

aquatherm climatherm

Pressure pipe system for
chilled & hot applications



aquatherm

aquatherm

A name for quality and reliability.



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aquatherm branch Radeberg

Stamp:

aquatherm GmbH

Kunststoff-Extrusions-
und Spritzgießtechnik



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aquatherm - world wide

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Italia	aquatherm-german pipe system GmbH & Co. KG	Zona Industriale Area Apuania Parco Produttivo Lotto 11	I	54100	Massa (MS)	0039-0585 25 99 01	0039-0585-25 99 99
Jugoslavija	Delta Term Export Import	Šime Milosevica 12	YU	11000	Belgrad	00381-11-3440705	00381-11-3440705
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Namibia	O. Behrens & Co. (Pty.) Ltd. Sanitaryware	P.O. box 5042	NA		Windhoek	00264-61-238300	00264-61-238743
Nederland	Verlinde VA aquatherm	Ambachstraat 8	NL	6951	CC Dieren	0031-313-414227	0031-313-415566
New Zealand	Aquatherm NZ	38c Lunn Ave	NZ		MT Wellington Auckland	0064-9-5707204	0064-9-5707206
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Norge	Nor-Term AS	Postboks 91	NO	4901	Tvedestrand	0047-37162094	0047-37161220
Austria	Michael Mittendrein Maximilian Kock	Hauptstrasse 61 Dorfstrasse 106 A	A	8042 6240	Graz St. Peter Radfield	0043-664-1040940 0043-6991-1169427	
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Saudi Arabia	Al Sahoo Sanitary Ware Co.	P.O. Box 27478	SA	11417	Riyadh	00966-1-4779140	00966-1-4764271
Schweiz	Thermotech GmbH	Seminarstrasse 114	CH	5430	Wettingen	0041-56-4274914	0041-56-4274915
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Slowakia	S-Komplex	Hrobonova 4	SK	81104	Bratislava	00421-7-54788225	00421-7-54788204
Syria	Tredex Syria	P.O. Box 33073 Malki - Bizem St.	SY		Damascus	00963-11-3734646	00963-11-3734733
Sverige	R.E. Therm Rörprodukter AB	Frillesasvägen 83	SE	43030	Frillesas	0046-340-657800	0046-340-657809
Türkiye	Gellisim Teknik-Ticaret Sanayi ve Pazarlama Ltd.Sti.	Apt. B-Blok No: 12/1-2 100. Yil Bulvarı Sevimli	TR	7050	Antalya	0090-242-3402575	0090-242-3402577
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USA	aquatherm piping systems, inc.	P.O. Box 110	USA	48065	Romeo MI 48065	001 586 336 2152	

Albania, France, Kazakhstan, Lithuania, Moldavia: These countries are supplied with our products by different traders.

Addresses available from the **aquatherm** export-department: +49 / 27 22 / 95 0 -121/122/123/124/125

Advantages of the System

The system includes all pipe installation components for chilled and hot fluid applications.

climatherm ...

... stops corrosion damages.

Air conditioning systems installed with metal pipes are affected by corrosion at the outer and inner surface of the pipes.

climatherm is manufactured from 100 % corrosion resistant materials which increases the life-time of chilled water plants considerably.



climatherm...

... reduced noise of flow in comparison with metal pipes.

Installation:

climatherm...

...offers an unequalled connection technique: Material joining by fusion.

climatherm...

...convinces by shortest connection times: e.g. outside diameter 20 mm = 9 sec.

climatherm-connections...

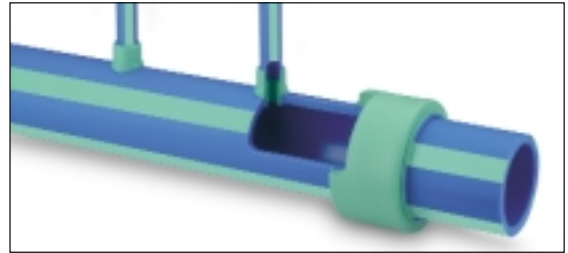
...can be pressurized and put into operation immediately after joining. There are no waiting times.

Composite technology:

aquatherm developed a manufacturing method, where the integration of a special fiber mixture within the material polypropylene is realized.

The result of this innovative technology is the unique compound of the different materials.

The advantages of **climatherm** in detail:



- absolutely corrosion resistant
- high stability
- noticeable less insulation - recommended are 10 mm of insulation for all pipe dimensions

The coefficient of linear expansion is nearly identical with the one of metal pipes. Compared with solid plastic pipes, support intervals can be increased and pipe clamps be saved.

Further real advantages of the **faser composite pipe** are:

- ▲ favourable priced
- ▲ light weight
- ▲ simply cut and weld!

System components

The **climatherm**-pipe system has to be installed in combination with the **fuiotherm**[®]-fittings (Brochure Order Nr. E10100) and consists of:

- ▲ pipes in length and/or coils
- ▲ fittings
- ▲ socket welded type nipples for flange connections
- ▲ armature connections and accessories
- ▲ transition pieces from PP-R (80) to metal resp. metal to PP-R (80)
- ▲ weld-in saddles
- ▲ distributors
- ▲ shut-off devices
- ▲ welding devices, welding tools
- ▲ cutters
- ▲ auxiliaries and mountings

climatherm-pipe / climatherm-faser composite pipe

Material : **Fuviolon® PP-R (80),**
Fuviolon® PP-R (80)-GF

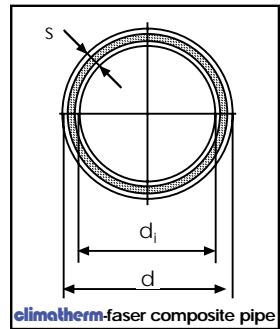
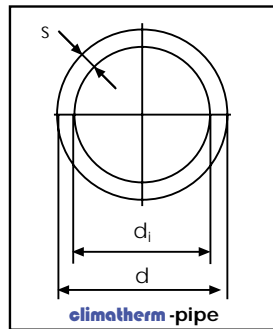
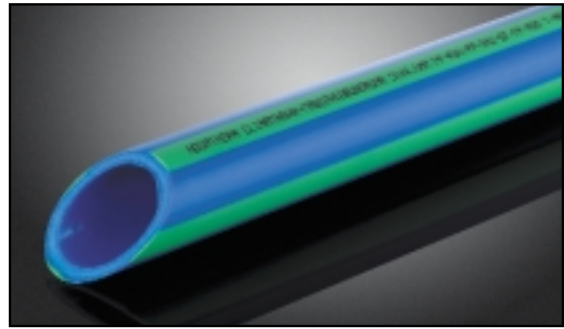
Pipe series : Art.-No. 2070708/2070710 = SDR 7,4
Art.-No. 2010208-2010308 = SDR 11
Art.-No. 2070112-2070126 = SDR 11

Form supplied : 4 m straight lengths
Packing unit : in meter
Colour : blue / 4 green stripes

Mechanically stabilized through a faser mix integrated in the middle layer of the PP-R(80)

Fields of application:

fluids under chilled or hot conditions,
heating systems
- temperature range: -20°C to +90°C
(Permissible working pressure see page 4)



	Pipe			Diameter d mm	Wall thickness s mm	internal diameter d _i mm	Water content l/m	Weight kg/m	DN
	Art.-No.	Dimension	PU						
climatherm -pipe	2010208	20 mm	100	20	1,9	16,2	0,206	0,107	15
	2010210	25 mm	100	25	2,3	20,4	0,327	0,164	20
climatherm -faser composite pipe	2070112	32 mm	40	32	2,9	26,0	0,531	0,267	25
	2070114	40 mm	40	40	3,7	32,6	0,834	0,412	32
	2070116	50 mm	20	50	4,6	40,8	1,307	0,638	40
	2070118	63 mm	20	63	5,8	51,4	2,075	1,010	50
	2070120	75 mm	20	75	6,8	61,2	2,941	1,420	60
	2070122	90 mm	12	90	8,2	73,6	4,254	2,030	65
	2070124	110 mm	8	110	10,0	90,0	6,362	3,010	80
	2070126	125 mm	4	125	11,4	102,2	8,203	3,910	100
The following item is supplied in coils:									
climatherm -pipe	2010308	20 mm	100	20	1,9	16,2	0,206	0,107	15
	2010310	25 mm	100	25	2,3	20,4	0,327	0,164	20

Extension of our product range

climatherm faser composite pipe	2070708	20 mm	100	20	2,8	14,4	0,163	0,156	15
	2070710	25 mm	100	25	3,5	18,0	0,254	0,237	20

SDR 7,4

Permissible Working Pressure

for hot water and heating pipes (fluid transported: water)

Heating period	Temperature	Service life	Safety-factor = 1.25	
			climatherm-faser composite pipe	
			Nominal pressure in bar	
			PN 10	
			Permissible working pressure in bar	
constant operating temperature 70 °C incl. 30 days per year at ►	75 °C	5	7.25	
		10	7.00	
		25	5.90	
		45	5.10	
	80 °C	5	6.85	
		10	6.47	
		25	5.59	
		42.5	4.89	
	85 °C	5	6.26	
		10	5.98	
		25	5.08	
		37.5	4.58	
90 °C	5	5.73		
	10	5.50		
	25	4.41		
	35	4.03		
constant operating temperature 70 °C incl. 60 days per year at ►	75 °C	5	7.16	
		10	6.87	
		25	5.84	
		45	5.02	
	80 °C	5	6.64	
		10	6.34	
		25	5.29	
		40	4.68	
	85 °C	5	6.07	
		10	5.79	
		25	4.58	
		35	4.20	
90 °C	5	5.54		
	10	4.87		
	25	3.84		
	30	3.66		
constant operating temperature 70 °C incl. 90 days per year at ►	75 °C	5	7.10	
		10	6.76	
		25	5.69	
		45	4.91	
	80 °C	5	6.51	
		10	6.24	
		25	5.02	
		37.5	4.52	
	85 °C	5	5.94	
		10	5.38	
		25	4.24	
		32.5	3.97	
90 °C	5	5.31		
	10	4.45		
	25	3.51		

Pressure conversion table

	1 bar (= 10 N/cm ²)
1 bar (=10 N/cm ²)	1
Pa (=1 N/m ²)	10 ⁵
psi (=1 lb/in ²)	14,5
Pa (=Pascal) = 1 kg/(ms ²) and bar = 10 ⁵ x kg/ (ms ²)	

Part A: Mounting of the Tools

1. Attention!

Only use original **fujiotherm**[®]-welding devices and **fujiotherm**[®]-welding tools.

Assemble and tighten the cold welding tools manually.

3. Before fusing distribution blocks, where 2 connections are welded at the same time (Art.-No.50137), place the welding tool into the corresponding holes of the heating surface.

4. All welding tools must be free from impurities. Check if they are clean before assembling. If necessary clean the welding tools with a non fibrous, coarse tissue and with spirit.

5. Place the welding tools on the welding device that there is full surface contact between the welding tool and the heating surface. Welding tools over $\varnothing 40$ mm must always be fitted to the rear bore of the heating surface.

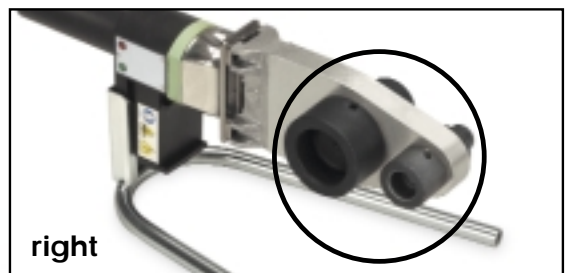
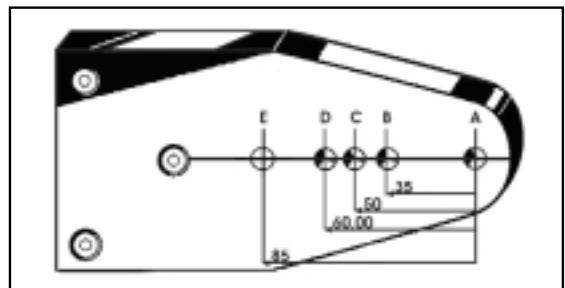
6. Plug in the welding device. Depending on the ambient temperature it takes 10 - 30 minutes to heat up the heating surface.



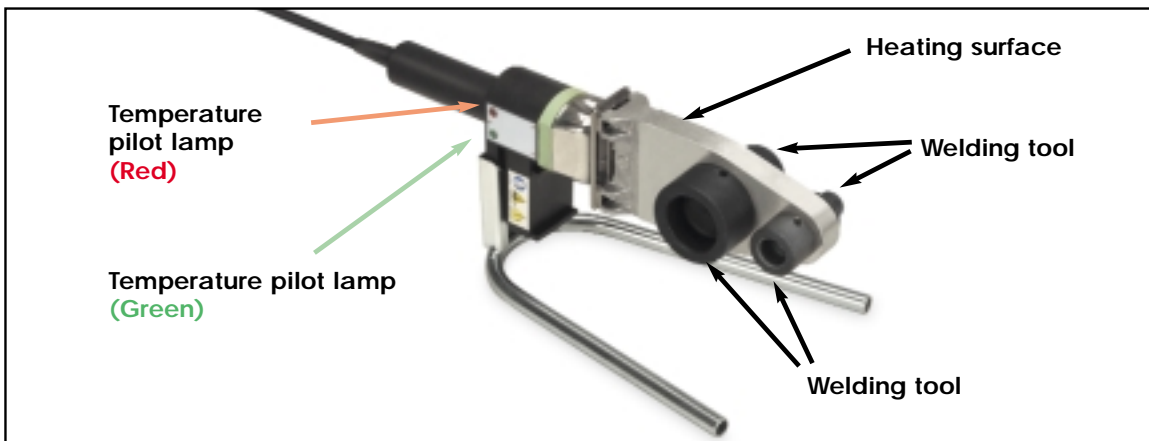
A

Art.-No.	Passage	Hole	Branch	Hole
30115	$\varnothing 25$ mm	A + E	$\varnothing 20$ mm	A + C
85123	$\varnothing 20$ mm	A + B	$\varnothing 16$ mm	A + C
85124	$\varnothing 20$ mm	A + B	$\varnothing 16$ mm	A + C

B



Part A: Heating up Phase



7. During the heating up phase tighten the welding tools carefully with the clamp.

Take care that the tools lie completely on the heating surface. Never use pliers or any other unsuitable tools, as this will damage the coating of the welding tools.

8. The necessary temperature to weld the **climatherm**-system is 260 °C.

- * Acc. to DVS-Welding Guidelines the temperature of the welding device has to be checked at its tool before starting the welding process.

ATTENTION:

First welding – five minutes after reaching the welding temperature!

Part A: Handling

9. A tool change on a heated device requires another check of the welding temperature at the new tool (after its heating up).
10. If the device has been switched off, i. e. during longer breaks, the heating up process has to be restarted (from item 6).
11. After use turn the welding device off and let it cool down. Water must never be used to cool the welding device, as this would destroy the heating resistances.
12. Protect **fusiotherm**[®]-welding devices and tools against impurity. Burnt particles may lead to an incorrect fusion. Clean the welding tools with non fibrous, coarse tissues and if necessary with spirit. Always keep the welding tools dry. If necessary, dry them with a clean, non fibrous tissue.
13. **For perfect fusion, damaged or dirty welding tools must be replaced.**
14. Never attempt to open or repair a defective device. Return the defective device for repair.

15. Check the operating temperature of **fusiotherm**[®]-welding devices regularly by means of suitable measuring instruments.
16. For the correct handling of welding machines the following must be observed
 - * General Regulations for Protection of Labour and Prevention of Accidents
 and particularly the
 - * Regulations of the Employers' Liability Insurance Association of the Chemical Industry regarding Machines for the Processing of Plastics, chapter: "Welding Machines and Welding Equipment".
17. For the handling of **fusiotherm**[®]-welding machines, devices and tools please observe
 - * General Regulations DVS 2208 Part 1 of the German Association for Welding Engineering, Registered Society (Deutscher Verband für Schweißtechnik e. V.)

Part B: Checking of Device and Tools

Checking of Devices and Tools

1. Check, if the **fusiotherm**[®]-welding device and tool correspond to the guidelines.
2. All used devices and tools must have reached the necessary operating temperature of 260 °C. This requires acc. to »Fusion Part A, item 9« a separate test, which is indispensable (DVS-Welding Guidelines):
The DVS-Welding Guidelines allow the use of a fast indicating surface temperature measuring instrument to check the welding temperature required.
Suitable measuring instruments have to facilitate a temperature measurement of up to 350 °C with a high accuracy.

Alternatively it is also possible to check the welding temperature with the **fusiotherm**[®]-thermocolor pencil. The application of the special thermocolor chalk in the aluminiumpen to heated surfaces enables an exact reading with a tolerance of ± 5 K.

Application:

After the temperature pilot lamp of the welding device has shown the end of the heating up period, put a firm chalk line on the heated external surface of the welding tool. The colour must change within 1 - 2 seconds.

If the temperature is too high, the colour will change immediately and if it is too low (below 260 °C) it will change after 3 or more seconds.

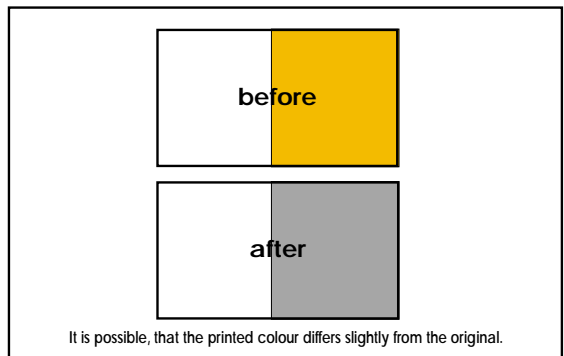
If the colour does not change within 1-2 seconds another temperature test has to be carried out.



Temperature control by means of profile meter



Temperature control by chalk



Part B: Preparation for the Fusion

3. Cut the pipe at right angles to the pipe axis. Only use **fuviotherm**[®]-pipe cutters or other suitable cutting pliers. Take care that the pipe axis is free from burrs or cutting chips and remove if necessary.
4. Mark the welding depth at the end of the pipe with the enclosed pencil and template.
5. Mark the desired position of the fitting on the pipe and / or fitting. (without picture)

The auxiliary markings on the fitting and the uninterrupted line on the pipe could be used as a help.



Cutting the pipe



Marking the welding depth

Part B: Heating of Pipe and Fitting

The fusion is subject to the following data

Pipe external-Ø	Welding depth	Heating time		Welding time	Cooling time
		sec. DVS	sec. AQE*		
16	13,0	5	8	4	2
20	14,0	5	8	4	2
25	15,0	7	11	4	2
32	16,5	8	12	6	4
40	18,0	12	18	6	4
50	20,0	18	27	6	4
63	24,0	24	36	8	6
75	26,0	30	45	8	8
90	29,0	40	60	8	8
110	32,5	50	75	10	8
125	40,0	60	90	10	8

* Following DVS 2207 part 11: At outdoor temperatures below +5 °C heating time will be increased of about 50%.

*heating times recommended by **aquatherm**

The General Guidelines for Heated Tool Socket Welding acc. to DVS 2207 Part 11 are applied hereupon.

Part B: Heating of Pipe and Fitting

- Push the end of the pipe, without turning, up to the marked welding depth into the welding tool.

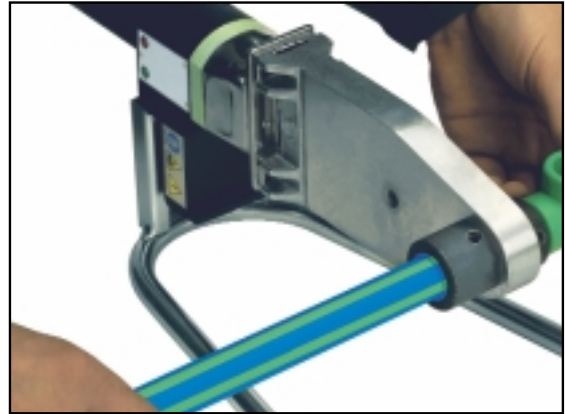
At the same time push the fitting, without turning, right down to the welding tool.

It is essential to observe the above mentioned heating times.

Pipes and fittings of the dimensions $\text{Ø } 75 + 125$ mm may only be welded with welding device art.-no. 50141. On using the **Fujiiotherm**[®]-welding machine art.-no. 50147 (with welding device art.-no. 50141) the separate operating instruction has to be observed.

ATTENTION:

The heating time starts, when pipe and fitting have been pushed to the correct welding depth on the welding tool.



Heating up of fittings

Part B: Setting and Alignment

- After the stipulated heating time quickly remove pipe and fitting from the welding tools. Join them immediately, and without turning, until the marked welding depth is covered by the bead of PP from the fitting.

ATTENTION: Do not push the pipe too far into the fitting, as this would reduce the bore and in an extreme case close the pipe.

- The joint elements have to be fixed during the specified assembly time. Use this time to correct the connection.

The correction is only restricted to the alignment of pipe and fitting. Never turn the elements or align the connection after the processing time.

- After the cooling period the fused joint is ready for use.

The result of the fusion of pipe and fitting is an inseperable material joining of the system elements. Unrivald connection technique with security for a life-time!



Fusioning, fixing and aligning of fittings



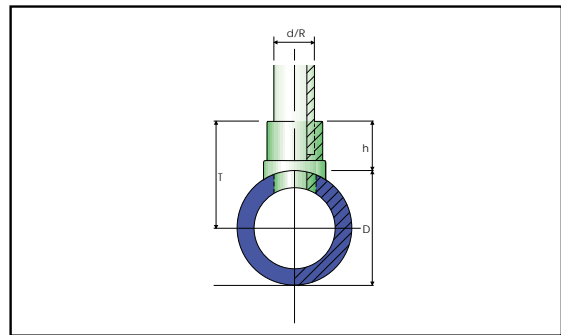
Part C: Weld in Saddles

Fujiotherm®-weld in saddles are available for pipe outer diameters of 40, 50, 63, 75, 90, 110 and 125mm.

Weld in saddles are used for

- ▲ branch connections in existing installations
- ▲ the substitution of a tee
- ▲ branch connections in risers
- ▲ sensor wells, etc.

The maximum sensor well diameter is specified in the following table.



Art. No.	Dimension	D	d	R	h	Sensor well	Borer	Tool
		mm	mm	female	mm	Ø mm	Art. No.	Art. No.
15156	40 / 20 mm	40	20	–	27,0	–	50940	50614
15158	40 / 25 mm	40	25	–	28,0	–	50940	50614
15160	50 / 20 mm	50	20	–	27,0	–	50940	50616
15162	50 / 25 mm	50	25	–	28,0	–	50940	50616
15164	63 / 20 mm	63	20	–	27,0	–	50940	50619
15166	63 / 25 mm	63	25	–	28,0	–	50940	50619
15168	63 / 32 mm	63	32	–	30,0	–	50942	50620
15170	75 / 20 mm	75	20	–	27,0	–	50940	50623
15172	75 / 25 mm	75	25	–	28,0	–	50940	50623
15174	75 / 32 mm	75	32	–	30,0	–	50942	50624
15176	90 / 20 mm	90	20	–	27,0	–	50940	50627
15178	90 / 25 mm	90	25	–	28,0	–	50940	50627
15180	90 / 32 mm	90	32	–	30,0	–	50942	50628
15181	90 / 40 mm	90	40	–	34,0	–	50944	50629
15182	110 / 20 mm	110	20	–	27,0	–	50940	50631
15184	110 / 25 mm	110	25	–	28,0	–	50940	50631
15186	110 / 32 mm	110	32	–	30,0	–	50942	50632
15188	110 / 40 mm	110	40	–	34,0	–	50944	50634
15190	125 / 20 mm	125	20	–	27,0	–	50940	50636
15192	125 / 25 mm	125	25	–	27,0	–	50940	50636
15194	125 / 32 mm	125	32	–	30,0	–	50942	50638
15196	125 / 40 mm	125	40	–	34,0	–	50944	50640
28214	40 / 25 x 1/2" f	40	–	1/2"	29,5	14	50940	50614
28216	50 / 25 x 1/2" f	50	–	1/2"	29,5	14	50940	50616
28218	63 / 25 x 1/2" f	63	–	1/2"	29,5	14	50940	50619
28220	75 / 25 x 1/2" f	75	–	1/2"	29,5	14	50940	50623
28222	90 / 25 x 1/2" f	90	–	1/2"	29,5	14	50940	50627
28224	110 / 25 x 1/2" f	110	–	1/2"	29,5	14	50940	50631
28226	125 / 25 x 1/2" f	125	–	1/2"	29,5	14	50940	50636
28234	40 / 25 x 3/4" f	40	–	3/4"	29,5	16	50940	50614
28236	50 / 25 x 3/4" f	50	–	3/4"	29,5	16	50940	50616
28238	63 / 25 x 3/4" f	63	–	3/4"	29,5	16	50940	50619
28240	75 / 25 x 3/4" f	75	–	3/4"	29,5	16	50940	50623
28242	90 / 25 x 3/4" f	90	–	3/4"	29,5	16	50940	50627
28244	110 / 25 x 3/4" f	110	–	3/4"	29,5	16	50940	50631
28246	125 / 25 x 3/4" f	125	–	3/4"	29,5	16	50940	50636

Teil C: Weld in Saddles

1. Before commencing the welding process, check whether the **fusiotherm**[®]-welding devices and tools meet the requirements of page 7.
2. The first step is to drill through the wall of the pipe at the point intended for the outlet using the **fusiotherm**[®]-drill.
 - ▲ branch 20/25 mm : art.-no. 50940
 - ▲ branch 32 mm : art.-no. 50942
 - ▲ branch 40 mm : art.-no. 50944
4. The welding device/saddle welding tool must have reached the required operating temperature of 260 °C
5. The welding surfaces have to be clean and dry.
6. Insert the heating nozzle on the concave side of the weld in saddle tool into the hole drilled in the side wall of the pipe until the tool is completely in contact with the outer wall of the pipe. At the same time the welding in saddle nozzle is inserted into the heating sleeve until the saddle surface is up against the convex side of the welding tool. The heating time of the elements is generally 30 seconds.
7. After the welding tool has been removed, the weld in saddle nozzle is immediately inserted into the heated, drilled hole. The weld in saddle should then be pressed on the pipe for about 15 seconds. After being allowed to cool for 10 minutes the connection can be exposed to its full loading. The appropriate branch pipe is fitted into the sleeve on the **fusiotherm**[®]-weld in saddle using conventional fusion technology.

By fusing the weld in saddle with the pipe outer surface and the pipe inner wall the connection reaches highest stability - the alternative to reducing tees.



Drilling through the pipe wall



Heating up of the elements



Insert of the fitting

Teil D: Handling and fusion

fujiotherm®-Welding Machine:

- ▲ 1 piece wooden transport box for the welding machine
- ▲ 1 piece stone boat with substructure, heat reflector
- ▲ 1 set clamping jaws composed of 8 contact bars for pipes and fittings, diameter 25, 32, 40, 50, 63, 75, 90, 110 and 125 mm
- ▲ each 1 piece **fujiotherm**®-welding tool diameter 50, 63, 75, 90, 110 and 125
- ▲ 1 piece **fujiotherm**®-welding device Art.No.: 50141
- ▲ each 1 piece Allan key and tool change clamp
- ▲ 1 piece **fujiotherm**®-thermocolor pencil
- ▲ 1 piece Installation manual

The **fujiotherm**®-welding machine was especially developed for stationary welding of pipe and fittings with an external diameter of 50 –125 mm. This machine is equipped with a hand crank to facilitate a precise pre-assembly of complicated installation parts.



The fusion is subject to the following data

Pipe external-Ø	Welding depth	Heating time		Welding time	Cooling time
		sec. DVS	sec. AQE*	sec.	
50	20,0	18	27	6	4
63	24,0	24	36	8	6
75	26,0	30	45	8	8
90	29,0	40	60	8	8
110	32,5	50	75	10	8
125	40,0	60	90	10	8

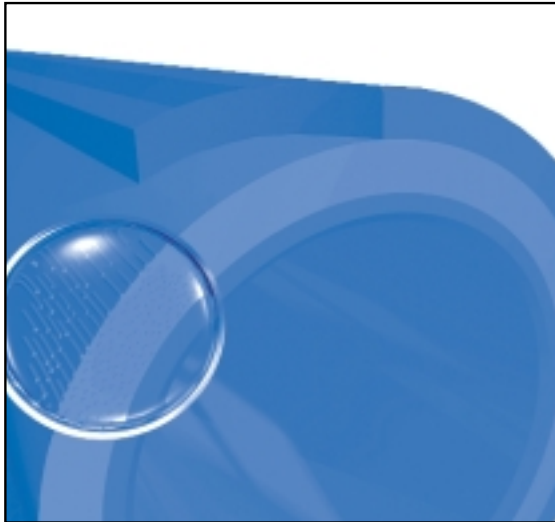
* Following DVS 2207 part 11: At outdoor temperatures below +5 °C heating time will be increased of about 50%.

*heating times recommended by **aquatherm**

The General Guidelines for Heated Tool Socket Welding acc. to DVS 2207 Part 11 are applied hereupon.

Linear Expansion Chart

The advantages of the **climatherm**-faser composite pipe on one view:



compound of **fuziolen® PP-R (80)** and a special faser filling - integrated as middle layer within the material **PP-R (80)** - **climatherm**-faser composite pipes have proved its worth as reasonable, resistant and innovative pipe-technology in more than 50 countries.

- ▲ Extension reduced more than 75 %
- ▲ Flow has been increased for 20 % - with the same loading capacity - due to the bigger inner diameter
- ▲ High stability and carrying capacity
- ▲ Easy handling: simply cut and weld

climatherm-pipe / climatherm-faser composite pipe

The diagram allows a simple and fast determination of extension changes and extension balgs.

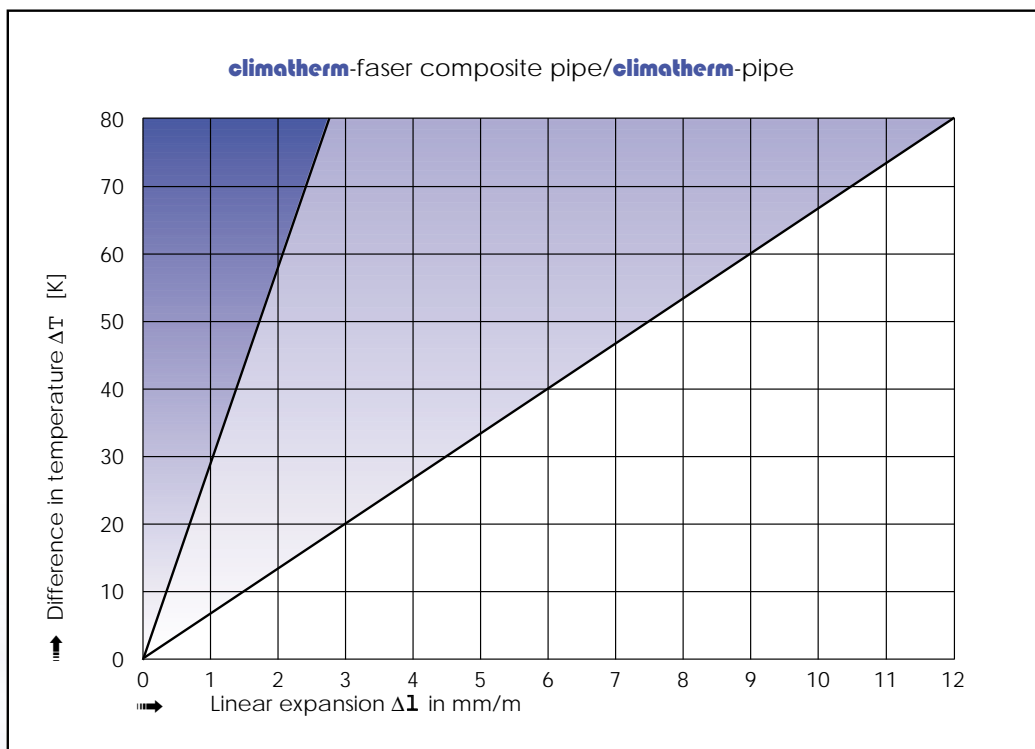


Diagram of linear expansion caused by temperature:

climatherm-faser composite pipe
climatherm-pipe

Pipe Friction Factor and Flow Rate

Pipe friction factor R
and calculated flow rate v in dependence on the circulatory \dot{V}

Roughness : 0,0070 mm

Recommended values for
heating systems, chilled water
or hot water applications.

climatherm-pipe SDR 11
climatherm-faser composite pipe

\dot{V} = circulatory [l/s]		R = pressure gradient [mbar/m]										v = flow rate [m/s]	
d x s ▶		20 x 1,9	25 x 2,3	32 x 2,9	40 x 3,7	50 x 4,6	63 x 5,8	75 x 6,8	90 x 8,2	110x10,0	125x11,4		
\dot{V}	d _i ▶	16,2 mm	20,4 mm	26,0 mm	32,6 mm	40,8 mm	51,4 mm	61,2 mm	73,6 mm	90,0 mm	102,2 mm		
0,01	R	0,06	0,02	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00		
	v	0,05	0,03	0,02	0,01	0,01	0,00	0,00	0,00	0,00	0,00		
0,02	R	0,12	0,05	0,02	0,01	0,00	0,00	0,00	0,00	0,00	0,00		
	v	0,10	0,06	0,04	0,02	0,02	0,01	0,01	0,00	0,00	0,00		
0,03	R	0,18	0,07	0,03	0,01	0,00	0,00	0,00	0,00	0,00	0,00		
	v	0,15	0,09	0,06	0,04	0,02	0,01	0,01	0,01	0,00	0,00		
0,04	R	0,50	0,17	0,04	0,01	0,01	0,00	0,00	0,00	0,00	0,00		
	v	0,19	0,12	0,08	0,05	0,03	0,02	0,01	0,01	0,00	0,00		
0,05	R	0,74	0,25	0,08	0,02	0,01	0,00	0,00	0,00	0,00	0,00		
	v	0,24	0,15	0,09	0,06	0,04	0,02	0,02	0,01	0,00	0,00		
0,06	R	1,01	0,34	0,11	0,02	0,01	0,00	0,00	0,00	0,00	0,00		
	v	0,29	0,18	0,11	0,07	0,05	0,03	0,02	0,01	0,00	0,00		
0,07	R	1,32	0,44	0,14	0,05	0,01	0,00	0,00	0,00	0,00	0,00		
	v	0,34	0,21	0,13	0,08	0,05	0,03	0,02	0,02	0,00	0,00		
0,08	R	1,66	0,56	0,18	0,06	0,02	0,00	0,00	0,00	0,00	0,00		
	v	0,39	0,24	0,15	0,10	0,06	0,04	0,03	0,02	0,00	0,00		
0,09	R	2,03	0,68	0,22	0,07	0,03	0,01	0,00	0,00	0,00	0,00		
	v	0,44	0,28	0,17	0,11	0,07	0,04	0,03	0,02	0,00	0,00		
0,10	R	2,44	0,82	0,26	0,09	0,03	0,01	0,00	0,00	0,00	0,00		
	v	0,49	0,31	0,19	0,12	0,08	0,05	0,03	0,02	0,00	0,00		
0,12	R	3,35	1,12	0,35	0,12	0,04	0,01	0,01	0,00	0,00	0,00		
	v	0,58	0,37	0,23	0,14	0,09	0,06	0,04	0,03	0,00	0,00		
0,14	R	4,39	1,46	0,46	0,16	0,06	0,02	0,01	0,00	0,00	0,00		
	v	0,68	0,43	0,26	0,17	0,11	0,07	0,05	0,03	0,00	0,00		
0,16	R	5,55	1,85	0,58	0,20	0,07	0,02	0,01	0,00	0,00	0,00		
	v	0,78	0,49	0,30	0,19	0,12	0,08	0,05	0,04	0,00	0,00		
0,18	R	6,84	2,27	0,72	0,24	0,08	0,03	0,01	0,01	0,00	0,00		
	v	0,87	0,55	0,34	0,22	0,14	0,09	0,06	0,04	0,00	0,00		
0,20	R	8,23	2,73	0,86	0,29	0,10	0,03	0,01	0,01	0,00	0,00		
	v	0,97	0,61	0,38	0,24	0,15	0,10	0,07	0,05	0,00	0,00		
0,30	R	16,93	5,59	1,75	0,59	0,20	0,07	0,03	0,01	0,00	0,00		
	v	1,46	0,92	0,57	0,36	0,23	0,14	0,10	0,07	0,00	0,04		
0,40	R	28,37	9,32	2,91	0,99	0,34	0,11	0,05	0,02	0,01	0,00		
	v	1,94	1,22	0,75	0,48	0,31	0,19	0,14	0,09	0,06	0,05		
0,50	R	42,45	13,89	4,32	1,46	0,50	0,17	0,07	0,03	0,01	0,01		
	v	2,43	1,53	0,94	0,60	0,38	0,24	0,17	0,12	0,08	0,06		
0,60	R	59,11	19,28	5,98	2,02	0,69	0,23	0,10	0,04	0,02	0,01		
	v	2,91	1,84	1,13	0,72	0,46	0,29	0,20	0,14	0,09	0,07		
0,70	R	78,31	25,46	7,87	2,65	0,90	0,30	0,13	0,05	0,02	0,01		
	v	3,40	2,14	1,32	0,84	0,54	0,34	0,24	0,16	0,11	0,09		

Pipe Friction Factor and Flow Rate

Pipe friction factor R
and calculated flow rate v in dependence on the circulatory \dot{V}

Roughness : 0,0070 mm

Recommended values for
heating systems, chilled water
or hot water applications.

climatherm-pipe SDR 11
climatherm-faser composite pipe

\dot{V} = circulatory [l/s]		R = pressure gradient [mbar/m]										v = flow rate [m/s]	
d x s ▶		20 x 1,9	25 x 2,3	32 x 2,9	40 x 3,7	50 x 4,6	63 x 5,8	75 x 6,8	90 x 8,2	110x10,0	125x11,4		
\dot{V}	d _i ▶	16,2 mm	20,4 mm	26,0 mm	32,6 mm	40,8 mm	51,4 mm	61,2 mm	73,6 mm	90,0 mm	102,2 mm		
0,80	R	100,01	32,43	10,01	3,36	1,15	0,38	0,17	0,07	0,03	0,01		
	v	3,88	2,45	1,51	0,96	0,61	0,39	0,27	0,19	0,13	0,10		
0,90	R	124,19	40,18	12,37	4,15	1,41	0,47	0,20	0,08	0,03	0,02		
	v	4,37	2,75	1,70	1,08	0,69	0,43	0,31	0,21	0,14	0,11		
1,00	R	150,84	48,69	14,96	5,01	1,70	0,56	0,24	0,10	0,04	0,02		
	v	4,85	3,06	1,88	1,20	0,76	0,48	0,34	0,24	0,16	0,12		
1,20	R	211,46	67,99	20,81	6,95	2,36	0,78	0,34	0,14	0,05	0,03		
	v	5,82	3,67	2,26	1,44	0,92	0,58	0,41	0,28	0,19	0,15		
1,40	R	281,77	90,28	27,55	9,18	3,11	1,02	0,44	0,18	0,07	0,04		
	v	6,79	4,28	2,64	1,68	1,07	0,67	0,48	0,33	0,22	0,17		
1,60	R	361,70	115,54	35,16	11,69	3,95	1,30	0,56	0,23	0,09	0,05		
	v	7,76	4,90	3,01	1,92	1,22	0,77	0,54	0,38	0,25	0,20		
1,80	R	451,22	143,73	43,63	14,48	4,88	1,60	0,69	0,29	0,11	0,06		
	v	8,73	5,51	3,39	2,16	1,38	0,87	0,61	0,42	0,28	0,22		
2,00	R	552,07	174,84	52,94	17,54	5,90	1,94	0,84	0,35	0,13	0,07		
	v	9,70	6,12	3,77	2,40	1,53	0,96	0,68	0,47	0,31	0,24		
2,20	R	660,78	208,86	63,11	20,87	7,02	2,30	0,99	0,41	0,16	0,09		
	v	10,67	6,73	4,14	2,64	1,68	1,06	0,75	0,52	0,35	0,27		
2,40	R	778,98	245,77	74,11	24,47	8,21	2,69	1,16	0,48	0,18	0,10		
	v	11,64	7,34	4,52	2,88	1,84	1,16	0,82	0,56	0,38	0,29		
2,60	R	906,64	285,56	85,94	28,33	9,50	3,10	1,34	0,55	0,21	0,11		
	v	12,61	7,95	4,90	3,11	1,99	1,25	0,88	0,61	0,41	0,32		
2,80	R	1043,75	328,23	98,61	32,46	10,87	3,55	1,53	0,63	0,24	0,13		
	v	13,58	8,57	5,27	3,35	2,14	1,35	0,95	0,66	0,44	0,34		
3,00	R	1190,30	373,77	112,10	36,85	12,32	4,02	1,73	0,71	0,27	0,15		
	v	14,55	9,18	5,65	3,59	2,29	1,45	1,02	0,71	0,47	0,37		
3,20	R	1346,28	423,56	126,42	41,50	13,86	4,52	1,94	0,80	0,30	0,17		
	v	15,52	9,79	6,03	3,83	2,45	1,54	1,09	0,75	0,50	0,39		
3,40	R	1511,68	474,89	141,56	46,41	15,49	5,04	2,17	0,89	0,34	0,18		
	v	16,50	10,40	6,40	4,07	2,60	1,64	1,16	0,80	0,53	0,41		
3,60	R	1686,50	529,07	157,51	51,58	17,19	5,59	2,40	0,99	0,38	0,20		
	v	17,47	11,01	6,78	4,31	2,75	1,73	1,22	0,85	0,57	0,44		
3,80	R	1870,73	586,10	174,29	57,00	18,98	6,17	2,65	1,09	0,41	0,22		
	v	18,44	11,63	7,16	4,55	2,91	1,83	1,29	0,89	0,60	0,46		
4,00	R	2064,37	645,97	191,88	62,69	20,86	6,77	2,91	1,19	0,45	0,25		
	v	19,41	12,24	7,53	4,79	3,06	1,93	1,36	0,94	0,63	0,49		
4,20	R	2267,41	708,68	210,28	68,63	22,81	7,40	3,18	1,30	0,49	0,27		
	v	20,38	12,85	7,91	5,03	3,21	2,02	1,43	0,99	0,66	0,51		
4,40	R	2479,85	774,22	229,50	74,82	24,85	8,06	3,46	1,42	0,54	0,29		
	v	21,35	13,46	8,29	5,27	3,37	2,12	1,50	1,03	0,69	0,54		

Pipe Friction Factor and Flow Rate

Pipe friction factor R
and calculated flow rate v in dependence on the circulatory \dot{V}

Roughness : 0,0070 mm

Recommended values for
heating systems, chilled water
or hot water applications.

climatherm-pipe SDR 11
climatherm-faser composite pipe

\dot{V} = circulatory [l/s]		R = pressure gradient [mbar/m]										v = flow rate [m/s]	
d x s ▶		20 x 1,9	25 x 2,3	32 x 2,9	40 x 3,7	50 x 4,6	63 x 5,8	75 x 6,8	90 x 8,2	110x10,0	125x11,4		
\dot{V}	d _i ▶	16,2 mm	20,4 mm	26,0 mm	32,6 mm	40,8 mm	51,4 mm	61,2 mm	73,6 mm	90,0 mm	102,2 mm		
4,60	R	2701,69	842,61	249,53	81,27	26,97	8,74	3,75	1,54	0,58	0,32		
	v	22,32	14,07	8,66	5,51	3,52	2,22	1,56	1,08	0,72	0,56		
4,80	R	2932,92	913,82	271,35	87,98	29,17	9,44	4,05	1,66	0,63	0,34		
	v	23,29	14,69	9,04	5,75	3,67	2,31	1,63	1,13	0,75	0,59		
5,00	R	3173,54	987,87	293,03	94,93	31,45	10,17	4,36	1,78	0,68	0,37		
	v	24,26	15,30	9,42	5,99	3,82	2,41	1,70	1,18	0,79	0,61		
5,20	R	3423,56	1064,75	315,52	102,14	33,81	10,93	4,68	1,92	0,73	0,39		
	v	25,23	15,91	9,79	6,23	3,98	2,51	1,77	1,22	0,82	0,63		
5,40	R	3682,96	1144,46	338,82	109,61	36,26	11,71	5,01	2,05	0,78	0,42		
	v	26,20	16,52	10,17	6,47	4,13	2,60	1,84	1,27	0,85	0,66		
5,60	R	3951,74	1227,00	362,92	117,32	38,78	12,52	5,36	2,19	0,83	0,45		
	v	27,17	17,13	10,55	6,71	4,28	2,70	1,90	1,32	0,88	0,68		
5,80	R	4229,92	1312,37	387,82	125,29	41,39	13,35	5,71	2,33	0,88	0,48		
	v	28,14	17,75	10,92	6,95	4,44	2,80	1,97	1,36	0,91	0,71		
6,00	R	4517,48	1400,00	413,53	133,51	44,07	14,21	6,07	2,48	0,94	0,51		
	v	29,11	18,36	11,30	7,19	4,59	2,89	2,04	1,41	0,94	0,73		
6,20	R	4814,42	1491,58	440,05	141,98	46,83	15,09	6,45	2,63	1,00	0,54		
	v	30,08	18,97	11,68	7,43	4,74	2,99	2,11	1,46	0,97	0,76		
6,40	R	5120,74	1585,42	467,37	150,70	49,68	16,00	6,83	2,79	1,06	0,57		
	v	31,05	19,58	12,05	7,67	4,90	3,08	2,18	1,50	1,01	0,78		
6,60	R	5436,44	1682,09	495,48	159,67	52,60	16,93	7,23	2,95	1,12	0,60		
	v	32,02	20,19	12,43	7,91	5,05	3,18	2,24	1,55	1,04	0,80		
6,80	R	5761,53	1781,58	524,41	168,89	55,60	17,89	7,63	3,12	1,18	0,64		
	v	32,99	20,80	12,81	8,15	5,20	3,28	2,31	1,60	1,07	0,83		
7,00	R	6095,99	1883,89	554,13	178,37	58,69	18,87	8,05	3,28	1,24	0,67		
	v	33,96	21,42	13,18	8,39	5,35	3,37	2,38	1,65	1,10	0,85		
7,50	R	6973,19	2152,02	631,95	203,89	66,74	21,43	9,13	3,72	1,41	0,76		
	v	36,39	22,95	14,13	8,99	5,74	3,61	2,55	1,76	1,18	0,91		
8,00	R	7908,99	2437,78	714,76	230,26	75,28	24,14	10,28	4,19	1,58	0,85		
	v	38,81	24,48	15,07	9,58	6,12	3,86	2,72	1,88	1,26	0,98		
9,00	R	9956,40	3062,18	895,39	287,67	93,85	30,02	12,77	5,19	1,96	1,06		
	v	43,66	27,54	16,95	10,78	6,88	4,34	3,06	2,12	1,41	1,10		
10,00	R		3757,04	1095,99	351,27	114,38	36,51	15,50	6,30	2,37	1,28		
	v		30,59	18,83	11,98	7,65	4,82	3,40	2,35	1,57	1,22		

Support Intervals

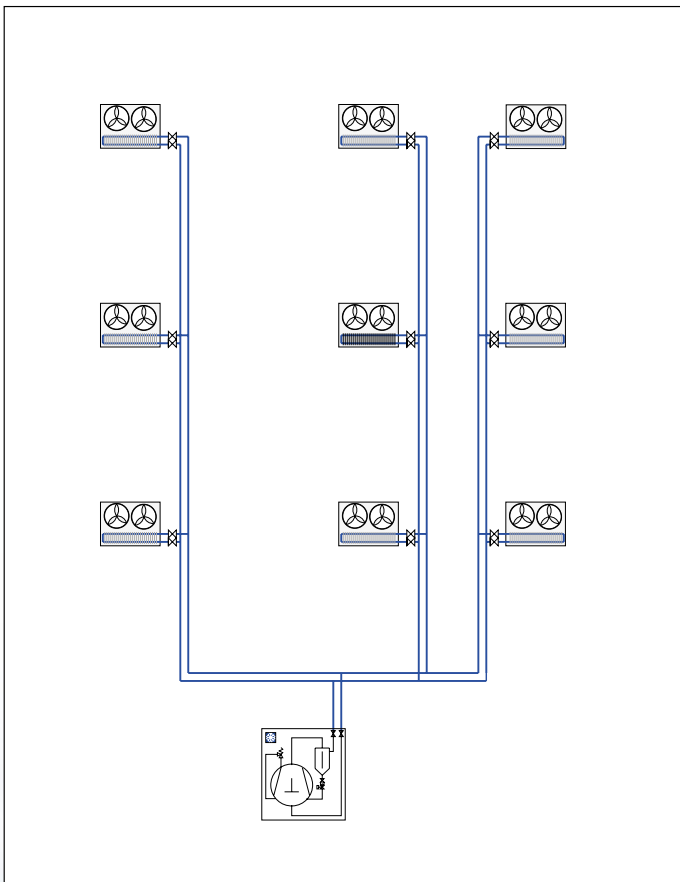
climatherm-pipe / climatherm-faser composite pipe

Table to determine support intervals for **climatherm**-pipes / **climatherm**-faser composite pipes in conjunction with temperature and outside diameter.

Difference in temperature ΔT [K]	Pipe diameter d (mm)									
	20	25	32	40	50	63	75	90	110	125
0	85	105	160	180	205	230	245	260	290	300
20	60	75	120	135	155	175	185	195	215	240
30	60	75	120	135	155	175	185	195	210	225
40	60	70	110	125	145	165	175	185	200	215
50	60	70	110	125	145	165	175	185	190	195
60	55	65	105	120	135	155	165	175	180	185
70	50	60	95	110	130	145	155	165	170	175

climatherm-pipe **climatherm-faser composite pipe**

Installation scheme chilled application



Reference



Hotel Meliton, Porto Carras (Hellas)



*Installation of **climatherm**-pipe system*