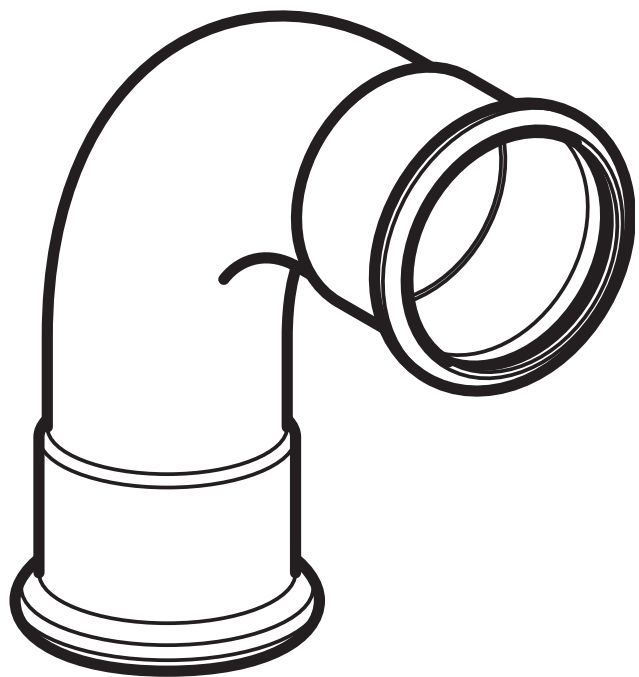


Product Information

Mapress Stainless Steel



Please be aware that this is only an excerpt of the product information.
The chapters included are marked with yellow on the table of contents.

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Alteration index

26.01.2007 / Creation / Dokuwerk Armin Müller

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5.2.7 Pressure loss, Mapress Stainless Steel sanitary applications

5.2.7.1 Pressure loss Mapress Stainless Steel sanitary applications cold water

- Medium: Water 10 °C
- Density: 999.7 kg/m³
- Viscosity: 0.0013 Pa·s
- Surface roughness: 0.0015 mm

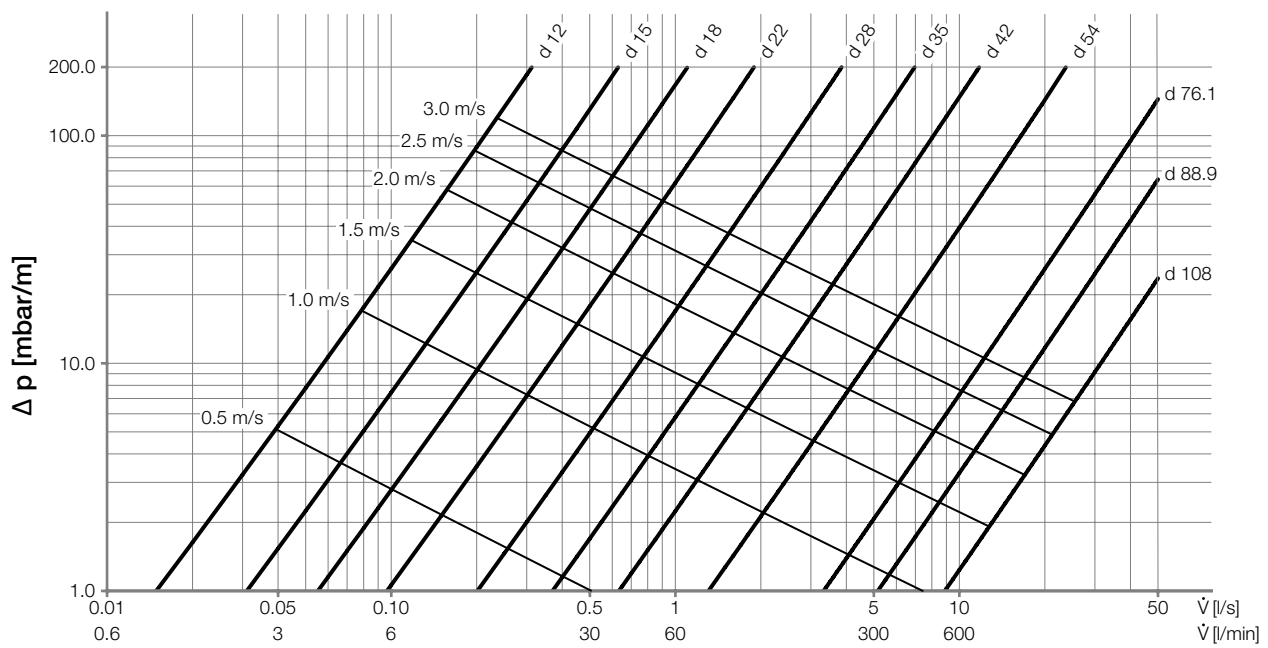


Figure 20: Pressure loss Mapress Stainless Steel sanitary applications cold water

Table 36: Pressure loss Mapress Stainless Steel sanitary applications cold water, depending on the volume flow, d 12 - d 35

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [l/s]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.01	0.1	0.5	0.1	0.2		0.1						
0.02	0.3	1.6	0.2	0.5	0.1	0.2	0.1	0.1				
0.03	0.4	3.2	0.2	0.9	0.1	0.4	0.1	0.1	0.1			
0.04	0.5	5.3	0.3	1.5	0.2	0.6	0.1	0.2	0.1	0.1		
0.05	0.6	7.8	0.4	2.2	0.2	0.8	0.2	0.3	0.1	0.1	0.1	
0.06	0.8	10.7	0.5	3.1	0.3	1.2	0.2	0.4	0.1	0.1	0.1	
0.07	0.9	14.0	0.5	4.0	0.3	1.5	0.2	0.6	0.1	0.2	0.1	0.1
0.08	1.0	17.6	0.6	5.0	0.4	1.9	0.3	0.7	0.2	0.2	0.1	0.1
0.09	1.1	21.6	0.7	6.2	0.4	2.3	0.3	0.9	0.2	0.3	0.1	0.1
0.10	1.3	26.0	0.8	7.4	0.5	2.8	0.3	1.1	0.2	0.3	0.1	0.1
0.15	1.9	53.3	1.1	15.1	0.7	5.6	0.5	2.1	0.3	0.6	0.2	0.2
0.20	2.5	89.1	1.5	25.1	1.0	9.3	0.7	3.5	0.4	1.0	0.2	0.3
0.25	3.2	133.1	1.9	37.4	1.2	13.8	0.8	5.2	0.5	1.5	0.3	0.5
0.30	3.8	185.1	2.3	51.8	1.5	19.0	1.0	7.2	0.6	2.0	0.4	0.7
0.35	4.5	245.0	2.6	68.3	1.7	25.0	1.2	9.4	0.7	2.6	0.4	0.9
0.40	5.1	312.7	3.0	86.9	2.0	31.8	1.3	12.0	0.8	3.3	0.5	1.1
0.45	5.7	388.1	3.4	107.5	2.2	39.2	1.5	14.7	0.9	4.1	0.6	1.4
0.50	6.4	471.1	3.8	130.1	2.5	47.4	1.7	17.8	1.0	4.9	0.6	1.7
0.55					2.7	56.3	1.8	21.1	1.1	5.8	0.7	2.0
0.60					3.0	65.9	2.0	24.7	1.2	6.8	0.7	2.3
0.65					3.2	76.2	2.2	28.5	1.3	7.9	0.8	2.7
0.70					3.5	87.1	2.3	32.5	1.4	9.0	0.9	3.1
0.75					3.7	98.8	2.5	36.8	1.5	10.1	0.9	3.5
0.80					4.0	111.1	2.7	41.4	1.6	11.4	1.0	3.9
0.85					4.2	124.1	2.8	46.2	1.7	12.7	1.1	4.3
0.90					4.5	137.8	3.0	51.2	1.7	14.1	1.1	4.8
0.95					4.7	152.1	3.1	56.5	1.8	15.5	1.2	5.3
1.00							3.3	62.0	1.9	17.0	1.2	5.8
1.05							3.5	67.8	2.0	18.5	1.3	6.3
1.10							3.6	73.7	2.1	20.2	1.4	6.9
1.15							3.8	80.0	2.2	21.8	1.4	7.4
1.20							4.0	86.4	2.3	23.6	1.5	8.0
1.25							4.1	93.1	2.4	25.4	1.6	8.6
1.30							4.3	100.0	2.5	27.3	1.6	9.3
1.40							4.6	114.6	2.7	31.2	1.7	10.6
1.50							5.0	130.1	2.9	35.3	1.9	12.0
1.60							5.3	146.5	3.1	39.7	2.0	13.5
1.70							5.6	163.8	3.3	44.3	2.1	15.0
1.80							6.0	182.0	3.5	49.2	2.2	16.6
1.90							6.3	201.1	3.7	54.3	2.4	18.4
2.00							6.6	221.1	3.9	59.6	2.5	20.1
2.10									4.1	65.2	2.6	22.0
2.20									4.3	71.0	2.7	23.9

d [mm]	12		15		18		22		28		35	
di [mm]	10		13		16		19.6		25.6		32	
\dot{V} [l/s]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
2.30									4.5	77.1	2.9	26.0
2.40									4.7	83.3	3.0	28.0
2.50									4.9	89.8	3.1	30.2
2.60									5.1	96.5	3.2	32.4
2.70									5.2	103.5	3.4	34.8
2.80									5.4	110.7	3.5	37.1
2.90									5.6	118.1	3.6	39.6
3.00									5.8	125.7	3.7	42.1
3.10									6.0	133.6	3.9	44.7
3.20									6.2	141.6	4.0	47.4
3.30									6.4	150.0	4.1	50.2
3.40									6.6	158.5	4.2	53.0
3.50									6.8	167.3	4.4	55.9
3.60									7.0	176.2	4.5	58.9
3.70									7.2	185.5	4.6	61.9
3.80									7.4	194.9	4.7	65.0
3.90									7.6	204.5	4.8	68.2
4.00									7.8	214.4	5.0	71.5
4.10									8.0	224.5	5.1	74.8
4.20											5.2	78.2
4.30											5.3	81.7
4.40											5.5	85.2
4.50											5.6	88.8
4.60											5.7	92.5
4.70											5.8	96.3
4.80											6.0	100.1
4.90											6.1	104.0
5.00											6.2	107.9
5.50											6.8	128.8
6.00											7.5	151.5
6.50											8.1	175.9
7.00											8.7	202.0
7.50											9.3	229.9
8.00											9.9	259.5

Table 37: Pressure loss Mapress Stainless Steel sanitary applications cold water, depending on the volume flow, d 42 - d 108

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [l/s]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.06	0.1									
0.07	0.1									
0.08	0.1									
0.09	0.1									
0.10	0.1									
0.15	0.1	0.1	0.1							
0.20	0.2	0.1	0.1							
0.25	0.2	0.2	0.1	0.1	0.1					
0.30	0.3	0.3	0.1	0.1	0.1		0.1			
0.35	0.3	0.4	0.2	0.1	0.1		0.1			
0.40	0.3	0.4	0.2	0.1	0.1		0.1			
0.45	0.4	0.5	0.2	0.2	0.1		0.1		0.1	
0.50	0.4	0.7	0.2	0.2	0.1		0.1		0.1	
0.55	0.5	0.8	0.3	0.2	0.1		0.1		0.1	
0.60	0.5	0.9	0.3	0.3	0.1		0.1		0.1	
0.65	0.5	1.0	0.3	0.3	0.2	0.1	0.1		0.1	
0.70	0.6	1.2	0.3	0.3	0.2	0.1	0.1		0.1	
0.75	0.6	1.3	0.4	0.4	0.2	0.1	0.1		0.1	
0.80	0.7	1.5	0.4	0.4	0.2	0.1	0.1		0.1	
0.85	0.7	1.7	0.4	0.5	0.2	0.1	0.2		0.1	
0.90	0.8	1.9	0.4	0.5	0.2	0.1	0.2		0.1	
0.95	0.8	2.0	0.5	0.6	0.2	0.1	0.2	0.1	0.1	
1.00	0.8	2.2	0.5	0.6	0.2	0.1	0.2	0.1	0.1	
1.05	0.9	2.4	0.5	0.7	0.3	0.1	0.2	0.1	0.1	
1.10	0.9	2.7	0.5	0.7	0.3	0.1	0.2	0.1	0.1	
1.15	1.0	2.9	0.6	0.8	0.3	0.2	0.2	0.1	0.1	
1.20	1.0	3.1	0.6	0.9	0.3	0.2	0.2	0.1	0.1	
1.25	1.0	3.3	0.6	0.9	0.3	0.2	0.2	0.1	0.1	
1.30	1.1	3.6	0.6	1.0	0.3	0.2	0.2	0.1	0.2	
1.40	1.2	4.1	0.7	1.1	0.3	0.2	0.2	0.1	0.2	
1.50	1.3	4.6	0.7	1.3	0.4	0.2	0.3	0.1	0.2	
1.60	1.3	5.2	0.8	1.4	0.4	0.3	0.3	0.1	0.2	
1.70	1.4	5.8	0.8	1.6	0.4	0.3	0.3	0.1	0.2	0.1
1.80	1.5	6.4	0.9	1.8	0.4	0.3	0.3	0.2	0.2	0.1
1.90	1.6	7.1	0.9	1.9	0.5	0.4	0.3	0.2	0.2	0.1
2.00	1.7	7.7	1.0	2.1	0.5	0.4	0.4	0.2	0.2	0.1
2.10	1.8	8.4	1.0	2.3	0.5	0.4	0.4	0.2	0.2	0.1
2.20	1.8	9.2	1.1	2.5	0.5	0.5	0.4	0.2	0.3	0.1
2.30	1.9	9.9	1.1	2.7	0.6	0.5	0.4	0.2	0.3	0.1
2.40	2.0	10.7	1.2	2.9	0.6	0.6	0.4	0.3	0.3	0.1
2.50	2.1	11.6	1.2	3.2	0.6	0.6	0.4	0.3	0.3	0.1
2.60	2.2	12.4	1.3	3.4	0.6	0.6	0.5	0.3	0.3	0.1
2.70	2.3	13.3	1.3	3.6	0.7	0.7	0.5	0.3	0.3	0.1

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d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [l/s]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
2.80	2.3	14.2	1.4	3.9	0.7	0.7	0.5	0.3	0.3	0.1
2.90	2.4	15.1	1.4	4.1	0.7	0.8	0.5	0.4	0.3	0.1
3.00	2.5	16.1	1.5	4.4	0.7	0.8	0.5	0.4	0.4	0.1
3.10	2.6	17.1	1.5	4.7	0.8	0.9	0.5	0.4	0.4	0.2
3.20	2.7	18.1	1.6	4.9	0.8	0.9	0.6	0.4	0.4	0.2
3.30	2.8	19.1	1.6	5.2	0.8	1.0	0.6	0.5	0.4	0.2
3.40	2.8	20.2	1.7	5.5	0.8	1.0	0.6	0.5	0.4	0.2
3.50	2.9	21.3	1.7	5.8	0.9	1.1	0.6	0.5	0.4	0.2
3.60	3.0	22.4	1.8	6.1	0.9	1.2	0.6	0.5	0.4	0.2
3.70	3.1	23.6	1.8	6.4	0.9	1.2	0.7	0.6	0.4	0.2
3.80	3.2	24.7	1.9	6.7	0.9	1.3	0.7	0.6	0.4	0.2
3.90	3.3	25.9	1.9	7.1	1.0	1.3	0.7	0.6	0.5	0.2
4.00	3.3	27.2	2.0	7.4	1.0	1.4	0.7	0.6	0.5	0.2
4.10	3.4	28.4	2.0	7.7	1.0	1.5	0.7	0.7	0.5	0.3
4.20	3.5	29.7	2.1	8.1	1.0	1.5	0.7	0.7	0.5	0.3
4.30	3.6	31.0	2.1	8.4	1.1	1.6	0.8	0.7	0.5	0.3
4.40	3.7	32.3	2.2	8.8	1.1	1.6	0.8	0.8	0.5	0.3
4.50	3.8	33.7	2.2	9.1	1.1	1.7	0.8	0.8	0.5	0.3
4.60	3.9	35.1	2.3	9.5	1.1	1.8	0.8	0.8	0.5	0.3
4.70	3.9	36.5	2.3	9.9	1.2	1.9	0.8	0.8	0.6	0.3
4.80	4.0	37.9	2.3	10.3	1.2	1.9	0.8	0.9	0.6	0.3
4.90	4.1	39.4	2.4	10.7	1.2	2.0	0.9	0.9	0.6	0.3
5.00	4.2	40.9	2.4	11.1	1.2	2.1	0.9	0.9	0.6	0.4
5.50	4.6	48.7	2.7	13.2	1.3	2.5	1.0	1.1	0.6	0.4
6.00	5.0	57.2	2.9	15.4	1.5	2.9	1.1	1.3	0.7	0.5
6.50	5.4	66.3	3.2	17.9	1.6	3.3	1.1	1.5	0.8	0.6
7.00	5.9	76.1	3.4	20.5	1.7	3.8	1.2	1.7	0.8	0.7
7.50	6.3	86.5	3.7	23.2	1.8	4.3	1.3	2.0	0.9	0.7
8.00	6.7	97.5	3.9	26.1	2.0	4.9	1.4	2.2	0.9	0.8
8.50	7.1	109.1	4.2	29.2	2.1	5.4	1.5	2.5	1.0	0.9
9.00	7.5	121.4	4.4	32.5	2.2	6.0	1.6	2.7	1.1	1.0
9.50	8.0	134.3	4.7	35.9	2.3	6.6	1.7	3.0	1.1	1.1
10.00	8.4	147.8	4.9	39.4	2.4	7.3	1.8	3.3	1.2	1.2
10.50	8.8	162.0	5.1	43.1	2.6	8.0	1.9	3.6	1.2	1.4
11.00	9.2	176.7	5.4	47.0	2.7	8.7	1.9	3.9	1.3	1.5
11.50	9.6	192.1	5.6	51.1	2.8	9.4	2.0	4.3	1.4	1.6
12.00	10.0	208.1	5.9	55.3	2.9	10.2	2.1	4.6	1.4	1.7
12.50	10.5	224.7	6.1	59.6	3.1	10.9	2.2	4.9	1.5	1.9
13.00	10.9	241.9	6.4	64.1	3.2	11.8	2.3	5.3	1.5	2.0
13.50	11.3	259.8	6.6	68.8	3.3	12.6	2.4	5.7	1.6	2.1
14.00	11.7	278.2	6.9	73.6	3.4	13.5	2.5	6.1	1.6	2.3
14.50	12.1	297.3	7.1	78.6	3.6	14.4	2.6	6.5	1.7	2.4
15.00			7.3	83.7	3.7	15.3	2.6	6.9	1.8	2.6

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [l/s]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
15.50			7.6	89.0	3.8	16.3	2.7	7.3	1.8	2.7
16.00			7.8	94.4	3.9	17.2	2.8	7.8	1.9	2.9
16.50			8.1	100.0	4.0	18.2	2.9	8.2	1.9	3.1
17.00			8.3	105.8	4.2	19.3	3.0	8.7	2.0	3.2
17.50			8.6	111.7	4.3	20.3	3.1	9.2	2.1	3.4
18.00			8.8	117.8	4.4	21.4	3.2	9.6	2.1	3.6
18.50			9.1	124.0	4.5	22.5	3.3	10.1	2.2	3.8
19.00			9.3	130.3	4.7	23.7	3.4	10.6	2.2	4.0
19.50			9.5	136.9	4.8	24.8	3.4	11.2	2.3	4.2
20.00			9.8	143.5	4.9	26.0	3.5	11.7	2.4	4.4
21.00			10.3	157.3	5.1	28.5	3.7	12.8	2.5	4.8
22.00			10.8	171.7	5.4	31.0	3.9	13.9	2.6	5.2
23.00			11.3	186.8	5.6	33.7	4.1	15.1	2.7	5.6
24.00			11.7	202.4	5.9	36.5	4.2	16.4	2.8	6.1
25.00					6.1	39.4	4.4	17.7	2.9	6.6
26.00					6.4	42.4	4.6	19.0	3.1	7.0
27.00					6.6	45.4	4.8	20.4	3.2	7.5
28.00					6.9	48.6	4.9	21.8	3.3	8.1
29.00					7.1	51.9	5.1	23.2	3.4	8.6
30.00					7.3	55.3	5.3	24.7	3.5	9.2
31.00					7.6	58.8	5.5	26.3	3.6	9.7
32.00					7.8	62.4	5.7	27.9	3.8	10.3
33.00					8.1	66.1	5.8	29.5	3.9	10.9
34.00					8.3	69.9	6.0	31.2	4.0	11.5
35.00					8.6	73.8	6.2	33.0	4.1	12.2
36.00					8.8	77.8	6.4	34.7	4.2	12.8
37.00					9.1	82.0	6.5	36.6	4.4	13.5
38.00					9.3	86.2	6.7	38.4	4.5	14.2
39.00					9.6	90.5	6.9	40.3	4.6	14.9
40.00					9.8	94.9	7.1	42.3	4.7	15.6
41.00					10.0	99.4	7.2	44.3	4.8	16.3
42.00					10.3	104.0	7.4	46.3	4.9	17.1
43.00					10.5	108.8	7.6	48.4	5.1	17.8
44.00					10.8	113.6	7.8	50.5	5.2	18.6
45.00					11.0	118.5	7.9	52.7	5.3	19.4
46.00					11.3	123.5	8.1	54.9	5.4	20.2
47.00					11.5	128.7	8.3	57.2	5.5	21.0
48.00					11.8	133.9	8.5	59.5	5.7	21.9
49.00					12.0	139.2	8.7	61.8	5.8	22.7
50.00					12.2	144.6	8.8	64.2	5.9	23.6

5.2.7.2 Pressure loss, Mapress Stainless Steel sanitary applications hot water

- Medium: Water 60 °C
- Density: 983.2 kg/m³
- Viscosity: 0.0005 Pa·s
- Surface roughness: 0.0015 mm

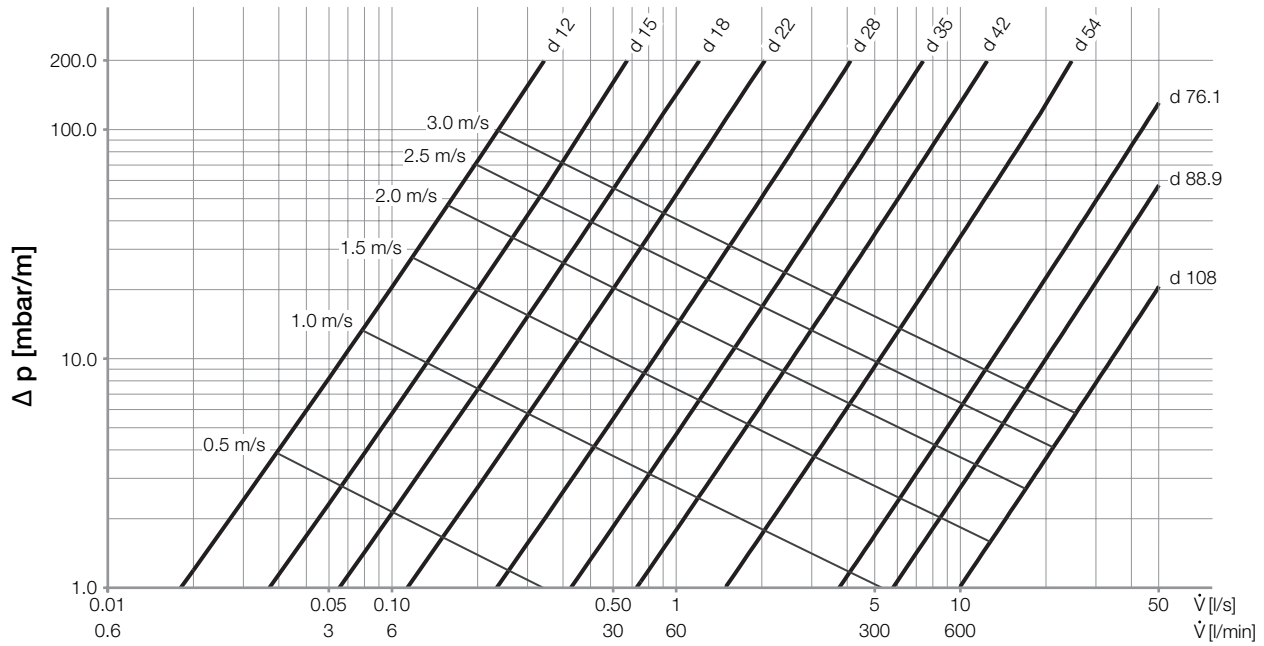


Figure 21: Pressure loss, Mapress Stainless Steel sanitary applications hot water

Table 38: Pressure loss Mapress Stainless Steel sanitary applications hot water, depending on the volume flow, d 12 - d 35

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [l/s]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.01	0.1	0.4	0.1	0.1								
0.02	0.3	1.2	0.2	0.3	0.1	0.1	0.1					
0.03	0.4	2.4	0.2	0.7	0.1	0.3	0.1	0.1	0.1			
0.04	0.5	4.0	0.3	1.1	0.2	0.4	0.1	0.2	0.1			
0.05	0.6	5.9	0.4	1.7	0.2	0.6	0.2	0.2	0.1	0.1	0.1	
0.06	0.8	8.2	0.5	2.3	0.3	0.9	0.2	0.3	0.1	0.1	0.1	
0.07	0.9	10.8	0.5	3.1	0.3	1.1	0.2	0.4	0.1	0.1	0.1	
0.08	1.0	13.7	0.6	3.9	0.4	1.4	0.3	0.5	0.2	0.2	0.1	0.1
0.09	1.1	17.0	0.7	4.8	0.4	1.8	0.3	0.7	0.2	0.2	0.1	0.1
0.10	1.3	20.6	0.8	5.8	0.5	2.1	0.3	0.8	0.2	0.2	0.1	0.1
0.15	1.9	43.0	1.1	11.9	0.7	4.4	0.5	1.6	0.3	0.5	0.2	0.2
0.20	2.5	73.0	1.5	20.1	1.0	7.3	0.7	2.7	0.4	0.8	0.2	0.3
0.25	3.2	110.5	1.9	30.3	1.2	11.0	0.8	4.1	0.5	1.1	0.3	0.4
0.30	3.8	155.4	2.3	42.3	1.5	15.3	1.0	5.7	0.6	1.6	0.4	0.5
0.35	4.5	207.5	2.6	56.3	1.7	20.3	1.2	7.5	0.7	2.1	0.4	0.7
0.40	5.1	267.0	3.0	72.1	2.0	25.9	1.3	9.6	0.8	2.6	0.5	0.9
0.45	5.7	333.7	3.4	89.9	2.2	32.2	1.5	11.9	0.9	3.2	0.6	1.1
0.50	6.4	407.6	3.8	109.4	2.5	39.1	1.7	14.4	1.0	3.9	0.6	1.3
0.55					2.7	46.7	1.8	17.2	1.1	4.7	0.7	1.6
0.60					3.0	54.8	2.0	20.2	1.2	5.5	0.7	1.8
0.65					3.2	63.7	2.2	23.4	1.3	6.3	0.8	2.1
0.70					3.5	73.1	2.3	26.8	1.4	7.2	0.9	2.4
0.75					3.7	83.2	2.5	30.4	1.5	8.2	0.9	2.8
0.80					4.0	94.0	2.7	34.3	1.6	9.2	1.0	3.1
0.85					4.2	105.3	2.8	38.4	1.7	10.3	1.1	3.5
0.90					4.5	117.3	3.0	42.7	1.7	11.5	1.1	3.9
0.95					4.7	129.9	3.1	47.3	1.8	12.7	1.2	4.3
1.00							3.3	52.0	1.9	13.9	1.2	4.7
1.05							3.5	57.0	2.0	15.2	1.3	5.1
1.10							3.6	62.2	2.1	16.6	1.4	5.6
1.15							3.8	67.6	2.2	18.0	1.4	6.0
1.20							4.0	73.2	2.3	19.5	1.5	6.5
1.25							4.1	79.1	2.4	21.0	1.6	7.0
1.30							4.3	85.1	2.5	22.6	1.6	7.6
1.40							4.6	97.9	2.7	26.0	1.7	8.7
1.50							5.0	111.6	2.9	29.5	1.9	9.8
1.60							5.3	126.1	3.1	33.3	2.0	11.1
1.70							5.6	141.4	3.3	37.3	2.1	12.4
1.80							6.0	157.7	3.5	41.5	2.2	13.8
1.90							6.3	174.8	3.7	46.0	2.4	15.2
2.00							6.6	192.7	3.9	50.6	2.5	16.8
2.10									4.1	55.5	2.6	18.3
2.20									4.3	60.6	2.7	20.0

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [l/s]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
2.30									4.5	65.9	2.9	21.7
2.40									4.7	71.4	3.0	23.5
2.50									4.9	77.1	3.1	25.4
2.60									5.1	83.1	3.2	27.3
2.70									5.2	89.2	3.4	29.3
2.80									5.4	95.6	3.5	31.4
2.90									5.6	102.2	3.6	33.5
3.00									5.8	109.0	3.7	35.8
3.10									6.0	116.0	3.9	38.0
3.20									6.2	123.2	4.0	40.4
3.30									6.4	130.7	4.1	42.8
3.40									6.6	138.4	4.2	45.3
3.50									6.8	146.2	4.4	47.8
3.60									7.0	154.3	4.5	50.4
3.70									7.2	162.6	4.6	53.1
3.80									7.4	171.1	4.7	55.8
3.90									7.6	179.9	4.8	58.7
4.00									7.8	188.8	5.0	61.5
4.10									8.0	198.0	5.1	64.5
4.20											5.2	67.5
4.30											5.3	70.6
4.40											5.5	73.7
4.50											5.6	77.0
4.60											5.7	80.3
4.70											5.8	83.6
4.80											6.0	87.0
4.90											6.1	90.5
5.00											6.2	94.1
5.50											6.8	112.8
6.00											7.5	133.3
6.50											8.1	155.4
7.00											8.7	179.2
7.50											9.3	204.6
8.00											9.9	231.8

Table 39: Pressure loss Mapress Stainless Steel sanitary applications hot water, depending on the volume flow, d 42 - d 108

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [l/s]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.06	0.1									
0.07	0.1									
0.08	0.1									
0.09	0.1									
0.10	0.1									
0.15	0.1	0.1	0.1							
0.20	0.2	0.1	0.1							
0.25	0.2	0.2	0.1		0.1					
0.30	0.3	0.2	0.1	0.1	0.1		0.1			
0.35	0.3	0.3	0.2	0.1	0.1		0.1			
0.40	0.3	0.3	0.2	0.1	0.1		0.1			
0.45	0.4	0.4	0.2	0.1	0.1		0.1		0.1	
0.50	0.4	0.5	0.2	0.1	0.1		0.1		0.1	
0.55	0.5	0.6	0.3	0.2	0.1		0.1		0.1	
0.60	0.5	0.7	0.3	0.2	0.1		0.1		0.1	
0.65	0.5	0.8	0.3	0.2	0.2		0.1		0.1	
0.70	0.6	0.9	0.3	0.3	0.2		0.1		0.1	
0.75	0.6	1.1	0.4	0.3	0.2	0.1	0.1		0.1	
0.80	0.7	1.2	0.4	0.3	0.2	0.1	0.1		0.1	
0.85	0.7	1.3	0.4	0.4	0.2	0.1	0.2		0.1	
0.90	0.8	1.5	0.4	0.4	0.2	0.1	0.2		0.1	
0.95	0.8	1.6	0.5	0.4	0.2	0.1	0.2		0.1	
1.00	0.8	1.8	0.5	0.5	0.2	0.1	0.2		0.1	
1.05	0.9	2.0	0.5	0.5	0.3	0.1	0.2		0.1	
1.10	0.9	2.1	0.5	0.6	0.3	0.1	0.2	0.1	0.1	
1.15	1.0	2.3	0.6	0.6	0.3	0.1	0.2	0.1	0.1	
1.20	1.0	2.5	0.6	0.7	0.3	0.1	0.2	0.1	0.1	
1.25	1.0	2.7	0.6	0.7	0.3	0.1	0.2	0.1	0.1	
1.30	1.1	2.9	0.6	0.8	0.3	0.1	0.2	0.1	0.2	
1.40	1.2	3.3	0.7	0.9	0.3	0.2	0.2	0.1	0.2	
1.50	1.3	3.7	0.7	1.0	0.4	0.2	0.3	0.1	0.2	
1.60	1.3	4.2	0.8	1.1	0.4	0.2	0.3	0.1	0.2	
1.70	1.4	4.7	0.8	1.3	0.4	0.2	0.3	0.1	0.2	
1.80	1.5	5.2	0.9	1.4	0.4	0.3	0.3	0.1	0.2	
1.90	1.6	5.8	0.9	1.6	0.5	0.3	0.3	0.1	0.2	0.1
2.00	1.7	6.3	1.0	1.7	0.5	0.3	0.4	0.1	0.2	0.1
2.10	1.8	6.9	1.0	1.9	0.5	0.3	0.4	0.2	0.2	0.1
2.20	1.8	7.6	1.1	2.0	0.5	0.4	0.4	0.2	0.3	0.1
2.30	1.9	8.2	1.1	2.2	0.6	0.4	0.4	0.2	0.3	0.1
2.40	2.0	8.9	1.2	2.4	0.6	0.4	0.4	0.2	0.3	0.1
2.50	2.1	9.6	1.2	2.6	0.6	0.5	0.4	0.2	0.3	0.1
2.60	2.2	10.3	1.3	2.8	0.6	0.5	0.5	0.2	0.3	0.1
2.70	2.3	11.0	1.3	3.0	0.7	0.6	0.5	0.3	0.3	0.1

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
\dot{V} [l/s]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
2.80	2.3	11.8	1.4	3.2	0.7	0.6	0.5	0.3	0.3	0.1
2.90	2.4	12.6	1.4	3.4	0.7	0.6	0.5	0.3	0.3	0.1
3.00	2.5	13.4	1.5	3.6	0.7	0.7	0.5	0.3	0.4	0.1
3.10	2.6	14.3	1.5	3.8	0.8	0.7	0.5	0.3	0.4	0.1
3.20	2.7	15.1	1.6	4.0	0.8	0.8	0.6	0.3	0.4	0.1
3.30	2.8	16.0	1.6	4.3	0.8	0.8	0.6	0.4	0.4	0.1
3.40	2.8	17.0	1.7	4.5	0.8	0.8	0.6	0.4	0.4	0.1
3.50	2.9	17.9	1.7	4.8	0.9	0.9	0.6	0.4	0.4	0.2
3.60	3.0	18.9	1.8	5.0	0.9	0.9	0.6	0.4	0.4	0.2
3.70	3.1	19.9	1.8	5.3	0.9	1.0	0.7	0.4	0.4	0.2
3.80	3.2	20.9	1.9	5.6	0.9	1.0	0.7	0.5	0.4	0.2
3.90	3.3	21.9	1.9	5.8	1.0	1.1	0.7	0.5	0.5	0.2
4.00	3.3	23.0	2.0	6.1	1.0	1.1	0.7	0.5	0.5	0.2
4.10	3.4	24.1	2.0	6.4	1.0	1.2	0.7	0.5	0.5	0.2
4.20	3.5	25.2	2.1	6.7	1.0	1.2	0.7	0.6	0.5	0.2
4.30	3.6	26.3	2.1	7.0	1.1	1.3	0.8	0.6	0.5	0.2
4.40	3.7	27.5	2.2	7.3	1.1	1.3	0.8	0.6	0.5	0.2
4.50	3.8	28.7	2.2	7.6	1.1	1.4	0.8	0.6	0.5	0.2
4.60	3.9	29.9	2.3	7.9	1.1	1.5	0.8	0.7	0.5	0.2
4.70	3.9	31.1	2.3	8.2	1.2	1.5	0.8	0.7	0.6	0.3
4.80	4.0	32.4	2.3	8.6	1.2	1.6	0.8	0.7	0.6	0.3
4.90	4.1	33.7	2.4	8.9	1.2	1.6	0.9	0.7	0.6	0.3
5.00	4.2	35.0	2.4	9.3	1.2	1.7	0.9	0.8	0.6	0.3
5.50	4.6	41.9	2.7	11.1	1.3	2.0	1.0	0.9	0.6	0.3
6.00	5.0	49.4	2.9	13.0	1.5	2.4	1.1	1.1	0.7	0.4
6.50	5.4	57.5	3.2	15.1	1.6	2.7	1.1	1.2	0.8	0.5
7.00	5.9	66.2	3.4	17.4	1.7	3.2	1.2	1.4	0.8	0.5
7.50	6.3	75.5	3.7	19.8	1.8	3.6	1.3	1.6	0.9	0.6
8.00	6.7	85.4	3.9	22.3	2.0	4.0	1.4	1.8	0.9	0.7
8.50	7.1	95.9	4.2	25.0	2.1	4.5	1.5	2.0	1.0	0.8
9.00	7.5	107.0	4.4	27.9	2.2	5.0	1.6	2.3	1.1	0.8
9.50	8.0	118.7	4.7	30.9	2.3	5.6	1.7	2.5	1.1	0.9
10.00	8.4	131.0	4.9	34.1	2.4	6.1	1.8	2.7	1.2	1.0
10.50	8.8	143.9	5.1	37.4	2.6	6.7	1.9	3.0	1.2	1.1
11.00	9.2	157.3	5.4	40.8	2.7	7.3	1.9	3.3	1.3	1.2
11.50	9.6	171.4	5.6	44.4	2.8	7.9	2.0	3.5	1.4	1.3
12.00	10.0	186.1	5.9	48.2	2.9	8.6	2.1	3.8	1.4	1.4
12.50	10.5	201.4	6.1	52.1	3.1	9.3	2.2	4.1	1.5	1.5
13.00	10.9	217.2	6.4	56.1	3.2	10.0	2.3	4.5	1.5	1.6
13.50	11.3	233.7	6.6	60.3	3.3	10.7	2.4	4.8	1.6	1.8
14.00	11.7	250.7	6.9	64.7	3.4	11.5	2.5	5.1	1.6	1.9
14.50	12.1	268.4	7.1	69.2	3.6	12.3	2.6	5.5	1.7	2.0
15.00			7.3	73.8	3.7	13.1	2.6	5.8	1.8	2.1

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [l/s]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
15.50			7.6	78.6	3.8	13.9	2.7	6.2	1.8	2.3
16.00			7.8	83.5	3.9	14.8	2.8	6.6	1.9	2.4
16.50			8.1	88.6	4.0	15.7	2.9	7.0	1.9	2.6
17.00			8.3	93.8	4.2	16.6	3.0	7.4	2.0	2.7
17.50			8.6	99.2	4.3	17.5	3.1	7.8	2.1	2.9
18.00			8.8	104.8	4.4	18.5	3.2	8.2	2.1	3.0
18.50			9.1	110.4	4.5	19.4	3.3	8.6	2.2	3.2
19.00			9.3	116.3	4.7	20.4	3.4	9.1	2.2	3.3
19.50			9.5	122.2	4.8	21.5	3.4	9.5	2.3	3.5
20.00			9.8	128.3	4.9	22.5	3.5	10.0	2.4	3.7
21.00			10.3	141.0	5.1	24.7	3.7	11.0	2.5	4.0
22.00			10.8	154.3	5.4	27.0	3.9	12.0	2.6	4.4
23.00			11.3	168.2	5.6	29.4	4.1	13.0	2.7	4.8
24.00			11.7	182.6	5.9	31.9	4.2	14.1	2.8	5.2
25.00					6.1	34.5	4.4	15.2	2.9	5.6
26.00					6.4	37.1	4.6	16.4	3.1	6.0
27.00					6.6	39.9	4.8	17.6	3.2	6.4
28.00					6.9	42.8	4.9	18.9	3.3	6.9
29.00					7.1	45.8	5.1	20.2	3.4	7.4
30.00					7.3	48.9	5.3	21.5	3.5	7.8
31.00					7.6	52.0	5.5	22.9	3.6	8.3
32.00					7.8	55.3	5.7	24.4	3.8	8.9
33.00					8.1	58.7	5.8	25.8	3.9	9.4
34.00					8.3	62.1	6.0	27.3	4.0	9.9
35.00					8.6	65.7	6.2	28.9	4.1	10.5
36.00					8.8	69.4	6.4	30.5	4.2	11.1
37.00					9.1	73.1	6.5	32.1	4.4	11.7
38.00					9.3	77.0	6.7	33.8	4.5	12.3
39.00					9.6	80.9	6.9	35.5	4.6	12.9
40.00					9.8	85.0	7.1	37.3	4.7	13.5
41.00					10.0	89.1	7.2	39.1	4.8	14.2
42.00					10.3	93.4	7.4	41.0	4.9	14.8
43.00					10.5	97.7	7.6	42.9	5.1	15.5
44.00					10.8	102.2	7.8	44.8	5.2	16.2
45.00					11.0	106.7	7.9	46.8	5.3	16.9
46.00					11.3	111.4	8.1	48.8	5.4	17.6
47.00					11.5	116.1	8.3	50.9	5.5	18.4
48.00					11.8	120.9	8.5	53.0	5.7	19.1
49.00					12.0	125.9	8.7	55.1	5.8	19.9
50.00					12.2	130.9	8.8	57.3	5.9	20.7

5.2.8 Pressure loss from individual resistance, sanitary applications

5.2.8.1 Pressure loss from individual resistance, sanitary applications cold water

- Medium: Water 10 °C
- Density: 999.7 kg/m³

Table 40: Pressure loss Δp_z [mbar] for cold water, in relation to the calculatory flow rate v and the total of loss coefficients $\Sigma\zeta$ (0.5 - 5)

v [m/s]	$\Sigma\zeta$									
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
0.20	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
0.30	0.23	0.45	0.68	0.90	1.12	1.35	1.57	1.80	2.02	2.25
0.40	0.40	0.80	1.20	1.60	2.00	2.40	2.80	3.20	3.60	4.00
0.50	0.62	1.25	1.88	2.50	3.12	3.75	4.37	5.00	5.62	6.25
0.60	0.90	1.80	2.70	3.60	4.50	5.40	6.30	7.20	8.10	9.00
0.70	1.23	2.45	3.68	4.90	6.12	7.35	8.57	9.80	11.02	12.25
0.80	1.60	3.20	4.80	6.40	8.00	9.60	11.20	12.80	14.40	16.00
0.90	2.02	4.05	6.07	8.10	10.12	12.15	14.17	16.20	18.22	20.24
1.00	2.50	5.00	7.50	10.00	12.50	15.00	17.49	19.99	22.49	24.99
1.10	3.02	6.05	9.07	12.10	15.12	18.14	21.17	24.19	27.22	30.24
1.20	3.61	7.20	10.82	14.40	17.99	21.59	25.19	28.79	32.39	35.99
1.30	4.23	8.45	12.67	16.89	21.12	25.34	29.57	33.79	38.01	42.24
1.40	4.90	9.80	14.70	19.59	24.19	29.39	34.29	39.19	44.09	48.99
1.50	5.63	11.25	16.87	22.49	28.12	33.74	39.36	44.99	50.61	56.23
1.60	6.40	12.80	19.19	25.59	31.99	38.39	44.79	51.18	57.58	63.98
1.70	7.23	14.45	21.67	28.89	36.11	43.34	50.56	57.78	65.01	72.23
1.80	8.10	16.20	24.30	32.39	40.49	48.59	56.68	64.78	72.88	80.98
1.90	9.02	18.04	27.07	36.09	45.11	54.13	63.16	72.18	81.20	90.22
2.00	10.00	19.99	30.00	39.99	49.99	59.98	69.58	79.98	89.97	99.97
2.10	11.03	22.04	33.07	44.09	55.11	66.13	77.15	88.17	99.20	110.22
2.20	12.10	24.19	36.29	48.39	60.48	72.58	84.67	96.77	108.87	120.96
2.30	13.23	26.44	39.66	52.88	66.11	79.33	92.55	105.77	118.99	132.21
2.40	14.40	28.79	43.19	57.58	71.98	86.37	100.77	115.17	129.56	143.96
2.50	15.62	31.24	46.86	62.48	78.10	93.72	109.34	124.96	140.58	156.20
2.60	16.90	33.79	50.70	67.58	84.47	101.37	118.26	135.16	152.05	168.95
2.70	18.22	36.44	54.66	72.88	91.10	109.32	127.54	145.76	163.98	182.20
2.80	19.60	39.19	58.79	78.39	97.97	117.56	137.16	156.75	176.35	195.94
2.90	21.02	42.04	63.06	84.07	105.09	126.11	147.13	168.15	189.17	210.19
3.00	22.49	44.99	67.48	89.97	112.47	134.96	157.45	179.95	202.44	224.93
3.10	24.02	48.04	72.06	96.07	120.09	144.11	168.12	192.14	216.16	240.18
3.20	25.59	51.18	76.77	102.37	127.96	153.55	179.15	204.74	230.33	255.92
3.30	27.22	54.43	81.65	108.87	136.08	163.30	190.52	217.73	244.95	272.17
3.40	28.89	57.78	86.67	115.57	144.46	173.35	202.24	231.13	260.02	288.91
3.50	30.62	61.23	91.85	122.46	153.08	183.69	214.31	244.93	275.54	306.16
3.60	32.39	64.78	97.17	129.56	161.95	194.34	226.73	259.12	291.51	323.90
3.70	34.21	68.43	102.64	136.86	171.07	205.29	239.50	273.72	307.93	342.15
3.80	36.09	72.18	108.27	144.36	180.45	216.54	252.62	288.71	324.80	360.98

v [m/s]	$\Sigma\zeta$									
	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
3.90	38.01	76.03	114.04	152.05	190.07	228.08	266.10	304.11	342.12	380.14
4.00	39.99	79.98	119.96	159.95	199.94	239.93	279.92	319.90	359.89	399.88
4.10	42.01	84.02	126.04	168.05	210.06	252.07	294.09	336.10	378.11	420.12
4.20	44.09	88.17	132.26	176.35	220.43	264.52	308.61	352.69	396.78	440.87
4.40	48.39	96.77	145.16	193.54	241.93	290.31	338.70	387.08	435.47	483.85
4.60	52.88	105.77	158.65	211.54	264.42	317.30	370.19	423.07	475.96	528.84
4.80	57.58	115.17	172.75	230.33	287.91	345.50	403.08	460.66	518.24	575.83
5.00	62.48	124.96	187.44	249.93	312.41	374.89	437.37	499.85	562.33	624.81
5.50	75.60	151.20	226.81	302.41	378.01	453.61	529.22	604.82	680.42	756.02

Table 41: Pressure loss Δp_z [mbar] for cold water, in relation to the calculatory flow rate v and the total of loss coefficients $\Sigma\zeta$ (5.5 - 10)

v [m/s]	$\Sigma\zeta$									
	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
0.20	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00
0.30	2.47	2.70	2.92	3.15	3.37	3.60	3.82	4.05	4.27	4.50
0.40	4.40	4.80	5.20	5.60	6.00	6.40	6.80	7.20	7.60	8.00
0.50	6.87	7.50	8.12	8.75	9.37	10.00	10.62	11.25	11.87	12.00
0.60	9.90	10.80	11.70	12.60	13.50	14.40	15.30	16.20	17.09	17.99
0.70	13.47	14.70	15.92	17.14	18.37	19.59	20.82	22.04	23.27	24.49
0.80	17.59	19.19	20.79	22.39	23.99	25.59	27.19	28.79	30.39	31.99
0.90	22.27	24.29	26.32	28.34	30.37	32.39	34.41	36.44	38.46	40.49
1.00	27.49	29.99	32.49	34.99	37.49	39.99	42.49	44.99	47.49	49.99
1.10	33.27	36.29	39.31	42.34	45.36	48.39	51.41	54.43	57.46	60.48
1.20	39.59	43.19	46.79	50.38	53.98	57.58	61.18	64.78	68.38	71.98
1.30	46.46	50.68	54.91	59.13	63.36	67.58	71.80	76.03	80.25	84.47
1.40	53.88	58.78	63.68	68.58	73.48	78.38	83.28	88.17	93.07	97.97
1.50	61.86	67.48	73.10	78.73	84.35	89.97	95.60	101.22	106.84	112.47
1.60	70.38	76.78	83.18	89.57	95.97	102.37	108.77	115.17	121.56	127.96
1.70	79.45	86.67	93.90	101.12	108.34	115.57	122.79	130.01	137.23	144.46
1.80	89.07	97.17	105.27	113.37	121.46	129.56	137.66	145.76	153.85	161.95
1.90	99.25	108.27	117.29	126.29	135.33	144.36	153.38	162.40	171.42	180.45
2.00	109.97	119.96	129.96	139.96	149.96	159.95	169.95	179.95	189.94	199.94
2.10	121.24	132.26	143.28	154.30	165.33	176.35	187.37	198.39	209.41	220.43
2.20	133.06	145.16	157.25	169.35	181.45	193.54	205.64	217.73	229.83	241.93
2.30	145.43	158.65	171.87	185.09	198.32	211.54	224.76	237.98	251.20	264.42
2.40	158.35	172.75	187.14	201.54	215.94	230.33	244.73	259.12	273.52	287.91
2.50	171.82	187.44	203.06	218.68	234.30	249.93	265.55	281.17	296.79	312.41
2.60	185.84	202.74	219.63	236.53	253.42	270.32	287.21	304.11	321.00	337.90
2.70	200.41	218.63	236.85	255.07	273.29	291.51	309.73	327.95	346.17	364.39
2.80	215.54	235.13	254.72	274.32	293.91	313.51	333.10	352.69	372.29	391.88
2.90	231.21	252.22	273.24	294.26	315.28	336.30	357.32	378.34	399.36	420.37
3.00	247.43	269.92	292.41	314.91	337.40	359.89	382.39	404.86	427.37	449.87
3.10	264.20	288.21	312.23	336.25	360.27	384.28	408.30	432.32	456.34	480.36
3.20	281.52	307.11	332.70	358.29	383.88	409.48	435.07	460.66	486.25	511.85
3.30	299.39	326.60	353.82	381.04	408.25	435.47	462.69	489.90	517.12	544.34

v [m/s]	$\Sigma\zeta$									
	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
3.40	317.80	346.70	375.59	404.48	433.37	462.26	491.15	520.04	548.94	577.83
3.50	336.77	367.39	398.01	428.62	459.24	489.85	520.47	551.08	581.70	612.32
3.60	356.29	388.68	421.07	453.46	485.85	518.24	550.63	583.03	615.42	647.81
3.70	376.36	410.58	444.79	479.01	513.22	547.44	581.65	615.87	650.08	684.29
3.80	396.98	433.07	469.16	505.25	541.34	577.43	613.52	649.61	685.69	721.78
3.90	418.15	456.16	494.18	532.19	570.20	608.22	646.23	684.24	722.26	760.27
4.00	439.87	479.86	519.84	559.83	599.82	639.81	679.80	719.78	759.77	799.76
4.10	462.14	504.15	546.16	588.17	630.19	672.20	714.21	756.22	798.24	840.25
4.20	484.95	529.04	573.13	617.21	661.30	705.39	749.48	793.56	837.65	881.74
4.40	532.24	580.63	629.01	677.40	725.78	774.17	822.55	870.94	919.32	967.71
4.60	581.73	634.61	687.49	740.38	793.26	846.15	899.03	951.91	1004.80	1057.68
4.80	633.41	690.99	748.58	806.16	863.74	921.32	978.91	1036.49	1094.07	1151.65
5.00	687.29	749.78	812.26	874.74	937.22	999.70	1062.18	1124.66	1187.14	1249.63
5.50	831.63	907.23	982.83	1058.43	1134.03	1209.64	1285.24	1360.84	1436.44	1512.05

5.2.8.2 Pressure loss from individual resistance, sanitary applications hot water

- Medium: Water 60 °C
- Density: 983.2 kg/m³

Table 42: Pressure loss Δp_z [mbar] for hot water, in relation to the calculatory flow rate v and the total of loss coefficients $\Sigma \zeta$ (0.5 - 5)

v [m/s]	$\Sigma \zeta$									
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
0.20	0.10	0.20	0.29	0.39	0.49	0.59	0.69	0.79	0.88	0.98
0.30	0.22	0.44	0.66	0.88	1.11	1.33	1.55	1.77	1.99	2.21
0.40	0.39	0.79	1.18	1.57	1.97	2.36	2.75	3.15	3.54	3.93
0.50	0.61	1.23	1.84	2.46	3.07	3.69	4.30	4.92	5.53	6.15
0.60	0.88	1.77	2.65	3.54	4.42	5.31	6.19	7.08	7.96	8.85
0.70	1.20	2.41	3.61	4.82	6.02	7.23	8.43	9.64	10.84	12.04
0.80	1.57	3.15	4.72	6.29	7.87	9.44	11.01	12.58	14.16	15.73
0.90	1.99	3.98	5.97	7.96	9.95	11.95	13.94	15.93	17.92	19.91
1.00	2.46	4.92	7.37	9.83	12.29	14.75	17.21	19.66	22.12	24.58
1.10	2.97	5.95	8.92	11.90	14.87	17.85	20.82	23.79	26.77	29.74
1.20	3.54	7.08	10.62	14.16	17.70	21.24	24.78	28.32	31.86	35.40
1.30	4.15	8.31	12.46	16.62	20.77	24.92	29.08	33.23	37.39	41.54
1.40	4.82	9.64	14.45	19.27	24.09	28.91	33.72	38.54	43.36	48.18
1.50	5.53	11.06	16.59	22.12	27.65	33.18	38.71	44.24	49.77	55.31
1.60	6.29	12.58	18.88	25.17	31.46	37.75	44.05	50.34	56.63	62.92
1.70	7.10	14.21	21.31	28.41	35.52	42.62	49.73	56.83	63.93	71.04
1.80	7.96	15.93	23.89	31.86	39.82	47.78	55.75	63.71	71.68	79.64
1.90	8.87	17.75	26.62	35.49	44.37	53.24	62.11	70.99	79.86	88.73
2.00	9.83	19.66	29.50	39.33	49.16	58.99	68.82	78.66	88.49	98.32
2.10	10.84	21.68	32.52	43.36	54.20	65.04	75.88	86.72	97.56	108.40
2.20	11.90	23.79	35.69	47.59	59.48	71.38	83.28	95.17	107.07	118.97
2.30	13.00	26.01	39.01	52.01	65.01	78.02	91.02	104.02	117.03	130.03
2.40	14.16	28.32	42.47	56.63	70.79	84.95	99.11	113.26	127.42	141.58
2.50	15.36	30.73	46.09	61.45	76.81	92.18	107.54	122.90	138.26	153.63
2.60	16.62	33.23	49.85	66.46	83.08	99.70	116.31	132.93	149.54	166.16
2.70	17.92	35.84	53.76	71.68	89.59	107.51	125.43	143.35	161.27	179.19
2.80	19.27	38.54	57.81	77.08	96.35	115.62	134.90	154.17	173.44	192.71
2.90	20.67	41.34	62.02	82.69	103.36	124.03	144.70	165.37	186.05	206.72
3.00	22.12	44.24	66.37	88.49	110.61	132.73	154.85	176.98	199.10	221.22
3.10	23.62	47.24	70.86	94.49	118.11	141.73	165.35	188.97	212.59	236.21
3.20	25.17	50.34	75.51	100.68	125.85	151.02	176.19	201.36	226.53	251.70
3.30	26.77	53.54	80.30	107.07	133.84	160.61	187.37	214.14	240.91	267.68
3.40	28.41	56.83	85.24	113.66	142.07	170.49	198.90	227.32	255.73	284.14
3.50	30.11	60.22	90.33	120.44	150.55	180.66	210.77	240.88	270.99	301.11
3.60	31.86	63.71	95.57	127.42	159.28	191.13	222.99	254.85	286.70	318.56
3.70	33.65	67.30	100.95	134.60	168.25	201.90	235.55	269.20	302.85	336.50
3.80	35.49	70.99	106.48	141.97	177.47	212.96	248.45	283.95	319.44	354.94
3.90	37.39	74.77	112.16	149.54	186.93	224.32	261.70	299.09	336.48	373.86
4.00	39.33	78.66	117.98	157.31	196.64	235.97	275.30	314.62	353.95	393.28

v [m/s]	$\Sigma\zeta$									
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
4.10	41.32	82.64	123.96	165.28	206.59	247.91	289.23	330.55	371.87	413.19
4.20	43.36	86.72	130.08	173.44	216.80	260.15	303.51	346.87	390.23	433.59
4.40	47.59	95.17	142.76	190.35	237.93	285.52	333.11	380.70	428.28	475.87
4.60	52.01	104.02	156.03	208.05	260.06	312.07	364.08	416.09	468.10	520.11
4.80	56.63	113.26	169.90	226.53	283.16	339.79	396.43	453.06	509.69	566.32
5.00	61.45	122.90	184.35	245.80	307.25	368.70	430.15	491.60	553.05	614.50
5.50	74.35	148.71	223.06	297.42	371.77	446.13	520.48	594.84	669.19	743.55

Table 43: Pressure loss Δp_z [mbar] for hot water, in relation to the calculatory flow rate v and the total of loss coefficients $\Sigma\zeta$ (5.5 - 10)

v [m/s]	$\Sigma\zeta$									
	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
0.20	1.08	1.18	1.28	1.38	1.47	1.57	1.67	1.77	1.87	1.97
0.30	2.43	2.65	2.88	3.10	3.32	3.54	3.76	3.98	4.20	4.42
0.40	4.33	4.72	5.11	5.51	5.90	6.29	6.69	7.08	7.47	7.87
0.50	6.76	7.37	7.99	8.60	9.22	9.83	10.45	11.06	11.68	12.29
0.60	9.73	10.62	11.50	12.39	13.27	14.16	15.04	15.93	16.81	17.70
0.70	13.25	14.45	15.66	16.86	18.07	19.27	20.48	21.68	22.88	24.09
0.80	17.30	18.88	20.45	22.02	23.60	25.17	26.74	28.32	29.89	31.46
0.90	21.90	23.89	25.88	27.87	29.86	31.86	33.85	35.84	37.83	39.82
1.00	27.04	29.50	31.95	34.41	36.87	39.33	41.79	44.24	46.70	49.16
1.10	32.72	35.69	38.66	41.64	44.61	47.59	50.56	53.54	56.51	59.48
1.20	38.93	42.47	46.01	49.55	53.09	56.63	60.17	63.71	67.25	70.79
1.30	45.69	49.85	54.00	58.16	62.31	66.46	70.62	74.77	78.93	83.08
1.40	52.99	57.81	62.63	67.45	72.27	77.08	81.90	86.72	91.54	96.35
1.50	60.84	66.37	71.90	77.43	82.96	88.49	94.02	99.55	105.08	110.61
1.60	69.22	75.51	81.80	88.09	94.39	100.68	106.97	113.26	119.56	125.85
1.70	78.14	85.24	92.35	99.45	106.55	113.66	120.76	127.87	134.97	142.07
1.80	87.60	95.57	103.53	111.49	119.46	127.42	135.39	143.35	151.31	159.28
1.90	97.61	106.48	115.35	124.23	133.10	141.97	150.85	159.72	168.59	177.47
2.00	108.15	117.98	127.82	137.65	147.48	157.31	167.14	176.98	186.81	196.64
2.10	119.24	130.08	140.92	151.76	162.60	173.44	184.28	195.12	205.96	216.80
2.20	130.86	142.76	154.66	166.55	178.45	190.35	202.24	214.14	226.04	237.93
2.30	143.03	156.03	169.04	182.04	195.04	208.05	221.05	234.05	247.05	260.06
2.40	155.74	169.90	184.06	198.21	212.37	226.53	240.69	254.85	269.00	283.16
2.50	168.99	184.35	199.71	215.08	230.44	245.80	261.16	276.53	291.89	307.25
2.60	182.78	199.39	216.01	232.63	249.24	265.86	282.47	299.09	315.71	332.32
2.70	197.11	215.03	232.94	250.86	268.78	286.70	304.62	322.54	340.46	358.38
2.80	211.98	231.25	250.52	269.79	289.06	308.33	327.60	346.87	366.14	385.41
2.90	227.39	248.06	268.73	289.40	310.08	330.75	351.42	372.09	392.76	413.44
3.00	243.34	265.46	287.59	309.71	331.83	353.95	376.07	398.20	420.32	442.44
3.10	259.84	283.46	307.08	330.70	354.32	377.94	401.56	425.18	448.81	472.43
3.20	276.87	302.04	327.21	352.38	377.55	402.72	427.89	453.06	478.23	503.40
3.30	294.44	321.21	347.98	374.75	401.51	428.28	455.05	481.82	508.58	535.35
3.40	312.56	340.97	369.39	397.80	426.22	454.63	483.05	511.46	539.88	568.29
3.50	331.22	361.33	391.44	421.55	451.66	481.77	511.88	541.99	572.10	602.21

v [m/s]	$\Sigma \zeta$									
	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
3.60	350.41	382.27	414.12	445.98	477.84	509.69	541.55	573.40	605.26	637.11
3.70	370.15	403.80	437.45	471.10	504.75	538.40	572.05	605.70	639.35	673.00
3.80	390.43	425.92	461.42	496.91	532.40	567.90	603.39	638.88	674.38	709.87
3.90	411.25	448.63	486.02	523.41	560.79	598.18	635.57	672.95	710.34	747.72
4.00	432.61	471.94	511.26	550.59	589.92	629.25	668.58	707.90	747.23	786.56
4.10	454.51	495.83	537.15	578.47	619.78	661.10	702.42	743.74	785.06	826.38
4.20	476.95	520.31	563.67	607.03	650.39	693.75	737.11	780.46	823.82	867.18
4.40	523.46	571.04	618.63	666.22	713.80	761.39	808.98	856.56	904.15	951.74
4.60	572.12	624.14	676.15	728.16	780.17	832.18	884.19	936.20	988.21	1040.23
4.80	622.96	679.59	736.22	792.85	849.48	906.12	962.75	1019.38	1076.01	1132.65
5.00	675.95	737.40	798.85	860.30	921.75	983.20	1044.65	1106.10	1167.55	1229.00
5.50	817.90	892.25	966.61	1040.96	1115.32	1189.67	1264.03	1338.38	1412.74	1487.09

5.2.9 Pressure loss Mapress Stainless Steel heating / cooling

5.2.9.1 Pressure loss, Mapress Stainless Steel cooling

Table 44: Pressure loss Mapress Stainless Steel cooling, inlet flow / return flow 10 °C / 11 °C, spread $\Delta T = 1$ K, d 15 - d 35

Q̇ [W]	d [mm]	15		18		22		28		35	
		v̇ [m/s]	Δp [Pa/m]	v̇ [m/s]	Δp [Pa/m]	v̇ [m/s]	Δp [Pa/m]	v̇ [m/s]	Δp [Pa/m]	v̇ [m/s]	Δp [Pa/m]
50	43.0	0.09	20	0.06	8	0.04	3				
100	86.0	0.18	64	0.12	24	0.08	9				
150	129.0	0.27	126	0.18	48	0.12	18	0.07	5		
200	172.0	0.36	205	0.24	77	0.16	30	0.09	9		
250	215.0	0.45	301	0.30	113	0.20	44	0.12	12	0.07	4
300	258.0	0.54	411	0.36	154	0.24	59	0.14	17	0.09	6
350	300.9	0.63	536	0.42	201	0.28	77	0.16	22	0.10	8
400	343.9	0.72	675	0.48	253	0.32	97	0.19	28	0.12	10
450	386.9	0.81	827	0.53	310	0.36	119	0.21	34	0.13	12
500	429.9	0.90	993	0.59	371	0.40	142	0.23	40	0.15	14
600	515.9	1.08	1364	0.71	509	0.47	195	0.28	55	0.18	19
700	601.9	1.26	1784	0.83	666	0.55	254	0.32	72	0.21	25
800	687.9			0.95	840	0.63	321	0.37	91	0.24	32
900	773.9			1.07	1032	0.71	394	0.42	111	0.27	39
1000	859.8			1.19	1241	0.79	473	0.46	133	0.30	46
1100	945.8			1.31	1466	0.87	558	0.51	157	0.33	55
1200	1031.8					0.95	650	0.56	183	0.36	64
1300	1117.8					1.03	748	0.60	210	0.39	73
1400	1203.8					1.11	852	0.65	239	0.42	83
1500	1289.8					1.19	961	0.70	270	0.45	94
1600	1375.8					1.27	1077	0.74	302	0.48	105
1700	1461.7					1.35	1198	0.79	336	0.50	116
1800	1547.7					1.42	1325	0.84	371	0.53	129
1900	1633.7					1.50	1458	0.88	408	0.56	141
2000	1719.7					1.58	1596	0.93	447	0.59	155
2500	2149.6							1.16	662	0.74	229
3000	2579.5							1.39	913	0.89	315
3500	3009.5							1.62	1199	1.04	413
4000	3439.4							1.86	1520	1.19	523
4500	3869.3									1.34	644
5000	4299.2									1.48	777
5500	4729.1									1.63	920
6000	5159.1									1.78	1074
6500	5589.0									1.93	1239
7000	6018.9									2.08	1414
7500	6448.8									2.23	1599

Table 45: Pressure loss, Mapress Stainless Steel cooling. Inlet flow / return flow 10 °C / 11 °C, spread $\Delta T = 1$ K, d 42 - d 108

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
400	343.9	0.08	4								
450	386.9	0.09	5								
500	429.9	0.10	6								
600	515.9	0.12	8	0.07	2						
700	601.9	0.14	10	0.08	3						
800	687.9	0.16	12	0.09	4						
900	773.9	0.18	15	0.11	4						
1000	859.8	0.20	18	0.12	5	0.06	1				
1100	945.8	0.22	21	0.13	6	0.06	1				
1200	1031.8	0.24	25	0.14	7	0.07	1				
1300	1117.8	0.26	29	0.15	8	0.08	2				
1400	1203.8	0.28	33	0.16	9	0.08	2				
1500	1289.8	0.30	37	0.18	10	0.09	2	0.06	1		
1600	1375.8	0.32	41	0.19	12	0.09	2	0.07	1		
1700	1461.7	0.34	46	0.20	13	0.10	2	0.07	1		
1800	1547.7	0.36	50	0.21	14	0.11	3	0.08	1		
1900	1633.7	0.38	55	0.22	16	0.11	3	0.08	1		
2000	1719.7	0.40	60	0.23	17	0.12	3	0.08	2	0.06	1
2500	2149.6	0.50	89	0.29	25	0.15	5	0.11	2	0.07	1
3000	2579.5	0.60	123	0.35	34	0.18	7	0.13	3	0.08	1
3500	3009.5	0.70	161	0.41	45	0.20	9	0.15	4	0.10	2
4000	3439.4	0.80	204	0.47	57	0.23	11	0.17	5	0.11	2
4500	3869.3	0.90	251	0.53	70	0.26	13	0.19	6	0.13	2
5000	4299.2	1.00	302	0.58	84	0.29	16	0.21	7	0.14	3
5500	4729.1	1.10	357	0.64	99	0.32	19	0.23	9	0.15	3
6000	5159.1	1.20	417	0.70	116	0.35	22	0.25	10	0.17	4
6500	5589.0	1.30	481	0.76	133	0.38	26	0.27	12	0.18	4
7000	6018.9	1.40	548	0.82	152	0.41	29	0.30	13	0.20	5
7500	6448.8	1.50	620	0.88	172	0.44	33	0.32	15	0.21	6
8000	6878.8	1.60	695	0.94	193	0.47	37	0.34	17	0.22	6
8500	7308.7	1.70	775	0.99	215	0.50	41	0.36	19	0.24	7
9000	7738.6	1.80	858	1.05	238	0.53	45	0.38	21	0.25	8
9500	8168.5	1.90	945	1.11	262	0.56	50	0.40	23	0.27	9
10000	8598.5	2.00	1035	1.17	287	0.59	55	0.42	25	0.28	10
10500	9028.4	2.10	1130	1.23	313	0.61	60	0.44	27	0.30	10
11000	9458.3	2.20	1228	1.29	340	0.64	65	0.46	30	0.31	11
11500	9888.2	2.30	1330	1.34	368	0.67	70	0.49	32	0.32	12
12000	10318.1	2.40	1435	1.40	396	0.70	76	0.51	35	0.34	13
12500	10748.1	2.50	1544	1.46	426	0.73	81	0.53	37	0.35	14
13000	11178.0	2.60	1656	1.52	457	0.76	87	0.55	40	0.37	15
13500	11607.9	2.70	1772	1.58	489	0.79	93	0.57	43	0.38	16
14000	12037.8			1.64	522	0.82	100	0.59	46	0.39	17
14500	12467.8			1.70	556	0.85	106	0.61	49	0.41	18
15000	12897.7			1.75	591	0.88	113	0.63	52	0.42	20

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
15500	13327.6			1.81	626	0.91	119	0.65	55	0.44	21
16000	13757.5			1.87	663	0.94	126	0.68	58	0.45	22
16500	14187.4			1.93	701	0.97	133	0.70	61	0.46	23
17000	14617.4			1.99	739	0.99	141	0.72	64	0.48	24
17500	15047.3			2.05	778	1.02	148	0.74	68	0.49	26
18000	15477.2			2.10	819	1.05	156	0.76	71	0.51	27
18500	15907.1			2.16	860	1.08	164	0.78	75	0.52	28
19000	16337.1			2.22	902	1.11	171	0.80	78	0.53	30
19500	16767.0			2.28	945	1.14	180	0.82	82	0.55	31
20000	17196.9			2.34	989	1.17	188	0.84	86	0.56	33
20500	17626.8			2.40	1034	1.20	196	0.86	90	0.58	34
21000	18056.7			2.46	1080	1.23	205	0.89	94	0.59	36
21500	18486.7			2.51	1127	1.26	214	0.91	98	0.60	37
22000	18916.6			2.57	1174	1.29	223	0.93	102	0.62	39
22500	19346.5			2.63	1223	1.32	232	0.95	106	0.63	40
23000	19776.4			2.69	1272	1.35	241	0.97	110	0.65	42
23500	20206.4			2.75	1322	1.37	251	0.99	115	0.66	43
24000	20636.3			2.81	1373	1.40	260	1.01	119	0.67	45
24500	21066.2					1.43	270	1.03	123	0.69	47
25000	21496.1					1.46	280	1.05	128	0.70	48
25500	21926.1					1.49	290	1.08	133	0.72	50
26000	22356.0					1.52	301	1.10	137	0.73	52
26500	22785.9					1.55	311	1.12	142	0.75	54
27000	23215.8					1.58	322	1.14	147	0.76	56
27500	23645.7					1.61	332	1.16	152	0.77	57
28000	24075.7					1.64	343	1.18	157	0.79	59
28500	24505.6					1.67	354	1.20	162	0.80	61
29000	24935.5					1.70	366	1.22	167	0.82	63
29500	25365.4					1.73	377	1.24	172	0.83	65
30000	25795.4					1.76	388	1.27	177	0.84	67
32500	27945.0					1.90	449	1.37	205	0.91	77
35000	30094.6					2.05	513	1.48	234	0.98	88
37500	32244.2					2.19	580	1.58	265	1.05	100
40000	34393.8					2.34	652	1.69	297	1.12	112
42500	36543.4					2.49	727	1.79	331	1.19	125
45000	38693.0					2.63	806	1.90	367	1.27	139
47500	40842.6					2.78	889	2.00	405	1.34	153
50000	42992.3					2.93	975	2.11	444	1.41	167
52500	45141.9					3.07	1065	2.21	485	1.48	183
55000	47291.5					3.22	1159	2.32	527	1.55	199
57500	49441.1					3.36	1256	2.43	571	1.62	215
60000	51590.7					3.51	1356	2.53	617	1.69	233
62500	53740.3					3.66	1461	2.64	664	1.76	250
65000	55889.9							2.74	713	1.83	269
67500	58039.6							2.85	764	1.90	288

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
70000	60189.2							2.95	816	1.97	307
72500	62338.8							3.06	869	2.04	327
75000	64488.4							3.16	924	2.11	348
77500	66638.0							3.27	981	2.18	369
80000	68787.6							3.38	1039	2.25	391
82500	70937.2							3.48	1099	2.32	413
85000	73086.8							3.59	1160	2.39	436
87500	75236.5							3.69	1222	2.46	460
90000	77386.1							3.80	1287	2.53	484
92500	79535.7							3.90	1352	2.60	508
95000	81685.3							4.01	1419	2.67	533
97500	83834.9									2.74	559
100000	85984.5									2.81	585
105000	90283.7									2.95	639
110000	94583.0									3.09	696
115000	98882.2									3.23	754
120000	103181.4									3.37	815
125000	107480.7									3.51	878
130000	111779.9									3.66	942
135000	116079.1									3.80	1009
140000	120378.3									3.94	1078
145000	124677.6									4.08	1150
150000	128976.8									4.22	1223
155000	133276.0									4.36	1298

5.2.9.2 Pressure loss Mapress Stainless Steel heating

The following recommendations apply for the heating design charts:

- Radiator connection pipes: Flow rate ≤ 0.3 m/s
- Heating distribution pipes: Flow rate ≤ 0.5 m/s
- Heating riser and cellar pipes: Flow rate ≤ 0.8 m/s

Table 46: Overview Design Charts Pressure loss heating

Inlet flow / Return flow	Spread ΔT	Pipe dimension	
35 °C / 30 °C	5 K	d 15 - d 35	Table 47 on page 67
		d 42 - d 108	Table 48 on page 70
90 °C / 70 °C	20 K	d 15 - d 35	Table 49 on page 75
		d 42 - d 108	Table 50 on page 78
75 °C / 65 °C	10 K	d 15 - d 35	Table 51 on page 83
		d 42 - d 108	Table 52 on page 86
70 °C / 55 °C	15 K	d 15 - d 35	Table 53 on page 91
		d 42 - d 108	Table 54 on page 94
70 °C / 50 °C	20 K	d 15 - d 35	Table 55 on page 99
		d 42 - d 108	Table 56 on page 102
60 °C / 61 °C	1 K	d 15 - d 35	Table 57 on page 107
		d 42 - d 108	Table 58 on page 108
55 °C / 45 °C	10 K	d 15 - d 35	Table 59 on page 111
		d 42 - d 108	Table 60 on page 114
80 °C / 50 °C	30 K	d 15 - d 35	Table 61 on page 119
		d 42 - d 108	Table 62 on page 122
80 °C / 60 °C	20 K	d 15 - d 35	Table 63 on page 128
		d 42 - d 108	Table 64 on page 131

Table 47: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 35 °C / 30 °C, spread $\Delta T = 5$ K, d 15 - d 35

\dot{Q} [W]	d [mm]	15		18		22		28		35	
		\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]
200	34.4	0.07	12	0.05	4						
300	51.6	0.11	23	0.07	9	0.05	3				
400	68.8	0.14	37	0.10	14	0.06	5				
500	86.0	0.18	54	0.12	20	0.08	8	0.05	2		
600	103.2	0.22	73	0.14	28	0.09	11	0.06	3		
700	120.4	0.25	95	0.17	36	0.11	14	0.06	4		
800	137.6	0.29	120	0.19	45	0.13	17	0.07	5	0.05	2
900	154.8	0.32	147	0.21	55	0.14	21	0.08	6	0.05	2
1000	172.0	0.36	176	0.24	66	0.16	25	0.09	7	0.06	3
1100	189.2	0.40	207	0.26	78	0.17	30	0.10	8	0.07	3
1200	206.4	0.43	241	0.29	90	0.19	35	0.11	10	0.07	3
1300	223.6	0.47	276	0.31	103	0.21	40	0.12	11	0.08	4
1400	240.8	0.50	314	0.33	118	0.22	45	0.13	13	0.08	4
1500	258.0	0.54	354	0.36	132	0.24	51	0.14	14	0.09	5
1600	275.2	0.58	396	0.38	148	0.25	57	0.15	16	0.10	6
1700	292.3	0.61	440	0.40	165	0.27	63	0.16	18	0.10	6
1800	309.5	0.65	486	0.43	182	0.28	69	0.17	20	0.11	7

Docu no.: B469-001&BDZ

Q̇ [W]	d [mm]	15		18		22		28		35	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
1900	326.7	0.68	535	0.45	200	0.30	76	0.18	22	0.11	8
2000	343.9	0.72	585	0.48	218	0.32	83	0.19	24	0.12	8
2500	429.9	0.90	864	0.59	322	0.40	123	0.23	35	0.15	12
3000	515.9	1.08	1190	0.71	443	0.47	169	0.28	48	0.18	17
3500	601.9			0.83	580	0.55	221	0.32	62	0.21	22
4000	687.9			0.95	733	0.63	279	0.37	78	0.24	27
4500	773.9			1.07	903	0.71	343	0.42	96	0.27	33
5000	859.8			1.19	1087	0.79	413	0.46	116	0.30	40
5500	945.8					0.87	488	0.51	137	0.33	47
6000	1031.8					0.95	569	0.56	159	0.36	55
6500	1117.8					1.03	656	0.60	183	0.39	63
7000	1203.8					1.11	748	0.65	209	0.42	72
7500	1289.8					1.19	845	0.70	236	0.45	82
8000	1375.8					1.27	947	0.74	265	0.48	91
8500	1461.7					1.35	1055	0.79	294	0.50	102
9000	1547.7							0.84	326	0.53	112
9500	1633.7							0.88	358	0.56	124
10000	1719.7							0.93	392	0.59	135
10500	1805.7							0.97	428	0.62	147
11000	1891.7							1.02	465	0.65	160
11500	1977.6							1.07	503	0.68	173
12000	2063.6							1.11	542	0.71	187
12500	2149.6							1.16	583	0.74	201
13000	2235.6							1.21	625	0.77	215
13500	2321.6							1.25	669	0.80	230
14000	2407.6							1.30	713	0.83	245
14500	2493.6							1.35	759	0.86	261
15000	2579.5							1.39	807	0.89	277
15500	2665.5							1.44	855	0.92	294
16000	2751.5							1.48	905	0.95	311
16500	2837.5							1.53	956	0.98	328
17000	2923.5							1.58	1009	1.01	346
17500	3009.5							1.62	1062	1.04	365
18000	3095.4									1.07	383
18500	3181.4									1.10	403
19000	3267.4									1.13	422
19500	3353.4									1.16	442
20000	3439.4									1.19	463
20500	3525.4									1.22	483
21000	3611.3									1.25	505
21500	3697.3									1.28	526
22000	3783.3									1.31	548
22500	3869.3									1.34	571
23000	3955.3									1.37	594
23500	4041.3									1.40	617

\dot{Q} [W]	d [mm]	15		18		22		28		35	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
24000	4127.3									1.43	641
24500	4213.2									1.46	665
25000	4299.2									1.48	689
25500	4385.2									1.51	714
26000	4471.2									1.54	739
26500	4557.2									1.57	765
27000	4643.2									1.60	791
27500	4729.1									1.63	817
28000	4815.1									1.66	844
28500	4901.1									1.69	871
29000	4987.1									1.72	899
29500	5073.1									1.75	927
30000	5159.1									1.78	955
32500	5589.0									1.93	1103

Table 48: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 35 °C / 30 °C, spread $\Delta T = 5$ K, d 42 - d 108

\dot{Q} [W]	d [mm]	42		54		76.1		88.9		108	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
1200	206.4	0.05	1								
1300	223.6	0.05	2								
1400	240.8	0.06	2								
1500	258.0	0.06	2								
1600	275.2	0.06	2								
1700	292.3	0.07	2								
1800	309.5	0.07	3								
1900	326.7	0.08	3								
2000	343.9	0.08	3	0.05	1						
2500	429.9	0.10	5	0.06	1						
3000	515.9	0.12	6	0.07	2						
3500	601.9	0.14	8	0.08	2						
4000	687.9	0.16	11	0.09	3	0.05	1				
4500	773.9	0.18	13	0.11	4	0.05	1				
5000	859.8	0.20	16	0.12	4	0.06	1				
5500	945.8	0.22	19	0.13	5	0.06	1				
6000	1031.8	0.24	22	0.14	6	0.07	1	0.05	1		
6500	1117.8	0.26	25	0.15	7	0.08	1	0.05	1		
7000	1203.8	0.28	28	0.16	8	0.08	2	0.06	1		
7500	1289.8	0.30	32	0.18	9	0.09	2	0.06	1		
8000	1375.8	0.32	36	0.19	10	0.09	2	0.07	1		
8500	1461.7	0.34	40	0.20	11	0.10	2	0.07	1		
9000	1547.7	0.36	44	0.21	12	0.11	2	0.08	1		
9500	1633.7	0.38	48	0.22	13	0.11	3	0.08	1		
10000	1719.7	0.40	53	0.23	15	0.12	3	0.08	1	0.06	1
10500	1805.7	0.42	57	0.25	16	0.12	3	0.09	1	0.06	1
11000	1891.7	0.44	62	0.26	17	0.13	3	0.09	2	0.06	1
11500	1977.6	0.46	67	0.27	19	0.13	4	0.10	2	0.06	1
12000	2063.6	0.48	73	0.28	20	0.14	4	0.10	2	0.07	1
12500	2149.6	0.50	78	0.29	22	0.15	4	0.11	2	0.07	1
13000	2235.6	0.52	84	0.30	23	0.15	4	0.11	2	0.07	1
13500	2321.6	0.54	89	0.32	25	0.16	5	0.11	2	0.08	1
14000	2407.6	0.56	95	0.33	27	0.16	5	0.12	2	0.08	1
14500	2493.6	0.58	101	0.34	28	0.17	5	0.12	3	0.08	1
15000	2579.5	0.60	108	0.35	30	0.18	6	0.13	3	0.08	1
15500	2665.5	0.62	114	0.36	32	0.18	6	0.13	3	0.09	1
16000	2751.5	0.64	121	0.37	34	0.19	6	0.14	3	0.09	1
16500	2837.5	0.66	128	0.39	35	0.19	7	0.14	3	0.09	1
17000	2923.5	0.68	134	0.40	37	0.20	7	0.14	3	0.10	1
17500	3009.5	0.70	142	0.41	39	0.20	8	0.15	3	0.10	1
18000	3095.4	0.72	149	0.42	41	0.21	8	0.15	4	0.10	1
18500	3181.4	0.74	156	0.43	43	0.22	8	0.16	4	0.10	1
19000	3267.4	0.76	164	0.44	45	0.22	9	0.16	4	0.11	2
19500	3353.4	0.78	172	0.46	48	0.23	9	0.16	4	0.11	2

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
20000	3439.4	0.80	179	0.47	50	0.23	10	0.17	4	0.11	2
20500	3525.4	0.82	187	0.48	52	0.24	10	0.17	5	0.12	2
21000	3611.3	0.84	196	0.49	54	0.25	10	0.18	5	0.12	2
21500	3697.3	0.86	204	0.50	57	0.25	11	0.18	5	0.12	2
22000	3783.3	0.88	213	0.51	59	0.26	11	0.19	5	0.12	2
22500	3869.3	0.90	221	0.53	61	0.26	12	0.19	5	0.13	2
23000	3955.3	0.92	230	0.54	64	0.27	12	0.19	6	0.13	2
23500	4041.3	0.94	239	0.55	66	0.27	13	0.20	6	0.13	2
24000	4127.3	0.96	248	0.56	69	0.28	13	0.20	6	0.13	2
24500	4213.2	0.98	257	0.57	71	0.29	14	0.21	6	0.14	2
25000	4299.2	1.00	267	0.58	74	0.29	14	0.21	7	0.14	2
25500	4385.2	1.02	277	0.60	77	0.30	15	0.22	7	0.14	3
26000	4471.2	1.04	286	0.61	79	0.30	15	0.22	7	0.15	3
26500	4557.2	1.06	296	0.62	82	0.31	16	0.22	7	0.15	3
27000	4643.2	1.08	306	0.63	85	0.32	16	0.23	7	0.15	3
27500	4729.1	1.10	316	0.64	88	0.32	17	0.23	8	0.15	3
28000	4815.1	1.12	327	0.65	90	0.33	17	0.24	8	0.16	3
28500	4901.1	1.14	337	0.67	93	0.33	18	0.24	8	0.16	3
29000	4987.1	1.16	348	0.68	96	0.34	18	0.24	8	0.16	3
29500	5073.1	1.18	359	0.69	99	0.35	19	0.25	9	0.17	3
30000	5159.1	1.20	370	0.70	102	0.35	20	0.25	9	0.17	3
32500	5589.0	1.30	426	0.76	118	0.38	23	0.27	10	0.18	4
35000	6018.9	1.40	487	0.82	135	0.41	26	0.30	12	0.20	4
37500	6448.8	1.50	551	0.88	152	0.44	29	0.32	13	0.21	5
40000	6878.8	1.60	619	0.94	171	0.47	33	0.34	15	0.22	6
42500	7308.7	1.70	690	0.99	190	0.50	36	0.36	17	0.24	6
45000	7738.6	1.80	765	1.05	211	0.53	40	0.38	18	0.25	7
47500	8168.5	1.90	843	1.11	232	0.56	44	0.40	20	0.27	8
50000	8598.5	2.00	924	1.17	255	0.59	48	0.42	22	0.28	8
52500	9028.4	2.10	1009	1.23	278	0.61	53	0.44	24	0.30	9
55000	9458.3	2.20	1097	1.29	302	0.64	57	0.46	26	0.31	10
57500	9888.2			1.34	327	0.67	62	0.49	28	0.32	11
60000	10318.1			1.40	353	0.70	67	0.51	31	0.34	12
62500	10748.1			1.46	380	0.73	72	0.53	33	0.35	12
65000	11178.0			1.52	408	0.76	77	0.55	35	0.37	13
67500	11607.9			1.58	436	0.79	83	0.57	38	0.38	14
70000	12037.8			1.64	466	0.82	88	0.59	40	0.39	15
72500	12467.8			1.70	496	0.85	94	0.61	43	0.41	16
75000	12897.7			1.75	528	0.88	100	0.63	46	0.42	17
77500	13327.6			1.81	560	0.91	106	0.65	48	0.44	18
80000	13757.5			1.87	593	0.94	112	0.68	51	0.45	19
82500	14187.4			1.93	627	0.97	119	0.70	54	0.46	20
85000	14617.4			1.99	661	0.99	125	0.72	57	0.48	22
87500	15047.3			2.05	697	1.02	132	0.74	60	0.49	23
90000	15477.2			2.10	733	1.05	139	0.76	63	0.51	24

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
92500	15907.1			2.16	770	1.08	146	0.78	66	0.52	25
95000	16337.1			2.22	808	1.11	153	0.80	70	0.53	26
97500	16767.0			2.28	847	1.14	160	0.82	73	0.55	28
100000	17196.9			2.34	887	1.17	168	0.84	76	0.56	29
105000	18056.7			2.46	969	1.23	183	0.89	83	0.59	32
110000	18916.6			2.57	1054	1.29	199	0.93	91	0.62	34
115000	19776.4					1.35	216	0.97	98	0.65	37
120000	20636.3					1.40	233	1.01	106	0.67	40
125000	21496.1					1.46	250	1.05	114	0.70	43
130000	22356.0					1.52	269	1.10	123	0.73	46
135000	23215.8					1.58	288	1.14	131	0.76	49
140000	24075.7					1.64	307	1.18	140	0.79	53
145000	24935.5					1.70	327	1.22	149	0.82	56
150000	25795.4					1.76	348	1.27	159	0.84	60
155000	26655.2					1.81	369	1.31	168	0.87	63
160000	27515.0					1.87	391	1.35	178	0.90	67
165000	28374.9					1.93	414	1.39	188	0.93	71
170000	29234.7					1.99	437	1.43	199	0.96	75
175000	30094.6					2.05	460	1.48	209	0.98	79
180000	30954.4					2.11	484	1.52	220	1.01	83
185000	31814.3					2.16	509	1.56	232	1.04	87
190000	32674.1					2.22	534	1.60	243	1.07	92
195000	33534.0					2.28	560	1.65	255	1.10	96
200000	34393.8					2.34	586	1.69	267	1.12	100
205000	35253.7					2.40	613	1.73	279	1.15	105
210000	36113.5					2.46	641	1.77	291	1.18	110
215000	36973.3					2.52	669	1.81	304	1.21	114
220000	37833.2					2.57	697	1.86	317	1.24	119
225000	38693.0					2.63	726	1.90	330	1.27	124
230000	39552.9					2.69	756	1.94	343	1.29	129
235000	40412.7					2.75	786	1.98	357	1.32	134
240000	41272.6					2.81	817	2.03	371	1.35	140
245000	42132.4					2.87	848	2.07	385	1.38	145
250000	42992.3					2.93	880	2.11	399	1.41	150
255000	43852.1					2.98	912	2.15	414	1.43	156
260000	44712.0					3.04	945	2.19	429	1.46	161
265000	45571.8					3.10	978	2.24	444	1.49	167
270000	46431.6					3.16	1012	2.28	459	1.52	173
275000	47291.5					3.22	1046	2.32	475	1.55	178
280000	48151.3					3.28	1081	2.36	491	1.57	184
285000	49011.2							2.40	507	1.60	190
290000	49871.0							2.45	523	1.63	197
295000	50730.9							2.49	540	1.66	203
300000	51590.7							2.53	556	1.69	209
305000	52450.6							2.57	573	1.72	215

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
310000	53310.4							2.62	591	1.74	222
315000	54170.2							2.66	608	1.77	228
320000	55030.1							2.70	626	1.80	235
325000	55889.9							2.74	644	1.83	242
330000	56749.8							2.78	662	1.86	248
335000	57609.6							2.83	680	1.88	255
340000	58469.5							2.87	699	1.91	262
345000	59329.3							2.91	718	1.94	269
350000	60189.2							2.95	737	1.97	276
355000	61049.0							3.00	756	2.00	284
360000	61908.9							3.04	776	2.02	291
365000	62768.7							3.08	795	2.05	298
370000	63628.5							3.12	815	2.08	306
375000	64488.4							3.16	836	2.11	313
380000	65348.2							3.21	856	2.14	321
385000	66208.1							3.25	877	2.16	329
390000	67067.9							3.29	898	2.19	337
395000	67927.8							3.33	919	2.22	344
400000	68787.6							3.38	940	2.25	352
405000	69647.5							3.42	962	2.28	360
410000	70507.3							3.46	983	2.31	369
415000	71367.2							3.50	1005	2.33	377
420000	72227.0							3.54	1028	2.36	385
425000	73086.8							3.59	1050	2.39	394
430000	73946.7							3.63	1073	2.42	402
435000	74806.5							3.67	1096	2.45	411
440000	75666.4							3.71	1119	2.47	419
445000	76526.2									2.50	428
450000	77386.1									2.53	437
455000	78245.9									2.56	446
460000	79105.8									2.59	455
465000	79965.6									2.61	464
470000	80825.5									2.64	473
475000	81685.3									2.67	482
480000	82545.1									2.70	491
485000	83405.0									2.73	501
490000	84264.8									2.76	510
495000	85124.7									2.78	520
500000	85984.5									2.81	529
505000	86844.4									2.84	539
510000	87704.2									2.87	549
515000	88564.1									2.90	559
520000	89423.9									2.92	568
525000	90283.7									2.95	578
530000	91143.6									2.98	589

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
535000	92003.4									3.01	599
540000	92863.3									3.04	609
550000	94583.0									3.09	630
600000	103181.4									3.37	738
650000	111779.9									3.66	855
700000	120378.3									3.94	979
750000	128976.8									4.22	1111

Table 49: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 90 °C / 70 °C, spread $\Delta T = 20$ K, d 15 - d 35

\dot{Q} [W]	d [mm]	15		18		22		28		35	
	\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
200	8.6	0.02	1	0.01	0						
300	12.9	0.03	2	0.02	1						
400	17.2	0.04	3	0.02	1						
500	21.5	0.04	4	0.03	2						
600	25.8	0.05	5	0.04	2						
700	30.1	0.06	7	0.04	3						
800	34.4	0.07	9	0.05	3						
900	38.7	0.08	11	0.05	4						
1000	43.0	0.09	13	0.06	5						
1100	47.3	0.10	15	0.07	6						
1200	51.6	0.11	17	0.07	7	0.05	3				
1300	55.9	0.12	20	0.08	8	0.05	3				
1400	60.2	0.13	23	0.08	9	0.06	3				
1500	64.5	0.13	26	0.09	10	0.06	4				
1600	68.8	0.14	28	0.10	11	0.06	4				
1700	73.1	0.15	32	0.10	12	0.07	5				
1800	77.4	0.16	35	0.11	13	0.07	5				
1900	81.7	0.17	38	0.11	14	0.08	6				
2000	86.0	0.18	42	0.12	16	0.08	6	0.05	2		
2500	107.5	0.22	62	0.15	23	0.10	9	0.06	3		
3000	129.0	0.27	84	0.18	32	0.12	12	0.07	3		
3500	150.5	0.31	110	0.21	41	0.14	16	0.08	4	0.05	2
4000	172.0	0.36	139	0.24	52	0.16	20	0.09	6	0.06	2
4500	193.5	0.40	171	0.27	64	0.18	24	0.10	7	0.07	2
5000	215.0	0.45	206	0.30	77	0.20	29	0.12	8	0.07	3
5500	236.5	0.49	244	0.33	91	0.22	35	0.13	10	0.08	3
6000	258.0	0.54	284	0.36	106	0.24	40	0.14	11	0.09	4
6500	279.4	0.58	327	0.39	122	0.26	46	0.15	13	0.10	5
7000	300.9	0.63	373	0.42	139	0.28	53	0.16	15	0.10	5
7500	322.4	0.67	422	0.45	156	0.30	59	0.17	17	0.11	6
8000	343.9	0.72	473	0.48	175	0.32	67	0.19	19	0.12	6
8500	365.4	0.76	526	0.50	195	0.34	74	0.20	21	0.13	7
9000	386.9	0.81	582	0.53	216	0.36	82	0.21	23	0.13	8
9500	408.4	0.85	641	0.56	237	0.38	90	0.22	25	0.14	9
10000	429.9	0.90	702	0.59	260	0.40	99	0.23	28	0.15	10
10500	451.4	0.94	766	0.62	283	0.42	108	0.24	30	0.16	10
11000	472.9	0.99	832	0.65	308	0.44	117	0.26	33	0.16	11
11500	494.4	1.03	901	0.68	333	0.46	126	0.27	35	0.17	12
12000	515.9	1.08	972	0.71	359	0.47	136	0.28	38	0.18	13
12500	537.4	1.12	1045	0.74	386	0.49	146	0.29	41	0.19	14
13000	558.9	1.17	1121	0.77	414	0.51	157	0.30	44	0.19	15
13500	580.4			0.80	443	0.53	168	0.31	47	0.20	16
14000	601.9			0.83	472	0.55	179	0.32	50	0.21	17
14500	623.4			0.86	503	0.57	190	0.34	53	0.22	18

	d [mm]	15		18		22		28		35	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
15000	644.9			0.89	534	0.59	202	0.35	56	0.22	19
15500	666.4			0.92	566	0.61	214	0.36	60	0.23	21
16000	687.9			0.95	599	0.63	227	0.37	63	0.24	22
16500	709.4			0.98	633	0.65	239	0.38	67	0.25	23
17000	730.9			1.01	668	0.67	252	0.39	70	0.25	24
17500	752.4			1.04	704	0.69	266	0.41	74	0.26	26
18000	773.9			1.07	740	0.71	279	0.42	78	0.27	27
18500	795.4			1.10	777	0.73	293	0.43	82	0.27	28
19000	816.9			1.13	815	0.75	308	0.44	86	0.28	30
19500	838.3			1.16	854	0.77	322	0.45	90	0.29	31
20000	859.8			1.19	893	0.79	337	0.46	94	0.30	32
20500	881.3			1.22	934	0.81	352	0.48	98	0.30	34
21000	902.8			1.25	975	0.83	368	0.49	102	0.31	35
21500	924.3			1.28	1017	0.85	384	0.50	107	0.32	37
22000	945.8			1.31	1060	0.87	400	0.51	111	0.33	38
22500	967.3			1.34	1104	0.89	416	0.52	116	0.33	40
23000	988.8			1.37	1148	0.91	433	0.53	120	0.34	41
23500	1010.3					0.93	450	0.55	125	0.35	43
24000	1031.8					0.95	467	0.56	130	0.36	45
24500	1053.3					0.97	485	0.57	135	0.36	46
25000	1074.8					0.99	502	0.58	140	0.37	48
25500	1096.3					1.01	521	0.59	145	0.38	50
26000	1117.8					1.03	539	0.60	150	0.39	51
26500	1139.3					1.05	558	0.61	155	0.39	53
27000	1160.8					1.07	577	0.63	160	0.40	55
27500	1182.3					1.09	596	0.64	165	0.41	57
28000	1203.8					1.11	616	0.65	171	0.42	59
28500	1225.3					1.13	635	0.66	176	0.42	61
29000	1246.8					1.15	655	0.67	182	0.43	62
29500	1268.3					1.17	676	0.68	187	0.44	64
30000	1289.8					1.19	697	0.70	193	0.45	66
32500	1397.2					1.29	804	0.75	223	0.48	76
35000	1504.7					1.39	919	0.81	254	0.52	87
37500	1612.2					1.48	1041	0.87	288	0.56	99
40000	1719.7					1.58	1169	0.93	323	0.59	111
42500	1827.2							0.99	360	0.63	123
45000	1934.7							1.04	399	0.67	137
47500	2042.1							1.10	440	0.71	151
50000	2149.6							1.16	483	0.74	165
52500	2257.1							1.22	527	0.78	180
55000	2364.6							1.28	573	0.82	196
57500	2472.1							1.33	621	0.85	212
60000	2579.5							1.39	670	0.89	229
62500	2687.0							1.45	722	0.93	246
65000	2794.5							1.51	775	0.97	264

Q̇ [W]	d [mm]	15		18		22		28		35	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
67500	2902.0							1.57	829	1.00	283
70000	3009.5							1.62	886	1.04	302
72500	3116.9							1.68	944	1.08	322
75000	3224.4							1.74	1004	1.11	342
77500	3331.9							1.80	1065	1.15	363
80000	3439.4									1.19	384
82500	3546.9									1.23	406
85000	3654.3									1.26	429
87500	3761.8									1.30	452
90000	3869.3									1.34	475
92500	3976.8									1.37	500
95000	4084.3									1.41	524
97500	4191.7									1.45	549
100000	4299.2									1.48	575
105000	4514.2									1.56	628
110000	4729.1									1.63	684
115000	4944.1									1.71	741
120000	5159.1									1.78	801
125000	5374.0									1.86	862
130000	5589.0									1.93	926
135000	5804.0									2.00	992
140000	6018.9									2.08	1060

Table 50: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 90 °C / 70 °C, spread $\Delta T = 20$ K, d 42 - d 108

\dot{Q} [W]	d [mm]	42		54		76.1		88.9		108	
		\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]
5000	215.0		0.05	1							
5500	236.5		0.05	1							
6000	258.0		0.06	2							
6500	279.4		0.06	2							
7000	300.9		0.07	2							
7500	322.4		0.07	2							
8000	343.9		0.08	3	0.05	1					
8500	365.4		0.08	3	0.05	1					
9000	386.9		0.09	3	0.05	1					
9500	408.4		0.09	3	0.06	1					
10000	429.9		0.10	4	0.06	1					
10500	451.4		0.10	4	0.06	1					
11000	472.9		0.11	4	0.06	1					
11500	494.4		0.11	5	0.07	1					
12000	515.9		0.12	5	0.07	1					
12500	537.4		0.12	6	0.07	2					
13000	558.9		0.13	6	0.08	2					
13500	580.4		0.13	6	0.08	2					
14000	601.9		0.14	7	0.08	2					
14500	623.4		0.14	7	0.08	2					
15000	644.9		0.15	8	0.09	2					
15500	666.4		0.15	8	0.09	2					
16000	687.9		0.16	9	0.09	2					
16500	709.4		0.16	9	0.10	3					
17000	730.9		0.17	9	0.10	3					
17500	752.4		0.17	10	0.10	3					
18000	773.9		0.18	10	0.11	3					
18500	795.4		0.18	11	0.11	3	0.05	1			
19000	816.9		0.19	12	0.11	3	0.06	1			
19500	838.3		0.19	12	0.11	3	0.06	1			
20000	859.8		0.20	13	0.12	4	0.06	1			
20500	881.3		0.20	13	0.12	4	0.06	1			
21000	902.8		0.21	14	0.12	4	0.06	1			
21500	924.3		0.21	14	0.13	4	0.06	1			
22000	945.8		0.22	15	0.13	4	0.06	1			
22500	967.3		0.22	15	0.13	4	0.07	1			
23000	988.8		0.23	16	0.13	4	0.07	1			
23500	1010.3		0.23	17	0.14	5	0.07	1			
24000	1031.8		0.24	17	0.14	5	0.07	1			
24500	1053.3		0.24	18	0.14	5	0.07	1			
25000	1074.8		0.25	19	0.15	5	0.07	1	0.05	0	
25500	1096.3		0.25	19	0.15	5	0.07	1	0.05	0	
26000	1117.8		0.26	20	0.15	6	0.08	1	0.05	0	
26500	1139.3		0.26	21	0.15	6	0.08	1	0.06	1	

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
27000	1160.8	0.27	21	0.16	6	0.08	1	0.06	1		
27500	1182.3	0.27	22	0.16	6	0.08	1	0.06	1		
28000	1203.8	0.28	23	0.16	6	0.08	1	0.06	1		
28500	1225.3	0.28	24	0.17	7	0.08	1	0.06	1		
29000	1246.8	0.29	24	0.17	7	0.08	1	0.06	1	0.04	0
29500	1268.3	0.29	25	0.17	7	0.09	1	0.06	1	0.04	0
30000	1289.8	0.30	26	0.18	7	0.09	1	0.06	1	0.04	0
32500	1397.2	0.32	30	0.19	8	0.10	2	0.07	1	0.05	0
35000	1504.7	0.35	34	0.20	9	0.10	2	0.07	1	0.05	0
37500	1612.2	0.37	38	0.22	11	0.11	2	0.08	1	0.05	0
40000	1719.7	0.40	43	0.23	12	0.12	2	0.08	1	0.06	0
42500	1827.2	0.42	48	0.25	13	0.12	3	0.09	1	0.06	0
45000	1934.7	0.45	53	0.26	15	0.13	3	0.09	1	0.06	0
47500	2042.1	0.47	58	0.28	16	0.14	3	0.10	1	0.07	1
50000	2149.6	0.50	64	0.29	18	0.15	3	0.11	2	0.07	1
52500	2257.1	0.52	70	0.31	19	0.15	4	0.11	2	0.07	1
55000	2364.6	0.55	76	0.32	21	0.16	4	0.12	2	0.08	1
57500	2472.1	0.57	82	0.34	23	0.17	4	0.12	2	0.08	1
60000	2579.5	0.60	89	0.35	24	0.18	5	0.13	2	0.08	1
62500	2687.0	0.62	95	0.37	26	0.18	5	0.13	2	0.09	1
65000	2794.5	0.65	102	0.38	28	0.19	5	0.14	2	0.09	1
67500	2902.0	0.67	109	0.39	30	0.20	6	0.14	3	0.09	1
70000	3009.5	0.70	117	0.41	32	0.20	6	0.15	3	0.10	1
72500	3116.9	0.72	124	0.42	34	0.21	7	0.15	3	0.10	1
75000	3224.4	0.75	132	0.44	36	0.22	7	0.16	3	0.11	1
77500	3331.9	0.77	140	0.45	39	0.23	7	0.16	3	0.11	1
80000	3439.4	0.80	148	0.47	41	0.23	8	0.17	4	0.11	1
82500	3546.9	0.82	157	0.48	43	0.24	8	0.17	4	0.12	1
85000	3654.3	0.85	165	0.50	46	0.25	9	0.18	4	0.12	2
87500	3761.8	0.87	174	0.51	48	0.26	9	0.18	4	0.12	2
90000	3869.3	0.90	183	0.53	51	0.26	10	0.19	4	0.13	2
92500	3976.8	0.92	193	0.54	53	0.27	10	0.20	5	0.13	2
95000	4084.3	0.95	202	0.56	56	0.28	11	0.20	5	0.13	2
97500	4191.7	0.97	212	0.57	58	0.29	11	0.21	5	0.14	2
100000	4299.2	1.00	222	0.58	61	0.29	12	0.21	5	0.14	2
105000	4514.2	1.05	242	0.61	67	0.31	13	0.22	6	0.15	2
110000	4729.1	1.10	263	0.64	72	0.32	14	0.23	6	0.15	2
115000	4944.1	1.15	285	0.67	78	0.34	15	0.24	7	0.16	3
120000	5159.1	1.20	308	0.70	85	0.35	16	0.25	7	0.17	3
125000	5374.0	1.25	332	0.73	91	0.37	17	0.26	8	0.18	3
130000	5589.0	1.30	356	0.76	98	0.38	19	0.27	8	0.18	3
135000	5804.0	1.35	381	0.79	105	0.39	20	0.28	9	0.19	3
140000	6018.9	1.40	407	0.82	112	0.41	21	0.30	10	0.20	4
145000	6233.9	1.45	434	0.85	119	0.42	23	0.31	10	0.20	4
150000	6448.8	1.50	461	0.88	127	0.44	24	0.32	11	0.21	4

	d [mm]	42		54		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
150000	6663.8	1.55	490	0.91	134	0.45	25	0.33	12	0.22	4
160000	6878.8	1.60	519	0.94	142	0.47	27	0.34	12	0.22	5
165000	7093.7	1.65	549	0.96	150	0.48	28	0.35	13	0.23	5
170000	7308.7	1.70	579	0.99	159	0.50	30	0.36	14	0.24	5
175000	7523.6	1.75	611	1.02	167	0.51	32	0.37	14	0.25	5
180000	7738.6	1.80	643	1.05	176	0.53	33	0.38	15	0.25	6
185000	7953.6	1.85	676	1.08	185	0.54	35	0.39	16	0.26	6
190000	8168.5	1.90	709	1.11	194	0.56	37	0.40	17	0.27	6
195000	8383.5	1.95	744	1.14	203	0.57	38	0.41	18	0.27	7
200000	8598.5	2.00	779	1.17	213	0.59	40	0.42	18	0.28	7
205000	8813.4	2.05	814	1.20	223	0.60	42	0.43	19	0.29	7
210000	9028.4	2.10	851	1.23	233	0.61	44	0.44	20	0.30	8
215000	9243.3	2.15	888	1.26	243	0.63	46	0.45	21	0.30	8
220000	9458.3	2.20	926	1.29	253	0.64	48	0.46	22	0.31	8
225000	9673.3	2.25	965	1.32	264	0.66	50	0.47	23	0.32	9
230000	9888.2	2.30	1005	1.34	274	0.67	52	0.49	24	0.32	9
235000	10103.2	2.35	1045	1.37	285	0.69	54	0.50	24	0.33	9
240000	10318.1	2.40	1086	1.40	296	0.70	56	0.51	25	0.34	10
245000	10533.1			1.43	308	0.72	58	0.52	26	0.34	10
250000	10748.1			1.46	319	0.73	60	0.53	27	0.35	10
255000	10963.0			1.49	331	0.75	62	0.54	28	0.36	11
260000	11178.0			1.52	343	0.76	65	0.55	29	0.37	11
265000	11392.9			1.55	355	0.78	67	0.56	30	0.37	11
270000	11607.9			1.58	367	0.79	69	0.57	31	0.38	12
275000	11822.9			1.61	380	0.80	71	0.58	33	0.39	12
280000	12037.8			1.64	392	0.82	74	0.59	34	0.39	13
285000	12252.8			1.67	405	0.83	76	0.60	35	0.40	13
290000	12467.8			1.70	418	0.85	79	0.61	36	0.41	13
295000	12682.7			1.72	431	0.86	81	0.62	37	0.41	14
300000	12897.7			1.75	445	0.88	84	0.63	38	0.42	14
305000	13112.6			1.78	458	0.89	86	0.64	39	0.43	15
310000	13327.6			1.81	472	0.91	89	0.65	40	0.44	15
315000	13542.6			1.84	486	0.92	91	0.66	42	0.44	16
320000	13757.5			1.87	500	0.94	94	0.68	43	0.45	16
325000	13972.5			1.90	515	0.95	97	0.69	44	0.46	17
330000	14187.4			1.93	529	0.97	99	0.70	45	0.46	17
335000	14402.4			1.96	544	0.98	102	0.71	46	0.47	17
340000	14617.4			1.99	559	0.99	105	0.72	48	0.48	18
345000	14832.3			2.02	574	1.01	108	0.73	49	0.49	18
350000	15047.3			2.05	589	1.02	110	0.74	50	0.49	19
355000	15262.3			2.08	605	1.04	113	0.75	52	0.50	19
360000	15477.2			2.10	620	1.05	116	0.76	53	0.51	20
365000	15692.2			2.13	636	1.07	119	0.77	54	0.51	20
370000	15907.1			2.16	652	1.08	122	0.78	56	0.52	21
375000	16122.1			2.19	669	1.10	125	0.79	57	0.53	21

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
380000	16337.1			2.22	685	1.11	128	0.80	58	0.53	22
385000	16552.0			2.25	702	1.13	131	0.81	60	0.54	22
390000	16767.0			2.28	718	1.14	134	0.82	61	0.55	23
395000	16981.9			2.31	735	1.16	138	0.83	63	0.56	24
400000	17196.9			2.34	752	1.17	141	0.84	64	0.56	24
405000	17411.9			2.37	770	1.18	144	0.85	65	0.57	25
410000	17626.8			2.40	787	1.20	147	0.86	67	0.58	25
415000	17841.8			2.43	805	1.21	151	0.88	68	0.58	26
420000	18056.7			2.46	823	1.23	154	0.89	70	0.59	26
425000	18271.7			2.48	841	1.24	157	0.90	71	0.60	27
430000	18486.7			2.51	859	1.26	161	0.91	73	0.60	27
435000	18701.6			2.54	877	1.27	164	0.92	75	0.61	28
440000	18916.6			2.57	896	1.29	167	0.93	76	0.62	29
445000	19131.6			2.60	915	1.30	171	0.94	78	0.63	29
450000	19346.5			2.63	934	1.32	174	0.95	79	0.63	30
455000	19561.5			2.66	953	1.33	178	0.96	81	0.64	30
460000	19776.4			2.69	972	1.35	182	0.97	82	0.65	31
465000	19991.4			2.72	992	1.36	185	0.98	84	0.65	32
470000	20206.4			2.75	1011	1.37	189	0.99	86	0.66	32
475000	20421.3			2.78	1031	1.39	192	1.00	87	0.67	33
480000	20636.3			2.81	1051	1.40	196	1.01	89	0.67	33
485000	20851.2			2.84	1071	1.42	200	1.02	91	0.68	34
490000	21066.2			2.86	1092	1.43	204	1.03	92	0.69	35
495000	21281.2					1.45	207	1.04	94	0.70	35
500000	21496.1					1.46	211	1.05	96	0.70	36
505000	21711.1					1.48	215	1.07	98	0.71	37
510000	21926.1					1.49	219	1.08	99	0.72	37
515000	22141.0					1.51	223	1.09	101	0.72	38
520000	22356.0					1.52	227	1.10	103	0.73	39
525000	22570.9					1.54	231	1.11	105	0.74	39
530000	22785.9					1.55	235	1.12	107	0.75	40
535000	23000.9					1.56	239	1.13	108	0.75	41
540000	23215.8					1.58	243	1.14	110	0.76	41
550000	23645.7					1.61	251	1.16	114	0.77	43
600000	25795.4					1.76	295	1.27	134	0.84	50
650000	27945.0					1.90	341	1.37	155	0.91	58
700000	30094.6					2.05	391	1.48	177	0.98	66
750000	32244.2					2.19	443	1.58	201	1.05	75
800000	34393.8					2.34	499	1.69	226	1.12	85
850000	36543.4					2.49	558	1.79	252	1.19	95
900000	38693.0					2.63	620	1.90	280	1.27	105
1000000	42992.3					2.93	752	2.11	340	1.41	127
1050000	45141.9					3.07	823	2.21	372	1.48	139
1100000	47291.5					3.22	897	2.32	405	1.55	151
1150000	49441.1					3.36	974	2.43	440	1.62	164

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
1200000	51590.7					3.51	1053	2.53	475	1.69	178
1250000	53740.3					3.66	1136	2.64	512	1.76	191
1300000	55889.9							2.74	551	1.83	206
1350000	58039.6							2.85	591	1.90	220
1400000	60189.2							2.95	631	1.97	236
1450000	62338.8							3.06	674	2.04	251
1500000	64488.4							3.16	717	2.11	267
1550000	66638.0							3.27	762	2.18	284
1600000	68787.6							3.38	808	2.25	301
1650000	70937.2							3.48	855	2.32	319
1700000	73086.8							3.59	904	2.39	337
1750000	75236.5							3.69	954	2.46	355
1800000	77386.1							3.80	1005	2.53	374
1850000	79535.7							3.90	1057	2.60	393
1900000	81685.3									2.67	413
1950000	83834.9									2.74	433
2000000	85984.5									2.81	454
2050000	88134.1									2.88	475
2100000	90283.7									2.95	497
2150000	92433.4									3.02	519
2200000	94583.0									3.09	541
2250000	96732.6									3.16	564
2300000	98882.2									3.23	588
2350000	101031.8									3.30	612
2400000	103181.4									3.37	636
2450000	105331.0									3.44	661
2500000	107480.7									3.51	686
2550000	109630.3									3.58	711
2600000	111779.9									3.66	737
2650000	113929.5									3.73	764
2700000	116079.1									3.80	791
2750000	118228.7									3.87	818
2800000	120378.3									3.94	846
2850000	122527.9									4.01	874
2900000	124677.6									4.08	903
2950000	126827.2									4.15	932
3000000	128976.8									4.22	961

Table 51: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 75 °C / 65 °C, spread $\Delta T = 10$ K, d 15 - d 35

\dot{Q} [W]	d [mm]	15		18		22		28		35	
	\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
200	17.2	0.04	3	0.02	1						
300	25.8	0.05	6	0.04	2						
400	34.4	0.07	9	0.05	3						
500	43.0	0.09	13	0.06	5						
600	51.6	0.11	18	0.07	7	0.05	3				
700	60.2	0.13	24	0.08	9	0.06	3				
800	68.8	0.14	30	0.10	11	0.06	4				
900	77.4	0.16	37	0.11	14	0.07	5				
1000	86.0	0.18	44	0.12	16	0.08	6	0.05	2		
1100	94.6	0.20	52	0.13	19	0.09	7	0.05	2		
1200	103.2	0.22	60	0.14	22	0.09	9	0.06	2		
1300	111.8	0.23	69	0.15	26	0.10	10	0.06	3		
1400	120.4	0.25	78	0.17	29	0.11	11	0.06	3		
1500	129.0	0.27	88	0.18	33	0.12	13	0.07	4		
1600	137.6	0.29	99	0.19	37	0.13	14	0.07	4	0.05	1
1700	146.2	0.31	110	0.20	41	0.13	16	0.08	4	0.05	2
1800	154.8	0.32	121	0.21	45	0.14	17	0.08	5	0.05	2
1900	163.4	0.34	133	0.23	50	0.15	19	0.09	5	0.06	2
2000	172.0	0.36	145	0.24	54	0.16	21	0.09	6	0.06	2
2500	215.0	0.45	215	0.30	80	0.20	31	0.12	9	0.07	3
3000	258.0	0.54	296	0.36	110	0.24	42	0.14	12	0.09	4
3500	300.9	0.63	388	0.42	144	0.28	55	0.16	15	0.10	5
4000	343.9	0.72	491	0.48	182	0.32	69	0.19	20	0.12	7
4500	386.9	0.81	605	0.53	224	0.36	85	0.21	24	0.13	8
5000	429.9	0.90	729	0.59	270	0.40	103	0.23	29	0.15	10
5500	472.9	0.99	864	0.65	320	0.44	121	0.26	34	0.16	12
6000	515.9	1.08	1008	0.71	373	0.47	141	0.28	40	0.18	14
6500	558.9	1.17	1163	0.77	430	0.51	163	0.30	46	0.19	16
7000	601.9	1.26	1327	0.83	490	0.55	186	0.32	52	0.21	18
7500	644.9	1.35	1501	0.89	554	0.59	210	0.35	59	0.22	20
8000	687.9	1.44	1684	0.95	622	0.63	235	0.37	66	0.24	23
8500	730.9	1.53	1878	1.01	693	0.67	262	0.39	73	0.25	25
9000	773.9	1.62	2080	1.07	767	0.71	290	0.42	81	0.27	28
9500	816.9	1.71	2292	1.13	845	0.75	319	0.44	89	0.28	31
10000	859.8			1.19	926	0.79	350	0.46	98	0.30	34
10500	902.8			1.25	1010	0.83	382	0.49	106	0.31	37
11000	945.8			1.31	1098	0.87	415	0.51	115	0.33	40
11500	988.8			1.37	1189	0.91	449	0.53	125	0.34	43
12000	1031.8			1.43	1283	0.95	484	0.56	135	0.36	46
12500	1074.8			1.48	1381	0.99	521	0.58	145	0.37	50
13000	1117.8			1.54	1481	1.03	558	0.60	155	0.39	53
13500	1160.8			1.60	1585	1.07	597	0.63	166	0.40	57
14000	1203.8			1.66	1692	1.11	638	0.65	177	0.42	61
14500	1246.8			1.72	1803	1.15	679	0.67	189	0.43	65

Q̇ [W]	d [mm]	15		18		22		28		35	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
15000	1289.8			1.78	1916	1.19	721	0.70	200	0.45	69
15500	1332.8			1.84	2032	1.23	765	0.72	212	0.46	73
16000	1375.8			1.90	2152	1.27	810	0.74	225	0.48	77
16500	1418.7			1.96	2275	1.31	856	0.77	237	0.49	82
17000	1461.7					1.35	903	0.79	250	0.50	86
17500	1504.7					1.39	951	0.81	264	0.52	91
18000	1547.7					1.42	1001	0.84	277	0.53	95
18500	1590.7					1.46	1051	0.86	291	0.55	100
19000	1633.7					1.50	1103	0.88	305	0.56	105
19500	1676.7					1.54	1156	0.90	320	0.58	110
20000	1719.7					1.58	1209	0.93	335	0.59	115
20500	1762.7					1.62	1264	0.95	350	0.61	120
21000	1805.7					1.66	1320	0.97	365	0.62	125
21500	1848.7					1.70	1378	1.00	381	0.64	131
22000	1891.7					1.74	1436	1.02	397	0.65	136
22500	1934.7					1.78	1495	1.04	413	0.67	142
23000	1977.6					1.82	1556	1.07	430	0.68	147
23500	2020.6					1.86	1617	1.09	447	0.70	153
24000	2063.6					1.90	1680	1.11	464	0.71	159
24500	2106.6					1.94	1744	1.14	482	0.73	165
25000	2149.6					1.98	1809	1.16	500	0.74	171
25500	2192.6					2.02	1875	1.18	518	0.76	177
26000	2235.6					2.06	1942	1.21	536	0.77	183
26500	2278.6					2.10	2010	1.23	555	0.79	190
27000	2321.6					2.14	2079	1.25	574	0.80	196
27500	2364.6					2.18	2149	1.28	593	0.82	203
28000	2407.6					2.22	2220	1.30	612	0.83	209
28500	2450.6							1.32	632	0.85	216
29000	2493.6							1.35	652	0.86	223
29500	2536.5							1.37	673	0.88	230
30000	2579.5							1.39	693	0.89	237
32500	2794.5							1.51	801	0.97	274
35000	3009.5							1.62	916	1.04	313
37500	3224.4							1.74	1037	1.11	354
40000	3439.4							1.86	1165	1.19	397
42500	3654.3							1.97	1301	1.26	443
45000	3869.3							2.09	1443	1.34	491
47500	4084.3							2.20	1591	1.41	542
50000	4299.2							2.32	1747	1.48	594
52500	4514.2							2.44	1909	1.56	649
55000	4729.1							2.55	2077	1.63	706
57500	4944.1							2.67	2252	1.71	765
60000	5159.1									1.78	827
62500	5374.0									1.86	890
65000	5589.0									1.93	956

\dot{Q} [W]	d [mm]	15		18		22		28		35	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
67500	5804.0									2.00	1024
70000	6018.9									2.08	1094
72500	6233.9									2.15	1166
75000	6448.8									2.23	1240
77500	6663.8									2.30	1316
80000	6878.8									2.38	1394
82500	7093.7									2.45	1475
85000	7308.7									2.52	1557
87500	7523.6									2.60	1642
90000	7738.6									2.67	1728
92500	7953.6									2.75	1817
95000	8168.5									2.82	1907
97500	8383.5									2.90	2000
100000	8598.5									2.97	2095
105000	9028.4									3.12	2290

Table 52: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 75 °C / 65 °C, spread $\Delta T = 10$ K, d 42 - d 108

\dot{Q} [W]	d [mm]	42		54		76.1		88.9		108	
		\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]
2500	215.0		0.05	1							
3000	258.0		0.06	2							
3500	300.9		0.07	2							
4000	343.9		0.08	3	0.05	1					
4500	386.9		0.09	3	0.05	1					
5000	429.9		0.10	4	0.06	1					
5500	472.9		0.11	5	0.06	1					
6000	515.9		0.12	5	0.07	2					
6500	558.9		0.13	6	0.08	2					
7000	601.9		0.14	7	0.08	2					
7500	644.9		0.15	8	0.09	2					
8000	687.9		0.16	9	0.09	2					
8500	730.9		0.17	10	0.10	3	0.05	1			
9000	773.9		0.18	11	0.11	3	0.05	1			
9500	816.9		0.19	12	0.11	3	0.06	1			
10000	859.8		0.20	13	0.12	4	0.06	1			
10500	902.8		0.21	14	0.12	4	0.06	1			
11000	945.8		0.22	15	0.13	4	0.06	1			
11500	988.8		0.23	17	0.13	5	0.07	1			
12000	1031.8		0.24	18	0.14	5	0.07	1			
12500	1074.8		0.25	19	0.15	5	0.07	1			
13000	1117.8		0.26	21	0.15	6	0.08	1	0.05	1	
13500	1160.8		0.27	22	0.16	6	0.08	1	0.06	1	
14000	1203.8		0.28	24	0.16	7	0.08	1	0.06	1	
14500	1246.8		0.29	25	0.17	7	0.08	1	0.06	1	
15000	1289.8		0.30	27	0.18	7	0.09	1	0.06	1	
15500	1332.8		0.31	28	0.18	8	0.09	2	0.07	1	
16000	1375.8		0.32	30	0.19	8	0.09	2	0.07	1	
16500	1418.7		0.33	32	0.19	9	0.10	2	0.07	1	
17000	1461.7		0.34	33	0.20	9	0.10	2	0.07	1	
17500	1504.7		0.35	35	0.20	10	0.10	2	0.07	1	
18000	1547.7		0.36	37	0.21	10	0.11	2	0.08	1	
18500	1590.7		0.37	39	0.22	11	0.11	2	0.08	1	
19000	1633.7		0.38	41	0.22	11	0.11	2	0.08	1	
19500	1676.7		0.39	43	0.23	12	0.11	2	0.08	1	
20000	1719.7		0.40	45	0.23	12	0.12	2	0.08	1	
20500	1762.7		0.41	47	0.24	13	0.12	2	0.09	1	
21000	1805.7		0.42	49	0.25	13	0.12	3	0.09	1	
21500	1848.7		0.43	51	0.25	14	0.13	3	0.09	1	
22000	1891.7		0.44	53	0.26	15	0.13	3	0.09	1	
22500	1934.7		0.45	55	0.26	15	0.13	3	0.09	1	0.06
23000	1977.6		0.46	57	0.27	16	0.13	3	0.10	1	0.06
23500	2020.6		0.47	59	0.27	16	0.14	3	0.10	1	0.07
24000	2063.6		0.48	62	0.28	17	0.14	3	0.10	2	0.07

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Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
24500	2106.6	0.49	64	0.29	18	0.14	3	0.10	2	0.07	1
25000	2149.6	0.50	66	0.29	18	0.15	4	0.11	2	0.07	1
25500	2192.6	0.51	69	0.30	19	0.15	4	0.11	2	0.07	1
26000	2235.6	0.52	71	0.30	20	0.15	4	0.11	2	0.07	1
26500	2278.6	0.53	74	0.31	20	0.16	4	0.11	2	0.07	1
27000	2321.6	0.54	76	0.32	21	0.16	4	0.11	2	0.08	1
27500	2364.6	0.55	79	0.32	22	0.16	4	0.12	2	0.08	1
28000	2407.6	0.56	81	0.33	22	0.16	4	0.12	2	0.08	1
28500	2450.6	0.57	84	0.33	23	0.17	4	0.12	2	0.08	1
29000	2493.6	0.58	86	0.34	24	0.17	5	0.12	2	0.08	1
29500	2536.5	0.59	89	0.34	25	0.17	5	0.12	2	0.08	1
30000	2579.5	0.60	92	0.35	25	0.18	5	0.13	2	0.08	1
32500	2794.5	0.65	106	0.38	29	0.19	6	0.14	3	0.09	1
35000	3009.5	0.70	121	0.41	33	0.20	6	0.15	3	0.10	1
37500	3224.4	0.75	137	0.44	38	0.22	7	0.16	3	0.11	1
40000	3439.4	0.80	154	0.47	42	0.23	8	0.17	4	0.11	1
42500	3654.3	0.85	171	0.50	47	0.25	9	0.18	4	0.12	2
45000	3869.3	0.90	190	0.53	52	0.26	10	0.19	5	0.13	2
47500	4084.3	0.95	209	0.56	58	0.28	11	0.20	5	0.13	2
50000	4299.2	1.00	229	0.58	63	0.29	12	0.21	6	0.14	2
52500	4514.2	1.05	250	0.61	69	0.31	13	0.22	6	0.15	2
55000	4729.1	1.10	272	0.64	75	0.32	14	0.23	7	0.15	2
57500	4944.1	1.15	295	0.67	81	0.34	15	0.24	7	0.16	3
60000	5159.1	1.20	318	0.70	88	0.35	17	0.25	8	0.17	3
62500	5374.0	1.25	343	0.73	94	0.37	18	0.26	8	0.18	3
65000	5589.0	1.30	368	0.76	101	0.38	19	0.27	9	0.18	3
67500	5804.0	1.35	394	0.79	108	0.39	21	0.28	9	0.19	4
70000	6018.9	1.40	421	0.82	116	0.41	22	0.30	10	0.20	4
72500	6233.9	1.45	448	0.85	123	0.42	23	0.31	11	0.20	4
75000	6448.8	1.50	477	0.88	131	0.44	25	0.32	11	0.21	4
77500	6663.8	1.55	506	0.91	139	0.45	26	0.33	12	0.22	5
80000	6878.8	1.60	536	0.94	147	0.47	28	0.34	13	0.22	5
82500	7093.7	1.65	566	0.96	155	0.48	29	0.35	13	0.23	5
85000	7308.7	1.70	598	0.99	164	0.50	31	0.36	14	0.24	5
87500	7523.6	1.75	630	1.02	173	0.51	33	0.37	15	0.25	6
90000	7738.6	1.80	663	1.05	182	0.53	34	0.38	16	0.25	6
92500	7953.6	1.85	697	1.08	191	0.54	36	0.39	17	0.26	6
95000	8168.5	1.90	732	1.11	201	0.56	38	0.40	17	0.27	7
97500	8383.5	1.95	767	1.14	210	0.57	40	0.41	18	0.27	7
100000	8598.5	2.00	803	1.17	220	0.59	42	0.42	19	0.28	7
105000	9028.4	2.10	878	1.23	240	0.61	45	0.44	21	0.30	8
110000	9458.3	2.20	955	1.29	261	0.64	49	0.46	23	0.31	9
115000	9888.2	2.30	1036	1.34	283	0.67	53	0.49	24	0.32	9
120000	10318.1	2.40	1120	1.40	306	0.70	58	0.51	26	0.34	10
125000	10748.1	2.50	1206	1.46	330	0.73	62	0.53	28	0.35	11

	d [mm]	42		54		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
130000	11178.0	2.60	1296	1.52	354	0.76	67	0.55	30	0.37	11
135000	11607.9	2.70	1388	1.58	379	0.79	71	0.57	33	0.38	12
140000	12037.8	2.80	1484	1.64	405	0.82	76	0.59	35	0.39	13
145000	12467.8	2.90	1582	1.70	431	0.85	81	0.61	37	0.41	14
150000	12897.7	3.00	1683	1.75	459	0.88	86	0.63	39	0.42	15
155000	13327.6	3.10	1787	1.81	487	0.91	92	0.65	42	0.44	16
160000	13757.5	3.20	1895	1.87	516	0.94	97	0.68	44	0.45	17
165000	14187.4	3.30	2004	1.93	546	0.97	103	0.70	47	0.46	18
170000	14617.4	3.40	2117	1.99	576	0.99	108	0.72	49	0.48	19
175000	15047.3	3.50	2233	2.05	608	1.02	114	0.74	52	0.49	20
180000	15477.2	3.60	2351	2.10	640	1.05	120	0.76	55	0.51	21
185000	15907.1			2.16	672	1.08	126	0.78	57	0.52	22
190000	16337.1			2.22	706	1.11	132	0.80	60	0.53	23
195000	16767.0			2.28	740	1.14	139	0.82	63	0.55	24
200000	17196.9			2.34	775	1.17	145	0.84	66	0.56	25
205000	17626.8			2.40	811	1.20	152	0.86	69	0.58	26
210000	18056.7			2.46	848	1.23	159	0.89	72	0.59	27
215000	18486.7			2.51	885	1.26	166	0.91	75	0.60	28
220000	18916.6			2.57	923	1.29	173	0.93	79	0.62	30
225000	19346.5			2.63	962	1.32	180	0.95	82	0.63	31
230000	19776.4			2.69	1001	1.35	187	0.97	85	0.65	32
235000	20206.4			2.75	1041	1.37	195	0.99	89	0.66	33
240000	20636.3			2.81	1082	1.40	202	1.01	92	0.67	35
245000	21066.2			2.86	1124	1.43	210	1.03	95	0.69	36
250000	21496.1			2.92	1166	1.46	218	1.05	99	0.70	37
255000	21926.1			2.98	1209	1.49	226	1.08	103	0.72	39
260000	22356.0			3.04	1253	1.52	234	1.10	106	0.73	40
265000	22785.9			3.10	1298	1.55	242	1.12	110	0.75	41
270000	23215.8			3.16	1343	1.58	251	1.14	114	0.76	43
275000	23645.7			3.22	1389	1.61	259	1.16	118	0.77	44
280000	24075.7			3.27	1436	1.64	268	1.18	122	0.79	46
285000	24505.6			3.33	1483	1.67	277	1.20	126	0.80	47
290000	24935.5			3.39	1532	1.70	286	1.22	130	0.82	49
295000	25365.4			3.45	1580	1.73	295	1.24	134	0.83	50
300000	25795.4			3.51	1630	1.76	304	1.27	138	0.84	52
305000	26225.3			3.57	1680	1.78	313	1.29	142	0.86	53
310000	26655.2			3.62	1731	1.81	323	1.31	146	0.87	55
315000	27085.1			3.68	1783	1.84	332	1.33	151	0.89	57
320000	27515.0			3.74	1836	1.87	342	1.35	155	0.90	58
325000	27945.0			3.80	1889	1.90	352	1.37	160	0.91	60
330000	28374.9			3.86	1943	1.93	362	1.39	164	0.93	62
335000	28804.8			3.92	1997	1.96	372	1.41	169	0.94	63
340000	29234.7			3.98	2052	1.99	382	1.43	173	0.96	65
345000	29664.7			4.03	2108	2.02	392	1.46	178	0.97	67
350000	30094.6			4.09	2165	2.05	403	1.48	183	0.98	69

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
355000	30524.5			4.15	2223	2.08	413	1.50	187	1.00	70
360000	30954.4			4.21	2281	2.11	424	1.52	192	1.01	72
365000	31384.4					2.14	435	1.54	197	1.03	74
370000	31814.3					2.16	446	1.56	202	1.04	76
375000	32244.2					2.19	457	1.58	207	1.05	78
380000	32674.1					2.22	468	1.60	212	1.07	80
385000	33104.0					2.25	479	1.62	217	1.08	81
390000	33534.0					2.28	491	1.65	222	1.10	83
395000	33963.9					2.31	502	1.67	228	1.11	85
400000	34393.8					2.34	514	1.69	233	1.12	87
405000	34823.7					2.37	526	1.71	238	1.14	89
410000	35253.7					2.40	538	1.73	244	1.15	91
415000	35683.6					2.43	550	1.75	249	1.17	93
420000	36113.5					2.46	562	1.77	255	1.18	95
425000	36543.4					2.49	575	1.79	260	1.19	98
430000	36973.3					2.52	587	1.81	266	1.21	100
435000	37403.3					2.54	600	1.84	272	1.22	102
440000	37833.2					2.57	612	1.86	277	1.24	104
445000	38263.1					2.60	625	1.88	283	1.25	106
450000	38693.0					2.63	638	1.90	289	1.27	108
455000	39123.0					2.66	651	1.92	295	1.28	110
460000	39552.9					2.69	664	1.94	301	1.29	113
465000	39982.8					2.72	678	1.96	307	1.31	115
470000	40412.7					2.75	691	1.98	313	1.32	117
475000	40842.6					2.78	705	2.00	319	1.34	119
480000	41272.6					2.81	718	2.03	325	1.35	122
485000	41702.5					2.84	732	2.05	331	1.36	124
490000	42132.4					2.87	746	2.07	338	1.38	126
495000	42562.3					2.90	760	2.09	344	1.39	129
500000	42992.3					2.93	774	2.11	350	1.41	131
505000	43422.2					2.95	789	2.13	357	1.42	134
510000	43852.1					2.98	803	2.15	363	1.43	136
515000	44282.0					3.01	817	2.17	370	1.45	138
520000	44712.0					3.04	832	2.19	376	1.46	141
525000	45141.9					3.07	847	2.21	383	1.48	143
530000	45571.8					3.10	862	2.24	390	1.49	146
535000	46001.7					3.13	877	2.26	396	1.50	148
540000	46431.6					3.16	892	2.28	403	1.52	151
550000	47291.5					3.22	923	2.32	417	1.55	156
600000	51590.7					3.51	1083	2.53	489	1.69	183
650000	55889.9					3.80	1255	2.74	567	1.83	212
700000	60189.2					4.10	1439	2.95	650	1.97	243
750000	64488.4					4.39	1635	3.16	737	2.11	275
800000	68787.6					4.68	1842	3.38	831	2.25	310
850000	73086.8					4.97	2061	3.59	929	2.39	346

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
900000	77386.1					5.27	2292	3.80	1032	2.53	385
1000000	85984.5							4.22	1254	2.81	467
1050000	90283.7							4.43	1373	2.95	511
1100000	94583.0							4.64	1496	3.09	557
1150000	98882.2							4.85	1625	3.23	604
1200000	103181.4							5.06	1758	3.37	653
1250000	107480.7							5.27	1897	3.51	705
1300000	111779.9							5.48	2040	3.66	758
1350000	116079.1							5.70	2189	3.80	812
1400000	120378.3							5.91	2342	3.94	869
1450000	124677.6									4.08	927
1500000	128976.8									4.22	987
1550000	133276.0									4.36	1049
1600000	137575.2									4.50	1113
1650000	141874.5									4.64	1178
1700000	146173.7									4.78	1245
1750000	150472.9									4.92	1314
1800000	154772.1									5.06	1385
1850000	159071.4									5.20	1457
1900000	163370.6									5.34	1531
1950000	167669.8									5.48	1607
2000000	171969.0									5.62	1684
2050000	176268.3									5.76	1764
2100000	180567.5									5.90	1844
2150000	184866.7									6.05	1927
2200000	189166.0									6.19	2012
2250000	193465.2									6.33	2098
2300000	197764.4									6.47	2185
2350000	202063.6									6.61	2275
2400000	206362.9									6.75	2366

Table 53: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 70 °C / 55 °C, spread $\Delta T = 15$ K, d 15 - d 35

\dot{Q} [W]	d [mm]	15		18		22		28		35	
	\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
200	11.5	0.02	2	0.02	1						
300	17.2	0.04	3	0.02	1						
400	22.9	0.05	5	0.03	2						
500	28.7	0.06	7	0.04	3						
600	34.4	0.07	10	0.05	4						
700	40.1	0.08	12	0.06	5						
800	45.9	0.10	16	0.06	6						
900	51.6	0.11	19	0.07	7						
1000	57.3	0.12	23	0.08	9	0.05	3				
1100	63.1	0.13	27	0.09	10	0.06	4				
1200	68.8	0.14	31	0.10	12	0.06	4				
1300	74.5	0.16	35	0.10	13	0.07	5				
1400	80.3	0.17	40	0.11	15	0.07	6				
1500	86.0	0.18	45	0.12	17	0.08	7	0.05	2		
1600	91.7	0.19	51	0.13	19	0.08	7	0.05	2		
1700	97.4	0.20	56	0.13	21	0.09	8	0.05	2		
1800	103.2	0.22	62	0.14	23	0.09	9	0.06	3		
1900	108.9	0.23	68	0.15	26	0.10	10	0.06	3		
2000	114.6	0.24	74	0.16	28	0.11	11	0.06	3		
2500	143.3	0.30	109	0.20	41	0.13	16	0.08	4	0.05	2
3000	172.0	0.36	150	0.24	56	0.16	21	0.09	6	0.06	2
3500	200.6	0.42	197	0.28	73	0.18	28	0.11	8	0.07	3
4000	229.3	0.48	248	0.32	93	0.21	35	0.12	10	0.08	3
4500	258.0	0.54	305	0.36	114	0.24	43	0.14	12	0.09	4
5000	286.6	0.60	367	0.40	137	0.26	52	0.15	15	0.10	5
5500	315.3	0.66	434	0.44	162	0.29	62	0.17	17	0.11	6
6000	343.9	0.72	506	0.48	188	0.32	72	0.19	20	0.12	7
6500	372.6	0.78	583	0.51	217	0.34	82	0.20	23	0.13	8
7000	401.3	0.84	665	0.55	247	0.37	94	0.22	26	0.14	9
7500	429.9	0.90	751	0.59	279	0.40	106	0.23	30	0.15	10
8000	458.6	0.96	842	0.63	312	0.42	119	0.25	33	0.16	12
8500	487.2	1.02	938	0.67	347	0.45	132	0.26	37	0.17	13
9000	515.9	1.08	1038	0.71	384	0.47	146	0.28	41	0.18	14
9500	544.6	1.14	1142	0.75	423	0.50	161	0.29	45	0.19	16
10000	573.2			0.79	463	0.53	176	0.31	49	0.20	17
10500	601.9			0.83	505	0.55	192	0.32	54	0.21	19
11000	630.6			0.87	548	0.58	208	0.34	58	0.22	20
11500	659.2			0.91	593	0.61	225	0.36	63	0.23	22
12000	687.9			0.95	640	0.63	242	0.37	68	0.24	23
12500	716.5			0.99	688	0.66	261	0.39	73	0.25	25
13000	745.2			1.03	738	0.69	279	0.40	78	0.26	27
13500	773.9			1.07	789	0.71	299	0.42	83	0.27	29
14000	802.5			1.11	842	0.74	319	0.43	89	0.28	31
14500	831.2			1.15	896	0.77	339	0.45	95	0.29	33

Q̇ [W]	d [mm]	15		18		22		28		35	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
15000	859.8			1.19	952	0.79	360	0.46	101	0.30	35
15500	888.5			1.23	1010	0.82	382	0.48	106	0.31	37
16000	917.2			1.27	1069	0.84	404	0.49	113	0.32	39
16500	945.8			1.31	1129	0.87	427	0.51	119	0.33	41
17000	974.5					0.90	450	0.53	125	0.34	43
17500	1003.2					0.92	474	0.54	132	0.35	46
18000	1031.8					0.95	498	0.56	139	0.36	48
18500	1060.5					0.98	523	0.57	146	0.37	50
19000	1089.1					1.00	548	0.59	153	0.38	53
19500	1117.8					1.03	574	0.60	160	0.39	55
20000	1146.5					1.06	601	0.62	167	0.40	58
20500	1175.1					1.08	628	0.63	175	0.41	60
21000	1203.8					1.11	656	0.65	182	0.42	63
21500	1232.4					1.13	684	0.67	190	0.43	65
22000	1261.1					1.16	713	0.68	198	0.44	68
22500	1289.8					1.19	742	0.70	206	0.45	71
23000	1318.4					1.21	771	0.71	214	0.46	74
23500	1347.1					1.24	802	0.73	223	0.47	77
24000	1375.8					1.27	833	0.74	231	0.48	80
24500	1404.4					1.29	864	0.76	240	0.49	83
25000	1433.1					1.32	896	0.77	249	0.49	86
25500	1461.7					1.35	928	0.79	258	0.50	89
26000	1490.4					1.37	961	0.80	267	0.51	92
26500	1519.1					1.40	994	0.82	276	0.52	95
27000	1547.7					1.42	1028	0.84	285	0.53	98
27500	1576.4					1.45	1063	0.85	295	0.54	101
28000	1605.0					1.48	1097	0.87	304	0.55	105
28500	1633.7							0.88	314	0.56	108
29000	1662.4							0.90	324	0.57	111
29500	1691.0							0.91	334	0.58	115
30000	1719.7							0.93	344	0.59	118
32500	1863.0							1.01	397	0.64	136
35000	2006.3							1.08	454	0.69	156
37500	2149.6							1.16	513	0.74	176
40000	2292.9							1.24	576	0.79	197
42500	2436.2							1.31	643	0.84	220
45000	2579.5							1.39	712	0.89	244
47500	2722.8							1.47	785	0.94	268
50000	2866.2							1.55	861	0.99	294
52500	3009.5							1.62	940	1.04	321
55000	3152.8							1.70	1022	1.09	349
57500	3296.1							1.78	1107	1.14	378
60000	3439.4									1.19	408
62500	3582.7									1.24	439
65000	3726.0									1.29	471

Q̇ [W]	d [mm]	15		18		22		28		35	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
67500	3869.3									1.34	505
70000	4012.6									1.39	539
72500	4155.9									1.44	574
75000	4299.2									1.48	610
77500	4442.5									1.53	647
80000	4585.8									1.58	686
82500	4729.1									1.63	725
85000	4872.5									1.68	765
87500	5015.8									1.73	806
90000	5159.1									1.78	848
92500	5302.4									1.83	891
95000	5445.7									1.88	935
97500	5589.0									1.93	980
100000	5732.3									1.98	1026
105000	6018.9									2.08	1121

Table 54: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 70 °C / 55 °C, spread $\Delta T = 15$ K, d 42 - d 108

\dot{Q} [W]	d [mm]	42		54		76.1		88.9		108	
		\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]
4000	229.3		0.05	1							
4500	258.0		0.06	2							
5000	286.6		0.07	2							
5500	315.3		0.07	2							
6000	343.9		0.08	3							
6500	372.6		0.09	3							
7000	401.3		0.09	4	0.05	1					
7500	429.9		0.10	4	0.06	1					
8000	458.6		0.11	5	0.06	1					
8500	487.2		0.11	5	0.07	1					
9000	515.9		0.12	6	0.07	2					
9500	544.6		0.13	6	0.07	2					
10000	573.2		0.13	7	0.08	2					
10500	601.9		0.14	7	0.08	2					
11000	630.6		0.15	8	0.09	2					
11500	659.2		0.15	8	0.09	2					
12000	687.9		0.16	9	0.09	3					
12500	716.5		0.17	10	0.10	3					
13000	745.2		0.17	11	0.10	3					
13500	773.9		0.18	11	0.11	3					
14000	802.5		0.19	12	0.11	3	0.05	1			
14500	831.2		0.19	13	0.11	4	0.06	1			
15000	859.8		0.20	14	0.12	4	0.06	1			
15500	888.5		0.21	14	0.12	4	0.06	1			
16000	917.2		0.21	15	0.12	4	0.06	1			
16500	945.8		0.22	16	0.13	4	0.06	1			
17000	974.5		0.23	17	0.13	5	0.07	1			
17500	1003.2		0.23	18	0.14	5	0.07	1			
18000	1031.8		0.24	19	0.14	5	0.07	1			
18500	1060.5		0.25	20	0.14	5	0.07	1			
19000	1089.1		0.25	20	0.15	6	0.07	1			
19500	1117.8		0.26	21	0.15	6	0.08	1	0.05	1	
20000	1146.5		0.27	22	0.16	6	0.08	1	0.06	1	
20500	1175.1		0.27	23	0.16	7	0.08	1	0.06	1	
21000	1203.8		0.28	24	0.16	7	0.08	1	0.06	1	
21500	1232.4		0.29	25	0.17	7	0.08	1	0.06	1	
22000	1261.1		0.29	27	0.17	7	0.09	1	0.06	1	
22500	1289.8		0.30	28	0.18	8	0.09	1	0.06	1	
23000	1318.4		0.31	29	0.18	8	0.09	2	0.06	1	
23500	1347.1		0.31	30	0.18	8	0.09	2	0.07	1	
24000	1375.8		0.32	31	0.19	9	0.09	2	0.07	1	
24500	1404.4		0.33	32	0.19	9	0.10	2	0.07	1	
25000	1433.1		0.33	33	0.19	9	0.10	2	0.07	1	
25500	1461.7		0.34	34	0.20	10	0.10	2	0.07	1	

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
26000	1490.4	0.35	36	0.20	10	0.10	2	0.07	1		
26500	1519.1	0.35	37	0.21	10	0.10	2	0.07	1		
27000	1547.7	0.36	38	0.21	11	0.11	2	0.08	1		
27500	1576.4	0.37	39	0.21	11	0.11	2	0.08	1		
28000	1605.0	0.37	41	0.22	11	0.11	2	0.08	1		
28500	1633.7	0.38	42	0.22	12	0.11	2	0.08	1		
29000	1662.4	0.39	43	0.23	12	0.11	2	0.08	1	0.05	0
29500	1691.0	0.39	45	0.23	12	0.12	2	0.08	1	0.06	0
30000	1719.7	0.40	46	0.23	13	0.12	2	0.08	1	0.06	0
32500	1863.0	0.43	53	0.25	15	0.13	3	0.09	1	0.06	0
35000	2006.3	0.47	60	0.27	17	0.14	3	0.10	1	0.07	1
37500	2149.6	0.50	68	0.29	19	0.15	4	0.11	2	0.07	1
40000	2292.9	0.53	77	0.31	21	0.16	4	0.11	2	0.07	1
42500	2436.2	0.57	85	0.33	24	0.17	5	0.12	2	0.08	1
45000	2579.5	0.60	94	0.35	26	0.18	5	0.13	2	0.08	1
47500	2722.8	0.63	104	0.37	29	0.19	6	0.13	3	0.09	1
50000	2866.2	0.67	114	0.39	32	0.20	6	0.14	3	0.09	1
52500	3009.5	0.70	124	0.41	34	0.20	7	0.15	3	0.10	1
55000	3152.8	0.73	135	0.43	37	0.21	7	0.15	3	0.10	1
57500	3296.1	0.77	146	0.45	40	0.22	8	0.16	4	0.11	1
60000	3439.4	0.80	158	0.47	44	0.23	8	0.17	4	0.11	1
62500	3582.7	0.83	170	0.49	47	0.24	9	0.18	4	0.12	2
65000	3726.0	0.87	182	0.51	50	0.25	10	0.18	4	0.12	2
67500	3869.3	0.90	195	0.53	54	0.26	10	0.19	5	0.13	2
70000	4012.6	0.93	208	0.55	57	0.27	11	0.20	5	0.13	2
72500	4155.9	0.97	222	0.57	61	0.28	12	0.20	5	0.14	2
75000	4299.2	1.00	236	0.58	65	0.29	12	0.21	6	0.14	2
77500	4442.5	1.03	250	0.60	69	0.30	13	0.22	6	0.15	2
80000	4585.8	1.07	264	0.62	73	0.31	14	0.23	6	0.15	2
82500	4729.1	1.10	280	0.64	77	0.32	15	0.23	7	0.15	3
85000	4872.5	1.13	295	0.66	81	0.33	15	0.24	7	0.16	3
87500	5015.8	1.17	311	0.68	86	0.34	16	0.25	7	0.16	3
90000	5159.1	1.20	327	0.70	90	0.35	17	0.25	8	0.17	3
92500	5302.4	1.23	343	0.72	95	0.36	18	0.26	8	0.17	3
95000	5445.7	1.27	360	0.74	99	0.37	19	0.27	9	0.18	3
97500	5589.0	1.30	378	0.76	104	0.38	20	0.27	9	0.18	3
100000	5732.3	1.33	395	0.78	109	0.39	21	0.28	9	0.19	4
105000	6018.9	1.40	432	0.82	119	0.41	23	0.30	10	0.20	4
110000	6305.5	1.47	470	0.86	129	0.43	25	0.31	11	0.21	4
115000	6592.1	1.53	509	0.90	140	0.45	27	0.32	12	0.22	5
120000	6878.8	1.60	550	0.94	151	0.47	29	0.34	13	0.22	5
125000	7165.4	1.67	592	0.97	162	0.49	31	0.35	14	0.23	5
130000	7452.0	1.73	635	1.01	174	0.51	33	0.37	15	0.24	6
135000	7738.6	1.80	680	1.05	187	0.53	35	0.38	16	0.25	6
140000	8025.2	1.87	727	1.09	199	0.55	38	0.39	17	0.26	7

	d [mm]	42		54		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
145000	8311.8	1.93	774	1.13	212	0.57	40	0.41	18	0.27	7
150000	8598.5	2.00	823	1.17	226	0.59	43	0.42	20	0.28	7
155000	8885.1	2.07	874	1.21	240	0.60	45	0.44	21	0.29	8
160000	9171.7	2.13	926	1.25	254	0.62	48	0.45	22	0.30	8
165000	9458.3	2.20	979	1.29	268	0.64	51	0.46	23	0.31	9
170000	9744.9	2.27	1034	1.33	283	0.66	53	0.48	24	0.32	9
175000	10031.5	2.33	1090	1.36	298	0.68	56	0.49	26	0.33	10
180000	10318.1	2.40	1147	1.40	314	0.70	59	0.51	27	0.34	10
185000	10604.8			1.44	330	0.72	62	0.52	28	0.35	11
190000	10891.4			1.48	346	0.74	65	0.53	30	0.36	11
195000	11178.0			1.52	363	0.76	68	0.55	31	0.37	12
200000	11464.6			1.56	380	0.78	72	0.56	33	0.37	12
205000	11751.2			1.60	397	0.80	75	0.58	34	0.38	13
210000	12037.8			1.64	415	0.82	78	0.59	36	0.39	13
215000	12324.4			1.68	433	0.84	82	0.60	37	0.40	14
220000	12611.1			1.71	452	0.86	85	0.62	39	0.41	15
225000	12897.7			1.75	470	0.88	89	0.63	40	0.42	15
230000	13184.3			1.79	490	0.90	92	0.65	42	0.43	16
235000	13470.9			1.83	509	0.92	96	0.66	44	0.44	16
240000	13757.5			1.87	529	0.94	100	0.68	45	0.45	17
245000	14044.1			1.91	549	0.96	103	0.69	47	0.46	18
250000	14330.8			1.95	570	0.98	107	0.70	49	0.47	18
255000	14617.4			1.99	591	0.99	111	0.72	51	0.48	19
260000	14904.0			2.03	612	1.01	115	0.73	52	0.49	20
265000	15190.6			2.07	633	1.03	119	0.75	54	0.50	20
270000	15477.2			2.10	655	1.05	123	0.76	56	0.51	21
275000	15763.8			2.14	678	1.07	127	0.77	58	0.52	22
280000	16050.4			2.18	700	1.09	132	0.79	60	0.52	23
285000	16337.1			2.22	723	1.11	136	0.80	62	0.53	23
290000	16623.7			2.26	746	1.13	140	0.82	64	0.54	24
295000	16910.3			2.30	770	1.15	145	0.83	66	0.55	25
300000	17196.9			2.34	794	1.17	149	0.84	68	0.56	26
305000	17483.5			2.38	818	1.19	154	0.86	70	0.57	26
310000	17770.1			2.42	843	1.21	158	0.87	72	0.58	27
315000	18056.7			2.46	868	1.23	163	0.89	74	0.59	28
320000	18343.4			2.49	893	1.25	168	0.90	76	0.60	29
325000	18630.0			2.53	919	1.27	172	0.91	78	0.61	30
330000	18916.6			2.57	945	1.29	177	0.93	81	0.62	30
335000	19203.2			2.61	971	1.31	182	0.94	83	0.63	31
340000	19489.8			2.65	998	1.33	187	0.96	85	0.64	32
345000	19776.4			2.69	1025	1.35	192	0.97	87	0.65	33
350000	20063.1			2.73	1052	1.37	197	0.98	90	0.66	34
355000	20349.7			2.77	1080	1.38	202	1.00	92	0.67	35
360000	20636.3			2.81	1108	1.40	207	1.01	94	0.67	36
365000	20922.9					1.42	213	1.03	97	0.68	36

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
370000	21209.5					1.44	218	1.04	99	0.69	37
375000	21496.1					1.46	223	1.05	102	0.70	38
380000	21782.7					1.48	229	1.07	104	0.71	39
385000	22069.4					1.50	234	1.08	107	0.72	40
390000	22356.0					1.52	240	1.10	109	0.73	41
395000	22642.6					1.54	246	1.11	112	0.74	42
400000	22929.2					1.56	251	1.13	114	0.75	43
405000	23215.8					1.58	257	1.14	117	0.76	44
410000	23502.4					1.60	263	1.15	119	0.77	45
415000	23789.1					1.62	269	1.17	122	0.78	46
420000	24075.7					1.64	275	1.18	125	0.79	47
425000	24362.3					1.66	281	1.20	127	0.80	48
430000	24648.9					1.68	287	1.21	130	0.81	49
435000	24935.5					1.70	293	1.22	133	0.82	50
440000	25222.1					1.72	299	1.24	136	0.82	51
445000	25508.7					1.74	305	1.25	139	0.83	52
450000	25795.4					1.76	311	1.27	141	0.84	53
455000	26082.0					1.77	318	1.28	144	0.85	54
460000	26368.6					1.79	324	1.29	147	0.86	55
465000	26655.2					1.81	330	1.31	150	0.87	56
470000	26941.8					1.83	337	1.32	153	0.88	58
475000	27228.4					1.85	344	1.34	156	0.89	59
480000	27515.0					1.87	350	1.35	159	0.90	60
485000	27801.7					1.89	357	1.36	162	0.91	61
490000	28088.3					1.91	364	1.38	165	0.92	62
495000	28374.9					1.93	370	1.39	168	0.93	63
500000	28661.5					1.95	377	1.41	171	0.94	64
505000	28948.1					1.97	384	1.42	174	0.95	65
510000	29234.7					1.99	391	1.43	177	0.96	67
515000	29521.4					2.01	398	1.45	181	0.97	68
520000	29808.0					2.03	405	1.46	184	0.97	69
525000	30094.6					2.05	412	1.48	187	0.98	70
530000	30381.2					2.07	420	1.49	190	0.99	71
535000	30667.8					2.09	427	1.50	194	1.00	73
540000	30954.4					2.11	434	1.52	197	1.01	74
550000	31527.7					2.15	449	1.55	204	1.03	76
600000	34393.8					2.34	526	1.69	239	1.12	90
650000	37260.0					2.54	609	1.83	276	1.22	104
700000	40126.1					2.73	698	1.97	316	1.31	118
750000	42992.3					2.93	792	2.11	359	1.41	134
800000	45858.4					3.12	891	2.25	403	1.50	151
850000	48724.6					3.32	997	2.39	451	1.59	169
900000	51590.7					3.51	1107	2.53	501	1.69	187
1000000	57323.0							2.81	607	1.87	227
1050000	60189.2							2.95	664	1.97	248

	d [mm]	42		54		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
1100000	63055.3							3.09	723	2.06	270
1150000	65921.5							3.23	785	2.16	293
1200000	68787.6							3.38	849	2.25	317
1250000	71653.8							3.52	915	2.34	342
1300000	74519.9							3.66	984	2.44	367
1350000	77386.1							3.80	1055	2.53	393
1400000	80252.2							3.94	1128	2.62	421
1450000	83118.4									2.72	449
1500000	85984.5									2.81	477
1550000	88850.7									2.91	507
1600000	91716.8									3.00	538
1650000	94583.0									3.09	569
1700000	97449.1									3.19	601
1750000	100315.3									3.28	634
1800000	103181.4									3.37	668
1850000	106047.6									3.47	702
1900000	108913.7									3.56	738
1950000	111779.9									3.66	774
2000000	114646.0									3.75	811
2050000	117512.2									3.84	849
2100000	120378.3									3.94	887
2150000	123244.5									4.03	927
2200000	126110.6									4.12	967
2250000	128976.8									4.22	1008
2300000	131842.9									4.31	1050
2350000	134709.1									4.40	1093
2400000	137575.2									4.50	1136

Table 55: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 70 °C / 50 °C, spread $\Delta T = 20$ K, d 15 - d 35

\dot{Q} [W]	d [mm]	15		18		22		28		35	
	\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
200	8.6	0.02	1	0.01	0						
300	12.9	0.03	2	0.02	1						
400	17.2	0.04	3	0.02	1						
500	21.5	0.04	4	0.03	2						
600	25.8	0.05	6	0.04	2						
700	30.1	0.06	8	0.04	3						
800	34.4	0.07	10	0.05	4						
900	38.7	0.08	12	0.05	4						
1000	43.0	0.09	14	0.06	5						
1100	47.3	0.10	17	0.07	6						
1200	51.6	0.11	19	0.07	7	0.05	3				
1300	55.9	0.12	22	0.08	8	0.05	3				
1400	60.2	0.13	25	0.08	9	0.06	4				
1500	64.5	0.13	28	0.09	11	0.06	4				
1600	68.8	0.14	31	0.10	12	0.06	5				
1700	73.1	0.15	35	0.10	13	0.07	5				
1800	77.4	0.16	38	0.11	14	0.07	6				
1900	81.7	0.17	42	0.11	16	0.08	6				
2000	86.0	0.18	46	0.12	17	0.08	7	0.05	2		
2500	107.5	0.22	67	0.15	25	0.10	10	0.06	3		
3000	129.0	0.27	92	0.18	35	0.12	13	0.07	4		
3500	150.5	0.31	121	0.21	45	0.14	17	0.08	5	0.05	2
4000	172.0	0.36	152	0.24	57	0.16	22	0.09	6	0.06	2
4500	193.5	0.40	187	0.27	70	0.18	27	0.10	8	0.07	3
5000	215.0	0.45	224	0.30	84	0.20	32	0.12	9	0.07	3
5500	236.5	0.49	265	0.33	99	0.22	38	0.13	11	0.08	4
6000	258.0	0.54	309	0.36	115	0.24	44	0.14	12	0.09	4
6500	279.4	0.58	355	0.39	132	0.26	50	0.15	14	0.10	5
7000	300.9	0.63	405	0.42	151	0.28	57	0.16	16	0.10	6
7500	322.4	0.67	457	0.45	170	0.30	65	0.17	18	0.11	6
8000	343.9	0.72	512	0.48	190	0.32	72	0.19	20	0.12	7
8500	365.4	0.76	569	0.50	212	0.34	81	0.20	23	0.13	8
9000	386.9	0.81	630	0.53	234	0.36	89	0.21	25	0.13	9
9500	408.4	0.85	693	0.56	257	0.38	98	0.22	28	0.14	10
10000	429.9	0.90	759	0.59	282	0.40	107	0.23	30	0.15	10
10500	451.4	0.94	827	0.62	307	0.42	117	0.24	33	0.16	11
11000	472.9	0.99	898	0.65	333	0.44	127	0.26	36	0.16	12
11500	494.4	1.03	972	0.68	360	0.46	137	0.27	38	0.17	13
12000	515.9	1.08	1048	0.71	388	0.47	147	0.28	41	0.18	14
12500	537.4			0.74	417	0.49	158	0.29	44	0.19	15
13000	558.9			0.77	447	0.51	170	0.30	48	0.19	16
13500	580.4			0.80	478	0.53	181	0.31	51	0.20	18
14000	601.9			0.83	510	0.55	194	0.32	54	0.21	19
14500	623.4			0.86	543	0.57	206	0.34	58	0.22	20

Q̇ [W]	d [mm]	15		18		22		28		35	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
15000	644.9			0.89	577	0.59	219	0.35	61	0.22	21
15500	666.4			0.92	611	0.61	232	0.36	65	0.23	22
16000	687.9			0.95	647	0.63	245	0.37	69	0.24	24
16500	709.4			0.98	683	0.65	259	0.38	72	0.25	25
17000	730.9			1.01	720	0.67	273	0.39	76	0.25	26
17500	752.4			1.04	758	0.69	287	0.41	80	0.26	28
18000	773.9			1.07	797	0.71	302	0.42	84	0.27	29
18500	795.4			1.10	837	0.73	317	0.43	89	0.27	31
19000	816.9			1.13	878	0.75	332	0.44	93	0.28	32
19500	838.3			1.16	919	0.77	348	0.45	97	0.29	34
20000	859.8			1.19	962	0.79	364	0.46	102	0.30	35
20500	881.3			1.22	1005	0.81	380	0.48	106	0.30	37
21000	902.8			1.25	1049	0.83	397	0.49	111	0.31	38
21500	924.3			1.28	1094	0.85	414	0.50	115	0.32	40
22000	945.8			1.31	1140	0.87	431	0.51	120	0.33	41
22500	967.3					0.89	448	0.52	125	0.33	43
23000	988.8					0.91	466	0.53	130	0.34	45
23500	1010.3					0.93	485	0.55	135	0.35	47
24000	1031.8					0.95	503	0.56	140	0.36	48
24500	1053.3					0.97	522	0.57	145	0.36	50
25000	1074.8					0.99	541	0.58	151	0.37	52
25500	1096.3					1.01	560	0.59	156	0.38	54
26000	1117.8					1.03	580	0.60	162	0.39	56
26500	1139.3					1.05	600	0.61	167	0.39	58
27000	1160.8					1.07	620	0.63	173	0.40	59
27500	1182.3					1.09	641	0.64	178	0.41	61
28000	1203.8					1.11	662	0.65	184	0.42	63
28500	1225.3					1.13	683	0.66	190	0.42	65
29000	1246.8					1.15	705	0.67	196	0.43	68
29500	1268.3					1.17	727	0.68	202	0.44	70
30000	1289.8					1.19	749	0.70	208	0.45	72
32500	1397.2					1.29	864	0.75	240	0.48	83
35000	1504.7					1.39	987	0.81	274	0.52	94
37500	1612.2					1.48	1117	0.87	310	0.56	106
40000	1719.7							0.93	348	0.59	119
42500	1827.2							0.99	387	0.63	133
45000	1934.7							1.04	429	0.67	147
47500	2042.1							1.10	473	0.71	162
50000	2149.6							1.16	518	0.74	178
52500	2257.1							1.22	566	0.78	194
55000	2364.6							1.28	615	0.82	211
57500	2472.1							1.33	666	0.85	228
60000	2579.5							1.39	719	0.89	246
62500	2687.0							1.45	773	0.93	265
65000	2794.5							1.51	830	0.97	284

Q̇ [W]	d [mm]	15		18		22		28		35	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
67500	2902.0							1.57	888	1.00	304
70000	3009.5							1.62	948	1.04	324
72500	3116.9							1.68	1010	1.08	345
75000	3224.4							1.74	1074	1.11	367
77500	3331.9									1.15	389
80000	3439.4									1.19	412
82500	3546.9									1.23	435
85000	3654.3									1.26	459
87500	3761.8									1.30	484
90000	3869.3									1.34	509
92500	3976.8									1.37	535
95000	4084.3									1.41	561
97500	4191.7									1.45	588
100000	4299.2									1.48	616
105000	4514.2									1.56	672
110000	4729.1									1.63	731
115000	4944.1									1.71	792
120000	5159.1									1.78	856
125000	5374.0									1.86	921
130000	5589.0									1.93	989
135000	5804.0									2.00	1059

Table 56: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 70 °C / 50 °C, spread $\Delta T = 20$ K, d 42 - d 108

\dot{Q} [W]	d [mm]	42		54		76.1		88.9		108	
		\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]
5000	215.0		0.05	1							
5500	236.5		0.05	1							
6000	258.0		0.06	2							
6500	279.4		0.06	2							
7000	300.9		0.07	2							
7500	322.4		0.07	2							
8000	343.9		0.08	3	0.05	1					
8500	365.4		0.08	3	0.05	1					
9000	386.9		0.09	3	0.05	1					
9500	408.4		0.09	4	0.06	1					
10000	429.9		0.10	4	0.06	1					
10500	451.4		0.10	4	0.06	1					
11000	472.9		0.11	5	0.06	1					
11500	494.4		0.11	5	0.07	1					
12000	515.9		0.12	6	0.07	2					
12500	537.4		0.12	6	0.07	2					
13000	558.9		0.13	6	0.08	2					
13500	580.4		0.13	7	0.08	2					
14000	601.9		0.14	7	0.08	2					
14500	623.4		0.14	8	0.08	2					
15000	644.9		0.15	8	0.09	2					
15500	666.4		0.15	9	0.09	2					
16000	687.9		0.16	9	0.09	3					
16500	709.4		0.16	10	0.10	3					
17000	730.9		0.17	10	0.10	3					
17500	752.4		0.17	11	0.10	3					
18000	773.9		0.18	11	0.11	3					
18500	795.4		0.18	12	0.11	3	0.05	1			
19000	816.9		0.19	12	0.11	3	0.06	1			
19500	838.3		0.19	13	0.11	4	0.06	1			
20000	859.8		0.20	14	0.12	4	0.06	1			
20500	881.3		0.20	14	0.12	4	0.06	1			
21000	902.8		0.21	15	0.12	4	0.06	1			
21500	924.3		0.21	16	0.13	4	0.06	1			
22000	945.8		0.22	16	0.13	5	0.06	1			
22500	967.3		0.22	17	0.13	5	0.07	1			
23000	988.8		0.23	17	0.13	5	0.07	1			
23500	1010.3		0.23	18	0.14	5	0.07	1			
24000	1031.8		0.24	19	0.14	5	0.07	1			
24500	1053.3		0.24	20	0.14	5	0.07	1			
25000	1074.8		0.25	20	0.15	6	0.07	1	0.05	1	
25500	1096.3		0.25	21	0.15	6	0.07	1	0.05	1	
26000	1117.8		0.26	22	0.15	6	0.08	1	0.05	1	
26500	1139.3		0.26	22	0.15	6	0.08	1	0.06	1	

Docu no.: B469-001&BDZ

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
27000	1160.8	0.27	23	0.16	6	0.08	1	0.06	1		
27500	1182.3	0.27	24	0.16	7	0.08	1	0.06	1		
28000	1203.8	0.28	25	0.16	7	0.08	1	0.06	1		
28500	1225.3	0.28	25	0.17	7	0.08	1	0.06	1		
29000	1246.8	0.29	26	0.17	7	0.08	1	0.06	1	0.04	0
29500	1268.3	0.29	27	0.17	8	0.09	1	0.06	1	0.04	0
30000	1289.8	0.30	28	0.18	8	0.09	1	0.06	1	0.04	0
32500	1397.2	0.32	32	0.19	9	0.10	2	0.07	1	0.05	0
35000	1504.7	0.35	37	0.20	10	0.10	2	0.07	1	0.05	0
37500	1612.2	0.37	41	0.22	12	0.11	2	0.08	1	0.05	0
40000	1719.7	0.40	46	0.23	13	0.12	2	0.08	1	0.06	0
42500	1827.2	0.42	52	0.25	14	0.12	3	0.09	1	0.06	0
45000	1934.7	0.45	57	0.26	16	0.13	3	0.09	1	0.06	1
47500	2042.1	0.47	63	0.28	17	0.14	3	0.10	2	0.07	1
50000	2149.6	0.50	69	0.29	19	0.15	4	0.11	2	0.07	1
52500	2257.1	0.52	75	0.31	21	0.15	4	0.11	2	0.07	1
55000	2364.6	0.55	82	0.32	23	0.16	4	0.12	2	0.08	1
57500	2472.1	0.57	88	0.34	24	0.17	5	0.12	2	0.08	1
60000	2579.5	0.60	95	0.35	26	0.18	5	0.13	2	0.08	1
62500	2687.0	0.62	103	0.37	28	0.18	5	0.13	2	0.09	1
65000	2794.5	0.65	110	0.38	30	0.19	6	0.14	3	0.09	1
67500	2902.0	0.67	118	0.39	33	0.20	6	0.14	3	0.09	1
70000	3009.5	0.70	125	0.41	35	0.20	7	0.15	3	0.10	1
72500	3116.9	0.72	134	0.42	37	0.21	7	0.15	3	0.10	1
75000	3224.4	0.75	142	0.44	39	0.22	8	0.16	3	0.11	1
77500	3331.9	0.77	151	0.45	42	0.23	8	0.16	4	0.11	1
80000	3439.4	0.80	159	0.47	44	0.23	8	0.17	4	0.11	1
82500	3546.9	0.82	168	0.48	47	0.24	9	0.17	4	0.12	2
85000	3654.3	0.85	178	0.50	49	0.25	9	0.18	4	0.12	2
87500	3761.8	0.87	187	0.51	52	0.26	10	0.18	5	0.12	2
90000	3869.3	0.90	197	0.53	54	0.26	10	0.19	5	0.13	2
92500	3976.8	0.92	207	0.54	57	0.27	11	0.20	5	0.13	2
95000	4084.3	0.95	217	0.56	60	0.28	11	0.20	5	0.13	2
97500	4191.7	0.97	227	0.57	63	0.29	12	0.21	5	0.14	2
100000	4299.2	1.00	238	0.58	66	0.29	13	0.21	6	0.14	2
105000	4514.2	1.05	259	0.61	72	0.31	14	0.22	6	0.15	2
110000	4729.1	1.10	282	0.64	78	0.32	15	0.23	7	0.15	3
115000	4944.1	1.15	306	0.67	84	0.34	16	0.24	7	0.16	3
120000	5159.1	1.20	330	0.70	91	0.35	17	0.25	8	0.17	3
125000	5374.0	1.25	355	0.73	98	0.37	19	0.26	9	0.18	3
130000	5589.0	1.30	381	0.76	105	0.38	20	0.27	9	0.18	3
135000	5804.0	1.35	408	0.79	112	0.39	21	0.28	10	0.19	4
140000	6018.9	1.40	436	0.82	120	0.41	23	0.30	10	0.20	4
145000	6233.9	1.45	464	0.85	128	0.42	24	0.31	11	0.20	4
150000	6448.8	1.50	493	0.88	136	0.44	26	0.32	12	0.21	4

	d [mm]	42		54		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
155000	6663.8	1.55	523	0.91	144	0.45	27	0.33	12	0.22	5
160000	6878.8	1.60	554	0.94	152	0.47	29	0.34	13	0.22	5
165000	7093.7	1.65	586	0.96	161	0.48	31	0.35	14	0.23	5
170000	7308.7	1.70	619	0.99	170	0.50	32	0.36	15	0.24	6
175000	7523.6	1.75	652	1.02	179	0.51	34	0.37	16	0.25	6
180000	7738.6	1.80	686	1.05	188	0.53	36	0.38	16	0.25	6
185000	7953.6	1.85	721	1.08	198	0.54	37	0.39	17	0.26	6
190000	8168.5	1.90	757	1.11	208	0.56	39	0.40	18	0.27	7
195000	8383.5	1.95	793	1.14	218	0.57	41	0.41	19	0.27	7
200000	8598.5	2.00	830	1.17	228	0.59	43	0.42	20	0.28	7
205000	8813.4	2.05	869	1.20	238	0.60	45	0.43	21	0.29	8
210000	9028.4	2.10	907	1.23	249	0.61	47	0.44	21	0.30	8
215000	9243.3	2.15	947	1.26	260	0.63	49	0.45	22	0.30	8
220000	9458.3	2.20	987	1.29	271	0.64	51	0.46	23	0.31	9
225000	9673.3	2.25	1029	1.32	282	0.66	53	0.47	24	0.32	9
230000	9888.2	2.30	1070	1.34	293	0.67	55	0.49	25	0.32	10
235000	10103.2			1.37	305	0.69	58	0.50	26	0.33	10
240000	10318.1			1.40	317	0.70	60	0.51	27	0.34	10
245000	10533.1			1.43	329	0.72	62	0.52	28	0.34	11
250000	10748.1			1.46	341	0.73	64	0.53	29	0.35	11
255000	10963.0			1.49	353	0.75	67	0.54	30	0.36	11
260000	11178.0			1.52	366	0.76	69	0.55	32	0.37	12
265000	11392.9			1.55	379	0.78	72	0.56	33	0.37	12
270000	11607.9			1.58	392	0.79	74	0.57	34	0.38	13
275000	11822.9			1.61	405	0.80	76	0.58	35	0.39	13
280000	12037.8			1.64	419	0.82	79	0.59	36	0.39	14
285000	12252.8			1.67	432	0.83	82	0.60	37	0.40	14
290000	12467.8			1.70	446	0.85	84	0.61	38	0.41	14
295000	12682.7			1.72	460	0.86	87	0.62	40	0.41	15
300000	12897.7			1.75	474	0.88	89	0.63	41	0.42	15
305000	13112.6			1.78	489	0.89	92	0.64	42	0.43	16
310000	13327.6			1.81	503	0.91	95	0.65	43	0.44	16
315000	13542.6			1.84	518	0.92	98	0.66	44	0.44	17
320000	13757.5			1.87	533	0.94	100	0.68	46	0.45	17
325000	13972.5			1.90	549	0.95	103	0.69	47	0.46	18
330000	14187.4			1.93	564	0.97	106	0.70	48	0.46	18
335000	14402.4			1.96	580	0.98	109	0.71	50	0.47	19
340000	14617.4			1.99	595	0.99	112	0.72	51	0.48	19
345000	14832.3			2.02	612	1.01	115	0.73	52	0.49	20
350000	15047.3			2.05	628	1.02	118	0.74	54	0.49	20
355000	15262.3			2.08	644	1.04	121	0.75	55	0.50	21
360000	15477.2			2.10	661	1.05	124	0.76	57	0.51	21
365000	15692.2			2.13	678	1.07	127	0.77	58	0.51	22
370000	15907.1			2.16	695	1.08	131	0.78	59	0.52	22
375000	16122.1			2.19	712	1.10	134	0.79	61	0.53	23

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
380000	16337.1			2.22	729	1.11	137	0.80	62	0.53	24
385000	16552.0			2.25	747	1.13	140	0.81	64	0.54	24
390000	16767.0			2.28	764	1.14	144	0.82	65	0.55	25
395000	16981.9			2.31	782	1.16	147	0.83	67	0.56	25
400000	17196.9			2.34	800	1.17	150	0.84	68	0.56	26
405000	17411.9			2.37	819	1.18	154	0.85	70	0.57	26
410000	17626.8			2.40	837	1.20	157	0.86	72	0.58	27
415000	17841.8			2.43	856	1.21	161	0.88	73	0.58	28
420000	18056.7			2.46	875	1.23	164	0.89	75	0.59	28
425000	18271.7			2.48	894	1.24	168	0.90	76	0.60	29
430000	18486.7			2.51	913	1.26	171	0.91	78	0.60	29
435000	18701.6			2.54	933	1.27	175	0.92	80	0.61	30
440000	18916.6			2.57	952	1.29	179	0.93	81	0.62	31
445000	19131.6			2.60	972	1.30	182	0.94	83	0.63	31
450000	19346.5			2.63	992	1.32	186	0.95	85	0.63	32
455000	19561.5			2.66	1013	1.33	190	0.96	86	0.64	33
460000	19776.4			2.69	1033	1.35	194	0.97	88	0.65	33
465000	19991.4			2.72	1054	1.36	198	0.98	90	0.65	34
470000	20206.4			2.75	1074	1.37	201	0.99	92	0.66	34
475000	20421.3			2.78	1095	1.39	205	1.00	93	0.67	35
480000	20636.3			2.81	1117	1.40	209	1.01	95	0.67	36
485000	20851.2					1.42	213	1.02	97	0.68	37
490000	21066.2					1.43	217	1.03	99	0.69	37
495000	21281.2					1.45	221	1.04	101	0.70	38
500000	21496.1					1.46	225	1.05	102	0.70	39
505000	21711.1					1.48	229	1.07	104	0.71	39
510000	21926.1					1.49	234	1.08	106	0.72	40
515000	22141.0					1.51	238	1.09	108	0.72	41
520000	22356.0					1.52	242	1.10	110	0.73	41
525000	22570.9					1.54	246	1.11	112	0.74	42
530000	22785.9					1.55	251	1.12	114	0.75	43
535000	23000.9					1.56	255	1.13	116	0.75	44
540000	23215.8					1.58	259	1.14	118	0.76	44
550000	23645.7					1.61	268	1.16	122	0.77	46
600000	25795.4					1.76	314	1.27	143	0.84	54
650000	27945.0					1.90	363	1.37	165	0.91	62
700000	30094.6					2.05	416	1.48	189	0.98	71
750000	32244.2					2.19	471	1.58	214	1.05	80
800000	34393.8					2.34	530	1.69	241	1.12	90
850000	36543.4					2.49	593	1.79	269	1.19	101
900000	38693.0					2.63	658	1.90	298	1.27	112
1000000	42992.3					2.93	798	2.11	361	1.41	135
1050000	45141.9					3.07	873	2.21	395	1.48	148
1100000	47291.5					3.22	951	2.32	430	1.55	161
1150000	49441.1					3.36	1031	2.43	467	1.62	175

	d [mm]	42		54		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
1200000	51590.7					3.51	1115	2.53	505	1.69	189
1250000	53740.3							2.64	544	1.76	203
1300000	55889.9							2.74	584	1.83	219
1350000	58039.6							2.85	626	1.90	234
1400000	60189.2							2.95	669	1.97	250
1450000	62338.8							3.06	714	2.04	267
1500000	64488.4							3.16	760	2.11	284
1550000	66638.0							3.27	807	2.18	301
1600000	68787.6							3.38	855	2.25	320
1650000	70937.2							3.48	905	2.32	338
1700000	73086.8							3.59	956	2.39	357
1750000	75236.5							3.69	1009	2.46	377
1800000	77386.1							3.80	1063	2.53	396
1850000	79535.7									2.60	417
1900000	81685.3									2.67	438
1950000	83834.9									2.74	459
2000000	85984.5									2.81	481
2050000	88134.1									2.88	503
2100000	90283.7									2.95	526
2150000	92433.4									3.02	549
2200000	94583.0									3.09	573
2250000	96732.6									3.16	597
2300000	98882.2									3.23	622
2350000	101031.8									3.30	647
2400000	103181.4									3.37	673
2450000	105331.0									3.44	699
2500000	107480.7									3.51	725
2550000	109630.3									3.58	752
2600000	111779.9									3.66	780
2650000	113929.5									3.73	808
2700000	116079.1									3.80	836
2750000	118228.7									3.87	865
2800000	120378.3									3.94	894
2850000	122527.9									4.01	924
2900000	124677.6									4.08	954
2950000	126827.2									4.15	984
3000000	128976.8									4.22	1015

Table 57: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 60 °C / 61 °C, spread $\Delta T = 1$ K, d 15 - d 35

\dot{Q} [W]	d [mm]	15		18		22		28		35	
	\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
50	43.0	0.09	14	0.06	5	0.04	2				
100	86.0	0.18	46	0.12	17	0.08	7				
150	129.0	0.27	92	0.18	34	0.12	13	0.07	4		
200	172.0	0.36	152	0.24	57	0.16	22	0.09	6		
250	215.0	0.45	224	0.30	83	0.20	32	0.12	9	0.07	3
300	258.0	0.54	308	0.36	115	0.24	44	0.14	12	0.09	4
350	300.9	0.63	404	0.42	150	0.28	57	0.16	16	0.10	6
400	343.9	0.72	511	0.48	190	0.32	72	0.19	20	0.12	7
450	386.9	0.81	629	0.53	233	0.36	89	0.21	25	0.13	9
500	429.9	0.90	757	0.59	281	0.40	107	0.23	30	0.15	10
600	515.9	1.08	1046	0.71	388	0.47	147	0.28	41	0.18	14
700	601.9	1.26	1376	0.83	509	0.55	193	0.32	54	0.21	19
800	687.9			0.95	645	0.63	244	0.37	68	0.24	24
900	773.9			1.07	795	0.71	301	0.42	84	0.27	29
1000	859.8			1.19	960	0.79	363	0.46	101	0.30	35
1100	945.8			1.31	1138	0.87	430	0.51	120	0.33	41
1200	1031.8					0.95	502	0.56	140	0.36	48
1300	1117.8					1.03	579	0.60	161	0.39	56
1400	1203.8					1.11	661	0.65	184	0.42	63
1500	1289.8					1.19	747	0.70	208	0.45	72
1600	1375.8					1.27	839	0.74	233	0.48	80
1700	1461.7					1.35	935	0.79	260	0.50	89
1800	1547.7					1.42	1036	0.84	288	0.53	99
1900	1633.7					1.50	1141	0.88	317	0.56	109
2000	1719.7					1.58	1251	0.93	347	0.59	119
2500	2149.6							1.16	517	0.74	177
3000	2579.5							1.39	717	0.89	246
3500	3009.5							1.62	947	1.04	324
4000	3439.4							1.86	1204	1.19	411
4500	3869.3									1.34	508
5000	4299.2									1.48	615
5500	4729.1									1.63	730
6000	5159.1									1.78	854
6500	5589.0									1.93	987
7000	6018.9									2.08	1129
7500	6448.8									2.23	1279

Table 58: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 60 °C / 61 °C, spread $\Delta T = 1$ K, d 42 - d 108

\dot{Q} [W]	d [mm]	42		54		76.1		88.9		108	
		\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]
400	343.9		0.08	3							
450	386.9		0.09	3							
500	429.9		0.10	4							
600	515.9		0.12	6	0.07	2					
700	601.9		0.14	7	0.08	2					
800	687.9		0.16	9	0.09	3					
900	773.9		0.18	11	0.11	3					
1000	859.8		0.20	14	0.12	4	0.06	1			
1100	945.8		0.22	16	0.13	5	0.06	1			
1200	1031.8		0.24	19	0.14	5	0.07	1			
1300	1117.8		0.26	22	0.15	6	0.08	1			
1400	1203.8		0.28	25	0.16	7	0.08	1			
1500	1289.8		0.30	28	0.18	8	0.09	1	0.06	1	
1600	1375.8		0.32	31	0.19	9	0.09	2	0.07	1	
1700	1461.7		0.34	35	0.20	10	0.10	2	0.07	1	
1800	1547.7		0.36	38	0.21	11	0.11	2	0.08	1	
1900	1633.7		0.38	42	0.22	12	0.11	2	0.08	1	
2000	1719.7		0.40	46	0.23	13	0.12	2	0.08	1	0.06
2500	2149.6		0.50	69	0.29	19	0.15	4	0.11	2	0.07
3000	2579.5		0.60	95	0.35	26	0.18	5	0.13	2	0.08
3500	3009.5		0.70	125	0.41	35	0.20	7	0.15	3	0.10
4000	3439.4		0.80	159	0.47	44	0.23	8	0.17	4	0.11
4500	3869.3		0.90	196	0.53	54	0.26	10	0.19	5	0.13
5000	4299.2		1.00	237	0.58	65	0.29	12	0.21	6	0.14
5500	4729.1		1.10	282	0.64	78	0.32	15	0.23	7	0.15
6000	5159.1		1.20	329	0.70	91	0.35	17	0.25	8	0.17
6500	5589.0		1.30	380	0.76	105	0.38	20	0.27	9	0.18
7000	6018.9		1.40	435	0.82	120	0.41	23	0.30	10	0.20
7500	6448.8		1.50	492	0.88	135	0.44	26	0.32	12	0.21
8000	6878.8		1.60	553	0.94	152	0.47	29	0.34	13	0.22
8500	7308.7		1.70	618	0.99	170	0.50	32	0.36	15	0.24
9000	7738.6		1.80	685	1.05	188	0.53	36	0.38	16	0.25
9500	8168.5		1.90	755	1.11	207	0.56	39	0.40	18	0.27
10000	8598.5		2.00	829	1.17	227	0.59	43	0.42	20	0.28
10500	9028.4		2.10	906	1.23	248	0.61	47	0.44	21	0.30
11000	9458.3		2.20	986	1.29	270	0.64	51	0.46	23	0.31
11500	9888.2		2.30	1069	1.34	293	0.67	55	0.49	25	0.32
12000	10318.1		2.40	1155	1.40	316	0.70	60	0.51	27	0.34
12500	10748.1		2.50	1244	1.46	340	0.73	64	0.53	29	0.35
13000	11178.0		2.60	1336	1.52	365	0.76	69	0.55	31	0.37
13500	11607.9		2.70	1431	1.58	391	0.79	74	0.57	34	0.38
14000	12037.8				1.64	418	0.82	79	0.59	36	0.39
14500	12467.8				1.70	445	0.85	84	0.61	38	0.41
15000	12897.7				1.75	474	0.88	89	0.63	41	0.42

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
15500	13327.6			1.81	503	0.91	95	0.65	43	0.44	16
16000	13757.5			1.87	532	0.94	100	0.68	46	0.45	17
16500	14187.4			1.93	563	0.97	106	0.70	48	0.46	18
17000	14617.4			1.99	594	0.99	112	0.72	51	0.48	19
17500	15047.3			2.05	627	1.02	118	0.74	54	0.49	20
18000	15477.2			2.10	660	1.05	124	0.76	56	0.51	21
18500	15907.1			2.16	693	1.08	130	0.78	59	0.52	22
19000	16337.1			2.22	728	1.11	137	0.80	62	0.53	23
19500	16767.0			2.28	763	1.14	143	0.82	65	0.55	25
20000	17196.9			2.34	799	1.17	150	0.84	68	0.56	26
20500	17626.8			2.40	836	1.20	157	0.86	71	0.58	27
21000	18056.7			2.46	874	1.23	164	0.89	75	0.59	28
21500	18486.7			2.51	912	1.26	171	0.91	78	0.60	29
22000	18916.6			2.57	951	1.29	178	0.93	81	0.62	31
22500	19346.5			2.63	991	1.32	186	0.95	85	0.63	32
23000	19776.4			2.69	1031	1.35	193	0.97	88	0.65	33
23500	20206.4			2.75	1073	1.37	201	0.99	91	0.66	34
24000	20636.3			2.81	1115	1.40	209	1.01	95	0.67	36
24500	21066.2					1.43	217	1.03	99	0.69	37
25000	21496.1					1.46	225	1.05	102	0.70	39
25500	21926.1					1.49	233	1.08	106	0.72	40
26000	22356.0					1.52	242	1.10	110	0.73	41
26500	22785.9					1.55	250	1.12	114	0.75	43
27000	23215.8					1.58	259	1.14	118	0.76	44
27500	23645.7					1.61	268	1.16	122	0.77	46
28000	24075.7					1.64	276	1.18	126	0.79	47
28500	24505.6					1.67	285	1.20	130	0.80	49
29000	24935.5					1.70	295	1.22	134	0.82	50
29500	25365.4					1.73	304	1.24	138	0.83	52
30000	25795.4					1.76	313	1.27	142	0.84	54
32500	27945.0					1.90	363	1.37	165	0.91	62
35000	30094.6					2.05	415	1.48	188	0.98	71
37500	32244.2					2.19	471	1.58	214	1.05	80
40000	34393.8					2.34	530	1.69	240	1.12	90
42500	36543.4					2.49	592	1.79	268	1.19	101
45000	38693.0					2.63	657	1.90	298	1.27	112
47500	40842.6					2.78	725	2.00	329	1.34	123
50000	42992.3					2.93	797	2.11	361	1.41	135
52500	45141.9					3.07	871	2.21	394	1.48	148
55000	47291.5					3.22	949	2.32	430	1.55	161
57500	49441.1					3.36	1030	2.43	466	1.62	174
60000	51590.7					3.51	1114	2.53	504	1.69	189
62500	53740.3					3.66	1201	2.64	543	1.76	203
65000	55889.9							2.74	583	1.83	218
67500	58039.6							2.85	625	1.90	234

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
70000	60189.2							2.95	668	1.97	250
72500	62338.8							3.06	713	2.04	266
75000	64488.4							3.16	759	2.11	283
77500	66638.0							3.27	806	2.18	301
80000	68787.6							3.38	854	2.25	319
82500	70937.2							3.48	904	2.32	338
85000	73086.8							3.59	955	2.39	356
87500	75236.5							3.69	1007	2.46	376
90000	77386.1							3.80	1061	2.53	396
92500	79535.7							3.90	1116	2.60	416
95000	81685.3							4.01	1172	2.67	437
97500	83834.9									2.74	459
100000	85984.5									2.81	480
105000	90283.7									2.95	525
110000	94583.0									3.09	572
115000	98882.2									3.23	621
120000	103181.4									3.37	672
125000	107480.7									3.51	724
130000	111779.9									3.66	779
135000	116079.1									3.80	835
140000	120378.3									3.94	893
145000	124677.6									4.08	952
150000	128976.8									4.22	1014
155000	133276.0									4.36	1077
160000	137575.2									4.50	1142

Table 59: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 55 °C / 45 °C, spread $\Delta T = 10$ K, d 15 - d 35

\dot{Q} [W]	d [mm]	15		18		22		28		35	
	\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	DP [Pa/m]	v [m/s]	DP [Pa/m]
200	17.2	0.04	3	0.02	1						
300	25.8	0.05	6	0.04	2						
400	34.4	0.07	10	0.05	4						
500	43.0	0.09	15	0.06	6						
600	51.6	0.11	20	0.07	8	0.05	3				
700	60.2	0.13	26	0.08	10	0.06	4				
800	68.8	0.14	33	0.10	12	0.06	5				
900	77.4	0.16	40	0.11	15	0.07	6				
1000	86.0	0.18	48	0.12	18	0.08	7	0.05	2		
1100	94.6	0.20	57	0.13	21	0.09	8	0.05	2		
1200	103.2	0.22	66	0.14	25	0.09	10	0.06	3		
1300	111.8	0.23	76	0.15	28	0.10	11	0.06	3		
1400	120.4	0.25	86	0.17	32	0.11	12	0.06	4		
1500	129.0	0.27	97	0.18	36	0.12	14	0.07	4		
1600	137.6	0.29	108	0.19	41	0.13	16	0.07	4	0.05	2
1700	146.2	0.31	120	0.20	45	0.13	17	0.08	5	0.05	2
1800	154.8	0.32	133	0.21	50	0.14	19	0.08	5	0.05	2
1900	163.4	0.34	146	0.23	55	0.15	21	0.09	6	0.06	2
2000	172.0	0.36	160	0.24	60	0.16	23	0.09	6	0.06	2
2500	215.0	0.45	235	0.30	88	0.20	34	0.12	10	0.07	3
3000	258.0	0.54	323	0.36	121	0.24	46	0.14	13	0.09	5
3500	300.9	0.63	423	0.42	158	0.28	60	0.16	17	0.10	6
4000	343.9	0.72	535	0.48	199	0.32	76	0.19	21	0.12	7
4500	386.9	0.81	658	0.53	245	0.36	93	0.21	26	0.13	9
5000	429.9	0.90	792	0.59	294	0.40	112	0.23	32	0.15	11
5500	472.9	0.99	938	0.65	348	0.44	132	0.26	37	0.16	13
6000	515.9	1.08	1094	0.71	406	0.47	154	0.28	43	0.18	15
6500	558.9	1.17	1260	0.77	467	0.51	178	0.30	50	0.19	17
7000	601.9	1.26	1437	0.83	532	0.55	202	0.32	57	0.21	20
7500	644.9	1.35	1624	0.89	602	0.59	228	0.35	64	0.22	22
8000	687.9	1.44	1822	0.95	674	0.63	256	0.37	72	0.24	25
8500	730.9	1.53	2030	1.01	751	0.67	285	0.39	80	0.25	28
9000	773.9	1.62	2247	1.07	831	0.71	315	0.42	88	0.27	30
9500	816.9	1.71	2475	1.13	915	0.75	347	0.44	97	0.28	34
10000	859.8			1.19	1002	0.79	380	0.46	106	0.30	37
10500	902.8			1.25	1093	0.83	414	0.49	116	0.31	40
11000	945.8			1.31	1187	0.87	449	0.51	126	0.33	43
11500	988.8			1.37	1285	0.91	486	0.53	136	0.34	47
12000	1031.8			1.43	1386	0.95	524	0.56	146	0.36	51
12500	1074.8			1.48	1491	0.99	564	0.58	157	0.37	54
13000	1117.8			1.54	1599	1.03	604	0.60	169	0.39	58
13500	1160.8			1.60	1710	1.07	646	0.63	180	0.40	62
14000	1203.8			1.66	1825	1.11	690	0.65	192	0.42	66
14500	1246.8			1.72	1944	1.15	734	0.67	205	0.43	70

	d [mm]	15		18		22		28		35	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	DP [Pa/m]	v [m/s]	DP [Pa/m]
15000	1289.8			1.78	2065	1.19	780	0.70	217	0.45	75
15500	1332.8			1.84	2190	1.23	827	0.72	230	0.46	79
16000	1375.8			1.90	2318	1.27	875	0.74	244	0.48	84
16500	1418.7			1.96	2450	1.31	924	0.77	257	0.49	89
17000	1461.7					1.35	975	0.79	271	0.50	93
17500	1504.7					1.39	1027	0.81	286	0.52	98
18000	1547.7					1.42	1080	0.84	300	0.53	103
18500	1590.7					1.46	1134	0.86	315	0.55	108
19000	1633.7					1.50	1189	0.88	330	0.56	114
19500	1676.7					1.54	1246	0.90	346	0.58	119
20000	1719.7					1.58	1304	0.93	362	0.59	124
20500	1762.7					1.62	1362	0.95	378	0.61	130
21000	1805.7					1.66	1423	0.97	395	0.62	136
21500	1848.7					1.70	1484	1.00	412	0.64	142
22000	1891.7					1.74	1546	1.02	429	0.65	147
22500	1934.7					1.78	1610	1.04	447	0.67	153
23000	1977.6					1.82	1675	1.07	464	0.68	160
23500	2020.6					1.86	1741	1.09	483	0.70	166
24000	2063.6					1.90	1808	1.11	501	0.71	172
24500	2106.6					1.94	1876	1.14	520	0.73	179
25000	2149.6					1.98	1945	1.16	539	0.74	185
25500	2192.6					2.02	2016	1.18	558	0.76	192
26000	2235.6					2.06	2087	1.21	578	0.77	198
26500	2278.6					2.10	2160	1.23	598	0.79	205
27000	2321.6					2.14	2234	1.25	619	0.80	212
27500	2364.6					2.18	2309	1.28	639	0.82	219
28000	2407.6					2.22	2385	1.30	660	0.83	226
28500	2450.6							1.32	681	0.85	234
29000	2493.6							1.35	703	0.86	241
29500	2536.5							1.37	725	0.88	249
30000	2579.5							1.39	747	0.89	256
32500	2794.5							1.51	862	0.97	295
35000	3009.5							1.62	985	1.04	337
37500	3224.4							1.74	1115	1.11	382
40000	3439.4							1.86	1252	1.19	428
42500	3654.3							1.97	1397	1.26	477
45000	3869.3							2.09	1549	1.34	529
47500	4084.3							2.20	1707	1.41	583
50000	4299.2							2.32	1873	1.48	639
52500	4514.2							2.44	2046	1.56	698
55000	4729.1							2.55	2225	1.63	759
57500	4944.1							2.67	2412	1.71	822
60000	5159.1									1.78	888
62500	5374.0									1.86	956
65000	5589.0									1.93	1026

Q̇ [W]	d [mm]	15		18		22		28		35	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	DP [Pa/m]	v [m/s]	DP [Pa/m]
67500	5804.0									2.00	1098
70000	6018.9									2.08	1173
72500	6233.9									2.15	1249
75000	6448.8									2.23	1328
77500	6663.8									2.30	1410
80000	6878.8									2.38	1493
82500	7093.7									2.45	1579
85000	7308.7									2.52	1666
87500	7523.6									2.60	1756
90000	7738.6									2.67	1848
92500	7953.6									2.75	1943
95000	8168.5									2.82	2039
97500	8383.5									2.90	2138
100000	8598.5									2.97	2238
105000	9028.4									3.12	2446

Table 60: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 55 °C / 45 °C, spread $\Delta T = 10$ K, d 42 - d 108

\dot{Q} [W]	d [mm]	42		54		76.1		88.9		108	
		\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]
2500	215.0		0.05	1							
3000	258.0		0.06	2							
3500	300.9		0.07	2							
4000	343.9		0.08	3	0.05	1					
4500	386.9		0.09	4	0.05	1					
5000	429.9		0.10	4	0.06	1					
5500	472.9		0.11	5	0.06	1					
6000	515.9		0.12	6	0.07	2					
6500	558.9		0.13	7	0.08	2					
7000	601.9		0.14	8	0.08	2					
7500	644.9		0.15	9	0.09	2					
8000	687.9		0.16	10	0.09	3					
8500	730.9		0.17	11	0.10	3	0.05	1			
9000	773.9		0.18	12	0.11	3	0.05	1			
9500	816.9		0.19	13	0.11	4	0.06	1			
10000	859.8		0.20	14	0.12	4	0.06	1			
10500	902.8		0.21	16	0.12	4	0.06	1			
11000	945.8		0.22	17	0.13	5	0.06	1			
11500	988.8		0.23	18	0.13	5	0.07	1			
12000	1031.8		0.24	20	0.14	6	0.07	1			
12500	1074.8		0.25	21	0.15	6	0.07	1			
13000	1117.8		0.26	23	0.15	6	0.08	1	0.05	1	
13500	1160.8		0.27	24	0.16	7	0.08	1	0.06	1	
14000	1203.8		0.28	26	0.16	7	0.08	1	0.06	1	
14500	1246.8		0.29	27	0.17	8	0.08	1	0.06	1	
15000	1289.8		0.30	29	0.18	8	0.09	2	0.06	1	
15500	1332.8		0.31	31	0.18	9	0.09	2	0.07	1	
16000	1375.8		0.32	33	0.19	9	0.09	2	0.07	1	
16500	1418.7		0.33	34	0.19	10	0.10	2	0.07	1	
17000	1461.7		0.34	36	0.20	10	0.10	2	0.07	1	
17500	1504.7		0.35	38	0.20	11	0.10	2	0.07	1	
18000	1547.7		0.36	40	0.21	11	0.11	2	0.08	1	
18500	1590.7		0.37	42	0.22	12	0.11	2	0.08	1	
19000	1633.7		0.38	44	0.22	12	0.11	2	0.08	1	
19500	1676.7		0.39	46	0.23	13	0.11	2	0.08	1	
20000	1719.7		0.40	48	0.23	13	0.12	3	0.08	1	
20500	1762.7		0.41	51	0.24	14	0.12	3	0.09	1	
21000	1805.7		0.42	53	0.25	15	0.12	3	0.09	1	
21500	1848.7		0.43	55	0.25	15	0.13	3	0.09	1	
22000	1891.7		0.44	57	0.26	16	0.13	3	0.09	1	
22500	1934.7		0.45	60	0.26	17	0.13	3	0.09	1	0.06
23000	1977.6		0.46	62	0.27	17	0.13	3	0.10	2	0.06
23500	2020.6		0.47	64	0.27	18	0.14	3	0.10	2	0.07
24000	2063.6		0.48	67	0.28	19	0.14	4	0.10	2	0.07

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
24500	2106.6	0.49	69	0.29	19	0.14	4	0.10	2	0.07	1
25000	2149.6	0.50	72	0.29	20	0.15	4	0.11	2	0.07	1
25500	2192.6	0.51	74	0.30	21	0.15	4	0.11	2	0.07	1
26000	2235.6	0.52	77	0.30	21	0.15	4	0.11	2	0.07	1
26500	2278.6	0.53	80	0.31	22	0.16	4	0.11	2	0.07	1
27000	2321.6	0.54	82	0.32	23	0.16	4	0.11	2	0.08	1
27500	2364.6	0.55	85	0.32	24	0.16	5	0.12	2	0.08	1
28000	2407.6	0.56	88	0.33	24	0.16	5	0.12	2	0.08	1
28500	2450.6	0.57	91	0.33	25	0.17	5	0.12	2	0.08	1
29000	2493.6	0.58	94	0.34	26	0.17	5	0.12	2	0.08	1
29500	2536.5	0.59	96	0.34	27	0.17	5	0.12	2	0.08	1
30000	2579.5	0.60	99	0.35	28	0.18	5	0.13	2	0.08	1
32500	2794.5	0.65	115	0.38	32	0.19	6	0.14	3	0.09	1
35000	3009.5	0.70	131	0.41	36	0.20	7	0.15	3	0.10	1
37500	3224.4	0.75	148	0.44	41	0.22	8	0.16	4	0.11	1
40000	3439.4	0.80	166	0.47	46	0.23	9	0.17	4	0.11	2
42500	3654.3	0.85	185	0.50	51	0.25	10	0.18	4	0.12	2
45000	3869.3	0.90	205	0.53	57	0.26	11	0.19	5	0.13	2
47500	4084.3	0.95	225	0.56	62	0.28	12	0.20	5	0.13	2
50000	4299.2	1.00	247	0.58	68	0.29	13	0.21	6	0.14	2
52500	4514.2	1.05	270	0.61	75	0.31	14	0.22	7	0.15	2
55000	4729.1	1.10	293	0.64	81	0.32	15	0.23	7	0.15	3
57500	4944.1	1.15	318	0.67	88	0.34	17	0.24	8	0.16	3
60000	5159.1	1.20	343	0.70	95	0.35	18	0.25	8	0.17	3
62500	5374.0	1.25	369	0.73	102	0.37	19	0.26	9	0.18	3
65000	5589.0	1.30	396	0.76	109	0.38	21	0.27	10	0.18	4
67500	5804.0	1.35	424	0.79	117	0.39	22	0.28	10	0.19	4
70000	6018.9	1.40	452	0.82	125	0.41	24	0.30	11	0.20	4
72500	6233.9	1.45	482	0.85	133	0.42	25	0.31	12	0.20	4
75000	6448.8	1.50	512	0.88	141	0.44	27	0.32	12	0.21	5
77500	6663.8	1.55	543	0.91	150	0.45	28	0.33	13	0.22	5
80000	6878.8	1.60	575	0.94	158	0.47	30	0.34	14	0.22	5
82500	7093.7	1.65	608	0.96	167	0.48	32	0.35	15	0.23	6
85000	7308.7	1.70	642	0.99	177	0.50	34	0.36	15	0.24	6
87500	7523.6	1.75	676	1.02	186	0.51	35	0.37	16	0.25	6
90000	7738.6	1.80	711	1.05	196	0.53	37	0.38	17	0.25	6
92500	7953.6	1.85	748	1.08	205	0.54	39	0.39	18	0.26	7
95000	8168.5	1.90	784	1.11	216	0.56	41	0.40	19	0.27	7
97500	8383.5	1.95	822	1.14	226	0.57	43	0.41	20	0.27	7
100000	8598.5	2.00	861	1.17	236	0.59	45	0.42	20	0.28	8
105000	9028.4	2.10	940	1.23	258	0.61	49	0.44	22	0.30	8
110000	9458.3	2.20	1023	1.29	281	0.64	53	0.46	24	0.31	9
115000	9888.2	2.30	1109	1.34	304	0.67	58	0.49	26	0.32	10
120000	10318.1	2.40	1198	1.40	328	0.70	62	0.51	28	0.34	11
125000	10748.1	2.50	1290	1.46	354	0.73	67	0.53	31	0.35	12

	d [mm]	42		54		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
130000	11178.0	2.60	1385	1.52	380	0.76	72	0.55	33	0.37	12
135000	11607.9	2.70	1483	1.58	406	0.79	77	0.57	35	0.38	13
140000	12037.8	2.80	1585	1.64	434	0.82	82	0.59	37	0.39	14
145000	12467.8	2.90	1689	1.70	462	0.85	87	0.61	40	0.41	15
150000	12897.7	3.00	1797	1.75	492	0.88	93	0.63	42	0.42	16
155000	13327.6	3.10	1908	1.81	522	0.91	98	0.65	45	0.44	17
160000	13757.5	3.20	2021	1.87	553	0.94	104	0.68	48	0.45	18
165000	14187.4	3.30	2138	1.93	584	0.97	110	0.70	50	0.46	19
170000	14617.4	3.40	2257	1.99	617	0.99	116	0.72	53	0.48	20
175000	15047.3	3.50	2380	2.05	650	1.02	123	0.74	56	0.49	21
180000	15477.2	3.60	2506	2.10	684	1.05	129	0.76	59	0.51	22
185000	15907.1			2.16	719	1.08	135	0.78	62	0.52	23
190000	16337.1			2.22	755	1.11	142	0.80	65	0.53	24
195000	16767.0			2.28	791	1.14	149	0.82	68	0.55	26
200000	17196.9			2.34	829	1.17	156	0.84	71	0.56	27
205000	17626.8			2.40	867	1.20	163	0.86	74	0.58	28
210000	18056.7			2.46	905	1.23	170	0.89	78	0.59	29
215000	18486.7			2.51	945	1.26	178	0.91	81	0.60	31
220000	18916.6			2.57	985	1.29	185	0.93	84	0.62	32
225000	19346.5			2.63	1027	1.32	193	0.95	88	0.63	33
230000	19776.4			2.69	1069	1.35	201	0.97	91	0.65	34
235000	20206.4			2.75	1111	1.37	209	0.99	95	0.66	36
240000	20636.3			2.81	1155	1.40	217	1.01	99	0.67	37
245000	21066.2			2.86	1199	1.43	225	1.03	102	0.69	39
250000	21496.1			2.92	1244	1.46	234	1.05	106	0.70	40
255000	21926.1			2.98	1290	1.49	242	1.08	110	0.72	41
260000	22356.0			3.04	1336	1.52	251	1.10	114	0.73	43
265000	22785.9			3.10	1383	1.55	260	1.12	118	0.75	44
270000	23215.8			3.16	1432	1.58	268	1.14	122	0.76	46
275000	23645.7			3.22	1480	1.61	278	1.16	126	0.77	48
280000	24075.7			3.27	1530	1.64	287	1.18	130	0.79	49
285000	24505.6			3.33	1580	1.67	296	1.20	135	0.80	51
290000	24935.5			3.39	1631	1.70	306	1.22	139	0.82	52
295000	25365.4			3.45	1683	1.73	315	1.24	143	0.83	54
300000	25795.4			3.51	1736	1.76	325	1.27	148	0.84	56
305000	26225.3			3.57	1789	1.78	335	1.29	152	0.86	57
310000	26655.2			3.62	1843	1.81	345	1.31	157	0.87	59
315000	27085.1			3.68	1898	1.84	355	1.33	161	0.89	61
320000	27515.0			3.74	1953	1.87	365	1.35	166	0.90	62
325000	27945.0			3.80	2009	1.90	376	1.37	171	0.91	64
330000	28374.9			3.86	2066	1.93	386	1.39	176	0.93	66
335000	28804.8			3.92	2124	1.96	397	1.41	180	0.94	68
340000	29234.7			3.98	2183	1.99	408	1.43	185	0.96	70
345000	29664.7			4.03	2242	2.02	419	1.46	190	0.97	72
350000	30094.6			4.09	2302	2.05	430	1.48	195	0.98	73

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
355000	30524.5			4.15	2362	2.08	441	1.50	200	1.00	75
360000	30954.4			4.21	2424	2.11	453	1.52	206	1.01	77
365000	31384.4					2.14	464	1.54	211	1.03	79
370000	31814.3					2.16	476	1.56	216	1.04	81
375000	32244.2					2.19	488	1.58	221	1.05	83
380000	32674.1					2.22	500	1.60	227	1.07	85
385000	33104.0					2.25	512	1.62	232	1.08	87
390000	33534.0					2.28	524	1.65	238	1.10	89
395000	33963.9					2.31	536	1.67	243	1.11	91
400000	34393.8					2.34	549	1.69	249	1.12	94
405000	34823.7					2.37	561	1.71	255	1.14	96
410000	35253.7					2.40	574	1.73	260	1.15	98
415000	35683.6					2.43	587	1.75	266	1.17	100
420000	36113.5					2.46	600	1.77	272	1.18	102
425000	36543.4					2.49	613	1.79	278	1.19	104
430000	36973.3					2.52	626	1.81	284	1.21	107
435000	37403.3					2.54	639	1.84	290	1.22	109
440000	37833.2					2.57	653	1.86	296	1.24	111
445000	38263.1					2.60	666	1.88	302	1.25	114
450000	38693.0					2.63	680	1.90	309	1.27	116
455000	39123.0					2.66	694	1.92	315	1.28	118
460000	39552.9					2.69	708	1.94	321	1.29	121
465000	39982.8					2.72	722	1.96	327	1.31	123
470000	40412.7					2.75	736	1.98	334	1.32	125
475000	40842.6					2.78	751	2.00	340	1.34	128
480000	41272.6					2.81	765	2.03	347	1.35	130
485000	41702.5					2.84	780	2.05	354	1.36	133
490000	42132.4					2.87	795	2.07	360	1.38	135
495000	42562.3					2.90	810	2.09	367	1.39	138
500000	42992.3					2.93	825	2.11	374	1.41	140
505000	43422.2					2.95	840	2.13	381	1.42	143
510000	43852.1					2.98	855	2.15	388	1.43	145
515000	44282.0					3.01	870	2.17	394	1.45	148
520000	44712.0					3.04	886	2.19	402	1.46	151
525000	45141.9					3.07	902	2.21	409	1.48	153
530000	45571.8					3.10	917	2.24	416	1.49	156
535000	46001.7					3.13	933	2.26	423	1.50	159
540000	46431.6					3.16	949	2.28	430	1.52	161
550000	47291.5					3.22	982	2.32	445	1.55	167
600000	51590.7					3.51	1151	2.53	521	1.69	195
650000	55889.9					3.80	1334	2.74	604	1.83	226
700000	60189.2					4.10	1528	2.95	691	1.97	259
750000	64488.4					4.39	1735	3.16	784	2.11	293
800000	68787.6					4.68	1954	3.38	883	2.25	330
850000	73086.8					4.97	2185	3.59	987	2.39	369

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
900000	77386.1					5.27	2428	3.80	1096	2.53	410
1000000	85984.5							4.22	1331	2.81	497
1050000	90283.7							4.43	1456	2.95	543
1100000	94583.0							4.64	1586	3.09	592
1150000	98882.2							4.85	1722	3.23	642
1200000	103181.4							5.06	1862	3.37	694
1250000	107480.7							5.27	2008	3.51	748
1300000	111779.9							5.48	2159	3.66	804
1350000	116079.1							5.70	2315	3.80	862
1400000	120378.3							5.91	2476	3.94	922
1450000	124677.6									4.08	983
1500000	128976.8									4.22	1047
1550000	133276.0									4.36	1112
1600000	137575.2									4.50	1179
1650000	141874.5									4.64	1248
1700000	146173.7									4.78	1319
1750000	150472.9									4.92	1391
1800000	154772.1									5.06	1465
1850000	159071.4									5.20	1542
1900000	163370.6									5.34	1619
1950000	167669.8									5.48	1699
2000000	171969.0									5.62	1781
2050000	176268.3									5.76	1864
2100000	180567.5									5.90	1949
2150000	184866.7									6.05	2036
2200000	189166.0									6.19	2125
2250000	193465.2									6.33	2215
2300000	197764.4									6.47	2307
2350000	202063.6									6.61	2401
2400000	206362.9									6.75	2497

Table 61: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 80 °C / 50 °C, spread $\Delta T = 30$ K, d 15 - d 35

\dot{Q} [W]	d [mm]	15		18		22		28		35	
	\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
200	5.7	0.01	1	0.01	0						
300	8.6	0.02	1	0.01	0						
400	11.5	0.02	2	0.02	1						
500	14.3	0.03	2	0.02	1						
600	17.2	0.04	3	0.02	1						
700	20.1	0.04	4	0.03	1						
800	22.9	0.05	5	0.03	2						
900	25.8	0.05	6	0.04	2						
1000	28.7	0.06	7	0.04	3						
1100	31.5	0.07	8	0.04	3						
1200	34.4	0.07	9	0.05	4	0.03	1				
1300	37.3	0.08	11	0.05	4	0.03	2				
1400	40.1	0.08	12	0.06	5	0.04	2				
1500	43.0	0.09	14	0.06	5	0.04	2				
1600	45.9	0.10	15	0.06	6	0.04	2				
1700	48.7	0.10	17	0.07	6	0.04	2				
1800	51.6	0.11	19	0.07	7	0.05	3				
1900	54.5	0.11	21	0.08	8	0.05	3				
2000	57.3	0.12	22	0.08	8	0.05	3	0.03	1		
2500	71.7	0.15	33	0.10	12	0.07	5	0.04	1		
3000	86.0	0.18	45	0.12	17	0.08	6	0.05	2		
3500	100.3	0.21	58	0.14	22	0.09	8	0.05	2	0.03	1
4000	114.6	0.24	74	0.16	28	0.11	11	0.06	3	0.04	1
4500	129.0	0.27	90	0.18	34	0.12	13	0.07	4	0.04	1
5000	143.3	0.30	108	0.20	40	0.13	16	0.08	4	0.05	2
5500	157.6	0.33	128	0.22	48	0.15	18	0.09	5	0.05	2
6000	172.0	0.36	149	0.24	56	0.16	21	0.09	6	0.06	2
6500	186.3	0.39	171	0.26	64	0.17	24	0.10	7	0.06	2
7000	200.6	0.42	194	0.28	73	0.18	28	0.11	8	0.07	3
7500	215.0	0.45	219	0.30	82	0.20	31	0.12	9	0.07	3
8000	229.3	0.48	246	0.32	92	0.21	35	0.12	10	0.08	3
8500	243.6	0.51	273	0.34	102	0.22	39	0.13	11	0.08	4
9000	258.0	0.54	302	0.36	112	0.24	43	0.14	12	0.09	4
9500	272.3	0.57	332	0.38	124	0.25	47	0.15	13	0.09	5
10000	286.6	0.60	363	0.40	135	0.26	52	0.15	15	0.10	5
10500	300.9	0.63	396	0.42	147	0.28	56	0.16	16	0.10	5
11000	315.3	0.66	430	0.44	160	0.29	61	0.17	17	0.11	6
11500	329.6	0.69	465	0.46	173	0.30	66	0.18	19	0.11	6
12000	343.9	0.72	501	0.48	186	0.32	71	0.19	20	0.12	7
12500	358.3	0.75	539	0.49	200	0.33	76	0.19	21	0.12	7
13000	372.6	0.78	577	0.51	214	0.34	82	0.20	23	0.13	8
13500	386.9	0.81	617	0.53	229	0.36	87	0.21	24	0.13	8
14000	401.3	0.84	658	0.55	244	0.37	93	0.22	26	0.14	9
14500	415.6	0.87	700	0.57	260	0.38	99	0.22	28	0.14	10

	d [mm]	15		18		22		28		35	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
15000	429.9	0.90	744	0.59	276	0.40	105	0.23	29	0.15	10
15500	444.3	0.93	788	0.61	292	0.41	111	0.24	31	0.15	11
16000	458.6	0.96	834	0.63	309	0.42	117	0.25	33	0.16	11
16500	472.9	0.99	880	0.65	326	0.44	124	0.26	35	0.16	12
17000	487.2	1.02	928	0.67	344	0.45	131	0.26	37	0.17	13
17500	501.6	1.05	977	0.69	362	0.46	137	0.27	39	0.17	13
18000	515.9	1.08	1028	0.71	380	0.47	144	0.28	40	0.18	14
18500	530.2	1.11	1079	0.73	399	0.49	152	0.29	42	0.18	15
19000	544.6	1.14	1131	0.75	419	0.50	159	0.29	45	0.19	15
19500	558.9			0.77	438	0.51	166	0.30	47	0.19	16
20000	573.2			0.79	459	0.53	174	0.31	49	0.20	17
20500	587.6			0.81	479	0.54	182	0.32	51	0.20	18
21000	601.9			0.83	500	0.55	190	0.32	53	0.21	18
21500	616.2			0.85	521	0.57	198	0.33	55	0.21	19
22000	630.6			0.87	543	0.58	206	0.34	58	0.22	20
22500	644.9			0.89	565	0.59	214	0.35	60	0.22	21
23000	659.2			0.91	588	0.61	223	0.36	62	0.23	22
23500	673.5			0.93	611	0.62	231	0.36	65	0.23	22
24000	687.9			0.95	634	0.63	240	0.37	67	0.24	23
24500	702.2			0.97	657	0.65	249	0.38	70	0.24	24
25000	716.5			0.99	682	0.66	258	0.39	72	0.25	25
25500	730.9			1.01	706	0.67	267	0.39	75	0.25	26
26000	745.2			1.03	731	0.69	277	0.40	77	0.26	27
26500	759.5			1.05	756	0.70	286	0.41	80	0.26	28
27000	773.9			1.07	782	0.71	296	0.42	83	0.27	29
27500	788.2			1.09	808	0.73	306	0.43	85	0.27	29
28000	802.5			1.11	834	0.74	315	0.43	88	0.28	30
28500	816.9			1.13	861	0.75	326	0.44	91	0.28	31
29000	831.2			1.15	888	0.77	336	0.45	94	0.29	32
29500	845.5			1.17	915	0.78	346	0.46	97	0.29	33
30000	859.8			1.19	943	0.79	357	0.46	99	0.30	34
32500	931.5			1.29	1088	0.86	411	0.50	115	0.32	40
35000	1003.2					0.92	469	0.54	131	0.35	45
37500	1074.8					0.99	531	0.58	148	0.37	51
40000	1146.5					1.06	595	0.62	166	0.40	57
42500	1218.1					1.12	663	0.66	184	0.42	63
45000	1289.8					1.19	735	0.70	204	0.45	70
47500	1361.4					1.25	809	0.73	225	0.47	77
50000	1433.1					1.32	887	0.77	246	0.49	85
52500	1504.7					1.39	969	0.81	269	0.52	92
55000	1576.4					1.45	1053	0.85	292	0.54	100
57500	1648.0							0.89	316	0.57	109
60000	1719.7							0.93	341	0.59	117
62500	1791.3							0.97	367	0.62	126
65000	1863.0							1.01	394	0.64	135

Q̇ [W]	d [mm]	15		18		22		28		35	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
67500	1934.7							1.04	421	0.67	144
70000	2006.3							1.08	449	0.69	154
72500	2078.0							1.12	479	0.72	164
75000	2149.6							1.16	509	0.74	174
77500	2221.3							1.20	539	0.77	185
80000	2292.9							1.24	571	0.79	196
82500	2364.6							1.28	603	0.82	207
85000	2436.2							1.31	637	0.84	218
87500	2507.9							1.35	671	0.87	230
90000	2579.5							1.39	706	0.89	241
92500	2651.2							1.43	741	0.92	254
95000	2722.8							1.47	778	0.94	266
97500	2794.5							1.51	815	0.97	279
100000	2866.2							1.55	853	0.99	292
105000	3009.5							1.62	932	1.04	318
110000	3152.8							1.70	1013	1.09	346
115000	3296.1									1.14	375
120000	3439.4									1.19	405
125000	3582.7									1.24	435
130000	3726.0									1.29	467
135000	3869.3									1.34	500
140000	4012.6									1.39	534
145000	4155.9									1.44	569
150000	4299.2									1.48	605
155000	4442.5									1.53	642
160000	4585.8									1.58	680
165000	4729.1									1.63	718
170000	4872.5									1.68	758
175000	5015.8									1.73	799
180000	5159.1									1.78	841
185000	5302.4									1.83	884
190000	5445.7									1.88	927
195000	5589.0									1.93	972
200000	5732.3									1.98	1018

Table 62: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 80 °C / 50 °C, spread $\Delta T = 30$ K, d 42 - d 108

\dot{Q} [W]	d [mm]	42		54		76.1		88.9		108	
		\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]
5000	143.3		0.03	1							
5500	157.6		0.04	1							
6000	172.0		0.04	1							
6500	186.3		0.04	1							
7000	200.6		0.05	1							
7500	215.0		0.05	1							
8000	229.3		0.05	1							
8500	243.6		0.06	2							
9000	258.0		0.06	2							
9500	272.3		0.06	2							
10000	286.6		0.07	2							
10500	300.9		0.07	2							
11000	315.3		0.07	2							
11500	329.6		0.08	3							
12000	343.9		0.08	3							
12500	358.3		0.08	3							
13000	372.6		0.09	3							
13500	386.9		0.09	3							
14000	401.3		0.09	4	0.05	1					
14500	415.6		0.10	4	0.06	1					
15000	429.9		0.10	4	0.06	1					
15500	444.3		0.10	4	0.06	1					
16000	458.6		0.11	4	0.06	1					
16500	472.9		0.11	5	0.06	1					
17000	487.2		0.11	5	0.07	1					
17500	501.6		0.12	5	0.07	1					
18000	515.9		0.12	5	0.07	2					
18500	530.2		0.12	6	0.07	2					
19000	544.6		0.13	6	0.07	2					
19500	558.9		0.13	6	0.08	2					
20000	573.2		0.13	7	0.08	2					
20500	587.6		0.14	7	0.08	2					
21000	601.9		0.14	7	0.08	2					
21500	616.2		0.14	7	0.08	2					
22000	630.6		0.15	8	0.09	2					
22500	644.9		0.15	8	0.09	2					
23000	659.2		0.15	8	0.09	2					
23500	673.5		0.16	9	0.09	2					
24000	687.9		0.16	9	0.09	3					
24500	702.2		0.16	9	0.10	3					
25000	716.5		0.17	10	0.10	3					
25500	730.9		0.17	10	0.10	3					
26000	745.2		0.17	10	0.10	3					
26500	759.5		0.18	11	0.10	3					

Docu no.: B469-001&BDZ

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
27000	773.9	0.18	11	0.11	3						
27500	788.2	0.18	11	0.11	3	0.05	1				
28000	802.5	0.19	12	0.11	3	0.05	1				
28500	816.9	0.19	12	0.11	3	0.06	1				
29000	831.2	0.19	13	0.11	4	0.06	1				
29500	845.5	0.20	13	0.11	4	0.06	1				
30000	859.8	0.20	13	0.12	4	0.06	1				
32500	931.5	0.22	15	0.13	4	0.06	1				
35000	1003.2	0.23	18	0.14	5	0.07	1				
37500	1074.8	0.25	20	0.15	6	0.07	1				
40000	1146.5	0.27	22	0.16	6	0.08	1	0.06	1		
42500	1218.1	0.28	25	0.17	7	0.08	1	0.06	1		
45000	1289.8	0.30	27	0.18	8	0.09	1	0.06	1		
47500	1361.4	0.32	30	0.19	8	0.09	2	0.07	1		
50000	1433.1	0.33	33	0.19	9	0.10	2	0.07	1		
52500	1504.7	0.35	36	0.20	10	0.10	2	0.07	1		
55000	1576.4	0.37	39	0.21	11	0.11	2	0.08	1		
57500	1648.0	0.38	42	0.22	12	0.11	2	0.08	1		
60000	1719.7	0.40	45	0.23	13	0.12	2	0.08	1		
62500	1791.3	0.42	49	0.24	14	0.12	3	0.09	1		
65000	1863.0	0.43	52	0.25	15	0.13	3	0.09	1		
67500	1934.7	0.45	56	0.26	16	0.13	3	0.09	1	0.06	1
70000	2006.3	0.47	60	0.27	17	0.14	3	0.10	1	0.07	1
72500	2078.0	0.48	64	0.28	18	0.14	3	0.10	2	0.07	1
75000	2149.6	0.50	68	0.29	19	0.15	4	0.11	2	0.07	1
77500	2221.3	0.52	72	0.30	20	0.15	4	0.11	2	0.07	1
80000	2292.9	0.53	76	0.31	21	0.16	4	0.11	2	0.07	1
82500	2364.6	0.55	80	0.32	22	0.16	4	0.12	2	0.08	1
85000	2436.2	0.57	84	0.33	23	0.17	4	0.12	2	0.08	1
87500	2507.9	0.58	89	0.34	25	0.17	5	0.12	2	0.08	1
90000	2579.5	0.60	93	0.35	26	0.18	5	0.13	2	0.08	1
92500	2651.2	0.62	98	0.36	27	0.18	5	0.13	2	0.09	1
95000	2722.8	0.63	103	0.37	29	0.19	5	0.13	3	0.09	1
97500	2794.5	0.65	108	0.38	30	0.19	6	0.14	3	0.09	1
100000	2866.2	0.67	113	0.39	31	0.20	6	0.14	3	0.09	1
105000	3009.5	0.70	123	0.41	34	0.20	7	0.15	3	0.10	1
110000	3152.8	0.73	134	0.43	37	0.21	7	0.15	3	0.10	1
115000	3296.1	0.77	145	0.45	40	0.22	8	0.16	4	0.11	1
120000	3439.4	0.80	156	0.47	43	0.23	8	0.17	4	0.11	1
125000	3582.7	0.83	168	0.49	46	0.24	9	0.18	4	0.12	2
130000	3726.0	0.87	180	0.51	50	0.25	10	0.18	4	0.12	2
135000	3869.3	0.90	193	0.53	53	0.26	10	0.19	5	0.13	2
140000	4012.6	0.93	206	0.55	57	0.27	11	0.20	5	0.13	2
145000	4155.9	0.97	220	0.57	61	0.28	12	0.20	5	0.14	2
150000	4299.2	1.00	233	0.58	64	0.29	12	0.21	6	0.14	2

	d [mm]	42		54		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
155000	4442.5	1.03	248	0.60	68	0.30	13	0.22	6	0.15	2
160000	4585.8	1.07	262	0.62	72	0.31	14	0.23	6	0.15	2
165000	4729.1	1.10	277	0.64	76	0.32	15	0.23	7	0.15	3
170000	4872.5	1.13	292	0.66	81	0.33	15	0.24	7	0.16	3
175000	5015.8	1.17	308	0.68	85	0.34	16	0.25	7	0.16	3
180000	5159.1	1.20	324	0.70	89	0.35	17	0.25	8	0.17	3
185000	5302.4	1.23	340	0.72	94	0.36	18	0.26	8	0.17	3
190000	5445.7	1.27	357	0.74	98	0.37	19	0.27	9	0.18	3
195000	5589.0	1.30	374	0.76	103	0.38	20	0.27	9	0.18	3
200000	5732.3	1.33	392	0.78	108	0.39	20	0.28	9	0.19	4
205000	5875.6	1.37	410	0.80	113	0.40	21	0.29	10	0.19	4
210000	6018.9	1.40	428	0.82	118	0.41	22	0.30	10	0.20	4
215000	6162.2	1.43	447	0.84	123	0.42	23	0.30	11	0.20	4
220000	6305.5	1.47	465	0.86	128	0.43	24	0.31	11	0.21	4
225000	6448.8	1.50	485	0.88	133	0.44	25	0.32	12	0.21	4
230000	6592.1	1.53	504	0.90	139	0.45	26	0.32	12	0.22	5
235000	6735.5	1.57	524	0.92	144	0.46	27	0.33	12	0.22	5
240000	6878.8	1.60	545	0.94	150	0.47	28	0.34	13	0.22	5
245000	7022.1	1.63	566	0.95	155	0.48	29	0.34	13	0.23	5
250000	7165.4	1.67	587	0.97	161	0.49	31	0.35	14	0.23	5
255000	7308.7	1.70	608	0.99	167	0.50	32	0.36	14	0.24	5
260000	7452.0	1.73	630	1.01	173	0.51	33	0.37	15	0.24	6
265000	7595.3	1.77	652	1.03	179	0.52	34	0.37	15	0.25	6
270000	7738.6	1.80	674	1.05	185	0.53	35	0.38	16	0.25	6
275000	7881.9	1.83	697	1.07	191	0.54	36	0.39	17	0.26	6
280000	8025.2	1.87	720	1.09	198	0.55	37	0.39	17	0.26	6
285000	8168.5	1.90	744	1.11	204	0.56	39	0.40	18	0.27	7
290000	8311.8	1.93	768	1.13	210	0.57	40	0.41	18	0.27	7
295000	8455.1	1.97	792	1.15	217	0.58	41	0.41	19	0.28	7
300000	8598.5	2.00	817	1.17	224	0.59	42	0.42	19	0.28	7
305000	8741.8	2.03	841	1.19	231	0.59	44	0.43	20	0.29	8
310000	8885.1	2.07	867	1.21	237	0.60	45	0.44	20	0.29	8
315000	9028.4	2.10	892	1.23	244	0.61	46	0.44	21	0.30	8
320000	9171.7	2.13	918	1.25	251	0.62	48	0.45	22	0.30	8
325000	9315.0	2.17	944	1.27	259	0.63	49	0.46	22	0.30	8
330000	9458.3	2.20	971	1.29	266	0.64	50	0.46	23	0.31	9
335000	9601.6	2.23	998	1.31	273	0.65	52	0.47	24	0.31	9
340000	9744.9	2.27	1025	1.33	281	0.66	53	0.48	24	0.32	9
345000	9888.2			1.34	288	0.67	54	0.49	25	0.32	9
350000	10031.5			1.36	296	0.68	56	0.49	25	0.33	10
355000	10174.8			1.38	303	0.69	57	0.50	26	0.33	10
360000	10318.1			1.40	311	0.70	59	0.51	27	0.34	10
365000	10461.5			1.42	319	0.71	60	0.51	27	0.34	10
370000	10604.8			1.44	327	0.72	62	0.52	28	0.35	11
375000	10748.1			1.46	335	0.73	63	0.53	29	0.35	11

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
380000	10891.4			1.48	343	0.74	65	0.53	30	0.36	11
385000	11034.7			1.50	351	0.75	66	0.54	30	0.36	11
390000	11178.0			1.52	360	0.76	68	0.55	31	0.37	12
395000	11321.3			1.54	368	0.77	69	0.56	32	0.37	12
400000	11464.6			1.56	377	0.78	71	0.56	32	0.37	12
405000	11607.9			1.58	385	0.79	73	0.57	33	0.38	13
410000	11751.2			1.60	394	0.80	74	0.58	34	0.38	13
415000	11894.5			1.62	403	0.81	76	0.58	35	0.39	13
420000	12037.8			1.64	412	0.82	78	0.59	35	0.39	13
425000	12181.1			1.66	420	0.83	79	0.60	36	0.40	14
430000	12324.4			1.68	429	0.84	81	0.60	37	0.40	14
435000	12467.8			1.70	439	0.85	83	0.61	38	0.41	14
440000	12611.1			1.71	448	0.86	84	0.62	38	0.41	15
445000	12754.4			1.73	457	0.87	86	0.63	39	0.42	15
450000	12897.7			1.75	466	0.88	88	0.63	40	0.42	15
455000	13041.0			1.77	476	0.89	90	0.64	41	0.43	15
460000	13184.3			1.79	485	0.90	91	0.65	42	0.43	16
465000	13327.6			1.81	495	0.91	93	0.65	42	0.44	16
470000	13470.9			1.83	505	0.92	95	0.66	43	0.44	16
475000	13614.2			1.85	515	0.93	97	0.67	44	0.45	17
480000	13757.5			1.87	525	0.94	99	0.68	45	0.45	17
485000	13900.8			1.89	534	0.95	101	0.68	46	0.45	17
490000	14044.1			1.91	545	0.96	102	0.69	47	0.46	18
495000	14187.4			1.93	555	0.97	104	0.70	48	0.46	18
500000	14330.8			1.95	565	0.98	106	0.70	48	0.47	18
505000	14474.1			1.97	575	0.98	108	0.71	49	0.47	19
510000	14617.4			1.99	586	0.99	110	0.72	50	0.48	19
515000	14760.7			2.01	596	1.00	112	0.72	51	0.48	19
520000	14904.0			2.03	607	1.01	114	0.73	52	0.49	20
525000	15047.3			2.05	617	1.02	116	0.74	53	0.49	20
530000	15190.6			2.07	628	1.03	118	0.75	54	0.50	20
535000	15333.9			2.09	639	1.04	120	0.75	55	0.50	21
540000	15477.2			2.10	650	1.05	122	0.76	56	0.51	21
550000	15763.8			2.14	672	1.07	126	0.77	57	0.52	22
600000	17196.9			2.34	788	1.17	148	0.84	67	0.56	25
650000	18630.0			2.53	912	1.27	171	0.91	78	0.61	29
700000	20063.1			2.73	1044	1.37	195	0.98	89	0.66	33
750000	21496.1					1.46	222	1.05	101	0.70	38
800000	22929.2					1.56	249	1.13	113	0.75	43
850000	24362.3					1.66	278	1.20	126	0.80	48
900000	25795.4					1.76	309	1.27	140	0.84	53
1000000	28661.5					1.95	374	1.41	170	0.94	64
1050000	30094.6					2.05	409	1.48	186	0.98	70
1100000	31527.7					2.15	445	1.55	202	1.03	76
1150000	32960.7					2.24	483	1.62	219	1.08	82

	d [mm]	42		54		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
1200000	34393.8					2.34	522	1.69	237	1.12	89
1250000	35826.9					2.44	563	1.76	255	1.17	96
1300000	37260.0					2.54	604	1.83	274	1.22	103
1350000	38693.0					2.63	648	1.90	293	1.27	110
1400000	40126.1					2.73	692	1.97	314	1.31	118
1450000	41559.2					2.83	738	2.04	334	1.36	125
1500000	42992.3					2.93	786	2.11	356	1.41	133
1550000	44425.3					3.02	835	2.18	378	1.45	141
1600000	45858.4					3.12	885	2.25	400	1.50	150
1650000	47291.5					3.22	936	2.32	423	1.55	159
1700000	48724.6					3.32	989	2.39	447	1.59	167
1750000	50157.6					3.41	1043	2.46	472	1.64	177
1800000	51590.7					3.51	1099	2.53	497	1.69	186
1850000	53023.8							2.60	522	1.73	195
1900000	54456.9							2.67	548	1.78	205
1950000	55889.9							2.74	575	1.83	215
2000000	57323.0							2.81	603	1.87	225
2050000	58756.1							2.88	631	1.92	236
2100000	60189.2							2.95	659	1.97	246
2150000	61622.2							3.02	688	2.02	257
2200000	63055.3							3.09	718	2.06	268
2250000	64488.4							3.16	748	2.11	279
2300000	65921.5							3.23	779	2.16	291
2350000	67354.5							3.30	811	2.20	303
2400000	68787.6							3.38	843	2.25	315
2450000	70220.7							3.45	875	2.30	327
2500000	71653.8							3.52	909	2.34	339
2550000	73086.8							3.59	942	2.39	352
2600000	74519.9							3.66	977	2.44	364
2650000	75953.0							3.73	1012	2.48	377
2700000	77386.1							3.80	1047	2.53	390
2750000	78819.1							3.87	1083	2.58	404
2800000	80252.2									2.62	417
2850000	81685.3									2.67	431
2900000	83118.4									2.72	445
2950000	84551.4									2.76	459
3000000	85984.5									2.81	474
3050000	87417.6									2.86	488
3100000	88850.7									2.91	503
3150000	90283.7									2.95	518
3200000	91716.8									3.00	534
3250000	93149.9									3.05	549
3300000	94583.0									3.09	565
3350000	96016.1									3.14	581
3400000	97449.1									3.19	597

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Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
3450000	98882.2									3.23	613
3500000	100315.3									3.28	629
3550000	101748.4									3.33	646
3600000	103181.4									3.37	663
3650000	104614.5									3.42	680
3700000	106047.6									3.47	697
3750000	107480.7									3.51	715
3800000	108913.7									3.56	732
3850000	110346.8									3.61	750
3900000	111779.9									3.66	768
3950000	113213.0									3.70	787
4000000	114646.0									3.75	805
4050000	116079.1									3.80	824
4100000	117512.2									3.84	843
4150000	118945.3									3.89	862
4200000	120378.3									3.94	881
4250000	121811.4									3.98	901
4300000	123244.5									4.03	920
4350000	124677.6									4.08	940
4400000	126110.6									4.12	960
4450000	127543.7									4.17	981
4500000	128976.8									4.22	1001

Table 63: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 80 °C / 60 °C, spread $\Delta T = 20$ K, d 15 - d 35

Q̇ [W]	d [mm]	15		18		22		28		35	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
200	8.6	0.02	1	0.01	0						
300	12.9	0.03	2	0.02	1						
400	17.2	0.04	3	0.02	1						
500	21.5	0.04	4	0.03	2						
600	25.8	0.05	6	0.04	2						
700	30.1	0.06	7	0.04	3						
800	34.4	0.07	9	0.05	3						
900	38.7	0.08	11	0.05	4						
1000	43.0	0.09	13	0.06	5						
1100	47.3	0.10	16	0.07	6						
1200	51.6	0.11	18	0.07	7	0.05	3				
1300	55.9	0.12	21	0.08	8	0.05	3				
1400	60.2	0.13	24	0.08	9	0.06	3				
1500	64.5	0.13	27	0.09	10	0.06	4				
1600	68.8	0.14	30	0.10	11	0.06	4				
1700	73.1	0.15	33	0.10	12	0.07	5				
1800	77.4	0.16	37	0.11	14	0.07	5				
1900	81.7	0.17	40	0.11	15	0.08	6				
2000	86.0	0.18	44	0.12	16	0.08	6	0.05	2		
2500	107.5	0.22	64	0.15	24	0.10	9	0.06	3		
3000	129.0	0.27	88	0.18	33	0.12	13	0.07	4		
3500	150.5	0.31	115	0.21	43	0.14	16	0.08	5	0.05	2
4000	172.0	0.36	145	0.24	54	0.16	21	0.09	6	0.06	2
4500	193.5	0.40	179	0.27	67	0.18	25	0.10	7	0.07	3
5000	215.0	0.45	215	0.30	80	0.20	31	0.12	9	0.07	3
5500	236.5	0.49	254	0.33	95	0.22	36	0.13	10	0.08	4
6000	258.0	0.54	296	0.36	110	0.24	42	0.14	12	0.09	4
6500	279.4	0.58	341	0.39	127	0.26	48	0.15	14	0.10	5
7000	300.9	0.63	388	0.42	144	0.28	55	0.16	15	0.10	5
7500	322.4	0.67	438	0.45	163	0.30	62	0.17	17	0.11	6
8000	343.9	0.72	491	0.48	182	0.32	69	0.19	20	0.12	7
8500	365.4	0.76	547	0.50	203	0.34	77	0.20	22	0.13	8
9000	386.9	0.81	605	0.53	224	0.36	85	0.21	24	0.13	8
9500	408.4	0.85	666	0.56	247	0.38	94	0.22	26	0.14	9
10000	429.9	0.90	729	0.59	270	0.40	103	0.23	29	0.15	10
10500	451.4	0.94	795	0.62	295	0.42	112	0.24	31	0.16	11
11000	472.9	0.99	864	0.65	320	0.44	121	0.26	34	0.16	12
11500	494.4	1.03	935	0.68	346	0.46	131	0.27	37	0.17	13
12000	515.9	1.08	1008	0.71	373	0.47	141	0.28	40	0.18	14
12500	537.4			0.74	401	0.49	152	0.29	43	0.19	15
13000	558.9			0.77	430	0.51	163	0.30	46	0.19	16
13500	580.4			0.80	460	0.53	174	0.31	49	0.20	17
14000	601.9			0.83	490	0.55	186	0.32	52	0.21	18
14500	623.4			0.86	522	0.57	198	0.34	55	0.22	19

Q̇ [W]	d [mm]	15		18		22		28		35	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
15000	644.9			0.89	554	0.59	210	0.35	59	0.22	20
15500	666.4			0.92	588	0.61	222	0.36	62	0.23	21
16000	687.9			0.95	622	0.63	235	0.37	66	0.24	23
16500	709.4			0.98	657	0.65	249	0.38	69	0.25	24
17000	730.9			1.01	693	0.67	262	0.39	73	0.25	25
17500	752.4			1.04	729	0.69	276	0.41	77	0.26	27
18000	773.9			1.07	767	0.71	290	0.42	81	0.27	28
18500	795.4			1.10	805	0.73	305	0.43	85	0.27	29
19000	816.9			1.13	845	0.75	319	0.44	89	0.28	31
19500	838.3			1.16	885	0.77	334	0.45	93	0.29	32
20000	859.8			1.19	926	0.79	350	0.46	98	0.30	34
20500	881.3			1.22	968	0.81	366	0.48	102	0.30	35
21000	902.8			1.25	1010	0.83	382	0.49	106	0.31	37
21500	924.3			1.28	1054	0.85	398	0.50	111	0.32	38
22000	945.8			1.31	1098	0.87	415	0.51	115	0.33	40
22500	967.3					0.89	431	0.52	120	0.33	41
23000	988.8					0.91	449	0.53	125	0.34	43
23500	1010.3					0.93	466	0.55	130	0.35	45
24000	1031.8					0.95	484	0.56	135	0.36	46
24500	1053.3					0.97	502	0.57	140	0.36	48
25000	1074.8					0.99	521	0.58	145	0.37	50
25500	1096.3					1.01	539	0.59	150	0.38	52
26000	1117.8					1.03	558	0.60	155	0.39	53
26500	1139.3					1.05	578	0.61	161	0.39	55
27000	1160.8					1.07	597	0.63	166	0.40	57
27500	1182.3					1.09	617	0.64	172	0.41	59
28000	1203.8					1.11	638	0.65	177	0.42	61
28500	1225.3					1.13	658	0.66	183	0.42	63
29000	1246.8					1.15	679	0.67	189	0.43	65
29500	1268.3					1.17	700	0.68	194	0.44	67
30000	1289.8					1.19	721	0.70	200	0.45	69
32500	1397.2					1.29	833	0.75	231	0.48	79
35000	1504.7					1.39	951	0.81	264	0.52	91
37500	1612.2					1.48	1077	0.87	298	0.56	102
40000	1719.7							0.93	335	0.59	115
42500	1827.2							0.99	373	0.63	128
45000	1934.7							1.04	413	0.67	142
47500	2042.1							1.10	456	0.71	156
50000	2149.6							1.16	500	0.74	171
52500	2257.1							1.22	545	0.78	187
55000	2364.6							1.28	593	0.82	203
57500	2472.1							1.33	642	0.85	220
60000	2579.5							1.39	693	0.89	237
62500	2687.0							1.45	746	0.93	255
65000	2794.5							1.51	801	0.97	274

Q̇ [W]	d [mm]	15		18		22		28		35	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
67500	2902.0							1.57	857	1.00	293
70000	3009.5							1.62	916	1.04	313
72500	3116.9							1.68	975	1.08	333
75000	3224.4							1.74	1037	1.11	354
77500	3331.9									1.15	375
80000	3439.4									1.19	397
82500	3546.9									1.23	420
85000	3654.3									1.26	443
87500	3761.8									1.30	467
90000	3869.3									1.34	491
92500	3976.8									1.37	516
95000	4084.3									1.41	542
97500	4191.7									1.45	568
100000	4299.2									1.48	594
105000	4514.2									1.56	649
110000	4729.1									1.63	706
115000	4944.1									1.71	765
120000	5159.1									1.78	827
125000	5374.0									1.86	890
130000	5589.0									1.93	956
135000	5804.0									2.00	1024

Table 64: Pressure loss Mapress Stainless Steel heating, inlet flow / return flow 80 °C / 60 °C, spread $\Delta T = 20$ K, d 42 - d 108

\dot{Q} [W]	d [mm]	42		54		76.1		88.9		108	
		\dot{m} [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]
5000	215.0	0.05	1								
5500	236.5	0.05	1								
6000	258.0	0.06	2								
6500	279.4	0.06	2								
7000	300.9	0.07	2								
7500	322.4	0.07	2								
8000	343.9	0.08	3	0.05	1						
8500	365.4	0.08	3	0.05	1						
9000	386.9	0.09	3	0.05	1						
9500	408.4	0.09	4	0.06	1						
10000	429.9	0.10	4	0.06	1						
10500	451.4	0.10	4	0.06	1						
11000	472.9	0.11	5	0.06	1						
11500	494.4	0.11	5	0.07	1						
12000	515.9	0.12	5	0.07	2						
12500	537.4	0.12	6	0.07	2						
13000	558.9	0.13	6	0.08	2						
13500	580.4	0.13	7	0.08	2						
14000	601.9	0.14	7	0.08	2						
14500	623.4	0.14	7	0.08	2						
15000	644.9	0.15	8	0.09	2						
15500	666.4	0.15	8	0.09	2						
16000	687.9	0.16	9	0.09	2						
16500	709.4	0.16	9	0.10	3						
17000	730.9	0.17	10	0.10	3						
17500	752.4	0.17	10	0.10	3						
18000	773.9	0.18	11	0.11	3						
18500	795.4	0.18	11	0.11	3	0.05	1				
19000	816.9	0.19	12	0.11	3	0.06	1				
19500	838.3	0.19	13	0.11	4	0.06	1				
20000	859.8	0.20	13	0.12	4	0.06	1				
20500	881.3	0.20	14	0.12	4	0.06	1				
21000	902.8	0.21	14	0.12	4	0.06	1				
21500	924.3	0.21	15	0.13	4	0.06	1				
22000	945.8	0.22	15	0.13	4	0.06	1				
22500	967.3	0.22	16	0.13	4	0.07	1				
23000	988.8	0.23	17	0.13	5	0.07	1				
23500	1010.3	0.23	17	0.14	5	0.07	1				
24000	1031.8	0.24	18	0.14	5	0.07	1				
24500	1053.3	0.24	19	0.14	5	0.07	1				
25000	1074.8	0.25	19	0.15	5	0.07	1	0.05	0		
25500	1096.3	0.25	20	0.15	6	0.07	1	0.05	0		
26000	1117.8	0.26	21	0.15	6	0.08	1	0.05	1		
26500	1139.3	0.26	22	0.15	6	0.08	1	0.06	1		

	d [mm]	42		54		76.1		88.9		108	
Q̇ [W]	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
27000	1160.8	0.27	22	0.16	6	0.08	1	0.06	1		
27500	1182.3	0.27	23	0.16	6	0.08	1	0.06	1		
28000	1203.8	0.28	24	0.16	7	0.08	1	0.06	1		
28500	1225.3	0.28	24	0.17	7	0.08	1	0.06	1		
29000	1246.8	0.29	25	0.17	7	0.08	1	0.06	1	0.04	0
29500	1268.3	0.29	26	0.17	7	0.09	1	0.06	1	0.04	0
30000	1289.8	0.30	27	0.18	7	0.09	1	0.06	1	0.04	0
32500	1397.2	0.32	31	0.19	9	0.10	2	0.07	1	0.05	0
35000	1504.7	0.35	35	0.20	10	0.10	2	0.07	1	0.05	0
37500	1612.2	0.37	40	0.22	11	0.11	2	0.08	1	0.05	0
40000	1719.7	0.40	45	0.23	12	0.12	2	0.08	1	0.06	0
42500	1827.2	0.42	50	0.25	14	0.12	3	0.09	1	0.06	0
45000	1934.7	0.45	55	0.26	15	0.13	3	0.09	1	0.06	1
47500	2042.1	0.47	60	0.28	17	0.14	3	0.10	1	0.07	1
50000	2149.6	0.50	66	0.29	18	0.15	4	0.11	2	0.07	1
52500	2257.1	0.52	72	0.31	20	0.15	4	0.11	2	0.07	1
55000	2364.6	0.55	79	0.32	22	0.16	4	0.12	2	0.08	1
57500	2472.1	0.57	85	0.34	24	0.17	5	0.12	2	0.08	1
60000	2579.5	0.60	92	0.35	25	0.18	5	0.13	2	0.08	1
62500	2687.0	0.62	99	0.37	27	0.18	5	0.13	2	0.09	1
65000	2794.5	0.65	106	0.38	29	0.19	6	0.14	3	0.09	1
67500	2902.0	0.67	113	0.39	31	0.20	6	0.14	3	0.09	1
70000	3009.5	0.70	121	0.41	33	0.20	6	0.15	3	0.10	1
72500	3116.9	0.72	129	0.42	36	0.21	7	0.15	3	0.10	1
75000	3224.4	0.75	137	0.44	38	0.22	7	0.16	3	0.11	1
77500	3331.9	0.77	145	0.45	40	0.23	8	0.16	4	0.11	1
80000	3439.4	0.80	154	0.47	42	0.23	8	0.17	4	0.11	1
82500	3546.9	0.82	162	0.48	45	0.24	9	0.17	4	0.12	1
85000	3654.3	0.85	171	0.50	47	0.25	9	0.18	4	0.12	2
87500	3761.8	0.87	180	0.51	50	0.26	9	0.18	4	0.12	2
90000	3869.3	0.90	190	0.53	52	0.26	10	0.19	5	0.13	2
92500	3976.8	0.92	199	0.54	55	0.27	10	0.20	5	0.13	2
95000	4084.3	0.95	209	0.56	58	0.28	11	0.20	5	0.13	2
97500	4191.7	0.97	219	0.57	60	0.29	12	0.21	5	0.14	2
100000	4299.2	1.00	229	0.58	63	0.29	12	0.21	6	0.14	2
105000	4514.2	1.05	250	0.61	69	0.31	13	0.22	6	0.15	2
110000	4729.1	1.10	272	0.64	75	0.32	14	0.23	7	0.15	2
115000	4944.1	1.15	295	0.67	81	0.34	15	0.24	7	0.16	3
120000	5159.1	1.20	318	0.70	88	0.35	17	0.25	8	0.17	3
125000	5374.0	1.25	343	0.73	94	0.37	18	0.26	8	0.18	3
130000	5589.0	1.30	368	0.76	101	0.38	19	0.27	9	0.18	3
135000	5804.0	1.35	394	0.79	108	0.39	21	0.28	9	0.19	4
140000	6018.9	1.40	421	0.82	116	0.41	22	0.30	10	0.20	4
145000	6233.9	1.45	448	0.85	123	0.42	23	0.31	11	0.20	4
150000	6448.8	1.50	477	0.88	131	0.44	25	0.32	11	0.21	4

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
155000	6663.8	1.55	506	0.91	139	0.45	26	0.33	12	0.22	5
160000	6878.8	1.60	536	0.94	147	0.47	28	0.34	13	0.22	5
165000	7093.7	1.65	566	0.96	155	0.48	29	0.35	13	0.23	5
170000	7308.7	1.70	598	0.99	164	0.50	31	0.36	14	0.24	5
175000	7523.6	1.75	630	1.02	173	0.51	33	0.37	15	0.25	6
180000	7738.6	1.80	663	1.05	182	0.53	34	0.38	16	0.25	6
185000	7953.6	1.85	697	1.08	191	0.54	36	0.39	17	0.26	6
190000	8168.5	1.90	732	1.11	201	0.56	38	0.40	17	0.27	7
195000	8383.5	1.95	767	1.14	210	0.57	40	0.41	18	0.27	7
200000	8598.5	2.00	803	1.17	220	0.59	42	0.42	19	0.28	7
205000	8813.4	2.05	840	1.20	230	0.60	43	0.43	20	0.29	7
210000	9028.4	2.10	878	1.23	240	0.61	45	0.44	21	0.30	8
215000	9243.3	2.15	916	1.26	251	0.63	47	0.45	22	0.30	8
220000	9458.3	2.20	955	1.29	261	0.64	49	0.46	23	0.31	9
225000	9673.3	2.25	995	1.32	272	0.66	51	0.47	23	0.32	9
230000	9888.2	2.30	1036	1.34	283	0.67	53	0.49	24	0.32	9
235000	10103.2			1.37	295	0.69	56	0.50	25	0.33	10
240000	10318.1			1.40	306	0.70	58	0.51	26	0.34	10
245000	10533.1			1.43	318	0.72	60	0.52	27	0.34	10
250000	10748.1			1.46	330	0.73	62	0.53	28	0.35	11
255000	10963.0			1.49	342	0.75	64	0.54	29	0.36	11
260000	11178.0			1.52	354	0.76	67	0.55	30	0.37	11
265000	11392.9			1.55	366	0.78	69	0.56	31	0.37	12
270000	11607.9			1.58	379	0.79	71	0.57	33	0.38	12
275000	11822.9			1.61	392	0.80	74	0.58	34	0.39	13
280000	12037.8			1.64	405	0.82	76	0.59	35	0.39	13
285000	12252.8			1.67	418	0.83	79	0.60	36	0.40	14
290000	12467.8			1.70	431	0.85	81	0.61	37	0.41	14
295000	12682.7			1.72	445	0.86	84	0.62	38	0.41	14
300000	12897.7			1.75	459	0.88	86	0.63	39	0.42	15
305000	13112.6			1.78	473	0.89	89	0.64	41	0.43	15
310000	13327.6			1.81	487	0.91	92	0.65	42	0.44	16
315000	13542.6			1.84	502	0.92	94	0.66	43	0.44	16
320000	13757.5			1.87	516	0.94	97	0.68	44	0.45	17
325000	13972.5			1.90	531	0.95	100	0.69	45	0.46	17
330000	14187.4			1.93	546	0.97	103	0.70	47	0.46	18
335000	14402.4			1.96	561	0.98	105	0.71	48	0.47	18
340000	14617.4			1.99	576	0.99	108	0.72	49	0.48	19
345000	14832.3			2.02	592	1.01	111	0.73	51	0.49	19
350000	15047.3			2.05	608	1.02	114	0.74	52	0.49	20
355000	15262.3			2.08	624	1.04	117	0.75	53	0.50	20
360000	15477.2			2.10	640	1.05	120	0.76	55	0.51	21
365000	15692.2			2.13	656	1.07	123	0.77	56	0.51	21
370000	15907.1			2.16	672	1.08	126	0.78	57	0.52	22
375000	16122.1			2.19	689	1.10	129	0.79	59	0.53	22

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
	ṁ [kg/h]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
380000	16337.1			2.22	706	1.11	132	0.80	60	0.53	23
385000	16552.0			2.25	723	1.13	136	0.81	62	0.54	23
390000	16767.0			2.28	740	1.14	139	0.82	63	0.55	24
395000	16981.9			2.31	758	1.16	142	0.83	65	0.56	24
400000	17196.9			2.34	775	1.17	145	0.84	66	0.56	25
405000	17411.9			2.37	793	1.18	149	0.85	68	0.57	25
410000	17626.8			2.40	811	1.20	152	0.86	69	0.58	26
415000	17841.8			2.43	829	1.21	155	0.88	71	0.58	27
420000	18056.7			2.46	848	1.23	159	0.89	72	0.59	27
425000	18271.7			2.48	866	1.24	162	0.90	74	0.60	28
430000	18486.7			2.51	885	1.26	166	0.91	75	0.60	28
435000	18701.6			2.54	904	1.27	169	0.92	77	0.61	29
440000	18916.6			2.57	923	1.29	173	0.93	79	0.62	30
445000	19131.6			2.60	942	1.30	176	0.94	80	0.63	30
450000	19346.5			2.63	962	1.32	180	0.95	82	0.63	31
455000	19561.5			2.66	981	1.33	184	0.96	83	0.64	31
460000	19776.4			2.69	1001	1.35	187	0.97	85	0.65	32
465000	19991.4			2.72	1021	1.36	191	0.98	87	0.65	33
470000	20206.4			2.75	1041	1.37	195	0.99	89	0.66	33
475000	20421.3			2.78	1062	1.39	199	1.00	90	0.67	34
480000	20636.3			2.81	1082	1.40	202	1.01	92	0.67	35
485000	20851.2					1.42	206	1.02	94	0.68	35
490000	21066.2					1.43	210	1.03	95	0.69	36
495000	21281.2					1.45	214	1.04	97	0.70	37
500000	21496.1					1.46	218	1.05	99	0.70	37
505000	21711.1					1.48	222	1.07	101	0.71	38
510000	21926.1					1.49	226	1.08	103	0.72	39
515000	22141.0					1.51	230	1.09	105	0.72	39
520000	22356.0					1.52	234	1.10	106	0.73	40
525000	22570.9					1.54	238	1.11	108	0.74	41
530000	22785.9					1.55	242	1.12	110	0.75	41
535000	23000.9					1.56	247	1.13	112	0.75	42
540000	23215.8					1.58	251	1.14	114	0.76	43
550000	23645.7					1.61	259	1.16	118	0.77	44
600000	25795.4					1.76	304	1.27	138	0.84	52
650000	27945.0					1.90	352	1.37	160	0.91	60
700000	30094.6					2.05	403	1.48	183	0.98	69
750000	32244.2					2.19	457	1.58	207	1.05	78
800000	34393.8					2.34	514	1.69	233	1.12	87
850000	36543.4					2.49	575	1.79	260	1.19	98
900000	38693.0					2.63	638	1.90	289	1.27	108
1000000	42992.3					2.93	774	2.11	350	1.41	131
1050000	45141.9					3.07	847	2.21	383	1.48	143
1100000	47291.5					3.22	923	2.32	417	1.55	156
1150000	49441.1					3.36	1001	2.43	453	1.62	169

Q̇ [W]	d [mm]	42		54		76.1		88.9		108	
		v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]	v [m/s]	Δp [Pa/m]
1200000	51590.7					3.51	1083	2.53	489	1.69	183
1250000	53740.3							2.64	527	1.76	197
1300000	55889.9							2.74	567	1.83	212
1350000	58039.6							2.85	607	1.90	227
1400000	60189.2							2.95	650	1.97	243
1450000	62338.8							3.06	693	2.04	259
1500000	64488.4							3.16	737	2.11	275
1550000	66638.0							3.27	783	2.18	292
1600000	68787.6							3.38	831	2.25	310
1650000	70937.2							3.48	879	2.32	328
1700000	73086.8							3.59	929	2.39	346
1750000	75236.5							3.69	980	2.46	365
1800000	77386.1							3.80	1032	2.53	385
1850000	79535.7									2.60	405
1900000	81685.3									2.67	425
1950000	83834.9									2.74	446
2000000	85984.5									2.81	467
2050000	88134.1									2.88	489
2100000	90283.7									2.95	511
2150000	92433.4									3.02	533
2200000	94583.0									3.09	557
2250000	96732.6									3.16	580
2300000	98882.2									3.23	604
2350000	101031.8									3.30	629
2400000	103181.4									3.37	653
2450000	105331.0									3.44	679
2500000	107480.7									3.51	705
2550000	109630.3									3.58	731
2600000	111779.9									3.66	758
2650000	113929.5									3.73	785
2700000	116079.1									3.80	812
2750000	118228.7									3.87	840
2800000	120378.3									3.94	869
2850000	122527.9									4.01	898
2900000	124677.6									4.08	927
2950000	126827.2									4.15	957
3000000	128976.8									4.22	987

5.2.10 Pressure loss Mapress Stainless Steel gas

5.2.10.1 Pressure loss Mapress Stainless Steel gas, 1st gas family

- Density: 0.61 kg/m³
- Viscosity: 0.000015 Pa·s
- Surface roughness: 0.0015 mm

Table 65: Pressure loss Mapress Stainless Steel gas, 1st gas family, depending on the volume flow, d 15 - d 35

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.9	0.0222	0.5	0.0067	0.3	0.0026	0.2	0.0010	0.1	0.0003	0.1	0.0001
0.50	1.8	0.0674	1.0	0.0201	0.7	0.0077	0.5	0.0030	0.3	0.0009	0.2	0.0003
0.75	2.7	0.1310	1.6	0.0387	1.0	0.0148	0.7	0.0058	0.4	0.0017	0.3	0.0006
1.00	3.5	0.2108	2.1	0.0621	1.4	0.0237	0.9	0.0092	0.5	0.0027	0.3	0.0010
1.25	4.4	0.3059	2.6	0.0899	1.7	0.0342	1.2	0.0133	0.7	0.0039	0.4	0.0014
1.50	5.3	0.4153	3.1	0.1217	2.1	0.0462	1.4	0.0180	0.8	0.0052	0.5	0.0019
1.75	6.2	0.5384	3.7	0.1575	2.4	0.0597	1.6	0.0232	0.9	0.0067	0.6	0.0024
2.00	7.1	0.6748	4.2	0.1971	2.8	0.0746	1.8	0.0289	1.1	0.0083	0.7	0.0030
2.25	8.0	0.8240	4.7	0.2404	3.1	0.0909	2.1	0.0352	1.2	0.0101	0.8	0.0036
2.50	8.8	0.9857	5.2	0.2872	3.5	0.1085	2.3	0.0420	1.3	0.0121	0.9	0.0043
2.75	9.7	1.1596	5.8	0.3375	3.8	0.1274	2.5	0.0492	1.5	0.0141	0.9	0.0050
3.00	10.6	1.3454	6.3	0.3912	4.1	0.1475	2.8	0.0570	1.6	0.0163	1.0	0.0058
3.25			6.8	0.4483	4.5	0.1689	3.0	0.0652	1.8	0.0187	1.1	0.0066
3.50			7.3	0.5086	4.8	0.1915	3.2	0.0739	1.9	0.0212	1.2	0.0075
3.75			7.8	0.5722	5.2	0.2154	3.5	0.0830	2.0	0.0238	1.3	0.0084
4.00			8.4	0.6389	5.5	0.2403	3.7	0.0926	2.2	0.0265	1.4	0.0093
4.50			9.4	0.7817	6.2	0.2938	4.1	0.1131	2.4	0.0323	1.6	0.0114
5.00			10.5	0.9367	6.9	0.3517	4.6	0.1353	2.7	0.0386	1.7	0.0136
5.50					7.6	0.4140	5.1	0.1591	3.0	0.0453	1.9	0.0159
6.00					8.3	0.4807	5.5	0.1846	3.2	0.0525	2.1	0.0184
6.50					9.0	0.5516	6.0	0.2117	3.5	0.0602	2.2	0.0211
7.00					9.7	0.6266	6.4	0.2404	3.8	0.0683	2.4	0.0239
7.50					10.4	0.7	6.9	0.2706	4.0	0.0768	2.6	0.0269
8.00							7.4	0.3023	4.3	0.0858	2.8	0.0300
8.50							7.8	0.3356	4.6	0.0952	2.9	0.0333
9.00							8.3	0.3703	4.9	0.1049	3.1	0.0367
9.50							8.7	0.4065	5.1	0.1151	3.3	0.0402
10.00							9.2	0.4441	5.4	0.1257	3.5	0.0439
10.50							9.7	0.4832	5.7	0.1367	3.6	0.0477
11.00							10.1	0.5237	5.9	0.1481	3.8	0.0517
11.50									6.2	0.1599	4.0	0.0558
12.00									6.5	0.1721	4.1	0.0600
12.50									6.7	0.1846	4.3	0.0644
13.00									7.0	0.1976	4.5	0.0688
13.50									7.3	0.2109	4.7	0.0735

d [mm]	12		15		18		22		28		35	
di [mm]	10		13		16		19.6		25.6		32	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
14.00									7.6	0.2246	4.8	0.0782
14.50									7.8	0.2386	5.0	0.0831
15.00									8.1	0.2531	5.2	0.0881
16.00									8.6	0.2830	5.5	0.0984
17.00									9.2	0.3144	5.9	0.1093
18.00									9.7	0.3472	6.2	0.1207
19.00									10.3	0.3814	6.6	0.1325
20.00									10.8	0.4170	6.9	0.1448
21.00											7.3	0.1576
22.00											7.6	0.1709
23.00											7.9	0.1846
24.00											8.3	0.1987
25.00											8.6	0.2134
30.00											10.4	0.2932

Table 66: Pressure loss Mapress Stainless Steel gas, 1st gas family, depending on the volume flow, d 42 - d 108

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.0000	0.0	0.0000						
0.50	0.1	0.0001	0.1	0.0000						
0.75	0.2	0.0002	0.1	0.0001						
1.00	0.2	0.0004	0.1	0.0001						
1.25	0.3	0.0006	0.2	0.0002						
1.50	0.3	0.0007	0.2	0.0002						
1.75	0.4	0.0010	0.2	0.0003						
2.00	0.5	0.0012	0.3	0.0003						
2.25	0.5	0.0014	0.3	0.0004						
2.50	0.6	0.0017	0.3	0.0005						
2.75	0.6	0.0020	0.4	0.0006						
3.00	0.7	0.0023	0.4	0.0007						
3.25	0.8	0.0026	0.4	0.0008						
3.50	0.8	0.0030	0.5	0.0009						
3.75	0.9	0.0033	0.5	0.0010						
4.00	0.9	0.0037	0.5	0.0011						
4.50	1.0	0.0045	0.6	0.0013						
5.00	1.2	0.0054	0.7	0.0015						
5.50	1.3	0.0063	0.7	0.0018						
6.00	1.4	0.0073	0.8	0.0021						
6.50	1.5	0.0083	0.9	0.0024						

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
7.00	1.6	0.0095	1.0	0.0027						
7.50	1.7	0.0106	1.0	0.0030						
8.00	1.9	0.0118	1.1	0.0034						
8.50	2.0	0.0131	1.2	0.0037						
9.00	2.1	0.0145	1.2	0.0041						
9.50	2.2	0.0159	1.3	0.0045						
10.00	2.3	0.0173	1.4	0.0049	0.7	0.0010	0.5	0.0005	0.3	0.0002
10.50	2.4	0.0188	1.4	0.0053	0.7	0.0011	0.5	0.0005	0.3	0.0002
11.00	2.6	0.0204	1.5	0.0058	0.7	0.0011	0.5	0.0005	0.4	0.0002
11.50	2.7	0.0220	1.6	0.0062	0.8	0.0012	0.6	0.0006	0.4	0.0002
12.00	2.8	0.0236	1.6	0.0067	0.8	0.0013	0.6	0.0006	0.4	0.0002
12.50	2.9	0.0253	1.7	0.0072	0.9	0.0014	0.6	0.0007	0.4	0.0003
13.00	3.0	0.0271	1.8	0.0077	0.9	0.0015	0.6	0.0007	0.4	0.0003
13.50	3.1	0.0289	1.8	0.0082	0.9	0.0016	0.7	0.0007	0.4	0.0003
14.00	3.3	0.0307	1.9	0.0087	1.0	0.0017	0.7	0.0008	0.5	0.0003
14.50	3.4	0.0326	2.0	0.0092	1.0	0.0018	0.7	0.0008	0.5	0.0003
15.00	3.5	0.0346	2.0	0.0098	1.0	0.0019	0.7	0.0009	0.5	0.0003
16.00	3.7	0.0387	2.2	0.0109	1.1	0.0021	0.8	0.0010	0.5	0.0004
17.00	4.0	0.0429	2.3	0.0121	1.2	0.0024	0.8	0.0011	0.6	0.0004
18.00	4.2	0.0474	2.4	0.0134	1.2	0.0026	0.9	0.0012	0.6	0.0005
19.00	4.4	0.0520	2.6	0.0146	1.3	0.0029	0.9	0.0013	0.6	0.0005
20.00	4.7	0.0568	2.7	0.0160	1.4	0.0031	1.0	0.0015	0.7	0.0006
21.00	4.9	0.0618	2.9	0.0174	1.4	0.0034	1.0	0.0016	0.7	0.0006
22.00	5.1	0.0670	3.0	0.0188	1.5	0.0037	1.1	0.0017	0.7	0.0007
23.00	5.3	0.0723	3.1	0.0203	1.6	0.0040	1.1	0.0018	0.8	0.0007
24.00	5.6	0.0778	3.3	0.0219	1.6	0.0043	1.2	0.0020	0.8	0.0008
25.00	5.8	0.0836	3.4	0.0235	1.7	0.0046	1.2	0.0021	0.8	0.0008
30.00	7.0	0.1147	4.1	0.0322	2.0	0.0063	1.5	0.0029	1.0	0.0011
35.00	8.1	0.1500	4.8	0.0420	2.4	0.0082	1.7	0.0038	1.1	0.0015
40.00	9.3	0.1894	5.4	0.0530	2.7	0.0103	2.0	0.0048	1.3	0.0018
45.00	10.5	0.2328	6.1	0.0651	3.1	0.0126	2.2	0.0058	1.5	0.0022
50.00			6.8	0.0782	3.4	0.0151	2.5	0.0070	1.6	0.0027
55.00			7.5	0.0924	3.7	0.0179	2.7	0.0082	1.8	0.0032
60.00			8.2	0.1076	4.1	0.0208	2.9	0.0096	2.0	0.0037
65.00			8.8	0.1238	4.4	0.0239	3.2	0.0110	2.1	0.0042
70.00			9.5	0.1410	4.8	0.0272	3.4	0.0125	2.3	0.0048
75.00			10.2	0.1592	5.1	0.0307	3.7	0.0141	2.5	0.0054
80.00			10.9	0.1784	5.4	0.0344	3.9	0.0158	2.6	0.0060
85.00					5.8	0.0382	4.2	0.0176	2.8	0.0067
90.00					6.1	0.0422	4.4	0.0194	2.9	0.0074
95.00					6.5	0.0464	4.7	0.0214	3.1	0.0081
100.00					6.8	0.0508	4.9	0.0234	3.3	0.0089
105.00					7.1	0.0553	5.2	0.0254	3.4	0.0097

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
110.00					7.5	0.0601	5.4	0.0276	3.6	0.0105
115.00					7.8	0.0650	5.6	0.0298	3.8	0.0114
120.00					8.2	0.0700	5.9	0.0322	3.9	0.0123
125.00					8.5	0.0752	6.1	0.0345	4.1	0.0132
130.00					8.8	0.0806	6.4	0.0370	4.3	0.0141
135.00					9.2	0.0862	6.6	0.0396	4.4	0.0151
140.00					9.5	0.0919	6.9	0.0422	4.6	0.0161
145.00					9.9	0.0977	7.1	0.0449	4.7	0.0171
150.00					10.2	0.1038	7.4	0.0476	4.9	0.0181
160.00							7.9	0.0534	5.2	0.0203
170.00							8.3	0.0594	5.6	0.0226
180.00							8.8	0.0657	5.9	0.0250
190.00							9.3	0.0723	6.2	0.0275
200.00							9.8	0.0791	6.5	0.0301
210.00							10.3	0.0863	6.9	0.0328
220.00									7.2	0.0356
230.00									7.5	0.0385
240.00									7.8	0.0415
250.00									8.2	0.0446
300.00									9.8	0.0616

5.2.10.2 Pressure loss Mapress Stainless Steel gas, 2nd gas family

- Density: 0.79 kg/m³
- Viscosity: 0.000015 Pa·s
- Surface roughness: 0.0015 mm

Table 67: Pressure loss Mapress Stainless Steel gas, 2nd gas family, depending on the volume flow, d 15 - d 35

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.9	0.0258	0.5	0.0077	0.3	0.0030	0.2	0.0012	0.1	0.0004	0.1	0.0001
0.50	1.8	0.0794	1.0	0.0235	0.7	0.0090	0.5	0.0035	0.3	0.0010	0.2	0.0004
0.75	2.7	0.1551	1.6	0.0457	1.0	0.0174	0.7	0.0068	0.4	0.0020	0.3	0.0007
1.00	3.5	0.2506	2.1	0.0736	1.4	0.0280	0.9	0.0109	0.5	0.0032	0.3	0.0011
1.25	4.4	0.3646	2.6	0.1068	1.7	0.0405	1.2	0.0157	0.7	0.0045	0.4	0.0016
1.50	5.3	0.4960	3.1	0.1449	2.1	0.0549	1.4	0.0213	0.8	0.0061	0.5	0.0022
1.75	6.2	0.6441	3.7	0.1879	2.4	0.0710	1.6	0.0275	0.9	0.0079	0.6	0.0028
2.00	7.1	0.8085	4.2	0.2355	2.8	0.0889	1.8	0.0344	1.1	0.0099	0.7	0.0035
2.25	8.0	0.9884	4.7	0.2875	3.1	0.1085	2.1	0.0419	1.2	0.0120	0.8	0.0042
2.50	8.8	1.1837	5.2	0.3439	3.5	0.1296	2.3	0.0500	1.3	0.0143	0.9	0.0051
2.75	9.7	1.3939	5.8	0.4046	3.8	0.1523	2.5	0.0588	1.5	0.0168	0.9	0.0059
3.00	10.6	1.6186	6.3	0.4694	4.1	0.1766	2.8	0.0681	1.6	0.0195	1.0	0.0069
3.25			6.8	0.5383	4.5	0.2024	3.0	0.0779	1.8	0.0223	1.1	0.0078
3.50			7.3	0.6111	4.8	0.2297	3.2	0.0884	1.9	0.0252	1.2	0.0089
3.75			7.8	0.6880	5.2	0.2584	3.5	0.0994	2.0	0.0284	1.3	0.0100
4.00			8.4	0.7687	5.5	0.2885	3.7	0.1109	2.2	0.0316	1.4	0.0111
4.50			9.4	0.9415	6.2	0.3531	4.1	0.1356	2.4	0.0386	1.6	0.0135
5.00			10.5	1.1293	6.9	0.4231	4.6	0.1624	2.7	0.0462	1.7	0.0162
5.50					7.6	0.4986	5.1	0.1912	3.0	0.0543	1.9	0.0190
6.00					8.3	0.5793	5.5	0.2220	3.2	0.0630	2.1	0.0221
6.50					9.0	0.6653	6.0	0.2548	3.5	0.0723	2.2	0.0253
7.00					9.7	0.7563	6.4	0.2895	3.8	0.0820	2.4	0.0287
7.50					10.4	0.9	6.9	0.3261	4.0	0.0924	2.6	0.0323
8.00							7.4	0.3646	4.3	0.1032	2.8	0.0360
8.50							7.8	0.4049	4.6	0.1145	2.9	0.0400
9.00							8.3	0.4470	4.9	0.1264	3.1	0.0441
9.50							8.7	0.4910	5.1	0.1387	3.3	0.0484
10.00							9.2	0.5367	5.4	0.1516	3.5	0.0528
10.50							9.7	0.5842	5.7	0.1649	3.6	0.0574
11.00							10.1	0.6334	5.9	0.1787	3.8	0.0622
11.50									6.2	0.1930	4.0	0.0672
12.00									6.5	0.2078	4.1	0.0723
12.50									6.7	0.2230	4.3	0.0776
13.00									7.0	0.2387	4.5	0.0830
13.50									7.3	0.2549	4.7	0.0886
14.00									7.6	0.2715	4.8	0.0943
14.50									7.8	0.2886	5.0	0.1003

d [mm]	12		15		18		22		28		35	
di [mm]	10		13		16		19.6		25.6		32	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
15.00									8.1	0.3061	5.2	0.1063
16.00									8.6	0.3425	5.5	0.1189
17.00									9.2	0.3807	5.9	0.1321
18.00									9.7	0.4206	6.2	0.1459
19.00									10.3	0.4623	6.6	0.1603
20.00									10.8	0.5056	6.9	0.1752
21.00											7.3	0.1908
22.00											7.6	0.2069
23.00											7.9	0.2236
24.00											8.3	0.2409
25.00											8.6	0.2587
30.00											10.4	0.3560

Table 68: Pressure loss Mapress Stainless Steel gas, 2nd gas family, depending on the volume flow, d 42 - d 108

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.0001	0.0	0.0000						
0.50	0.1	0.0002	0.1	0.0000						
0.75	0.2	0.0003	0.1	0.0001						
1.00	0.2	0.0005	0.1	0.0001						
1.25	0.3	0.0006	0.2	0.0002						
1.50	0.3	0.0009	0.2	0.0003						
1.75	0.4	0.0011	0.2	0.0003						
2.00	0.5	0.0014	0.3	0.0004						
2.25	0.5	0.0017	0.3	0.0005						
2.50	0.6	0.0020	0.3	0.0006						
2.75	0.6	0.0024	0.4	0.0007						
3.00	0.7	0.0027	0.4	0.0008						
3.25	0.8	0.0031	0.4	0.0009						
3.50	0.8	0.0035	0.5	0.0010						
3.75	0.9	0.0040	0.5	0.0011						
4.00	0.9	0.0044	0.5	0.0013						
4.50	1.0	0.0054	0.6	0.0015						
5.00	1.2	0.0064	0.7	0.0018						
5.50	1.3	0.0075	0.7	0.0021						
6.00	1.4	0.0087	0.8	0.0025						
6.50	1.5	0.0100	0.9	0.0028						
7.00	1.6	0.0113	1.0	0.0032						
7.50	1.7	0.0127	1.0	0.0036						

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
8.00	1.9	0.0142	1.1	0.0040						
8.50	2.0	0.0157	1.2	0.0045						
9.00	2.1	0.0173	1.2	0.0049						
9.50	2.2	0.0190	1.3	0.0054						
10.00	2.3	0.0208	1.4	0.0059	0.7	0.0012	0.5	0.0005	0.3	0.0002
10.50	2.4	0.0226	1.4	0.0064	0.7	0.0013	0.5	0.0006	0.3	0.0002
11.00	2.6	0.0245	1.5	0.0069	0.7	0.0014	0.5	0.0006	0.4	0.0002
11.50	2.7	0.0264	1.6	0.0075	0.8	0.0015	0.6	0.0007	0.4	0.0003
12.00	2.8	0.0284	1.6	0.0080	0.8	0.0016	0.6	0.0007	0.4	0.0003
12.50	2.9	0.0305	1.7	0.0086	0.9	0.0017	0.6	0.0008	0.4	0.0003
13.00	3.0	0.0326	1.8	0.0092	0.9	0.0018	0.6	0.0008	0.4	0.0003
13.50	3.1	0.0348	1.8	0.0098	0.9	0.0019	0.7	0.0009	0.4	0.0003
14.00	3.3	0.0370	1.9	0.0104	1.0	0.0020	0.7	0.0009	0.5	0.0004
14.50	3.4	0.0393	2.0	0.0111	1.0	0.0022	0.7	0.0010	0.5	0.0004
15.00	3.5	0.0417	2.0	0.0117	1.0	0.0023	0.7	0.0011	0.5	0.0004
16.00	3.7	0.0466	2.2	0.0131	1.1	0.0026	0.8	0.0012	0.5	0.0005
17.00	4.0	0.0518	2.3	0.0146	1.2	0.0028	0.8	0.0013	0.6	0.0005
18.00	4.2	0.0572	2.4	0.0161	1.2	0.0031	0.9	0.0015	0.6	0.0006
19.00	4.4	0.0628	2.6	0.0176	1.3	0.0034	0.9	0.0016	0.6	0.0006
20.00	4.7	0.0686	2.7	0.0193	1.4	0.0038	1.0	0.0017	0.7	0.0007
21.00	4.9	0.0747	2.9	0.0210	1.4	0.0041	1.0	0.0019	0.7	0.0007
22.00	5.1	0.0810	3.0	0.0227	1.5	0.0044	1.1	0.0020	0.7	0.0008
23.00	5.3	0.0875	3.1	0.0245	1.6	0.0048	1.1	0.0022	0.8	0.0009
24.00	5.6	0.0942	3.3	0.0264	1.6	0.0051	1.2	0.0024	0.8	0.0009
25.00	5.8	0.1011	3.4	0.0284	1.7	0.0055	1.2	0.0026	0.8	0.0010
30.00	7.0	0.1390	4.1	0.0389	2.0	0.0076	1.5	0.0035	1.0	0.0013
35.00	8.1	0.1820	4.8	0.0509	2.4	0.0099	1.7	0.0046	1.1	0.0017
40.00	9.3	0.2301	5.4	0.0643	2.7	0.0124	2.0	0.0057	1.3	0.0022
45.00	10.5	0.2830	6.1	0.0790	3.1	0.0153	2.2	0.0070	1.5	0.0027
50.00			6.8	0.0950	3.4	0.0183	2.5	0.0084	1.6	0.0032
55.00			7.5	0.1123	3.7	0.0217	2.7	0.0100	1.8	0.0038
60.00			8.2	0.1308	4.1	0.0252	2.9	0.0116	2.0	0.0044
65.00			8.8	0.1506	4.4	0.0290	3.2	0.0133	2.1	0.0051
70.00			9.5	0.1717	4.8	0.0330	3.4	0.0152	2.3	0.0058
75.00			10.2	0.1939	5.1	0.0373	3.7	0.0171	2.5	0.0065
80.00			10.9	0.2173	5.4	0.0417	3.9	0.0192	2.6	0.0073
85.00					5.8	0.0464	4.2	0.0213	2.8	0.0081
90.00					6.1	0.0514	4.4	0.0236	2.9	0.0090
95.00					6.5	0.0565	4.7	0.0259	3.1	0.0099
100.00					6.8	0.0618	4.9	0.0284	3.3	0.0108
105.00					7.1	0.0674	5.2	0.0309	3.4	0.0118
110.00					7.5	0.0732	5.4	0.0336	3.6	0.0128
115.00					7.8	0.0791	5.6	0.0363	3.8	0.0138

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
120.00					8.2	0.0853	5.9	0.0391	3.9	0.0149
125.00					8.5	0.0917	6.1	0.0421	4.1	0.0160
130.00					8.8	0.0983	6.4	0.0451	4.3	0.0171
135.00					9.2	0.1051	6.6	0.0482	4.4	0.0183
140.00					9.5	0.1121	6.9	0.0514	4.6	0.0195
145.00					9.9	0.1193	7.1	0.0547	4.7	0.0208
150.00					10.2	0.1266	7.4	0.0580	4.9	0.0221
160.00							7.9	0.0651	5.2	0.0247
170.00							8.3	0.0724	5.6	0.0275
180.00							8.8	0.0802	5.9	0.0304
190.00							9.3	0.0882	6.2	0.0335
200.00							9.8	0.0967	6.5	0.0367
210.00							10.3	0.1054	6.9	0.0400
220.00									7.2	0.0434
230.00									7.5	0.0470
240.00									7.8	0.0507
250.00									8.2	0.0545
300.00									9.8	0.0753

5.2.10.3 Pressure loss Mapress Stainless Steel gas, 3rd gas family

- Density: 540 kg/m³
- Viscosity: 0.0002 Pa·s
- Surface roughness: 0.0015 mm

Table 69: Pressure loss Mapress Stainless Steel gas, 3rd gas family, depending on the volume flow, d 15 - d 35

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.9	5.31	0.5	1.52	0.3	0.56	0.2	0.21	0.1	0.06	0.1	0.02
0.50	1.8	18.26	1.0	5.17	0.7	1.91	0.5	0.73	0.3	0.20	0.2	0.07
0.75	2.7	37.90	1.6	10.68	1.0	3.94	0.7	1.49	0.4	0.42	0.3	0.14
1.00	3.5	63.89	2.1	17.93	1.4	6.59	0.9	2.48	0.5	0.69	0.3	0.24
1.25	4.4	96.00	2.6	26.84	1.7	9.84	1.2	3.70	0.7	1.03	0.4	0.35
1.50	5.3	134.12	3.1	37.38	2.1	13.68	1.4	5.14	0.8	1.42	0.5	0.49
1.75	6.2	178.13	3.7	49.51	2.4	18.08	1.6	6.78	0.9	1.88	0.6	0.64
2.00	7.1	227.98	4.2	63.20	2.8	23.04	1.8	8.63	1.1	2.38	0.7	0.82
2.25	8.0	283.60	4.7	78.43	3.1	28.55	2.1	10.68	1.2	2.95	0.8	1.01
2.50	8.8	344.96	5.2	95.19	3.5	34.60	2.3	12.93	1.3	3.56	0.9	1.22
2.75	9.7	412.02	5.8	113.46	3.8	41.19	2.5	15.38	1.5	4.23	0.9	1.44
3.00	10.6	484.74	6.3	133.23	4.1	48.31	2.8	18.01	1.6	4.95	1.0	1.69
3.25			6.8	154.49	4.5	55.95	3.0	20.84	1.8	5.72	1.1	1.95
3.50			7.3	177.24	4.8	64.11	3.2	23.86	1.9	6.54	1.2	2.23
3.75			7.8	201.46	5.2	72.79	3.5	27.07	2.0	7.42	1.3	2.53
4.00			8.4	227.15	5.5	81.99	3.7	30.46	2.2	8.34	1.4	2.84
4.50			9.4	282.91	6.2	101.92	4.1	37.81	2.4	10.33	1.6	3.51
5.00			10.5	344.50	6.9	123.88	4.6	45.89	2.7	12.52	1.7	4.25
5.50					7.6	147.86	5.1	54.69	3.0	14.89	1.9	5.05
6.00					8.3	173.84	5.5	64.22	3.2	17.46	2.1	5.92
6.50					9.0	201.82	6.0	74.46	3.5	20.22	2.2	6.85
7.00					9.7	231.79	6.4	85.41	3.8	23.17	2.4	7.84
7.50					10.4	263.73	6.9	97.07	4.0	26.30	2.6	8.89
8.00							7.4	109.44	4.3	29.61	2.8	10.00
8.50							7.8	122.50	4.6	33.11	2.9	11.17
9.00							8.3	136.27	4.9	36.79	3.1	12.40
9.50							8.7	150.73	5.1	40.65	3.3	13.70
10.00							9.2	165.89	5.4	44.69	3.5	15.05
10.50							9.7	181.73	5.7	48.91	3.6	16.46
11.00							10.1	198.27	5.9	53.31	3.8	17.93
11.50									6.2	57.89	4.0	19.45
12.00									6.5	62.65	4.1	21.04
12.50									6.7	67.58	4.3	22.68
13.00									7.0	72.69	4.5	24.39
13.50									7.3	77.98	4.7	26.14
14.00									7.6	83.45	4.8	27.96
14.50									7.8	89.08	5.0	29.83

d [mm]	12		15		18		22		28		35	
di [mm]	10		13		16		19.6		25.6		32	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
15.00									8.1	94.90	5.2	31.76
16.00									8.6	107.05	5.5	35.79
17.00									9.2	119.90	5.9	40.05
18.00									9.7	133.44	6.2	44.53
19.00									10.3	147.67	6.6	49.24
20.00									10.8	162.60	6.9	54.17
21.00											7.3	59.32
22.00											7.6	64.69
23.00											7.9	70.28
24.00											8.3	76.10
25.00											8.6	82.13
30.00											10.4	115.58

Table 70: Pressure loss Mapress Stainless Steel gas, 3rd gas family, depending on the volume flow, d 42 - d 108

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.01	0.0	0.00						
0.50	0.1	0.03	0.1	0.01						
0.75	0.2	0.06	0.1	0.02						
1.00	0.2	0.09	0.1	0.03						
1.25	0.3	0.14	0.2	0.04						
1.50	0.3	0.19	0.2	0.05						
1.75	0.4	0.25	0.2	0.07						
2.00	0.5	0.32	0.3	0.09						
2.25	0.5	0.39	0.3	0.11						
2.50	0.6	0.47	0.3	0.13						
2.75	0.6	0.56	0.4	0.15						
3.00	0.7	0.65	0.4	0.18						
3.25	0.8	0.75	0.4	0.21						
3.50	0.8	0.86	0.5	0.24						
3.75	0.9	0.97	0.5	0.27						
4.00	0.9	1.09	0.5	0.30						
4.50	1.0	1.35	0.6	0.37						
5.00	1.2	1.64	0.7	0.45						
5.50	1.3	1.94	0.7	0.53						
6.00	1.4	2.28	0.8	0.62						
6.50	1.5	2.63	0.9	0.72						
7.00	1.6	3.01	1.0	0.82						
7.50	1.7	3.41	1.0	0.93						

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
8.00	1.9	3.83	1.1	1.05						
8.50	2.0	4.28	1.2	1.17						
9.00	2.1	4.75	1.2	1.30						
9.50	2.2	5.24	1.3	1.43						
10.00	2.3	5.76	1.4	1.57	0.7	0.30	0.5	0.14	0.3	0.05
10.50	2.4	6.29	1.4	1.72	0.7	0.32	0.5	0.15	0.3	0.06
11.00	2.6	6.85	1.5	1.87	0.7	0.35	0.5	0.16	0.4	0.06
11.50	2.7	7.43	1.6	2.03	0.8	0.38	0.6	0.17	0.4	0.07
12.00	2.8	8.04	1.6	2.19	0.8	0.41	0.6	0.19	0.4	0.07
12.50	2.9	8.66	1.7	2.36	0.9	0.44	0.6	0.20	0.4	0.08
13.00	3.0	9.31	1.8	2.53	0.9	0.48	0.6	0.22	0.4	0.08
13.50	3.1	9.97	1.8	2.71	0.9	0.51	0.7	0.23	0.4	0.09
14.00	3.3	10.66	1.9	2.90	1.0	0.54	0.7	0.25	0.5	0.09
14.50	3.4	11.37	2.0	3.09	1.0	0.58	0.7	0.26	0.5	0.10
15.00	3.5	12.10	2.0	3.29	1.0	0.62	0.7	0.28	0.5	0.11
16.00	3.7	13.63	2.2	3.70	1.1	0.69	0.8	0.32	0.5	0.12
17.00	4.0	15.23	2.3	4.13	1.2	0.77	0.8	0.35	0.6	0.13
18.00	4.2	16.93	2.4	4.59	1.2	0.86	0.9	0.39	0.6	0.15
19.00	4.4	18.70	2.6	5.07	1.3	0.95	0.9	0.43	0.6	0.16
20.00	4.7	20.56	2.7	5.57	1.4	1.04	1.0	0.47	0.7	0.18
21.00	4.9	22.50	2.9	6.09	1.4	1.14	1.0	0.52	0.7	0.19
22.00	5.1	24.53	3.0	6.63	1.5	1.24	1.1	0.56	0.7	0.21
23.00	5.3	26.63	3.1	7.20	1.6	1.34	1.1	0.61	0.8	0.23
24.00	5.6	28.82	3.3	7.78	1.6	1.45	1.2	0.66	0.8	0.25
25.00	5.8	31.08	3.4	8.39	1.7	1.56	1.2	0.71	0.8	0.27
30.00	7.0	43.63	4.1	11.74	2.0	2.18	1.5	0.99	1.0	0.37
35.00	8.1	58.17	4.8	15.61	2.4	2.89	1.7	1.31	1.1	0.49
40.00	9.3	74.69	5.4	20.00	2.7	3.70	2.0	1.67	1.3	0.63
45.00	10.5	93.17	6.1	24.89	3.1	4.59	2.2	2.07	1.5	0.78
50.00			6.8	30.29	3.4	5.57	2.5	2.52	1.6	0.94
55.00			7.5	36.18	3.7	6.65	2.7	3.00	1.8	1.12
60.00			8.2	42.57	4.1	7.81	2.9	3.52	2.0	1.31
65.00			8.8	49.46	4.4	9.05	3.2	4.08	2.1	1.52
70.00			9.5	56.84	4.8	10.39	3.4	4.68	2.3	1.74
75.00			10.2	64.71	5.1	11.81	3.7	5.31	2.5	1.98
80.00			10.9	73.06	5.4	13.31	3.9	5.99	2.6	2.23
85.00					5.8	14.90	4.2	6.70	2.8	2.49
90.00					6.1	16.57	4.4	7.45	2.9	2.77
95.00					6.5	18.33	4.7	8.23	3.1	3.06
100.00					6.8	20.17	4.9	9.06	3.3	3.36
105.00					7.1	22.10	5.2	9.92	3.4	3.68
110.00					7.5	24.11	5.4	10.81	3.6	4.01
115.00					7.8	26.20	5.6	11.75	3.8	4.36

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
120.00					8.2	28.37	5.9	12.71	3.9	4.71
125.00					8.5	30.63	6.1	13.72	4.1	5.08
130.00					8.8	32.97	6.4	14.76	4.3	5.47
135.00					9.2	35.39	6.6	15.84	4.4	5.86
140.00					9.5	37.89	6.9	16.95	4.6	6.27
145.00					9.9	40.48	7.1	18.10	4.7	6.70
150.00					10.2	43.14	7.4	19.29	4.9	7.13
160.00							7.9	21.77	5.2	8.04
170.00							8.3	24.39	5.6	9.00
180.00							8.8	27.15	5.9	10.02
190.00							9.3	30.05	6.2	11.08
200.00							9.8	33.10	6.5	12.19
210.00							10.3	36.28	6.9	13.36
220.00									7.2	14.57
230.00									7.5	15.84
240.00									7.8	17.15
250.00									8.2	18.52
300.00									9.8	26.09

5.2.10.4 Pressure loss Mapress Stainless Steel gas, 4th gas family

- Density: 1.43 kg/m³
- Viscosity: 0.000015 Pa·s
- Surface roughness: 0.0015 mm

Table 71: Pressure loss Mapress Stainless Steel gas, 4th gas family, depending on the volume flow, d 15 - d 35

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
V	v	Δp	v	Δp	v	Δp	v	Δp	v	Δp	v	Δp
[m ³ /h]	[m/s]	[mbar/m]	[m/s]	[mbar/m]	[m/s]	[mbar/m]	[m/s]	[mbar/m]	[m/s]	[mbar/m]	[m/s]	[mbar/m]
0.25	0.9	0.0373	0.5	0.0111	0.3	0.0042	0.2	0.0017	0.1	0.0005	0.1	0.0002
0.50	1.8	0.1172	1.0	0.0345	0.7	0.0131	0.5	0.0051	0.3	0.0015	0.2	0.0005
0.75	2.7	0.2315	1.6	0.0677	1.0	0.0257	0.7	0.0100	0.4	0.0029	0.3	0.0010
1.00	3.5	0.3769	2.1	0.1099	1.4	0.0415	0.9	0.0161	0.5	0.0046	0.3	0.0016
1.25	4.4	0.5513	2.6	0.1604	1.7	0.0605	1.2	0.0234	0.7	0.0067	0.4	0.0024
1.50	5.3	0.7534	3.1	0.2187	2.1	0.0824	1.4	0.0318	0.8	0.0091	0.5	0.0032
1.75	6.2	0.9820	3.7	0.2846	2.4	0.1070	1.6	0.0412	0.9	0.0118	0.6	0.0041
2.00	7.1	1.2362	4.2	0.3578	2.8	0.1344	1.8	0.0517	1.1	0.0148	0.7	0.0052
2.25	8.0	1.5154	4.7	0.4380	3.1	0.1644	2.1	0.0632	1.2	0.0180	0.8	0.0063
2.50	8.8	1.8189	5.2	0.5252	3.5	0.1969	2.3	0.0756	1.3	0.0215	0.9	0.0076
2.75	9.7	2.1463	5.8	0.6191	3.8	0.2320	2.5	0.0890	1.5	0.0253	0.9	0.0089
3.00	10.6	2.4970	6.3	0.7196	4.1	0.2695	2.8	0.1034	1.6	0.0294	1.0	0.0103
3.25			6.8	0.8267	4.5	0.3093	3.0	0.1186	1.8	0.0337	1.1	0.0118
3.50			7.3	0.9401	4.8	0.3516	3.2	0.1347	1.9	0.0382	1.2	0.0134
3.75			7.8	1.0598	5.2	0.3961	3.5	0.1517	2.0	0.0430	1.3	0.0150
4.00			8.4	1.1857	5.5	0.4430	3.7	0.1695	2.2	0.0480	1.4	0.0168
4.50			9.4	1.4559	6.2	0.5434	4.1	0.2078	2.4	0.0588	1.6	0.0205
5.00			10.5	1.7500	6.9	0.6527	4.6	0.2494	2.7	0.0705	1.7	0.0246
5.50					7.6	0.7705	5.1	0.2942	3.0	0.0831	1.9	0.0290
6.00					8.3	0.8969	5.5	0.3422	3.2	0.0966	2.1	0.0336
6.50					9.0	1.0315	6.0	0.3934	3.5	0.1109	2.2	0.0386
7.00					9.7	1.1744	6.4	0.4476	3.8	0.1261	2.4	0.0439
7.50					10.4	1.3	6.9	0.5049	4.0	0.1422	2.6	0.0494
8.00							7.4	0.5652	4.3	0.1591	2.8	0.0553
8.50							7.8	0.6284	4.6	0.1767	2.9	0.0614
9.00							8.3	0.6945	4.9	0.1953	3.1	0.0678
9.50							8.7	0.7636	5.1	0.2146	3.3	0.0744
10.00							9.2	0.8355	5.4	0.2346	3.5	0.0814
10.50							9.7	0.9102	5.7	0.2555	3.6	0.0886
11.00							10.1	0.9877	5.9	0.2772	3.8	0.0961
11.50									6.2	0.2996	4.0	0.1038
12.00									6.5	0.3228	4.1	0.1118
12.50									6.7	0.3467	4.3	0.1201
13.00									7.0	0.3714	4.5	0.1286
13.50									7.3	0.3968	4.7	0.1373
14.00									7.6	0.4230	4.8	0.1463
14.50									7.8	0.4499	5.0	0.1556

d [mm]	12		15		18		22		28		35	
di [mm]	10		13		16		19.6		25.6		32	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
15.00									8.1	0.4775	5.2	0.1651
16.00									8.6	0.5349	5.5	0.1849
17.00									9.2	0.5951	5.9	0.2056
18.00									9.7	0.6582	6.2	0.2273
19.00									10.3	0.7241	6.6	0.2500
20.00									10.8	0.7928	6.9	0.2736
21.00											7.3	0.2981
22.00											7.6	0.3236
23.00											7.9	0.3499
24.00											8.3	0.3772
25.00											8.6	0.4054
30.00											10.4	0.5596

Table 72: Pressure loss Mapress Stainless Steel gas, 4th gas family, depending on the volume flow, d 42 - d 108

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.0001	0.0	0.0000						
0.50	0.1	0.0002	0.1	0.0001						
0.75	0.2	0.0004	0.1	0.0001						
1.00	0.2	0.0007	0.1	0.0002						
1.25	0.3	0.0009	0.2	0.0003						
1.50	0.3	0.0013	0.2	0.0004						
1.75	0.4	0.0016	0.2	0.0005						
2.00	0.5	0.0021	0.3	0.0006						
2.25	0.5	0.0025	0.3	0.0007						
2.50	0.6	0.0030	0.3	0.0009						
2.75	0.6	0.0035	0.4	0.0010						
3.00	0.7	0.0041	0.4	0.0012						
3.25	0.8	0.0047	0.4	0.0013						
3.50	0.8	0.0053	0.5	0.0015						
3.75	0.9	0.0059	0.5	0.0017						
4.00	0.9	0.0066	0.5	0.0019						
4.50	1.0	0.0081	0.6	0.0023						
5.00	1.2	0.0097	0.7	0.0027						
5.50	1.3	0.0114	0.7	0.0032						
6.00	1.4	0.0132	0.8	0.0037						
6.50	1.5	0.0152	0.9	0.0043						
7.00	1.6	0.0172	1.0	0.0049						
7.50	1.7	0.0194	1.0	0.0055						

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
8.00	1.9	0.0217	1.1	0.0061						
8.50	2.0	0.0241	1.2	0.0068						
9.00	2.1	0.0266	1.2	0.0075						
9.50	2.2	0.0292	1.3	0.0082						
10.00	2.3	0.0319	1.4	0.0090	0.7	0.0018	0.5	0.0008	0.3	0.0003
10.50	2.4	0.0347	1.4	0.0098	0.7	0.0019	0.5	0.0009	0.3	0.0003
11.00	2.6	0.0376	1.5	0.0106	0.7	0.0021	0.5	0.0010	0.4	0.0004
11.50	2.7	0.0406	1.6	0.0114	0.8	0.0022	0.6	0.0010	0.4	0.0004
12.00	2.8	0.0437	1.6	0.0123	0.8	0.0024	0.6	0.0011	0.4	0.0004
12.50	2.9	0.0470	1.7	0.0132	0.9	0.0026	0.6	0.0012	0.4	0.0005
13.00	3.0	0.0503	1.8	0.0141	0.9	0.0027	0.6	0.0013	0.4	0.0005
13.50	3.1	0.0537	1.8	0.0151	0.9	0.0029	0.7	0.0014	0.4	0.0005
14.00	3.3	0.0572	1.9	0.0160	1.0	0.0031	0.7	0.0014	0.5	0.0006
14.50	3.4	0.0608	2.0	0.0170	1.0	0.0033	0.7	0.0015	0.5	0.0006
15.00	3.5	0.0645	2.0	0.0181	1.0	0.0035	0.7	0.0016	0.5	0.0006
16.00	3.7	0.0722	2.2	0.0202	1.1	0.0039	0.8	0.0018	0.5	0.0007
17.00	4.0	0.0803	2.3	0.0225	1.2	0.0044	0.8	0.0020	0.6	0.0008
18.00	4.2	0.0887	2.4	0.0248	1.2	0.0048	0.9	0.0022	0.6	0.0009
19.00	4.4	0.0975	2.6	0.0273	1.3	0.0053	0.9	0.0024	0.6	0.0009
20.00	4.7	0.1067	2.7	0.0298	1.4	0.0058	1.0	0.0027	0.7	0.0010
21.00	4.9	0.1162	2.9	0.0325	1.4	0.0063	1.0	0.0029	0.7	0.0011
22.00	5.1	0.1261	3.0	0.0352	1.5	0.0068	1.1	0.0031	0.7	0.0012
23.00	5.3	0.1364	3.1	0.0381	1.6	0.0074	1.1	0.0034	0.8	0.0013
24.00	5.6	0.1470	3.3	0.0410	1.6	0.0079	1.2	0.0037	0.8	0.0014
25.00	5.8	0.1579	3.4	0.0441	1.7	0.0085	1.2	0.0039	0.8	0.0015
30.00	7.0	0.2177	4.1	0.0607	2.0	0.0117	1.5	0.0054	1.0	0.0021
35.00	8.1	0.2859	4.8	0.0795	2.4	0.0153	1.7	0.0070	1.1	0.0027
40.00	9.3	0.3621	5.4	0.1007	2.7	0.0194	2.0	0.0089	1.3	0.0034
45.00	10.5	0.4462	6.1	0.1239	3.1	0.0238	2.2	0.0109	1.5	0.0042
50.00			6.8	0.1493	3.4	0.0287	2.5	0.0132	1.6	0.0050
55.00			7.5	0.1768	3.7	0.0339	2.7	0.0156	1.8	0.0059
60.00			8.2	0.2063	4.1	0.0395	2.9	0.0181	2.0	0.0069
65.00			8.8	0.2378	4.4	0.0455	3.2	0.0209	2.1	0.0079
70.00			9.5	0.2713	4.8	0.0519	3.4	0.0238	2.3	0.0091
75.00			10.2	0.3067	5.1	0.0586	3.7	0.0269	2.5	0.0102
80.00			10.9	0.3441	5.4	0.0657	3.9	0.0301	2.6	0.0115
85.00					5.8	0.0732	4.2	0.0335	2.8	0.0127
90.00					6.1	0.0810	4.4	0.0371	2.9	0.0141
95.00					6.5	0.0892	4.7	0.0408	3.1	0.0155
100.00					6.8	0.0977	4.9	0.0447	3.3	0.0170
105.00					7.1	0.1065	5.2	0.0488	3.4	0.0185
110.00					7.5	0.1157	5.4	0.0530	3.6	0.0201
115.00					7.8	0.1253	5.6	0.0573	3.8	0.0217

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
V [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
120.00					8.2	0.1351	5.9	0.0618	3.9	0.0235
125.00					8.5	0.1453	6.1	0.0665	4.1	0.0252
130.00					8.8	0.1559	6.4	0.0713	4.3	0.0270
135.00					9.2	0.1667	6.6	0.0763	4.4	0.0289
140.00					9.5	0.1779	6.9	0.0814	4.6	0.0308
145.00					9.9	0.1894	7.1	0.0866	4.7	0.0328
150.00					10.2	0.2013	7.4	0.0920	4.9	0.0349
160.00							7.9	0.1032	5.2	0.0391
170.00							8.3	0.1150	5.6	0.0436
180.00							8.8	0.1274	5.9	0.0482
190.00							9.3	0.1403	6.2	0.0531
200.00							9.8	0.1538	6.5	0.0582
210.00							10.3	0.1679	6.9	0.0635
220.00									7.2	0.0690
230.00									7.5	0.0747
240.00									7.8	0.0806
250.00									8.2	0.0867
300.00									9.8	0.1202

5.2.11 Pressure loss from individual resistance gas

5.2.11.1 Pressure loss from individual resistance gas, 1st gas family

- Density: 0.61 kg/m³
- Pressure losses in [mbar]

Table 73: Pressure loss from individual resistance gas, 1st gas family, ζ 0.2 - 3.5

v [m/s]	Pressure loss coefficient ζ									
	0.2	0.4	0.6	0.8	1.0	1.5	2.0	2.5	3.0	3.5
0.50	0.0002	0.0003	0.0005	0.0006	0.0008	0.0011	0.0015	0.0019	0.0023	0.0027
0.75	0.0003	0.0007	0.0010	0.0014	0.0017	0.0026	0.0034	0.0043	0.0051	0.0060
1.00	0.0006	0.0012	0.0018	0.0024	0.0031	0.0046	0.0061	0.0076	0.0092	0.0107
1.10	0.0007	0.0015	0.0022	0.0030	0.0037	0.0055	0.0074	0.0092	0.0111	0.0129
1.20	0.0009	0.0018	0.0026	0.0035	0.0044	0.0066	0.0088	0.0110	0.0132	0.0154
1.30	0.0010	0.0021	0.0031	0.0041	0.0052	0.0077	0.0103	0.0129	0.0155	0.0180
1.40	0.0012	0.0024	0.0036	0.0048	0.0060	0.0090	0.0120	0.0149	0.0179	0.0209
1.50	0.0014	0.0027	0.0041	0.0055	0.0069	0.0103	0.0137	0.0172	0.0206	0.0240
1.60	0.0016	0.0031	0.0047	0.0062	0.0078	0.0117	0.0156	0.0195	0.0234	0.0273
1.70	0.0018	0.0035	0.0053	0.0071	0.0088	0.0132	0.0176	0.0220	0.0264	0.0309
1.80	0.0020	0.0040	0.0059	0.0079	0.0099	0.0148	0.0198	0.0247	0.0296	0.0346
1.90	0.0022	0.0044	0.0066	0.0088	0.0110	0.0165	0.0220	0.0275	0.0330	0.0385
2.00	0.0024	0.0049	0.0073	0.0098	0.0122	0.0183	0.0244	0.0305	0.0366	0.0427
2.10	0.0027	0.0054	0.0081	0.0108	0.0135	0.0202	0.0269	0.0336	0.0404	0.0471
2.20	0.0030	0.0059	0.0089	0.0118	0.0148	0.0221	0.0295	0.0369	0.0443	0.0517
2.30	0.0032	0.0065	0.0097	0.0129	0.0161	0.0242	0.0323	0.0403	0.0484	0.0565
2.40	0.0035	0.0070	0.0105	0.0141	0.0176	0.0264	0.0351	0.0439	0.0527	0.0615
2.50	0.0038	0.0076	0.0114	0.0153	0.0191	0.0286	0.0381	0.0477	0.0572	0.0667
2.60	0.0041	0.0082	0.0124	0.0165	0.0206	0.0309	0.0412	0.0515	0.0619	0.0722
2.70	0.0044	0.0089	0.0133	0.0178	0.0222	0.0334	0.0445	0.0556	0.0667	0.0778
2.80	0.0048	0.0096	0.0143	0.0191	0.0239	0.0359	0.0478	0.0598	0.0717	0.0837
2.90	0.0051	0.0103	0.0154	0.0205	0.0257	0.0385	0.0513	0.0641	0.0770	0.0898
3.00	0.0055	0.0110	0.0165	0.0220	0.0275	0.0412	0.0549	0.0686	0.0824	0.0961
3.10	0.0059	0.0117	0.0176	0.0234	0.0293	0.0440	0.0586	0.0733	0.0879	0.1026
3.20	0.0062	0.0125	0.0187	0.0250	0.0312	0.0468	0.0625	0.0781	0.0937	0.1093
3.30	0.0066	0.0133	0.0199	0.0266	0.0332	0.0498	0.0664	0.0830	0.0996	0.1163
3.40	0.0071	0.0141	0.0212	0.0282	0.0353	0.0529	0.0705	0.0881	0.1058	0.1234
3.50	0.0075	0.0149	0.0224	0.0299	0.0374	0.0560	0.0747	0.0934	0.1121	0.1308
3.60	0.0079	0.0158	0.0237	0.0316	0.0395	0.0593	0.0791	0.0988	0.1186	0.1383
3.70	0.0084	0.0167	0.0251	0.0334	0.0418	0.0626	0.0835	0.1044	0.1253	0.1461
3.80	0.0088	0.0176	0.0264	0.0352	0.0440	0.0661	0.0881	0.1101	0.1321	0.1541
3.90	0.0093	0.0186	0.0278	0.0371	0.0464	0.0696	0.0928	0.1160	0.1392	0.1624
4.00	0.0098	0.0195	0.0293	0.0390	0.0488	0.0732	0.0976	0.1220	0.1464	0.1708
4.20	0.0108	0.0215	0.0323	0.0430	0.0538	0.0807	0.1076	0.1345	0.1614	0.1883
4.40	0.0118	0.0236	0.0354	0.0472	0.0590	0.0886	0.1181	0.1476	0.1771	0.2067
4.60	0.0129	0.0258	0.0387	0.0516	0.0645	0.0968	0.1291	0.1613	0.1936	0.2259
4.80	0.0141	0.0281	0.0422	0.0562	0.0703	0.1054	0.1405	0.1757	0.2108	0.2460
5.00	0.0153	0.0305	0.0458	0.0610	0.0763	0.1144	0.1525	0.1906	0.2288	0.2669
5.25	0.0168	0.0336	0.0504	0.0673	0.0841	0.1261	0.1681	0.2102	0.2522	0.2942

v [m/s]	Pressure loss coefficient ζ									
	0.2	0.4	0.6	0.8	1.0	1.5	2.0	2.5	3.0	3.5
5.50	0.0185	0.0369	0.0554	0.0738	0.0923	0.1384	0.1845	0.2307	0.2768	0.3229
5.75	0.0202	0.0403	0.0605	0.0807	0.1008	0.1513	0.2017	0.2521	0.3025	0.3529
6.00	0.0220	0.0439	0.0659	0.0878	0.1098	0.1647	0.2196	0.2745	0.3294	0.3843
7.00	0.0299	0.0598	0.0897	0.1196	0.1495	0.2242	0.2989	0.3736	0.4484	0.5231
8.00	0.0390	0.0781	0.1171	0.1562	0.1952	0.2928	0.3904	0.4880	0.5856	0.6832
9.00	0.0494	0.0988	0.1482	0.1976	0.2471	0.3706	0.4941	0.6176	0.7412	0.8647
10.00	0.0610	0.1220	0.1830	0.2440	0.3050	0.4575	0.6100	0.7625	0.9150	1.0675

Table 74: Pressure loss from individual resistance gas, 1st gas family, ζ 4.0 - 20.0

v [m/s]	Pressure loss coefficient ζ									
	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	15.0	20.0
0.50	0.0031	0.0034	0.0038	0.0046	0.0053	0.0061	0.0069	0.0076	0.0114	0.0153
0.75	0.0069	0.0077	0.0086	0.0103	0.0120	0.0137	0.0154	0.0172	0.0257	0.0343
1.00	0.0122	0.0137	0.0153	0.0183	0.0214	0.0244	0.0275	0.0305	0.0458	0.0610
1.10	0.0148	0.0166	0.0185	0.0221	0.0258	0.0295	0.0332	0.0369	0.0554	0.0738
1.20	0.0176	0.0198	0.0220	0.0264	0.0307	0.0351	0.0395	0.0439	0.0659	0.0878
1.30	0.0206	0.0232	0.0258	0.0309	0.0361	0.0412	0.0464	0.0515	0.0773	0.1031
1.40	0.0239	0.0269	0.0299	0.0359	0.0418	0.0478	0.0538	0.0598	0.0897	0.1196
1.50	0.0275	0.0309	0.0343	0.0412	0.0480	0.0549	0.0618	0.0686	0.1029	0.1373
1.60	0.0312	0.0351	0.0390	0.0468	0.0547	0.0625	0.0703	0.0781	0.1171	0.1562
1.70	0.0353	0.0397	0.0441	0.0529	0.0617	0.0705	0.0793	0.0881	0.1322	0.1763
1.80	0.0395	0.0445	0.0494	0.0593	0.0692	0.0791	0.0889	0.0988	0.1482	0.1976
1.90	0.0440	0.0495	0.0551	0.0661	0.0771	0.0881	0.0991	0.1101	0.1652	0.2202
2.00	0.0488	0.0549	0.0610	0.0732	0.0854	0.0976	0.1098	0.1220	0.1830	0.2440
2.10	0.0538	0.0605	0.0673	0.0807	0.0942	0.1076	0.1211	0.1345	0.2018	0.2690
2.20	0.0590	0.0664	0.0738	0.0886	0.1033	0.1181	0.1329	0.1476	0.2214	0.2952
2.30	0.0645	0.0726	0.0807	0.0968	0.1129	0.1291	0.1452	0.1613	0.2420	0.3227
2.40	0.0703	0.0791	0.0878	0.1054	0.1230	0.1405	0.1581	0.1757	0.2635	0.3514
2.50	0.0763	0.0858	0.0953	0.1144	0.1334	0.1525	0.1716	0.1906	0.2859	0.3813
2.60	0.0825	0.0928	0.1031	0.1237	0.1443	0.1649	0.1856	0.2062	0.3093	0.4124
2.70	0.0889	0.1001	0.1112	0.1334	0.1556	0.1779	0.2001	0.2223	0.3335	0.4447
2.80	0.0956	0.1076	0.1196	0.1435	0.1674	0.1913	0.2152	0.2391	0.3587	0.4782
2.90	0.1026	0.1154	0.1283	0.1539	0.1796	0.2052	0.2309	0.2565	0.3848	0.5130
3.00	0.1098	0.1235	0.1373	0.1647	0.1922	0.2196	0.2471	0.2745	0.4118	0.5490
3.10	0.1172	0.1319	0.1466	0.1759	0.2052	0.2345	0.2638	0.2931	0.4397	0.5862
3.20	0.1249	0.1405	0.1562	0.1874	0.2186	0.2499	0.2811	0.3123	0.4685	0.6246
3.30	0.1329	0.1495	0.1661	0.1993	0.2325	0.2657	0.2989	0.3321	0.4982	0.6643
3.40	0.1410	0.1587	0.1763	0.2115	0.2468	0.2821	0.3173	0.3526	0.5289	0.7052
3.50	0.1495	0.1681	0.1868	0.2242	0.2615	0.2989	0.3363	0.3736	0.5604	0.7473
3.60	0.1581	0.1779	0.1976	0.2372	0.2767	0.3162	0.3558	0.3953	0.5929	0.7906
3.70	0.1670	0.1879	0.2088	0.2505	0.2923	0.3340	0.3758	0.4175	0.6263	0.8351
3.80	0.1762	0.1982	0.2202	0.2643	0.3083	0.3523	0.3964	0.4404	0.6606	0.8808
3.90	0.1856	0.2088	0.2320	0.2783	0.3247	0.3711	0.4175	0.4639	0.6959	0.9278
4.00	0.1952	0.2196	0.2440	0.2928	0.3416	0.3904	0.4392	0.4880	0.7320	0.9760
4.20	0.2152	0.2421	0.2690	0.3228	0.3766	0.4304	0.4842	0.5380	0.8070	1.0760
4.40	0.2362	0.2657	0.2952	0.3543	0.4133	0.4724	0.5314	0.5905	0.8857	1.1810

v [m/s]	Pressure loss coefficient ζ									
	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	15.0	20.0
4.60	0.2582	0.2904	0.3227	0.3872	0.4518	0.5163	0.5808	0.6454	0.9681	1.2908
4.80	0.2811	0.3162	0.3514	0.4216	0.4919	0.5622	0.6324	0.7027	1.0541	1.4054
5.00	0.3050	0.3431	0.3813	0.4575	0.5338	0.6100	0.6863	0.7625	1.1438	1.5250
5.25	0.3363	0.3783	0.4203	0.5044	0.5885	0.6725	0.7566	0.8407	1.2610	1.6813
5.50	0.3691	0.4152	0.4613	0.5536	0.6458	0.7381	0.8304	0.9226	1.3839	1.8453
5.75	0.4034	0.4538	0.5042	0.6050	0.7059	0.8067	0.9076	1.0084	1.5126	2.0168
6.00	0.4392	0.4941	0.5490	0.6588	0.7686	0.8784	0.9882	1.0980	1.6470	2.1960
7.00	0.5978	0.6725	0.7473	0.8967	1.0462	1.1956	1.3451	1.4945	2.2418	2.9890
8.00	0.7808	0.8784	0.9760	1.1712	1.3664	1.5616	1.7568	1.9520	2.9280	3.9040
9.00	0.9882	1.1117	1.2353	1.4823	1.7294	1.9764	2.2235	2.4705	3.7058	4.9410
10.00	1.2200	1.3725	1.5250	1.8300	2.1350	2.4400	2.7450	3.0500	4.5750	6.1000

5.2.11.2 Pressure loss from individual resistance, 2nd gas family

- Density: 0.79 kg/m³
- Pressure losses in [mbar]

Table 75: Pressure loss from individual resistance gas, 2nd gas family, ζ 0.2 - 3.5

v [m/s]	Pressure loss coefficient ζ									
	0.2	0.4	0.6	0.8	1.0	1.5	2.0	2.5	3.0	3.5
0.50	0.0002	0.0004	0.0006	0.0008	0.0010	0.0015	0.0020	0.0025	0.0030	0.0035
0.75	0.0004	0.0009	0.0013	0.0018	0.0022	0.0033	0.0044	0.0056	0.0067	0.0078
1.00	0.0008	0.0016	0.0024	0.0032	0.0040	0.0059	0.0079	0.0099	0.0119	0.0138
1.10	0.0010	0.0019	0.0029	0.0038	0.0048	0.0072	0.0096	0.0119	0.0143	0.0167
1.20	0.0011	0.0023	0.0034	0.0046	0.0057	0.0085	0.0114	0.0142	0.0171	0.0199
1.30	0.0013	0.0027	0.0040	0.0053	0.0067	0.0100	0.0134	0.0167	0.0200	0.0234
1.40	0.0015	0.0031	0.0046	0.0062	0.0077	0.0116	0.0155	0.0194	0.0232	0.0271
1.50	0.0018	0.0036	0.0053	0.0071	0.0089	0.0133	0.0178	0.0222	0.0267	0.0311
1.60	0.0020	0.0040	0.0061	0.0081	0.0101	0.0152	0.0202	0.0253	0.0303	0.0354
1.70	0.0023	0.0046	0.0068	0.0091	0.0114	0.0171	0.0228	0.0285	0.0342	0.0400
1.80	0.0026	0.0051	0.0077	0.0102	0.0128	0.0192	0.0256	0.0320	0.0384	0.0448
1.90	0.0029	0.0057	0.0086	0.0114	0.0143	0.0214	0.0285	0.0356	0.0428	0.0499
2.00	0.0032	0.0063	0.0095	0.0126	0.0158	0.0237	0.0316	0.0395	0.0474	0.0553
2.10	0.0035	0.0070	0.0105	0.0139	0.0174	0.0261	0.0348	0.0435	0.0523	0.0610
2.20	0.0038	0.0076	0.0115	0.0153	0.0191	0.0287	0.0382	0.0478	0.0574	0.0669
2.30	0.0042	0.0084	0.0125	0.0167	0.0209	0.0313	0.0418	0.0522	0.0627	0.0731
2.40	0.0046	0.0091	0.0137	0.0182	0.0228	0.0341	0.0455	0.0569	0.0683	0.0796
2.50	0.0049	0.0099	0.0148	0.0198	0.0247	0.0370	0.0494	0.0617	0.0741	0.0864
2.60	0.0053	0.0107	0.0160	0.0214	0.0267	0.0401	0.0534	0.0668	0.0801	0.0935
2.70	0.0058	0.0115	0.0173	0.0230	0.0288	0.0432	0.0576	0.0720	0.0864	0.1008
2.80	0.0062	0.0124	0.0186	0.0248	0.0310	0.0465	0.0619	0.0774	0.0929	0.1084
2.90	0.0066	0.0133	0.0199	0.0266	0.0332	0.0498	0.0664	0.0830	0.0997	0.1163
3.00	0.0071	0.0142	0.0213	0.0284	0.0356	0.0533	0.0711	0.0889	0.1067	0.1244
3.10	0.0076	0.0152	0.0228	0.0304	0.0380	0.0569	0.0759	0.0949	0.1139	0.1329
3.20	0.0081	0.0162	0.0243	0.0324	0.0404	0.0607	0.0809	0.1011	0.1213	0.1416
3.30	0.0086	0.0172	0.0258	0.0344	0.0430	0.0645	0.0860	0.1075	0.1290	0.1506
3.40	0.0091	0.0183	0.0274	0.0365	0.0457	0.0685	0.0913	0.1142	0.1370	0.1598
3.50	0.0097	0.0194	0.0290	0.0387	0.0484	0.0726	0.0968	0.1210	0.1452	0.1694
3.60	0.0102	0.0205	0.0307	0.0410	0.0512	0.0768	0.1024	0.1280	0.1536	0.1792
3.70	0.0108	0.0216	0.0324	0.0433	0.0541	0.0811	0.1082	0.1352	0.1622	0.1893
3.80	0.0114	0.0228	0.0342	0.0456	0.0570	0.0856	0.1141	0.1426	0.1711	0.1996
3.90	0.0120	0.0240	0.0360	0.0481	0.0601	0.0901	0.1202	0.1502	0.1802	0.2103
4.00	0.0126	0.0253	0.0379	0.0506	0.0632	0.0948	0.1264	0.1580	0.1896	0.2212
4.20	0.0139	0.0279	0.0418	0.0557	0.0697	0.1045	0.1394	0.1742	0.2090	0.2439
4.40	0.0153	0.0306	0.0459	0.0612	0.0765	0.1147	0.1529	0.1912	0.2294	0.2677
4.60	0.0167	0.0334	0.0501	0.0669	0.0836	0.1254	0.1672	0.2090	0.2507	0.2925
4.80	0.0182	0.0364	0.0546	0.0728	0.0910	0.1365	0.1820	0.2275	0.2730	0.3185
5.00	0.0198	0.0395	0.0593	0.0790	0.0988	0.1481	0.1975	0.2469	0.2963	0.3456
5.25	0.0218	0.0435	0.0653	0.0871	0.1089	0.1633	0.2177	0.2722	0.3266	0.3811
5.50	0.0239	0.0478	0.0717	0.0956	0.1195	0.1792	0.2390	0.2987	0.3585	0.4182
5.75	0.0261	0.0522	0.0784	0.1045	0.1306	0.1959	0.2612	0.3265	0.3918	0.4571

v [m/s]	Pressure loss coefficient ζ									
	0.2	0.4	0.6	0.8	1.0	1.5	2.0	2.5	3.0	3.5
6.00	0.0284	0.0569	0.0853	0.1138	0.1422	0.2133	0.2844	0.3555	0.4266	0.4977
7.00	0.0387	0.0774	0.1161	0.1548	0.1936	0.2903	0.3871	0.4839	0.5807	0.6774
8.00	0.0506	0.1011	0.1517	0.2022	0.2528	0.3792	0.5056	0.6320	0.7584	0.8848
9.00	0.0640	0.1280	0.1920	0.2560	0.3200	0.4799	0.6399	0.7999	0.9599	1.1198
10.00	0.0790	0.1580	0.2370	0.3160	0.3950	0.5925	0.7900	0.9875	1.1850	1.3825

Table 76: Pressure loss from individual resistance gas, 2nd gas family, ζ 4.0 - 20.0

v [m/s]	Pressure loss coefficient ζ									
	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	15.0	20.0
0.50	0.0040	0.0044	0.0049	0.0059	0.0069	0.0079	0.0089	0.0099	0.0148	0.0198
0.75	0.0089	0.0100	0.0111	0.0133	0.0156	0.0178	0.0200	0.0222	0.0333	0.0444
1.00	0.0158	0.0178	0.0198	0.0237	0.0277	0.0316	0.0356	0.0395	0.0593	0.0790
1.10	0.0191	0.0215	0.0239	0.0287	0.0335	0.0382	0.0430	0.0478	0.0717	0.0956
1.20	0.0228	0.0256	0.0284	0.0341	0.0398	0.0455	0.0512	0.0569	0.0853	0.1138
1.30	0.0267	0.0300	0.0334	0.0401	0.0467	0.0534	0.0601	0.0668	0.1001	0.1335
1.40	0.0310	0.0348	0.0387	0.0465	0.0542	0.0619	0.0697	0.0774	0.1161	0.1548
1.50	0.0356	0.0400	0.0444	0.0533	0.0622	0.0711	0.0800	0.0889	0.1333	0.1778
1.60	0.0404	0.0455	0.0506	0.0607	0.0708	0.0809	0.0910	0.1011	0.1517	0.2022
1.70	0.0457	0.0514	0.0571	0.0685	0.0799	0.0913	0.1027	0.1142	0.1712	0.2283
1.80	0.0512	0.0576	0.0640	0.0768	0.0896	0.1024	0.1152	0.1280	0.1920	0.2560
1.90	0.0570	0.0642	0.0713	0.0856	0.0998	0.1141	0.1283	0.1426	0.2139	0.2852
2.00	0.0632	0.0711	0.0790	0.0948	0.1106	0.1264	0.1422	0.1580	0.2370	0.3160
2.10	0.0697	0.0784	0.0871	0.1045	0.1219	0.1394	0.1568	0.1742	0.2613	0.3484
2.20	0.0765	0.0860	0.0956	0.1147	0.1338	0.1529	0.1721	0.1912	0.2868	0.3824
2.30	0.0836	0.0940	0.1045	0.1254	0.1463	0.1672	0.1881	0.2090	0.3134	0.4179
2.40	0.0910	0.1024	0.1138	0.1365	0.1593	0.1820	0.2048	0.2275	0.3413	0.4550
2.50	0.0988	0.1111	0.1234	0.1481	0.1728	0.1975	0.2222	0.2469	0.3703	0.4938
2.60	0.1068	0.1202	0.1335	0.1602	0.1869	0.2136	0.2403	0.2670	0.4005	0.5340
2.70	0.1152	0.1296	0.1440	0.1728	0.2016	0.2304	0.2592	0.2880	0.4319	0.5759
2.80	0.1239	0.1394	0.1548	0.1858	0.2168	0.2477	0.2787	0.3097	0.4645	0.6194
2.90	0.1329	0.1495	0.1661	0.1993	0.2325	0.2658	0.2990	0.3322	0.4983	0.6644
3.00	0.1422	0.1600	0.1778	0.2133	0.2489	0.2844	0.3200	0.3555	0.5333	0.7110
3.10	0.1518	0.1708	0.1898	0.2278	0.2657	0.3037	0.3416	0.3796	0.5694	0.7592
3.20	0.1618	0.1820	0.2022	0.2427	0.2831	0.3236	0.3640	0.4045	0.6067	0.8090
3.30	0.1721	0.1936	0.2151	0.2581	0.3011	0.3441	0.3871	0.4302	0.6452	0.8603
3.40	0.1826	0.2055	0.2283	0.2740	0.3196	0.3653	0.4110	0.4566	0.6849	0.9132
3.50	0.1936	0.2177	0.2419	0.2903	0.3387	0.3871	0.4355	0.4839	0.7258	0.9678
3.60	0.2048	0.2304	0.2560	0.3072	0.3583	0.4095	0.4607	0.5119	0.7679	1.0238
3.70	0.2163	0.2433	0.2704	0.3245	0.3785	0.4326	0.4867	0.5408	0.8111	1.0815
3.80	0.2282	0.2567	0.2852	0.3422	0.3993	0.4563	0.5133	0.5704	0.8556	1.1408
3.90	0.2403	0.2704	0.3004	0.3605	0.4206	0.4806	0.5407	0.6008	0.9012	1.2016
4.00	0.2528	0.2844	0.3160	0.3792	0.4424	0.5056	0.5688	0.6320	0.9480	1.2640
4.20	0.2787	0.3136	0.3484	0.4181	0.4877	0.5574	0.6271	0.6968	1.0452	1.3936
4.40	0.3059	0.3441	0.3824	0.4588	0.5353	0.6118	0.6882	0.7647	1.1471	1.5294
4.60	0.3343	0.3761	0.4179	0.5015	0.5851	0.6687	0.7522	0.8358	1.2537	1.6716
4.80	0.3640	0.4095	0.4550	0.5460	0.6371	0.7281	0.8191	0.9101	1.3651	1.8202

v [m/s]	Pressure loss coefficient ζ									
	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	15.0	20.0
5.00	0.3950	0.4444	0.4938	0.5925	0.6913	0.7900	0.8888	0.9875	1.4813	1.9750
5.25	0.4355	0.4899	0.5444	0.6532	0.7621	0.8710	0.9798	1.0887	1.6331	2.1774
5.50	0.4780	0.5377	0.5974	0.7169	0.8364	0.9559	1.0754	1.1949	1.7923	2.3898
5.75	0.5224	0.5877	0.6530	0.7836	0.9142	1.0448	1.1754	1.3060	1.9590	2.6119
6.00	0.5688	0.6399	0.7110	0.8532	0.9954	1.1376	1.2798	1.4220	2.1330	2.8440
7.00	0.7742	0.8710	0.9678	1.1613	1.3549	1.5484	1.7420	1.9355	2.9033	3.8710
8.00	1.0112	1.1376	1.2640	1.5168	1.7696	2.0224	2.2752	2.5280	3.7920	5.0560
9.00	1.2798	1.4398	1.5998	1.9197	2.2397	2.5596	2.8796	3.1995	4.7993	6.3990
10.00	1.5800	1.7775	1.9750	2.3700	2.7650	3.1600	3.5550	3.9500	5.9250	7.9000

5.2.11.3 Pressure loss from individual resistance, 3rd gas family

- Density: 540 kg/m³
- Pressure losses in [mbar]

Table 77: Pressure loss from individual resistance gas, 3rd gas family, ζ 0.2 - 3.5

v [m/s]	Pressure loss coefficient ζ									
	0.2	0.4	0.6	0.8	1.0	1.5	2.0	2.5	3.0	3.5
0.50	0.14	0.27	0.41	0.54	0.68	1.01	1.35	1.69	2.03	2.36
0.75	0.30	0.61	0.91	1.22	1.52	2.28	3.04	3.80	4.56	5.32
1.00	0.54	1.08	1.62	2.16	2.70	4.05	5.40	6.75	8.10	9.45
1.10	0.65	1.31	1.96	2.61	3.27	4.90	6.53	8.17	9.80	11.43
1.20	0.78	1.56	2.33	3.11	3.89	5.83	7.78	9.72	11.66	13.61
1.30	0.91	1.83	2.74	3.65	4.56	6.84	9.13	11.41	13.69	15.97
1.40	1.06	2.12	3.18	4.23	5.29	7.94	10.58	13.23	15.88	18.52
1.50	1.22	2.43	3.65	4.86	6.08	9.11	12.15	15.19	18.23	21.26
1.60	1.38	2.76	4.15	5.53	6.91	10.37	13.82	17.28	20.74	24.19
1.70	1.56	3.12	4.68	6.24	7.80	11.70	15.61	19.51	23.41	27.31
1.80	1.75	3.50	5.25	7.00	8.75	13.12	17.50	21.87	26.24	30.62
1.90	1.95	3.90	5.85	7.80	9.75	14.62	19.49	24.37	29.24	34.11
2.00	2.16	4.32	6.48	8.64	10.80	16.20	21.60	27.00	32.40	37.80
2.10	2.38	4.76	7.14	9.53	11.91	17.86	23.81	29.77	35.72	41.67
2.20	2.61	5.23	7.84	10.45	13.07	19.60	26.14	32.67	39.20	45.74
2.30	2.86	5.71	8.57	11.43	14.28	21.42	28.57	35.71	42.85	49.99
2.40	3.11	6.22	9.33	12.44	15.55	23.33	31.10	38.88	46.66	54.43
2.50	3.38	6.75	10.13	13.50	16.88	25.31	33.75	42.19	50.63	59.06
2.60	3.65	7.30	10.95	14.60	18.25	27.38	36.50	45.63	54.76	63.88
2.70	3.94	7.87	11.81	15.75	19.68	29.52	39.37	49.21	59.05	68.89
2.80	4.23	8.47	12.70	16.93	21.17	31.75	42.34	52.92	63.50	74.09
2.90	4.54	9.08	13.62	18.17	22.71	34.06	45.41	56.77	68.12	79.47
3.00	4.86	9.72	14.58	19.44	24.30	36.45	48.60	60.75	72.90	85.05
3.10	5.19	10.38	15.57	20.76	25.95	38.92	51.89	64.87	77.84	90.81
3.20	5.53	11.06	16.59	22.12	27.65	41.47	55.30	69.12	82.94	96.77
3.30	5.88	11.76	17.64	23.52	29.40	44.10	58.81	73.51	88.21	102.91
3.40	6.24	12.48	18.73	24.97	31.21	46.82	62.42	78.03	93.64	109.24
3.50	6.62	13.23	19.85	26.46	33.08	49.61	66.15	82.69	99.23	115.76
3.60	7.00	14.00	21.00	27.99	34.99	52.49	69.98	87.48	104.98	122.47
3.70	7.39	14.79	22.18	29.57	36.96	55.44	73.93	92.41	110.89	129.37
3.80	7.80	15.60	23.39	31.19	38.99	58.48	77.98	97.47	116.96	136.46
3.90	8.21	16.43	24.64	32.85	41.07	61.60	82.13	102.67	123.20	143.73
4.00	8.64	17.28	25.92	34.56	43.20	64.80	86.40	108.00	129.60	151.20
4.20	9.53	19.05	28.58	38.10	47.63	71.44	95.26	119.07	142.88	166.70
4.40	10.45	20.91	31.36	41.82	52.27	78.41	104.54	130.68	156.82	182.95
4.60	11.43	22.85	34.28	45.71	57.13	85.70	114.26	142.83	171.40	199.96
4.80	12.44	24.88	37.32	49.77	62.21	93.31	124.42	155.52	186.62	217.73
5.00	13.50	27.00	40.50	54.00	67.50	101.25	135.00	168.75	202.50	236.25
5.25	14.88	29.77	44.65	59.54	74.42	111.63	148.84	186.05	223.26	260.47
5.50	16.34	32.67	49.01	65.34	81.68	122.51	163.35	204.19	245.03	285.86
5.75	17.85	35.71	53.56	71.42	89.27	133.90	178.54	223.17	267.81	312.44

v [m/s]	Pressure loss coefficient ζ									
	0.2	0.4	0.6	0.8	1.0	1.5	2.0	2.5	3.0	3.5
6.00	19.44	38.88	58.32	77.76	97.20	145.80	194.40	243.00	291.60	340.20
7.00	26.46	52.92	79.38	105.84	132.30	198.45	264.60	330.75	396.90	463.05
8.00	34.56	69.12	103.68	138.24	172.80	259.20	345.60	432.00	518.40	604.80
9.00	43.74	87.48	131.22	174.96	218.70	328.05	437.40	546.75	656.10	765.45
10.00	54.00	108.00	162.00	216.00	270.00	405.00	540.00	675.00	810.00	945.00

Table 78: Pressure loss from individual resistance gas, 3rd gas family, ζ 4.0 - 20.0

v [m/s]	Pressure loss coefficient ζ									
	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	15.0	20.0
0.50	2.70	3.04	3.38	4.05	4.73	5.40	6.08	6.75	10.13	13.50
0.75	6.08	6.83	7.59	9.11	10.63	12.15	13.67	15.19	22.78	30.38
1.00	10.80	12.15	13.50	16.20	18.90	21.60	24.30	27.00	40.50	54.00
1.10	13.07	14.70	16.34	19.60	22.87	26.14	29.40	32.67	49.01	65.34
1.20	15.55	17.50	19.44	23.33	27.22	31.10	34.99	38.88	58.32	77.76
1.30	18.25	20.53	22.82	27.38	31.94	36.50	41.07	45.63	68.45	91.26
1.40	21.17	23.81	26.46	31.75	37.04	42.34	47.63	52.92	79.38	105.84
1.50	24.30	27.34	30.38	36.45	42.53	48.60	54.68	60.75	91.13	121.50
1.60	27.65	31.10	34.56	41.47	48.38	55.30	62.21	69.12	103.68	138.24
1.70	31.21	35.11	39.02	46.82	54.62	62.42	70.23	78.03	117.05	156.06
1.80	34.99	39.37	43.74	52.49	61.24	69.98	78.73	87.48	131.22	174.96
1.90	38.99	43.86	48.74	58.48	68.23	77.98	87.72	97.47	146.21	194.94
2.00	43.20	48.60	54.00	64.80	75.60	86.40	97.20	108.00	162.00	216.00
2.10	47.63	53.58	59.54	71.44	83.35	95.26	107.16	119.07	178.61	238.14
2.20	52.27	58.81	65.34	78.41	91.48	104.54	117.61	130.68	196.02	261.36
2.30	57.13	64.27	71.42	85.70	99.98	114.26	128.55	142.83	214.25	285.66
2.40	62.21	69.98	77.76	93.31	108.86	124.42	139.97	155.52	233.28	311.04
2.50	67.50	75.94	84.38	101.25	118.13	135.00	151.88	168.75	253.13	337.50
2.60	73.01	82.13	91.26	109.51	127.76	146.02	164.27	182.52	273.78	365.04
2.70	78.73	88.57	98.42	118.10	137.78	157.46	177.15	196.83	295.25	393.66
2.80	84.67	95.26	105.84	127.01	148.18	169.34	190.51	211.68	317.52	423.36
2.90	90.83	102.18	113.54	136.24	158.95	181.66	204.36	227.07	340.61	454.14
3.00	97.20	109.35	121.50	145.80	170.10	194.40	218.70	243.00	364.50	486.00
3.10	103.79	116.76	129.74	155.68	181.63	207.58	233.52	259.47	389.21	518.94
3.20	110.59	124.42	138.24	165.89	193.54	221.18	248.83	276.48	414.72	552.96
3.30	117.61	132.31	147.02	176.42	205.82	235.22	264.63	294.03	441.05	588.06
3.40	124.85	140.45	156.06	187.27	218.48	249.70	280.91	312.12	468.18	624.24
3.50	132.3	148.8	165.4	198.5	231.5	264.6	297.7	330.8	496.1	661.5
3.60	140.0	157.5	175.0	210.0	244.9	279.9	314.9	349.9	524.9	699.8
3.70	147.9	166.3	184.8	221.8	258.7	295.7	332.7	369.6	554.4	739.3
3.80	156.0	175.4	194.9	233.9	272.9	311.9	350.9	389.9	584.8	779.8
3.90	164.3	184.8	205.3	246.4	287.5	328.5	369.6	410.7	616.0	821.3
4.00	172.8	194.4	216.0	259.2	302.4	345.6	388.8	432.0	648.0	864.0
4.20	190.5	214.3	238.1	285.8	333.4	381.0	428.7	476.3	714.4	952.6
4.40	209.1	235.2	261.4	313.6	365.9	418.2	470.4	522.7	784.1	1045.4
4.60	228.5	257.1	285.7	342.8	399.9	457.1	514.2	571.3	857.0	1142.6
4.80	248.8	279.9	311.0	373.2	435.5	497.7	559.9	622.1	933.1	1244.2

v [m/s]	Pressure loss coefficient ζ									
	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	15.0	20.0
5.00	270.0	303.8	337.5	405.0	472.5	540.0	607.5	675.0	1012.5	1350.0
5.25	297.7	334.9	372.1	446.5	520.9	595.4	669.8	744.2	1116.3	1488.4
5.50	326.7	367.5	408.4	490.1	571.7	653.4	735.1	816.8	1225.1	1633.5
5.75	357.1	401.7	446.3	535.6	624.9	714.2	803.4	892.7	1339.0	1785.4
6.00	388.8	437.4	486.0	583.2	680.4	777.6	874.8	972.0	1458.0	1944.0
7.00	529.2	595.4	661.5	793.8	926.1	1058.4	1190.7	1323.0	1984.5	2646.0
8.00	691.2	777.6	864.0	1036.8	1209.6	1382.4	1555.2	1728.0	2592.0	3456.0
9.00	874.8	984.2	1093.5	1312.2	1530.9	1749.6	1968.3	2187.0	3280.5	4374.0
10.00	1080.0	1215.0	1350.0	1620.0	1890.0	2160.0	2430.0	2700.0	4050.0	5400.0

5.2.11.4 Pressure loss from individual resistance, 4th gas family

- Density: 1.43 kg/m³
- Pressure losses in [mbar]

Table 79: Pressure loss from individual resistance gas, 4th gas family, ζ 0.2 - 3.5

v [m/s]	Pressure loss coefficient ζ									
	0.2	0.4	0.6	0.8	1.0	1.5	2.0	2.5	3.0	3.5
0.50	0.0004	0.0007	0.0011	0.0014	0.0018	0.0027	0.0036	0.0045	0.0054	0.0063
0.75	0.0008	0.0016	0.0024	0.0032	0.0040	0.0060	0.0080	0.0101	0.0121	0.0141
1.00	0.0014	0.0029	0.0043	0.0057	0.0072	0.0107	0.0143	0.0179	0.0215	0.0250
1.10	0.0017	0.0035	0.0052	0.0069	0.0087	0.0130	0.0173	0.0216	0.0260	0.0303
1.20	0.0021	0.0041	0.0062	0.0082	0.0103	0.0154	0.0206	0.0257	0.0309	0.0360
1.30	0.0024	0.0048	0.0073	0.0097	0.0121	0.0181	0.0242	0.0302	0.0363	0.0423
1.40	0.0028	0.0056	0.0084	0.0112	0.0140	0.0210	0.0280	0.0350	0.0420	0.0490
1.50	0.0032	0.0064	0.0097	0.0129	0.0161	0.0241	0.0322	0.0402	0.0483	0.0563
1.60	0.0037	0.0073	0.0110	0.0146	0.0183	0.0275	0.0366	0.0458	0.0549	0.0641
1.70	0.0041	0.0083	0.0124	0.0165	0.0207	0.0310	0.0413	0.0517	0.0620	0.0723
1.80	0.0046	0.0093	0.0139	0.0185	0.0232	0.0347	0.0463	0.0579	0.0695	0.0811
1.90	0.0052	0.0103	0.0155	0.0206	0.0258	0.0387	0.0516	0.0645	0.0774	0.0903
2.00	0.0057	0.0114	0.0172	0.0229	0.0286	0.0429	0.0572	0.0715	0.0858	0.1001
2.10	0.0063	0.0126	0.0189	0.0252	0.0315	0.0473	0.0631	0.0788	0.0946	0.1104
2.20	0.0069	0.0138	0.0208	0.0277	0.0346	0.0519	0.0692	0.0865	0.1038	0.1211
2.30	0.0076	0.0151	0.0227	0.0303	0.0378	0.0567	0.0756	0.0946	0.1135	0.1324
2.40	0.0082	0.0165	0.0247	0.0329	0.0412	0.0618	0.0824	0.1030	0.1236	0.1441
2.50	0.0089	0.0179	0.0268	0.0358	0.0447	0.0670	0.0894	0.1117	0.1341	0.1564
2.60	0.0097	0.0193	0.0290	0.0387	0.0483	0.0725	0.0967	0.1208	0.1450	0.1692
2.70	0.0104	0.0208	0.0313	0.0417	0.0521	0.0782	0.1042	0.1303	0.1564	0.1824
2.80	0.0112	0.0224	0.0336	0.0448	0.0561	0.0841	0.1121	0.1401	0.1682	0.1962
2.90	0.0120	0.0241	0.0361	0.0481	0.0601	0.0902	0.1203	0.1503	0.1804	0.2105
3.00	0.0129	0.0257	0.0386	0.0515	0.0644	0.0965	0.1287	0.1609	0.1931	0.2252
3.10	0.0137	0.0275	0.0412	0.0550	0.0687	0.1031	0.1374	0.1718	0.2061	0.2405
3.20	0.0146	0.0293	0.0439	0.0586	0.0732	0.1098	0.1464	0.1830	0.2196	0.2563
3.30	0.0156	0.0311	0.0467	0.0623	0.0779	0.1168	0.1557	0.1947	0.2336	0.2725
3.40	0.0165	0.0331	0.0496	0.0661	0.0827	0.1240	0.1653	0.2066	0.2480	0.2893
3.50	0.0175	0.0350	0.0526	0.0701	0.0876	0.1314	0.1752	0.2190	0.2628	0.3066
3.60	0.0185	0.0371	0.0556	0.0741	0.0927	0.1390	0.1853	0.2317	0.2780	0.3243
3.70	0.0196	0.0392	0.0587	0.0783	0.0979	0.1468	0.1958	0.2447	0.2937	0.3426
3.80	0.0206	0.0413	0.0619	0.0826	0.1032	0.1549	0.2065	0.2581	0.3097	0.3614
3.90	0.0218	0.0435	0.0653	0.0870	0.1088	0.1631	0.2175	0.2719	0.3263	0.3806
4.00	0.0229	0.0458	0.0686	0.0915	0.1144	0.1716	0.2288	0.2860	0.3432	0.4004
4.20	0.0252	0.0505	0.0757	0.1009	0.1261	0.1892	0.2523	0.3153	0.3784	0.4414
4.40	0.0277	0.0554	0.0831	0.1107	0.1384	0.2076	0.2768	0.3461	0.4153	0.4845
4.60	0.0303	0.0605	0.0908	0.1210	0.1513	0.2269	0.3026	0.3782	0.4539	0.5295
4.80	0.0329	0.0659	0.0988	0.1318	0.1647	0.2471	0.3295	0.4118	0.4942	0.5766
5.00	0.0358	0.0715	0.1073	0.1430	0.1788	0.2681	0.3575	0.4469	0.5363	0.6256
5.25	0.0394	0.0788	0.1182	0.1577	0.1971	0.2956	0.3941	0.4927	0.5912	0.6898
5.50	0.0433	0.0865	0.1298	0.1730	0.2163	0.3244	0.4326	0.5407	0.6489	0.7570
5.75	0.0473	0.0946	0.1418	0.1891	0.2364	0.3546	0.4728	0.5910	0.7092	0.8274

v [m/s]	Pressure loss coefficient ζ									
	0.2	0.4	0.6	0.8	1.0	1.5	2.0	2.5	3.0	3.5
6.00	0.0515	0.1030	0.1544	0.2059	0.2574	0.3861	0.5148	0.6435	0.7722	0.9009
7.00	0.0701	0.1401	0.2102	0.2803	0.3504	0.5255	0.7007	0.8759	1.0511	1.2262
8.00	0.0915	0.1830	0.2746	0.3661	0.4576	0.6864	0.9152	1.1440	1.3728	1.6016
9.00	0.1158	0.2317	0.3475	0.4633	0.5792	0.8687	1.1583	1.4479	1.7375	2.0270
10.00	0.1430	0.2860	0.4290	0.5720	0.7150	1.0725	1.4300	1.7875	2.1450	2.5025

Table 80: Pressure loss from individual resistance gas, 4th gas family, ζ 4.0 - 20.0

v [m/s]	Pressure loss coefficient ζ									
	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	15.0	20.0
0.50	0.0072	0.0080	0.0089	0.0107	0.0125	0.0143	0.0161	0.0179	0.0268	0.0358
0.75	0.0161	0.0181	0.0201	0.0241	0.0282	0.0322	0.0362	0.0402	0.0603	0.0804
1.00	0.0286	0.0322	0.0358	0.0429	0.0501	0.0572	0.0644	0.0715	0.1073	0.1430
1.10	0.0346	0.0389	0.0433	0.0519	0.0606	0.0692	0.0779	0.0865	0.1298	0.1730
1.20	0.0412	0.0463	0.0515	0.0618	0.0721	0.0824	0.0927	0.1030	0.1544	0.2059
1.30	0.0483	0.0544	0.0604	0.0725	0.0846	0.0967	0.1088	0.1208	0.1813	0.2417
1.40	0.0561	0.0631	0.0701	0.0841	0.0981	0.1121	0.1261	0.1401	0.2102	0.2803
1.50	0.0644	0.0724	0.0804	0.0965	0.1126	0.1287	0.1448	0.1609	0.2413	0.3218
1.60	0.0732	0.0824	0.0915	0.1098	0.1281	0.1464	0.1647	0.1830	0.2746	0.3661
1.70	0.0827	0.0930	0.1033	0.1240	0.1446	0.1653	0.1860	0.2066	0.3100	0.4133
1.80	0.0927	0.1042	0.1158	0.1390	0.1622	0.1853	0.2085	0.2317	0.3475	0.4633
1.90	0.1032	0.1162	0.1291	0.1549	0.1807	0.2065	0.2323	0.2581	0.3872	0.5162
2.00	0.1144	0.1287	0.1430	0.1716	0.2002	0.2288	0.2574	0.2860	0.4290	0.5720
2.10	0.1261	0.1419	0.1577	0.1892	0.2207	0.2523	0.2838	0.3153	0.4730	0.6306
2.20	0.1384	0.1557	0.1730	0.2076	0.2422	0.2768	0.3115	0.3461	0.5191	0.6921
2.30	0.1513	0.1702	0.1891	0.2269	0.2648	0.3026	0.3404	0.3782	0.5674	0.7565
2.40	0.1647	0.1853	0.2059	0.2471	0.2883	0.3295	0.3707	0.4118	0.6178	0.8237
2.50	0.1788	0.2011	0.2234	0.2681	0.3128	0.3575	0.4022	0.4469	0.6703	0.8938
2.60	0.1933	0.2175	0.2417	0.2900	0.3383	0.3867	0.4350	0.4833	0.7250	0.9667
2.70	0.2085	0.2346	0.2606	0.3127	0.3649	0.4170	0.4691	0.5212	0.7819	1.0425
2.80	0.2242	0.2523	0.2803	0.3363	0.3924	0.4484	0.5045	0.5606	0.8408	1.1211
2.90	0.2405	0.2706	0.3007	0.3608	0.4209	0.4811	0.5412	0.6013	0.9020	1.2026
3.00	0.2574	0.2896	0.3218	0.3861	0.4505	0.5148	0.5792	0.6435	0.9653	1.2870
3.10	0.2748	0.3092	0.3436	0.4123	0.4810	0.5497	0.6184	0.6871	1.0307	1.3742
3.20	0.2929	0.3295	0.3661	0.4393	0.5125	0.5857	0.6589	0.7322	1.0982	1.4643
3.30	0.3115	0.3504	0.3893	0.4672	0.5450	0.6229	0.7008	0.7786	1.1680	1.5573
3.40	0.3306	0.3719	0.4133	0.4959	0.5786	0.6612	0.7439	0.8265	1.2398	1.6531
3.50	0.3504	0.3941	0.4379	0.5255	0.6131	0.7007	0.7883	0.8759	1.3138	1.7518
3.60	0.3707	0.4170	0.4633	0.5560	0.6486	0.7413	0.8340	0.9266	1.3900	1.8533
3.70	0.3915	0.4405	0.4894	0.5873	0.6852	0.7831	0.8810	0.9788	1.4683	1.9577
3.80	0.4130	0.4646	0.5162	0.6195	0.7227	0.8260	0.9292	1.0325	1.5487	2.0649
3.90	0.4350	0.4894	0.5438	0.6525	0.7613	0.8700	0.9788	1.0875	1.6313	2.1750
4.00	0.4576	0.5148	0.5720	0.6864	0.8008	0.9152	1.0296	1.1440	1.7160	2.2880
4.20	0.5045	0.5676	0.6306	0.7568	0.8829	1.0090	1.1351	1.2613	1.8919	2.5225
4.40	0.5537	0.6229	0.6921	0.8305	0.9690	1.1074	1.2458	1.3842	2.0764	2.7685
4.60	0.6052	0.6808	0.7565	0.9078	1.0591	1.2104	1.3616	1.5129	2.2694	3.0259
4.80	0.6589	0.7413	0.8237	0.9884	1.1532	1.3179	1.4826	1.6474	2.4710	3.2947

v [m/s]	Pressure loss coefficient ζ									
	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0	15.0	20.0
5.00	0.7150	0.8044	0.8938	1.0725	1.2513	1.4300	1.6088	1.7875	2.6813	3.5750
5.25	0.7883	0.8868	0.9854	1.1824	1.3795	1.5766	1.7736	1.9707	2.9561	3.9414
5.50	0.8652	0.9733	1.0814	1.2977	1.5140	1.7303	1.9466	2.1629	3.2443	4.3258
5.75	0.9456	1.0638	1.1820	1.4184	1.6548	1.8912	2.1276	2.3640	3.5460	4.7279
6.00	1.0296	1.1583	1.2870	1.5444	1.8018	2.0592	2.3166	2.5740	3.8610	5.1480
7.00	1.4014	1.5766	1.7518	2.1021	2.4525	2.8028	3.1532	3.5035	5.2553	7.0070
8.00	1.8304	2.0592	2.2880	2.7456	3.2032	3.6608	4.1184	4.5760	6.8640	9.1520
9.00	2.3166	2.6062	2.8958	3.4749	4.0541	4.6332	5.2124	5.7915	8.6873	11.5830
10.00	2.8600	3.2175	3.5750	4.2900	5.0050	5.7200	6.4350	7.1500	10.7250	14.3000

5.2.12 Pressure loss, Mapress Stainless Steel compressed air

5.2.12.1 Pressure loss Mapress Stainless Steel compressed air 3 bar

- Temperature: 20 °C
- Density: 3.612 kg/m³
- Viscosity: 0.0000171 Pa·s
- Surface roughness: 0.0015 mm

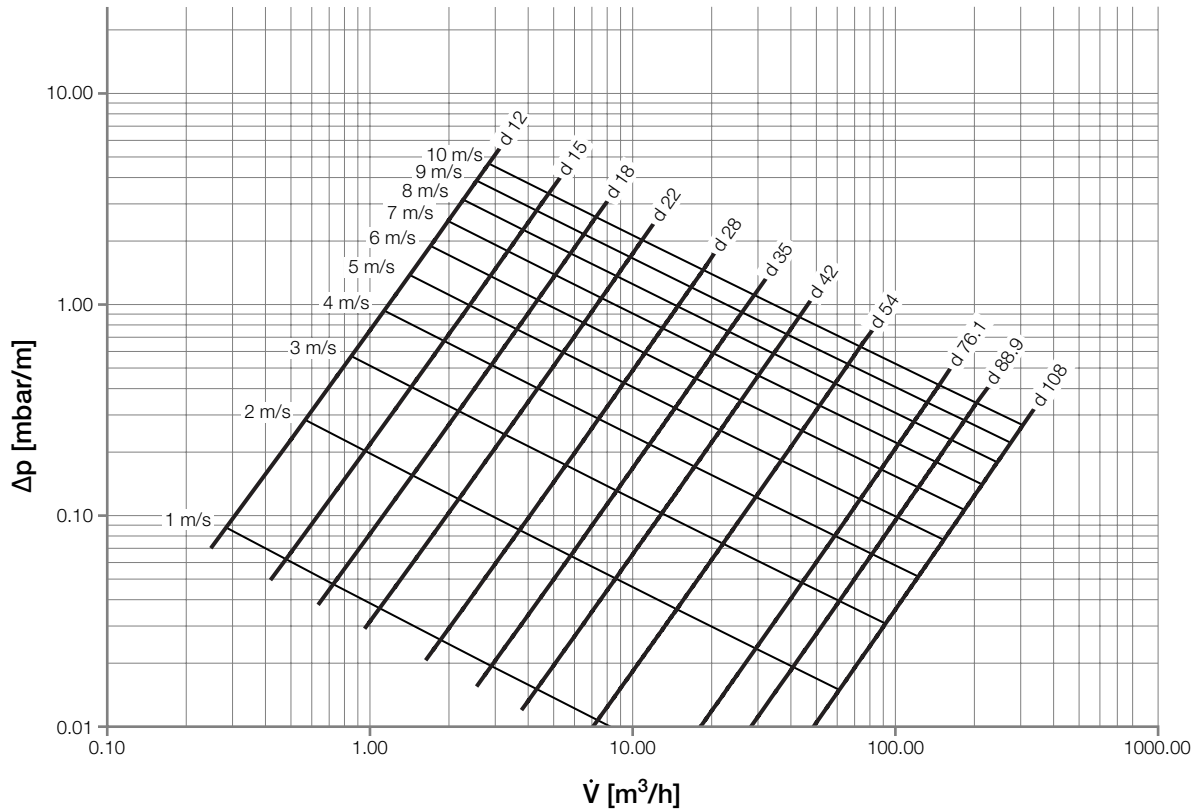


Figure 22: Pressure loss Mapress Stainless Steel compressed air 3 bar

Table 81: Pressure loss Mapress Stainless Steel compressed air 3 bar, depending on the volume flow, d 12 - d 35

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.9	0.0716	0.5	0.0210	0.3	0.0080	0.2	0.0031	0.1	0.0009	0.1	0.0003
0.50	1.8	0.2308	1.0	0.0672	0.7	0.0254	0.5	0.0098	0.3	0.0028	0.2	0.0010
0.75	2.7	0.4622	1.6	0.1340	1.0	0.0504	0.7	0.0194	0.4	0.0056	0.3	0.0020
1.00	3.5	0.7592	2.1	0.2195	1.4	0.0824	0.9	0.0317	0.5	0.0090	0.3	0.0032
1.25	4.4	1.1180	2.6	0.3225	1.7	0.1208	1.2	0.0464	0.7	0.0132	0.4	0.0046
1.50	5.3	1.5358	3.1	0.4422	2.1	0.1654	1.4	0.0634	0.8	0.0180	0.5	0.0063
1.75	6.2	2.0105	3.7	0.5779	2.4	0.2160	1.6	0.0827	0.9	0.0234	0.6	0.0082
2.00	7.1	2.5405	4.2	0.7292	2.8	0.2722	1.8	0.1041	1.1	0.0295	0.7	0.0103
2.25	8.0	3.1244	4.7	0.8958	3.1	0.3341	2.1	0.1277	1.2	0.0361	0.8	0.0126
2.50	8.8	3.7610	5.2	1.0771	3.5	0.4014	2.3	0.1533	1.3	0.0433	0.9	0.0151
2.75	9.7	4.4494	5.8	1.2729	3.8	0.4740	2.5	0.1809	1.5	0.0510	0.9	0.0178
3.00	10.6	5.1887	6.3	1.4831	4.1	0.5519	2.8	0.2104	1.6	0.0593	1.0	0.0206
3.25			6.8	1.7072	4.5	0.6349	3.0	0.2420	1.8	0.0682	1.1	0.0237
3.50			7.3	1.9453	4.8	0.7230	3.2	0.2754	1.9	0.0775	1.2	0.0269
3.75			7.8	2.1969	5.2	0.8161	3.5	0.3107	2.0	0.0874	1.3	0.0304
4.00			8.4	2.4621	5.5	0.9142	3.7	0.3479	2.2	0.0978	1.4	0.0340
4.50			9.4	3.0322	6.2	1.1248	4.1	0.4276	2.4	0.1201	1.6	0.0417
5.00			10.5	3.6546	6.9	1.3545	4.6	0.5146	2.7	0.1444	1.7	0.0500
5.50					7.6	1.6030	5.1	0.6085	3.0	0.1706	1.9	0.0591
6.00					8.3	1.8699	5.5	0.7094	3.2	0.1987	2.1	0.0688
6.50					9.0	2.1549	6.0	0.8170	3.5	0.2287	2.2	0.0791
7.00					9.7	2.4578	6.4	0.9314	3.8	0.2605	2.4	0.0901
7.50					10.4	2.8	6.9	1.0523	4.0	0.2942	2.6	0.1017
8.00							7.4	1.1797	4.3	0.3296	2.8	0.1138
8.50							7.8	1.3136	4.6	0.3668	2.9	0.1266
9.00							8.3	1.4539	4.9	0.4058	3.1	0.1400
9.50							8.7	1.6004	5.1	0.4464	3.3	0.1540
10.00							9.2	1.7533	5.4	0.4888	3.5	0.1686
10.50							9.7	1.9123	5.7	0.5329	3.6	0.1837
11.00							10.1	2.0775	5.9	0.5787	3.8	0.1994
11.50									6.2	0.6262	4.0	0.2157
12.00									6.5	0.6753	4.1	0.2326
12.50									6.7	0.7260	4.3	0.2500
13.00									7.0	0.7784	4.5	0.2679
13.50									7.3	0.8324	4.7	0.2864
14.00									7.6	0.8880	4.8	0.3055
14.50									7.8	0.9453	5.0	0.3251
15.00									8.1	1.0041	5.2	0.3452
16.00									8.6	1.1264	5.5	0.3871
17.00									9.2	1.2551	5.9	0.4311
18.00									9.7	1.3899	6.2	0.4772
19.00									10.3	1.5309	6.6	0.5254

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
20.00									10.8	1.6780	6.9	0.5757
21.00											7.3	0.6280
22.00											7.6	0.6823
23.00											7.9	0.7386
24.00											8.3	0.7969
25.00											8.6	0.8572
30.00											10.4	1.1880

Table 82: Pressure loss Mapress Stainless Steel compressed air 3 bar, depending on the volume flow, d 42 - d 108

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.0001	0.0	0.0000						
0.50	0.1	0.0004	0.1	0.0001						
0.75	0.2	0.0008	0.1	0.0002						
1.00	0.2	0.0013	0.1	0.0004						
1.25	0.3	0.0018	0.2	0.0005						
1.50	0.3	0.0025	0.2	0.0007						
1.75	0.4	0.0032	0.2	0.0009						
2.00	0.5	0.0041	0.3	0.0011						
2.25	0.5	0.0050	0.3	0.0014						
2.50	0.6	0.0059	0.3	0.0017						
2.75	0.6	0.0070	0.4	0.0020						
3.00	0.7	0.0081	0.4	0.0023						
3.25	0.8	0.0093	0.4	0.0026						
3.50	0.8	0.0106	0.5	0.0030						
3.75	0.9	0.0119	0.5	0.0034						
4.00	0.9	0.0133	0.5	0.0037						
4.50	1.0	0.0163	0.6	0.0046						
5.00	1.2	0.0196	0.7	0.0055						
5.50	1.3	0.0231	0.7	0.0065						
6.00	1.4	0.0269	0.8	0.0075						
6.50	1.5	0.0309	0.9	0.0087						
7.00	1.6	0.0352	1.0	0.0099						
7.50	1.7	0.0397	1.0	0.0111						
8.00	1.9	0.0444	1.1	0.0124						
8.50	2.0	0.0494	1.2	0.0138						
9.00	2.1	0.0546	1.2	0.0153						
9.50	2.2	0.0600	1.3	0.0168						
10.00	2.3	0.0657	1.4	0.0184	0.7	0.0036	0.5	0.0016	0.3	0.0006

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
10.50	2.4	0.0716	1.4	0.0200	0.7	0.0039	0.5	0.0018	0.3	0.0007
11.00	2.6	0.0777	1.5	0.0217	0.7	0.0042	0.5	0.0019	0.4	0.0007
11.50	2.7	0.0840	1.6	0.0234	0.8	0.0045	0.6	0.0021	0.4	0.0008
12.00	2.8	0.0905	1.6	0.0253	0.8	0.0049	0.6	0.0022	0.4	0.0009
12.50	2.9	0.0973	1.7	0.0271	0.9	0.0052	0.6	0.0024	0.4	0.0009
13.00	3.0	0.1043	1.8	0.0291	0.9	0.0056	0.6	0.0026	0.4	0.0010
13.50	3.1	0.1114	1.8	0.0310	0.9	0.0060	0.7	0.0028	0.4	0.0011
14.00	3.3	0.1188	1.9	0.0331	1.0	0.0064	0.7	0.0029	0.5	0.0011
14.50	3.4	0.1264	2.0	0.0352	1.0	0.0068	0.7	0.0031	0.5	0.0012
15.00	3.5	0.1342	2.0	0.0374	1.0	0.0072	0.7	0.0033	0.5	0.0013
16.00	3.7	0.1504	2.2	0.0419	1.1	0.0081	0.8	0.0037	0.5	0.0014
17.00	4.0	0.1675	2.3	0.0466	1.2	0.0090	0.8	0.0041	0.6	0.0016
18.00	4.2	0.1853	2.4	0.0515	1.2	0.0099	0.9	0.0046	0.6	0.0017
19.00	4.4	0.2040	2.6	0.0567	1.3	0.0109	0.9	0.0050	0.6	0.0019
20.00	4.7	0.2234	2.7	0.0621	1.4	0.0119	1.0	0.0055	0.7	0.0021
21.00	4.9	0.2436	2.9	0.0676	1.4	0.0130	1.0	0.0060	0.7	0.0023
22.00	5.1	0.2646	3.0	0.0734	1.5	0.0141	1.1	0.0065	0.7	0.0025
23.00	5.3	0.2864	3.1	0.0795	1.6	0.0152	1.1	0.0070	0.8	0.0027
24.00	5.6	0.3089	3.3	0.0857	1.6	0.0164	1.2	0.0075	0.8	0.0029
25.00	5.8	0.3322	3.4	0.0921	1.7	0.0177	1.2	0.0081	0.8	0.0031
30.00	7.0	0.4599	4.1	0.1273	2.0	0.0244	1.5	0.0112	1.0	0.0043
35.00	8.1	0.6058	4.8	0.1675	2.4	0.0320	1.7	0.0147	1.1	0.0056
40.00	9.3	0.7695	5.4	0.2125	2.7	0.0406	2.0	0.0186	1.3	0.0071
45.00	10.5	0.9506	6.1	0.2623	3.1	0.0500	2.2	0.0229	1.5	0.0087
50.00			6.8	0.3167	3.4	0.0603	2.5	0.0276	1.6	0.0105
55.00			7.5	0.3757	3.7	0.0715	2.7	0.0327	1.8	0.0124
60.00			8.2	0.4391	4.1	0.0835	2.9	0.0382	2.0	0.0145
65.00			8.8	0.5070	4.4	0.0963	3.2	0.0440	2.1	0.0167
70.00			9.5	0.5793	4.8	0.1099	3.4	0.0502	2.3	0.0190
75.00			10.2	0.6559	5.1	0.1244	3.7	0.0568	2.5	0.0215
80.00			10.9	0.7367	5.4	0.1396	3.9	0.0638	2.6	0.0241
85.00					5.8	0.1556	4.2	0.0711	2.8	0.0269
90.00					6.1	0.1724	4.4	0.0787	2.9	0.0298
95.00					6.5	0.1900	4.7	0.0867	3.1	0.0328
100.00					6.8	0.2084	4.9	0.0951	3.3	0.0359
105.00					7.1	0.2275	5.2	0.1038	3.4	0.0392
110.00					7.5	0.2473	5.4	0.1128	3.6	0.0426
115.00					7.8	0.2679	5.6	0.1222	3.8	0.0462
120.00					8.2	0.2893	5.9	0.1319	3.9	0.0498
125.00					8.5	0.3113	6.1	0.1419	4.1	0.0536
130.00					8.8	0.3342	6.4	0.1523	4.3	0.0575
135.00					9.2	0.3577	6.6	0.1630	4.4	0.0615
140.00					9.5	0.3820	6.9	0.1740	4.6	0.0657

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
145.00					9.9	0.4069	7.1	0.1854	4.7	0.0699
150.00					10.2	0.4326	7.4	0.1971	4.9	0.0743
160.00							7.9	0.2214	5.2	0.0835
170.00							8.3	0.2470	5.6	0.0931
180.00							8.8	0.2738	5.9	0.1032
190.00							9.3	0.3019	6.2	0.1137
200.00							9.8	0.3312	6.5	0.1248
210.00							10.3	0.3618	6.9	0.1362
220.00									7.2	0.1482
230.00									7.5	0.1605
240.00									7.8	0.1734
250.00									8.2	0.1866
300.00									9.8	0.2596
315.00									10.3	0.2836

5.2.12.2 Pressure loss Mapress Stainless Steel compressed air 6 bar

- Temperature: 20 °C
- Density: 7.224 kg/m³
- Viscosity: 0.0000171 Pa·s
- Surface roughness: 0.0015 mm

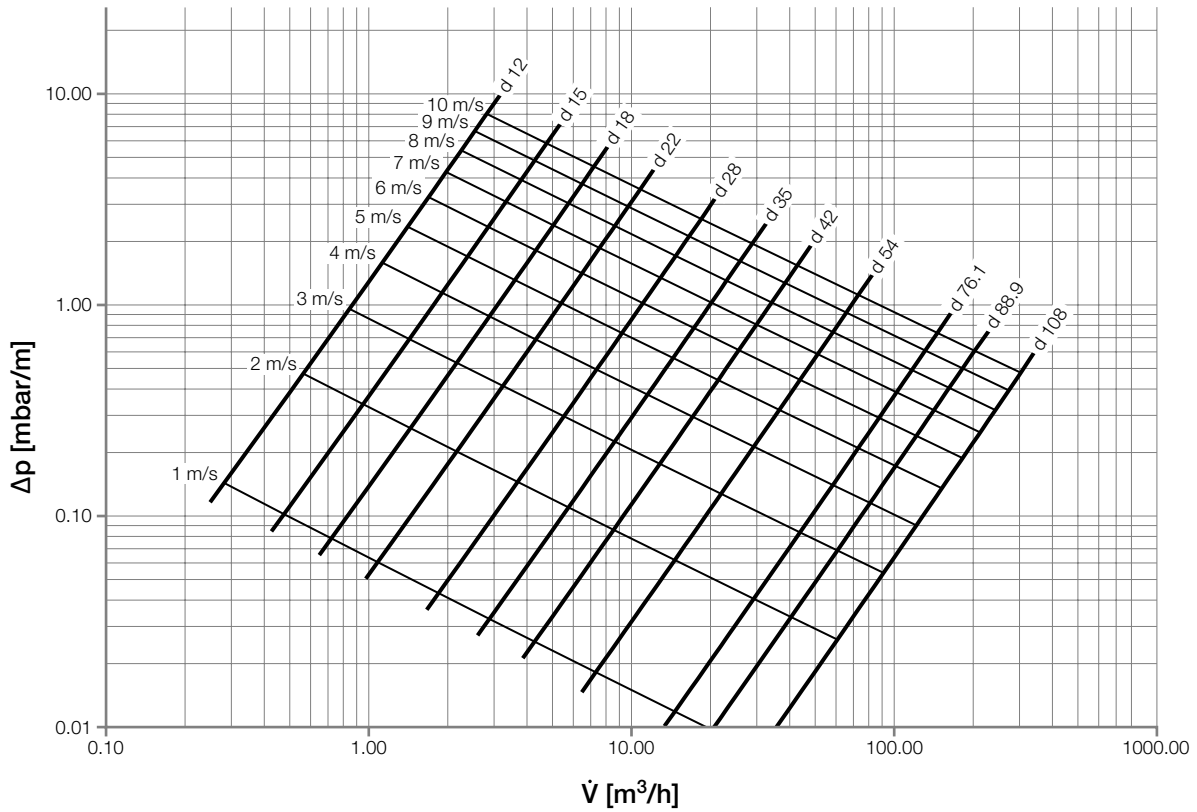


Figure 23: Pressure loss Mapress Stainless Steel compressed air 6 bar

Table 83: Pressure loss Mapress Stainless Steel compressed air 6 bar, depending on the volume flow, d 12 - d 35

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.9	0.1154	0.5	0.0336	0.3	0.0127	0.2	0.0049	0.1	0.0014	0.1	0.0005
0.50	1.8	0.3796	1.0	0.1097	0.7	0.0412	0.5	0.0158	0.3	0.0045	0.2	0.0016
0.75	2.7	0.7679	1.6	0.2211	1.0	0.0827	0.7	0.0317	0.4	0.0090	0.3	0.0031
1.00	3.5	1.2702	2.1	0.3646	1.4	0.1361	0.9	0.0521	0.5	0.0147	0.3	0.0051
1.25	4.4	1.8805	2.6	0.5385	1.7	0.2007	1.2	0.0766	0.7	0.0216	0.4	0.0075
1.50	5.3	2.5943	3.1	0.7415	2.1	0.2760	1.4	0.1052	0.8	0.0297	0.5	0.0103
1.75	6.2	3.4085	3.7	0.9726	2.4	0.3615	1.6	0.1377	0.9	0.0388	0.6	0.0135
2.00	7.1	4.3205	4.2	1.2310	2.8	0.4571	1.8	0.1739	1.1	0.0489	0.7	0.0170
2.25	8.0	5.3281	4.7	1.5161	3.1	0.5624	2.1	0.2138	1.2	0.0601	0.8	0.0208
2.50	8.8	6.4296	5.2	1.8273	3.5	0.6773	2.3	0.2573	1.3	0.0722	0.9	0.0250
2.75	9.7	7.6236	5.8	2.1642	3.8	0.8015	2.5	0.3043	1.5	0.0853	0.9	0.0295
3.00	10.6	8.9087	6.3	2.5263	4.1	0.9349	2.8	0.3547	1.6	0.0994	1.0	0.0344
3.25			6.8	2.9133	4.5	1.0774	3.0	0.4085	1.8	0.1144	1.1	0.0396
3.50			7.3	3.3250	4.8	1.2289	3.2	0.4657	1.9	0.1303	1.2	0.0450
3.75			7.8	3.7609	5.2	1.3892	3.5	0.5261	2.0	0.1471	1.3	0.0508
4.00			8.4	4.2209	5.5	1.5582	3.7	0.5899	2.2	0.1648	1.4	0.0569
4.50			9.4	5.2121	6.2	1.9221	4.1	0.7269	2.4	0.2029	1.6	0.0700
5.00			10.5	6.2969	6.9	2.3198	4.6	0.8766	2.7	0.2444	1.7	0.0843
5.50					7.6	2.7510	5.1	1.0388	3.0	0.2894	1.9	0.0997
6.00					8.3	3.2149	5.5	1.2131	3.2	0.3376	2.1	0.1163
6.50					9.0	3.7114	6.0	1.3994	3.5	0.3892	2.2	0.1340
7.00					9.7	4.2399	6.4	1.5977	3.8	0.4440	2.4	0.1527
7.50					10.4	4.8	6.9	1.8077	4.0	0.5020	2.6	0.1726
8.00							7.4	2.0293	4.3	0.5632	2.8	0.1936
8.50							7.8	2.2625	4.6	0.6275	2.9	0.2156
9.00							8.3	2.5070	4.9	0.6950	3.1	0.2386
9.50							8.7	2.7629	5.1	0.7654	3.3	0.2627
10.00							9.2	3.0299	5.4	0.8390	3.5	0.2878
10.50							9.7	3.3081	5.7	0.9155	3.6	0.3140
11.00							10.1	3.5974	5.9	0.9951	3.8	0.3411
11.50									6.2	1.0776	4.0	0.3693
12.00									6.5	1.1631	4.1	0.3985
12.50									6.7	1.2515	4.3	0.4286
13.00									7.0	1.3428	4.5	0.4597
13.50									7.3	1.4371	4.7	0.4918
14.00									7.6	1.5342	4.8	0.5249
14.50									7.8	1.6342	5.0	0.5590
15.00									8.1	1.7370	5.2	0.5940
16.00									8.6	1.9512	5.5	0.6669
17.00									9.2	2.1766	5.9	0.7435
18.00									9.7	2.4132	6.2	0.8239
19.00									10.3	2.6609	6.6	0.9080

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
20.00									10.8	2.9195	6.9	0.9958
21.00											7.3	1.0873
22.00											7.6	1.1824
23.00											7.9	1.2811
24.00											8.3	1.3833
25.00											8.6	1.4892
30.00											10.4	2.0710

Table 84: Pressure loss Mapress Stainless Steel compressed air 6 bar, depending on the volume flow, d 42 - d 108

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.0002	0.0	0.0001						
0.50	0.1	0.0006	0.1	0.0002						
0.75	0.2	0.0012	0.1	0.0004						
1.00	0.2	0.0020	0.1	0.0006						
1.25	0.3	0.0030	0.2	0.0008						
1.50	0.3	0.0041	0.2	0.0011						
1.75	0.4	0.0053	0.2	0.0015						
2.00	0.5	0.0067	0.3	0.0019						
2.25	0.5	0.0082	0.3	0.0023						
2.50	0.6	0.0098	0.3	0.0028						
2.75	0.6	0.0116	0.4	0.0032						
3.00	0.7	0.0134	0.4	0.0038						
3.25	0.8	0.0155	0.4	0.0043						
3.50	0.8	0.0176	0.5	0.0049						
3.75	0.9	0.0198	0.5	0.0056						
4.00	0.9	0.0222	0.5	0.0062						
4.50	1.0	0.0273	0.6	0.0076						
5.00	1.2	0.0329	0.7	0.0092						
5.50	1.3	0.0388	0.7	0.0108						
6.00	1.4	0.0453	0.8	0.0126						
6.50	1.5	0.0521	0.9	0.0145						
7.00	1.6	0.0594	1.0	0.0165						
7.50	1.7	0.0671	1.0	0.0187						
8.00	1.9	0.0752	1.1	0.0209						
8.50	2.0	0.0837	1.2	0.0233						
9.00	2.1	0.0927	1.2	0.0258						
9.50	2.2	0.1020	1.3	0.0283						
10.00	2.3	0.1117	1.4	0.0310	0.7	0.0060	0.5	0.0027	0.3	0.0010

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d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
10.50	2.4	0.1218	1.4	0.0338	0.7	0.0065	0.5	0.0030	0.3	0.0011
11.00	2.6	0.1323	1.5	0.0367	0.7	0.0070	0.5	0.0032	0.4	0.0012
11.50	2.7	0.1432	1.6	0.0397	0.8	0.0076	0.6	0.0035	0.4	0.0013
12.00	2.8	0.1545	1.6	0.0428	0.8	0.0082	0.6	0.0038	0.4	0.0014
12.50	2.9	0.1661	1.7	0.0461	0.9	0.0088	0.6	0.0041	0.4	0.0015
13.00	3.0	0.1781	1.8	0.0494	0.9	0.0095	0.6	0.0043	0.4	0.0017
13.50	3.1	0.1905	1.8	0.0528	0.9	0.0101	0.7	0.0046	0.4	0.0018
14.00	3.3	0.2033	1.9	0.0563	1.0	0.0108	0.7	0.0049	0.5	0.0019
14.50	3.4	0.2164	2.0	0.0599	1.0	0.0115	0.7	0.0053	0.5	0.0020
15.00	3.5	0.2299	2.0	0.0637	1.0	0.0122	0.7	0.0056	0.5	0.0021
16.00	3.7	0.2580	2.2	0.0714	1.1	0.0137	0.8	0.0063	0.5	0.0024
17.00	4.0	0.2876	2.3	0.0795	1.2	0.0152	0.8	0.0070	0.6	0.0027
18.00	4.2	0.3185	2.4	0.0881	1.2	0.0168	0.9	0.0077	0.6	0.0029
19.00	4.4	0.3509	2.6	0.0970	1.3	0.0185	0.9	0.0085	0.6	0.0032
20.00	4.7	0.3847	2.7	0.1063	1.4	0.0203	1.0	0.0093	0.7	0.0035
21.00	4.9	0.4199	2.9	0.1159	1.4	0.0221	1.0	0.0101	0.7	0.0038
22.00	5.1	0.4565	3.0	0.1260	1.5	0.0240	1.1	0.0110	0.7	0.0042
23.00	5.3	0.4944	3.1	0.1364	1.6	0.0260	1.1	0.0119	0.8	0.0045
24.00	5.6	0.5338	3.3	0.1472	1.6	0.0280	1.2	0.0128	0.8	0.0049
25.00	5.8	0.5744	3.4	0.1584	1.7	0.0302	1.2	0.0138	0.8	0.0052
30.00	7.0	0.7978	4.1	0.2196	2.0	0.0417	1.5	0.0191	1.0	0.0072
35.00	8.1	1.0538	4.8	0.2896	2.4	0.0550	1.7	0.0251	1.1	0.0095
40.00	9.3	1.3420	5.4	0.3684	2.7	0.0698	2.0	0.0319	1.3	0.0121
45.00	10.5	1.6615	6.1	0.4556	3.1	0.0862	2.2	0.0394	1.5	0.0149
50.00			6.8	0.5511	3.4	0.1042	2.5	0.0475	1.6	0.0180
55.00			7.5	0.6548	3.7	0.1237	2.7	0.0564	1.8	0.0213
60.00			8.2	0.7665	4.1	0.1446	2.9	0.0660	2.0	0.0249
65.00			8.8	0.8863	4.4	0.1671	3.2	0.0762	2.1	0.0288
70.00			9.5	1.0139	4.8	0.1910	3.4	0.0870	2.3	0.0328
75.00			10.2	1.1494	5.1	0.2163	3.7	0.0985	2.5	0.0372
80.00			10.9	1.2926	5.4	0.2431	3.9	0.1107	2.6	0.0417
85.00					5.8	0.2712	4.2	0.1235	2.8	0.0465
90.00					6.1	0.3008	4.4	0.1369	2.9	0.0516
95.00					6.5	0.3318	4.7	0.1510	3.1	0.0569
100.00					6.8	0.3641	4.9	0.1656	3.3	0.0624
105.00					7.1	0.3978	5.2	0.1809	3.4	0.0681
110.00					7.5	0.4328	5.4	0.1968	3.6	0.0741
115.00					7.8	0.4692	5.6	0.2133	3.8	0.0803
120.00					8.2	0.5070	5.9	0.2304	3.9	0.0867
125.00					8.5	0.5460	6.1	0.2481	4.1	0.0933
130.00					8.8	0.5864	6.4	0.2664	4.3	0.1002
135.00					9.2	0.6281	6.6	0.2853	4.4	0.1073
140.00					9.5	0.6712	6.9	0.3047	4.6	0.1146

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
145.00					9.9	0.7155	7.1	0.3248	4.7	0.1221
150.00					10.2	0.7611	7.4	0.3455	4.9	0.1298
160.00							7.9	0.3885	5.2	0.1459
170.00							8.3	0.4338	5.6	0.1629
180.00							8.8	0.4814	5.9	0.1807
190.00							9.3	0.5313	6.2	0.1993
200.00							9.8	0.5834	6.5	0.2188
210.00							10.3	0.6377	6.9	0.2391
220.00									7.2	0.2602
230.00									7.5	0.2821
240.00									7.8	0.3049
250.00									8.2	0.3284
300.00									9.8	0.4581
315.00									10.3	0.5009

5.2.12.3 Pressure loss Mapress Stainless Steel compressed air 9 bar

- Temperature: 20 °C
- Density: 10.836 kg/m³
- Viscosity: 0.0000171 Pa·s
- Surface roughness: 0.0015 mm

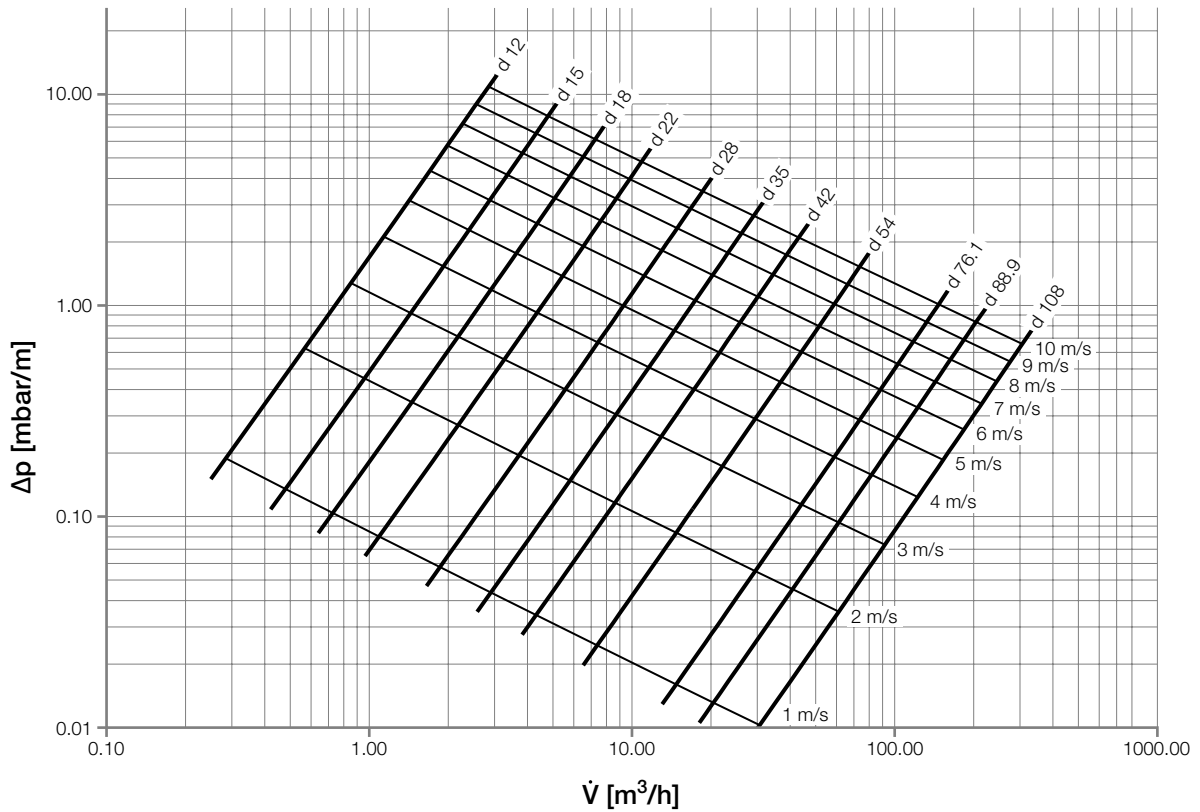


Figure 24: Pressure loss Mapress Stainless Steel compressed air 9 bar

Table 85: Pressure loss Mapress Stainless Steel compressed air 9 bar, depending on the volume flow, d 12 - d 35

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.9	0.1541	0.5	0.0447	0.3	0.0168	0.2	0.0065	0.1	0.0019	0.1	0.0007
0.50	1.8	0.5119	1.0	0.1474	0.7	0.0551	0.5	0.0211	0.3	0.0060	0.2	0.0021
0.75	2.7	1.0415	1.6	0.2986	1.0	0.1114	0.7	0.0426	0.4	0.0120	0.3	0.0042
1.00	3.5	1.7296	2.1	0.4944	1.4	0.1840	0.9	0.0701	0.5	0.0198	0.3	0.0069
1.25	4.4	2.5683	2.6	0.7323	1.7	0.2720	1.2	0.1036	0.7	0.0291	0.4	0.0101
1.50	5.3	3.5521	3.1	1.0107	2.1	0.3749	1.4	0.1425	0.8	0.0400	0.5	0.0139
1.75	6.2	4.6768	3.7	1.3284	2.4	0.4921	1.6	0.1869	0.9	0.0524	0.6	0.0182
2.00	7.1	5.9391	4.2	1.6842	2.8	0.6233	1.8	0.2365	1.1	0.0662	0.7	0.0229
2.25	8.0	7.3365	4.7	2.0774	3.1	0.7680	2.1	0.2911	1.2	0.0815	0.8	0.0282
2.50	8.8	8.8667	5.2	2.5073	3.5	0.9261	2.3	0.3508	1.3	0.0981	0.9	0.0339
2.75	9.7	10.5278	5.8	2.9732	3.8	1.0973	2.5	0.4153	1.5	0.1160	0.9	0.0401
3.00	10.6	12.3183	6.3	3.4747	4.1	1.2814	2.8	0.4846	1.6	0.1353	1.0	0.0467
3.25			6.8	4.0113	4.5	1.4782	3.0	0.5587	1.8	0.1558	1.1	0.0537
3.50			7.3	4.5827	4.8	1.6875	3.2	0.6374	1.9	0.1776	1.2	0.0612
3.75			7.8	5.1883	5.2	1.9093	3.5	0.7208	2.0	0.2007	1.3	0.0692
4.00			8.4	5.8280	5.5	2.1433	3.7	0.8087	2.2	0.2251	1.4	0.0775
4.50			9.4	7.2084	6.2	2.6478	4.1	0.9981	2.4	0.2775	1.6	0.0955
5.00			10.5	8.7216	6.9	3.2000	4.6	1.2051	2.7	0.3347	1.7	0.1151
5.50					7.6	3.7995	5.1	1.4296	3.0	0.3967	1.9	0.1363
6.00					8.3	4.4454	5.5	1.6713	3.2	0.4633	2.1	0.1591
6.50					9.0	5.1373	6.0	1.9300	3.5	0.5346	2.2	0.1834
7.00					9.7	5.8747	6.4	2.2054	3.8	0.6104	2.4	0.2093
7.50					10.4	6.7	6.9	2.4975	4.0	0.6907	2.6	0.2367
8.00							7.4	2.8059	4.3	0.7754	2.8	0.2656
8.50							7.8	3.1307	4.6	0.8645	2.9	0.2960
9.00							8.3	3.4716	4.9	0.9581	3.1	0.3279
9.50							8.7	3.8285	5.1	1.0559	3.3	0.3612
10.00							9.2	4.2014	5.4	1.1580	3.5	0.3960
10.50							9.7	4.5901	5.7	1.2644	3.6	0.4322
11.00							10.1	4.9945	5.9	1.3750	3.8	0.4698
11.50									6.2	1.4898	4.0	0.5088
12.00									6.5	1.6088	4.1	0.5493
12.50									6.7	1.7319	4.3	0.5911
13.00									7.0	1.8592	4.5	0.6343
13.50									7.3	1.9906	4.7	0.6789
14.00									7.6	2.1260	4.8	0.7249
14.50									7.8	2.2655	5.0	0.7722
15.00									8.1	2.4091	5.2	0.8209
16.00									8.6	2.7083	5.5	0.9222
17.00									9.2	3.0235	5.9	1.0289
18.00									9.7	3.3545	6.2	1.1410
19.00									10.3	3.7013	6.6	1.2582

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
20.00									10.8	4.0637	6.9	1.3807
21.00											7.3	1.5083
22.00											7.6	1.6411
23.00											7.9	1.7790
24.00											8.3	1.9220
25.00											8.6	2.0701
30.00											10.4	2.8852

Table 86: Pressure loss Mapress Stainless Steel compressed air 9 bar, depending on the volume flow, d 42 - d 108

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.0003	0.0	0.0001						
0.50	0.1	0.0008	0.1	0.0002						
0.75	0.2	0.0017	0.1	0.0005						
1.00	0.2	0.0027	0.1	0.0008						
1.25	0.3	0.0040	0.2	0.0011						
1.50	0.3	0.0054	0.2	0.0015						
1.75	0.4	0.0071	0.2	0.0020						
2.00	0.5	0.0090	0.3	0.0025						
2.25	0.5	0.0110	0.3	0.0031						
2.50	0.6	0.0132	0.3	0.0037						
2.75	0.6	0.0156	0.4	0.0044						
3.00	0.7	0.0182	0.4	0.0051						
3.25	0.8	0.0209	0.4	0.0059						
3.50	0.8	0.0239	0.5	0.0067						
3.75	0.9	0.0269	0.5	0.0075						
4.00	0.9	0.0302	0.5	0.0084						
4.50	1.0	0.0371	0.6	0.0103						
5.00	1.2	0.0447	0.7	0.0125						
5.50	1.3	0.0530	0.7	0.0147						
6.00	1.4	0.0618	0.8	0.0172						
6.50	1.5	0.0712	0.9	0.0198						
7.00	1.6	0.0812	1.0	0.0225						
7.50	1.7	0.0918	1.0	0.0255						
8.00	1.9	0.1030	1.1	0.0286						
8.50	2.0	0.1147	1.2	0.0318						
9.00	2.1	0.1270	1.2	0.0352						
9.50	2.2	0.1399	1.3	0.0387						
10.00	2.3	0.1533	1.4	0.0424	0.7	0.0081	0.5	0.0037	0.3	0.0014

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
10.50	2.4	0.1672	1.4	0.0463	0.7	0.0089	0.5	0.0041	0.3	0.0015
11.00	2.6	0.1817	1.5	0.0503	0.7	0.0096	0.5	0.0044	0.4	0.0017
11.50	2.7	0.1968	1.6	0.0544	0.8	0.0104	0.6	0.0048	0.4	0.0018
12.00	2.8	0.2124	1.6	0.0587	0.8	0.0112	0.6	0.0051	0.4	0.0020
12.50	2.9	0.2285	1.7	0.0631	0.9	0.0121	0.6	0.0055	0.4	0.0021
13.00	3.0	0.2451	1.8	0.0677	0.9	0.0129	0.6	0.0059	0.4	0.0023
13.50	3.1	0.2623	1.8	0.0724	0.9	0.0138	0.7	0.0063	0.4	0.0024
14.00	3.3	0.2800	1.9	0.0773	1.0	0.0147	0.7	0.0068	0.5	0.0026
14.50	3.4	0.2982	2.0	0.0823	1.0	0.0157	0.7	0.0072	0.5	0.0027
15.00	3.5	0.3169	2.0	0.0874	1.0	0.0167	0.7	0.0076	0.5	0.0029
16.00	3.7	0.3558	2.2	0.0981	1.1	0.0187	0.8	0.0086	0.5	0.0032
17.00	4.0	0.3968	2.3	0.1094	1.2	0.0208	0.8	0.0095	0.6	0.0036
18.00	4.2	0.4398	2.4	0.1212	1.2	0.0231	0.9	0.0105	0.6	0.0040
19.00	4.4	0.4849	2.6	0.1335	1.3	0.0254	0.9	0.0116	0.6	0.0044
20.00	4.7	0.5318	2.7	0.1464	1.4	0.0278	1.0	0.0127	0.7	0.0048
21.00	4.9	0.5808	2.9	0.1598	1.4	0.0304	1.0	0.0139	0.7	0.0053
22.00	5.1	0.6317	3.0	0.1737	1.5	0.0330	1.1	0.0151	0.7	0.0057
23.00	5.3	0.6845	3.1	0.1882	1.6	0.0357	1.1	0.0163	0.8	0.0062
24.00	5.6	0.7393	3.3	0.2031	1.6	0.0385	1.2	0.0176	0.8	0.0067
25.00	5.8	0.7960	3.4	0.2186	1.7	0.0415	1.2	0.0189	0.8	0.0072
30.00	7.0	1.1077	4.1	0.3037	2.0	0.0575	1.5	0.0262	1.0	0.0099
35.00	8.1	1.4658	4.8	0.4013	2.4	0.0758	1.7	0.0346	1.1	0.0131
40.00	9.3	1.8694	5.4	0.5110	2.7	0.0964	2.0	0.0440	1.3	0.0166
45.00	10.5	2.3177	6.1	0.6327	3.1	0.1192	2.2	0.0543	1.5	0.0205
50.00			6.8	0.7663	3.4	0.1442	2.5	0.0657	1.6	0.0248
55.00			7.5	0.9114	3.7	0.1713	2.7	0.0780	1.8	0.0294
60.00			8.2	1.0680	4.1	0.2005	2.9	0.0913	2.0	0.0344
65.00			8.8	1.2359	4.4	0.2318	3.2	0.1055	2.1	0.0397
70.00			9.5	1.4151	4.8	0.2652	3.4	0.1206	2.3	0.0454
75.00			10.2	1.6054	5.1	0.3006	3.7	0.1366	2.5	0.0514
80.00			10.9	1.8067	5.4	0.3380	3.9	0.1536	2.6	0.0578
85.00					5.8	0.3774	4.2	0.1714	2.8	0.0645
90.00					6.1	0.4188	4.4	0.1902	2.9	0.0715
95.00					6.5	0.4621	4.7	0.2098	3.1	0.0789
100.00					6.8	0.5074	4.9	0.2303	3.3	0.0865
105.00					7.1	0.5546	5.2	0.2517	3.4	0.0945
110.00					7.5	0.6038	5.4	0.2739	3.6	0.1028
115.00					7.8	0.6548	5.6	0.2970	3.8	0.1115
120.00					8.2	0.7078	5.9	0.3209	3.9	0.1204
125.00					8.5	0.7627	6.1	0.3457	4.1	0.1297
130.00					8.8	0.8194	6.4	0.3714	4.3	0.1393
135.00					9.2	0.8780	6.6	0.3978	4.4	0.1492
140.00					9.5	0.9385	6.9	0.4251	4.6	0.1594

d [mm]	42		54		76.1		88.9		108	
di [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
145.00					9.9	1.0009	7.1	0.4533	4.7	0.1699
150.00					10.2	1.0651	7.4	0.4822	4.9	0.1807
160.00							7.9	0.5427	5.2	0.2033
170.00							8.3	0.6063	5.6	0.2270
180.00							8.8	0.6733	5.9	0.2520
190.00							9.3	0.7434	6.2	0.2781
200.00							9.8	0.8168	6.5	0.3054
210.00							10.3	0.8933	6.9	0.3339
220.00									7.2	0.3636
230.00									7.5	0.3944
240.00									7.8	0.4264
250.00									8.2	0.4595
300.00									9.8	0.6421
315.00									10.3	0.7024

5.2.12.4 Pressure loss Mapress Stainless Steel compressed air 12 bar

- Temperature: 20 °C
- Density: 14.448 kg/m³
- Viscosity: 0.0000171 Pa·s
- Surface roughness: 0.0015 mm

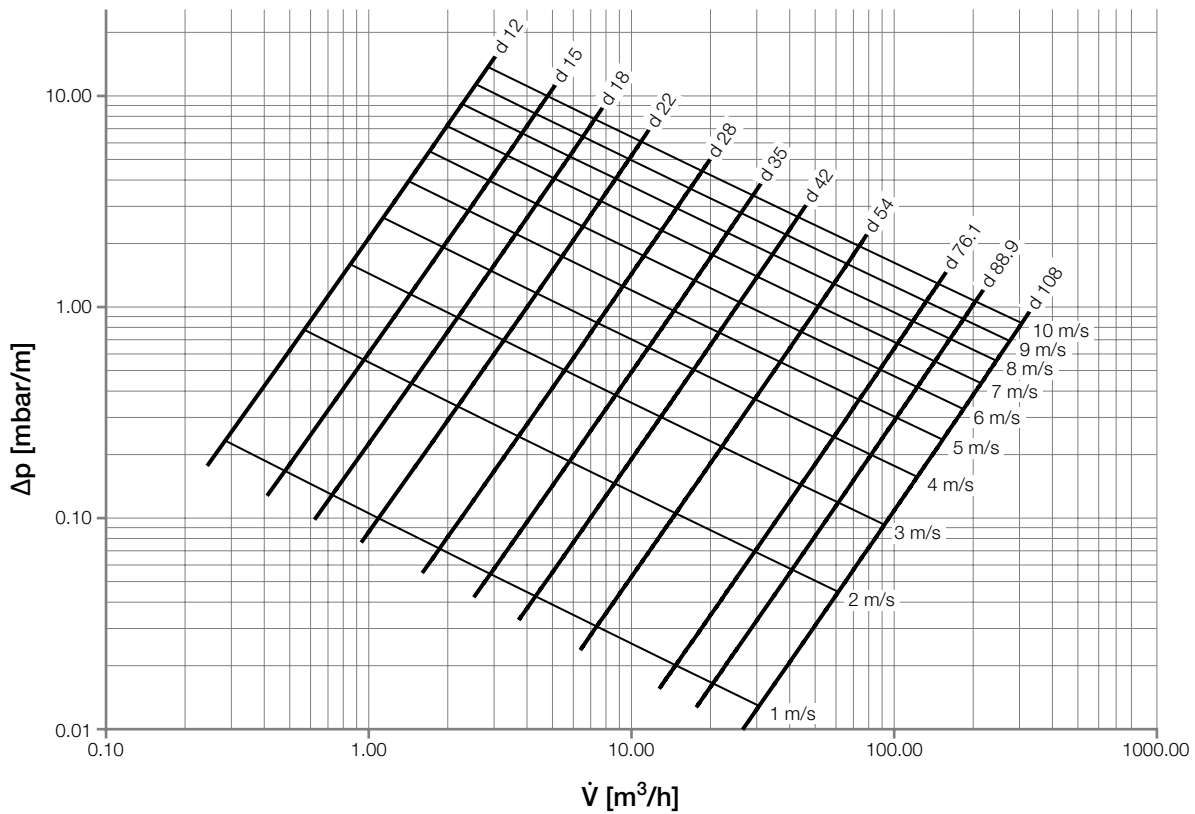


Figure 25: Pressure loss Mapress Stainless Steel compressed air 12 bar

Table 87: Pressure loss Mapress Stainless Steel compressed air 12 bar, depending on the volume flow, d 12 - d 35

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.9	0.1898	0.5	0.0549	0.3	0.0206	0.2	0.0079	0.1	0.0023	0.1	0.0008
0.50	1.8	0.6351	1.0	0.1823	0.7	0.0681	0.5	0.0260	0.3	0.0074	0.2	0.0026
0.75	2.7	1.2972	1.6	0.3708	1.0	0.1380	0.7	0.0526	0.4	0.0148	0.3	0.0052
1.00	3.5	2.1602	2.1	0.6155	1.4	0.2285	0.9	0.0870	0.5	0.0245	0.3	0.0085
1.25	4.4	3.2148	2.6	0.9137	1.7	0.3386	1.2	0.1286	0.7	0.0361	0.4	0.0125
1.50	5.3	4.4544	3.1	1.2632	2.1	0.4675	1.4	0.1773	0.8	0.0497	0.5	0.0172
1.75	6.2	5.8739	3.7	1.6625	2.4	0.6144	1.6	0.2328	0.9	0.0651	0.6	0.0225
2.00	7.1	7.4698	4.2	2.1104	2.8	0.7791	1.8	0.2949	1.1	0.0824	0.7	0.0285
2.25	8.0	9.2387	4.7	2.6060	3.1	0.9610	2.1	0.3635	1.2	0.1014	0.8	0.0350
2.50	8.8	11.1783	5.2	3.1485	3.5	1.1599	2.3	0.4383	1.3	0.1222	0.9	0.0421
2.75	9.7	13.2863	5.8	3.7370	3.8	1.3755	2.5	0.5194	1.5	0.1447	0.9	0.0499
3.00	10.6	15.5610	6.3	4.3710	4.1	1.6075	2.8	0.6065	1.6	0.1688	1.0	0.0581
3.25			6.8	5.0501	4.5	1.8557	3.0	0.6997	1.8	0.1946	1.1	0.0670
3.50			7.3	5.7736	4.8	2.1199	3.2	0.7988	1.9	0.2220	1.2	0.0764
3.75			7.8	6.5412	5.2	2.4000	3.5	0.9039	2.0	0.2510	1.3	0.0863
4.00			8.4	7.3526	5.5	2.6958	3.7	1.0147	2.2	0.2816	1.4	0.0968
4.50			9.4	9.1051	6.2	3.3340	4.1	1.2535	2.4	0.3475	1.6	0.1193
5.00			10.5	11.0289	6.9	4.0335	4.6	1.5150	2.7	0.4195	1.7	0.1439
5.50					7.6	4.7935	5.1	1.7987	3.0	0.4975	1.9	0.1706
6.00					8.3	5.6132	5.5	2.1044	3.2	0.5815	2.1	0.1992
6.50					9.0	6.4920	6.0	2.4319	3.5	0.6714	2.2	0.2299
7.00					9.7	7.4294	6.4	2.7808	3.8	0.7671	2.4	0.2625
7.50					10.4	8.4	6.9	3.1510	4.0	0.8685	2.6	0.2970
8.00							7.4	3.5424	4.3	0.9756	2.8	0.3334
8.50							7.8	3.9546	4.6	1.0883	2.9	0.3718
9.00							8.3	4.3876	4.9	1.2066	3.1	0.4120
9.50							8.7	4.8413	5.1	1.3304	3.3	0.4540
10.00							9.2	5.3154	5.4	1.4598	3.5	0.4979
10.50							9.7	5.8100	5.7	1.5945	3.6	0.5437
11.00							10.1	6.3248	5.9	1.7347	3.8	0.5912
11.50									6.2	1.8803	4.0	0.6405
12.00									6.5	2.0312	4.1	0.6917
12.50									6.7	2.1875	4.3	0.7446
13.00									7.0	2.3490	4.5	0.7993
13.50									7.3	2.5159	4.7	0.8557
14.00									7.6	2.6879	4.8	0.9139
14.50									7.8	2.8652	5.0	0.9738
15.00									8.1	3.0478	5.2	1.0355
16.00									8.6	3.4283	5.5	1.1640
17.00									9.2	3.8294	5.9	1.2994
18.00									9.7	4.2510	6.2	1.4415
19.00									10.3	4.6928	6.6	1.5904

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
20.00									10.8	5.1549	6.9	1.7460
21.00											7.3	1.9082
22.00											7.6	2.0770
23.00											7.9	2.2524
24.00											8.3	2.4344
25.00											8.6	2.6228
30.00											10.4	3.6617

Table 88: Pressure loss Mapress Stainless Steel compressed air 12 bar, depending on the volume flow, d 42 - d 108

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.0003	0.0	0.0001						
0.50	0.1	0.0010	0.1	0.0003						
0.75	0.2	0.0020	0.1	0.0006						
1.00	0.2	0.0033	0.1	0.0009						
1.25	0.3	0.0049	0.2	0.0014						
1.50	0.3	0.0067	0.2	0.0019						
1.75	0.4	0.0088	0.2	0.0025						
2.00	0.5	0.0111	0.3	0.0031						
2.25	0.5	0.0137	0.3	0.0038						
2.50	0.6	0.0164	0.3	0.0046						
2.75	0.6	0.0194	0.4	0.0054						
3.00	0.7	0.0226	0.4	0.0063						
3.25	0.8	0.0261	0.4	0.0073						
3.50	0.8	0.0297	0.5	0.0083						
3.75	0.9	0.0336	0.5	0.0093						
4.00	0.9	0.0376	0.5	0.0105						
4.50	1.0	0.0463	0.6	0.0129						
5.00	1.2	0.0559	0.7	0.0155						
5.50	1.3	0.0662	0.7	0.0184						
6.00	1.4	0.0772	0.8	0.0214						
6.50	1.5	0.0891	0.9	0.0247						
7.00	1.6	0.1016	1.0	0.0282						
7.50	1.7	0.1150	1.0	0.0318						
8.00	1.9	0.1290	1.1	0.0357						
8.50	2.0	0.1438	1.2	0.0398						
9.00	2.1	0.1593	1.2	0.0440						
9.50	2.2	0.1755	1.3	0.0485						
10.00	2.3	0.1924	1.4	0.0531	0.7	0.0101	0.5	0.0046	0.3	0.0018

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d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
10.50	2.4	0.2100	1.4	0.0580	0.7	0.0111	0.5	0.0051	0.3	0.0019
11.00	2.6	0.2282	1.5	0.0630	0.7	0.0120	0.5	0.0055	0.4	0.0021
11.50	2.7	0.2472	1.6	0.0682	0.8	0.0130	0.6	0.0060	0.4	0.0023
12.00	2.8	0.2669	1.6	0.0736	0.8	0.0140	0.6	0.0064	0.4	0.0024
12.50	2.9	0.2872	1.7	0.0792	0.9	0.0151	0.6	0.0069	0.4	0.0026
13.00	3.0	0.3082	1.8	0.0849	0.9	0.0162	0.6	0.0074	0.4	0.0028
13.50	3.1	0.3299	1.8	0.0909	0.9	0.0173	0.7	0.0079	0.4	0.0030
14.00	3.3	0.3522	1.9	0.0970	1.0	0.0184	0.7	0.0084	0.5	0.0032
14.50	3.4	0.3752	2.0	0.1033	1.0	0.0196	0.7	0.0090	0.5	0.0034
15.00	3.5	0.3989	2.0	0.1098	1.0	0.0209	0.7	0.0095	0.5	0.0036
16.00	3.7	0.4482	2.2	0.1233	1.1	0.0234	0.8	0.0107	0.5	0.0041
17.00	4.0	0.5000	2.3	0.1375	1.2	0.0261	0.8	0.0119	0.6	0.0045
18.00	4.2	0.5545	2.4	0.1524	1.2	0.0289	0.9	0.0132	0.6	0.0050
19.00	4.4	0.6115	2.6	0.1679	1.3	0.0318	0.9	0.0145	0.6	0.0055
20.00	4.7	0.6710	2.7	0.1842	1.4	0.0349	1.0	0.0159	0.7	0.0060
21.00	4.9	0.7330	2.9	0.2011	1.4	0.0381	1.0	0.0174	0.7	0.0066
22.00	5.1	0.7975	3.0	0.2187	1.5	0.0414	1.1	0.0189	0.7	0.0072
23.00	5.3	0.8646	3.1	0.2370	1.6	0.0448	1.1	0.0205	0.8	0.0077
24.00	5.6	0.9340	3.3	0.2559	1.6	0.0484	1.2	0.0221	0.8	0.0084
25.00	5.8	1.0060	3.4	0.2755	1.7	0.0521	1.2	0.0238	0.8	0.0090
30.00	7.0	1.4020	4.1	0.3833	2.0	0.0723	1.5	0.0330	1.0	0.0125
35.00	8.1	1.8577	4.8	0.5070	2.4	0.0955	1.7	0.0435	1.1	0.0164
40.00	9.3	2.3720	5.4	0.6463	2.7	0.1215	2.0	0.0553	1.3	0.0209
45.00	10.5	2.9440	6.1	0.8010	3.1	0.1504	2.2	0.0685	1.5	0.0258
50.00			6.8	0.9708	3.4	0.1821	2.5	0.0828	1.6	0.0312
55.00			7.5	1.1555	3.7	0.2164	2.7	0.0984	1.8	0.0370
60.00			8.2	1.3550	4.1	0.2535	2.9	0.1152	2.0	0.0433
65.00			8.8	1.5691	4.4	0.2932	3.2	0.1332	2.1	0.0501
70.00			9.5	1.7977	4.8	0.3356	3.4	0.1524	2.3	0.0573
75.00			10.2	2.0407	5.1	0.3805	3.7	0.1727	2.5	0.0649
80.00			10.9	2.2979	5.4	0.4281	3.9	0.1942	2.6	0.0730
85.00					5.8	0.4782	4.2	0.2169	2.8	0.0814
90.00					6.1	0.5309	4.4	0.2407	2.9	0.0903
95.00					6.5	0.5860	4.7	0.2656	3.1	0.0997
100.00					6.8	0.6437	4.9	0.2917	3.3	0.1094
105.00					7.1	0.7039	5.2	0.3189	3.4	0.1195
110.00					7.5	0.7666	5.4	0.3471	3.6	0.1301
115.00					7.8	0.8317	5.6	0.3765	3.8	0.1411
120.00					8.2	0.8993	5.9	0.4070	3.9	0.1524
125.00					8.5	0.9693	6.1	0.4386	4.1	0.1642
130.00					8.8	1.0417	6.4	0.4712	4.3	0.1764
135.00					9.2	1.1166	6.6	0.5049	4.4	0.1890
140.00					9.5	1.1938	6.9	0.5397	4.6	0.2019

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
145.00					9.9	1.2735	7.1	0.5756	4.7	0.2153
150.00					10.2	1.3556	7.4	0.6126	4.9	0.2291
160.00							7.9	0.6896	5.2	0.2578
170.00							8.3	0.7709	5.6	0.2880
180.00							8.8	0.8564	5.9	0.3198
190.00							9.3	0.9460	6.2	0.3531
200.00							9.8	1.0398	6.5	0.3879
210.00							10.3	1.1377	6.9	0.4243
220.00									7.2	0.4621
230.00									7.5	0.5014
240.00									7.8	0.5423
250.00									8.2	0.5846
300.00									9.8	0.8180
315.00									10.3	0.8951

5.2.13 Pressure loss Mapress Stainless Steel heating oil

- Density: 860 kg/m³
- Viscosity: 0.0034 Pa·s
- Surface roughness: 0.0015 mm

Table 89: Pressure loss Mapress Stainless Steel heating oil, depending on the volume flow, d 12 - d 35

d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.9	16.08	0.5	4.71	0.3	1.79	0.2	0.69	0.1	0.20	0.1	0.07
0.50	1.8	52.14	1.0	15.16	0.7	5.71	0.5	2.21	0.3	0.63	0.2	0.22
0.75	2.7	104.69	1.6	30.30	1.0	11.38	0.7	4.38	0.4	1.25	0.3	0.44
1.00	3.5	172.29	2.1	49.72	1.4	18.63	0.9	7.15	0.5	2.04	0.3	0.71
1.25	4.4	254.07	2.6	73.15	1.7	27.37	1.2	10.49	0.7	2.98	0.4	1.04
1.50	5.3	349.41	3.1	100.41	2.1	37.51	1.4	14.36	0.8	4.07	0.5	1.42
1.75	6.2	457.85	3.7	131.36	2.4	49.02	1.6	18.74	0.9	5.30	0.6	1.85
2.00	7.1	579.01	4.2	165.89	2.8	61.84	1.8	23.62	1.1	6.67	0.7	2.33
2.25	8.0	712.59	4.7	203.91	3.1	75.95	2.1	28.98	1.2	8.18	0.8	2.85
2.50	8.8	858.33	5.2	245.34	3.5	91.30	2.3	34.81	1.3	9.81	0.9	3.41
2.75	9.7	1016.02	5.8	290.12	3.8	107.89	2.5	41.11	1.5	11.58	0.9	4.03
3.00	10.6	1185.47	6.3	338.18	4.1	125.67	2.8	47.86	1.6	13.47	1.0	4.68
3.25			6.8	389.48	4.5	144.65	3.0	55.05	1.8	15.48	1.1	5.38
3.50			7.3	443.96	4.8	164.78	3.2	62.68	1.9	17.62	1.2	6.11
3.75			7.8	501.60	5.2	186.07	3.5	70.74	2.0	19.87	1.3	6.89
4.00			8.4	562.35	5.5	208.50	3.7	79.23	2.2	22.24	1.4	7.71
4.50			9.4	693.04	6.2	256.71	4.1	97.47	2.4	27.33	1.6	9.47
5.00			10.5	835.81	6.9	309.32	4.6	117.35	2.7	32.87	1.7	11.38
5.50					7.6	366.25	5.1	138.85	3.0	38.86	1.9	13.44
6.00					8.3	427.43	5.5	161.94	3.2	45.29	2.1	15.66
6.50					9.0	492.80	6.0	186.59	3.5	52.15	2.2	18.02
7.00					9.7	562.30	6.4	212.79	3.8	59.43	2.4	20.52
7.50					10.4	635.89	6.9	240.50	4.0	67.12	2.6	23.17
8.00							7.4	269.72	4.3	75.23	2.8	25.95
8.50							7.8	300.43	4.6	83.75	2.9	28.88
9.00							8.3	332.61	4.9	92.67	3.1	31.94
9.50							8.7	366.25	5.1	101.99	3.3	35.14
10.00							9.2	401.33	5.4	111.71	3.5	38.47
10.50							9.7	437.85	5.7	121.81	3.6	41.94
11.00							10.1	475.79	5.9	132.31	3.8	45.53
11.50									6.2	143.19	4.0	49.26
12.00									6.5	154.45	4.1	53.12
12.50									6.7	166.10	4.3	57.11
13.00									7.0	178.12	4.5	61.22
13.50									7.3	190.51	4.7	65.46
14.00									7.6	203.28	4.8	69.83
14.50									7.8	216.41	5.0	74.33

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d [mm]	12		15		18		22		28		35	
d _i [mm]	10		13		16		19.6		25.6		32	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
15.00									8.1	229.92	5.2	78.94
16.00									8.6	258.02	5.5	88.55
17.00									9.2	287.57	5.9	98.65
18.00									9.7	318.56	6.2	109.23
19.00									10.3	350.97	6.6	120.29
20.00									10.8	384.79	6.9	131.82
21.00											7.3	143.83
22.00											7.6	156.31
23.00											7.9	169.25
24.00											8.3	182.65
25.00											8.6	196.51
30.00											10.4	272.58

Table 90: Pressure loss Mapress Stainless Steel heating oil, depending on the volume flow, d 42 - d 108

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
0.25	0.1	0.03	0.0	0.01						
0.50	0.1	0.09	0.1	0.03						
0.75	0.2	0.17	0.1	0.05						
1.00	0.2	0.28	0.1	0.08						
1.25	0.3	0.41	0.2	0.12						
1.50	0.3	0.56	0.2	0.16						
1.75	0.4	0.73	0.2	0.21						
2.00	0.5	0.92	0.3	0.26						
2.25	0.5	1.12	0.3	0.32						
2.50	0.6	1.34	0.3	0.38						
2.75	0.6	1.58	0.4	0.45						
3.00	0.7	1.84	0.4	0.52						
3.25	0.8	2.11	0.4	0.59						
3.50	0.8	2.40	0.5	0.67						
3.75	0.9	2.70	0.5	0.76						
4.00	0.9	3.02	0.5	0.85						
4.50	1.0	3.70	0.6	1.04						
5.00	1.2	4.45	0.7	1.25						
5.50	1.3	5.25	0.7	1.47						
6.00	1.4	6.11	0.8	1.71						
6.50	1.5	7.03	0.9	1.97						
7.00	1.6	8.01	1.0	2.24						
7.50	1.7	9.03	1.0	2.53						

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
8.00	1.9	10.12	1.1	2.83						
8.50	2.0	11.25	1.2	3.14						
9.00	2.1	12.44	1.2	3.47						
9.50	2.2	13.68	1.3	3.82						
10.00	2.3	14.98	1.4	4.18	0.7	0.81	0.5	0.37	0.3	0.14
10.50	2.4	16.32	1.4	4.55	0.7	0.88	0.5	0.40	0.3	0.15
11.00	2.6	17.72	1.5	4.94	0.7	0.95	0.5	0.44	0.4	0.17
11.50	2.7	19.16	1.6	5.34	0.8	1.03	0.6	0.47	0.4	0.18
12.00	2.8	20.66	1.6	5.75	0.8	1.11	0.6	0.51	0.4	0.20
12.50	2.9	22.20	1.7	6.18	0.9	1.19	0.6	0.55	0.4	0.21
13.00	3.0	23.80	1.8	6.62	0.9	1.28	0.6	0.59	0.4	0.22
13.50	3.1	25.44	1.8	7.08	0.9	1.36	0.7	0.63	0.4	0.24
14.00	3.3	27.13	1.9	7.55	1.0	1.45	0.7	0.67	0.5	0.26
14.50	3.4	28.87	2.0	8.03	1.0	1.54	0.7	0.71	0.5	0.27
15.00	3.5	30.66	2.0	8.52	1.0	1.64	0.7	0.75	0.5	0.29
16.00	3.7	34.38	2.2	9.55	1.1	1.84	0.8	0.84	0.5	0.32
17.00	4.0	38.28	2.3	10.63	1.2	2.04	0.8	0.94	0.6	0.36
18.00	4.2	42.37	2.4	11.76	1.2	2.26	0.9	1.04	0.6	0.40
19.00	4.4	46.65	2.6	12.94	1.3	2.48	0.9	1.14	0.6	0.43
20.00	4.7	51.10	2.7	14.17	1.4	2.72	1.0	1.25	0.7	0.48
21.00	4.9	55.74	2.9	15.45	1.4	2.96	1.0	1.36	0.7	0.52
22.00	5.1	60.56	3.0	16.78	1.5	3.22	1.1	1.48	0.7	0.56
23.00	5.3	65.55	3.1	18.16	1.6	3.48	1.1	1.60	0.8	0.61
24.00	5.6	70.72	3.3	19.59	1.6	3.75	1.2	1.72	0.8	0.65
25.00	5.8	76.07	3.4	21.06	1.7	4.03	1.2	1.85	0.8	0.70
30.00	7.0	105.39	4.1	29.13	2.0	5.57	1.5	2.55	1.0	0.97
35.00	8.1	138.92	4.8	38.36	2.4	7.32	1.7	3.35	1.1	1.27
40.00	9.3	176.58	5.4	48.70	2.7	9.28	2.0	4.25	1.3	1.61
45.00	10.5	218.27	6.1	60.13	3.1	11.44	2.2	5.24	1.5	1.99
50.00			6.8	72.64	3.4	13.81	2.5	6.32	1.6	2.39
55.00			7.5	86.20	3.7	16.37	2.7	7.48	1.8	2.84
60.00			8.2	100.80	4.1	19.12	2.9	8.74	2.0	3.31
65.00			8.8	116.43	4.4	22.07	3.2	10.08	2.1	3.82
70.00			9.5	133.07	4.8	25.21	3.4	11.51	2.3	4.36
75.00			10.2	150.71	5.1	28.53	3.7	13.02	2.5	4.93
80.00			10.9	169.34	5.4	32.03	3.9	14.62	2.6	5.53
85.00					5.8	35.72	4.2	16.30	2.8	6.16
90.00					6.1	39.58	4.4	18.06	2.9	6.82
95.00					6.5	43.63	4.7	19.90	3.1	7.52
100.00					6.8	47.85	4.9	21.82	3.3	8.24
105.00					7.1	52.25	5.2	23.82	3.4	8.99
110.00					7.5	56.82	5.4	25.90	3.6	9.78
115.00					7.8	61.56	5.6	28.05	3.8	10.59

d [mm]	42		54		76.1		88.9		108	
d _i [mm]	39		51		72.1		84.9		104	
\dot{V} [m ³ /h]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]	v [m/s]	Δp [mbar/m]
120.00					8.2	66.48	5.9	30.29	3.9	11.43
125.00					8.5	71.56	6.1	32.60	4.1	12.30
130.00					8.8	76.82	6.4	34.99	4.3	13.19
135.00					9.2	82.24	6.6	37.45	4.4	14.12
140.00					9.5	87.83	6.9	39.99	4.6	15.08
145.00					9.9	93.59	7.1	42.60	4.7	16.06
150.00					10.2	99.52	7.4	45.29	4.9	17.07
160.00							7.9	50.89	5.2	19.17
170.00							8.3	56.79	5.6	21.39
180.00							8.8	62.98	5.9	23.71
190.00							9.3	69.45	6.2	26.14
200.00							9.8	76.22	6.5	28.68
210.00							10.3	83.27	6.9	31.32
220.00									7.2	34.07
230.00									7.5	36.92
240.00									7.8	39.88
250.00									8.2	42.94
300.00									9.8	59.77

5.2.14 Equivalent pipe length Mapress Stainless Steel

- Equivalent pipe length [m]
- $v = 2 \text{ m/s}$

Table 91: Equivalent pipe length Mapress Stainless Steel, d 12 - d 28







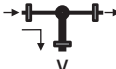

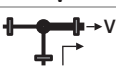

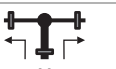







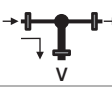
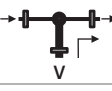
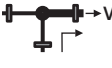
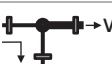
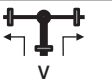
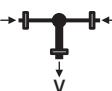















Designation	Pressfitting	Loss coefficient ζ	Dimensions d x s [mm]				
			12 x 1.0	15 x 1.0	18 x 1.0	22 x 1.2	28 x 1.2
Bend 90°		0.7	0.267	0.370	0.479	0.615	0.854
Elbow adapter 90°		1.5	0.572	0.793	1.026	1.318	1.829
Pipe bridge		0.5	0.191	0.264	0.342	0.439	0.610
Bend 45°		0.5	0.191	0.264	0.342	0.439	0.610
Reducer		0.2	-	0.106	0.137	0.176	0.244
Sleeve / Adapter		0.1	0.038	0.053	0.068	0.088	0.122
T-piece (flow separation)		1.3	0.496	0.688	0.889	1.142	1.585
T-piece (flow integration)		0.9	0.343	0.476	0.616	0.791	1.097
T-piece (through-flow for flow integration)		0.3	0.114	0.159	0.205	0.264	0.366
T-piece (through-flow for flow separation)		0.2	0.076	0.106	0.137	0.176	0.244
T-piece (counterflow for flow integration)		3.0	1.145	1.587	2.052	2.636	3.658
T-piece (counterflow for flow separation)		1.5	0.572	0.793	1.026	1.318	1.829

Table 92: Equivalent pipe length Mapress Stainless Steel, d 35 - d 108

Designation	Pressfitting	Loss coefficient ζ	Dimensions d x s [mm]					
			35 x 1.5	42 x 1.5	54 x 1.5	76.1 x 2.0	88.9 x 2.0	108 x 2.0
Bend 90°		0.7	1.121	1.427	1.975	-	-	-
Elbow adapter 90°		1.5	2.403	3.057	4.232	-	-	-
Pipe bridge		0.5	-	-	-	-	-	-
Bend 45°		0.5	0.801	1.019	1.411	2.142	2.607	3.325
Reducer		0.2	0.320	0.408	0.564	0.857	1.043	1.330
Sleeve / Adapter		0.1	0.160	0.204	0.282	0.428	0.521	0.665
T-piece (flow separation)		1.3	2.082	2.649	3.668	5.570	6.779	8.646
T-piece (flow integration)		0.9	1.442	1.834	2.539	3.856	4.693	5.985
T-piece (through-flow for flow integration)		0.3	0.481	0.611	0.846	1.285	1.564	1.995
T-piece (through-flow for flow separation)		0.2	0.320	0.408	0.564	0.857	1.043	1.330
T-piece (counterflow for flow integration)		3.0	4.805	6.114	8.465	12.855	15.644	19.951
T-piece (counterflow for flow separation)		1.5	2.403	3.057	4.232	6.427	7.822	9.976

5.2.15 Pressure loss coefficients ζ Mapress pressfittings

Table 93: Pressure loss coefficients ζ Mapress pressfittings

Designation	Pressfitting	Pressure loss coefficient ζ	TW	H	G
Bend 90°		0.7	X	X	X
Elbow adapters		1.5		X	
Pipe bridge		0.5	X	X	X
Bend 45°		0.5	X	X	X
Reducer		0.2	X	X	X
Sleeve / Adapter		0.1	X	X	X
T-piece (flow separation)		1.3	X	X	X
T-piece (flow integration)		0.9	X	X	X
T-piece (through-flow for flow separation)		0.3	X	X	X
T-piece (through-flow for flow integration)		0.2	X	X	X
T-piece (counterflow for flow separation)		1.5	X	X	X
T-piece (counterflow for flow integration)		3.0	X	X	X
Cross piece 30° (through-flow)		0.3		X	
Pipe cross 30° (flow separation)		1.3		X	
Pipe cross 30° (flow integration)		0.9		X	

Designation	Pressfitting	Pressure loss coefficient ζ	TW	H	G
Pipe cross 90° (through-flow)		0.2		X	
Pipe cross 90° (flow separation)		1.7		X	
Pipe cross 90° (flow integration)		1.3		X	

TW: Drinking water installation

H: Heating installations

G: Gas installation

Table 94: Pressure loss coefficients ζ Mapress pressfittings, radiator connectors

Designation	Pressfitting	d [mm]	Pressure loss coefficient			
			D ₁ - ζ	D ₂ - ζ	V ₁	V ₂
Radiator connectors copper						
With clamping ring union for inlet and return flow		15 - 15 18 - 15 22 - 15	3.0	1.0	1.8	2.3
For inlet and return flow		15 - 15 18 - 15 22 - 15	3.0	1.0	1.5	2.0
For inlet flow		15 - 15 18 - 15 22 - 15	3.0	1.0	-	1.5
Radiator connectors carbon steel						
With clamping ring union for inlet and return flow		15 - 15 18 - 15 22 - 15	5.0	3.0	8.0	10.0
For inlet and return flow		15 - 15 18 - 15 22 - 15 28 - 15	5.0	3.0	6.0	8.0
For return flow		15 - 15 18 - 15 22 - 15 28 - 15	2.0	2.5	-	8.0