

Hydraulic balancing

Heizung Hydraulikreport

Dendrit 

Project cover sheet

Project and real property

Project number	1
Project name	Demoprojekt
Creation date	
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Country	Deutschland

Designer

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Versions

Date	
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Basis of the report

The hydraulic report was created from the following drawing: 'Heizung Hydraulikreport'

Standards used

The heating surfaces were determined on the basis of the following regulations:

DIN 4703-3

Space heaters Part 3: Conversion of standardised heat power

DIN EN 1264

Room surface-integrated heating and cooling systems with water flow

VDI 6030 Blatt 1

Design of free room heating surfaces - Basics - Design of room radiators

The heating pipe network was calculated on the basis of the following regulations:

VDI 2073

Hydraulics in technical building equipment systems - Hydraulic circuits

VDI 2072

Flow-through drinking water heating with water/water heat exchanger

VDMA 24199

Control engineering requirements for hydraulics in the planning and execution of heating, cooling, drinking water and ventilation systems

Maximum permissible flow velocities and pressure drops

Network section	v_s m/s	R_m hPa/m
Consumer section	0.50	1.00
Distribution section	0.70	1.00
Producer section	1.00	1.00

Valve authorities

Min	Max	unfavourable.
Strangarmaturen		
20	70	20
Thermostatventile		
30	70	30

Preset return screw connection: **X**

Warning for residual pressure greater than: 50 hPa

XP tape: 2K

Heating fluid options

Fluid	Water
Specific heat capacity	4.19 kJ/(kg*K)
Density	988 kg/m ³
Kinematic viscosity	0.550 mm ² /s
Thermal conductivity	0.641 W/(m*K)

Presetting pipes / insulation

Section type	Pipe sequence	Insulation	λ_D W/(m·K)
VL			
Producer pipe	Geberit - Mapress Therm	100% - Rock wool - aluminium-laminated	
Distribution pipework	Geberit - Mapress carbon steel	100% - Rock wool - aluminium-laminated	
Riser/downpipe	Geberit - Mapress carbon steel	100% - Rock wool - aluminium-laminated	
Floor pipework	Geberit - FlowFit (roll)	100% - Pipe insulation	
Connection pipe	Geberit - FlowFit (roll)	100% - Pipe insulation	
RL			
Producer pipe	Geberit - Mapress Therm	100% - Rock wool - aluminium-laminated	
Distribution pipework	Geberit - Mapress carbon steel	100% - Rock wool - aluminium-laminated	
Riser/downpipe	Geberit - Mapress carbon steel	100% - Rock wool - aluminium-laminated	
Floor pipework	Geberit - FlowFit (roll)	100% - Pipe insulation	
Connection pipe	Geberit - FlowFit (roll)	100% - Pipe insulation	
KVL			
Producer pipe	Geberit - Mapress Therm	100% - Rock wool - aluminium-laminated	
Distribution pipework	Geberit - Mapress carbon steel	100% - Rock wool - aluminium-laminated	
Riser/downpipe	Geberit - Mapress carbon steel	100% - Rock wool - aluminium-laminated	
Floor pipework	Geberit - FlowFit (roll)	100% - Pipe insulation	
Connection pipe	Geberit - FlowFit (roll)	100% - Pipe insulation	
KRL			
Producer pipe	Geberit - Mapress Therm	100% - Rock wool - aluminium-laminated	
Distribution pipework	Geberit - Mapress carbon steel	100% - Rock wool - aluminium-laminated	
Riser/downpipe	Geberit - Mapress carbon steel	100% - Rock wool - aluminium-laminated	
Floor pipework	Geberit - FlowFit (roll)	100% - Pipe insulation	
Connection pipe	Geberit - FlowFit (roll)	100% - Pipe insulation	
EH			
Floor pipework	Geberit - FlowFit (roll)	100% - Pipe insulation	

Pipe series used

DN	d _a	d _i	s _R	k	Delivery length	Curved
DN	mm	mm	mm	mm	m	
Geberit - Mapress Therm						
25	28.0	25.6	1.2	0.0015	6	✗
Geberit - Mapress carbon steel						
10	12.0	9.6	1.2	0.0100	6	✗
20	22.0	19.0	1.5	0.0100	6	✗
25	28.0	25.0	1.5	0.0100	6	✗
Geberit - FlowFit						
25	32.0	26.4	2.8	0.0070	5	✗
Geberit - FlowFit (roll)						
12	16.0	12.0	2.0	0.0070	50	✓
15	20.0	16.0	2.0	0.0070	50	✓
20	25.0	20.0	2.5	0.0070	50	✓

Message list

Drawing

-  In the pipe network, 47 of 51 distribution lines have not yet been edited.
-  Alle Bauteile wurden entsprechend ihrer Fließrichtung eingezeichnet.

Hydraulics

-  The residual pressure of 50 hPa set in the options is exceeded (53 hPa).
-  The residual pressure of 50 hPa set in the options is exceeded (54 hPa).
-  The residual pressure of 50 hPa set in the options is exceeded (53 hPa).
-  The residual pressure of 50 hPa set in the options is exceeded (54 hPa).
-  All balancing valves are within the authority range of 20-70%.
-  The heat generator covers 21% of the maximum demand.
-  All thermostatic valves are within the authority range of 30-70%.

RV data network no: 1 - PU 6

Flow path number	Pump pressure	Pressure loss piping					Pressure loss Installation parts					Total without reg	Pressure loss control valves				Residual pressure
		Pipe length	Available pipe friction gradient	Share of pipe friction	Share of individual resistance	Total from pipework	WMZ	Mixer	Filter	Consumers	Total built-in parts		Thermostatic valve	Return fitting	Control unit	Sum of control elements	
	P erf	I	R availab	I-R	Z	$\Sigma(I-R+Z)$	ΔP WMZ	ΔP MIX	ΔP FIL	ΔP VERB	ΔP	ΔP without reg	ΔP THV	ΔP RLV	ΔP RGV	ΔP Abgl.	ΔP Remain
	hPa	m	hPa/m	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa
1	381	73.1	2.5	84	97	180	0	25	0	100	125	305	0	0	76	76	0
2	381	73.1	2.5	84	97	180	0	25	0	100	125	305	0	0	76	76	0
3	381	73.1	2.5	84	97	180	0	25	0	100	125	305	0	0	76	76	0
4	381	79.9	3.0	92	101	193	0	25	0	1	26	219	41	3	76	119	43
5	381	75.9	3.1	89	102	191	0	25	0	1	26	217	41	3	76	119	45
6	381	74.3	3.2	89	100	190	0	25	0	1	26	215	41	3	76	119	47
7	381	70.3	3.4	86	101	187	0	25	0	1	26	213	41	3	76	119	49
8	381	71.9	3.3	87	100	187	0	25	0	1	26	213	41	3	76	119	49
9	381	66.3	3.6	84	100	183	0	25	0	1	26	209	41	3	76	119	53
10	381	68.7	3.4	83	99	183	0	25	0	1	26	208	41	3	76	119	54
11	381	64.7	3.1	80	100	181	0	25	0	1	26	206	73	3	76	152	23
12	381	60.7	3.4	78	99	176	0	25	0	1	26	202	73	3	76	152	27

RV data network no: 2 - PU 5

Flow path number	Pump pressure	Pressure loss piping					Pressure loss Installation parts					Total without reg	Pressure loss control valves				Residual pressure
		Pipe length	Available pipe friction gradient	Share of pipe friction	Share of individual resistance	Total from pipework	WMZ	Mixer	Filter	Consumers	Total built-in parts		Thermostatic valve	Return fitting	Control unit	Sum of control elements	
	P erf	I	R availab	I-R	Z	$\Sigma(I-R+Z)$	ΔP WMZ	ΔP MIX	ΔP FIL	ΔP VERB	ΔP	ΔP without reg	ΔP THV	ΔP RLV	ΔP RGV	ΔP Abgl.	ΔP Remain
	hPa	m	hPa/m	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa
13	348	59.5	2.7	66	93	159	0	19	0	100	119	278	0	0	69	69	0
14	348	59.5	2.7	66	93	159	0	19	0	100	119	278	0	0	69	69	0
15	348	59.5	2.7	66	93	159	0	19	0	100	119	278	0	0	69	69	0
16	348	66.3	3.2	75	97	172	0	19	0	1	20	192	41	3	69	113	43
17	348	62.3	3.5	72	98	170	0	19	0	1	20	190	41	3	69	113	45
18	348	60.7	3.5	72	97	169	0	19	0	1	20	188	41	3	69	113	47
19	348	56.7	3.8	69	98	166	0	19	0	1	20	186	41	3	69	113	49
20	348	58.3	3.7	69	97	166	0	19	0	1	20	186	41	3	69	113	49
21	348	52.7	4.1	66	96	162	0	19	0	1	20	182	41	3	69	113	53
22	348	55.1	3.9	66	96	162	0	19	0	1	20	181	41	3	69	113	54
23	348	51.1	3.6	63	97	159	0	19	0	1	20	179	73	3	69	145	23
24	348	47.1	3.9	60	95	155	0	19	0	1	20	175	73	3	69	145	27

RV data network no: 3 - PU 2

Flow path number	Pump pressure	Pressure loss piping					Pressure loss Installation parts					Total without reg	Pressure loss control valves				Residual pressure
		Pipe length	Available pipe friction gradient	Share of pipe friction	Share of individual resistance	Total from pipework	WMZ	Mixer	Filter	Consumers	Total built-in parts		Thermostatic valve	Return fitting	Control unit	Sum of control elements	
	P erf	I	R availab	I-R	Z	$\Sigma(I-R+Z)$	ΔP WMZ	ΔP MIX	ΔP FIL	ΔP VERB	ΔP	ΔP without reg	ΔP THV	ΔP RLV	ΔP RGV	ΔP Abgl.	ΔP Remain
	hPa	m	hPa/m	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa
25	271	51.7	3.0	56	98	154	0	19	0	1	20	174	41	3	54	97	0
26	271	57.3	2.7	56	97	153	0	19	0	1	20	173	41	3	54	97	1
27	271	47.7	3.2	53	99	152	0	19	0	1	20	172	41	3	54	97	2
28	271	53.3	2.9	53	98	151	0	19	0	1	20	170	41	3	54	97	3
29	271	46.1	3.3	53	98	150	0	19	0	1	20	170	41	3	54	97	4
30	271	42.1	3.7	50	98	148	0	19	0	1	20	168	41	3	54	97	6
31	271	43.7	3.5	50	98	148	0	19	0	1	20	167	41	3	54	97	6
32	271	49.3	3.1	50	97	147	0	19	0	1	20	167	41	3	54	97	7
33	271	38.1	4.0	47	97	144	0	19	0	1	20	164	41	3	54	97	10
34	271	40.5	3.8	47	97	143	0	19	0	1	20	163	41	3	54	97	10
35	271	36.5	4.2	44	98	141	0	19	0	1	20	161	41	3	54	97	13
36	271	32.5	4.7	41	96	137	0	19	0	1	20	157	41	3	54	97	17

RV data network no: 4 - PU 3

Flow path number	Pump pressure	Pressure loss piping					Pressure loss Installation parts					Total without reg	Pressure loss control valves				Residual pressure
		Pipe length	Available pipe friction gradient	Share of pipe friction	Share of total resistance	Total from pipework	WMZ	Mixer	Filter	Consumers	Total built-in parts		Thermostatic valve	Return fitting	Control unit	Sum of control elements	
	P erf	I	R availab	I-R	Z	$\Sigma(I-R+Z)$	ΔP WMZ	ΔP MIX	ΔP FIL	ΔP VERB	ΔP	ΔP without reg	ΔP THV	ΔP RLV	ΔP RGV	ΔP Abgl.	ΔP Remain
	hPa	m	hPa/m	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa
37	203	51.0	2.1	49	60	109	0	0	0	1	1	110	41	3	50	93	0
38	203	45.4	2.4	47	61	108	0	0	0	1	1	109	41	3	50	93	1
39	203	47.0	2.3	46	61	107	0	0	0	1	1	108	41	3	50	93	2
40	203	41.4	2.6	44	62	106	0	0	0	1	1	107	41	3	50	93	3
41	203	39.8	2.7	44	61	105	0	0	0	1	1	106	41	3	50	93	4
42	203	35.8	3.0	41	61	102	0	0	0	1	1	103	41	3	50	93	7
43	203	41.0	2.7	42	60	102	0	0	0	1	1	102	41	3	50	93	7
44	203	35.4	3.1	40	61	101	0	0	0	1	1	101	41	3	50	93	9
45	203	34.2	3.2	38	60	98	0	0	0	1	1	99	41	3	50	93	11
46	203	29.8	3.7	37	60	97	0	0	0	1	1	98	41	3	50	93	12
47	203	30.2	3.6	35	61	96	0	0	0	1	1	96	41	3	50	93	14
48	203	24.2	4.5	31	59	90	0	0	0	1	1	91	41	3	50	93	19

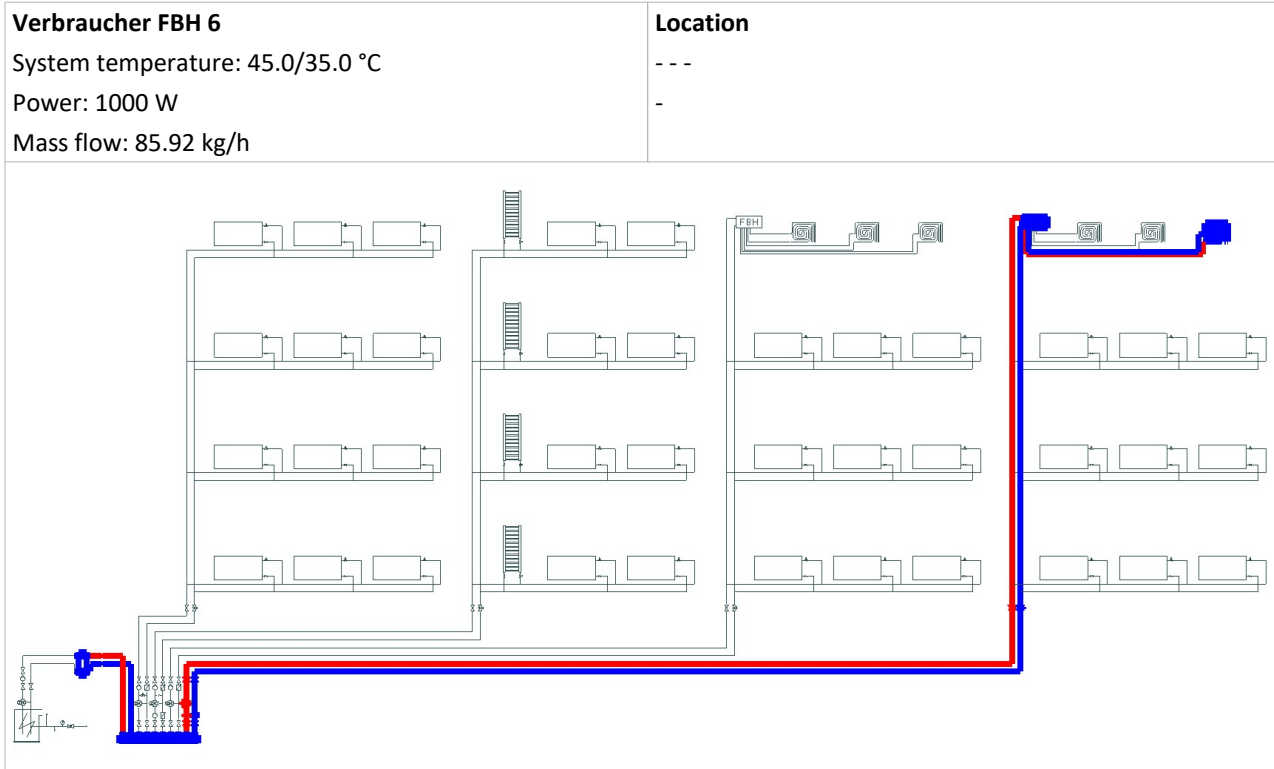
RV data network no: 5 - PU 4

Flow path number	Pump pressure	Pressure loss piping					Pressure loss Installation parts					Total without control valves	Pressure loss control valves				Residual pressure
		Pipe length	Available pipe friction gradient	Share of pipe friction	Share of total resistance	Total from pipework	WMZ	Mixer	Filter	Consumers	Total built-in parts		Thermostatic valve	Return fitting	Control unit	Sum of control elements	
	P erf	I	R availab	I-R	Z	$\Sigma(I \cdot R + Z)$	ΔP WMZ	ΔP MIX	ΔP FIL	ΔP VERB	ΔP	ΔP without reg	ΔP THV	ΔP RLV	ΔP RGV	ΔP Abgl.	ΔP Remain
	hPa	m	hPa/m	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa
49	83	7.3	8.0	9	49	58	0	25	0	0	25	83	0	0	0	0	0

RV data network no: 6 - PU 1

Flow path number	Pump pressure	Pressure loss piping					Pressure loss Installation parts					Total without control valves	Pressure loss control valves			Sum of control elements	Residual pressure
		Pipe length	Available pipe friction gradient	Share of pipe friction	Share of total resistance	Total from pipework	WMZ	Mixer	Filter	Consumers	Total built-in parts		Thermostatic valve	Return fitting	Control unit		
	P erf	I	R availab	I-R	Z	$\Sigma(I \cdot R + Z)$	ΔP WMZ	ΔP MIX	ΔP FIL	ΔP VERB	ΔP	ΔP without reg	ΔP THV	ΔP RLV	ΔP RGV	ΔP Abgl.	ΔP Remain
	hPa	m	hPa/m	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa	hPa
50	82	6.3	9.9	7	56	63	0	19	0	0	19	82	0	0	0	0	0

Flow path data sheet of flow path no. 1



TS. no.	Designation		Transfer circuit	Complete circuit	Unit
	Required pressure difference	p_{perf}	116	381	hPa
	Pipe length	l	19.4	73.1	m
	Available pipe friction pressure gradient	R_{verf}	0.8	2.5	hPa/m
	Share of pipe friction	l · R	14	84	hPa
	Proportion of individual resistances	Z	2	97	hPa
	Σ Pipework	Σ (l · R + Z)	16	180	hPa
	Heat meter	ΔP_{WMZ}	0	0	hPa
3	3-way fitting	ΔP_{MISCH}	0	25	hPa
	Filters/dirt traps	ΔP_{FIL}	0	0	hPa
11	Consumers	ΔP_{VERB}	100	100	hPa
	Σ Installation parts	ΔP_{Einbau}	100	125	hPa
	Pressure loss without control elements	Δp_{ohne REG}	116	305	hPa
	Thermostatic valve	ΔP_{THV}	0	0	hPa
	Return fitting	ΔP_{RLV}	0	0	hPa
17	Control unit	ΔP_{RGV}	0	76	hPa
	Unbalanced residual pressure	Δp_{Rest}	0	0	hPa

Section table for flow path no. 1

TS-Nr.	l	Mass flow	Temp.	DN	d _i	D	v	R	l·R	Σζ	Z	Σ(l·R+Z)
-	m	kg/h	°C	-	mm	%	m/s	hPa/m	hPa	-	hPa	hPa
1	0.40	859.2	45.0	25	25.0	121	0.49	1.3	0.5	0.3	0.3	0.9
2	2.33	859.2	45.0	25	25.0	121	0.49	1.3	3.0	0.9	1.0	4.0
3	0.70	859.2	45.0	25	25.0	121	0.49	1.3	0.9	15.3	18.3	19.3
4	21.80	859.2	45.0	25	25.0	121	0.49	1.3	28.2	15.8	19.1	47.3
5	1.50	859.2	45.0	25	25.0	121	0.49	1.3	1.9	5.6	6.8	8.7
6	0.50	859.2	45.0	25	25.0	121	0.49	1.3	0.6	0.0	0.0	0.6
7	2.80	773.3	45.0	25	25.0	121	0.44	1.1	3.0	0.2	0.2	3.2
8	2.80	515.5	45.0	25	25.0	121	0.29	0.5	1.5	0.2	0.1	1.5
9	3.60	257.8	45.0	20	19.0	136	0.25	0.6	2.1	0.5	0.2	2.3
10	0.20	257.8	45.0	20	19.0	136	0.25	0.6	0.1	0.0	0.0	0.1
11	0.00	85.9	45.0	20	20.0		0.08	0.1	0.0	0.0	0.0	0.0
12	0.00	85.9	35.0	20	20.0		0.08	0.1	0.0	0.0	0.0	0.0
13	3.60	257.8	35.0	20	19.0	136	0.25	0.6	2.1	0.7	0.2	2.3
14	2.80	515.5	35.0	25	25.0	121	0.29	0.5	1.5	0.8	0.3	1.8
15	2.80	773.3	35.0	25	25.0	121	0.44	1.1	3.0	0.8	0.7	3.8
16	0.30	859.2	35.0	25	25.0	121	0.49	1.3	0.4	0.0	0.0	0.4
17	1.70	859.2	35.0	25	25.0	121	0.49	1.3	2.2	0.4	0.5	2.7
18	21.60	859.2	35.0	25	25.0	121	0.49	1.3	28.0	18.2	21.9	49.9
19	0.70	859.2	35.0	25	25.0	121	0.49	1.3	0.9	21.1	25.4	26.3
20	0.00	859.2	35.0	25	25.0		0.49	1.3	0.0	0.4	0.5	0.5
21	2.53	859.2	35.0	25	25.0	121	0.49	1.3	3.3	0.3	0.4	3.7
22	0.40	859.2	35.0	25	25.0	121	0.49	1.3	0.5	0.4	0.5	1.0

Section list

TS no.	Quantity	Designation	ζ	Σζ
-	Pieces	-	-	-
	1	Reflex SINUS Hydraulische Weiche 160/80 DN65/PN6	0.0	0.0
	1	Geberit Mapress Carbon Steel flange PN 10/16, with pressing socket: d=76.1mm, DN=65	0.1	0.1
	1	Geberit Mapress Carbon Steel reducer with plain end: d=76.1mm, d1=42mm	0.1	0.1
	1	Geberit Mapress Carbon Steel reducer with plain end: d=42mm, d1=28mm	0.1	0.1
1				0.3
	1	Geberit Mapress Carbon Steel bend: 90°, d=28mm	0.3	0.3
	1	Geberit Mapress Carbon Steel adaptor with female thread: d=28mm, Rp=1/2"	0.1	0.1
	1	Threaded connector DN15	0.0	0.0
	1	Dual-chamber distributor 4-fold 120/080	0.4	0.4
2				0.9
	1	Dual-chamber distributor 4-fold 120/080	0.0	0.0
	1	Threaded connector DN15	0.0	0.0
	1	Geberit Mapress Carbon Steel adaptor with female thread: d=28mm, Rp=1/2"	0.0	0.0
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
	1	Resideo Strangabsperrrventil Kombi-3-Plus Messing, Muffe, DN 25	14.8	14.8
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
	1	Geberit Mapress Carbon Steel reducer with plain end: d=35mm, d1=28mm	0.0	0.0
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=35mm, R=1 1/2"	0.0	0.0
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=35mm, R=1 1/2"	0.1	0.1
	1	Geberit Mapress Carbon Steel reducer with plain end: d=35mm, d1=28mm	0.1	0.1
	1	Geberit Mapress Carbon Steel adaptor with female thread: d=28mm, Rp=3/4"	0.1	0.1
3				15.3
	2	Geberit Mapress Carbon Steel bend: 90°, d=28mm	0.3	0.7
	1	Geberit Mapress Carbon Steel coupling: d=28mm	0.1	0.1
	1	Geberit Mapress Carbon Steel adaptor with female thread: d=28mm, Rp=3/4"	0.1	0.1
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
	1	Resideo Strangabsperrrventil Kombi-3-Plus Messing, Muffe, DN 25	14.8	14.8
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
4				15.8
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
	1	Resideo Strangabsp.Vent. Kombi-S V5001S DN 25	5.4	5.4
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
5				5.6
	1	Geberit Mapress Carbon Steel T-piece, reduced: d=28mm, d1=18mm, d2=28mm	0.2	0.2
7				0.2

TS no.	Quantity	Designation	ζ	Σζ
-	Pieces	-	-	-
	1	Geberit Mapress Carbon Steel T-piece, reduced: d=28mm, d1=18mm, d2=28mm	0.2	0.2
8				0.2
	1	Geberit Mapress T-piece, reduced: CW617N, d=28mm, d1=22mm, d2=22mm	0.1	0.1
	1	Geberit Mapress Carbon Steel bend: 90°, d=22mm	0.4	0.4
9				0.5
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=22mm, R=1"	0.0	0.0
	1	Underfloor heating manifold 3-fold	0.0	0.0
10				0.0
	1	Underfloor heating manifold 3-fold	0.0	0.0
11				0.0
	1	Underfloor heating manifold 3-fold	0.0	0.0
12				0.0
	1	Underfloor heating manifold 3-fold	0.0	0.0
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=22mm, R=1"	0.1	0.1
	1	Geberit Mapress T-piece, reduced: CW617N, d=28mm, d1=22mm, d2=22mm	0.6	0.6
13				0.7
	1	Geberit Mapress Carbon Steel T-piece, reduced: d=28mm, d1=18mm, d2=28mm	0.8	0.8
14				0.8
	1	Geberit Mapress Carbon Steel T-piece, reduced: d=28mm, d1=18mm, d2=28mm	0.8	0.8
15				0.8
	1	Geberit Mapress Carbon Steel bend: 90°, d=28mm	0.3	0.3
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=3/4"	0.1	0.1
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=3/4"	0.0	0.0
17				0.4
	1	Geberit Mapress Carbon Steel bend: 90°, d=28mm	0.3	0.3
	2	Geberit Mapress Carbon Steel coupling: d=28mm	0.1	0.2
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
	1	Resideo Strangabsperrentil Kombi-3-Plus Messing, Muffe, DN 25	14.8	14.8
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
	1	Geberit Mapress Carbon Steel T-piece, equal: d=28mm	2.7	2.7
18				18.2
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
	1	AFRISO Rückschlagventil 1 - DN 25 Messing, 12 bar, 110 C, für Wasser	5.9	5.9
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
	1	Resideo Strangabsperrentil Kombi-3-Plus Messing, Muffe, DN 25	14.8	14.8
19				20.9

TS no.	Quantity	Designation	ζ	$\Sigma\zeta$
-	Pieces	-	-	-
	1	Geberit Mapress Carbon Steel adaptor with male thread: d=28mm, R=1"	0.1	0.1
	1	Geberit Mapress Carbon Steel adaptor with female thread: d=28mm, Rp=1/2"	0.1	0.1
	1	Threaded connector DN15	0.0	0.0
	1	Dual-chamber distributor 4-fold 120/080	0.0	0.0
19				0.2
	1	Dual-chamber distributor 4-fold 120/080	0.4	0.4
20				0.4
	1	Geberit Mapress Carbon Steel bend: 90°, d=28mm	0.3	0.3
21				0.3
	1	Geberit Mapress Carbon Steel reducer with plain end: d=42mm, d1=28mm	0.0	0.0
	1	Geberit Mapress Carbon Steel reducer with plain end: d=76.1mm, d1=42mm	0.0	0.0
	1	Geberit Mapress Carbon Steel flange PN 10/16, with pressing socket: d=76.1mm, DN=65	0.1	0.1
	1	Reflex SINUS Hydraulische Weiche 160/80 DN65/PN6	0.0	0.0
	1	Geberit Mapress Carbon Steel bend: 90°, d=28mm	0.3	0.3
22				0.4

Consumer settings list

No.	Room Name	Ref.	Component Product	Q	kV	NV
				W	m³/h	
		FBH 6		1000		
		FBH 5		1000		
		FBH 4		1000		
		THV 42	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 42	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 41	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 41	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 36	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 36	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 35	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 35	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 40	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 40	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 34	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 34	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 39	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 39	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 38	Resideo Thermostatventilkörper LX Messing vernickelt, Eck, 1/2		0.32	3.0
		RLV 38	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 37	Resideo Thermostatventilkörper LX Messing vernickelt, Eck, 1/2		0.32	3.0
		RLV 37	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		FBH 3		1000		
		FBH 2		1000		
		FBH 1		1000		
		THV 14	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0

No.	Room Name	Ref.	Component Product	Q	kV	NV
				W	m³/h	
		RLV 15	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 13	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 14	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 23	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 24	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 22	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 23	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 12	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 13	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 21	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 22	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 32	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 33	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 31	Resideo Thermostatventilkörper LX Messing vernickelt, Eck, 1/2		0.32	3.0
		RLV 32	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 30	Resideo Thermostatventilkörper LX Messing vernickelt, Eck, 1/2		0.32	3.0
		RLV 31	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 9	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 9	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 3	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 3	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 8	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 8	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0

No.	Room Name	Ref.	Component Product	Q	kV	NV
				W	m³/h	
		THV 2	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 2	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 18	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 18	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 17	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 17	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 7	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 7	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 1	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 1	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 16	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 16	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 27	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 27	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 26	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 26	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 25	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 25	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 5	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 6	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 11	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 12	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 4	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0

No.	Room Name	Ref.	Component Product	Q	kV	NV
				W	m ³ /h	
		RLV 5	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 10	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 11	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 20	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 21	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 19	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 20	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 6	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 4	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 15	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 10	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 29	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 30	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 24	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 19	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 28	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 29	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0
		THV 33	Resideo Thermostatventilkörper SX Messing vernickelt, Eck, 1/2		0.43	5.0
		RLV 28	Resideo Rücklaufverschraubung Verafix Messing, vernickelt, Eck, 1/2		1.70	8.0

Setting list for pipe fittings

TS number	Ref.		Component Product	DN	kV m³/h	NV
17	DDR 3		Resideo Diff-dr.R. Kombi-Auto V5001PY1 50...350 mbar DN 20	20	3.14	7.50
71	DDR 4		Resideo Diff-dr.R. Kombi-Auto V5001PY1 50...350 mbar DN 20	20	3.29	7.50
181	DDR 2		Resideo Diff-dr.R. Kombi-Auto V5001PY1 50...350 mbar DN 20	20	3.87	4.00
124	DDR 1		Resideo Diff-dr.R. Kombi-Auto V5001PY1 50...350 mbar DN 20	20	3.72	4.50
233	EV 1		Resideo Strang.- u Absperrv.Kombi-2-PI BLF, R1/2 LF, Kvs 0,43	15	0.07	1.0

Design MAG 1

Output data

Thermal generator power	$Q_{W,ges}$	48.00	kW
System volume	V_A	489.54	l
Evaporation pressure	p_D	0.00	bar
Static pressure	p_{St}	1.25	bar

Pressure calculation

Preprint	p_0	1.45	bar
Safety valve response pressure	p_{SV}	2.50	bar
Final pressure	p_e	2.00	bar

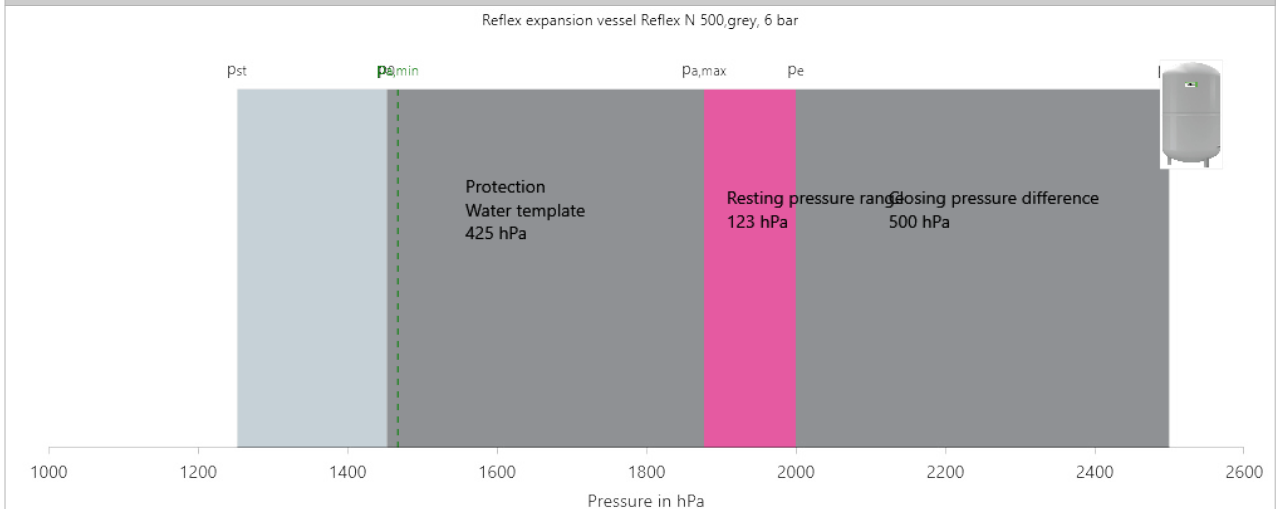
Vessel

Expansion volume	V_e	17.45	l
Water template	V_V	3.00	l
Nominal volume	V_n	112.07	l
Filling pressure, minimum	$p_{a,min}$	1.47	bar
Filling pressure, maximum	$p_{a,max}$	1.88	bar

Product information

Reflex expansion vessel Reflex N 500, grey, 6 bar
Item number 8218300

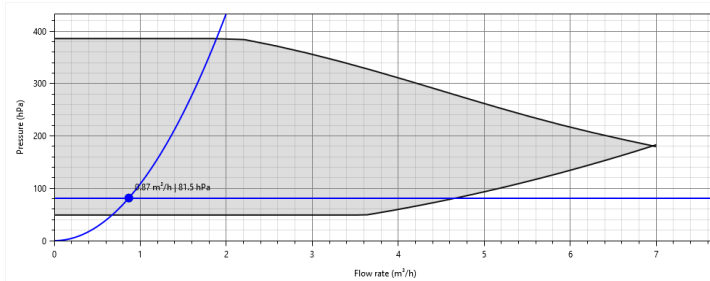
MAG characteristic diagram



Circulation pump design PU 1

Characteristic diagram

Wilo Nassläufer-Premium-Smart-Pumpe
Stratos MAXO 30/0,5-4 PN10,G2,69W



wilo



Operating point

Flow rate	Q_p	866 l/h
Delivery pressure	P_v	82 hPa
Operating mode	Constant pressure	
Set value		82 hPa

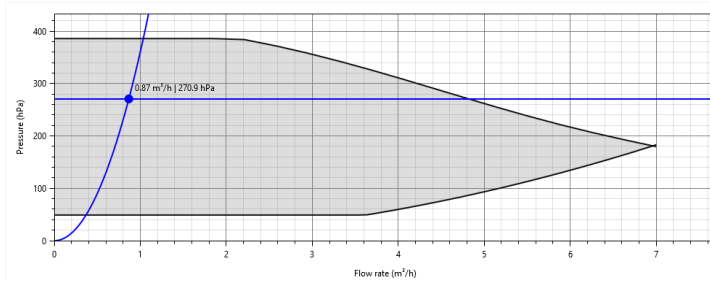
Calculation of delivery pressure

TS. no.	Designation		Transfer circuit	Complete circuit	Unit
	Required pressure difference	p_{perf}	0	82	hPa
	Pipe length	l	0.0	6.3	m
	Available pipe friction pressure gradient	R_{verf}	0.0	9.9	hPa/m
	Share of pipe friction	$l \cdot R$	0	7	hPa
	Proportion of individual resistances	Z	0	56	hPa
	Σ Pipework	$\Sigma (l \cdot R + Z)$	0	63	hPa
	Heat meter	ΔP_{VERB}	0	0	hPa
222	3-way fitting	ΔP_{VERB}	0	19	hPa
	Filters/dirt traps	ΔP_{VERB}	0	0	hPa
	Consumers	ΔP_{VERB}	0	0	hPa
	Σ Installation parts	ΔP_{Einbau}	0	19	hPa
	Pressure loss without control elements	$\Delta p_{\text{ohne REG}}$	0	82	hPa
	Thermostatic valve	ΔP_{RGV}	0	0	hPa
	Return fitting	ΔP_{RGV}	0	0	hPa
	Control unit	ΔP_{RGV}	0	0	hPa
	Unbalanced residual pressure	Δp_{Rest}	0	0	hPa

Circulation pump design PU 2

Characteristic diagram

Wilo Nassläufer-Premium-Smart-Pumpe
Stratos MAXO 25/0,5-4 PN10,G11/2,69W



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Operating point

Flow rate	Q_p	866 l/h
Delivery pressure	P_v	271 hPa
Operating mode	Constant pressure	
Set value		271 hPa

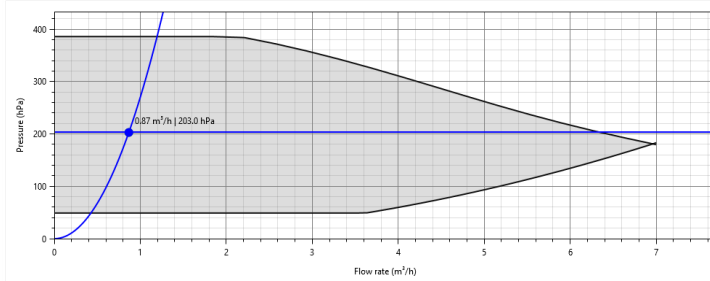
Calculation of delivery pressure

TS. no.	Designation		Transfer circuit	Complete circuit	Unit
	Required pressure difference	p_{perf}	73	271	hPa
	Pipe length	l	26.2	51.7	m
	Available pipe friction pressure gradient	R_{verf}	1.1	3.0	hPa/m
	Share of pipe friction	$l \cdot R$	23	56	hPa
	Proportion of individual resistances	Z	6	98	hPa
	Σ Pipework	$\Sigma (l \cdot R + Z)$	29	154	hPa
	Heat meter	ΔP_{VERB}	0	0	hPa
109	3-way fitting	ΔP_{VERB}	0	19	hPa
	Filters/dirt traps	ΔP_{VERB}	0	0	hPa
117	Consumers	ΔP_{VERB}	1	1	hPa
	Σ Installation parts	ΔP_{Einbau}	1	20	hPa
	Pressure loss without control elements	$\Delta p_{\text{ohne REG}}$	30	174	hPa
117	Thermostatic valve	ΔP_{RGV}	41	41	hPa
118	Return fitting	ΔP_{RGV}	3	3	hPa
124	Control unit	ΔP_{RGV}	0	54	hPa
	Unbalanced residual pressure	Δp_{Rest}	0	0	hPa

Circulation pump design PU 3

Characteristic diagram

Wilo Nassläufer-Premium-Smart-Pumpe
Stratos MAXO 25/0,5-4 PN10,G11/2,69W



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Operating point

Flow rate	Q_p	866 l/h
Delivery pressure	P_v	203 hPa
Operating mode	Constant pressure	
Set value		203 hPa

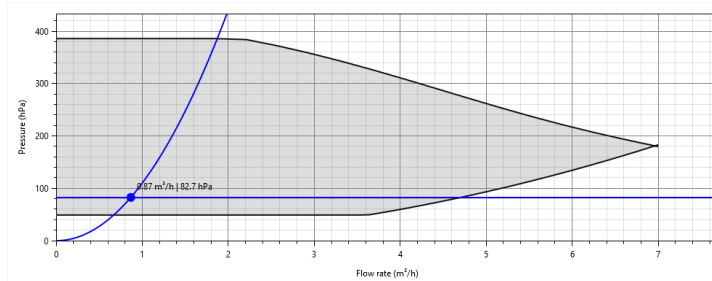
Calculation of delivery pressure

TS. no.	Designation		Transfer circuit	Complete circuit	Unit
	Required pressure difference	p_{perf}	71	203	hPa
	Pipe length	l	30.2	51.0	m
	Available pipe friction pressure gradient	R_{verf}	0.9	2.1	hPa/m
	Share of pipe friction	$l \cdot R$	22	49	hPa
	Proportion of individual resistances	Z	5	60	hPa
	Σ Pipework	$\Sigma (l \cdot R + Z)$	27	109	hPa
	Heat meter	ΔP_{VERB}	0	0	hPa
	3-way fitting	ΔP_{VERB}	0	0	hPa
	Filters/dirt traps	ΔP_{VERB}	0	0	hPa
173	Consumers	ΔP_{VERB}	1	1	hPa
	Σ Installation parts	ΔP_{Einbau}	1	1	hPa
	Pressure loss without control elements	$\Delta p_{\text{ohne REG}}$	28	110	hPa
173	Thermostatic valve	ΔP_{RGV}	41	41	hPa
174	Return fitting	ΔP_{RGV}	3	3	hPa
181	Control unit	ΔP_{RGV}	0	50	hPa
	Unbalanced residual pressure	Δp_{Rest}	0	0	hPa

Circulation pump design PU 4

Characteristic diagram

Wilo Nassläufer-Premium-Smart-Pumpe
Stratos MAXO 30/0,5-4 PN10,G2,69W



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Operating point

Flow rate	Q_p	866 l/h
Delivery pressure	P_v	83 hPa
Operating mode	Constant pressure	
Set value		83 hPa

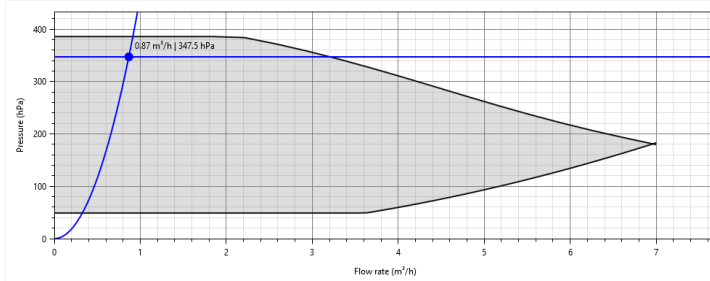
Calculation of delivery pressure

TS. no.	Designation		Transfer circuit	Complete circuit	Unit
	Required pressure difference	p_{perf}	82	83	hPa
	Pipe length	l	7.3	7.3	m
	Available pipe friction pressure gradient	R_{verf}	7.9	8.0	hPa/m
	Share of pipe friction	$l \cdot R$	9	9	hPa
	Proportion of individual resistances	Z	49	49	hPa
	Σ Pipework	$\Sigma (l \cdot R + Z)$	58	58	hPa
	Heat meter	ΔP_{VERB}	0	0	hPa
218	3-way fitting	ΔP_{VERB}	25	25	hPa
	Filters/dirt traps	ΔP_{VERB}	0	0	hPa
	Consumers	ΔP_{VERB}	0	0	hPa
	Σ Installation parts	ΔP_{Einbau}	25	25	hPa
	Pressure loss without control elements	$\Delta p_{\text{ohne REG}}$	83	83	hPa
	Thermostatic valve	ΔP_{RGV}	0	0	hPa
	Return fitting	ΔP_{RGV}	0	0	hPa
	Control unit	ΔP_{RGV}	0	0	hPa
	Unbalanced residual pressure	Δp_{Rest}	0	0	hPa

Circulation pump design PU 5

Characteristic diagram

Wilo Nassläufer-Premium-Smart-Pumpe
Stratos MAXO 25/0,5-4 PN10,G11/2,69W



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Operating point

Flow rate	Q_p	866 l/h
Delivery pressure	P_v	348 hPa
Operating mode	Constant pressure	
Set value		348 hPa

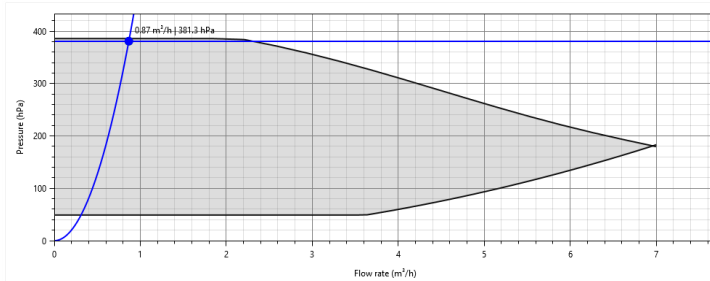
Calculation of delivery pressure

TS. no.	Designation		Transfer circuit	Complete circuit	Unit
	Required pressure difference	p_{perf}	116	348	hPa
	Pipe length	l	19.4	59.5	m
	Available pipe friction pressure gradient	R_{verf}	0.8	2.7	hPa/m
	Share of pipe friction	$l \cdot R$	14	66	hPa
	Proportion of individual resistances	Z	2	93	hPa
	Σ Pipework	$\Sigma (l \cdot R + Z)$	16	159	hPa
	Heat meter	ΔP_{VERB}	0	0	hPa
58	3-way fitting	ΔP_{VERB}	0	19	hPa
	Filters/dirt traps	ΔP_{VERB}	0	0	hPa
65	Consumers	ΔP_{VERB}	100	100	hPa
	Σ Installation parts	ΔP_{Einbau}	100	119	hPa
	Pressure loss without control elements	$\Delta p_{\text{ohne REG}}$	116	278	hPa
	Thermostatic valve	ΔP_{RGV}	0	0	hPa
	Return fitting	ΔP_{RGV}	0	0	hPa
71	Control unit	ΔP_{RGV}	0	69	hPa
	Unbalanced residual pressure	Δp_{Rest}	0	0	hPa

Circulation pump design PU 6

Characteristic diagram

Wilo Nassläufer-Premium-Smart-Pumpe
Stratos MAXO 25/0,5-4 PN10,G11/2,69W





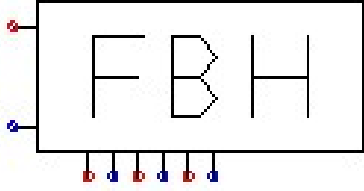
Operating point

Flow rate	Q_p	866 l/h
Delivery pressure	P_v	381 hPa
Operating mode	Constant pressure	
Set value		381 hPa

Calculation of delivery pressure

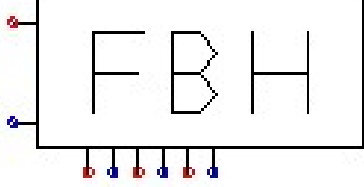
TS. no.	Designation		Transfer circuit	Complete circuit	Unit
	Required pressure difference	p_{perf}	116	381	hPa
	Pipe length	l	19.4	73.1	m
	Available pipe friction pressure gradient	R_{verf}	0.8	2.5	hPa/m
	Share of pipe friction	$l \cdot R$	14	84	hPa
	Proportion of individual resistances	Z	2	97	hPa
	Σ Pipework	$\Sigma (l \cdot R + Z)$	16	180	hPa
	Heat meter	ΔP_{VERB}	0	0	hPa
3	3-way fitting	ΔP_{VERB}	0	25	hPa
	Filters/dirt traps	ΔP_{VERB}	0	0	hPa
11	Consumers	ΔP_{VERB}	100	100	hPa
	Σ Installation parts	ΔP_{Einbau}	100	125	hPa
	Pressure loss without control elements	$\Delta p_{\text{ohne REG}}$	116	305	hPa
	Thermostatic valve	ΔP_{RGV}	0	0	hPa
	Return fitting	ΔP_{RGV}	0	0	hPa
17	Control unit	ΔP_{RGV}	0	76	hPa
	Unbalanced residual pressure	Δp_{Rest}	0	0	hPa

Underfloor heating manifold

FBHV 2		
		Underfloor heating manifold 3-fold

Outlet	Room no.	Room name	Length m	Surface area m²	ΔP hPa	V l/min
1			50.00		100	1.44
2			50.00		100	1.44
3			50.00		100	1.44
Σ				0.0		4.33

Underfloor heating manifold

FBHV 1		
		Underfloor heating manifold 3-fold

Outlet	Room no.	Room name	Length m	Surface area m²	ΔP hPa	V l/min
1			50.00		100	1.44
2			50.00		100	1.44
3			50.00		100	1.44
Σ				0.0		4.33