.220
26,500	2,281.8	1.25	6.144	0.80	2.108	0.54	0.818	0.31	0.227
27,000	2,324.8	1.27	6.353	0.81	2.180	0.55	0.846	0.32	0.235
27,500	2,367.9	1.29	6.565	0.83	2.252	0.56	0.874	0.33	0.243
28,000	2,410.9	1.32	6.781	0.84	2.326	0.57	0.902	0.33	0.251
28,500	2,454.0	1.34	6.999	0.86	2.400	0.58	0.931	0.34	0.259
29,000	2,497.0	1.36	7.220	0.87	2.476	0.59	0.960	0.34	0.267
29,500	2,540.1	1.39	7.445	0.89	2.552	0.60	0.990	0.35	0.275
30,000	2,583.1	1.41	7.672	0.90	2.630	0.61	1.020	0.36	0.283
32,500	2,798.4	1.53	8.857	0.98	3.034	0.66	1.176	0.39	0.326
35,000	3,013.6	1.65	10.117	1.05	3.464	0.71	1.342	0.41	0.372
37,500	3,228.9	1.76	11.453	1.13	3.919	0.76	1.518	0.44	0.420
40,000	3,444.2	1.88	12.863	1.20	4.399	0.81	1.703	0.47	0.472
42,500	3,659.4	2.00	14.347	1.28	4.904	0.86	1.898	0.50	0.525
45,000	3,874.7	2.12	15.905	1.35	5.434	0.91	2.102	0.53	0.581
47,500	4,089.9	2.23	17.534	1.43	5.988	0.96	2.315	0.56	0.640
50,000	4,305.2	2.35	19.237	1.50	6.566	1.01	2.538	0.59	0.701
52,500	4,520.4	2.47	21.010	1.58	7.168	1.06	2.770	0.62	0.765
55,000	4,735.7	2.59	22.855	1.66	7.795	1.11	3.011	0.65	0.831
57,500	4,951.0	2.70	24.770	1.73	8.444	1.17	3.261	0.68	0.900
60,000	5,166.2	2.82	26.756	1.81	9.118	1.22	3.520	0.71	0.971
62,500	5,381.5	2.94	28.811	1.88	9.814	1.27	3.788	0.74	1.045
65,000	5,596.7	3.06	30.936	1.96	10.534	1.32	4.064	0.77	1.121
67,500	5,812.0	–	–	2.03	11.277	1.37	4.350	0.80	1.199
70,000	6,027.3	–	–	2.11	12.043	1.42	4.644	0.83	1.280
72,500	6,242.5	–	–	2.18	12.832	1.47	4.947	0.86	1.363
75,000	6,457.8	–	–	2.26	13.643	1.52	5.258	0.89	1.448
77,500	6,673.0	–	–	2.33	14.478	1.57	5.579	0.92	1.536
80,000	6,888.3	–	–	2.41	15.334	1.62	5.907	0.95	1.626
82,500	7,103.6	–	–	2.48	16.214	1.67	6.244	0.98	1.718
85,000	7,318.8	–	–	2.56	17.115	1.72	6.590	1.01	1.813
87,500	7,534.1	–	–	2.63	18.039	1.77	6.944	1.04	1.910
90,000	7,749.3	–	–	2.71	18.985	1.82	7.307	1.07	2.009
92,500	7,964.6	–	–	2.78	19.953	1.87	7.678	1.10	2.111
95,000	8,179.9	–	–	2.86	20.943	1.93	8.057	1.13	2.214
97,500	8,395.1	–	–	2.93	21.955	1.98	8.444	1.16	2.320
100,000	8,610.4	–	–	3.01	22.989	2.03	8.840	1.19	2.428
105,000	9,040.9	–	–	–	–	2.13	9.657	1.24	2.651

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]
110,000	9,471.4	–	–	–	–	2.23	10.506	1.30	2.883
115,000	9,901.9	–	–	–	–	2.33	11.387	1.36	3.124
120,000	10,332.5	–	–	–	–	2.43	12.301	1.42	3.373
125,000	10,763.0	–	–	–	–	2.53	13.248	1.48	3.631
130,000	11,193.5	–	–	–	–	2.63	14.226	1.54	3.898
135,000	11,624.0	–	–	–	–	2.74	15.236	1.60	4.173
140,000	12,054.5	–	–	–	–	2.84	16.278	1.66	4.457
145,000	12,485.1	–	–	–	–	2.94	17.351	1.72	4.749
150,000	12,915.6	–	–	–	–	3.04	18.456	1.78	5.049
155,000	13,346.1	–	–	–	–	–	–	1.84	5.358
160,000	13,776.6	–	–	–	–	–	–	1.90	5.675
165,000	14,207.1	–	–	–	–	–	–	1.96	6.001
170,000	14,637.6	–	–	–	–	–	–	2.01	6.335
175,000	15,068.2	–	–	–	–	–	–	2.07	6.677
180,000	15,498.7	–	–	–	–	–	–	2.13	7.027
185,000	15,929.2	–	–	–	–	–	–	2.19	7.385
190,000	16,359.7	–	–	–	–	–	–	2.25	7.752
195,000	16,790.2	–	–	–	–	–	–	2.31	8.127
200,000	17,220.8	–	–	–	–	–	–	2.37	8.510
205,000	17,651.3	–	–	–	–	–	–	2.43	8.900
210,000	18,081.8	–	–	–	–	–	–	2.49	9.299
215,000	18,512.3	–	–	–	–	–	–	2.55	9.706
220,000	18,942.8	–	–	–	–	–	–	2.61	10.121
225,000	19,373.4	–	–	–	–	–	–	2.67	10.544
230,000	19,803.9	–	–	–	–	–	–	2.73	10.974
235,000	20,234.4	–	–	–	–	–	–	2.78	11.413
240,000	20,664.9	–	–	–	–	–	–	2.84	11.859
245,000	21,095.4	–	–	–	–	–	–	2.90	12.314
250,000	21,526.0	–	–	–	–	–	–	2.96	12.776
255,000	21,956.5	–	–	–	–	–	–	3.02	13.246
260,000	22,387.0	–	–	–	–	–	–	3.08	13.724

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Table 31: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, heating, inlet flow 55 °C / return flow 45 °C, d76.1–108 mm

d [mm]		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]
7,000	602.7	0.04	0.004	–	–	–	–
7,500	645.8	0.04	0.005	–	–	–	–
8,000	688.8	0.05	0.005	–	–	–	–
8,500	731.9	0.05	0.006	–	–	–	–
9,000	774.9	0.05	0.007	–	–	–	–
9,500	818.0	0.06	0.007	0.04	0.003	–	–
10,000	861.0	0.06	0.008	0.04	0.004	–	–
10,500	904.1	0.06	0.009	0.04	0.004	–	–
11,000	947.1	0.07	0.009	0.05	0.004	–	–
11,500	990.2	0.07	0.010	0.05	0.005	–	–
12,000	1,033.2	0.07	0.011	0.05	0.005	–	–
12,500	1,076.3	0.07	0.012	0.05	0.005	–	–

d [mm]		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]
13,000	1,119.3	0.08	0.013	0.06	0.006	–	–
13,500	1,162.4	0.08	0.013	0.06	0.006	–	–
14,000	1,205.5	0.08	0.014	0.06	0.007	–	–
14,500	1,248.5	0.09	0.015	0.06	0.007	0.04	0.003
15,000	1,291.6	0.09	0.016	0.06	0.007	0.04	0.003
15,500	1,334.6	0.09	0.017	0.07	0.008	0.04	0.003
16,000	1,377.7	0.09	0.018	0.07	0.008	0.05	0.003
16,500	1,420.7	0.10	0.019	0.07	0.009	0.05	0.003
17,000	1,463.8	0.10	0.020	0.07	0.009	0.05	0.004
17,500	1,506.8	0.10	0.021	0.07	0.010	0.05	0.004
18,000	1,549.9	0.11	0.022	0.08	0.010	0.05	0.004
18,500	1,592.9	0.11	0.023	0.08	0.011	0.05	0.004
19,000	1,636.0	0.11	0.024	0.08	0.011	0.05	0.004
19,500	1,679.0	0.12	0.026	0.08	0.012	0.06	0.004
20,000	1,722.1	0.12	0.027	0.09	0.012	0.06	0.005
20,500	1,765.1	0.12	0.028	0.09	0.013	0.06	0.005
21,000	1,808.2	0.12	0.029	0.09	0.013	0.06	0.005
21,500	1,851.2	0.13	0.030	0.09	0.014	0.06	0.005
22,000	1,894.3	0.13	0.032	0.09	0.015	0.06	0.006
22,500	1,937.3	0.13	0.033	0.10	0.015	0.06	0.006
23,000	1,980.4	0.14	0.034	0.10	0.016	0.07	0.006
23,500	2,023.4	0.14	0.035	0.10	0.016	0.07	0.006
24,000	2,066.5	0.14	0.037	0.10	0.017	0.07	0.006
24,500	2,109.5	0.15	0.038	0.10	0.018	0.07	0.007
25,000	2,152.6	0.15	0.039	0.11	0.018	0.07	0.007
25,500	2,195.6	0.15	0.041	0.11	0.019	0.07	0.007
26,000	2,238.7	0.15	0.042	0.11	0.019	0.07	0.007
26,500	2,281.8	0.16	0.044	0.11	0.020	0.08	0.008
27,000	2,324.8	0.16	0.045	0.12	0.021	0.08	0.008
27,500	2,367.9	0.16	0.047	0.12	0.021	0.08	0.008
28,000	2,410.9	0.17	0.048	0.12	0.022	0.08	0.008
28,500	2,454.0	0.17	0.050	0.12	0.023	0.08	0.009
29,000	2,497.0	0.17	0.051	0.12	0.024	0.08	0.009
29,500	2,540.1	0.17	0.053	0.13	0.024	0.08	0.009
30,000	2,583.1	0.18	0.054	0.13	0.025	0.09	0.010
32,500	2,798.4	0.19	0.063	0.14	0.029	0.09	0.011
35,000	3,013.6	0.21	0.071	0.15	0.033	0.10	0.012
37,500	3,228.9	0.22	0.081	0.16	0.037	0.11	0.014
40,000	3,444.2	0.24	0.090	0.17	0.041	0.11	0.016
42,500	3,659.4	0.25	0.100	0.18	0.046	0.12	0.018
45,000	3,874.7	0.27	0.111	0.19	0.051	0.13	0.019
47,500	4,089.9	0.28	0.122	0.20	0.056	0.14	0.021
50,000	4,305.2	0.30	0.134	0.21	0.061	0.14	0.023
52,500	4,520.4	0.31	0.146	0.22	0.067	0.15	0.025
55,000	4,735.7	0.33	0.159	0.24	0.073	0.16	0.028
57,500	4,951.0	0.34	0.172	0.25	0.079	0.16	0.030
60,000	5,166.2	0.36	0.185	0.26	0.085	0.17	0.032
62,500	5,381.5	0.37	0.199	0.27	0.091	0.18	0.035
65,000	5,596.7	0.39	0.213	0.28	0.098	0.19	0.037

d [mm]		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]
67,500	5,812.0	0.40	0.228	0.29	0.105	0.19	0.040
70,000	6,027.3	0.42	0.244	0.30	0.111	0.20	0.042
72,500	6,242.5	0.43	0.259	0.31	0.119	0.21	0.045
75,000	6,457.8	0.44	0.275	0.32	0.126	0.21	0.048
77,500	6,673.0	0.46	0.292	0.33	0.134	0.22	0.051
80,000	6,888.3	0.47	0.309	0.34	0.141	0.23	0.054
82,500	7,103.6	0.49	0.327	0.35	0.149	0.24	0.057
85,000	7,318.8	0.50	0.344	0.36	0.158	0.24	0.060
87,500	7,534.1	0.52	0.363	0.37	0.166	0.25	0.063
90,000	7,749.3	0.53	0.381	0.38	0.174	0.26	0.066
92,500	7,964.6	0.55	0.401	0.40	0.183	0.26	0.069
95,000	8,179.9	0.56	0.420	0.41	0.192	0.27	0.073
97,500	8,395.1	0.58	0.440	0.42	0.201	0.28	0.076
100,000	8,610.4	0.59	0.461	0.43	0.210	0.28	0.080
105,000	9,040.9	0.62	0.503	0.45	0.230	0.30	0.087
110,000	9,471.4	0.65	0.546	0.47	0.250	0.31	0.094
115,000	9,901.9	0.68	0.592	0.49	0.270	0.33	0.102
120,000	10,332.5	0.71	0.639	0.51	0.292	0.34	0.110
125,000	10,763.0	0.74	0.687	0.53	0.314	0.36	0.119
130,000	11,193.5	0.77	0.737	0.56	0.337	0.37	0.127
135,000	11,624.0	0.80	0.789	0.58	0.360	0.38	0.136
140,000	12,054.5	0.83	0.842	0.60	0.384	0.40	0.145
145,000	12,485.1	0.86	0.897	0.62	0.409	0.41	0.155
150,000	12,915.6	0.89	0.954	0.64	0.435	0.43	0.164
155,000	13,346.1	0.92	1.011	0.66	0.461	0.44	0.174
160,000	13,776.6	0.95	1.071	0.68	0.488	0.46	0.184
165,000	14,207.1	0.98	1.132	0.71	0.516	0.47	0.195
170,000	14,637.6	1.01	1.195	0.73	0.545	0.48	0.206
175,000	15,068.2	1.04	1.259	0.75	0.574	0.50	0.217
180,000	15,498.7	1.07	1.324	0.77	0.604	0.51	0.228
185,000	15,929.2	1.10	1.391	0.79	0.634	0.53	0.239
190,000	16,359.7	1.13	1.460	0.81	0.665	0.54	0.251
195,000	16,790.2	1.16	1.530	0.83	0.697	0.56	0.263
200,000	17,220.8	1.19	1.602	0.86	0.730	0.57	0.275
205,000	17,651.3	1.22	1.675	0.88	0.763	0.58	0.288
210,000	18,081.8	1.25	1.749	0.90	0.797	0.60	0.300
215,000	18,512.3	1.27	1.825	0.92	0.831	0.61	0.313
220,000	18,942.8	1.30	1.903	0.94	0.866	0.63	0.327
225,000	19,373.4	1.33	1.982	0.96	0.902	0.64	0.340
230,000	19,803.9	1.36	2.062	0.98	0.939	0.66	0.354
235,000	20,234.4	1.39	2.144	1.00	0.976	0.67	0.368
240,000	20,664.9	1.42	2.227	1.03	1.014	0.68	0.382
245,000	21,095.4	1.45	2.312	1.05	1.052	0.70	0.397
250,000	21,526.0	1.48	2.398	1.07	1.091	0.71	0.411
255,000	21,956.5	1.51	2.486	1.09	1.131	0.73	0.426
260,000	22,387.0	1.54	2.575	1.11	1.171	0.74	0.441
265,000	22,817.5	1.57	2.665	1.13	1.213	0.76	0.457
270,000	23,248.0	1.60	2.757	1.15	1.254	0.77	0.472
275,000	23,678.5	1.63	2.851	1.18	1.297	0.78	0.488

d [mm]		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]
280,000	24,109.1	1.66	2.945	1.20	1.339	0.80	0.504
285,000	24,539.6	1.69	3.041	1.22	1.383	0.81	0.521
290,000	24,970.1	1.72	3.139	1.24	1.427	0.83	0.537
295,000	25,400.6	1.75	3.238	1.26	1.472	0.84	0.554
300,000	25,831.1	1.78	3.338	1.28	1.518	0.85	0.571
310,000	26,692.2	1.84	3.543	1.33	1.611	0.88	0.606
320,000	27,553.2	1.90	3.753	1.37	1.706	0.91	0.642
330,000	28,414.3	1.96	3.969	1.41	1.804	0.94	0.679
340,000	29,275.3	2.02	4.191	1.45	1.904	0.97	0.716
350,000	30,136.3	2.08	4.418	1.50	2.007	1.00	0.755
360,000	30,997.4	2.13	4.650	1.54	2.112	1.03	0.794
370,000	31,858.4	2.19	4.888	1.58	2.220	1.05	0.835
380,000	32,719.4	2.25	5.132	1.62	2.330	1.08	0.876
390,000	33,580.5	2.31	5.380	1.67	2.443	1.11	0.918
400,000	34,441.5	2.37	5.634	1.71	2.558	1.14	0.961
410,000	35,302.6	2.43	5.894	1.75	2.675	1.17	1.005
420,000	36,163.6	2.49	6.159	1.80	2.795	1.20	1.050
430,000	37,024.6	2.55	6.429	1.84	2.917	1.23	1.096
440,000	37,885.7	2.61	6.704	1.88	3.042	1.25	1.142
450,000	38,746.7	2.67	6.985	1.92	3.169	1.28	1.190
460,000	39,607.7	2.73	7.271	1.97	3.298	1.31	1.238
470,000	40,468.8	2.79	7.563	2.01	3.430	1.34	1.287
480,000	41,329.8	2.85	7.860	2.05	3.564	1.37	1.338
490,000	42,190.9	2.91	8.161	2.10	3.700	1.40	1.389
500,000	43,051.9	2.96	8.469	2.14	3.839	1.42	1.441
550,000	47,357.1	–	–	2.35	4.568	1.57	1.713
600,000	51,662.3	–	–	2.57	5.355	1.71	2.007
650,000	55,967.5	–	–	2.78	6.199	1.85	2.322
700,000	60,272.7	–	–	2.99	7.099	1.99	2.658
750,000	64,577.9	–	–	–	–	2.14	3.014
800,000	68,883.0	–	–	–	–	2.28	3.392
850,000	73,188.2	–	–	–	–	2.42	3.789
900,000	77,493.4	–	–	–	–	2.56	4.207
950,000	81,798.6	–	–	–	–	2.71	4.644
1,000,000	86,103.8	–	–	–	–	2.85	5.102
1,050,000	90,409.0	–	–	–	–	2.99	5.579

5 COMPRESSED AIR PRESSURE LOSS

5.1 COMPRESSED AIR, 3 BAR

Medium:	Compressed air	Density:	4.771 kg/m^3
Relative operating pressure:	3 bar	Viscosity:	0.0000182635 Pa•s
Absolute operating pressure:	4 bar	Surface roughness:	0.0015 mm
Temperature:	20 °C		

The pressure loss values are shown in the diagram or in the Geberit pressure loss tables.

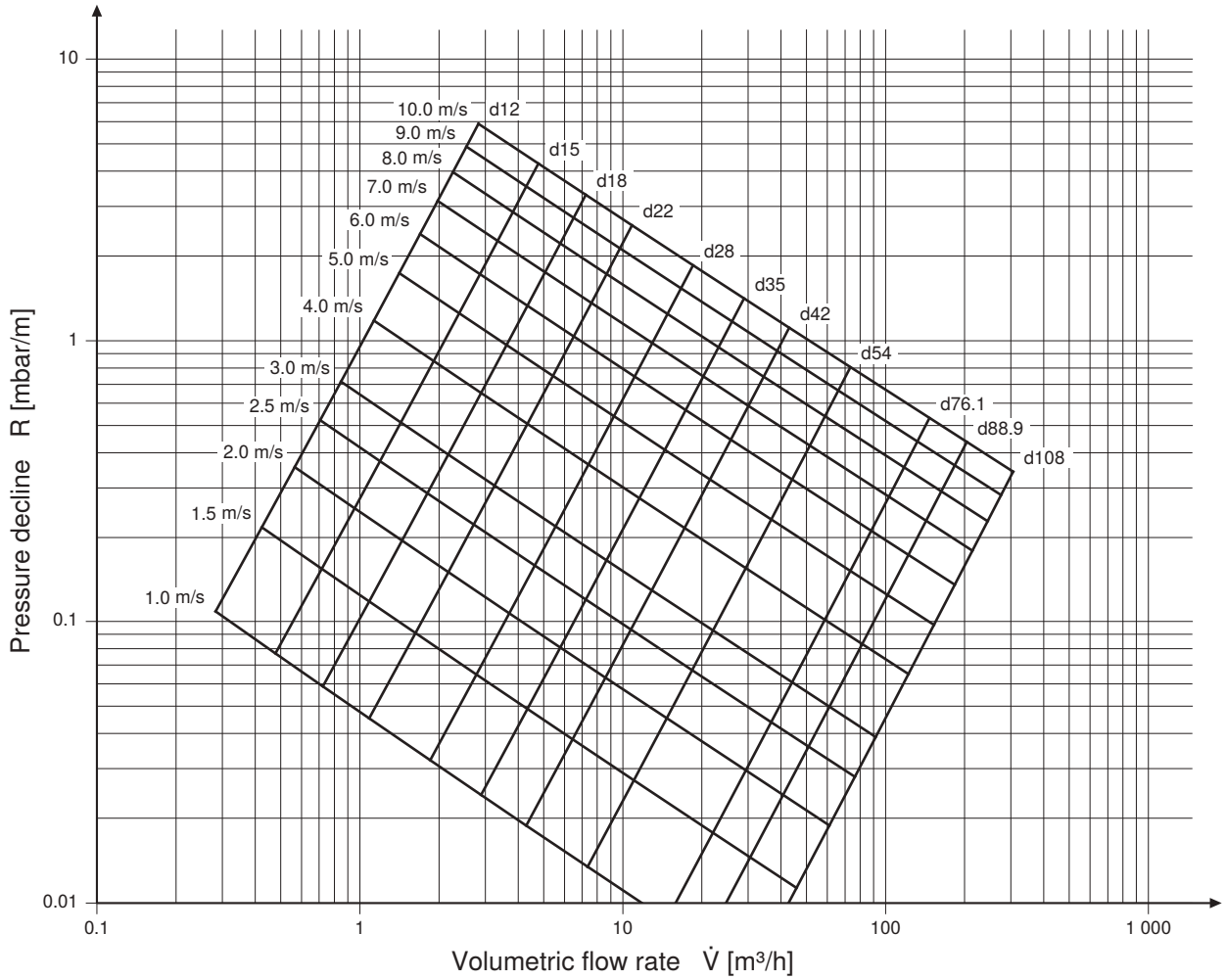

Table 32: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 3 bar, d12–22 mm

d [mm]	12		15		18		22	
$\dot{V}$ [m³/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	0.88	0.0884	–	–	–	–	–	–
0.50	1.77	0.2870	1.05	0.0834	–	–	–	–
0.75	2.65	0.5765	1.57	0.1668	1.04	0.0626	–	–
1.00	3.54	0.9490	2.09	0.2738	1.38	0.1026	0.92	0.0394
1.25	4.42	1.3997	2.62	0.4029	1.73	0.1507	1.15	0.0577
1.50	5.31	1.9253	3.14	0.5531	2.07	0.2066	1.38	0.0791
1.75	6.19	2.5231	3.66	0.7237	2.42	0.2700	1.61	0.1032
2.00	7.07	3.1912	4.19	0.9141	2.76	0.3407	1.84	0.1301
2.25	7.96	3.9278	4.71	1.1237	3.11	0.4184	2.07	0.1596
2.50	8.84	4.7317	5.23	1.3521	3.45	0.5031	2.30	0.1918
2.75	9.73	5.6015	5.76	1.5990	3.80	0.5945	2.53	0.2265
3.00	–	–	6.28	1.8640	4.14	0.6925	2.76	0.2637
3.25	–	–	6.80	2.1469	4.49	0.7972	2.99	0.3033
3.50	–	–	7.32	2.4474	4.84	0.9082	3.22	0.3454
3.75	–	–	7.85	2.7653	5.18	1.0256	3.45	0.3898
4.00	–	–	8.37	3.1004	5.53	1.1493	3.68	0.4366
4.50	–	–	9.42	3.8213	6.22	1.4152	4.14	0.5372
5.00	–	–	–	–	6.91	1.7053	4.60	0.6468
5.50	–	–	–	–	7.60	2.0194	5.06	0.7654
6.00	–	–	–	–	8.29	2.3568	5.52	0.8927
6.50	–	–	–	–	8.98	2.7175	5.98	1.0287
7.00	–	–	–	–	9.67	3.1009	6.44	1.1732
7.50	–	–	–	–	–	–	6.90	1.3261
8.00	–	–	–	–	–	–	7.37	1.4873
8.50	–	–	–	–	–	–	7.83	1.6567
9.00	–	–	–	–	–	–	8.29	1.8342
9.50	–	–	–	–	–	–	8.75	2.0198
10.00	–	–	–	–	–	–	9.21	2.2134
10.50	–	–	–	–	–	–	9.67	2.4149

Table 33: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 3 bar, d28–54 mm

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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	0.94	0.0292	–	–	–	–	–	–
2.00	1.08	0.0367	–	–	–	–	–	–
2.25	1.21	0.0450	–	–	–	–	–	–
2.50	1.35	0.0541	0.86	0.0188	–	–	–	–
2.75	1.48	0.0638	0.95	0.0222	–	–	–	–
3.00	1.62	0.0742	1.04	0.0258	–	–	–	–
3.25	1.75	0.0853	1.12	0.0296	–	–	–	–
3.50	1.89	0.0970	1.21	0.0337	–	–	–	–
3.75	2.02	0.1095	1.30	0.0380	0.87	0.0149	–	–
4.00	2.16	0.1225	1.38	0.0425	0.93	0.0166	–	–
4.50	2.43	0.1506	1.55	0.0522	1.05	0.0204	–	–
5.00	2.70	0.1812	1.73	0.0627	1.16	0.0245	–	–
5.50	2.97	0.2142	1.90	0.0741	1.28	0.0289	–	–

d [mm]	28		35		42		54	
V̇ [m³/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]
6.00	3.24	0.2496	2.07	0.0863	1.40	0.0337	–	–
6.50	3.51	0.2874	2.25	0.0993	1.51	0.0387	0.88	0.0108
7.00	3.78	0.3276	2.42	0.1131	1.63	0.0441	0.95	0.0123
7.50	4.05	0.3700	2.59	0.1277	1.74	0.0498	1.02	0.0139
8.00	4.32	0.4147	2.76	0.1430	1.86	0.0558	1.09	0.0156
8.50	4.59	0.4617	2.94	0.1592	1.98	0.0620	1.16	0.0173
9.00	4.86	0.5109	3.11	0.1761	2.09	0.0686	1.22	0.0191
9.50	5.13	0.5623	3.28	0.1937	2.21	0.0754	1.29	0.0210
10.00	5.40	0.6159	3.45	0.2121	2.33	0.0826	1.36	0.0230
10.50	5.67	0.6717	3.63	0.2312	2.44	0.0900	1.43	0.0251
11.00	5.94	0.7296	3.80	0.2510	2.56	0.0977	1.50	0.0272
11.50	6.21	0.7896	3.97	0.2716	2.67	0.1056	1.56	0.0294
12.00	6.48	0.8517	4.14	0.2929	2.79	0.1139	1.63	0.0317
12.50	6.75	0.9159	4.32	0.3149	2.91	0.1224	1.70	0.0341
13.00	7.02	0.9823	4.49	0.3376	3.02	0.1312	1.77	0.0365
13.50	7.29	1.0506	4.66	0.3610	3.14	0.1402	1.84	0.0390
14.00	7.56	1.1211	4.84	0.3851	3.26	0.1496	1.90	0.0416
14.50	7.83	1.1936	5.01	0.4098	3.37	0.1592	1.97	0.0442
15.00	8.10	1.2681	5.18	0.4353	3.49	0.1690	2.04	0.0470
16.00	8.63	1.4231	5.53	0.4883	3.72	0.1895	2.18	0.0526
17.00	9.17	1.5862	5.87	0.5440	3.95	0.2111	2.31	0.0586
18.00	9.71	1.7572	6.22	0.6024	4.19	0.2336	2.45	0.0648
19.00	–	–	6.56	0.6634	4.42	0.2572	2.58	0.0714
20.00	–	–	6.91	0.7271	4.65	0.2818	2.72	0.0781
21.00	–	–	7.25	0.7933	4.88	0.3074	2.86	0.0852
22.00	–	–	7.60	0.8621	5.12	0.3340	2.99	0.0925
23.00	–	–	7.94	0.9336	5.35	0.3615	3.13	0.1001
24.00	–	–	8.29	1.0075	5.58	0.3900	3.26	0.1080
25.00	–	–	8.63	1.0840	5.81	0.4195	3.40	0.1161
30.00	–	–	–	–	6.98	0.5813	4.08	0.1607
35.00	–	–	–	–	8.14	0.7664	4.76	0.2115
40.00	–	–	–	–	9.30	0.9742	5.44	0.2686
45.00	–	–	–	–	–	–	6.12	0.3317
50.00	–	–	–	–	–	–	6.80	0.4007
55.00	–	–	–	–	–	–	7.48	0.4756
60.00	–	–	–	–	–	–	8.16	0.5562
65.00	–	–	–	–	–	–	8.84	0.6424
70.00	–	–	–	–	–	–	9.52	0.7343

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Table 34: Pressure loss Geberit Mapress stainless steel system pipes 1.4401, compressed air 3 bar, d76.1–108 mm

d [mm]	76.1		88.9		108	
V̇ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
12.50	0.85	0.0066	–	–	–	–
13.00	0.88	0.0070	–	–	–	–
13.50	0.92	0.0075	–	–	–	–
14.00	0.95	0.0080	–	–	–	–
14.50	0.99	0.0085	–	–	–	–

d [mm]	76.1		88.9		108	
V̇ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
15.00	1.02	0.0090	–	–	–	–
16.00	1.09	0.0101	–	–	–	–
17.00	1.16	0.0113	–	–	–	–
18.00	1.22	0.0124	0.88	0.0057	–	–
19.00	1.29	0.0137	0.93	0.0063	–	–
20.00	1.36	0.0150	0.98	0.0069	–	–
21.00	1.43	0.0163	1.03	0.0075	–	–
22.00	1.50	0.0177	1.08	0.0081	–	–
23.00	1.56	0.0192	1.13	0.0088	–	–
24.00	1.63	0.0207	1.18	0.0095	–	–
25.00	1.70	0.0222	1.23	0.0102	–	–
30.00	2.04	0.0307	1.47	0.0141	0.98	0.0053
35.00	2.38	0.0403	1.72	0.0185	1.14	0.0070
40.00	2.72	0.0512	1.96	0.0234	1.31	0.0089
45.00	3.06	0.0631	2.21	0.0289	1.47	0.0109
50.00	3.40	0.0761	2.45	0.0348	1.63	0.0132
55.00	3.74	0.0903	2.70	0.0413	1.80	0.0156
60.00	4.08	0.1055	2.94	0.0482	1.96	0.0183
65.00	4.42	0.1217	3.19	0.0556	2.13	0.0210
70.00	4.76	0.1390	3.43	0.0635	2.29	0.0240
75.00	5.10	0.1574	3.68	0.0718	2.45	0.0272
80.00	5.44	0.1767	3.93	0.0806	2.62	0.0305
85.00	5.78	0.1970	4.17	0.0899	2.78	0.0340
90.00	6.12	0.2184	4.42	0.0996	2.94	0.0376
95.00	6.46	0.2407	4.66	0.1098	3.11	0.0415
100.00	6.80	0.2640	4.91	0.1204	3.27	0.0455
105.00	7.14	0.2883	5.15	0.1314	3.43	0.0496
110.00	7.48	0.3135	5.40	0.1429	3.60	0.0539
115.00	7.82	0.3397	5.64	0.1548	3.76	0.0584
120.00	8.16	0.3668	5.89	0.1671	3.92	0.0630
125.00	8.50	0.3949	6.13	0.1799	4.09	0.0678
130.00	8.84	0.4239	6.38	0.1930	4.25	0.0728
135.00	9.18	0.4539	6.62	0.2066	4.41	0.0779
140.00	9.53	0.4847	6.87	0.2207	4.58	0.0832
145.00	9.87	0.5165	7.11	0.2351	4.74	0.0886
150.00	–	–	7.36	0.2499	4.90	0.0942
155.00	–	–	7.61	0.2652	5.07	0.0999
160.00	–	–	7.85	0.2809	5.23	0.1058
165.00	–	–	8.10	0.2969	5.40	0.1118
170.00	–	–	8.34	0.3134	5.56	0.1180
175.00	–	–	8.59	0.3303	5.72	0.1243
180.00	–	–	8.83	0.3476	5.89	0.1308
185.00	–	–	9.08	0.3652	6.05	0.1375
190.00	–	–	9.32	0.3833	6.21	0.1442
195.00	–	–	9.57	0.4018	6.38	0.1512
200.00	–	–	9.81	0.4207	6.54	0.1582
205.00	–	–	10.06	0.4399	6.70	0.1655
210.00	–	–	–	–	6.87	0.1728
215.00	–	–	–	–	7.03	0.1804

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
220.00	–	–	–	–	7.19	0.1880
225.00	–	–	–	–	7.36	0.1958
230.00	–	–	–	–	7.52	0.2038
235.00	–	–	–	–	7.68	0.2119
240.00	–	–	–	–	7.85	0.2201
245.00	–	–	–	–	8.01	0.2285
250.00	–	–	–	–	8.17	0.2370
255.00	–	–	–	–	8.34	0.2456
260.00	–	–	–	–	8.50	0.2544
265.00	–	–	–	–	8.67	0.2634
270.00	–	–	–	–	8.83	0.2725
275.00	–	–	–	–	8.99	0.2817
280.00	–	–	–	–	9.16	0.2911
285.00	–	–	–	–	9.32	0.3006
290.00	–	–	–	–	9.48	0.3102
295.00	–	–	–	–	9.65	0.3200
300.00	–	–	–	–	9.81	0.3299

5.2 COMPRESSED AIR, 6 BAR

Medium:	Compressed air	Density:	8.352 kg/m^3
Relative operating pressure:	6 bar	Viscosity:	0.000018302 Pa•s
Absolute operating pressure:	7 bar	Surface roughness:	0.0015 mm
Temperature:	20 °C		

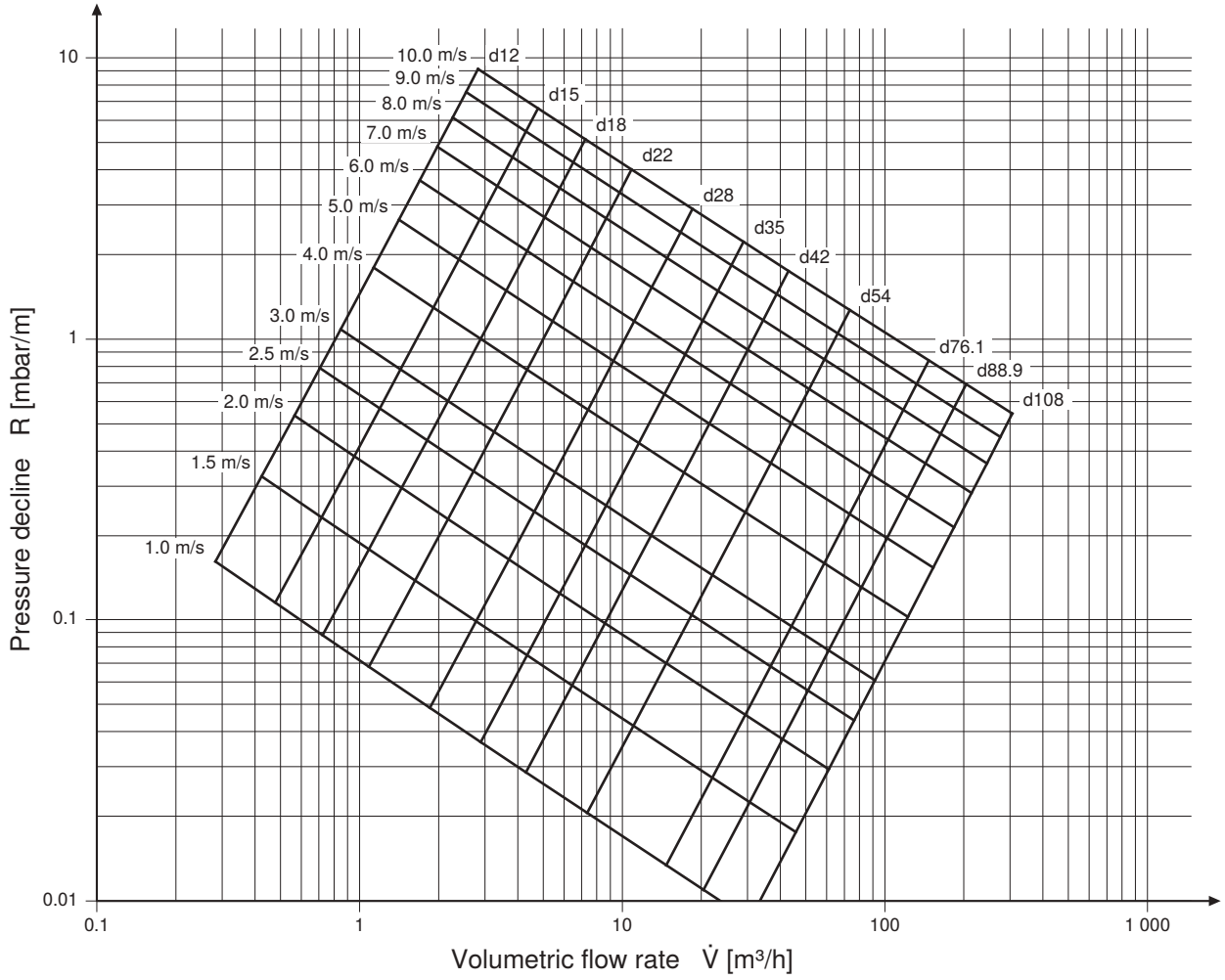

Table 35: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 6 bar, d12–22 mm

d [mm]	12		15		18		22	
$\dot{V}$ [m³/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	0.88	0.0884	–	–	–	–	–	–
0.50	1.77	0.2870	1.05	0.0834	–	–	–	–
0.75	2.65	0.5765	1.57	0.1668	1.04	0.0626	–	–
1.00	3.54	0.9490	2.09	0.2738	1.38	0.1026	0.92	0.0394
1.25	4.42	1.3997	2.62	0.4029	1.73	0.1507	1.15	0.0577
1.50	5.31	1.9253	3.14	0.5531	2.07	0.2066	1.38	0.0791
1.75	6.19	2.5231	3.66	0.7237	2.42	0.2700	1.61	0.1032
2.00	7.07	3.1912	4.19	0.9141	2.76	0.3407	1.84	0.1301
2.25	7.96	3.9278	4.71	1.1237	3.11	0.4184	2.07	0.1596
2.50	8.84	4.7317	5.23	1.3521	3.45	0.5031	2.30	0.1918
2.75	9.73	5.6015	5.76	1.5990	3.80	0.5945	2.53	0.2265
3.00	–	–	6.28	1.8640	4.14	0.6925	2.76	0.2637
3.25	–	–	6.80	2.1469	4.49	0.7972	2.99	0.3033
3.50	–	–	7.32	2.4474	4.84	0.9082	3.22	0.3454
3.75	–	–	7.85	2.7653	5.18	1.0256	3.45	0.3898
4.00	–	–	8.37	3.1004	5.53	1.1493	3.68	0.4366
4.50	–	–	9.42	3.8213	6.22	1.4152	4.14	0.5372
5.00	–	–	–	–	6.91	1.7053	4.60	0.6468
5.50	–	–	–	–	7.60	2.0194	5.06	0.7654
6.00	–	–	–	–	8.29	2.3568	5.52	0.8927
6.50	–	–	–	–	8.98	2.7175	5.98	1.0287
7.00	–	–	–	–	9.67	3.1009	6.44	1.1732
7.50	–	–	–	–	–	–	6.90	1.3261
8.00	–	–	–	–	–	–	7.37	1.4873
8.50	–	–	–	–	–	–	7.83	1.6567
9.00	–	–	–	–	–	–	8.29	1.8342
9.50	–	–	–	–	–	–	8.75	2.0198
10.00	–	–	–	–	–	–	9.21	2.2134
10.50	–	–	–	–	–	–	9.67	2.4149

Table 36: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 6 bar, d28–54 mm

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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	0.94	0.0292	–	–	–	–	–	–
2.00	1.08	0.0367	–	–	–	–	–	–
2.25	1.21	0.0450	–	–	–	–	–	–
2.50	1.35	0.0541	0.86	0.0188	–	–	–	–
2.75	1.48	0.0638	0.95	0.0222	–	–	–	–
3.00	1.62	0.0742	1.04	0.0258	–	–	–	–
3.25	1.75	0.0853	1.12	0.0296	–	–	–	–
3.50	1.89	0.0970	1.21	0.0337	–	–	–	–
3.75	2.02	0.1095	1.30	0.0380	0.87	0.0149	–	–
4.00	2.16	0.1225	1.38	0.0425	0.93	0.0166	–	–
4.50	2.43	0.1506	1.55	0.0522	1.05	0.0204	–	–
5.00	2.70	0.1812	1.73	0.0627	1.16	0.0245	–	–
5.50	2.97	0.2142	1.90	0.0741	1.28	0.0289	–	–

d [mm]	28		35		42		54	
V̇ [m³/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]
6.00	3.24	0.2496	2.07	0.0863	1.40	0.0337	–	–
6.50	3.51	0.2874	2.25	0.0993	1.51	0.0387	0.88	0.0108
7.00	3.78	0.3276	2.42	0.1131	1.63	0.0441	0.95	0.0123
7.50	4.05	0.3700	2.59	0.1277	1.74	0.0498	1.02	0.0139
8.00	4.32	0.4147	2.76	0.1430	1.86	0.0558	1.09	0.0156
8.50	4.59	0.4617	2.94	0.1592	1.98	0.0620	1.16	0.0173
9.00	4.86	0.5109	3.11	0.1761	2.09	0.0686	1.22	0.0191
9.50	5.13	0.5623	3.28	0.1937	2.21	0.0754	1.29	0.0210
10.00	5.40	0.6159	3.45	0.2121	2.33	0.0826	1.36	0.0230
10.50	5.67	0.6717	3.63	0.2312	2.44	0.0900	1.43	0.0251
11.00	5.94	0.7296	3.80	0.2510	2.56	0.0977	1.50	0.0272
11.50	6.21	0.7896	3.97	0.2716	2.67	0.1056	1.56	0.0294
12.00	6.48	0.8517	4.14	0.2929	2.79	0.1139	1.63	0.0317
12.50	6.75	0.9159	4.32	0.3149	2.91	0.1224	1.70	0.0341
13.00	7.02	0.9823	4.49	0.3376	3.02	0.1312	1.77	0.0365
13.50	7.29	1.0506	4.66	0.3610	3.14	0.1402	1.84	0.0390
14.00	7.56	1.1211	4.84	0.3851	3.26	0.1496	1.90	0.0416
14.50	7.83	1.1936	5.01	0.4098	3.37	0.1592	1.97	0.0442
15.00	8.10	1.2681	5.18	0.4353	3.49	0.1690	2.04	0.0470
16.00	8.63	1.4231	5.53	0.4883	3.72	0.1895	2.18	0.0526
17.00	9.17	1.5862	5.87	0.5440	3.95	0.2111	2.31	0.0586
18.00	9.71	1.7572	6.22	0.6024	4.19	0.2336	2.45	0.0648
19.00	–	–	6.56	0.6634	4.42	0.2572	2.58	0.0714
20.00	–	–	6.91	0.7271	4.65	0.2818	2.72	0.0781
21.00	–	–	7.25	0.7933	4.88	0.3074	2.86	0.0852
22.00	–	–	7.60	0.8621	5.12	0.3340	2.99	0.0925
23.00	–	–	7.94	0.9336	5.35	0.3615	3.13	0.1001
24.00	–	–	8.29	1.0075	5.58	0.3900	3.26	0.1080
25.00	–	–	8.63	1.0840	5.81	0.4195	3.40	0.1161
30.00	–	–	–	–	6.98	0.5813	4.08	0.1607
35.00	–	–	–	–	8.14	0.7664	4.76	0.2115
40.00	–	–	–	–	9.30	0.9742	5.44	0.2686
45.00	–	–	–	–	–	–	6.12	0.3317
50.00	–	–	–	–	–	–	6.80	0.4007
55.00	–	–	–	–	–	–	7.48	0.4756
60.00	–	–	–	–	–	–	8.16	0.5562
65.00	–	–	–	–	–	–	8.84	0.6424
70.00	–	–	–	–	–	–	9.52	0.7343

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Table 37: Pressure loss Geberit Mapress stainless steel system pipes 1.4401, compressed air 6 bar, d76.1–108 mm

d [mm]	76.1		88.9		108	
V̇ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
12.50	0.85	0.0066	–	–	–	–
13.00	0.88	0.0070	–	–	–	–
13.50	0.92	0.0075	–	–	–	–
14.00	0.95	0.0080	–	–	–	–
14.50	0.99	0.0085	–	–	–	–

d [mm]	76.1		88.9		108	
V̇ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
15.00	1.02	0.0090	–	–	–	–
16.00	1.09	0.0101	–	–	–	–
17.00	1.16	0.0113	–	–	–	–
18.00	1.22	0.0124	0.88	0.0057	–	–
19.00	1.29	0.0137	0.93	0.0063	–	–
20.00	1.36	0.0150	0.98	0.0069	–	–
21.00	1.43	0.0163	1.03	0.0075	–	–
22.00	1.50	0.0177	1.08	0.0081	–	–
23.00	1.56	0.0192	1.13	0.0088	–	–
24.00	1.63	0.0207	1.18	0.0095	–	–
25.00	1.70	0.0222	1.23	0.0102	–	–
30.00	2.04	0.0307	1.47	0.0141	0.98	0.0053
35.00	2.38	0.0403	1.72	0.0185	1.14	0.0070
40.00	2.72	0.0512	1.96	0.0234	1.31	0.0089
45.00	3.06	0.0631	2.21	0.0289	1.47	0.0109
50.00	3.40	0.0761	2.45	0.0348	1.63	0.0132
55.00	3.74	0.0903	2.70	0.0413	1.80	0.0156
60.00	4.08	0.1055	2.94	0.0482	1.96	0.0183
65.00	4.42	0.1217	3.19	0.0556	2.13	0.0210
70.00	4.76	0.1390	3.43	0.0635	2.29	0.0240
75.00	5.10	0.1574	3.68	0.0718	2.45	0.0272
80.00	5.44	0.1767	3.93	0.0806	2.62	0.0305
85.00	5.78	0.1970	4.17	0.0899	2.78	0.0340
90.00	6.12	0.2184	4.42	0.0996	2.94	0.0376
95.00	6.46	0.2407	4.66	0.1098	3.11	0.0415
100.00	6.80	0.2640	4.91	0.1204	3.27	0.0455
105.00	7.14	0.2883	5.15	0.1314	3.43	0.0496
110.00	7.48	0.3135	5.40	0.1429	3.60	0.0539
115.00	7.82	0.3397	5.64	0.1548	3.76	0.0584
120.00	8.16	0.3668	5.89	0.1671	3.92	0.0630
125.00	8.50	0.3949	6.13	0.1799	4.09	0.0678
130.00	8.84	0.4239	6.38	0.1930	4.25	0.0728
135.00	9.18	0.4539	6.62	0.2066	4.41	0.0779
140.00	9.53	0.4847	6.87	0.2207	4.58	0.0832
145.00	9.87	0.5165	7.11	0.2351	4.74	0.0886
150.00	–	–	7.36	0.2499	4.90	0.0942
155.00	–	–	7.61	0.2652	5.07	0.0999
160.00	–	–	7.85	0.2809	5.23	0.1058
165.00	–	–	8.10	0.2969	5.40	0.1118
170.00	–	–	8.34	0.3134	5.56	0.1180
175.00	–	–	8.59	0.3303	5.72	0.1243
180.00	–	–	8.83	0.3476	5.89	0.1308
185.00	–	–	9.08	0.3652	6.05	0.1375
190.00	–	–	9.32	0.3833	6.21	0.1442
195.00	–	–	9.57	0.4018	6.38	0.1512
200.00	–	–	9.81	0.4207	6.54	0.1582
205.00	–	–	10.06	0.4399	6.70	0.1655
210.00	–	–	–	–	6.87	0.1728
215.00	–	–	–	–	7.03	0.1804

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
220.00	–	–	–	–	7.19	0.1880
225.00	–	–	–	–	7.36	0.1958
230.00	–	–	–	–	7.52	0.2038
235.00	–	–	–	–	7.68	0.2119
240.00	–	–	–	–	7.85	0.2201
245.00	–	–	–	–	8.01	0.2285
250.00	–	–	–	–	8.17	0.2370
255.00	–	–	–	–	8.34	0.2456
260.00	–	–	–	–	8.50	0.2544
265.00	–	–	–	–	8.67	0.2634
270.00	–	–	–	–	8.83	0.2725
275.00	–	–	–	–	8.99	0.2817
280.00	–	–	–	–	9.16	0.2911
285.00	–	–	–	–	9.32	0.3006
290.00	–	–	–	–	9.48	0.3102
295.00	–	–	–	–	9.65	0.3200
300.00	–	–	–	–	9.81	0.3299

5.3 COMPRESSED AIR, 8 BAR

Medium:	Compressed air	Density:	10.739 kg/m^3
Relative operating pressure:	8 bar	Viscosity:	0.00001833 Pa•s
Absolute operating pressure:	9 bar	Surface roughness:	0.0015 mm
Temperature:	20 °C		

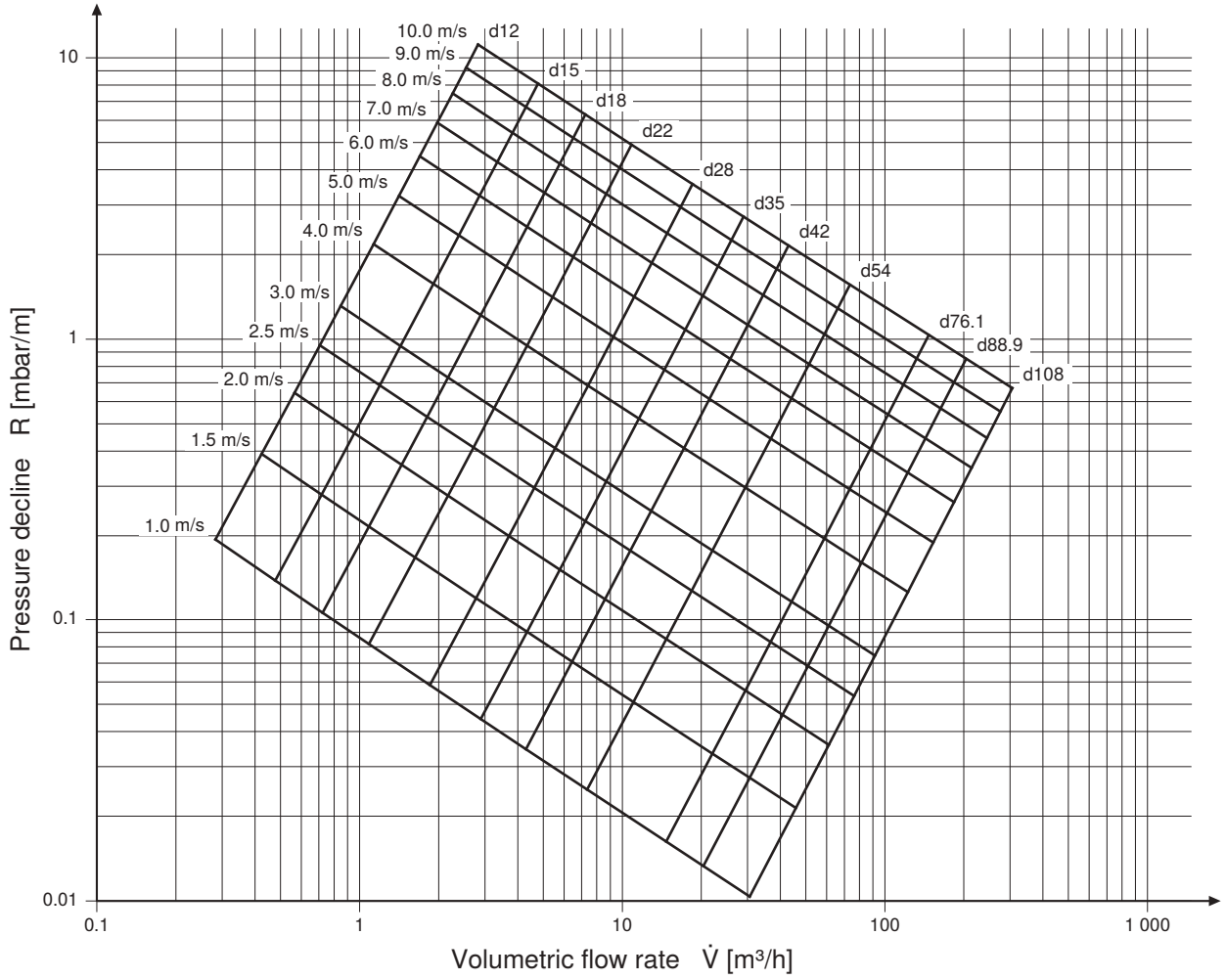

Table 38: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 8 bar, d12–22 mm

d [mm]	12		15		18		22	
$\dot{V}$ [m³/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	0.88	0.1563	–	–	–	–	–	–
0.50	1.77	0.5183	1.05	0.1494	–	–	–	–
0.75	2.65	1.0533	1.57	0.3022	1.04	0.1128	–	–
1.00	3.54	1.7477	2.09	0.5000	1.38	0.1862	0.92	0.0710
1.25	4.42	2.5936	2.62	0.7402	1.73	0.2752	1.15	0.1048
1.50	5.31	3.5853	3.14	1.0212	2.07	0.3791	1.38	0.1442
1.75	6.19	4.7185	3.66	1.3415	2.42	0.4974	1.61	0.1890
2.00	7.07	5.9898	4.19	1.7003	2.76	0.6297	1.84	0.2390
2.25	7.96	7.3964	4.71	2.0965	3.11	0.7757	2.07	0.2942
2.50	8.84	8.9362	5.23	2.5296	3.45	0.9351	2.30	0.3544
2.75	9.73	10.6074	5.76	2.9990	3.80	1.1076	2.53	0.4195
3.00	–	–	6.28	3.5040	4.14	1.2931	2.76	0.4894
3.25	–	–	6.80	4.0442	4.49	1.4914	2.99	0.5641
3.50	–	–	7.32	4.6193	4.84	1.7023	3.22	0.6435
3.75	–	–	7.85	5.2288	5.18	1.9257	3.45	0.7275
4.00	–	–	8.37	5.8724	5.53	2.1614	3.68	0.8161
4.50	–	–	9.42	7.2607	6.22	2.6692	4.14	1.0069
5.00	–	–	–	–	6.91	3.2251	4.60	1.2155
5.50	–	–	–	–	7.60	3.8283	5.06	1.4416
6.00	–	–	–	–	8.29	4.4780	5.52	1.6849
6.50	–	–	–	–	8.98	5.1738	5.98	1.9453
7.00	–	–	–	–	9.67	5.9152	6.44	2.2224
7.50	–	–	–	–	–	–	6.90	2.5162
8.00	–	–	–	–	–	–	7.37	2.8265
8.50	–	–	–	–	–	–	7.83	3.1532
9.00	–	–	–	–	–	–	8.29	3.4960
9.50	–	–	–	–	–	–	8.75	3.8549
10.00	–	–	–	–	–	–	9.21	4.2298
10.50	–	–	–	–	–	–	9.67	4.6205

Table 39: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 8 bar, d28–54 mm

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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	0.94	0.0530	–	–	–	–	–	–
2.00	1.08	0.0670	–	–	–	–	–	–
2.25	1.21	0.0824	–	–	–	–	–	–
2.50	1.35	0.0991	0.86	0.0343	–	–	–	–
2.75	1.48	0.1173	0.95	0.0405	–	–	–	–
3.00	1.62	0.1367	1.04	0.0472	–	–	–	–
3.25	1.75	0.1574	1.12	0.0543	–	–	–	–
3.50	1.89	0.1795	1.21	0.0619	–	–	–	–
3.75	2.02	0.2028	1.30	0.0699	0.87	0.0272	–	–
4.00	2.16	0.2273	1.38	0.0783	0.93	0.0305	–	–
4.50	2.43	0.2802	1.55	0.0965	1.05	0.0375	–	–
5.00	2.70	0.3378	1.73	0.1162	1.16	0.0452	–	–
5.50	2.97	0.4003	1.90	0.1376	1.28	0.0535	–	–

d [mm]	28		35		42		54	
V̇ [m³/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]
6.00	3.24	0.4675	2.07	0.1606	1.40	0.0624	–	–
6.50	3.51	0.5393	2.25	0.1852	1.51	0.0719	0.88	0.0200
7.00	3.78	0.6156	2.42	0.2113	1.63	0.0820	0.95	0.0228
7.50	4.05	0.6965	2.59	0.2389	1.74	0.0927	1.02	0.0257
8.00	4.32	0.7818	2.76	0.2680	1.86	0.1040	1.09	0.0288
8.50	4.59	0.8716	2.94	0.2986	1.98	0.1158	1.16	0.0321
9.00	4.86	0.9657	3.11	0.3307	2.09	0.1282	1.22	0.0355
9.50	5.13	1.0642	3.28	0.3643	2.21	0.1411	1.29	0.0391
10.00	5.40	1.1670	3.45	0.3993	2.33	0.1547	1.36	0.0428
10.50	5.67	1.2740	3.63	0.4358	2.44	0.1687	1.43	0.0467
11.00	5.94	1.3853	3.80	0.4737	2.56	0.1833	1.50	0.0508
11.50	6.21	1.5009	3.97	0.5130	2.67	0.1985	1.56	0.0549
12.00	6.48	1.6206	4.14	0.5537	2.79	0.2142	1.63	0.0593
12.50	6.75	1.7444	4.32	0.5958	2.91	0.2304	1.70	0.0637
13.00	7.02	1.8724	4.49	0.6393	3.02	0.2472	1.77	0.0683
13.50	7.29	2.0045	4.66	0.6842	3.14	0.2645	1.84	0.0731
14.00	7.56	2.1407	4.84	0.7304	3.26	0.2823	1.90	0.0780
14.50	7.83	2.2810	5.01	0.7781	3.37	0.3006	1.97	0.0830
15.00	8.10	2.4253	5.18	0.8270	3.49	0.3194	2.04	0.0882
16.00	8.63	2.7261	5.53	0.9290	3.72	0.3587	2.18	0.0990
17.00	9.17	3.0428	5.87	1.0364	3.95	0.3999	2.31	0.1103
18.00	9.71	3.3755	6.22	1.1490	4.19	0.4432	2.45	0.1222
19.00	–	–	6.56	1.2670	4.42	0.4885	2.58	0.1346
20.00	–	–	6.91	1.3901	4.65	0.5358	2.72	0.1476
21.00	–	–	7.25	1.5185	4.88	0.5851	2.86	0.1611
22.00	–	–	7.60	1.6520	5.12	0.6363	2.99	0.1751
23.00	–	–	7.94	1.7906	5.35	0.6894	3.13	0.1897
24.00	–	–	8.29	1.9343	5.58	0.7445	3.26	0.2047
25.00	–	–	8.63	2.0831	5.81	0.8015	3.40	0.2203
30.00	–	–	–	–	6.98	1.1149	4.08	0.3059
35.00	–	–	–	–	8.14	1.4748	4.76	0.4041
40.00	–	–	–	–	9.30	1.8803	5.44	0.5145
45.00	–	–	–	–	–	–	6.12	0.6368
50.00	–	–	–	–	–	–	6.80	0.7710
55.00	–	–	–	–	–	–	7.48	0.9169
60.00	–	–	–	–	–	–	8.16	1.0742
65.00	–	–	–	–	–	–	8.84	1.2429
70.00	–	–	–	–	–	–	9.52	1.4228

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Table 40: Pressure loss Geberit Mapress stainless steel system pipes 1.4401, compressed air 8 bar, d76.1–108 mm

d [mm]	76.1		88.9		108	
V̇ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
12.50	0.85	0.0122	–	–	–	–
13.00	0.88	0.0131	–	–	–	–
13.50	0.92	0.0140	–	–	–	–
14.00	0.95	0.0149	–	–	–	–
14.50	0.99	0.0158	–	–	–	–

d [mm]	76.1		88.9		108	
V̇ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
15.00	1.02	0.0168	–	–	–	–
16.00	1.09	0.0189	–	–	–	–
17.00	1.16	0.0210	–	–	–	–
18.00	1.22	0.0233	0.88	0.0107	–	–
19.00	1.29	0.0256	0.93	0.0117	–	–
20.00	1.36	0.0281	0.98	0.0128	–	–
21.00	1.43	0.0306	1.03	0.0140	–	–
22.00	1.50	0.0333	1.08	0.0152	–	–
23.00	1.56	0.0360	1.13	0.0165	–	–
24.00	1.63	0.0389	1.18	0.0178	–	–
25.00	1.70	0.0418	1.23	0.0191	–	–
30.00	2.04	0.0580	1.47	0.0265	0.98	0.0100
35.00	2.38	0.0764	1.72	0.0349	1.14	0.0132
40.00	2.72	0.0972	1.96	0.0443	1.31	0.0167
45.00	3.06	0.1201	2.21	0.0548	1.47	0.0207
50.00	3.40	0.1453	2.45	0.0662	1.63	0.0250
55.00	3.74	0.1725	2.70	0.0786	1.80	0.0296
60.00	4.08	0.2019	2.94	0.0919	1.96	0.0347
65.00	4.42	0.2334	3.19	0.1062	2.13	0.0400
70.00	4.76	0.2669	3.43	0.1214	2.29	0.0457
75.00	5.10	0.3025	3.68	0.1376	2.45	0.0518
80.00	5.44	0.3401	3.93	0.1546	2.62	0.0582
85.00	5.78	0.3797	4.17	0.1726	2.78	0.0649
90.00	6.12	0.4213	4.42	0.1914	2.94	0.0720
95.00	6.46	0.4648	4.66	0.2111	3.11	0.0794
100.00	6.80	0.5103	4.91	0.2317	3.27	0.0871
105.00	7.14	0.5578	5.15	0.2532	3.43	0.0952
110.00	7.48	0.6072	5.40	0.2756	3.60	0.1035
115.00	7.82	0.6585	5.64	0.2988	3.76	0.1122
120.00	8.16	0.7117	5.89	0.3228	3.92	0.1212
125.00	8.50	0.7667	6.13	0.3477	4.09	0.1305
130.00	8.84	0.8237	6.38	0.3735	4.25	0.1402
135.00	9.18	0.8826	6.62	0.4001	4.41	0.1501
140.00	9.53	0.9433	6.87	0.4275	4.58	0.1604
145.00	9.87	1.0059	7.11	0.4558	4.74	0.1709
150.00	–	–	7.36	0.4849	4.90	0.1818
155.00	–	–	7.61	0.5148	5.07	0.1930
160.00	–	–	7.85	0.5455	5.23	0.2045
165.00	–	–	8.10	0.5771	5.40	0.2162
170.00	–	–	8.34	0.6095	5.56	0.2283
175.00	–	–	8.59	0.6427	5.72	0.2407
180.00	–	–	8.83	0.6767	5.89	0.2534
185.00	–	–	9.08	0.7115	6.05	0.2664
190.00	–	–	9.32	0.7471	6.21	0.2797
195.00	–	–	9.57	0.7835	6.38	0.2932
200.00	–	–	9.81	0.8207	6.54	0.3071
205.00	–	–	10.06	0.8587	6.70	0.3213
210.00	–	–	–	–	6.87	0.3357
215.00	–	–	–	–	7.03	0.3505

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
220.00	–	–	–	–	7.19	0.3655
225.00	–	–	–	–	7.36	0.3808
230.00	–	–	–	–	7.52	0.3965
235.00	–	–	–	–	7.68	0.4124
240.00	–	–	–	–	7.85	0.4286
245.00	–	–	–	–	8.01	0.4450
250.00	–	–	–	–	8.17	0.4618
255.00	–	–	–	–	8.34	0.4789
260.00	–	–	–	–	8.50	0.4962
265.00	–	–	–	–	8.67	0.5138
270.00	–	–	–	–	8.83	0.5317
275.00	–	–	–	–	8.99	0.5499
280.00	–	–	–	–	9.16	0.5684
285.00	–	–	–	–	9.32	0.5871
290.00	–	–	–	–	9.48	0.6062
295.00	–	–	–	–	9.65	0.6255
300.00	–	–	–	–	9.81	0.6451

5.4 COMPRESSED AIR, 10 BAR

Medium:	Compressed air	Density:	13.133 kg/m^3
Relative operating pressure:	10 bar	Viscosity:	0.0000183576 Pa•s
Absolute operating pressure:	11 bar	Surface roughness:	0.0015 mm
Temperature:	20 °C		

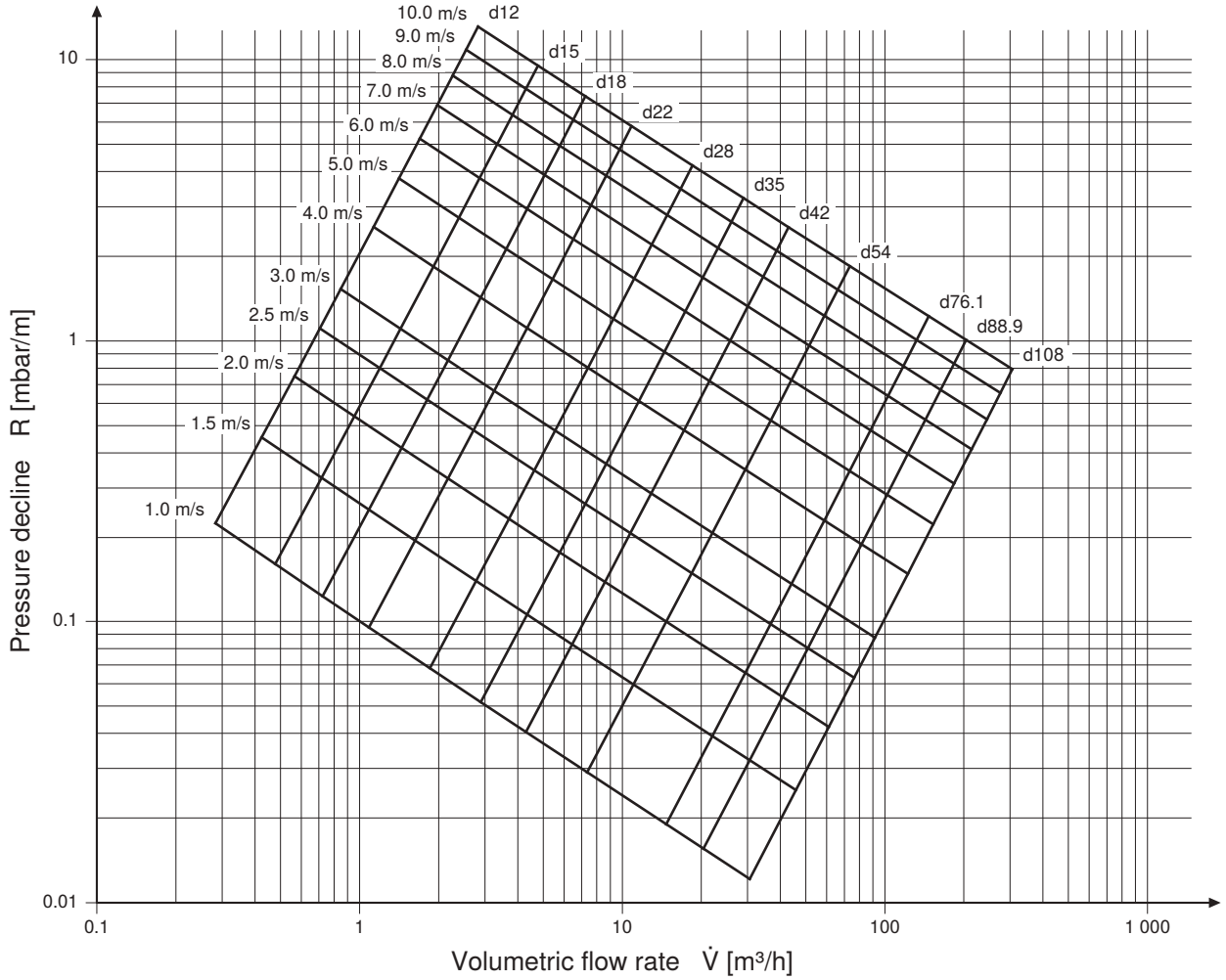

Table 41: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 10 bar, d12–22 mm

d [mm]	12		15		18		22	
V̇ [m³/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	0.88	0.1808	–	–	–	–	–	–
0.50	1.77	0.6024	1.05	0.1732	–	–	–	–
0.75	2.65	1.2275	1.57	0.3515	1.04	0.1310	–	–
1.00	3.54	2.0408	2.09	0.5826	1.38	0.2166	0.92	0.0825
1.25	4.42	3.0332	2.62	0.8637	1.73	0.3206	1.15	0.1219
1.50	5.31	4.1981	3.14	1.1929	2.07	0.4421	1.38	0.1679
1.75	6.19	5.5309	3.66	1.5688	2.42	0.5806	1.61	0.2203
2.00	7.07	7.0276	4.19	1.9900	2.76	0.7357	1.84	0.2789
2.25	7.96	8.6855	4.71	2.4556	3.11	0.9070	2.07	0.3435

d [mm]	12		15		18		22	
$\dot{V}$ [m³/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]
2.50	8.84	10.5017	5.23	2.9650	3.45	1.0940	2.30	0.4140
2.75	9.73	12.4743	5.76	3.5173	3.80	1.2967	2.53	0.4903
3.00	–	–	6.28	4.1120	4.14	1.5147	2.76	0.5723
3.25	–	–	6.80	4.7485	4.49	1.7478	2.99	0.6600
3.50	–	–	7.32	5.4264	4.84	1.9959	3.22	0.7532
3.75	–	–	7.85	6.1453	5.18	2.2588	3.45	0.8519
4.00	–	–	8.37	6.9048	5.53	2.5363	3.68	0.9560
4.50	–	–	9.42	8.5443	6.22	3.1346	4.14	1.1804
5.00	–	–	–	–	6.91	3.7900	4.60	1.4258
5.50	–	–	–	–	7.60	4.5016	5.06	1.6920
6.00	–	–	–	–	8.29	5.2686	5.52	1.9786
6.50	–	–	–	–	8.98	6.0906	5.98	2.2855
7.00	–	–	–	–	9.67	6.9670	6.44	2.6124
7.50	–	–	–	–	–	–	6.90	2.9591
8.00	–	–	–	–	–	–	7.37	3.3253
8.50	–	–	–	–	–	–	7.83	3.7110
9.00	–	–	–	–	–	–	8.29	4.1161
9.50	–	–	–	–	–	–	8.75	4.5402
10.00	–	–	–	–	–	–	9.21	4.9834
10.50	–	–	–	–	–	–	9.67	5.4455

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Table 42: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 10 bar, d28–54 mm

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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	0.94	0.0617	–	–	–	–	–	–
2.00	1.08	0.0780	–	–	–	–	–	–
2.25	1.21	0.0960	–	–	–	–	–	–
2.50	1.35	0.1156	0.86	0.0399	–	–	–	–
2.75	1.48	0.1368	0.95	0.0472	–	–	–	–
3.00	1.62	0.1596	1.04	0.0550	–	–	–	–
3.25	1.75	0.1839	1.12	0.0634	–	–	–	–
3.50	1.89	0.2097	1.21	0.0722	–	–	–	–
3.75	2.02	0.2370	1.30	0.0816	0.87	0.0318	–	–
4.00	2.16	0.2658	1.38	0.0915	0.93	0.0356	–	–
4.50	2.43	0.3278	1.55	0.1127	1.05	0.0438	–	–
5.00	2.70	0.3955	1.73	0.1359	1.16	0.0528	–	–
5.50	2.97	0.4689	1.90	0.1610	1.28	0.0625	–	–
6.00	3.24	0.5478	2.07	0.1879	1.40	0.0729	–	–
6.50	3.51	0.6322	2.25	0.2167	1.51	0.0841	0.88	0.0233
7.00	3.78	0.7221	2.42	0.2474	1.63	0.0959	0.95	0.0266
7.50	4.05	0.8172	2.59	0.2799	1.74	0.1084	1.02	0.0301
8.00	4.32	0.9177	2.76	0.3141	1.86	0.1217	1.09	0.0337
8.50	4.59	1.0234	2.94	0.3501	1.98	0.1356	1.16	0.0375
9.00	4.86	1.1343	3.11	0.3879	2.09	0.1501	1.22	0.0416
9.50	5.13	1.2504	3.28	0.4273	2.21	0.1654	1.29	0.0458
10.00	5.40	1.3716	3.45	0.4686	2.33	0.1812	1.36	0.0501
10.50	5.67	1.4978	3.63	0.5115	2.44	0.1978	1.43	0.0547

d [mm]	28		35		42		54	
V̇ [m³/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]
11.00	5.94	1.6291	3.80	0.5561	2.56	0.2149	1.50	0.0594
11.50	6.21	1.7654	3.97	0.6024	2.67	0.2328	1.56	0.0643
12.00	6.48	1.9067	4.14	0.6503	2.79	0.2512	1.63	0.0694
12.50	6.75	2.0530	4.32	0.6999	2.91	0.2703	1.70	0.0746
13.00	7.02	2.2041	4.49	0.7512	3.02	0.2900	1.77	0.0800
13.50	7.29	2.3602	4.66	0.8041	3.14	0.3104	1.84	0.0856
14.00	7.56	2.5211	4.84	0.8586	3.26	0.3313	1.90	0.0914
14.50	7.83	2.6869	5.01	0.9148	3.37	0.3529	1.97	0.0973
15.00	8.10	2.8575	5.18	0.9726	3.49	0.3751	2.04	0.1034
16.00	8.63	3.2132	5.53	1.0929	3.72	0.4213	2.18	0.1161
17.00	9.17	3.5879	5.87	1.2196	3.95	0.4700	2.31	0.1294
18.00	9.71	3.9816	6.22	1.3526	4.19	0.5210	2.45	0.1434
19.00	–	–	6.56	1.4919	4.42	0.5744	2.58	0.1580
20.00	–	–	6.91	1.6374	4.65	0.6302	2.72	0.1733
21.00	–	–	7.25	1.7891	4.88	0.6883	2.86	0.1891
22.00	–	–	7.60	1.9469	5.12	0.7487	2.99	0.2057
23.00	–	–	7.94	2.1109	5.35	0.8114	3.13	0.2228
24.00	–	–	8.29	2.2809	5.58	0.8765	3.26	0.2406
25.00	–	–	8.63	2.4569	5.81	0.9438	3.40	0.2589
30.00	–	–	–	–	6.98	1.3141	4.08	0.3599
35.00	–	–	–	–	8.14	1.7399	4.76	0.4757
40.00	–	–	–	–	9.30	2.2200	5.44	0.6061
45.00	–	–	–	–	–	–	6.12	0.7507
50.00	–	–	–	–	–	–	6.80	0.9094
55.00	–	–	–	–	–	–	7.48	1.0820
60.00	–	–	–	–	–	–	8.16	1.2683
65.00	–	–	–	–	–	–	8.84	1.4681
70.00	–	–	–	–	–	–	9.52	1.6813

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Table 43: Pressure loss Geberit Mapress stainless steel system pipes 1.4401, compressed air 10 bar, d76.1–108 mm

d [mm]	76.1		88.9		108	
V̇ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
12.50	0.85	0.0142	–	–	–	–
13.00	0.88	0.0153	–	–	–	–
13.50	0.92	0.0163	–	–	–	–
14.00	0.95	0.0174	–	–	–	–
14.50	0.99	0.0185	–	–	–	–
15.00	1.02	0.0197	–	–	–	–
16.00	1.09	0.0221	–	–	–	–
17.00	1.16	0.0246	–	–	–	–
18.00	1.22	0.0272	0.88	0.0125	–	–
19.00	1.29	0.0300	0.93	0.0137	–	–
20.00	1.36	0.0329	0.98	0.0150	–	–
21.00	1.43	0.0359	1.03	0.0164	–	–
22.00	1.50	0.0390	1.08	0.0178	–	–
23.00	1.56	0.0422	1.13	0.0193	–	–
24.00	1.63	0.0456	1.18	0.0208	–	–

d [mm]	76.1		88.9		108	
V̇ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
25.00	1.70	0.0490	1.23	0.0224	–	–
30.00	2.04	0.0680	1.47	0.0310	0.98	0.0117
35.00	2.38	0.0898	1.72	0.0409	1.14	0.0155
40.00	2.72	0.1142	1.96	0.0520	1.31	0.0196
45.00	3.06	0.1413	2.21	0.0643	1.47	0.0243
50.00	3.40	0.1709	2.45	0.0778	1.63	0.0293
55.00	3.74	0.2031	2.70	0.0924	1.80	0.0348
60.00	4.08	0.2378	2.94	0.1082	1.96	0.0407
65.00	4.42	0.2750	3.19	0.1250	2.13	0.0471
70.00	4.76	0.3146	3.43	0.1430	2.29	0.0538
75.00	5.10	0.3567	3.68	0.1620	2.45	0.0609
80.00	5.44	0.4011	3.93	0.1822	2.62	0.0685
85.00	5.78	0.4479	4.17	0.2034	2.78	0.0764
90.00	6.12	0.4971	4.42	0.2256	2.94	0.0848
95.00	6.46	0.5487	4.66	0.2490	3.11	0.0935
100.00	6.80	0.6026	4.91	0.2733	3.27	0.1026
105.00	7.14	0.6587	5.15	0.2987	3.43	0.1121
110.00	7.48	0.7172	5.40	0.3251	3.60	0.1220
115.00	7.82	0.7780	5.64	0.3526	3.76	0.1323
120.00	8.16	0.8410	5.89	0.3811	3.92	0.1429
125.00	8.50	0.9063	6.13	0.4105	4.09	0.1539
130.00	8.84	0.9739	6.38	0.4410	4.25	0.1653
135.00	9.18	1.0437	6.62	0.4725	4.41	0.1771
140.00	9.53	1.1157	6.87	0.5050	4.58	0.1892
145.00	9.87	1.1900	7.11	0.5385	4.74	0.2017
150.00	–	–	7.36	0.5730	4.90	0.2145
155.00	–	–	7.61	0.6084	5.07	0.2278
160.00	–	–	7.85	0.6449	5.23	0.2413
165.00	–	–	8.10	0.6823	5.40	0.2553
170.00	–	–	8.34	0.7207	5.56	0.2696
175.00	–	–	8.59	0.7600	5.72	0.2843
180.00	–	–	8.83	0.8004	5.89	0.2993
185.00	–	–	9.08	0.8417	6.05	0.3146
190.00	–	–	9.32	0.8839	6.21	0.3304
195.00	–	–	9.57	0.9271	6.38	0.3464
200.00	–	–	9.81	0.9713	6.54	0.3629
205.00	–	–	10.06	1.0164	6.70	0.3797
210.00	–	–	–	–	6.87	0.3968
215.00	–	–	–	–	7.03	0.4143
220.00	–	–	–	–	7.19	0.4321
225.00	–	–	–	–	7.36	0.4503
230.00	–	–	–	–	7.52	0.4688
235.00	–	–	–	–	7.68	0.4876
240.00	–	–	–	–	7.85	0.5069
245.00	–	–	–	–	8.01	0.5264
250.00	–	–	–	–	8.17	0.5463
255.00	–	–	–	–	8.34	0.5665
260.00	–	–	–	–	8.50	0.5871
265.00	–	–	–	–	8.67	0.6080

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
270.00	–	–	–	–	8.83	0.6292
275.00	–	–	–	–	8.99	0.6508
280.00	–	–	–	–	9.16	0.6728
285.00	–	–	–	–	9.32	0.6950
290.00	–	–	–	–	9.48	0.7176
295.00	–	–	–	–	9.65	0.7405
300.00	–	–	–	–	9.81	0.7638

5.5 COMPRESSED AIR, 16 BAR

Medium:	Compressed air	Density:	20.336 kg/m^3
Relative operating pressure:	16 bar	Viscosity:	0.0000184392 Pa•s
Absolute operating pressure:	17 bar	Surface roughness:	0.0015 mm
Temperature:	20 °C		

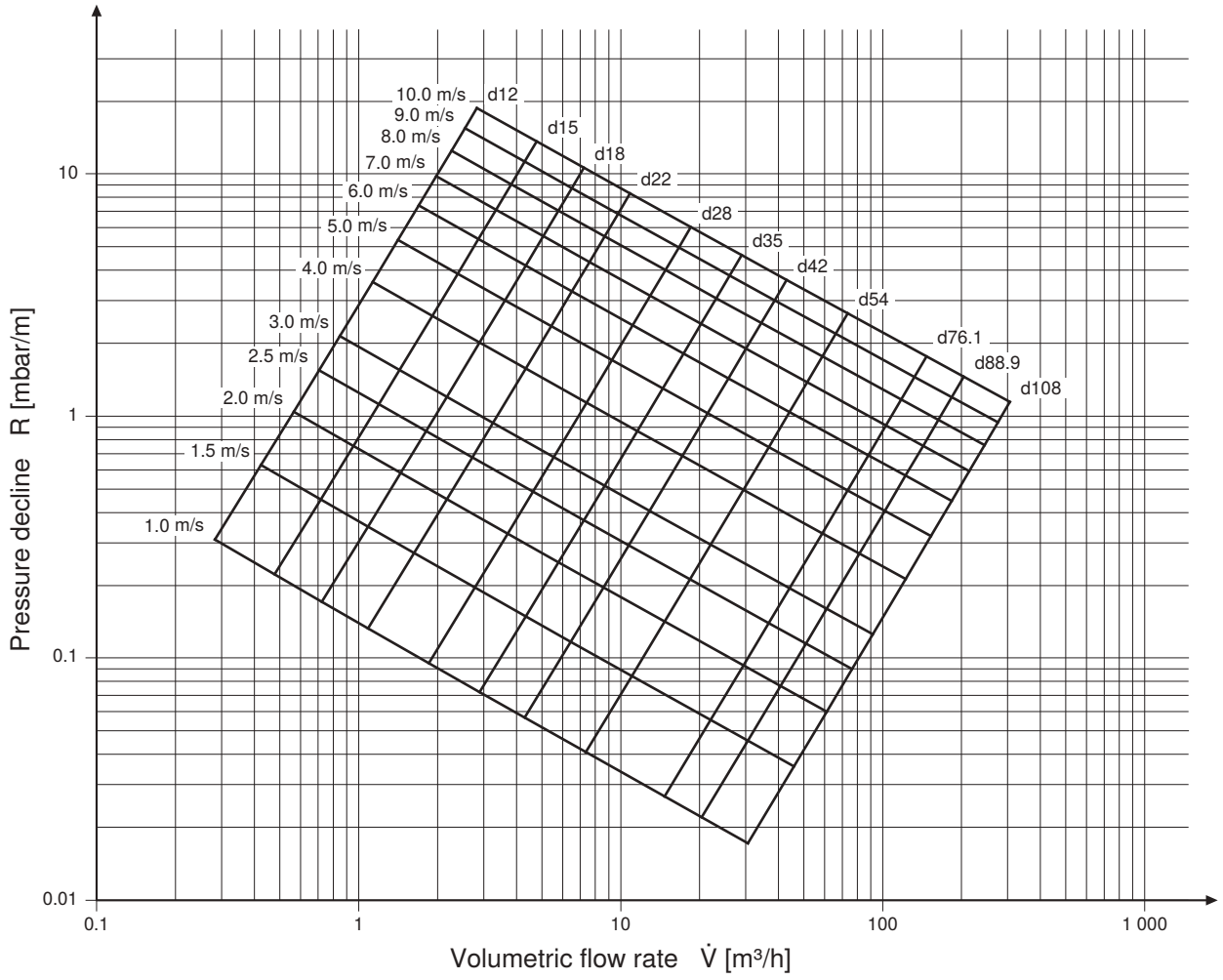

Table 44: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 16 bar, d12–22 mm

d [mm]	12		15		18		22	
$\dot{V}$ [m³/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	0.88	0.2493	–	–	–	–	–	–
0.50	1.77	0.8393	1.05	0.2403	–	–	–	–
0.75	2.65	1.7204	1.57	0.4903	1.04	0.1821	–	–
1.00	3.54	2.8724	2.09	0.8160	1.38	0.3023	0.92	0.1148
1.25	4.42	4.2834	2.62	1.2135	1.73	0.4488	1.15	0.1702
1.50	5.31	5.9451	3.14	1.6803	2.07	0.6204	1.38	0.2349
1.75	6.19	7.8514	3.66	2.2144	2.42	0.8165	1.61	0.3088
2.00	7.07	9.9976	4.19	2.8143	2.76	1.0364	1.84	0.3915
2.25	7.96	12.3798	4.71	3.4788	3.11	1.2797	2.07	0.4830
2.50	8.84	14.9951	5.23	4.2069	3.45	1.5458	2.30	0.5829
2.75	9.73	17.8409	5.76	4.9976	3.80	1.8346	2.53	0.6912
3.00	–	–	6.28	5.8502	4.14	2.1456	2.76	0.8077
3.25	–	–	6.80	6.7641	4.49	2.4786	2.99	0.9324
3.50	–	–	7.32	7.7387	4.84	2.8333	3.22	1.0651
3.75	–	–	7.85	8.7734	5.18	3.2096	3.45	1.2058
4.00	–	–	8.37	9.8679	5.53	3.6073	3.68	1.3544
4.50	–	–	9.42	12.2343	6.22	4.4659	4.14	1.6747
5.00	–	–	–	–	6.91	5.4081	4.60	2.0258
5.50	–	–	–	–	7.60	6.4326	5.06	2.4071
6.00	–	–	–	–	8.29	7.5389	5.52	2.8184
6.50	–	–	–	–	8.98	8.7259	5.98	3.2592
7.00	–	–	–	–	9.67	9.9931	6.44	3.7292
7.50	–	–	–	–	–	–	6.90	4.2283
8.00	–	–	–	–	–	–	7.37	4.7561
8.50	–	–	–	–	–	–	7.83	5.3125
9.00	–	–	–	–	–	–	8.29	5.8974
9.50	–	–	–	–	–	–	8.75	6.5104
10.00	–	–	–	–	–	–	9.21	7.1514
10.50	–	–	–	–	–	–	9.67	7.8204

Table 45: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 16 bar, d28–54 mm

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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	0.94	0.0862	–	–	–	–	–	–
2.00	1.08	0.1091	–	–	–	–	–	–
2.25	1.21	0.1345	–	–	–	–	–	–
2.50	1.35	0.1621	0.86	0.0558	–	–	–	–
2.75	1.48	0.1921	0.95	0.0661	–	–	–	–
3.00	1.62	0.2242	1.04	0.0771	–	–	–	–
3.25	1.75	0.2586	1.12	0.0888	–	–	–	–
3.50	1.89	0.2952	1.21	0.1014	–	–	–	–
3.75	2.02	0.3340	1.30	0.1146	0.87	0.0445	–	–
4.00	2.16	0.3749	1.38	0.1286	0.93	0.0499	–	–
4.50	2.43	0.4629	1.55	0.1586	1.05	0.0615	–	–
5.00	2.70	0.5593	1.73	0.1915	1.16	0.0742	–	–
5.50	2.97	0.6639	1.90	0.2271	1.28	0.0879	–	–

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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]
6.00	3.24	0.7765	2.07	0.2654	1.40	0.1027	–	–
6.50	3.51	0.8970	2.25	0.3064	1.51	0.1185	0.88	0.0328
7.00	3.78	1.0254	2.42	0.3501	1.63	0.1353	0.95	0.0374
7.50	4.05	1.1616	2.59	0.3963	1.74	0.1531	1.02	0.0423
8.00	4.32	1.3055	2.76	0.4451	1.86	0.1719	1.09	0.0475
8.50	4.59	1.4570	2.94	0.4965	1.98	0.1917	1.16	0.0529
9.00	4.86	1.6161	3.11	0.5504	2.09	0.2124	1.22	0.0586
9.50	5.13	1.7827	3.28	0.6069	2.21	0.2341	1.29	0.0645
10.00	5.40	1.9568	3.45	0.6658	2.33	0.2567	1.36	0.0708
10.50	5.67	2.1383	3.63	0.7272	2.44	0.2803	1.43	0.0772
11.00	5.94	2.3272	3.80	0.7911	2.56	0.3048	1.50	0.0839
11.50	6.21	2.5235	3.97	0.8574	2.67	0.3303	1.56	0.0909
12.00	6.48	2.7270	4.14	0.9262	2.79	0.3566	1.63	0.0981
12.50	6.75	2.9378	4.32	0.9973	2.91	0.3839	1.70	0.1056
13.00	7.02	3.1558	4.49	1.0709	3.02	0.4121	1.77	0.1133
13.50	7.29	3.3810	4.66	1.1468	3.14	0.4412	1.84	0.1213
14.00	7.56	3.6134	4.84	1.2252	3.26	0.4712	1.90	0.1295
14.50	7.83	3.8529	5.01	1.3059	3.37	0.5021	1.97	0.1379
15.00	8.10	4.0996	5.18	1.3889	3.49	0.5339	2.04	0.1466
16.00	8.63	4.6141	5.53	1.5621	3.72	0.6001	2.18	0.1647
17.00	9.17	5.1567	5.87	1.7446	3.95	0.6699	2.31	0.1837
18.00	9.71	5.7274	6.22	1.9363	4.19	0.7431	2.45	0.2037
19.00	–	–	6.56	2.1372	4.42	0.8198	2.58	0.2246
20.00	–	–	6.91	2.3472	4.65	0.8999	2.72	0.2464
21.00	–	–	7.25	2.5664	4.88	0.9835	2.86	0.2691
22.00	–	–	7.60	2.7945	5.12	1.0705	2.99	0.2928
23.00	–	–	7.94	3.0316	5.35	1.1608	3.13	0.3173
24.00	–	–	8.29	3.2777	5.58	1.2545	3.26	0.3428
25.00	–	–	8.63	3.5327	5.81	1.3515	3.40	0.3691
30.00	–	–	–	–	6.98	1.8863	4.08	0.5141
35.00	–	–	–	–	8.14	2.5026	4.76	0.6808
40.00	–	–	–	–	9.30	3.1990	5.44	0.8687
45.00	–	–	–	–	–	–	6.12	1.0776
50.00	–	–	–	–	–	–	6.80	1.3071
55.00	–	–	–	–	–	–	7.48	1.5570
60.00	–	–	–	–	–	–	8.16	1.8271
65.00	–	–	–	–	–	–	8.84	2.1171
70.00	–	–	–	–	–	–	9.52	2.4271

Table 46: Pressure loss Geberit Mapress stainless steel system pipes 1.4401, compressed air 16 bar, d76.1–108 mm

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
12.50	0.85	0.0201	–	–	–	–
13.00	0.88	0.0215	–	–	–	–
13.50	0.92	0.0230	–	–	–	–
14.00	0.95	0.0246	–	–	–	–
14.50	0.99	0.0261	–	–	–	–
15.00	1.02	0.0278	–	–	–	–
16.00	1.09	0.0312	–	–	–	–
17.00	1.16	0.0348	–	–	–	–
18.00	1.22	0.0385	0.88	0.0176	–	–
19.00	1.29	0.0425	0.93	0.0194	–	–
20.00	1.36	0.0466	0.98	0.0212	–	–
21.00	1.43	0.0508	1.03	0.0232	–	–
22.00	1.50	0.0553	1.08	0.0252	–	–
23.00	1.56	0.0599	1.13	0.0273	–	–
24.00	1.63	0.0647	1.18	0.0295	–	–
25.00	1.70	0.0696	1.23	0.0317	–	–
30.00	2.04	0.0967	1.47	0.0440	0.98	0.0166
35.00	2.38	0.1278	1.72	0.0582	1.14	0.0219
40.00	2.72	0.1628	1.96	0.0741	1.31	0.0279
45.00	3.06	0.2017	2.21	0.0917	1.47	0.0345
50.00	3.40	0.2443	2.45	0.1110	1.63	0.0417
55.00	3.74	0.2905	2.70	0.1319	1.80	0.0496
60.00	4.08	0.3405	2.94	0.1545	1.96	0.0580
65.00	4.42	0.3941	3.19	0.1787	2.13	0.0671
70.00	4.76	0.4512	3.43	0.2046	2.29	0.0768
75.00	5.10	0.5119	3.68	0.2320	2.45	0.0870
80.00	5.44	0.5762	3.93	0.2610	2.62	0.0979
85.00	5.78	0.6439	4.17	0.2916	2.78	0.1093
90.00	6.12	0.7151	4.42	0.3237	2.94	0.1213
95.00	6.46	0.7897	4.66	0.3573	3.11	0.1338
100.00	6.80	0.8677	4.91	0.3925	3.27	0.1469
105.00	7.14	0.9492	5.15	0.4292	3.43	0.1606
110.00	7.48	1.0341	5.40	0.4674	3.60	0.1749
115.00	7.82	1.1223	5.64	0.5072	3.76	0.1897
120.00	8.16	1.2139	5.89	0.5484	3.92	0.2050
125.00	8.50	1.3088	6.13	0.5911	4.09	0.2209
130.00	8.84	1.4070	6.38	0.6352	4.25	0.2373
135.00	9.18	1.5086	6.62	0.6809	4.41	0.2543
140.00	9.53	1.6135	6.87	0.7280	4.58	0.2718
145.00	9.87	1.7216	7.11	0.7766	4.74	0.2899
150.00	–	–	7.36	0.8266	4.90	0.3085
155.00	–	–	7.61	0.8782	5.07	0.3276
160.00	–	–	7.85	0.9311	5.23	0.3473
165.00	–	–	8.10	0.9855	5.40	0.3674
170.00	–	–	8.34	1.0413	5.56	0.3882
175.00	–	–	8.59	1.0985	5.72	0.4094
180.00	–	–	8.83	1.1573	5.89	0.4312
185.00	–	–	9.08	1.2174	6.05	0.4534

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
190.00	–	–	9.32	1.2789	6.21	0.4762
195.00	–	–	9.57	1.3419	6.38	0.4996
200.00	–	–	9.81	1.4062	6.54	0.5234
205.00	–	–	10.06	1.4720	6.70	0.5478
210.00	–	–	–	–	6.87	0.5726
215.00	–	–	–	–	7.03	0.5980
220.00	–	–	–	–	7.19	0.6239
225.00	–	–	–	–	7.36	0.6503
230.00	–	–	–	–	7.52	0.6772
235.00	–	–	–	–	7.68	0.7046
240.00	–	–	–	–	7.85	0.7326
245.00	–	–	–	–	8.01	0.7610
250.00	–	–	–	–	8.17	0.7900
255.00	–	–	–	–	8.34	0.8194
260.00	–	–	–	–	8.50	0.8493
265.00	–	–	–	–	8.67	0.8798
270.00	–	–	–	–	8.83	0.9107
275.00	–	–	–	–	8.99	0.9422
280.00	–	–	–	–	9.16	0.9741
285.00	–	–	–	–	9.32	1.0066
290.00	–	–	–	–	9.48	1.0395
295.00	–	–	–	–	9.65	1.0730
300.00	–	–	–	–	9.81	1.1069

5.6 COMPRESSED AIR, 25 BAR

Medium:	Compressed air	Density:	31.179 kg/m^3
Relative operating pressure:	25 bar	Viscosity:	0.0000185784 Pa•s
Absolute operating pressure:	26 bar	Surface roughness:	0.0015 mm
Temperature:	20 °C		

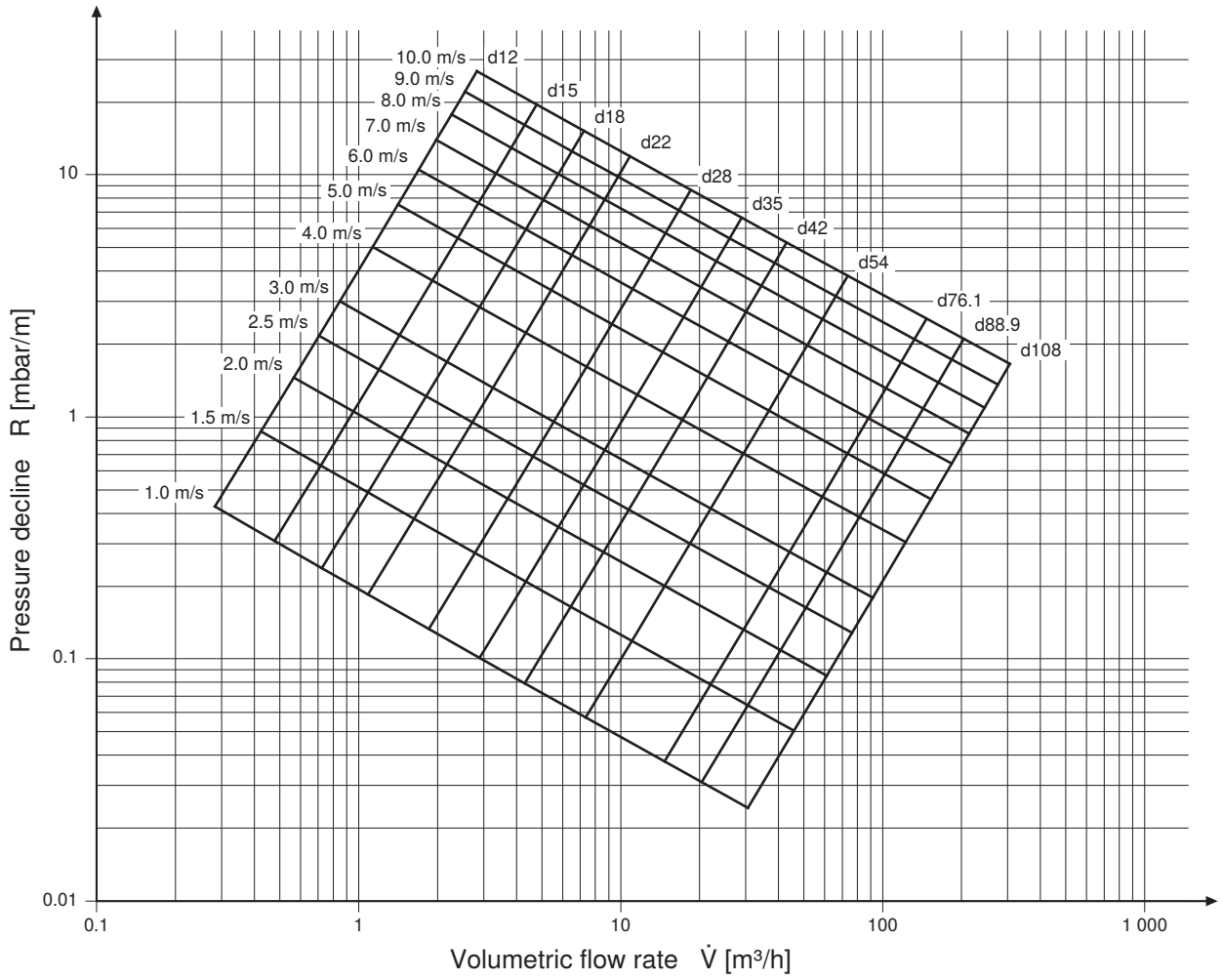

Table 47: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 25 bar, d12–22 mm

d [mm]	12		15		18		22	
$\dot{V}$ [m³/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	0.88	0.3437	–	–	–	–	–	–
0.50	1.77	1.1685	1.05	0.3330	–	–	–	–
0.75	2.65	2.4091	1.57	0.6833	1.04	0.2529	–	–
1.00	3.54	4.0395	2.09	1.1415	1.38	0.4214	0.92	0.1595
1.25	4.42	6.0445	2.62	1.7027	1.73	0.6274	1.15	0.2371
1.50	5.31	8.4136	3.14	2.3638	2.07	0.8694	1.38	0.3281
1.75	6.19	11.1395	3.66	3.1221	2.42	1.1465	1.61	0.4321
2.00	7.07	14.2165	4.19	3.9757	2.76	1.4579	1.84	0.5488
2.25	7.96	17.6399	4.71	4.9230	3.11	1.8029	2.07	0.6779
2.50	8.84	21.4063	5.23	5.9630	3.45	2.1811	2.30	0.8193
2.75	9.73	25.5128	5.76	7.0942	3.80	2.5919	2.53	0.9727
3.00	–	–	6.28	8.3161	4.14	3.0350	2.76	1.1380
3.25	–	–	6.80	9.6276	4.49	3.5101	2.99	1.3150
3.50	–	–	7.32	11.0281	4.84	4.0168	3.22	1.5037
3.75	–	–	7.85	12.5170	5.18	4.5550	3.45	1.7038
4.00	–	–	8.37	14.0939	5.53	5.1242	3.68	1.9154
4.50	–	–	9.42	17.5095	6.22	6.3553	4.14	2.3723
5.00	–	–	–	–	6.91	7.7087	4.60	2.8738
5.50	–	–	–	–	7.60	9.1832	5.06	3.4194
6.00	–	–	–	–	8.29	10.7778	5.52	4.0086
6.50	–	–	–	–	8.98	12.4914	5.98	4.6410
7.00	–	–	–	–	9.67	14.3235	6.44	5.3162
7.50	–	–	–	–	–	–	6.90	6.0340
8.00	–	–	–	–	–	–	7.37	6.7941
8.50	–	–	–	–	–	–	7.83	7.5961
9.00	–	–	–	–	–	–	8.29	8.4399
9.50	–	–	–	–	–	–	8.75	9.3254
10.00	–	–	–	–	–	–	9.21	10.2521
10.50	–	–	–	–	–	–	9.67	11.2202

Table 48: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, compressed air 25 bar, d28–54 mm

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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	0.94	0.1201	–	–	–	–	–	–
2.00	1.08	0.1523	–	–	–	–	–	–
2.25	1.21	0.1879	–	–	–	–	–	–
2.50	1.35	0.2269	0.86	0.0778	–	–	–	–
2.75	1.48	0.2691	0.95	0.0923	–	–	–	–
3.00	1.62	0.3145	1.04	0.1078	–	–	–	–
3.25	1.75	0.3631	1.12	0.1243	–	–	–	–
3.50	1.89	0.4148	1.21	0.1420	–	–	–	–
3.75	2.02	0.4697	1.30	0.1606	0.87	0.0622	–	–
4.00	2.16	0.5276	1.38	0.1803	0.93	0.0698	–	–
4.50	2.43	0.6525	1.55	0.2228	1.05	0.0861	–	–
5.00	2.70	0.7893	1.73	0.2693	1.16	0.1040	–	–
5.50	2.97	0.9380	1.90	0.3197	1.28	0.1234	–	–
6.00	3.24	1.0983	2.07	0.3740	1.40	0.1443	–	–

d [mm]	28		35		42		54	
V̇ [m³/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]
6.50	3.51	1.2701	2.25	0.4322	1.51	0.1667	0.88	0.0459
7.00	3.78	1.4533	2.42	0.4942	1.63	0.1905	0.95	0.0525
7.50	4.05	1.6478	2.59	0.5599	1.74	0.2157	1.02	0.0594
8.00	4.32	1.8535	2.76	0.6294	1.86	0.2423	1.09	0.0667
8.50	4.59	2.0703	2.94	0.7026	1.98	0.2704	1.16	0.0743
9.00	4.86	2.2981	3.11	0.7794	2.09	0.2998	1.22	0.0824
9.50	5.13	2.5370	3.28	0.8599	2.21	0.3306	1.29	0.0908
10.00	5.40	2.7867	3.45	0.9440	2.33	0.3628	1.36	0.0996
10.50	5.67	3.0473	3.63	1.0317	2.44	0.3963	1.43	0.1088
11.00	5.94	3.3187	3.80	1.1229	2.56	0.4312	1.50	0.1183
11.50	6.21	3.6008	3.97	1.2177	2.67	0.4675	1.56	0.1282
12.00	6.48	3.8936	4.14	1.3161	2.79	0.5050	1.63	0.1384
12.50	6.75	4.1971	4.32	1.4180	2.91	0.5439	1.70	0.1490
13.00	7.02	4.5112	4.49	1.5233	3.02	0.5841	1.77	0.1599
13.50	7.29	4.8358	4.66	1.6322	3.14	0.6256	1.84	0.1712
14.00	7.56	5.1711	4.84	1.7445	3.26	0.6685	1.90	0.1829
14.50	7.83	5.5167	5.01	1.8602	3.37	0.7126	1.97	0.1949
15.00	8.10	5.8729	5.18	1.9795	3.49	0.7580	2.04	0.2072
16.00	8.63	6.6166	5.53	2.2282	3.72	0.8527	2.18	0.2330
17.00	9.17	7.4018	5.87	2.4905	3.95	0.9525	2.31	0.2601
18.00	9.71	8.2285	6.22	2.7664	4.19	1.0574	2.45	0.2885
19.00	–	–	6.56	3.0558	4.42	1.1673	2.58	0.3183
20.00	–	–	6.91	3.3586	4.65	1.2823	2.72	0.3494
21.00	–	–	7.25	3.6747	4.88	1.4022	2.86	0.3819
22.00	–	–	7.60	4.0041	5.12	1.5271	2.99	0.4157
23.00	–	–	7.94	4.3467	5.35	1.6569	3.13	0.4507
24.00	–	–	8.29	4.7025	5.58	1.7917	3.26	0.4871
25.00	–	–	8.63	5.0714	5.81	1.9313	3.40	0.5248
30.00	–	–	–	–	6.98	2.7022	4.08	0.7325
35.00	–	–	–	–	8.14	3.5928	4.76	0.9718
40.00	–	–	–	–	9.30	4.6017	5.44	1.2421
45.00	–	–	–	–	–	–	6.12	1.5431
50.00	–	–	–	–	–	–	6.80	1.8743
55.00	–	–	–	–	–	–	7.48	2.2355
60.00	–	–	–	–	–	–	8.16	2.6264
65.00	–	–	–	–	–	–	8.84	3.0468
70.00	–	–	–	–	–	–	9.52	3.4965

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Table 49: Pressure loss Geberit Mapress stainless steel system pipes 1.4401, compressed air 25 bar, d76.1–108 mm

d [mm]	76.1		88.9		108	
V̇ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
12.50	0.85	0.0282	–	–	–	–
13.00	0.88	0.0302	–	–	–	–
13.50	0.92	0.0324	–	–	–	–
14.00	0.95	0.0345	–	–	–	–
14.50	0.99	0.0368	–	–	–	–
15.00	1.02	0.0391	–	–	–	–

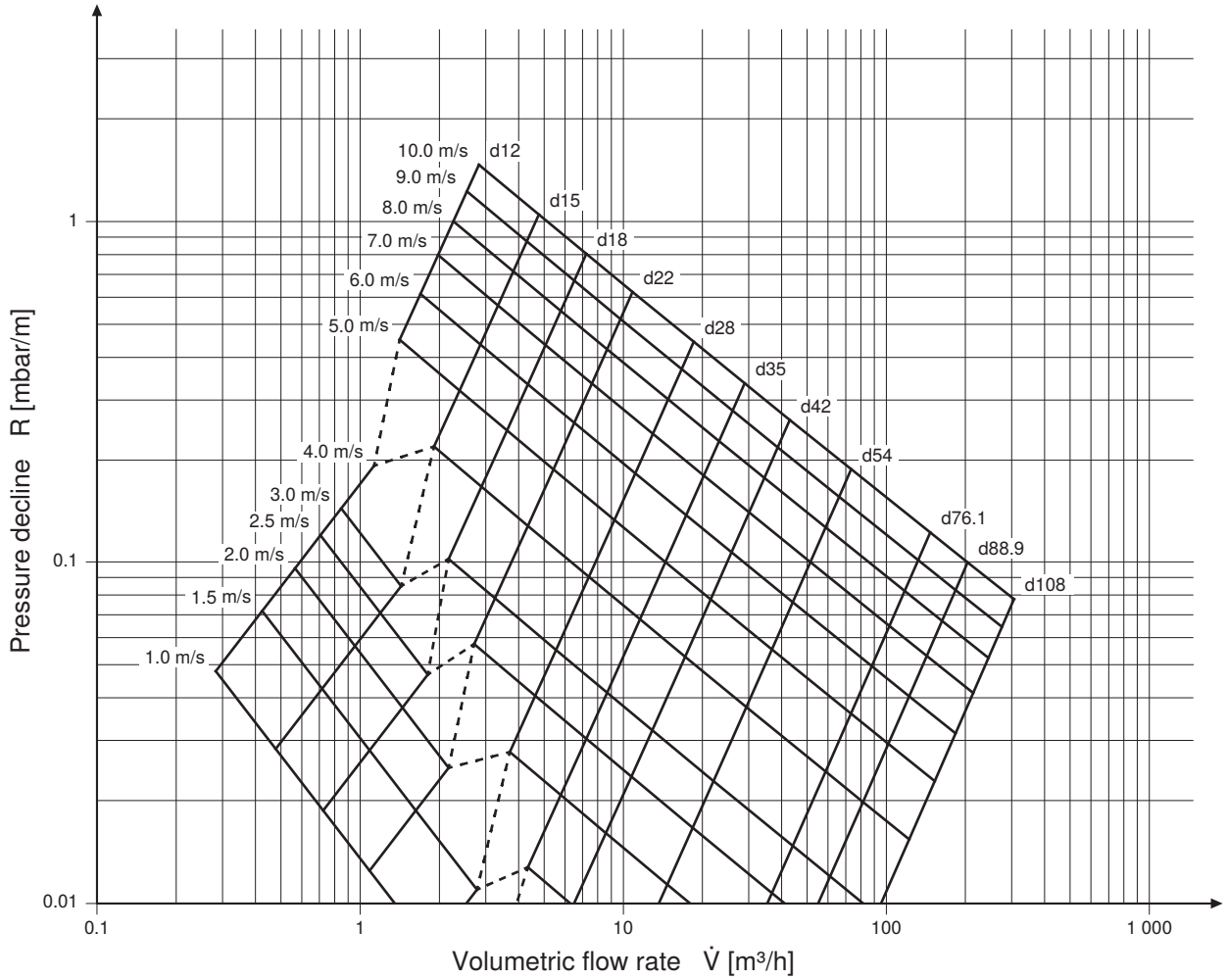
d [mm]	76.1		88.9		108	
V̇ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
16.00	1.09	0.0439	–	–	–	–
17.00	1.16	0.0490	–	–	–	–
18.00	1.22	0.0543	0.88	0.0248	–	–
19.00	1.29	0.0599	0.93	0.0273	–	–
20.00	1.36	0.0657	0.98	0.0299	–	–
21.00	1.43	0.0718	1.03	0.0327	–	–
22.00	1.50	0.0781	1.08	0.0355	–	–
23.00	1.56	0.0846	1.13	0.0385	–	–
24.00	1.63	0.0914	1.18	0.0416	–	–
25.00	1.70	0.0984	1.23	0.0448	–	–
30.00	2.04	0.1371	1.47	0.0623	0.98	0.0234
35.00	2.38	0.1814	1.72	0.0824	1.14	0.0310
40.00	2.72	0.2314	1.96	0.1050	1.31	0.0394
45.00	3.06	0.2870	2.21	0.1301	1.47	0.0488
50.00	3.40	0.3480	2.45	0.1577	1.63	0.0591
55.00	3.74	0.4144	2.70	0.1877	1.80	0.0703
60.00	4.08	0.4861	2.94	0.2200	1.96	0.0824
65.00	4.42	0.5631	3.19	0.2547	2.13	0.0954
70.00	4.76	0.6453	3.43	0.2918	2.29	0.1092
75.00	5.10	0.7327	3.68	0.3311	2.45	0.1238
80.00	5.44	0.8253	3.93	0.3728	2.62	0.1393
85.00	5.78	0.9229	4.17	0.4167	2.78	0.1557
90.00	6.12	1.0257	4.42	0.4629	2.94	0.1729
95.00	6.46	1.1335	4.66	0.5113	3.11	0.1909
100.00	6.80	1.2464	4.91	0.5620	3.27	0.2097
105.00	7.14	1.3642	5.15	0.6149	3.43	0.2293
110.00	7.48	1.4871	5.40	0.6700	3.60	0.2498
115.00	7.82	1.6149	5.64	0.7273	3.76	0.2711
120.00	8.16	1.7476	5.89	0.7868	3.92	0.2931
125.00	8.50	1.8853	6.13	0.8485	4.09	0.3160
130.00	8.84	2.0279	6.38	0.9124	4.25	0.3396
135.00	9.18	2.1754	6.62	0.9784	4.41	0.3641
140.00	9.53	2.3278	6.87	1.0466	4.58	0.3893
145.00	9.87	2.4850	7.11	1.1169	4.74	0.4153
150.00	–	–	7.36	1.1894	4.90	0.4421
155.00	–	–	7.61	1.2640	5.07	0.4697
160.00	–	–	7.85	1.3408	5.23	0.4981
165.00	–	–	8.10	1.4197	5.40	0.5272
170.00	–	–	8.34	1.5007	5.56	0.5571
175.00	–	–	8.59	1.5838	5.72	0.5878
180.00	–	–	8.83	1.6690	5.89	0.6192
185.00	–	–	9.08	1.7564	6.05	0.6515
190.00	–	–	9.32	1.8458	6.21	0.6844
195.00	–	–	9.57	1.9373	6.38	0.7182
200.00	–	–	9.81	2.0310	6.54	0.7527
205.00	–	–	10.06	2.1267	6.70	0.7879
210.00	–	–	–	–	6.87	0.8239
215.00	–	–	–	–	7.03	0.8607
220.00	–	–	–	–	7.19	0.8982

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
225.00	–	–	–	–	7.36	0.9365
230.00	–	–	–	–	7.52	0.9755
235.00	–	–	–	–	7.68	1.0153
240.00	–	–	–	–	7.85	1.0558
245.00	–	–	–	–	8.01	1.0971
250.00	–	–	–	–	8.17	1.1391
255.00	–	–	–	–	8.34	1.1819
260.00	–	–	–	–	8.50	1.2254
265.00	–	–	–	–	8.67	1.2696
270.00	–	–	–	–	8.83	1.3146
275.00	–	–	–	–	8.99	1.3603
280.00	–	–	–	–	9.16	1.4068
285.00	–	–	–	–	9.32	1.4540
290.00	–	–	–	–	9.48	1.5019
295.00	–	–	–	–	9.65	1.5506
300.00	–	–	–	–	9.81	1.6000

6 PRESSURE LOSS GAS

6.1 2ND GAS FAMILY, NATURAL GASES

Medium:	2nd gas family, natural gases
Density:	0.79 kg/m^3
Viscosity:	0.000015 Pa•s
Surface roughness:	0.0015 mm



Pure turbulent or laminar flow

Transition between turbulent and laminar flow

Table 50: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 2nd gas family, d12–22 mm

d [mm]	12		15		18		22	
$\dot{V}$ [m³/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	0.88	0.0424	0.52	0.0149	–	–	–	–
0.50	1.77	0.0849	1.05	0.0297	0.69	0.0130	–	–
0.75	2.65	0.1273	1.57	0.0446	1.04	0.0194	0.69	0.0086
1.00	3.54	0.1698	2.09	0.0594	1.38	0.0259	0.92	0.0115
1.25	4.42	0.3651	2.62	0.0743	1.73	0.0324	1.15	0.0144
1.50	5.31	0.4968	3.14	0.0892	2.07	0.0389	1.38	0.0173
1.75	6.19	0.6451	3.66	0.1882	2.42	0.0453	1.61	0.0201
2.00	7.07	0.8097	4.19	0.2358	2.76	0.0891	1.84	0.0230
2.25	7.96	0.9899	4.71	0.2880	3.11	0.1086	2.07	0.0259
2.50	8.84	1.1854	5.23	0.3444	3.45	0.1298	2.30	0.0501
2.75	9.73	1.3958	5.76	0.4052	3.80	0.1526	2.53	0.0588
3.00	–	–	6.28	0.4701	4.14	0.1769	2.76	0.0682
3.25	–	–	6.80	0.5390	4.49	0.2027	2.99	0.0781
3.50	–	–	7.32	0.6120	4.84	0.2300	3.22	0.0885
3.75	–	–	7.85	0.6889	5.18	0.2587	3.45	0.0995
4.00	–	–	8.37	0.7698	5.53	0.2889	3.68	0.1111
4.50	–	–	9.42	0.9428	6.22	0.3536	4.14	0.1358
5.00	–	–	10.46	1.1308	6.91	0.4237	4.60	0.1626
5.50	–	–	–	–	7.60	0.4993	5.06	0.1915
6.00	–	–	–	–	8.29	0.5801	5.52	0.2224
6.50	–	–	–	–	8.98	0.6662	5.98	0.2552
7.00	–	–	–	–	9.67	0.7573	6.44	0.2899
7.50	–	–	–	–	10.36	0.8535	6.90	0.3266
8.00	–	–	–	–	–	–	7.37	0.3651
8.50	–	–	–	–	–	–	7.83	0.4055
9.00	–	–	–	–	–	–	8.29	0.4476
9.50	–	–	–	–	–	–	8.75	0.4916
10.00	–	–	–	–	–	–	9.21	0.5374
10.50	–	–	–	–	–	–	9.67	0.5849
11.00	–	–	–	–	–	–	10.13	0.6342

Table 51: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 2nd gas family, d28–54 mm

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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]
1.00	0.54	0.0040	–	–	–	–	–	–
1.25	0.67	0.0049	–	–	–	–	–	–
1.50	0.81	0.0059	0.52	0.0024	–	–	–	–
1.75	0.94	0.0069	0.60	0.0028	–	–	–	–
2.00	1.08	0.0079	0.69	0.0032	–	–	–	–
2.25	1.21	0.0089	0.78	0.0036	0.52	0.0017	–	–
2.50	1.35	0.0099	0.86	0.0040	0.58	0.0018	–	–
2.75	1.48	0.0109	0.95	0.0045	0.64	0.0020	–	–
3.00	1.62	0.0119	1.04	0.0049	0.70	0.0022	–	–
3.25	1.75	0.0223	1.12	0.0053	0.76	0.0024	–	–
3.50	1.89	0.0253	1.21	0.0057	0.81	0.0026	–	–
3.75	2.02	0.0284	1.30	0.0061	0.87	0.0028	0.51	0.0009

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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]
4.00	2.16	0.0317	1.38	0.0111	0.93	0.0029	0.54	0.0010
4.50	2.43	0.0387	1.55	0.0136	1.05	0.0033	0.61	0.0011
5.00	2.70	0.0462	1.73	0.0162	1.16	0.0064	0.68	0.0013
5.50	2.97	0.0544	1.90	0.0191	1.28	0.0075	0.75	0.0014
6.00	3.24	0.0631	2.07	0.0221	1.40	0.0087	0.82	0.0015
6.50	3.51	0.0724	2.25	0.0253	1.51	0.0100	0.88	0.0028
7.00	3.78	0.0822	2.42	0.0287	1.63	0.0113	0.95	0.0032
7.50	4.05	0.0925	2.59	0.0323	1.74	0.0127	1.02	0.0036
8.00	4.32	0.1033	2.76	0.0361	1.86	0.0142	1.09	0.0040
8.50	4.59	0.1147	2.94	0.0400	1.98	0.0158	1.16	0.0045
9.00	4.86	0.1265	3.11	0.0441	2.09	0.0174	1.22	0.0049
9.50	5.13	0.1389	3.28	0.0484	2.21	0.0191	1.29	0.0054
10.00	5.40	0.1518	3.45	0.0529	2.33	0.0208	1.36	0.0059
10.50	5.67	0.1651	3.63	0.0575	2.44	0.0226	1.43	0.0064
11.00	5.94	0.1789	3.80	0.0623	2.56	0.0245	1.50	0.0069
11.50	6.21	0.1933	3.97	0.0673	2.67	0.0264	1.56	0.0075
12.00	6.48	0.2080	4.14	0.0724	2.79	0.0284	1.63	0.0080
12.50	6.75	0.2233	4.32	0.0777	2.91	0.0305	1.70	0.0086
13.00	7.02	0.2390	4.49	0.0831	3.02	0.0326	1.77	0.0092
13.50	7.29	0.2552	4.66	0.0887	3.14	0.0348	1.84	0.0098
14.00	7.56	0.2718	4.84	0.0945	3.26	0.0371	1.90	0.0105
14.50	7.83	0.2889	5.01	0.1004	3.37	0.0394	1.97	0.0111
15.00	8.10	0.3065	5.18	0.1065	3.49	0.0418	2.04	0.0118
16.00	8.63	0.3429	5.53	0.1191	3.72	0.0467	2.18	0.0131
17.00	9.17	0.3812	5.87	0.1323	3.95	0.0518	2.31	0.0146
18.00	9.71	0.4211	6.22	0.1461	4.19	0.0572	2.45	0.0161
19.00	10.25	0.4628	6.56	0.1605	4.42	0.0628	2.58	0.0177
20.00	–	–	6.91	0.1755	4.65	0.0687	2.72	0.0193
21.00	–	–	7.25	0.1910	4.88	0.0748	2.86	0.0210
22.00	–	–	7.60	0.2072	5.12	0.0811	2.99	0.0228
23.00	–	–	7.94	0.2239	5.35	0.0876	3.13	0.0246
24.00	–	–	8.29	0.2412	5.58	0.0943	3.26	0.0265
25.00	–	–	8.63	0.2590	5.81	0.1013	3.40	0.0284
30.00	–	–	10.36	0.3564	6.98	0.1392	4.08	0.0390
35.00	–	–	–	–	8.14	0.1823	4.76	0.0510
40.00	–	–	–	–	9.30	0.2304	5.44	0.0643
45.00	–	–	–	–	10.46	0.2833	6.12	0.0791
50.00	–	–	–	–	–	–	6.80	0.0951
55.00	–	–	–	–	–	–	7.48	0.1124
60.00	–	–	–	–	–	–	8.16	0.1310
65.00	–	–	–	–	–	–	8.84	0.1508
70.00	–	–	–	–	–	–	9.52	0.1719
75.00	–	–	–	–	–	–	10.20	0.1941

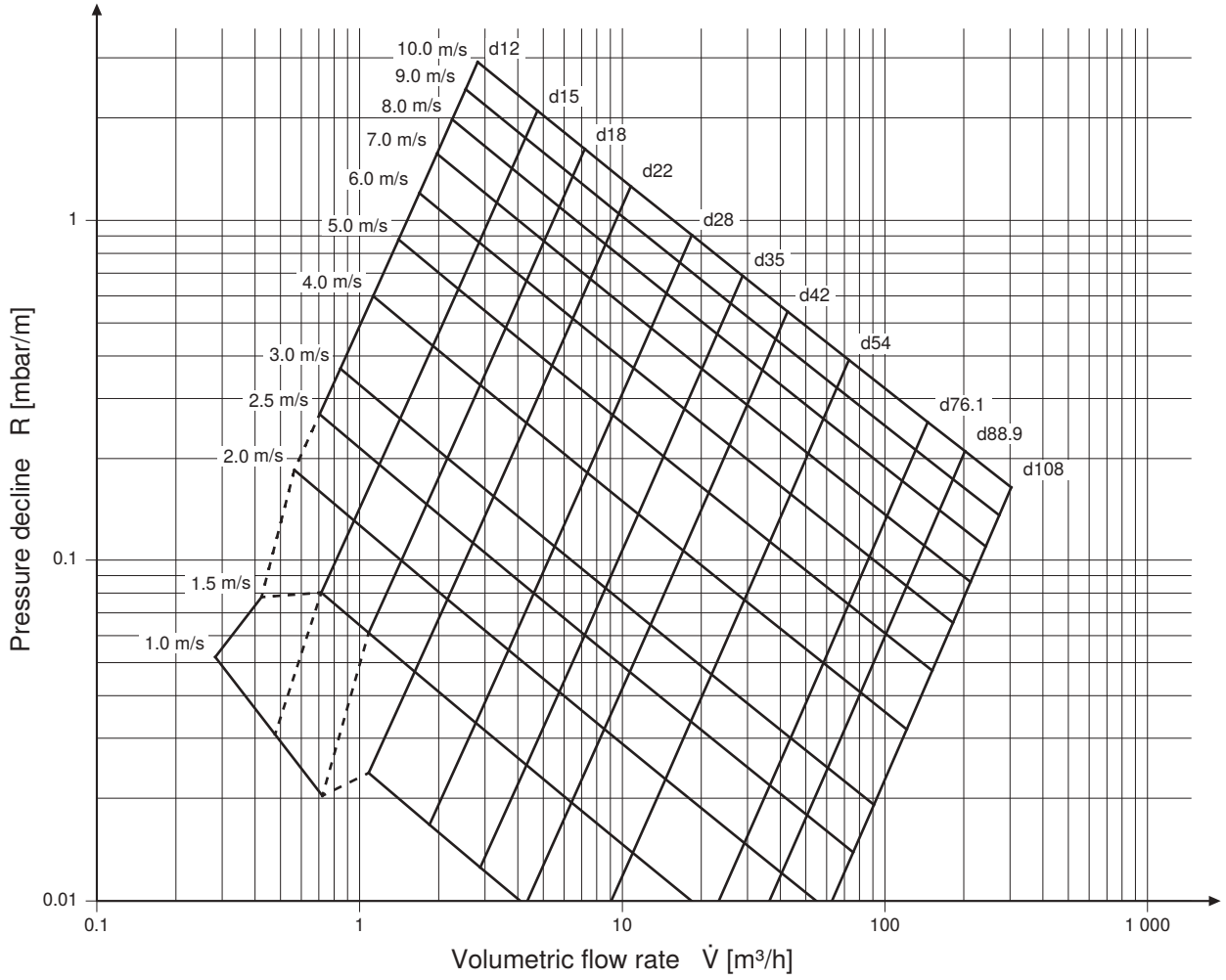
Table 52: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 2nd gas family, d76.1–108 mm

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
7.50	0.51	0.0005	–	–	–	–
8.00	0.54	0.0005	–	–	–	–
8.50	0.58	0.0005	–	–	–	–
9.00	0.61	0.0010	–	–	–	–
9.50	0.65	0.0011	–	–	–	–
10.00	0.68	0.0012	–	–	–	–
10.50	0.71	0.0013	0.52	0.0006	–	–
11.00	0.75	0.0014	0.54	0.0006	–	–
11.50	0.78	0.0015	0.56	0.0007	–	–
12.00	0.82	0.0016	0.59	0.0007	–	–
12.50	0.85	0.0017	0.61	0.0008	–	–
13.00	0.88	0.0018	0.64	0.0008	–	–
13.50	0.92	0.0019	0.66	0.0009	–	–
14.00	0.95	0.0020	0.69	0.0010	–	–
14.50	0.99	0.0022	0.71	0.0010	–	–
15.00	1.02	0.0023	0.74	0.0011	–	–
16.00	1.09	0.0026	0.79	0.0012	0.52	0.0005
17.00	1.16	0.0029	0.83	0.0013	0.56	0.0005
18.00	1.22	0.0031	0.88	0.0015	0.59	0.0006
19.00	1.29	0.0034	0.93	0.0016	0.62	0.0006
20.00	1.36	0.0038	0.98	0.0017	0.65	0.0007
21.00	1.43	0.0041	1.03	0.0019	0.69	0.0007
22.00	1.50	0.0044	1.08	0.0021	0.72	0.0008
23.00	1.56	0.0048	1.13	0.0022	0.75	0.0009
24.00	1.63	0.0051	1.18	0.0024	0.78	0.0009
25.00	1.70	0.0055	1.23	0.0026	0.82	0.0010
30.00	2.04	0.0076	1.47	0.0035	0.98	0.0013
35.00	2.38	0.0099	1.72	0.0046	1.14	0.0017
40.00	2.72	0.0125	1.96	0.0057	1.31	0.0022
45.00	3.06	0.0153	2.21	0.0070	1.47	0.0027
50.00	3.40	0.0184	2.45	0.0085	1.63	0.0032
55.00	3.74	0.0217	2.70	0.0100	1.80	0.0038
60.00	4.08	0.0252	2.94	0.0116	1.96	0.0044
65.00	4.42	0.0290	3.19	0.0134	2.13	0.0051
70.00	4.76	0.0331	3.43	0.0152	2.29	0.0058
75.00	5.10	0.0373	3.68	0.0172	2.45	0.0065
80.00	5.44	0.0418	3.93	0.0192	2.62	0.0073
85.00	5.78	0.0465	4.17	0.0214	2.78	0.0081
90.00	6.12	0.0514	4.42	0.0236	2.94	0.0090
95.00	6.46	0.0566	4.66	0.0260	3.11	0.0099
100.00	6.80	0.0619	4.91	0.0284	3.27	0.0108
105.00	7.14	0.0675	5.15	0.0310	3.43	0.0118
110.00	7.48	0.0732	5.40	0.0336	3.60	0.0128
115.00	7.82	0.0792	5.64	0.0364	3.76	0.0138
120.00	8.16	0.0854	5.89	0.0392	3.92	0.0149
125.00	8.50	0.0918	6.13	0.0421	4.09	0.0160
130.00	8.84	0.0984	6.38	0.0451	4.25	0.0172
135.00	9.18	0.1052	6.62	0.0482	4.41	0.0183

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
140.00	9.53	0.1122	6.87	0.0514	4.58	0.0196
145.00	9.87	0.1194	7.11	0.0547	4.74	0.0208
150.00	10.21	0.1268	7.36	0.0581	4.90	0.0221
155.00	–	–	7.61	0.0616	5.07	0.0234
160.00	–	–	7.85	0.0651	5.23	0.0247
165.00	–	–	8.10	0.0688	5.40	0.0261
170.00	–	–	8.34	0.0725	5.56	0.0275
175.00	–	–	8.59	0.0764	5.72	0.0290
180.00	–	–	8.83	0.0803	5.89	0.0305
185.00	–	–	9.08	0.0843	6.05	0.0320
190.00	–	–	9.32	0.0883	6.21	0.0335
195.00	–	–	9.57	0.0925	6.38	0.0351
200.00	–	–	9.81	0.0968	6.54	0.0367
205.00	–	–	10.06	0.1011	6.70	0.0384
210.00	–	–	10.30	0.1055	6.87	0.0400
215.00	–	–	–	–	7.03	0.0417
220.00	–	–	–	–	7.19	0.0435
225.00	–	–	–	–	7.36	0.0452
230.00	–	–	–	–	7.52	0.0470
235.00	–	–	–	–	7.68	0.0489
240.00	–	–	–	–	7.85	0.0507
245.00	–	–	–	–	8.01	0.0526
250.00	–	–	–	–	8.17	0.0545
255.00	–	–	–	–	8.34	0.0565
260.00	–	–	–	–	8.50	0.0585
265.00	–	–	–	–	8.67	0.0605
270.00	–	–	–	–	8.83	0.0625
275.00	–	–	–	–	8.99	0.0646
280.00	–	–	–	–	9.16	0.0667
285.00	–	–	–	–	9.32	0.0688
290.00	–	–	–	–	9.48	0.0710
295.00	–	–	–	–	9.65	0.0732
300.00	–	–	–	–	9.81	0.0754

6.2 3RD GAS FAMILY, LIQUID GASES

Medium:	3rd gas family, liquid gases
Density:	1.97 kg/m^3
Viscosity:	0.000016154 Pa•s
Surface roughness:	0.0015 mm



——— Pure turbulent or laminar flow

- - - - - Transition between turbulent and laminar flow

Table 53: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 3rd gas family, d12–22 mm

d [mm]	12		15		18		22	
$\dot{V}$ [m³/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	0.88	0.0457	0.52	0.0160	–	–	–	–
0.50	1.77	0.0914	1.05	0.0320	0.69	0.0139	–	–
0.75	2.65	0.2962	1.57	0.0864	1.04	0.0209	0.69	0.0093
1.00	3.54	0.4835	2.09	0.1406	1.38	0.0530	0.92	0.0124
1.25	4.42	0.7088	2.62	0.2056	1.73	0.0774	1.15	0.0298
1.50	5.31	0.9702	3.14	0.2809	2.07	0.1056	1.38	0.0406
1.75	6.19	1.2663	3.66	0.3661	2.42	0.1374	1.61	0.0528
2.00	7.07	1.5960	4.19	0.4607	2.76	0.1728	1.84	0.0663
2.25	7.96	1.9585	4.71	0.5647	3.11	0.2115	2.07	0.0812
2.50	8.84	2.3528	5.23	0.6777	3.45	0.2536	2.30	0.0972
2.75	9.73	2.7785	5.76	0.7995	3.80	0.2990	2.53	0.1146
3.00	–	–	6.28	0.9300	4.14	0.3476	2.76	0.1331
3.25	–	–	6.80	1.0690	4.49	0.3993	2.99	0.1528
3.50	–	–	7.32	1.2164	4.84	0.4541	3.22	0.1736
3.75	–	–	7.85	1.3721	5.18	0.5119	3.45	0.1957
4.00	–	–	8.37	1.5359	5.53	0.5727	3.68	0.2188
4.50	–	–	9.42	1.8876	6.22	0.7033	4.14	0.2684
5.00	–	–	10.46	2.2708	6.91	0.8453	4.60	0.3224
5.50	–	–	–	–	7.60	0.9987	5.06	0.3807
6.00	–	–	–	–	8.29	1.1633	5.52	0.4431
6.50	–	–	–	–	8.98	1.3388	5.98	0.5097
7.00	–	–	–	–	9.67	1.5250	6.44	0.5803
7.50	–	–	–	–	10.36	1.7219	6.90	0.6548
8.00	–	–	–	–	–	–	7.37	0.7334
8.50	–	–	–	–	–	–	7.83	0.8158
9.00	–	–	–	–	–	–	8.29	0.9020
9.50	–	–	–	–	–	–	8.75	0.9921
10.00	–	–	–	–	–	–	9.21	1.0859
10.50	–	–	–	–	–	–	9.67	1.1834
11.00	–	–	–	–	–	–	10.13	1.2847

Table 54: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 3rd gas family, d28–54 mm

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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]
1.00	0.54	0.0043	–	–	–	–	–	–
1.25	0.67	0.0053	–	–	–	–	–	–
1.50	0.81	0.0116	0.52	0.0026	–	–	–	–
1.75	0.94	0.0151	0.60	0.0053	–	–	–	–
2.00	1.08	0.0189	0.69	0.0066	–	–	–	–
2.25	1.21	0.0231	0.78	0.0081	0.52	0.0032	–	–
2.50	1.35	0.0276	0.86	0.0097	0.58	0.0038	–	–
2.75	1.48	0.0325	0.95	0.0114	0.64	0.0045	–	–
3.00	1.62	0.0377	1.04	0.0132	0.70	0.0052	–	–
3.25	1.75	0.0433	1.12	0.0151	0.76	0.0060	–	–
3.50	1.89	0.0491	1.21	0.0172	0.81	0.0068	–	–
3.75	2.02	0.0553	1.30	0.0193	0.87	0.0076	0.51	0.0022

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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]
4.00	2.16	0.0618	1.38	0.0216	0.93	0.0085	0.54	0.0024
4.50	2.43	0.0758	1.55	0.0264	1.05	0.0104	0.61	0.0029
5.00	2.70	0.0909	1.73	0.0316	1.16	0.0124	0.68	0.0035
5.50	2.97	0.1073	1.90	0.0373	1.28	0.0146	0.75	0.0041
6.00	3.24	0.1248	2.07	0.0434	1.40	0.0170	0.82	0.0048
6.50	3.51	0.1434	2.25	0.0498	1.51	0.0195	0.88	0.0055
7.00	3.78	0.1631	2.42	0.0566	1.63	0.0222	0.95	0.0063
7.50	4.05	0.1840	2.59	0.0638	1.74	0.0250	1.02	0.0070
8.00	4.32	0.2059	2.76	0.0714	1.86	0.0280	1.09	0.0079
8.50	4.59	0.2289	2.94	0.0794	1.98	0.0311	1.16	0.0087
9.00	4.86	0.2530	3.11	0.0877	2.09	0.0343	1.22	0.0096
9.50	5.13	0.2781	3.28	0.0963	2.21	0.0377	1.29	0.0106
10.00	5.40	0.3043	3.45	0.1054	2.33	0.0412	1.36	0.0116
10.50	5.67	0.3315	3.63	0.1147	2.44	0.0449	1.43	0.0126
11.00	5.94	0.3597	3.80	0.1245	2.56	0.0486	1.50	0.0136
11.50	6.21	0.3889	3.97	0.1345	2.67	0.0526	1.56	0.0147
12.00	6.48	0.4191	4.14	0.1449	2.79	0.0566	1.63	0.0159
12.50	6.75	0.4504	4.32	0.1557	2.91	0.0608	1.70	0.0170
13.00	7.02	0.4825	4.49	0.1668	3.02	0.0651	1.77	0.0182
13.50	7.29	0.5157	4.66	0.1782	3.14	0.0696	1.84	0.0195
14.00	7.56	0.5499	4.84	0.1899	3.26	0.0741	1.90	0.0207
14.50	7.83	0.5850	5.01	0.2020	3.37	0.0788	1.97	0.0220
15.00	8.10	0.6210	5.18	0.2144	3.49	0.0836	2.04	0.0234
16.00	8.63	0.6960	5.53	0.2402	3.72	0.0937	2.18	0.0262
17.00	9.17	0.7748	5.87	0.2672	3.95	0.1042	2.31	0.0291
18.00	9.71	0.8572	6.22	0.2955	4.19	0.1152	2.45	0.0322
19.00	10.25	0.9434	6.56	0.3251	4.42	0.1266	2.58	0.0353
20.00	–	–	6.91	0.3559	4.65	0.1386	2.72	0.0387
21.00	–	–	7.25	0.3880	4.88	0.1510	2.86	0.0421
22.00	–	–	7.60	0.4212	5.12	0.1639	2.99	0.0457
23.00	–	–	7.94	0.4557	5.35	0.1773	3.13	0.0494
24.00	–	–	8.29	0.4914	5.58	0.1911	3.26	0.0532
25.00	–	–	8.63	0.5282	5.81	0.2054	3.40	0.0572
30.00	–	–	10.36	0.7300	6.98	0.2836	4.08	0.0789
35.00	–	–	–	–	8.14	0.3727	4.76	0.1035
40.00	–	–	–	–	9.30	0.4725	5.44	0.1311
45.00	–	–	–	–	10.46	0.5828	6.12	0.1615
50.00	–	–	–	–	–	–	6.80	0.1948
55.00	–	–	–	–	–	–	7.48	0.2307
60.00	–	–	–	–	–	–	8.16	0.2694
65.00	–	–	–	–	–	–	8.84	0.3107
70.00	–	–	–	–	–	–	9.52	0.3546
75.00	–	–	–	–	–	–	10.20	0.4011

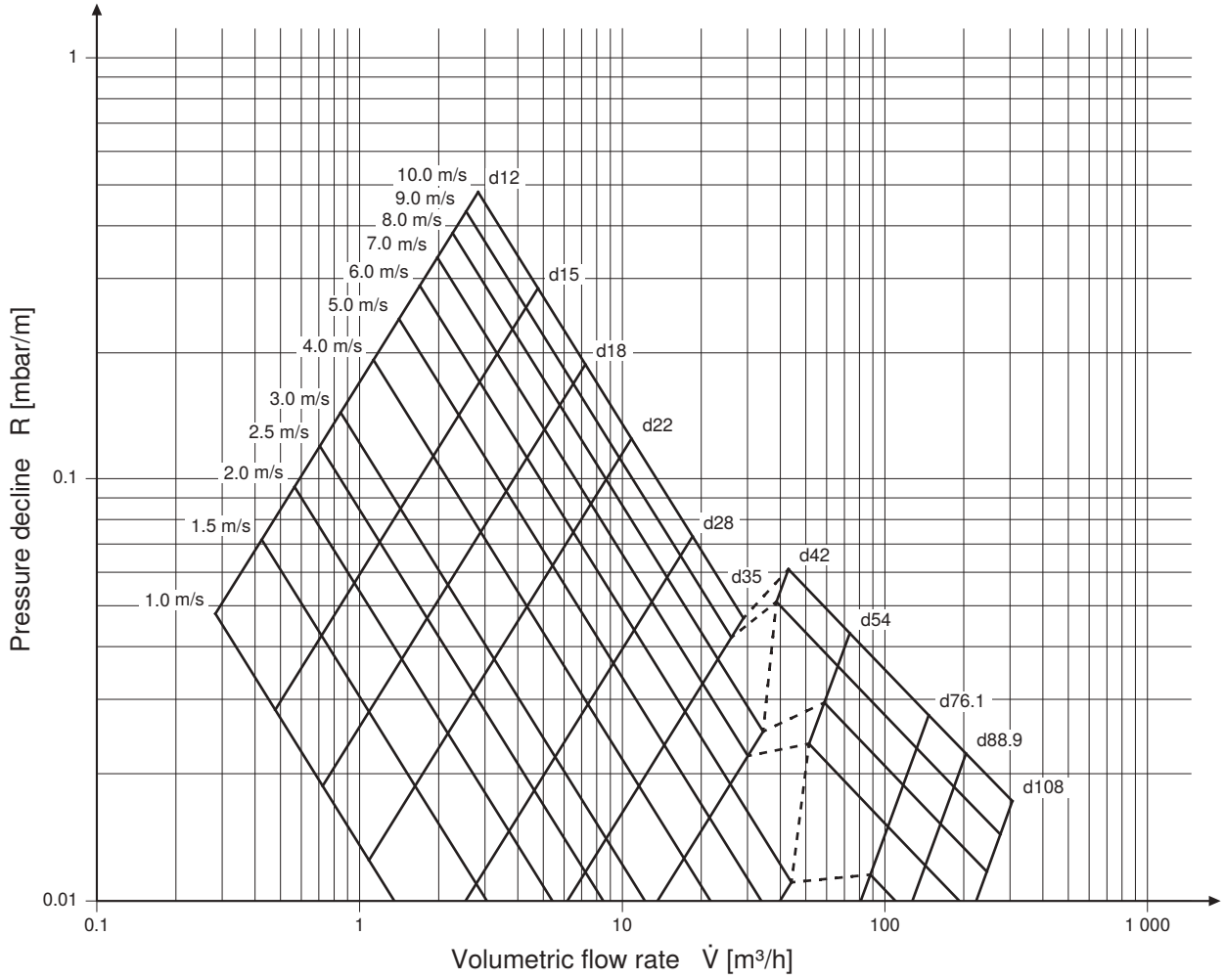
Table 55: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 3rd gas family, d76.1–108 mm

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
7.50	0.51	0.0014	–	–	–	–
8.00	0.54	0.0015	–	–	–	–
8.50	0.58	0.0017	–	–	–	–
9.00	0.61	0.0019	–	–	–	–
9.50	0.65	0.0021	–	–	–	–
10.00	0.68	0.0023	–	–	–	–
10.50	0.71	0.0024	0.52	0.0011	–	–
11.00	0.75	0.0027	0.54	0.0012	–	–
11.50	0.78	0.0029	0.56	0.0013	–	–
12.00	0.82	0.0031	0.59	0.0014	–	–
12.50	0.85	0.0033	0.61	0.0015	–	–
13.00	0.88	0.0035	0.64	0.0016	–	–
13.50	0.92	0.0038	0.66	0.0017	–	–
14.00	0.95	0.0040	0.69	0.0019	–	–
14.50	0.99	0.0043	0.71	0.0020	–	–
15.00	1.02	0.0045	0.74	0.0021	–	–
16.00	1.09	0.0051	0.79	0.0023	0.52	0.0009
17.00	1.16	0.0056	0.83	0.0026	0.56	0.0010
18.00	1.22	0.0062	0.88	0.0029	0.59	0.0011
19.00	1.29	0.0068	0.93	0.0032	0.62	0.0012
20.00	1.36	0.0075	0.98	0.0034	0.65	0.0013
21.00	1.43	0.0081	1.03	0.0037	0.69	0.0014
22.00	1.50	0.0088	1.08	0.0041	0.72	0.0016
23.00	1.56	0.0095	1.13	0.0044	0.75	0.0017
24.00	1.63	0.0103	1.18	0.0047	0.78	0.0018
25.00	1.70	0.0110	1.23	0.0051	0.82	0.0019
30.00	2.04	0.0152	1.47	0.0070	0.98	0.0027
35.00	2.38	0.0199	1.72	0.0091	1.14	0.0035
40.00	2.72	0.0252	1.96	0.0116	1.31	0.0044
45.00	3.06	0.0310	2.21	0.0142	1.47	0.0054
50.00	3.40	0.0373	2.45	0.0171	1.63	0.0065
55.00	3.74	0.0441	2.70	0.0202	1.80	0.0077
60.00	4.08	0.0515	2.94	0.0236	1.96	0.0090
65.00	4.42	0.0593	3.19	0.0272	2.13	0.0103
70.00	4.76	0.0677	3.43	0.0310	2.29	0.0118
75.00	5.10	0.0765	3.68	0.0350	2.45	0.0133
80.00	5.44	0.0858	3.93	0.0393	2.62	0.0149
85.00	5.78	0.0955	4.17	0.0437	2.78	0.0166
90.00	6.12	0.1058	4.42	0.0484	2.94	0.0184
95.00	6.46	0.1165	4.66	0.0533	3.11	0.0202
100.00	6.80	0.1276	4.91	0.0584	3.27	0.0221
105.00	7.14	0.1393	5.15	0.0637	3.43	0.0241
110.00	7.48	0.1513	5.40	0.0692	3.60	0.0262
115.00	7.82	0.1638	5.64	0.0749	3.76	0.0284
120.00	8.16	0.1768	5.89	0.0808	3.92	0.0306
125.00	8.50	0.1902	6.13	0.0869	4.09	0.0329
130.00	8.84	0.2040	6.38	0.0932	4.25	0.0353
135.00	9.18	0.2183	6.62	0.0997	4.41	0.0377

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
140.00	9.53	0.2329	6.87	0.1064	4.58	0.0403
145.00	9.87	0.2481	7.11	0.1133	4.74	0.0429
150.00	10.21	0.2636	7.36	0.1204	4.90	0.0455
155.00	–	–	7.61	0.1277	5.07	0.0483
160.00	–	–	7.85	0.1351	5.23	0.0511
165.00	–	–	8.10	0.1428	5.40	0.0540
170.00	–	–	8.34	0.1506	5.56	0.0570
175.00	–	–	8.59	0.1587	5.72	0.0600
180.00	–	–	8.83	0.1669	5.89	0.0631
185.00	–	–	9.08	0.1753	6.05	0.0662
190.00	–	–	9.32	0.1839	6.21	0.0695
195.00	–	–	9.57	0.1927	6.38	0.0728
200.00	–	–	9.81	0.2016	6.54	0.0762
205.00	–	–	10.06	0.2108	6.70	0.0796
210.00	–	–	10.30	0.2201	6.87	0.0831
215.00	–	–	–	–	7.03	0.0867
220.00	–	–	–	–	7.19	0.0903
225.00	–	–	–	–	7.36	0.0941
230.00	–	–	–	–	7.52	0.0978
235.00	–	–	–	–	7.68	0.1017
240.00	–	–	–	–	7.85	0.1056
245.00	–	–	–	–	8.01	0.1096
250.00	–	–	–	–	8.17	0.1136
255.00	–	–	–	–	8.34	0.1177
260.00	–	–	–	–	8.50	0.1219
265.00	–	–	–	–	8.67	0.1262
270.00	–	–	–	–	8.83	0.1305
275.00	–	–	–	–	8.99	0.1348
280.00	–	–	–	–	9.16	0.1393
285.00	–	–	–	–	9.32	0.1438
290.00	–	–	–	–	9.48	0.1484
295.00	–	–	–	–	9.65	0.1530
300.00	–	–	–	–	9.81	0.1577

6.3 5TH GAS FAMILY, GROUP A, HYDROGEN, PURITY ≥ 98 %

Medium:	5. gas family, group A, hydrogen, purity ≥ 98 %
Density:	0.107 kg/m^3
Viscosity:	0.000015 Pa•s
Surface roughness:	0.0015 mm



——— Pure turbulent or laminar flow

- - - - - Transition between turbulent and laminar flow

Table 56: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 5th gas family, group A, d12–22 mm

d [mm]	12		15		18		22	
$\dot{V}$ [m³/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	0.88	0.0424	0.52	0.0149	–	–	–	–
0.50	1.77	0.0849	1.05	0.0297	0.69	0.0130	–	–
0.75	2.65	0.1273	1.57	0.0446	1.04	0.0194	0.69	0.0086
1.00	3.54	0.1698	2.09	0.0594	1.38	0.0259	0.92	0.0115
1.25	4.42	0.2122	2.62	0.0743	1.73	0.0324	1.15	0.0144
1.50	5.31	0.2546	3.14	0.0892	2.07	0.0389	1.38	0.0173
1.75	6.19	0.2971	3.66	0.1040	2.42	0.0453	1.61	0.0201
2.00	7.07	0.3395	4.19	0.1189	2.76	0.0518	1.84	0.0230
2.25	7.96	0.3820	4.71	0.1337	3.11	0.0583	2.07	0.0259
2.50	8.84	0.4244	5.23	0.1486	3.45	0.0648	2.30	0.0288
2.75	9.73	0.4669	5.76	0.1635	3.80	0.0712	2.53	0.0316
3.00	–	–	6.28	0.1783	4.14	0.0777	2.76	0.0345
3.25	–	–	6.80	0.1932	4.49	0.0842	2.99	0.0374
3.50	–	–	7.32	0.2080	4.84	0.0907	3.22	0.0403
3.75	–	–	7.85	0.2229	5.18	0.0971	3.45	0.0431
4.00	–	–	8.37	0.2378	5.53	0.1036	3.68	0.0460
4.50	–	–	9.42	0.2675	6.22	0.1166	4.14	0.0518
5.00	–	–	10.46	0.2972	6.91	0.1295	4.60	0.0575
5.50	–	–	–	–	7.60	0.1425	5.06	0.0633
6.00	–	–	–	–	8.29	0.1554	5.52	0.0690
6.50	–	–	–	–	8.98	0.1684	5.98	0.0748
7.00	–	–	–	–	9.67	0.1813	6.44	0.0805
7.50	–	–	–	–	10.36	0.1943	6.90	0.0863
8.00	–	–	–	–	–	–	7.37	0.0920
8.50	–	–	–	–	–	–	7.83	0.0978
9.00	–	–	–	–	–	–	8.29	0.1035
9.50	–	–	–	–	–	–	8.75	0.1093
10.00	–	–	–	–	–	–	9.21	0.1150
10.50	–	–	–	–	–	–	9.67	0.1208
11.00	–	–	–	–	–	–	10.13	0.1265

Table 57: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 5th gas family, group A, d28–54 mm

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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]
1.00	0.54	0.0040	–	–	–	–	–	–
1.25	0.67	0.0049	–	–	–	–	–	–
1.50	0.81	0.0059	0.52	0.0024	–	–	–	–
1.75	0.94	0.0069	0.60	0.0028	–	–	–	–
2.00	1.08	0.0079	0.69	0.0032	–	–	–	–
2.25	1.21	0.0089	0.78	0.0036	0.52	0.0017	–	–
2.50	1.35	0.0099	0.86	0.0040	0.58	0.0018	–	–
2.75	1.48	0.0109	0.95	0.0045	0.64	0.0020	–	–
3.00	1.62	0.0119	1.04	0.0049	0.70	0.0022	–	–
3.25	1.75	0.0128	1.12	0.0053	0.76	0.0024	–	–
3.50	1.89	0.0138	1.21	0.0057	0.81	0.0026	–	–
3.75	2.02	0.0148	1.30	0.0061	0.87	0.0028	0.51	0.0009

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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]
4.00	2.16	0.0158	1.38	0.0065	0.93	0.0029	0.54	0.0010
4.50	2.43	0.0178	1.55	0.0073	1.05	0.0033	0.61	0.0011
5.00	2.70	0.0198	1.73	0.0081	1.16	0.0037	0.68	0.0013
5.50	2.97	0.0217	1.90	0.0089	1.28	0.0040	0.75	0.0014
6.00	3.24	0.0237	2.07	0.0097	1.40	0.0044	0.82	0.0015
6.50	3.51	0.0257	2.25	0.0105	1.51	0.0048	0.88	0.0016
7.00	3.78	0.0277	2.42	0.0113	1.63	0.0051	0.95	0.0018
7.50	4.05	0.0296	2.59	0.0121	1.74	0.0055	1.02	0.0019
8.00	4.32	0.0316	2.76	0.0130	1.86	0.0059	1.09	0.0020
8.50	4.59	0.0336	2.94	0.0138	1.98	0.0062	1.16	0.0021
9.00	4.86	0.0356	3.11	0.0146	2.09	0.0066	1.22	0.0023
9.50	5.13	0.0376	3.28	0.0154	2.21	0.0070	1.29	0.0024
10.00	5.40	0.0395	3.45	0.0162	2.33	0.0073	1.36	0.0025
10.50	5.67	0.0415	3.63	0.0170	2.44	0.0077	1.43	0.0026
11.00	5.94	0.0435	3.80	0.0178	2.56	0.0081	1.50	0.0028
11.50	6.21	0.0455	3.97	0.0186	2.67	0.0084	1.56	0.0029
12.00	6.48	0.0474	4.14	0.0194	2.79	0.0088	1.63	0.0030
12.50	6.75	0.0494	4.32	0.0202	2.91	0.0092	1.70	0.0031
13.00	7.02	0.0514	4.49	0.0210	3.02	0.0095	1.77	0.0033
13.50	7.29	0.0534	4.66	0.0219	3.14	0.0099	1.84	0.0034
14.00	7.56	0.0553	4.84	0.0227	3.26	0.0103	1.90	0.0035
14.50	7.83	0.0573	5.01	0.0235	3.37	0.0106	1.97	0.0036
15.00	8.10	0.0593	5.18	0.0243	3.49	0.0110	2.04	0.0038
16.00	8.63	0.0632	5.53	0.0259	3.72	0.0117	2.18	0.0040
17.00	9.17	0.0672	5.87	0.0275	3.95	0.0125	2.31	0.0043
18.00	9.71	0.0711	6.22	0.0291	4.19	0.0132	2.45	0.0045
19.00	10.25	0.0751	6.56	0.0308	4.42	0.0139	2.58	0.0048
20.00	–	–	6.91	0.0324	4.65	0.0147	2.72	0.0050
21.00	–	–	7.25	0.0340	4.88	0.0154	2.86	0.0053
22.00	–	–	7.60	0.0356	5.12	0.0161	2.99	0.0055
23.00	–	–	7.94	0.0372	5.35	0.0169	3.13	0.0058
24.00	–	–	8.29	0.0389	5.58	0.0176	3.26	0.0060
25.00	–	–	8.63	0.0405	5.81	0.0183	3.40	0.0063
30.00	–	–	10.36	0.0843	6.98	0.0220	4.08	0.0075
35.00	–	–	–	–	8.14	0.0257	4.76	0.0088
40.00	–	–	–	–	9.30	0.0542	5.44	0.0100
45.00	–	–	–	–	10.46	0.0661	6.12	0.0113
50.00	–	–	–	–	–	–	6.80	0.0225
55.00	–	–	–	–	–	–	7.48	0.0264
60.00	–	–	–	–	–	–	8.16	0.0306
65.00	–	–	–	–	–	–	8.84	0.0350
70.00	–	–	–	–	–	–	9.52	0.0397
75.00	–	–	–	–	–	–	10.20	0.0446

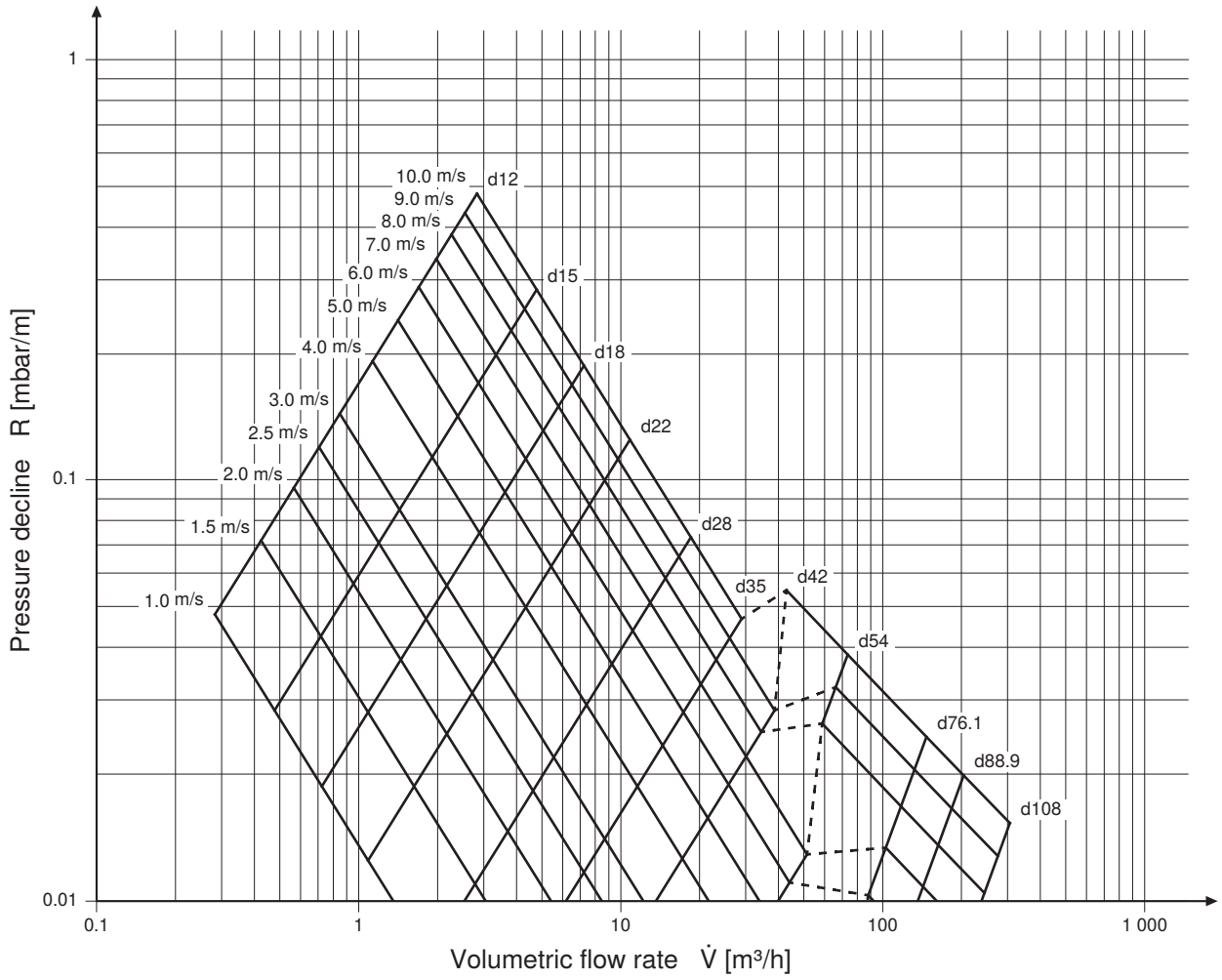
Table 58: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 5th gas family, group A, d76.1–108 mm

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
7.50	0.51	0.0005	–	–	–	–
8.00	0.54	0.0005	–	–	–	–
8.50	0.58	0.0005	–	–	–	–
9.00	0.61	0.0006	–	–	–	–
9.50	0.65	0.0006	–	–	–	–
10.00	0.68	0.0006	–	–	–	–
10.50	0.71	0.0007	0.52	0.0003	–	–
11.00	0.75	0.0007	0.54	0.0004	–	–
11.50	0.78	0.0007	0.56	0.0004	–	–
12.00	0.82	0.0008	0.59	0.0004	–	–
12.50	0.85	0.0008	0.61	0.0004	–	–
13.00	0.88	0.0008	0.64	0.0004	–	–
13.50	0.92	0.0008	0.66	0.0004	–	–
14.00	0.95	0.0009	0.69	0.0005	–	–
14.50	0.99	0.0009	0.71	0.0005	–	–
15.00	1.02	0.0009	0.74	0.0005	–	–
16.00	1.09	0.0010	0.79	0.0005	0.52	0.0002
17.00	1.16	0.0011	0.83	0.0006	0.56	0.0002
18.00	1.22	0.0011	0.88	0.0006	0.59	0.0003
19.00	1.29	0.0012	0.93	0.0006	0.62	0.0003
20.00	1.36	0.0013	0.98	0.0007	0.65	0.0003
21.00	1.43	0.0013	1.03	0.0007	0.69	0.0003
22.00	1.50	0.0014	1.08	0.0007	0.72	0.0003
23.00	1.56	0.0014	1.13	0.0008	0.75	0.0003
24.00	1.63	0.0015	1.18	0.0008	0.78	0.0003
25.00	1.70	0.0016	1.23	0.0008	0.82	0.0004
30.00	2.04	0.0019	1.47	0.0010	0.98	0.0004
35.00	2.38	0.0022	1.72	0.0011	1.14	0.0005
40.00	2.72	0.0025	1.96	0.0013	1.31	0.0006
45.00	3.06	0.0028	2.21	0.0015	1.47	0.0007
50.00	3.40	0.0031	2.45	0.0016	1.63	0.0007
55.00	3.74	0.0035	2.70	0.0018	1.80	0.0008
60.00	4.08	0.0038	2.94	0.0020	1.96	0.0009
65.00	4.42	0.0041	3.19	0.0021	2.13	0.0009
70.00	4.76	0.0078	3.43	0.0023	2.29	0.0010
75.00	5.10	0.0088	3.68	0.0025	2.45	0.0011
80.00	5.44	0.0098	3.93	0.0046	2.62	0.0012
85.00	5.78	0.0108	4.17	0.0050	2.78	0.0012
90.00	6.12	0.0120	4.42	0.0056	2.94	0.0013
95.00	6.46	0.0131	4.66	0.0061	3.11	0.0024
100.00	6.80	0.0143	4.91	0.0066	3.27	0.0026
105.00	7.14	0.0155	5.15	0.0072	3.43	0.0028
110.00	7.48	0.0168	5.40	0.0078	3.60	0.0030
115.00	7.82	0.0181	5.64	0.0084	3.76	0.0032
120.00	8.16	0.0195	5.89	0.0090	3.92	0.0035
125.00	8.50	0.0209	6.13	0.0097	4.09	0.0037
130.00	8.84	0.0224	6.38	0.0104	4.25	0.0040
135.00	9.18	0.0238	6.62	0.0110	4.41	0.0043

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
140.00	9.53	0.0254	6.87	0.0118	4.58	0.0045
145.00	9.87	0.0269	7.11	0.0125	4.74	0.0048
150.00	10.21	0.0286	7.36	0.0132	4.90	0.0051
155.00	–	–	7.61	0.0140	5.07	0.0054
160.00	–	–	7.85	0.0148	5.23	0.0057
165.00	–	–	8.10	0.0156	5.40	0.0060
170.00	–	–	8.34	0.0164	5.56	0.0063
175.00	–	–	8.59	0.0172	5.72	0.0066
180.00	–	–	8.83	0.0181	5.89	0.0069
185.00	–	–	9.08	0.0189	6.05	0.0073
190.00	–	–	9.32	0.0198	6.21	0.0076
195.00	–	–	9.57	0.0207	6.38	0.0080
200.00	–	–	9.81	0.0216	6.54	0.0083
205.00	–	–	10.06	0.0226	6.70	0.0087
210.00	–	–	10.30	0.0235	6.87	0.0090
215.00	–	–	–	–	7.03	0.0094
220.00	–	–	–	–	7.19	0.0098
225.00	–	–	–	–	7.36	0.0102
230.00	–	–	–	–	7.52	0.0106
235.00	–	–	–	–	7.68	0.0110
240.00	–	–	–	–	7.85	0.0114
245.00	–	–	–	–	8.01	0.0118
250.00	–	–	–	–	8.17	0.0122
255.00	–	–	–	–	8.34	0.0126
260.00	–	–	–	–	8.50	0.0130
265.00	–	–	–	–	8.67	0.0135
270.00	–	–	–	–	8.83	0.0139
275.00	–	–	–	–	8.99	0.0144
280.00	–	–	–	–	9.16	0.0148
285.00	–	–	–	–	9.32	0.0153
290.00	–	–	–	–	9.48	0.0157
295.00	–	–	–	–	9.65	0.0162
300.00	–	–	–	–	9.81	0.0167

6.4 5TH GAS FAMILY, GROUP D, HYDROGEN, PURITY ≥ 99.97 %

Medium:	5th gas family, group D, hydrogen, purity ≥ 99.97 %
Density:	0.091 kg/m^3
Viscosity:	0.000015 Pa•s
Surface roughness:	0.0015 mm



——— Pure turbulent or laminar flow

- - - - - Transition between turbulent and laminar flow

Table 59: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 5th gas family, group D, d12–22 mm

d [mm]	12		15		18		22	
$\dot{V}$ [m³/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	0.88	0.0424	0.52	0.0149	–	–	–	–
0.50	1.77	0.0849	1.05	0.0297	0.69	0.0130	–	–
0.75	2.65	0.1273	1.57	0.0446	1.04	0.0194	0.69	0.0086
1.00	3.54	0.1698	2.09	0.0594	1.38	0.0259	0.92	0.0115
1.25	4.42	0.2122	2.62	0.0743	1.73	0.0324	1.15	0.0144
1.50	5.31	0.2546	3.14	0.0892	2.07	0.0389	1.38	0.0173
1.75	6.19	0.2971	3.66	0.1040	2.42	0.0453	1.61	0.0201
2.00	7.07	0.3395	4.19	0.1189	2.76	0.0518	1.84	0.0230
2.25	7.96	0.3820	4.71	0.1337	3.11	0.0583	2.07	0.0259
2.50	8.84	0.4244	5.23	0.1486	3.45	0.0648	2.30	0.0288
2.75	9.73	0.4669	5.76	0.1635	3.80	0.0712	2.53	0.0316
3.00	–	–	6.28	0.1783	4.14	0.0777	2.76	0.0345
3.25	–	–	6.80	0.1932	4.49	0.0842	2.99	0.0374
3.50	–	–	7.32	0.2080	4.84	0.0907	3.22	0.0403
3.75	–	–	7.85	0.2229	5.18	0.0971	3.45	0.0431
4.00	–	–	8.37	0.2378	5.53	0.1036	3.68	0.0460
4.50	–	–	9.42	0.2675	6.22	0.1166	4.14	0.0518
5.00	–	–	10.46	0.2972	6.91	0.1295	4.60	0.0575
5.50	–	–	–	–	7.60	0.1425	5.06	0.0633
6.00	–	–	–	–	8.29	0.1554	5.52	0.0690
6.50	–	–	–	–	8.98	0.1684	5.98	0.0748
7.00	–	–	–	–	9.67	0.1813	6.44	0.0805
7.50	–	–	–	–	10.36	0.1943	6.90	0.0863
8.00	–	–	–	–	–	–	7.37	0.0920
8.50	–	–	–	–	–	–	7.83	0.0978
9.00	–	–	–	–	–	–	8.29	0.1035
9.50	–	–	–	–	–	–	8.75	0.1093
10.00	–	–	–	–	–	–	9.21	0.1150
10.50	–	–	–	–	–	–	9.67	0.1208
11.00	–	–	–	–	–	–	10.13	0.1265

Table 60: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 5th gas family, group D, d28–54 mm

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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]
1.00	0.54	0.0040	–	–	–	–	–	–
1.25	0.67	0.0049	–	–	–	–	–	–
1.50	0.81	0.0059	0.52	0.0024	–	–	–	–
1.75	0.94	0.0069	0.60	0.0028	–	–	–	–
2.00	1.08	0.0079	0.69	0.0032	–	–	–	–
2.25	1.21	0.0089	0.78	0.0036	0.52	0.0017	–	–
2.50	1.35	0.0099	0.86	0.0040	0.58	0.0018	–	–
2.75	1.48	0.0109	0.95	0.0045	0.64	0.0020	–	–
3.00	1.62	0.0119	1.04	0.0049	0.70	0.0022	–	–
3.25	1.75	0.0128	1.12	0.0053	0.76	0.0024	–	–
3.50	1.89	0.0138	1.21	0.0057	0.81	0.0026	–	–
3.75	2.02	0.0148	1.30	0.0061	0.87	0.0028	0.51	0.0009

d [mm]	28		35		42		54	
$\dot{V}$ [m³/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]
4.00	2.16	0.0158	1.38	0.0065	0.93	0.0029	0.54	0.0010
4.50	2.43	0.0178	1.55	0.0073	1.05	0.0033	0.61	0.0011
5.00	2.70	0.0198	1.73	0.0081	1.16	0.0037	0.68	0.0013
5.50	2.97	0.0217	1.90	0.0089	1.28	0.0040	0.75	0.0014
6.00	3.24	0.0237	2.07	0.0097	1.40	0.0044	0.82	0.0015
6.50	3.51	0.0257	2.25	0.0105	1.51	0.0048	0.88	0.0016
7.00	3.78	0.0277	2.42	0.0113	1.63	0.0051	0.95	0.0018
7.50	4.05	0.0296	2.59	0.0121	1.74	0.0055	1.02	0.0019
8.00	4.32	0.0316	2.76	0.0130	1.86	0.0059	1.09	0.0020
8.50	4.59	0.0336	2.94	0.0138	1.98	0.0062	1.16	0.0021
9.00	4.86	0.0356	3.11	0.0146	2.09	0.0066	1.22	0.0023
9.50	5.13	0.0376	3.28	0.0154	2.21	0.0070	1.29	0.0024
10.00	5.40	0.0395	3.45	0.0162	2.33	0.0073	1.36	0.0025
10.50	5.67	0.0415	3.63	0.0170	2.44	0.0077	1.43	0.0026
11.00	5.94	0.0435	3.80	0.0178	2.56	0.0081	1.50	0.0028
11.50	6.21	0.0455	3.97	0.0186	2.67	0.0084	1.56	0.0029
12.00	6.48	0.0474	4.14	0.0194	2.79	0.0088	1.63	0.0030
12.50	6.75	0.0494	4.32	0.0202	2.91	0.0092	1.70	0.0031
13.00	7.02	0.0514	4.49	0.0210	3.02	0.0095	1.77	0.0033
13.50	7.29	0.0534	4.66	0.0219	3.14	0.0099	1.84	0.0034
14.00	7.56	0.0553	4.84	0.0227	3.26	0.0103	1.90	0.0035
14.50	7.83	0.0573	5.01	0.0235	3.37	0.0106	1.97	0.0036
15.00	8.10	0.0593	5.18	0.0243	3.49	0.0110	2.04	0.0038
16.00	8.63	0.0632	5.53	0.0259	3.72	0.0117	2.18	0.0040
17.00	9.17	0.0672	5.87	0.0275	3.95	0.0125	2.31	0.0043
18.00	9.71	0.0711	6.22	0.0291	4.19	0.0132	2.45	0.0045
19.00	10.25	0.0751	6.56	0.0308	4.42	0.0139	2.58	0.0048
20.00	–	–	6.91	0.0324	4.65	0.0147	2.72	0.0050
21.00	–	–	7.25	0.0340	4.88	0.0154	2.86	0.0053
22.00	–	–	7.60	0.0356	5.12	0.0161	2.99	0.0055
23.00	–	–	7.94	0.0372	5.35	0.0169	3.13	0.0058
24.00	–	–	8.29	0.0389	5.58	0.0176	3.26	0.0060
25.00	–	–	8.63	0.0405	5.81	0.0183	3.40	0.0063
30.00	–	–	10.36	0.0486	6.98	0.0220	4.08	0.0075
35.00	–	–	–	–	8.14	0.0257	4.76	0.0088
40.00	–	–	–	–	9.30	0.0294	5.44	0.0100
45.00	–	–	–	–	10.46	0.0591	6.12	0.0113
50.00	–	–	–	–	–	–	6.80	0.0125
55.00	–	–	–	–	–	–	7.48	0.0236
60.00	–	–	–	–	–	–	8.16	0.0273
65.00	–	–	–	–	–	–	8.84	0.0313
70.00	–	–	–	–	–	–	9.52	0.0355
75.00	–	–	–	–	–	–	10.20	0.0398

Table 61: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 5th gas family, group D, d76.1–108 mm

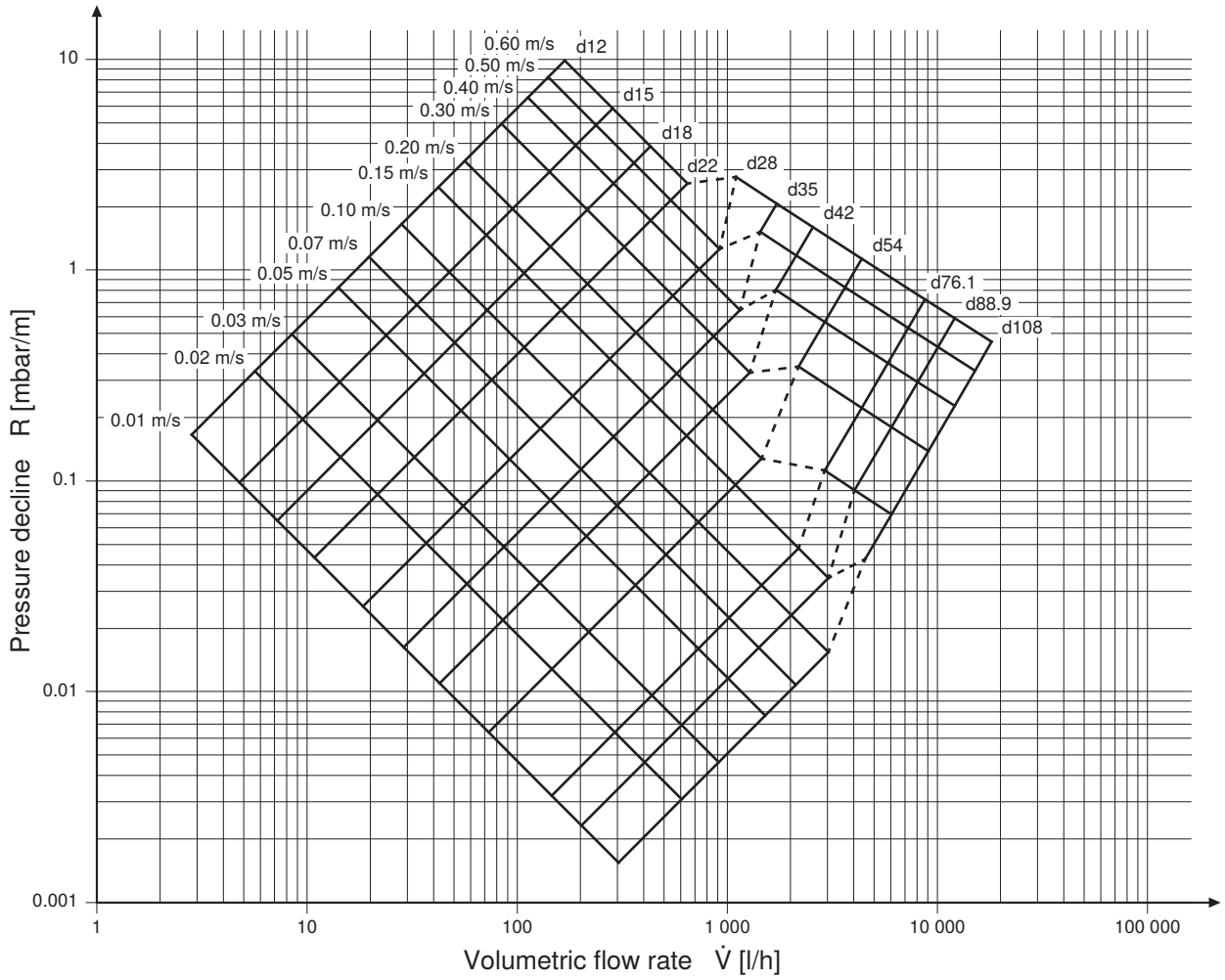
d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
7.50	0.51	0.0005	–	–	–	–
8.00	0.54	0.0005	–	–	–	–
8.50	0.58	0.0005	–	–	–	–
9.00	0.61	0.0006	–	–	–	–
9.50	0.65	0.0006	–	–	–	–
10.00	0.68	0.0006	–	–	–	–
10.50	0.71	0.0007	0.52	0.0003	–	–
11.00	0.75	0.0007	0.54	0.0004	–	–
11.50	0.78	0.0007	0.56	0.0004	–	–
12.00	0.82	0.0008	0.59	0.0004	–	–
12.50	0.85	0.0008	0.61	0.0004	–	–
13.00	0.88	0.0008	0.64	0.0004	–	–
13.50	0.92	0.0008	0.66	0.0004	–	–
14.00	0.95	0.0009	0.69	0.0005	–	–
14.50	0.99	0.0009	0.71	0.0005	–	–
15.00	1.02	0.0009	0.74	0.0005	–	–
16.00	1.09	0.0010	0.79	0.0005	0.52	0.0002
17.00	1.16	0.0011	0.83	0.0006	0.56	0.0002
18.00	1.22	0.0011	0.88	0.0006	0.59	0.0003
19.00	1.29	0.0012	0.93	0.0006	0.62	0.0003
20.00	1.36	0.0013	0.98	0.0007	0.65	0.0003
21.00	1.43	0.0013	1.03	0.0007	0.69	0.0003
22.00	1.50	0.0014	1.08	0.0007	0.72	0.0003
23.00	1.56	0.0014	1.13	0.0008	0.75	0.0003
24.00	1.63	0.0015	1.18	0.0008	0.78	0.0003
25.00	1.70	0.0016	1.23	0.0008	0.82	0.0004
30.00	2.04	0.0019	1.47	0.0010	0.98	0.0004
35.00	2.38	0.0022	1.72	0.0011	1.14	0.0005
40.00	2.72	0.0025	1.96	0.0013	1.31	0.0006
45.00	3.06	0.0028	2.21	0.0015	1.47	0.0007
50.00	3.40	0.0031	2.45	0.0016	1.63	0.0007
55.00	3.74	0.0035	2.70	0.0018	1.80	0.0008
60.00	4.08	0.0038	2.94	0.0020	1.96	0.0009
65.00	4.42	0.0041	3.19	0.0021	2.13	0.0009
70.00	4.76	0.0044	3.43	0.0023	2.29	0.0010
75.00	5.10	0.0047	3.68	0.0025	2.45	0.0011
80.00	5.44	0.0088	3.93	0.0026	2.62	0.0012
85.00	5.78	0.0097	4.17	0.0028	2.78	0.0012
90.00	6.12	0.0107	4.42	0.0029	2.94	0.0013
95.00	6.46	0.0117	4.66	0.0054	3.11	0.0014
100.00	6.80	0.0128	4.91	0.0059	3.27	0.0015
105.00	7.14	0.0139	5.15	0.0064	3.43	0.0015
110.00	7.48	0.0150	5.40	0.0070	3.60	0.0016
115.00	7.82	0.0162	5.64	0.0075	3.76	0.0029
120.00	8.16	0.0174	5.89	0.0081	3.92	0.0031
125.00	8.50	0.0186	6.13	0.0087	4.09	0.0033
130.00	8.84	0.0199	6.38	0.0092	4.25	0.0036
135.00	9.18	0.0213	6.62	0.0099	4.41	0.0038

d [mm]	76.1		88.9		108	
$\dot{V}$ [m³/h]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]	v [m/s]	R [mbar/m]
140.00	9.53	0.0226	6.87	0.0105	4.58	0.0040
145.00	9.87	0.0240	7.11	0.0111	4.74	0.0043
150.00	10.21	0.0254	7.36	0.0118	4.90	0.0045
155.00	–	–	7.61	0.0125	5.07	0.0048
160.00	–	–	7.85	0.0132	5.23	0.0051
165.00	–	–	8.10	0.0139	5.40	0.0053
170.00	–	–	8.34	0.0146	5.56	0.0056
175.00	–	–	8.59	0.0153	5.72	0.0059
180.00	–	–	8.83	0.0161	5.89	0.0062
185.00	–	–	9.08	0.0169	6.05	0.0065
190.00	–	–	9.32	0.0177	6.21	0.0068
195.00	–	–	9.57	0.0185	6.38	0.0071
200.00	–	–	9.81	0.0193	6.54	0.0074
205.00	–	–	10.06	0.0201	6.70	0.0077
210.00	–	–	10.30	0.0210	6.87	0.0081
215.00	–	–	–	–	7.03	0.0084
220.00	–	–	–	–	7.19	0.0087
225.00	–	–	–	–	7.36	0.0091
230.00	–	–	–	–	7.52	0.0094
235.00	–	–	–	–	7.68	0.0098
240.00	–	–	–	–	7.85	0.0101
245.00	–	–	–	–	8.01	0.0105
250.00	–	–	–	–	8.17	0.0109
255.00	–	–	–	–	8.34	0.0112
260.00	–	–	–	–	8.50	0.0116
265.00	–	–	–	–	8.67	0.0120
270.00	–	–	–	–	8.83	0.0124
275.00	–	–	–	–	8.99	0.0128
280.00	–	–	–	–	9.16	0.0132
285.00	–	–	–	–	9.32	0.0136
290.00	–	–	–	–	9.48	0.0140
295.00	–	–	–	–	9.65	0.0144
300.00	–	–	–	–	9.81	0.0148

7 PRESSURE LOSS HEATING OIL EL

7.1 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:	0.0015 mm



——— Pure turbulent or laminar flow

- - - - - Transition between turbulent and laminar flow

Table 62: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 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	0.0170	–	–	–	–	–	–
0.50	0.6	0.002	0.0340	0.001	0.0119	–	–	–	–
0.75	0.9	0.003	0.0509	0.002	0.0178	0.001	0.0078	–	–
1.00	1.2	0.004	0.0679	0.002	0.0238	0.002	0.0104	0.001	0.0046
1.25	1.5	0.005	0.0849	0.003	0.0297	0.002	0.0130	0.001	0.0058
1.50	1.7	0.006	0.1019	0.004	0.0357	0.002	0.0155	0.002	0.0069
1.75	2.0	0.007	0.1188	0.004	0.0416	0.003	0.0181	0.002	0.0081
2.00	2.3	0.008	0.1358	0.005	0.0476	0.003	0.0207	0.002	0.0092
2.25	2.6	0.009	0.1528	0.005	0.0535	0.004	0.0233	0.002	0.0104
2.50	2.9	0.010	0.1698	0.006	0.0594	0.004	0.0259	0.003	0.0115
2.75	3.2	0.011	0.1867	0.007	0.0654	0.004	0.0285	0.003	0.0127
3.00	3.5	0.012	0.2037	0.007	0.0713	0.005	0.0311	0.003	0.0138
3.25	3.8	0.013	0.2207	0.008	0.0773	0.005	0.0337	0.003	0.0150
3.50	4.1	0.014	0.2377	0.009	0.0832	0.006	0.0363	0.004	0.0161
3.75	4.4	0.015	0.2546	0.009	0.0892	0.006	0.0389	0.004	0.0173
4.00	4.7	0.016	0.2716	0.010	0.0951	0.006	0.0414	0.004	0.0184
4.25	4.9	0.017	0.2886	0.010	0.1010	0.007	0.0440	0.005	0.0196
4.50	5.2	0.019	0.3056	0.011	0.1070	0.007	0.0466	0.005	0.0207
4.75	5.5	0.020	0.3226	0.012	0.1129	0.008	0.0492	0.005	0.0219
5.00	5.8	0.021	0.3395	0.012	0.1189	0.008	0.0518	0.005	0.0230
5.50	6.4	0.023	0.3735	0.013	0.1308	0.009	0.0570	0.006	0.0253
6.00	7.0	0.025	0.4074	0.015	0.1427	0.010	0.0622	0.006	0.0276
6.50	7.6	0.027	0.4414	0.016	0.1545	0.010	0.0674	0.007	0.0299
7.00	8.1	0.029	0.4753	0.017	0.1664	0.011	0.0725	0.007	0.0322
7.50	8.7	0.031	0.5093	0.018	0.1783	0.012	0.0777	0.008	0.0345
8.00	9.3	0.033	0.5432	0.019	0.1902	0.013	0.0829	0.009	0.0368
8.50	9.9	0.035	0.5772	0.021	0.2021	0.014	0.0881	0.009	0.0391
9.00	10.5	0.037	0.6112	0.022	0.2140	0.014	0.0933	0.010	0.0414
9.50	11.0	0.039	0.6451	0.023	0.2259	0.015	0.0984	0.010	0.0437
10	11.6	0.041	0.6791	0.024	0.2378	0.016	0.1036	0.011	0.0460
15	17.4	0.062	1.0186	0.037	0.3566	0.024	0.1554	0.016	0.0690
20	23.3	0.082	1.3581	0.049	0.4755	0.032	0.2072	0.021	0.0920
25	29.1	0.103	1.6977	0.061	0.5944	0.040	0.2590	0.027	0.1150
30	34.9	0.123	2.0372	0.073	0.7133	0.048	0.3108	0.032	0.1380
35	40.7	0.144	2.3767	0.085	0.8322	0.056	0.3627	0.037	0.1610
40	46.5	0.165	2.7162	0.097	0.9510	0.064	0.4145	0.043	0.1841
45	52.3	0.185	3.0558	0.110	1.0699	0.072	0.4663	0.048	0.2071
50	58.1	0.206	3.3953	0.122	1.1888	0.080	0.5181	0.054	0.2301
55	64.0	0.226	3.7348	0.134	1.3077	0.088	0.5699	0.059	0.2531
60	69.8	0.247	4.0744	0.146	1.4265	0.096	0.6217	0.064	0.2761
65	75.6	0.267	4.4139	0.158	1.5454	0.104	0.6735	0.070	0.2991
70	81.4	0.288	4.7534	0.170	1.6643	0.112	0.7253	0.075	0.3221
75	87.2	0.308	5.0930	0.183	1.7832	0.120	0.7771	0.080	0.3451
80	93.0	0.329	5.4325	0.195	1.9021	0.129	0.8289	0.086	0.3681
85	98.8	0.350	5.7720	0.207	2.0209	0.137	0.8807	0.091	0.3911
90	104.7	0.370	6.1115	0.219	2.1398	0.145	0.9325	0.096	0.4141
95	110.5	0.391	6.4511	0.231	2.2587	0.153	0.9844	0.102	0.4371
100	116.3	0.411	6.7906	0.243	2.3776	0.161	1.0362	0.107	0.4601

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	0.514	8.4883	0.304	2.9720	0.201	1.2952	0.134	0.5752
150	174.4	–	–	0.365	3.5664	0.241	1.5542	0.161	0.6902
175	203.5	–	–	0.426	4.1608	0.281	1.8133	0.187	0.8052
200	232.6	–	–	0.487	4.7552	0.321	2.0723	0.214	0.9203
250	290.7	–	–	–	–	0.402	2.5904	0.268	1.1503
300	348.8	–	–	–	–	0.482	3.1085	0.321	1.3804
350	407.0	–	–	–	–	–	–	0.375	1.6105
400	465.1	–	–	–	–	–	–	0.428	1.8405
450	523.3	–	–	–	–	–	–	0.482	2.0706

Table 63: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, 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	0.0028	–	–	–	–	–	–
2.00	2.3	0.001	0.0032	–	–	–	–	–	–
2.25	2.6	0.001	0.0036	–	–	–	–	–	–
2.50	2.9	0.002	0.0040	0.001	0.0016	–	–	–	–
2.75	3.2	0.002	0.0043	0.001	0.0018	–	–	–	–
3.00	3.5	0.002	0.0047	0.001	0.0019	–	–	–	–
3.25	3.8	0.002	0.0051	0.001	0.0021	–	–	–	–
3.50	4.1	0.002	0.0055	0.001	0.0023	–	–	–	–
3.75	4.4	0.002	0.0059	0.002	0.0024	0.001	0.0011	–	–
4.00	4.7	0.003	0.0063	0.002	0.0026	0.001	0.0012	–	–
4.25	4.9	0.003	0.0067	0.002	0.0028	0.001	0.0012	–	–
4.50	5.2	0.003	0.0071	0.002	0.0029	0.001	0.0013	–	–
4.75	5.5	0.003	0.0075	0.002	0.0031	0.001	0.0014	–	–
5.00	5.8	0.003	0.0079	0.002	0.0032	0.001	0.0015	–	–
5.50	6.4	0.003	0.0087	0.002	0.0036	0.001	0.0016	–	–
6.00	7.0	0.004	0.0095	0.002	0.0039	0.002	0.0018	–	–
6.50	7.6	0.004	0.0103	0.003	0.0042	0.002	0.0019	0.001	0.0007
7.00	8.1	0.004	0.0111	0.003	0.0045	0.002	0.0021	0.001	0.0007
7.50	8.7	0.005	0.0119	0.003	0.0049	0.002	0.0022	0.001	0.0008
8.00	9.3	0.005	0.0126	0.003	0.0052	0.002	0.0023	0.001	0.0008
8.50	9.9	0.005	0.0134	0.003	0.0055	0.002	0.0025	0.001	0.0009
9.00	10.5	0.006	0.0142	0.004	0.0058	0.002	0.0026	0.001	0.0009
9.50	11.0	0.006	0.0150	0.004	0.0062	0.003	0.0028	0.002	0.0010
10	11.6	0.006	0.0158	0.004	0.0065	0.003	0.0029	0.002	0.0010
15	17.4	0.009	0.0237	0.006	0.0097	0.004	0.0044	0.002	0.0015
20	23.3	0.013	0.0316	0.008	0.0130	0.005	0.0059	0.003	0.0020
25	29.1	0.016	0.0395	0.010	0.0162	0.007	0.0073	0.004	0.0025
30	34.9	0.019	0.0474	0.012	0.0194	0.008	0.0088	0.005	0.0030
35	40.7	0.022	0.0553	0.014	0.0227	0.009	0.0103	0.006	0.0035
40	46.5	0.025	0.0632	0.016	0.0259	0.011	0.0117	0.006	0.0040
45	52.3	0.028	0.0711	0.018	0.0291	0.012	0.0132	0.007	0.0045
50	58.1	0.031	0.0791	0.020	0.0324	0.014	0.0147	0.008	0.0050
55	64.0	0.035	0.0870	0.022	0.0356	0.015	0.0161	0.009	0.0055
60	69.8	0.038	0.0949	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	0.041	0.1028	0.026	0.0421	0.018	0.0191	0.010	0.0065
70	81.4	0.044	0.1107	0.028	0.0453	0.019	0.0205	0.011	0.0070
75	87.2	0.047	0.1186	0.030	0.0486	0.020	0.0220	0.012	0.0075
80	93.0	0.050	0.1265	0.032	0.0518	0.022	0.0235	0.013	0.0080
85	98.8	0.053	0.1344	0.034	0.0550	0.023	0.0249	0.013	0.0085
90	104.7	0.056	0.1423	0.036	0.0583	0.024	0.0264	0.014	0.0090
95	110.5	0.060	0.1502	0.038	0.0615	0.026	0.0279	0.015	0.0095
100	116.3	0.063	0.1581	0.040	0.0648	0.027	0.0294	0.016	0.0100
125	145.3	0.078	0.1976	0.050	0.0810	0.034	0.0367	0.020	0.0125
150	174.4	0.094	0.2372	0.060	0.0971	0.041	0.0440	0.024	0.0151
175	203.5	0.110	0.2767	0.070	0.1133	0.047	0.0514	0.028	0.0176
200	232.6	0.126	0.3162	0.080	0.1295	0.054	0.0587	0.032	0.0201
250	290.7	0.157	0.3953	0.100	0.1619	0.068	0.0734	0.040	0.0251
300	348.8	0.188	0.4743	0.120	0.1943	0.081	0.0881	0.047	0.0301
350	407.0	0.220	0.5534	0.141	0.2267	0.095	0.1027	0.055	0.0351
400	465.1	0.251	0.6324	0.161	0.2590	0.108	0.1174	0.063	0.0402
450	523.3	0.282	0.7115	0.181	0.2914	0.122	0.1321	0.071	0.0452
500	581.4	0.314	0.7905	0.201	0.3238	0.135	0.1468	0.079	0.0502
550	639.5	0.345	0.8696	0.221	0.3562	0.149	0.1614	0.087	0.0552
600	697.7	0.377	0.9486	0.241	0.3886	0.162	0.1761	0.095	0.0602
650	755.8	0.408	1.0277	0.261	0.4209	0.176	0.1908	0.103	0.0652
700	814.0	0.439	1.1067	0.281	0.4533	0.189	0.2055	0.111	0.0703
750	872.1	0.471	1.1858	0.301	0.4857	0.203	0.2201	0.119	0.0753
800	930.2	0.502	1.2648	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	1.2335	0.297	0.3229	0.174	0.1104
1,150	1,337.2	–	–	0.462	1.3294	0.311	0.3376	0.182	0.1154
1,200	1,395.3	–	–	0.482	1.4284	0.324	0.3522	0.190	0.1205
1,250	1,453.5	–	–	0.502	1.5303	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	0.6893	0.213	0.1355
1,400	1,627.9	–	–	–	–	0.379	0.7329	0.221	0.1405
1,450	1,686.0	–	–	–	–	0.392	0.7776	0.229	0.1455
1,500	1,744.2	–	–	–	–	0.406	0.8234	0.237	0.1506
1,550	1,802.3	–	–	–	–	0.419	0.8702	0.245	0.1556
1,600	1,860.5	–	–	–	–	0.433	0.9182	0.253	0.1606
1,650	1,918.6	–	–	–	–	0.446	0.9673	0.261	0.1656
1,700	1,976.7	–	–	–	–	0.460	1.0174	0.269	0.1706
1,750	2,034.9	–	–	–	–	0.473	1.0686	0.277	0.3037
1,800	2,093.0	–	–	–	–	0.487	1.1209	0.285	0.3185
1,850	2,151.2	–	–	–	–	0.500	1.1742	0.293	0.3335
1,900	2,209.3	–	–	–	–	0.514	1.2286	0.300	0.3488
1,950	2,267.4	–	–	–	–	–	–	0.308	0.3645
2,000	2,325.6	–	–	–	–	–	–	0.316	0.3804
2,050	2,383.7	–	–	–	–	–	–	0.324	0.3966

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	0.4131
2,150	2,500.0	–	–	–	–	–	–	0.340	0.4299
2,200	2,558.1	–	–	–	–	–	–	0.348	0.4469
2,250	2,616.3	–	–	–	–	–	–	0.356	0.4643
2,300	2,674.4	–	–	–	–	–	–	0.364	0.4819
2,350	2,732.6	–	–	–	–	–	–	0.372	0.4998
2,400	2,790.7	–	–	–	–	–	–	0.379	0.5179
2,450	2,848.8	–	–	–	–	–	–	0.387	0.5364
2,500	2,907.0	–	–	–	–	–	–	0.395	0.5551
2,550	2,965.1	–	–	–	–	–	–	0.403	0.5741
2,600	3,023.3	–	–	–	–	–	–	0.411	0.5933
2,650	3,081.4	–	–	–	–	–	–	0.419	0.6128
2,700	3,139.5	–	–	–	–	–	–	0.427	0.6326
2,750	3,197.7	–	–	–	–	–	–	0.435	0.6527
2,800	3,255.8	–	–	–	–	–	–	0.443	0.6730
2,850	3,314.0	–	–	–	–	–	–	0.451	0.6936
2,900	3,372.1	–	–	–	–	–	–	0.459	0.7145
2,950	3,430.2	–	–	–	–	–	–	0.466	0.7356
3,000	3,488.4	–	–	–	–	–	–	0.474	0.7570
3,100	3,604.7	–	–	–	–	–	–	0.490	0.8005
3,200	3,720.9	–	–	–	–	–	–	0.506	0.8451

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Table 64: Pressure loss for Geberit Mapress stainless steel system pipes 1.4401, heating oil EL 20 °C, d76.1–108 mm

d [mm]		76.1		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]
15	17.4	0.001	0.0004	–	–	–	–
20	23.3	0.002	0.0005	0.001	0.0003	–	–
25	29.1	0.002	0.0006	0.001	0.0003	–	–
30	34.9	0.002	0.0008	0.002	0.0004	0.001	0.0002
35	40.7	0.003	0.0009	0.002	0.0005	0.001	0.0002
40	46.5	0.003	0.0010	0.002	0.0005	0.002	0.0002
45	52.3	0.004	0.0011	0.003	0.0006	0.002	0.0003
50	58.1	0.004	0.0013	0.003	0.0007	0.002	0.0003
55	64.0	0.004	0.0014	0.003	0.0007	0.002	0.0003
60	69.8	0.005	0.0015	0.003	0.0008	0.002	0.0003
65	75.6	0.005	0.0016	0.004	0.0008	0.002	0.0004
70	81.4	0.006	0.0018	0.004	0.0009	0.003	0.0004
75	87.2	0.006	0.0019	0.004	0.0010	0.003	0.0004
80	93.0	0.006	0.0020	0.005	0.0010	0.003	0.0005
85	98.8	0.007	0.0021	0.005	0.0011	0.003	0.0005
90	104.7	0.007	0.0023	0.005	0.0012	0.003	0.0005
95	110.5	0.008	0.0024	0.005	0.0012	0.004	0.0006
100	116.3	0.008	0.0025	0.006	0.0013	0.004	0.0006
125	145.3	0.010	0.0031	0.007	0.0016	0.005	0.0007
150	174.4	0.012	0.0038	0.009	0.0020	0.006	0.0009
175	203.5	0.014	0.0044	0.010	0.0023	0.007	0.0010
200	232.6	0.016	0.0050	0.011	0.0026	0.008	0.0012

d [mm]		76.1		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]
250	290.7	0.020	0.0063	0.014	0.0033	0.010	0.0015
300	348.8	0.024	0.0075	0.017	0.0039	0.011	0.0017
350	407.0	0.028	0.0088	0.020	0.0046	0.013	0.0020
400	465.1	0.032	0.0101	0.023	0.0052	0.015	0.0023
450	523.3	0.036	0.0113	0.026	0.0059	0.017	0.0026
500	581.4	0.040	0.0126	0.029	0.0065	0.019	0.0029
550	639.5	0.044	0.0138	0.031	0.0072	0.021	0.0032
600	697.7	0.047	0.0151	0.034	0.0078	0.023	0.0035
650	755.8	0.051	0.0163	0.037	0.0085	0.025	0.0038
700	814.0	0.055	0.0176	0.040	0.0091	0.027	0.0041
750	872.1	0.059	0.0188	0.043	0.0098	0.029	0.0044
800	930.2	0.063	0.0201	0.046	0.0105	0.030	0.0046
850	988.4	0.067	0.0214	0.048	0.0111	0.032	0.0049
900	1,046.5	0.071	0.0226	0.051	0.0118	0.034	0.0052
950	1,104.7	0.075	0.0239	0.054	0.0124	0.036	0.0055
1,000	1,162.8	0.079	0.0251	0.057	0.0131	0.038	0.0058
1,050	1,220.9	0.083	0.0264	0.060	0.0137	0.040	0.0061
1,100	1,279.1	0.087	0.0276	0.063	0.0144	0.042	0.0064
1,150	1,337.2	0.091	0.0289	0.066	0.0150	0.044	0.0067
1,200	1,395.3	0.095	0.0302	0.068	0.0157	0.046	0.0070
1,250	1,453.5	0.099	0.0314	0.071	0.0163	0.048	0.0073
1,300	1,511.6	0.103	0.0327	0.074	0.0170	0.049	0.0075
1,350	1,569.8	0.107	0.0339	0.077	0.0176	0.051	0.0078
1,400	1,627.9	0.111	0.0352	0.080	0.0183	0.053	0.0081
1,450	1,686.0	0.115	0.0364	0.083	0.0190	0.055	0.0084
1,500	1,744.2	0.119	0.0377	0.086	0.0196	0.057	0.0087
1,550	1,802.3	0.123	0.0389	0.088	0.0203	0.059	0.0090
1,600	1,860.5	0.127	0.0402	0.091	0.0209	0.061	0.0093
1,650	1,918.6	0.131	0.0415	0.094	0.0216	0.063	0.0096
1,700	1,976.7	0.134	0.0427	0.097	0.0222	0.065	0.0099
1,750	2,034.9	0.138	0.0440	0.100	0.0229	0.067	0.0102
1,800	2,093.0	0.142	0.0452	0.103	0.0235	0.068	0.0104
1,850	2,151.2	0.146	0.0465	0.106	0.0242	0.070	0.0107
1,900	2,209.3	0.150	0.0477	0.108	0.0248	0.072	0.0110
1,950	2,267.4	0.154	0.0490	0.111	0.0255	0.074	0.0113
2,000	2,325.6	0.158	0.0503	0.114	0.0261	0.076	0.0116
2,050	2,383.7	0.162	0.0515	0.117	0.0268	0.078	0.0119
2,100	2,441.9	0.166	0.0528	0.120	0.0274	0.080	0.0122
2,150	2,500.0	0.170	0.0540	0.123	0.0281	0.082	0.0125
2,200	2,558.1	0.174	0.0553	0.126	0.0288	0.084	0.0128
2,250	2,616.3	0.178	0.0565	0.128	0.0294	0.086	0.0131
2,300	2,674.4	0.182	0.0578	0.131	0.0301	0.087	0.0134
2,350	2,732.6	0.186	0.0591	0.134	0.0307	0.089	0.0136
2,400	2,790.7	0.190	0.0603	0.137	0.0314	0.091	0.0139
2,450	2,848.8	0.194	0.1057	0.140	0.0320	0.093	0.0142
2,500	2,907.0	0.198	0.1094	0.143	0.0327	0.095	0.0145
2,550	2,965.1	0.202	0.1131	0.145	0.0333	0.097	0.0148
2,600	3,023.3	0.206	0.1168	0.148	0.0340	0.099	0.0151
2,650	3,081.4	0.210	0.1207	0.151	0.0346	0.101	0.0154

d [mm]		76.1		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]
2,700	3,139.5	0.214	0.1245	0.154	0.0353	0.103	0.0157
2,750	3,197.7	0.218	0.1284	0.157	0.0359	0.105	0.0160
2,800	3,255.8	0.222	0.1324	0.160	0.0366	0.106	0.0163
2,850	3,314.0	0.225	0.1364	0.163	0.0634	0.108	0.0165
2,900	3,372.1	0.229	0.1405	0.165	0.0653	0.110	0.0168
2,950	3,430.2	0.233	0.1446	0.168	0.0672	0.112	0.0171
3,000	3,488.4	0.237	0.1488	0.171	0.0692	0.114	0.0174
3,100	3,604.7	0.245	0.1573	0.177	0.0731	0.118	0.0180
3,200	3,720.9	0.253	0.1660	0.183	0.0771	0.122	0.0186
3,300	3,837.2	0.261	0.1748	0.188	0.0812	0.125	0.0192
3,400	3,953.5	0.269	0.1839	0.194	0.0854	0.129	0.0197
3,500	4,069.8	0.277	0.1932	0.200	0.0897	0.133	0.0347
3,600	4,186.0	0.285	0.2027	0.205	0.0941	0.137	0.0363
3,700	4,302.3	0.293	0.2123	0.211	0.0985	0.141	0.0381
3,800	4,418.6	0.301	0.2222	0.217	0.1031	0.144	0.0398
3,900	4,534.9	0.309	0.2322	0.223	0.1077	0.148	0.0416
4,000	4,651.2	0.316	0.2424	0.228	0.1125	0.152	0.0434
4,100	4,767.4	0.324	0.2528	0.234	0.1173	0.156	0.0452
4,200	4,883.7	0.332	0.2634	0.240	0.1222	0.160	0.0471
4,300	5,000.0	0.340	0.2742	0.245	0.1272	0.163	0.0490
4,400	5,116.3	0.348	0.2852	0.251	0.1322	0.167	0.0510
4,500	5,232.6	0.356	0.2963	0.257	0.1374	0.171	0.0530
4,600	5,348.8	0.364	0.3077	0.262	0.1426	0.175	0.0550
4,700	5,465.1	0.372	0.3192	0.268	0.1479	0.179	0.0570
4,800	5,581.4	0.380	0.3309	0.274	0.1533	0.183	0.0591
4,900	5,697.7	0.388	0.3427	0.280	0.1588	0.186	0.0612
5,000	5,814.0	0.396	0.3548	0.285	0.1644	0.190	0.0633
5,100	5,930.2	0.403	0.3670	0.291	0.1700	0.194	0.0655
5,200	6,046.5	0.411	0.3794	0.297	0.1757	0.198	0.0677
5,300	6,162.8	0.419	0.3920	0.302	0.1815	0.202	0.0699
5,400	6,279.1	0.427	0.4048	0.308	0.1874	0.205	0.0722
5,500	6,395.3	0.435	0.4177	0.314	0.1934	0.209	0.0744
5,600	6,511.6	0.443	0.4308	0.320	0.1994	0.213	0.0768
5,700	6,627.9	0.451	0.4441	0.325	0.2056	0.217	0.0791
5,800	6,744.2	0.459	0.4575	0.331	0.2118	0.221	0.0815
5,900	6,860.5	0.467	0.4712	0.337	0.2181	0.224	0.0839
6,000	6,976.7	0.475	0.4849	0.342	0.2244	0.228	0.0863
6,100	7,093.0	0.483	0.4989	0.348	0.2309	0.232	0.0888
6,200	7,209.3	0.490	0.5130	0.354	0.2374	0.236	0.0913
6,300	7,325.6	0.498	0.5273	0.359	0.2440	0.240	0.0938
6,400	7,441.9	0.506	0.5418	0.365	0.2506	0.243	0.0964
6,500	7,558.1	0.514	0.5565	0.371	0.2574	0.247	0.0990
7,000	8,139.5	–	–	0.399	0.2923	0.266	0.1123
7,500	8,720.9	–	–	0.428	0.3291	0.285	0.1264
8,000	9,302.3	–	–	0.456	0.3677	0.304	0.1412
8,500	9,883.7	–	–	0.485	0.4082	0.323	0.1566
9,000	10,465.1	–	–	0.513	0.4505	0.342	0.1728
9,500	11,046.5	–	–	–	–	0.361	0.1896
10,000	11,627.9	–	–	–	–	0.380	0.2071

d [mm]		76.1		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]
10,500	12,209.3	–	–	–	–	0.399	0.2253
11,000	12,790.7	–	–	–	–	0.418	0.2441
11,500	13,372.1	–	–	–	–	0.437	0.2636
12,000	13,953.5	–	–	–	–	0.456	0.2837
12,500	14,534.9	–	–	–	–	0.475	0.3044
13,000	15,116.3	–	–	–	–	0.494	0.3258
13,500	15,697.7	–	–	–	–	0.513	0.3478

8 GENERAL INFORMATION

8.1 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.

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