TRAINING MANUAL

aquatherm
AUSTRALIA

Features - Quality Assurance - Fusion - Installation Principles - Planning - Product Range

Pipe System

For potable water, hydronic and industrial applications

MADE IN GERMANY
PIPESYSTEMS

CONTENTS

This manual has been prepared for training purposes. Should you require more detailed information download from the full manual from www.aquatherm.com.au/manual.

fusiolen® PP-R

All fusiotherm®- pipes and fittings are made of fusiolen® PP-R.

Special heat and extraction stability are only two of the features of this material. Its physical and chemical properties are well-suited to the transfer of potable water and to the heating field. Above all, the good welding properties and fusion, resulting in a permanent connection, have made the fusiotherm®- system and the raw material fusiolen® PP-R well known woldwide.

Environment

The environmentally friendly material polypropylen fusiolen® PP-R is recyclable and can be ground, melted and reutilised for various applications e.g. motor-protections, wheel linings, laundry baskets and other kinds of transport boxes. There are no polluting substances with PP-R either in its processing or in its disposal.

fusiolen® PP-R – for the benefit of our evironment!

Use of metal deactivators

By adding suitable food-approved additives the risk of a material damage caused by metal under extreme conditions of application is substantially reduced.

Higher long-term heat stabilization

The long-term heat stabilization has been increased to resist to the potential effects of peak temperatures within higher safety parameters.

THE ADVANTAGES AT ONE SIGHT:

RESISTANT AGAINST CHEMICALS

SMELL- AND TASTE NEUTRALITY

PHYSIOLOGICAL SUITABILITY

HIGH ENVIRONMENTAL COMPATIBILITY

HIGH IMPACT RATE

LESS PIPE FRICTION

HEAT- AND SOUND INSULATING CHARACTERISTICS

VERY GOOD WELDING PROPERTIES

HIGH HEAT - STABILITY

EQUIPPED WITH METAL DEACTIVATION

CAUTIONARY NOTE

1) Constant hot potable water temperatures should not exceed 70°C.

2) Care should be exercised in mixed PP-R/Copper hot potable water recirculation systems where temperatures/pressures may exceed 70°C (permissible working pressures see page 14) and where copper pipe velocities may exceed established international copper design practice – enquirers should refer to the projects Hydraulic Consultant.
Up stream use of copper pipe in PP-R hot water recirculating systems where the above operational parameters are exceeded should be avoided.

3) The se rvice life of aquatherm PP-R pipe systems could be reduced by using excessive concentration of disinfecting products.

from page 12 of Fuisotherm Manual

Permissible working pressure

for potable water installations

Fluid transported: water acc. to DIN 2000

Temperature	Service life	Fusiotherm®-pipe SDR 11 aquatherm lilac-pipe SDR 11 *	Fusiotherm®-pipe SDR 7.4 aquatherm lilac-pipe SDR 11 *	Fusiotherm®-pipe SDR 6 / Fusiotherm®-stabi composite pipe	Fusiotherm®-faser composite pipe SDR 7.4
	Permissible working pressure in bar and (psi)				
20°C 68°F	1	15.0	23.8	30.0	28.6
	5	14.1	22.3	28.1	26.8
	10	13.7	21.7	27.3	26.1
	25	13.3	21.1	26.5	25.3
	50	12.9	20.4	25.7	24.5
30°C 86°F	1	12.8	20.2	25.5	24.3
	5	12.0	19.0	23.9	22.8
	10	11.6	18.3	23.1	22.0
	25	11.2	17.7	22.3	21.3
	50	10.9	17.3	21.8	20.7
40°C 104°F	1	10.8	17.1	21.5	20.5
	5	10.1	16.0	20.2	19.2
	10	9.8	15.6	19.6	18.7
	25	9.4	15.0	18.8	18.0
	50	9.2	14.5	18.3	17.5
50°C 122°F	1	9.2	14.5	18.3	17.5
	5	8.5	13.5	17.0	16.2
	10	8.2	13.1	16.5	15.7
	25	8.0	12.6	15.9	15.2
	50	7.7	12.2	15.4	14.7
60°C 140°F	1	7.7	12.2	15.4	14.7
	5	7.2	11.4	14.3	13.7
	10	6.9	11.0	13.8	13.2
	25	6.7	10.5	13.3	12.6
	50	6.4	10.1	12.7	12.1
65°C 149°F	1		11.6	14.6	13.9
	5		10.8	13.6	12.9
	10		10.4	13.1	12.5
	25		10.0	12.6	12.0
	50		8.8	11.1	10.6
70°C 158°F	1		10.3	13.0	12.4
	5		9.5	11.9	11.4
	10		9.3	11.7	11.1
	25		8.0	10.1	9.6
	30		7.0	8.8	9.3
	50		6.7	8.5	8.1
75°C 167°F	1		9.8	12.3	11.7
	5		9.0	11.4	10.8
	10		8.3	10.5	10.0
	25		6.7	8.4	8.0

Potable water (cold)

Potable water (warm)

Faser and Stabi composite pipe: high working stress at lower wall thickness and higher flow rate

* Only for non-potable water
SDR = Standard Dimension Ratio (diameter / wall thickness ratio)
SDR = 2 x S + 1 ≈ d/s
(S = Pipe series index from ISO 4065)

from page 14 of Fuisotherm Manual

Features

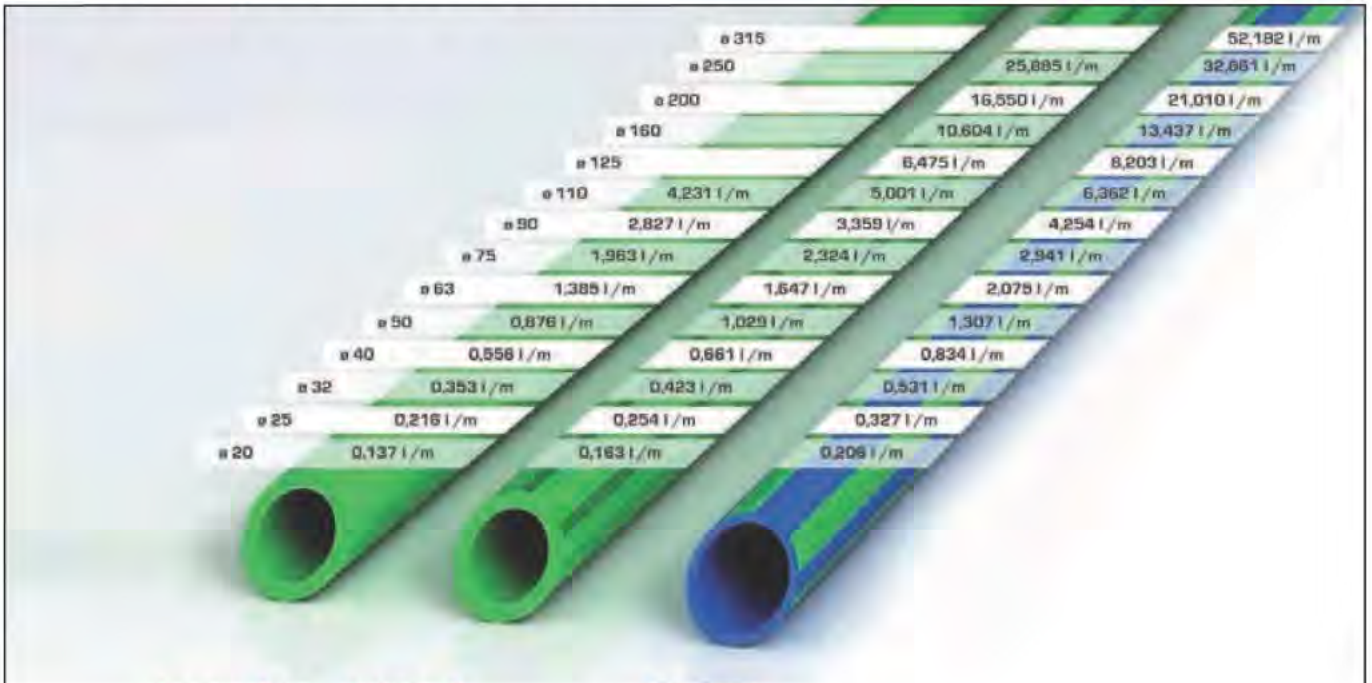
Fields of application of the fusiotherm®-, climatherm- and lilac- pipe systems:

System recommended due to its technical advantages: ●

Application of the system is suitable: ○

	fusiotherm®	climatherm	lilac
Potable water application	●		
Heating system construction	○	●	
Climate technology	○	●	
Chilled water technology	○	●	
Swimming-pool technology	●	●	
Chemical transport due to high chemical resistance	●	●	
Rainwater application			●
Irrigation	○	●	
Compressed air systems	○	●	
Under-floor-heating-systems	○	●	
Fire protection sprinkler-systems			
Application in the field of ship building	●	●	
Geothermal	●	●	

Water content per meter by comparison



fusiotherm®-pipe SDR 6

fusiotherm®-faser composite pipe SDR 7.4
climatherm-faser composite pipe SDR 7.4 & SDR OT 7.4

climatherm-faser composite pipe SDR 11 & SDR OT 11
climatherm-pipe SDR 11
fusiotherm®-pipe SDR 11
aquatherm lilac-pipe SDR 11

The specification concerning the chemical resistance and the included inquiery are both listed in chapter 1, page 22 for the fusiotherm® and climatherm pipe system. The conditions, regulations and recommendations, described in chapter 3 "fusion", chapter 4 "installation principles" and chapter 5 "planning" are also valid for fusiotherm® and the climatherm-pipes. The fittings applied with the climatherm-pipe are specified in chapter 6 "product range." In addition the same conditions of guarantee and delivery as for the other aquatherm-pipe systems are valid for the climatherm-pipes.

from page 25 of Fusiotherm Manual

Part A:
Mounting of the tools

1. **fusiotherm®** and **climatherm** are processed identically.

   IMPORTANT!

   Only use original fusiotherm®-welding devices and fusiotherm®-welding tools.

2. Assemble and tighten the cold welding tools manually.

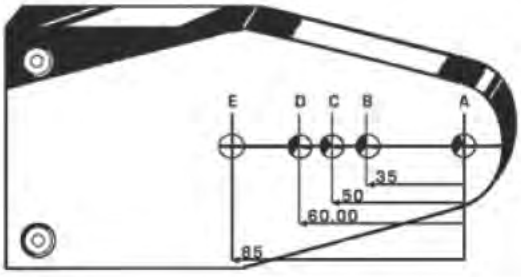
3. Before fusing the distribution block, in which two connections are fused simultaneously, the welding tools have to be placed into the respective holes as described in the adjoing table A and drawing B.

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 methylated spirit.

A

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

B



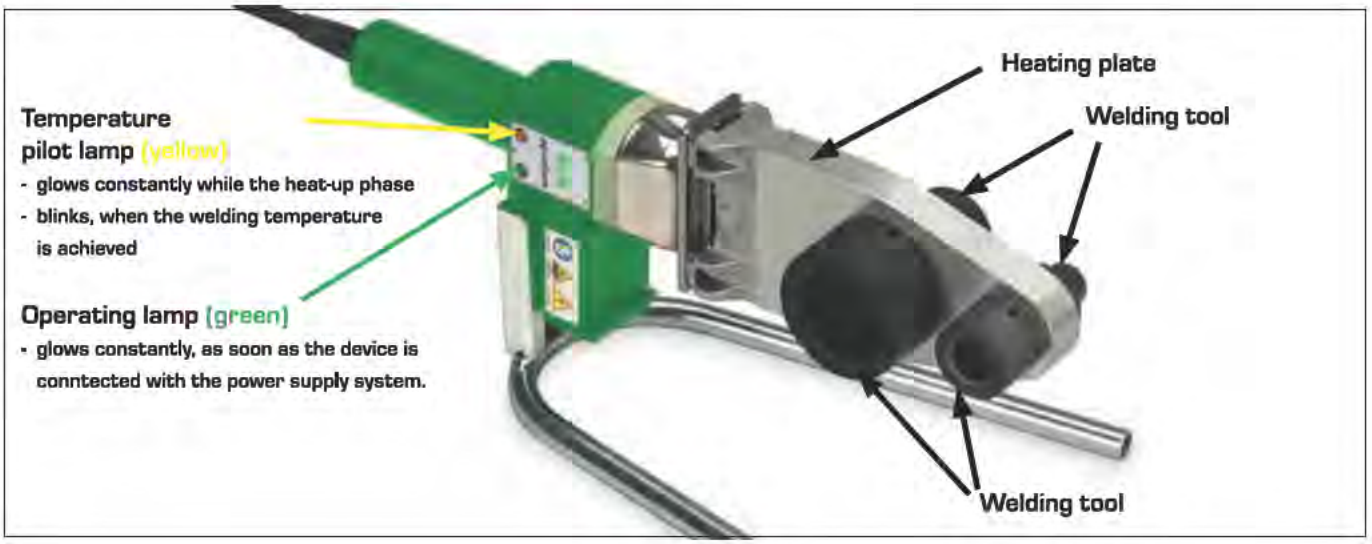
5. Place the welding tools on the welding device so that there is full surface contact between the welding tool and the heating plate. Welding tools over Ø 40 mm must always be fitted to the rear position of the heating plate.

   Electric supply:
   The power supply must coincide with the data on the type plate of the welding device and must be protected according to the local regulations. To avoide high power loss, the conductor cross-section of the used extension cables must be selected according to the power input of the welding devices.

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

from page 35 of Fusiotherm Manual

Part A: Heating up phase / Handling



Part A: Heating up phase

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

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

8. The temperature of 260° C is required for the welding of the fusiotherm®-system.

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

   This can be done with a fast indicating surface thermometer.

   ATTENTION:

   First welding - soonest 10 minutes after reaching of the welding temperature. DVS 2207, Part 11.

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 unplugged, e.g. during longer breaks, the heating up process, has to be restarted (see item 6).

11. After use unplug the welding device 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 impurities. Burnt particles may lead to an incorrect fusion. The tools may be cleaned with fusiotherm®-cleansing cloths, Art.-No.50193.

    Always keep the welding tools dry.

13. After welding, do not lay the the device on the Teflon-coated tool, but put it down in the provided supporting stand.

14. For a perfect fusion, damaged or dirty welding tools must be replaced, as only impeccable tools guarantee a perfect connection.

15. Never attempt to open or repair a defective device. Return the defective device for repair.

16. Check the operating temperature of fusiotherm®-welding devices regularly by means of suitable measuring instruments.

from page 36 of Fusiotherm Manual

Part A: Guidelines
Part B: Checking of devices and tools

Part A: Guidelines

17. 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".

18. 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.).

Temperature control with a thermometer

Part B: Checking of devices and tools

1. Check, if the fusiotherm®-welding devices and tools comply with to the guidelines "Fusion Part A".

2. All used devices and tools must have reached the necessary operating temperature of 260 °C. This requires acc. to "Fusion Part A, item 8" a separate test, which is indispensable (DVS-Welding Guidelines):

Suitable measuring instruments have to measure a temperature of up to 350° C with a high accuracy.

Note:
aquatherm recommends the original
fusiotherm®-temperature measuring device art.-no. 50188

fusiotherm®-temperature measuring device art.-no. 50188

from page 37 of Fusiotherm Manual

Part B: Preparation for the fusion

Part B: Preparation for the fusion

3. Cut the pipe at right angles to the pipe axis. Only use fusiotherm®-pipe cutters or other suitable cutting pliers. Take care that the pipe axis is free from burrs or cutting debris and remove where 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.

   The markings on the fitting and the uninterrupted line on the pipe may be used as a guide.

6. Before the fusion peel off the oxygen barrier layer of the climatherm OT-pipe, the aluminium-PP-composite layer of the stabi-composite pipe and the UV-layer of the faser-composite-pipe-UV completely to the stop by using the double peeling tools (Art.-No. 50507, 50511, 50516, 50519, 50525) considering the pipe diameter.

   By turning the adjusting screw clockwise to the stop, the peeling tools can be adjusted into small depths (sockets), by turning them counter clockwise up to the stop they can be adjusted into big peeling depth (electrofusion sockets).

   Alternatively the peeling tools Art.-No. 50506, 50508, 50512, 50514, 505018, 50524 and 50526 can be applied.

7. Only use original fusiotherm®-peeling tools with undamaged peeling blades. Blunt peeling blades have to be replaced by original ones. It will be necessary to make trial peelings to check the correct setting of the new blade. It should not be easier than usual to push the peeled stabi composite pipe or respectively climatherm OT-pipe into the welding tool.

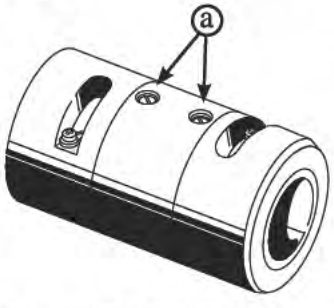
8. Push the end of the stabi composite pipe into the guide of the peeling tool. Peel off the aluminium-PP-composite layer respectively oxygen barrier layer up to the stop of the peeling tool. It is not necessary to mark the welding depth as the backstop of the peeling tool indicates the correct welding depth.

9. Before starting the fusion, check if the aluminium-PP-composite layer respectively oxygen barrier layer has been completely removed.

Cutting of the pipe

Marking of the welding depth

Peeling of the aluminium-PP-composite-layer respectively oxygen barrier layer (Necessary only for stabi-composite pipes and climatherm OT pipe!)



Peeling depth can be varied by turning the adjusting screw (a).

from page 38 of Fusiotherm Manual

Part B: Preparation for the fusion / Heating of pipe and fitting

Part B: Preparation for the fusion

The fusion is subject to the following data

Pipe external-Ø	Welding depth	Heating time		Welding time	Cooling time
mm	mm	sec. DVS	sec. AQE*	sec.	min.
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

*heating times recommended by aquatherm at ambient temperatures below + 5 °C

Dimension 160 - 315 mm:

The dimension 160 - 315 mm are joined by butt-welding.

Detailed information page 52 + 53.

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

Part B: Heating of pipe and fitting

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

    It is essential to observe the above mentioned heating times.

Pipes and fittings of the dimensions Ø 75 to 125 mm can only be welded with welding device Art.-No. 50141 (or with machine Art.-No. 50147). On using the fusiotherm *-welding machine Art.-No. 50147 a separate operating instruction has to be observed.

Heating-up of pipe and fitting

ATTENTION:

The heating time starts, when pipe and fitting have been pushed to the correct welding depth on the welding tool. NOT BEFORE!

from page 39 of Fusiotherm Manual

Part B: Setting and alignment
Part C: Weld-in saddles

Part B: Setting and alignment

11. After the required heating time quickly remove pipe and fitting from the welding tools. Joint them immediately, and without turning, until the marked welding depth is covered by the PP-bead 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 will close the pipe.

12. The joint elements have to be fixed during the specified assembly time. Use this time to correct the connection. Correction is restricted to the alignment of pipe and fitting. Never turn the elements or align the connection after the processing time.

13. After the required cooling time the fused joint is ready for use.

The result of the fusion of pipe and fitting is a permanent material joining of the system elements. Connection technique with security for a life-time.

Joining, fixing and...

...aligning

The result: a permanent connection!

Part C: Weld-in saddles

fusiotherm®-weld-in saddles are available for pipe outer diameter of 40 - 315 mm.

Weld in saddles are used for

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

The maximum sensor well diameter is specified in the table.

1. Before starting the welding process, check whether the fusiotherm®-welding devices and tools comply with the requirements of "Fusion Part A".

2. The first step is to drill through the pipe wall at the intended outlet point by using the fusiotherm® **-drill** (Art.-No. 50940-50958).

Drilling through the pipe wall

from page 40 of Fusiotherm Manual

Part C: Weld-in saddles

Part C: Weld-in saddles

3. IMPORTANT!

Only the oxgen barrier layer of the climatherm OT pipes Art.-No. 2170708-2170142 must be removed with the below mentioned fusiotherm special peeling drills.

Art.-No.	Dimension
50920	for weld-in saddles 20 & 25 mm for pipe dimension 40 mm*
50921	for weld-in saddles 20 & 25 mm for pipe dimensions 50 mm and more
50922	for weld-in saddles ø 32 mm
50924	for weld-in saddles ø 40 mm
50926	for weld-in saddles ø 50 mm
50928	for weld-in saddles ø 63 mm

* only for weld-in saddles Art.-No.: 15156, 15158, 28214, 28314

For this the special peeling drill is inserted into the bore hole and swaied 2-3 times with light pressure and low rotating speed between the pipe walls until the oxygen barrier layer is completely peeled off.

Remove burrs, debris and other dirts with a chamfering tool or the aquatherm cleaning wipes. Do not touch the peeled surface any more and protect it from new pollution.

When using fusiotherm®-stabi composite pipes remove the rest of the aluminium remaining at the bore hole with the fusiotherm®-chamfering device.

4. The welding device / saddle welding tool must have reached the required operating temperature of 260 °C (check with reference to "Fusion Part B, item 2").

5. The welding surfaces have to be clean and dry.

6. Insert the heating tool on the concave side of the weld-in saddle tool into the hole drilled in the pipe wall until the tool is completely in contact with the outer wall of the pipe. Next the weld-in saddle tool 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 tool is immediately inserted into the heated, drilled hole. Then the weld-in saddle should 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.

Removal of the oxgen barrier layer from the climatherm OT-pipe

The welding tool is inserted into the pipe wall ...

...heating-up of the elements

Joining

Ready!

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

from page 41 of Fuisotherm Manual

Part D: Electrical welding jig

By means of the electrical welding jig, fusiotherm®-pipes and fittings in dimensions of between 63 and 125 mm can be welded in the easiest way without any effort, with considerable time saving compared to customary welding.

Another advantage of the welding jig is the simple welding of pipes and fittings under ceilings, in narrow shafts and in other hardly accessible places.

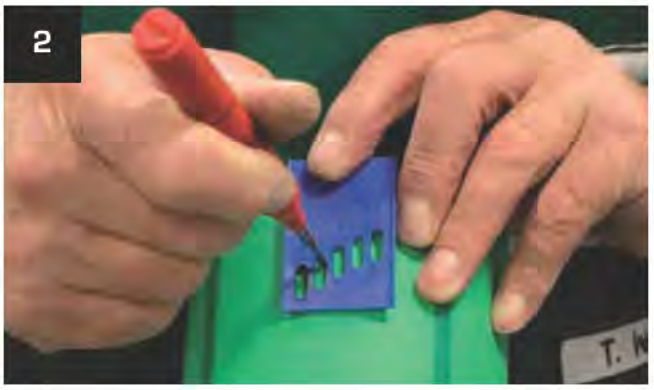
1. Preparation for the fusion

Mark the welding and clamping depth at the end of the pipe by using the attached blue template. (Illustration 2)

The welding jig is fixed with the clamping jaws at the pipe and fitting.

Secure the clamping jaws by means of the clamping fixtures.

Align the pipe that the back mark is precise with the inside edge of the clamping jaw. The front mark shows the welding depth (Illustration 2). Secure the pipe and fitting with the front setscrew. (Illustration 3+4)



Never overtighten the pipe for avoiding deformations.

from page 44 of Fuisotherm Manual

Part D: Electrical welding jig

2. Fusion

Keep the welding device between pipe and fitting and drive the machine slide in batches. Mind the welding depth!

Basically after introducing of pipe and fitting to the welding tool, the clamping jaws are to be relieved by a short return of the machine! The clamping jaws must always be parallel. (Illustration 5+6)

After the end of the heating time, release the machine slide and remove the welding device. (Illustration 7)

Pull the clamping jaws with pipe and fitting together and relieve the clamping jaws by a short return of the machine. (Illustration 8)

NOTE:

Clamping jaws and screws must not be loosened before the end of the cooling time!

By fusion of pipe and fitting a permanent connection is made. (Illustration 9)

7

8

5

6

9

Pipe external	Welding depth	Heating time		Welding time	Cooling time
mm	mm	sec. DVS	sec. AQE*	sec.	min.
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 increase of about 50%!

*heating times recommended by aquatherm

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

from page 45 of Fulsotherm Manual

Part E:
Fusiotherm®-welding machine

Part E: Fusiotherm®-welding machine

- for stationary processing 50 – 125 mm
- precise pre-assembly and facilitation by hand creek
- scope of supply: wooden case, machine slide with body, clamping jaws 50 – 125 mm, tools 50 – 125 mm, 2 welding plates, pipe support with rolls

1. Check welding machine: temperature lamp blinks after reaching the welding temperature (260°C), align clamping jaws 50-125 mm. Adjust the dimension (welding depth) with the adjusting knob.
2. Fix the fitting against the clamping jaws.
3. Place the pipe loose in the opposite clamping jaws.
4. Insert the medium calibration knob and push up the slide as far as it will go.
5. In this position push the pipe against the fitting and fix it with the clamping jaws. Now open the slide and pull out the calibration knob.
6. Regulate the welding time according to the table below, place the welding device and push the fitting and pipe slowly as far as it will go on the tool.

7. The heating time starts when pipe and fitting are completely pushed on the tool. When heating time is complete, return the slide, remove the heating device quickly and join pipe and fitting.
8. Consider cooling times in the table below.

More detailed information can be taken from the enclosed operating manuals.

The fusion is subject to the following data

Pipe external-Ø	Welding depth	Heating time		Welding time	Cooling time
mm	mm	sec. DVS	sec. AQE*	sec.	min.
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

*heating times recommended by aquatherm at ambient temperatures below + 5 °C

Dimension 160 - 315 mm:

These dimensions are joined by butt-welding.

Detailed information in this chapter on page 52 + 53.

The general guidelines for heated tool socket welding acc. **to DVS 2207 part 11 are applied hereupon.**

from page 46 of Fusiotherm Manual

Part E:
Fusiotherm®-welding machine prisma-light

Part E: Fusiotherm®-welding machine prisma-light

- with heating plate without tools
- clamping fixture for fixing the prisma-light e. g. at the work bench

1. Check machine: temperature lamp blinks after reaching the welding temperature (260° C), adjust clamping jaws 63 – 125 mm coarsely. Mark welding depth with the template at the pipe.
2. Fix the fitting against the clamping jaws.
3. Place the pipe loose in the opposite clamping jaws.
4. Position the welding device centrically to the pipe-fitting axis and remove it.
5. Lock the front calibration knob and drive up the slide as far as it will go.
6. In this position push the pipe against the fitting and fix it with the clamping jaws.
7. Regulate the welding time according to the table on page 46, place the welding device and push the fitting and pipe slowly as far as it will go up to the marking.
8. The heating time starts when pipe and fitting are completely pushed on the tool. When heating time is complete slide return the slide, remove the heating device quickly and join the pipe and fitting.
9. Consider cooling times from the table on page 46.

More detailed information can be taken from the enclosed operating manuals.

Part F: fusiotherm®-electrofusion device

Part F: fusiotherm®-electrofusion device

Fusion

The fusiotherm®-electrofusion device was specially developed for electrofusion sockets from Ø 20 - 250 mm.

The fusion of 160-250 mm fusiotherm®- and climatherm-faser com posite pipes UV-resistant with the electrofusion socket Art.-No. 17230 is not possible.

Technical information:

- supply voltage: 230 V (nominal voltage)
- nominal capacity: 2.800 VA, 80 % ED
- rated frequency: 50 Hz - 60 Hz
- protection class: IP 54

1. General and inspection

Cleanliness is - besides correct workmanship - the most important precondition for a correct fusion. For keeping the sockets clean do not unwrap them before processing.

The pipe surface must also be clean and undamaged. Deformed pipe ends must be cut off.

All parts of the system to be fused as well the temperature sensors shall have the same temperature (e.g. sun radiation or unadapted storing may cause differences in temperature!) within the acceptable range of temperature (e.g. +5 °C to 40 °C according to DVS 2207).

2. Preparation

Follow carefully the order of working steps!

Preparation is one of the most important steps of the electrofusion process!

1. Cut the ends of the pipes rectangularly and deburr them thoroughly
2. Clean and dry the ends of the pipes at the necessary length
3. Mark the depth of fusiotherm®-electro-fusion-socket on the end of the pipe

fusiotherm®-electrofusion device Ø 20-160 mm

fusiotherm®-electrofusion socket

fusiotherm®-peeling tool (Art.-No. 50558-70, up to 75 mm) (from 90-160 mm: Art.-No. 50572/50574/50576/ 50580 (without picture))

Welding depth up to 250 mm													
ø	20	25	32	40	50	63	75	90	110	125	160	200	250
depth	35.0	39.0	40.0	46.0	51.0	59.0	65.0	72.5	80.0	86.0	93.0	105,0	125,0

from page 48 of Fusiotherm Manual

Part F: fusiotherm®-electrofusion device

Part F: fusiotherm®- electrofusion device

Fusion

4. Peel the surface of both pipes up to the marks thoroughly with a peeling tool (use the fusiotherm®-peeling tool with the respective pipe diameter)

IMPORTANT!
Before the fusion peel off the oxygen barrier layer of the climatherm OT-pipe, the aluminium-PP-composite layer of the stabi-composite pipe and the UV-layer of the faser-composite-pipe-UV completely to the stop by using the double peeling tools (Art.-No. 50507, 50511, 50516, 50519, 50525) considering the pipe diameter.

By turning the adjusting screw clockwise to the stop, the peeling tools can be adjusted into small depths (sockets), by turning them counter clockwise up to the stop they can be adjusted into big peeling depth (electrofusion sockets).

5. Clean again thoroughly

Without complete peeling of the fusion surface a homogeneous and tight welding connection is not assured. Damages of the surface like axial grooves and scratches are not accepted in the fusion zone. Never touch peeled surfaces and protect them against dirt and grease. Start the fusion process within 30 mins after peeling.

3. Assembling the fusiotherm® electrofusion sockets

Avoid soiling and fix all parts securely!

1. Open the protective wrapping of the fusiotherm®-electrofusion sockets (cut with knife along the edge of the bore), leaving the rest of the foil intact. Clean the inside of the fitting carefully with aquatherm®-cleaning wipes. Assemble the fitting within 30 mins after opening of the protective foil.

2. Push the fusiotherm®-electrofusion sockets on the clean and dry end of the pipe (up to the marked depth). Use pressing clamps if necessary.

Cut, peel and clean the pipes to be welded carefully

Clean the inner surface of the electrofusion socket

Push the electrofusion socket onto the pipe end

from page 49 of Fusiotherm Manual

Part F: fusiotherm®-electrofusion device

Part F: fusiotherm®-electrofusion device

3. Remove the protective foil completely and push the other prepared pipe end into the fusiotherm®-electrofusion sockets tighten in the fixation.

Leave the pipes, free from bending stress or own weight, within the fusiotherm®-electrofusion socket. the socket is movable at both pipe ends after assembling. The air gap has to be even around the circumference. A non stress-free, resp. displaced connection can effect an unacceptable melt-flow and a defective connection while joining. The pipe ends and electrofusion sockets have to be dry when installed.

4. Fusion process

1. Position the fitting with even air gap around the circumference.
2. Regulate fusion equipment for the right fusion parameter.
3. Compare the indications of the fusion equipment with the parameters of the label.
4. Start and watch the fusion process.

Do not move or stress pipe and fitting during the whole fusion process and cooling time.

5. Cooling time and pressure test

A fused pipe-joint shall not be moved (no release of the fixation) or stressed before complete cooling.

The minimum required cooling time is marked on each fusiotherm®-electrofusion socket. Ambient temperatures of more than 25 °C or strong sun-radiation need longer cooling times.

Working pressure

fusiotherm®-electrofusion sockets correspond to the pressure of PN 20. The relation between working temperature, pressure load and service life is given in the tables "Permissible working pressure."

For further information concerning electrofusion socket and details about the fusiotherm®-electrofusion device read the enclosed operating instructions.

Push the second pipe - also peeled and cleaned - into the socket

WRONG **RIGHT**

For a stable welding result it is important that both pipe ends inside the electrofusion socket are with parallel faces! Follow the minimum welding depth - absolutely!

Adjust the socket diameter on the welding device. Start and control welding process. Keep the cooling time. Finished!

Kind of stress	Compressive stress	Minimum waiting period
Tension, bend, torsion of unpressurized pipes		20 minutes
Test- or working pressure of pipes pressurized	up to 0.1 bar (1.5 psi) 0.1 up to 1 bar (1.5-14.5 psi) over 1 bar (14.5 psi)	20 minutes 60 minutes 120 minutes
Repeating of the welding process		60 minutes

from page 50 of Fusiotherm Manual

Part F: fusiotherm®-electrofusion device
Part G: Additional possibilities of repair

Part F: fusiotherm®-electrofusion device

Pipe repairs with the fusiotherm®-electrofusion socket

Cut squarely 3 to 4 lengths of a fitting out of the defect pipe, symmetrically to the defect. Fit the new pipe into this gap. Prepare the pipe ends of the existing pipe as in the case ofa new welding.

Peel the new piece of pipe on both sides with the peeling tool on a length of more than the length of one fitting.

Unwrap two fittings and carefully move the fittings over both ends of the new pipe.

Then place the repair-pipe into the gap and move the fittings until they are aligned with the markings on the existing pipes.

Take care, that the fittings are exactly aligned and completely free of stress before welding.

Part G: Additional possibilities of repair

Damaged pipes may be repaired - as already mentioned - by means of

fusion (see Part B)
electrofusion socket (see Part F).

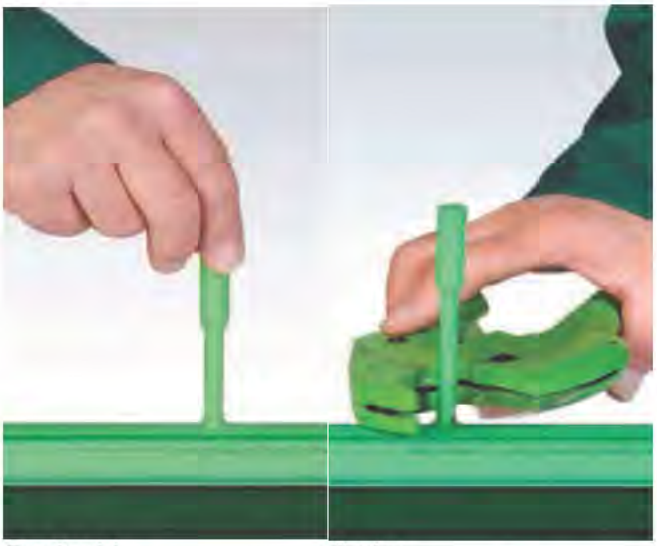
In addition to this the fusiotherm®-system offers the possibility of the

pipe repair stick.

The necessary welding tool (Art.-No. 50307 / 11) and repair stick (Art.-No. 60600) are described on page 167, 168 and 171.

The installation information is enclosed with the welding tool, but may also be ordered separately (Order-No. D 11450) from aquatherm.

Heat-up



Repair stick

Cutting

aquatherm Australia Pty. Limited

A.C.N. 059 578 782

ABN 40 059 578 782

Warehouse & Office
Kirby Industrial Park
Unit 6C, 443 West Botany St.
ROCKDALE NSW 2216

Ph. 61 2 95537199
Fax 61 2 95537899
aquatherm@aquatherm.com.au

2009/2010

Aquatherm fusiotherm pipe systems Welding Procedure:

Purpose:

The purpose of this procedure is to provide the Installer with appropriate instruction and training on the use of Aquatherm fusiotherm pipe system welding equipment and as far as practicable to eliminate the risk of personal injury or illness and to identify the hazards and risks associated with this equipment.

Intended Application:

The Aquatherm fusion welder is for working on Polypropylene pipes and fittings (fusiolen PP-R (80) with diameters of 20mm to 315mm. using the welder for its intended application also includes following the operating instructions and the respective notes. Keep these operating instructions with the welder at all times, and everyone who works with this welder must have the appropriate instruction and training on the use of Aquatherm fusiotherm pipe system welding equipment.
This welder is NOT to be used for any other purpose, as this may cause personal injury or damage. It is imperative not to make any structural modifications to the welder on your own initiative, or to use the welder for any purpose other than its intended application.

Safety notes / warnings:

The aquatherm fusion electric welder was engineered and built according to the current best practise and inspected in compliance with the Australian Standards. It should be emphasised that the fusion welder can be injurious, if operated incorrectly, or in a careless or negligent manner. Therefore always observe the safety notes and warnings provided in these operating instructions.

- **This welder is not to be used by employees that have not had the appropriate instruction and training.**
- Do not use the welder unless it is in perfect working order. Use it for its intended application only, and be aware of safety aspects and potential hazards.
- Each time you use the welder; first check all parts for damage.
- Recommendation: use an RCD for power system protection. (The national standards are to be observed.)
- The welder may not be opened. Damaged power cables must be replaced by a competent service centre.
- Make sure that unauthorised person are kept well clear of the working area.
- Soiled welders can be cleaned with a moist cloth when cool. Do not immerse the welder in water or other liquids.

ATTENTION! Danger of burns

To minimise the risk of burns, the following recommendations should be adhered to:

- Always assume the welding paddle is hot before it is picked up or moved.
- Do not pick up anything without ensuring it is cool enough to handle.
- Do not touch the hot section of pipe and/or fittings during the welding operation and cooling down phase.
- Never leave a hot welding paddle unattended, if a hot paddle is to be left unattended a safety sign must be displayed.
- Keep unauthorised persons clear of the work area and display safety signs to caution persons of the hazard.
- PPE must be worn.
- If the welder is to be used above ground (e.g. in ceiling space) it should be used from a scaffold or scissor lift.
- If a weld has to be completed off the ground and it is inpractical to use a scaffold or sissor lift, two platform steps with two workers may be used, with one worker to perform the weld and the other worker to ensure the welder is safely handled and secured.
- A risk assessment must be completed for this type of welding, to be compliant above procedures and steps to be completed.

Fastening technique / Fixed points / Sliding points

Fastening technique

Pipe clamps for fusiotherm®- pipes must be dimensioned for the external diameter of the plastic pipe.

Take care, that the fastening material does not mechanically damage the surface of the pipe (fusiotherm®- pipe clamps Art.-No.: 60516 - 60678).

All pipes should be fastened with only Aquatherm's green rubber compound fasteners, with expansion spacers, or other as deemed equal or approved by Aquatherm and / or the project's Hydraulic Consultant.

Basically it must be distinguished on pipe assembly, whether the fastening material is used as

- a fixed point or
- a sliding point.

Fixed points

On locating fixed points the pipelines are divided into individual sections. This avoids uncontrolled movements of the pipe.

In principle fixed points have to be measured and installed in a way, that the forces of expansion of fusiotherm®-pipes as well as probable additional loads are accommodated.

On using threaded rods or threaded screws the drop from the ceiling should be as short as possible. Swinging clamps should not be used as fixed points.

Basically vertical distributions can be installed. Risers do not require expansion loops, provided that fixed points are located immediately before or after a branch.

To compensate the forces arising from the linear expansion of the pipe there must be sufficient and stable clamps and mountings.

fusiotherm®- pipe clamps meet all mentioned requirements and - when considering the following installation instructions - are perfect for fixed point installations.

Sliding points

Sliding clamps have to allow axial pipe movements without damaging the pipe.

On locating a sliding clamp it has to be ensured that movements of the pipelines are not hindered by fittings or armatures installed next to the clamps.

fusiotherm®- pipe clamps have an extra even and sliding surface of the sound insulation insert.

from page 55 of Fuisotherm Manual

Installation advice / Linear expansion / Concealed installation

Installation advices

fusiotherm®-pipe clamps are perfectly suited for fixed point and sliding point installations.

The application of distance rings depends on the type of pipe.

Fastening	fusiotherm®-pipe fusiotherm®-faser composite pipe	fusiotherm®-stabi composite pipe
Sliding Point	1 distance ring	2 distance rings
Fixed point	no distance ring	1 distance ring

Linear expansion

The linear expansion of pipes depends on the difference of operating temperature to installation temperatur:
$\Delta T = T_{\text{operating temperature}} - T_{\text{installation temperature}}$

Therefore cold water pipes have practically no linear expansion.

Because of the heat dependent expansion of the material, the linear expansion must especially be considered in case of hot and heating installations. This requires a distinction of the types of installation, e.g.

- concealed installation
- installation in ducts
- open installation.

Concealed installation

Concealed installations generally do not require a consideration of the expansion of fusiotherm®-pipes.

The insulation acc. to DIN 1988 or the EnEV (Energieeinsparverordnung) provides enough expansion space for the pipe. In the case where the expansion is greater than the room to move in the insulation, the material absorbs any stress arising from a residual expansion.

The same applies to pipes, which do not have to be insulated acc. to current regulations.

A temperature induced linear expansion is prevented by the embedding in the floor, concrete or plaster. The compressive strain and tensile stress arising from this are not critical as they are absorbed by the material itself.

from page 56 of Fuisotherm Manual

Installation in ducts / fusiotherm®-pipe

Installation in ducts

Due to the different linear expansion of the fusiotherm®-pipes with or without stabilization, the installation of pipe branches in risers has to be made according to the selected type of pipe.

fusiotherm®-stabi/faser composite pipe

The linear expansion of fusiotherm®-stabi-composite pipes and fusiotherm®-faser composite pipes in vertical risers can be ignored.

The positioning of a fixed point directly before each branch-off point is sufficient. All clamps in the riser must be installed as fixed points (see 1).

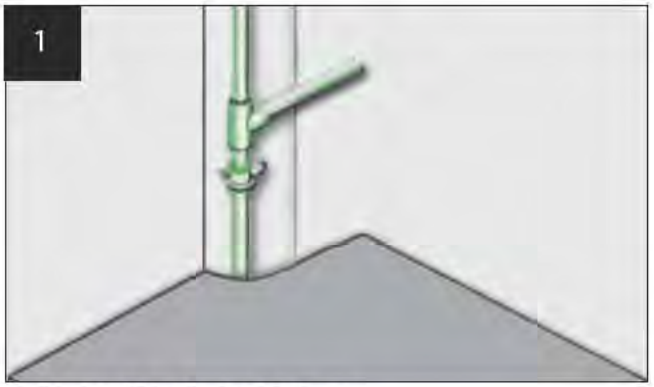
In general it is possible to install risers rigidly, that means without expansion joints. This directs the expansion on the distance between the fixed points, where it is ineffective.

A maximum distance of 3.0 meters between two fixed points must be regarded.

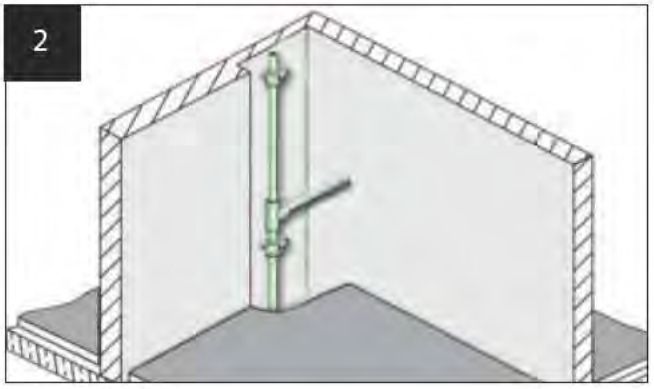
fusiotherm®-pipe

The installation of risers of fusiotherm®-pipes without stabilizing components (aluminium or faser) requires a branch pipe, which is elastic enough to take the linear expansion of the riser.

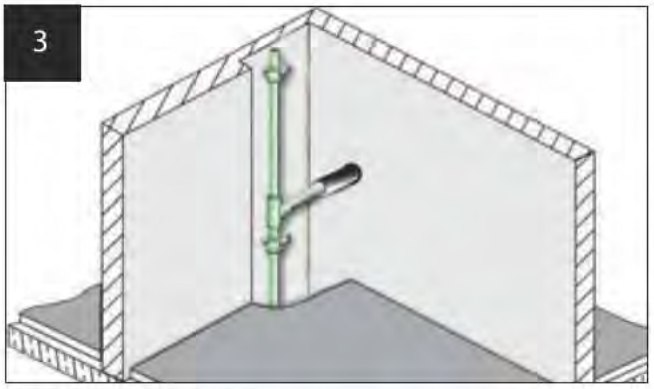
- This can be ensured by a favourable fixing of the riser in the duct (see 2).
- An adequate large pipe liner also gives sufficient elasticity to the branch-off pipe (see 3).
- Furthermore the installation of a spring leg gives the appropriate elasticity (see 4).



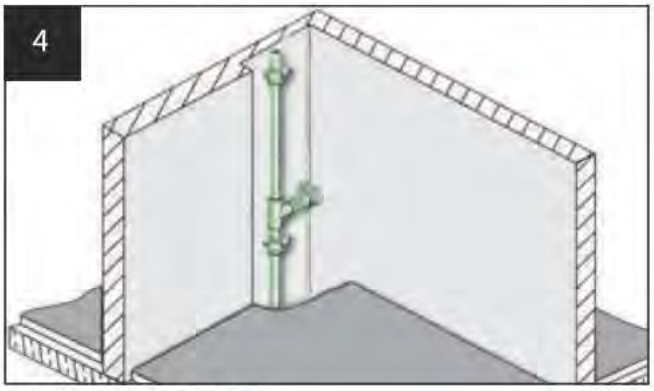
Positioning of the fixed point clamp



Favourable fixing



Large diameter pipe liner



Installation of a spring leg

from page 57 of Fusiotherm Manual

Open installation / Calculation of the linear expansion

Open installation

In case of open installed pipes (e.g. in the basement), excellent optical characteristics and form stability are important. fusiotherm®-pipes for cold water and fusiotherm®-stabi composite / faser composite pipes for hot water and heating plants make this possible. The coefficient (a) of linear expansion of fusiotherm®-composite pipes is only

$\alpha_{\text{stabi composite}}$ **= 0.030 mm / mK**
$\alpha_{\text{faser composite}}$ **= 0.035 mm / mK**

and therefore nearly identical with the linear expansion of metal pipes.

The coefficient of linear expansion of fusiotherm®-pipes without stabilizing components is

$\alpha_{\text{fusiotherm}}$ **= 0.150 mm / mK**

fusiotherm®-stabi / -faser composite pipes must have enough space to expand (see page 59). An expansion control must is required for long and straight stabi composite / faser composite pipes (over 40 m).

fusiotherm®-pipes without the stabilizing compound should have the expansion control after 10 m straight pipelines. Risers of composite pipes may be installed rigidly without expansion compensation. The following formula, calculation examples, data-tables and diagrams help to determine the linear expansion. The difference between working temperature and maximum or minimum installation temperature is essential for the calculation of linear expansion.

Calculation of the linear expansion

Calculation example: Linear expansion

Given and required values

Symbol	Meaning	Value	Measuring unit
ΔL	Linear expansion	?	[mm]
$\alpha 1$	Coefficient of linear expansion fusiotherm®-stabi composite pipe	0.03	mm / mK
$\alpha 2$	Coefficient of linear expansion fusiotherm®-faser composite pipe	0.035	mm / mK
$\alpha 3$	Linear expansion coefficient	0.15	mm / mK
L	Pipe length	25.0	[m]
T_W	Working temperature	60.0	°C
T_M	Installation temperature	20.0	°C
ΔT	Temperature difference between working and installation temperature ($\Delta T = T_W - T_M$)	40.0	K

The linear expansion ΔL is calculated according to the following formula:

$\Delta L = \alpha \times L \times \Delta T$

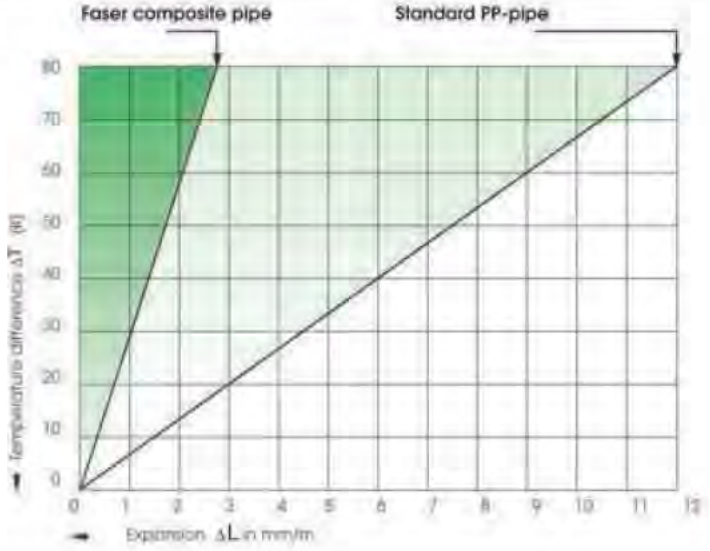
Material:
fusiotherm®-stabi composite pipe (α = 0.03 mm/mK)

ΔL = 0.03 mm / mK x 25.0 m x 40 K

ΔL = 30.0 mm

Linear expansion comparison:

faser composite-
to standard PP-pipe



from page 58 of Fusiotherm Manual

Bending side / Expansion loop

Linear expansion due to temperature difference between operating temperature and installation temperature can be compensated by different installation techniques.

Bending side

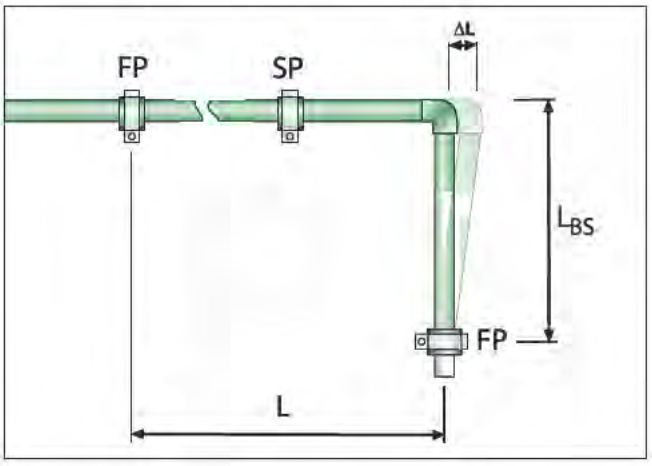
In most cases direction changes can be used to compensate for linear expansion in pipes.

The values of the bending side can be taken directly from the tables and graphs on the following pages.

Symbol	Meaning	
L_{BS}	Length of the bending side	[mm]
K	Material specific constant	15.0
d	Outside diameter	[mm]
ΔL	Linear expansion	[mm]
L	Pipe Length	[m]
FP	Fixed point	
SP	Sliding point	

Calculational determination of the bending side length

$$L_{BS} = K \times \sqrt{d \times \Delta L}$$



Expansion loop

If the linear expansion cannot be compensated by a change in direction, it will be necessary to install an expansion loop with long and straight pipelines.

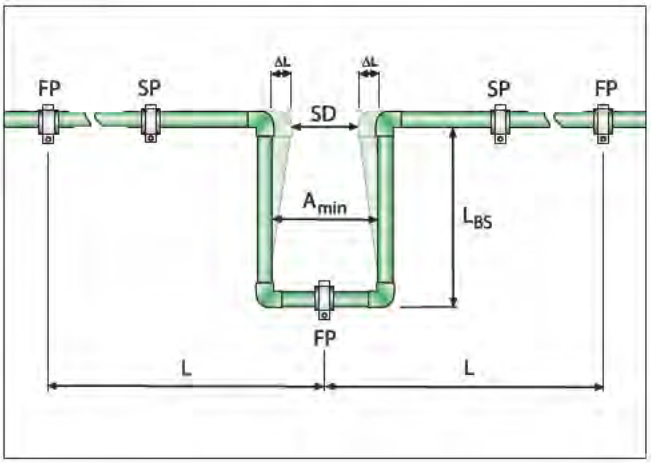
In addition to the length of the bending side L_{BS} the width of the pipe bend A_{min} must be considered.

Symbol	Meaning	
A_{min}	Width of the expansion loop	[mm]
SD	Safety distance	150 mm

The pipe bend A_{min} is calculated acc. to the following formula:

$$A_{min} = 2 \times \Delta L + SD$$

The width of the expansion loop A_{min} should be at least 210 mm.



Pre-stress / Bellow expansion joint

Pre-stress

Where space is limited, it is possible to shorten the total width A_{min} as well as the length of the bending side L_{BSV} by pre-stressing.

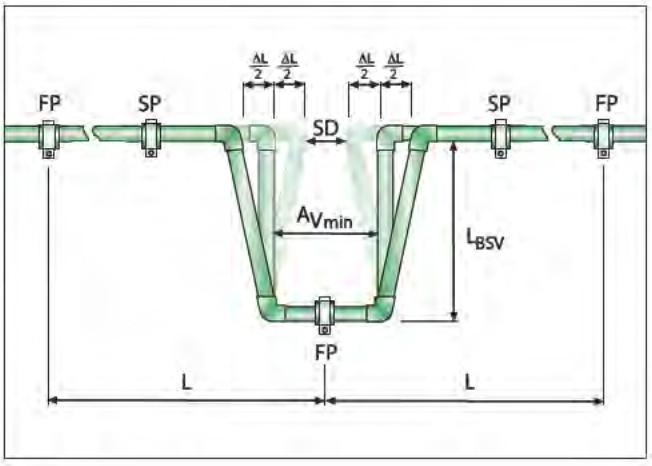
Pre-stress installations, if planned and carried out carefully, offer an optically perfect installation, as the linear expansion is hardly visible.

The side length L_{SV} is calculated acc. to the following calculation example:

Symbol	Meaning	Value	Measuring unit
L_{BSV}	Length of pre-stress	-	[mm]

The side length of expansion loops wih pre-stress is calculated acc. to the following example:

$$L_{BSV} = K \times \sqrt{d \times \frac{\Delta L}{2}}$$



Bellow expansion joint

All bellow expansion joints for corrugated pipes designed for metal materials are unsuitable for fusiotherm®-pipes.

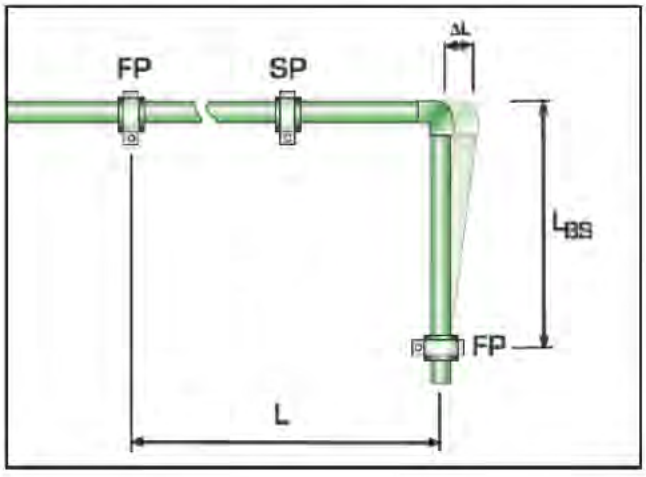
When using axial expansion joints observe the manufacturers instructions.

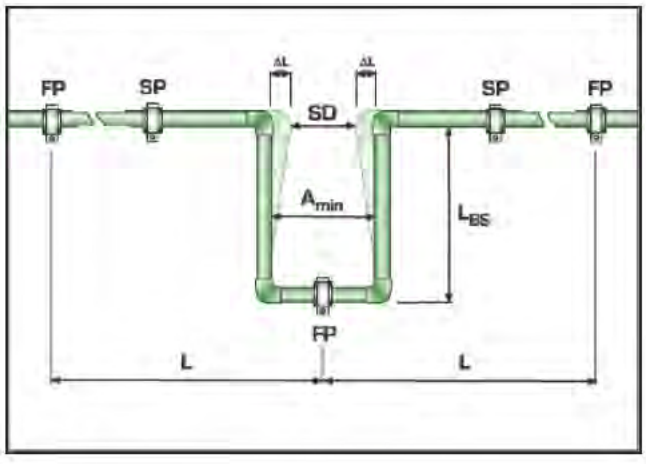
Linear expansion / bending sides / expansion loops:

Installation advice / linear expansion / fixed point constructions in Fusiotherm Faser SDR7.4 Pipe (hot water systems) (mixed) installations

There has been some misunderstanding about the interpretation of the graphs under chapter 4 "Installation Principles, Bending side / Expansion loop" on page 62 of Fusiotherm pipesystems brochure (AUS NZ 10101 Edition: 01/2011 and E 10101 Edition 07/08), page 62 of Fusiotherm Installation Manual (E11130 Edition: 08/2010) and page 28 of Aquatherm Australia Training Manual (version 2 Edition 12/12).

Please refer this document to the above mentioned sector in all previous Aquatherm catalogues.





The FP (fixed point) before (left of) the bending side or expansion loop is not the 2nd pipe clip before the bending side or expansion loop. This FP is the fixed point from where we start to calculate the linear expansion over straight pipe length ("L"). This straight pipe length (L) shouldn't be more than 40 meter. If L is more than 40 meter, we recommend an expansion loop in the middle of the pipe, instead of a bending side.

The interruption in the pipe, at the left of these graphs, means there is more pipe length between the "FP" and the adjacent "SP" (sliding point). All the clips between the "FP" and "SP" should be sliding points (SP). This way you direct the linear expansion towards the bending side and/or expansion loop.

The linear expansion (ΔL) is calculated according to the formula:

$\Delta L = \alpha \times L \times \Delta T$ (L = total straight pipe length; max. 40 meter)

The bending side length (LBS) is calculated according to the formula:

$LBS = K \times \sqrt{(d \times \Delta L)}$

Branch-off pipes:

If you let the (horizontal) Fusiotherm PP-R pipe expand into an expansion loop or bending side, make sure the branch-off pipes are flexible and have the possibility to flex (bending sides).

Metal (copper) branch-off pipes are not recommended and shouldn't be used as they are very rigid and have no flexibility. Plastic pipes, like spaghetti tubes (ie. Rehau PE-X), are recommended.

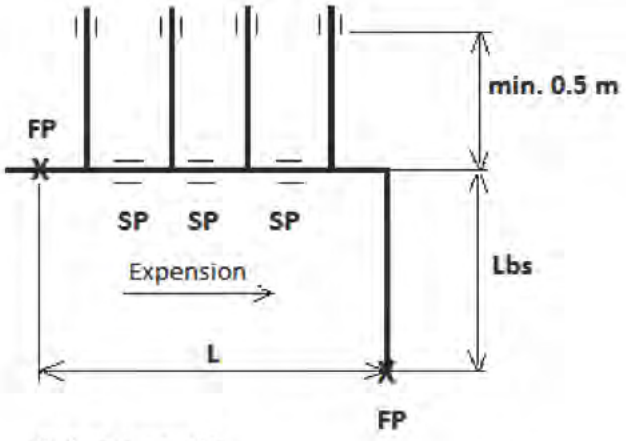
If the branch-off pipes are made of a flexible material, like PE-X, install the first (fixed point) pipe clip min. 0.5 meter away from the (reducing) tee or weld-in saddle. This way you create flexibility in the plastic branch-off pipe.

If the branch-off pipes go through a masonry wall, they should be able to expand (SP) straight through the masonry wall, via an adequate large pipe liner (see below graphs no.1 & 2).

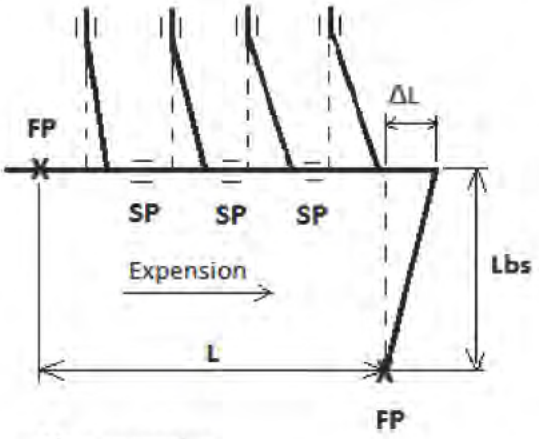
Fixed points in the masonry wall are unacceptable.

If the branch-off pipes are made of copper, please install an expansion loop in the copper pipes (see ** in the below graph no.2), to de-stress the copper pipes and therefore they won't cause any reaction force onto the fusiotherm PP-R reducing tee or weld-in saddle.

It all comes down to de-stressing the Fusiotherm PP-R pipe system.



Before expansion



After expansion

Installation in ducts:

It is critical to install a fixed point under the (reducing) tee.

If you are using weld-in saddles, please don't install the fixed point directly against the weld-in saddle but use the nearest adjacent Fusiotherm PP-R sockets. This way the whole (reducing) tee or weld-in saddle will be free from stress.

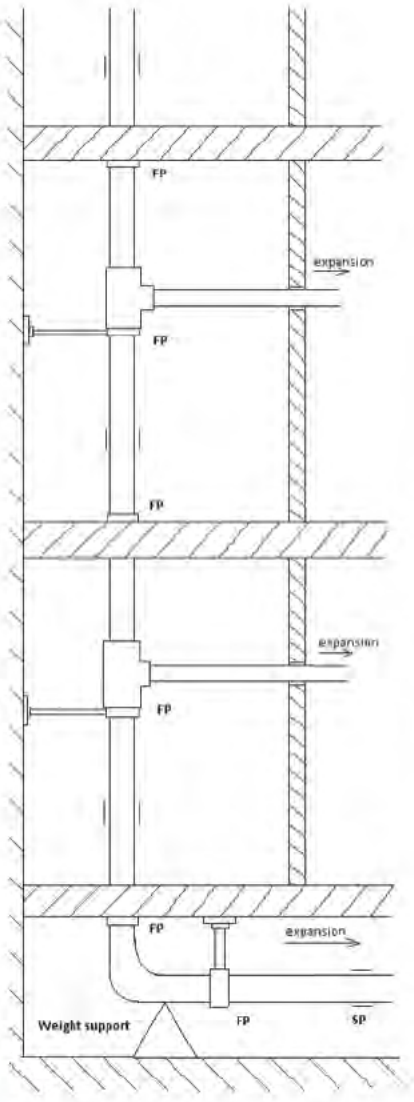
If the branch-off pipes are made of copper, because of the large expansion forces of copper (metal) pipes, please install a fixed point on all (3) sides of the (reducing) tees or weld-in saddles.

FP = Fixed Point (the first one under the floor, the next one above the next floor, or vice versa)
SP = Sliding Point (take notice of the support intervals, mentioned in the fusiothern brochures).

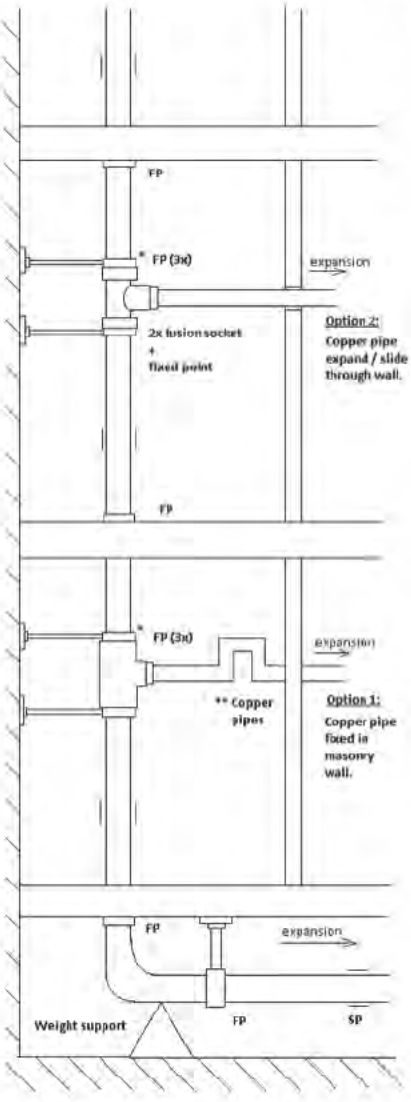
In risers we have to take the linear expansion/contraction forces and the weight of the pipe + weight of the water in consideration. This weight + forces can run up to 100's of kilos!
See the Excel sheet "Linear expansion forces".

To prevent the Fusiotherm pipes from moving/sliding vertically, we have to support the riser vertically by making a correct fixed point construction under the lowest elbow. A fixed point construction is more than just a fixed point pipe clip!

1) Branch-off pipes made of Fusiotherm PP-R:



2) Branch-off pipes made of metal (Copper):



from page 62 of Fusiotherm Manual

Support intervals

Support intervals
fusiotherm®-pipe SDR 6 & SDR 7.4

Table to determine support intervals in conjunction with temperature and outside diameter.

Difference in temperature ΔT [K]	Pipe diameter d (mm)									
	16	20	25	32	40	50	63	75	90	110
	Support intervals in cm									
0	70	85	105	125	140	165	190	205	220	250
20	50	60	75	90	100	120	140	150	160	180
30	50	60	75	90	100	120	140	150	160	180
40	50	60	70	80	90	110	130	140	150	170
50	50	60	70	80	90	110	130	140	150	170
60	50	55	65	75	85	100	115	125	140	160
70	50	50	60	75	80	95	105	115	125	140

Support intervals
fusiotherm®-pipe SDR 11 & climatherm-pipe SDR 11

Table to determine support intervals for cold water application (temperature of medium: 20° C) in conjunction with outside diameter.

Pipe diameter d (mm)													
20	25	32	40	50	63	75	90	110	125	160	200	250	315
Support intervals in cm													
60	75	90	100	120	140	150	160	180	200	220	230	240	250

from page 66 of Fuisotherm Manual

Support intervals

Support intervals
fusiotherm®-stabi composite pipe

Table to determine support intervals in conjunction with temperature and outside diameter.

Difference in temperature ΔT [K]	Pipe diameter d (mm)									
	16	20	25	32	40	50	63	75	90	110
	Support intervals in cm									
0	130	155	170	195	220	245	270	285	300	325
20	100	120	130	150	170	190	210	220	230	250
30	100	120	130	150	170	190	210	220	230	240
40	100	110	120	140	160	180	200	210	220	230
50	100	110	120	140	160	180	200	210	220	210
60	80	100	110	130	150	170	190	200	210	200
70	70	90	100	120	140	160	180	190	200	200

Support intervals
fusiotherm®-faser composite pipe SDR 7.4 &
climatherm-faser composite pipe SDR 11

Table to determine support intervals 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	160	200	250	315
	Support intervals in cm													
0	120	140	160	180	205	230	245	260	290	320	340	345	350	355
20	90	105	120	135	155	175	185	195	215	240	270	275	280	285
30	90	105	120	135	155	175	185	195	210	225	245	250	255	260
40	85	95	110	125	145	165	175	185	200	215	235	240	245	250
50	85	95	110	125	145	165	175	185	190	195	205	210	215	220
60	80	90	105	120	135	155	165	175	180	185	195	200	205	210
70	70	80	95	110	130	145	155	165	170	175	185	190	195	200

Pipe clamp distances of vertically installed pipes can be increased by 20 % of the tabular values, e.g. to multiply the tabular value by 1.2.

from page 67 of Fuisotherm Manual

Pressure test / Test control / Measuring of the test pressures / Test record

Pressure test / Test control

Acc. to the

➡ **Technical Rules for Potable Water Installations DIN 1988**

have to be (while still visible) hydraulically pressure tested all pipelines. The test pressure has to be 1.5 times of the operating pressure.

Due to the material properties of fusiotherm®-pipes a pressurization causes an expansion of the pipe. Different temperatures of pipe and test medium lead to alterations of pressure. A temperature change of 10 K corresponds to a pressure difference of 0.5 to 1 bar.

The pressure test of fusiotherm®-pipe systems should be made with a constant temperature of the medium.

The hydraulic pressure test requires a preliminary, principal and final test.

In the preliminary test the system is pressurized with the 1.5 times of the maximum operating pressure.

This test pressure has to be re-established twice within 30 minutes within an interval of 10 minutes. After a test time of a further 30 minutes the test pressure must not drop more than 0.6 bar. No leakage may appear.

The preliminary test is to be followed directly by the principal test. Test time is 2 hours. Now the test pressure taken from the preliminary test may not fall more than 0.2 bar.

The final test is made with a changing pressure of 1 bar and 10 bars according to the diagramm on page 72 . The pipe system must be unpressurized between each test cycle.

Between each test course the pressure has to be released.

No leakage must appear at any point of the tested installation system.

Measuring of the test pressures

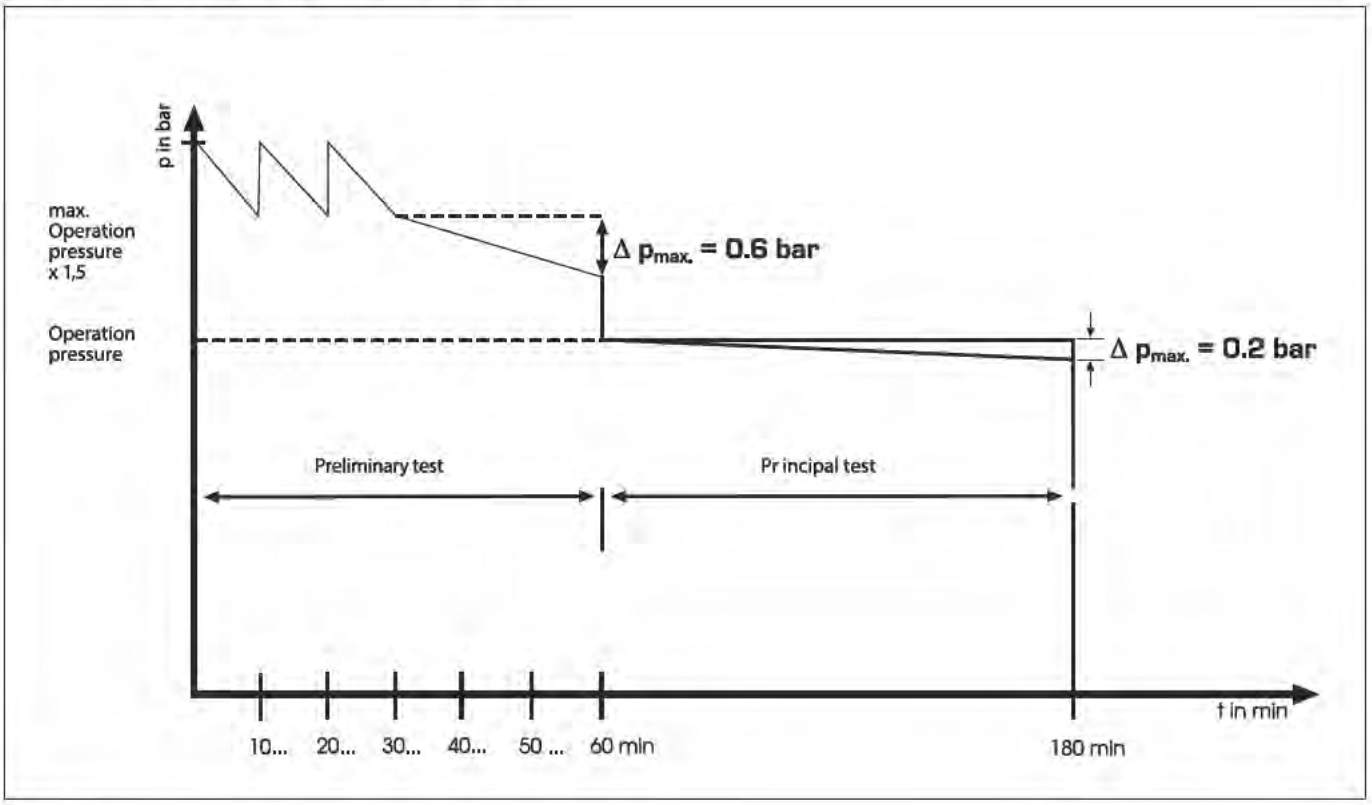
Measuring has to be done with a manometer allowing a perfect reading of a pressure change of 0.1 bar. The manometer has to be placed at the deepest point of the installation.

Test record

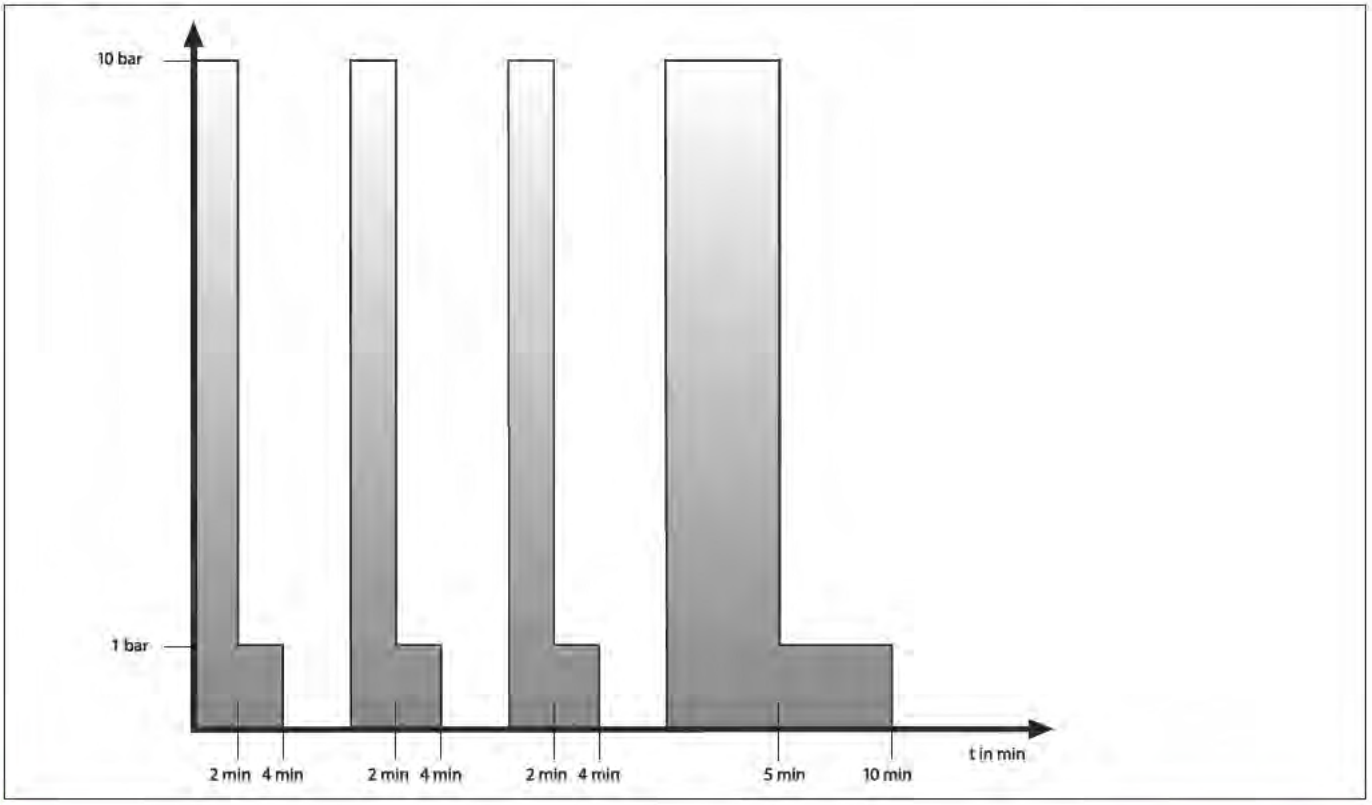
A record of the hydraulic pressure test has to be prepared and signed by the client and contractor stating place and date (see page: 73).

Pressure test / Test control

Preliminary- and principal test



Final test



from page 72 of Fusiotherm Manual

Test record - fusiotherm®-pipe installation

Description of the installation

Place: _____

Object: _____

Pipe-lengths:

Ø 16 mm	_____	m
Ø 20 mm	_____	m
Ø 25 mm	_____	m
Ø 32 mm	_____	m
Ø 40 mm	_____	m
Ø 50 mm	_____	m
Ø 63 mm	_____	m
Ø 75 mm	_____	m
Ø 90 mm	_____	m
Ø 110 mm	_____	m
Ø 125 mm	_____	m
Ø 160 mm	_____	m
Ø 200 mm	_____	m
Ø 250 mm	_____	m
Ø 315 mm	_____	m

Highest point: _____ m

(over manometer)

Start of the test: _____

End of the test: _____

Test period: _____

Client: _____

Contractor: _____

Place: _____

Date: _____

Stamp/Signature

from page 73 of Fuisotherm Manual

Preliminary test

max. working pressure x 1.5 _____ bar

Pressure drop after 30 minutes: _____ bar

(max. 0.6 bar)

Result preliminary test: _____

Principal test

Working pressure: _____ bar

(Result preliminary test)

Pressure after 2 hour: _____ bar

(max. 0.2 bar)

Result principal test: _____

Final test*

1. Working pressure 10 bar: _____ bar

   at least 2 minutes, then

   Working pressure 1 bar: _____ bar

   at least 2 minutes
2. Working pressure 10 bar: _____ bar

   at least 2 minutes, then

   Working pressure 1 bar: _____ bar

   at least 2 minutes
3. Working pressure 10 bar: _____ bar

   at least 2 minutes, then

   Working pressure 1 bar: _____ bar

   at least 2 minutes
4. Working pressure 10 bar: _____ bar

   at least 5 minutes, then

   Working pressure 1 bar: _____ bar

   at least 5 minutes

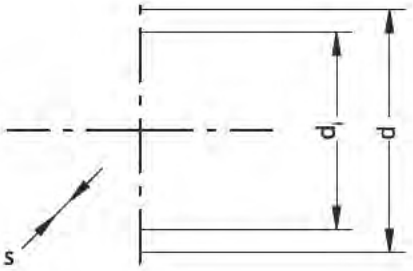
* Unpressurize the pipe between each cycle.

pipes

fusiotherm® Cold Water Pipe

SDR 11 (PN12.9)

Material: fusiolen PP-R
Pipe series : SDR 11 / S 5
Standards: DIN 8077 / 78, DIN EN ISO 15874, ASTM F 2389, CSA B 137.11
Registrations: ÖNORM, SAI, TIN, TSE, LNEC, AENOR, SKZ A 175, Shipbuilding, IIP
Colour: green with 4 blue stripes
Form supplied: 4 m straight lengths (ø 20-125 mm), 6 m straight lengths (ø 160-315 mm)
Packing Unit: in meter
Application: Drinking water, gen. pressure pipes



Fields of application:
I.a.: cold water and rain water pipes.

The relation between working temperature, pressure load and service years can be found in chapter 1.

Pipe			Dimension	Wall thickness	Internal diameter	Water content	Weight	
Art.-No.	Dimension	Packing unit	d	s	d_i	l / m	kg / m	DN
			mm	mm	mm			
10208	20 mm	100	20	1.9	16.2	0.206	0.109	15
10210	25 mm	100	25	2.3	20.4	0.327	0.165	20
10212	32 mm	40	32	2.9	26.2	0.539	0.265	25
10214	40 mm	40	40	3.7	32.6	0.834	0.415	32
10216	50 mm	20	50	4.6	40.8	1.307	0.645	40
10218	63 mm	20	63	5.8	51.4	2.074	1.015	50
10220	75 mm	20	75	6.8	61.4	2.959	1.415	65
10222	90 mm	12	90	8.2	73.6	4.252	2.045	80
10224	110 mm	8	110	10.0	90.0	6.359	3.136	80
10226	125 mm	4	125	11.4	102.2	8.199	3.927	100
10230	160 mm	6	160	14.6	130.8	13.430	6.416	125
10234	200 mm	6	200	18.2	163.6	21.010	9.990	150
10238	250 mm	6	250	22.7	204.6	32.861	15.540	200
10242	315 mm	6	315	28,6	257,8	52,172	24,650	250
The following items * are supplied in coils:								
10308*	20 mm	100	20	1.9	16.2	0.206	0.109	15
10310*	25 mm	100	25	2.3	20.4	0.327	0.158	20
10312*	32 mm	50	32	2.9	26.2	0.539	0.257	25

** **According the current list of licensed countries**

from page 127 of Fusiotherm Manual

pipes

fusiotherm® Hot Water Pipe

faser composite pipe SDR 7.4 (PN20)

Material:	fusiolen PP-R fibre reinforced
Pipe series:	SDR 7.4 / S 3.2
Standards:	SKZ HR 3.28, ASTM F 2389,' CSA B 137.11
Registrations:	ÖVGW, SAI-Global, SKZ A 314, TIN, TSE, Shipbuilding
Colour:	green with 4 dark-green stripes
Form supplied:	4 m straight lengths (ø 20-125 mm), 6 m straight lengths (ø 160-250 mm) also in *coils
Packing Unit:	in meter
Application:	Drinking water, gen. pressure pipes

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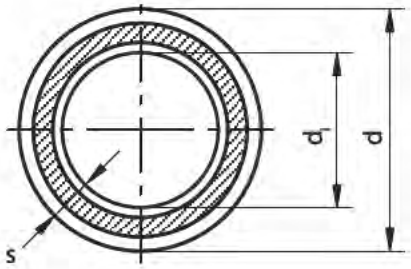


mechanically stabilized through a faser mix integrated in the middle layer of the fusiolen® PP-R

Identification:
4 dark-green stripes

The relation between working temperature, pressure load and service years can be found in chapter 1.

Pipe			Dimension	Wall thickness	Internal diameter	Water content	Weight	
Art.-No.	Dimension	Packing unit	d	s	d_i	l / m	kg / m	DN
			mm	mm	mm			
70708	20 mm	100	20	2.8	14.4	0.163	0.158	15
70710	25 mm	100	25	3.5	18.0	0.254	0.246	20
70712	32 mm	40	32	4.4	23.2	0.423	0.394	25
70714	40 mm	40	40	5.5	29.0	0.660	0.613	32
70716	50 mm	20	50	6.9	36.2	1.029	0.955	40
70718	63 mm	20	63	8.6	45.8	1.647	1.500	50
70720	75 mm	20	75	10.3	54.4	2.323	2.135	50
70722	90 mm	12	90	12.3	65.4	3.358	3.058	65
70724	110 mm	8	110	15.1	79.8	4.999	4.576	80
70726	125 mm	4	125	17.1	90.8	6.472	5.891	-
70730	160 mm	6	160	21.9	116.2	10.599	9.538	125
70734	200 mm	6	200	27.4	145.2	16.558	15.051	150
70738	250 mm	6	250	34.2	181.6	25.901	23.479	175

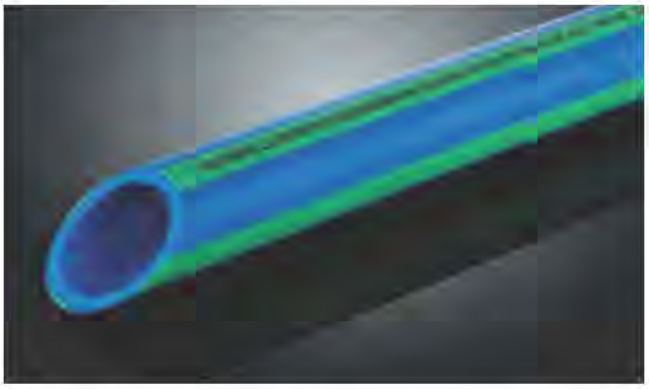
* **According the current list of licensed countries**

from page 129 of Fusiotherm Manual

pipes

climatherm **Non Potable**
faser composite pipe SDR 11
(PN12.9)

Material: fusiolen PP-R; fibre reinforced
Pipe series : Art.-No. 2070708/2070712 = **SDR 7.4**
Art.-No. 2070112-2070138 = **SDR 11**
Standards: SKZ HR 3.28, ASTM F2389,
CSA B 137.11, NSF 14
Registrations: TIN (Poland), EMI-TÜV (Hungary),
LNEC (Portugal), CentrSEPRO (Ukraine),
cNSFus-Industrial,
IAPMO- (Kanada/USA)
Colour: blue with 4 wider green stripes
Form supplied: 4 m straight lengths (ø 20-125 mm),
6 m straight lengths (ø 160-315 mm)
Packing unit: PU in meter
Application: HVAC, non-potable water applications



SKZ WÜRZBURG GEPRÜFT ÜBERWACHT
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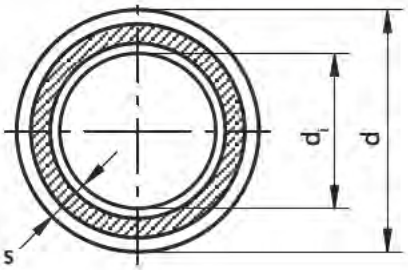


Fields of application:
For chilled / hot water and heating systems with a max. pressure of 12.9 bars and operating temperature of -20°C up to 90°C can be found in the table of permissible working pressures (chapter 1).

Pipe				Dimension	Wall thickness	Internal diameter	Water content	Weight	
Art.-No.	Dimension	SDR	Packing unit	d	s	d_i	l/m	kg/m	DN
				mm	mm	mm			
2070708	20 mm	7.4	100	20	2.8	14.4	0.163	0.159	15
2070710	25 mm	7.4	100	25	3.5	18.0	0.254	0.248	20
2070112	32 mm	11	40	32	2.9	26.2	0.539	0.281	25
2070114	40 mm	11	40	40	3.7	32.6	0.834	0.435	32
2070116	50 mm	11	20	50	4.6	40.8	1.307	0.675	40
2070118	63 mm	11	20	63	5.8	51.4	2.074	1.065	50
2070120	75 mm	11	20	75	6.8	61.4	2.959	1.482	65
2070122	90 mm	11	12	90	8.2	73.6	4.252	2.145	80
2070124	110 mm	11	8	110	10.0	90.0	6.359	3.175	80
2070126	125 mm	11	4	125	11.4	102.2	8.199	4.118	100
2070130	160 mm	11	6	160	14.6	130.8	13.430	6.728	125
2070134	200 mm	11	6	200	18.2	163.6	21.010	10.480	150
2070138	250 mm	11	6	250	22.7	204.6	32.861	16.300	200
2070142	315 mm	11	6	315	28,6	257,8	52,172	25,680	250
2070144	355 mm	11	6	355	32,2	290,6	66,29	32,600	300

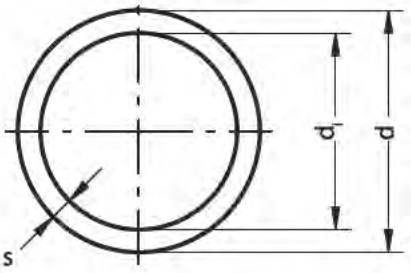
from page 133 of Fulsotherm Manual

pipes

aquatherm® lilac Recycled Water Pipe
SDR 11 (PN 12.9)

Material: fusiolen PP-R
Pipe series : Art.-No. 9010808/9010810 = **SDR 7.4**
Art.-No. 9010212-9010238 = **SDR 11**
Standards: DIN 8077/78,
DIN EN ISO 15874, ASTM F 2389,
CSA B 137.11, NSF 14
Registrations: cNSFus-rw
Colour: violet
Form supplied: 4 m straight lengths (ø 20-125 mm),
6 m straight lengths (ø 160-250 mm)
Packing unit: PU in meter
Application: Recycled/reclaimed water

Fields of application:
for recycled/reclaimed water



Pipe				Dimension	Wall thickness	Internal diameter	Water content	Weight	
Art.-No.	Dimension	SDR	Packing unit	d	s	d_i	l/m	kg/m	DN
				mm	mm	mm			
9010808	20	7.4	100	20	2.8	14.4	0.163	0.148	15
9010810	25	7.4	100	25	3.5	18.0	0.254	0.230	20
9010212	32	11	40	32	2.9	26.2	0.539	0.261	25
9010214	40	11	40	40	3.7	32.6	0.834	0.412	32
9010216	50	11	20	50	4.6	40.8	1.307	0.638	40
9010218	63	11	20	63	5.8	51.4	2.074	1.010	50
9010220	75	11	20	75	6.8	61.4	2.959	1.410	65
9010222	90	11	12	90	8.2	73.6	4.252	2.030	80
9010224	110	11	8	110	10.0	90.0	6.359	3.010	80
9010226	125	11	4	125	11.4	102.2	8.199	3.910	100
9010230	160	11	6	160	14.6	130.8	13.430	6.380	125
9010234	200	11	6	200	18.2	163.6	21.010	9.950	150
9010238	250	11	6	250	22.7	204.6	32.861	15.500	200

from page 137 of Fusiotherm Manual

NOTES

Client: _____ DATE: _____

Aquatherm Australia Pty Limited
6f Kirby Industrial Park
443 West Botany Street
Rockdale NSW 2216
Phone: (02) 9553 7199
Fax: (02) 9553 7899

TRAINING ATTENDANCE LIST

Name of Plumber	Date	Place	Signature

* Signature confirming acknowledgement of the Aquatherm Installation Principles and fusion welding.
* The signature confirms that the personnel has been trained that the Hydraulic presure test must be performed on the installation of all Aquaterm pipe and fittings.

Client: _____ DATE: _____

Aquatherm Australia Pty Limited
6f Kirby Industrial Park
443 West Botany Street
Rockdale NSW 2216
Phone: (02) 9553 7199
Fax: (02) 9553 7899

TRAINING ATTENDANCE LIST

Name of Plumber	Date	Place	Signature

* Signature confirming acknowledgement of the Aquatherm Installation Principles and fusion welding.
* The signature confirms that the personnel has been trained that the Hydraulic presure test must be performed on the installation of all Aquaterm pipe and fittings.

CERTIFICATE OF CONFORMITY

SAI Global hereby grants:

Aquatherm GmbH

Finnentroper Strasse 82, ATTENDORN, Germany

Watermark Certificate of Conformity - Level 1

Evaluated to:

ISO 15874.3:2003 - Plastics piping systems for hot and cold water installations - Polypropylene (PP) - Part 3: Fittings

& ISO 15874.2:2003 - Plastics piping systems for hot and cold water installations - Polypropylene (PP) - Part 2: Pipes

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Duncan Lilley
Global Head – Assurance Services

Alex Ezrakhovich
General Manager – Certification Services

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Web: www.aquatherm.com.au

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