State of the pipe

aquatherm
NZ Limited

Training Manual for fusion welding

aquatherm green pipe

Pipe system made of polypropylene
for potable water supply

old brand name	new brand name		Standard Dimension Ratio	structure of pipe	special features of pipe	material
	company	system				
fusiotherm SDR 11	aquatherm	green pipe	SDR 11	S		PP-R
fusiotherm SDR7.4	aquatherm	green pipe	SDR 7.4	S		PP-R
fuisotherm faser composite pipe	aquatherm	green pipe	SDR 7.4	MF		PP-R
fusiotherm faser composite pipe UV	aquatherm	green pipe	SDR 7.4	MF	UV	PP-R
aquatherm green pipe	aquatherm	green pipe	SDR 9	MF		PP-RP

aquatherm blue pipe

Pipe system made of polypropylene
for chilled, hot fluid and various industrial applications

old brand name	new brand name		Standard Dimension Ratio	structure of pipe	special features of pipe	material
	company	system				
climatherm faser composite pipe SDR 7.4/SDR 11	aquatherm	blue pipe	SDR 7.4/SDR 11	MF		PP-R
climatherm faser composite pipe SDR 7.4/SDR 11 UV	aquatherm	blue pipe	SDR 7.4/SDR 11	MF	UV	PP-R
climatherm faser composite pipe SDR 17.6	aquatherm	blue pipe	SDR 17.6	MF		PP-R

aquatherm red pipe

Pipe system made of polypropylene
for fire sprinkler systems

old brand name	new brand name		Standard Dimension Ratio	structure of pipe	special features of pipe	material
	company	system				
firestop SDR 7.4	aquatherm	red pipe	SDR 7.4	MF	HI	PP-R FS

aquatherm lilac pipe

Pipe system made of polypropylene
for reclaimed water

old brand name	new brand name		Standard Dimension Ratio	structure of pipe	special features of pipe	material
	company	system				
lilac	aquatherm	lilac pipe	SDR 7.4	MF	HI	PP-R FS

Fields of application

aquatherm flexi pipe

Potable water and heating installations
for potable hot and cold water

brand name	new brand name company	colour	structure of pipe	material
aquatherm flexi	aquatherm	black	S	PE-RT

aquatherm black system

System for room climatisation made of polyproylene
for ceiling and wall

old brand name	new brand name company	new brand name system	colour	special features of pipe	material
climasystem	aquatherm	black system	black	OT	PP

aquatherm orange system

Heating installations
for heating and underfloor heating connections

old brand name	new brand name company	new brand name system	colour	special features of pipe	material
aquatherm SHT	aquatherm	orange system	orange	M OT	PE-RT

Fields of application

	potable water		industrial floor cooling		rainwater application
	heating system construction		industrial floor heating		irrigation
	connection heating and cooling		chilled water technology		fire protection sprinkler-system
	underfloor heating		sports floor heating and cooling		application in the field of ship building
	wall heating		swimming pool technology		district heating pipeline systems
	ceiling heating and cooling		chemical transport		geothermal

short cuts structure of pipe		short cuts material	
S	single	**PP**	polypropylene
MF	multilayer faser	**PP-R**	polypropylene
MS	multilayer stabi	**PP-RP**	polypropylene with raised temperature resistance
OT	oxgen tight	**PB**	polybutylene
UV	UV resistant	**PE-RT**	polyethylene with raised temperature resistance
TI	thermal insulation	**PEX**	cross-linked polyethylene
HI	heat insulated	**AL**	aluminium

fusiolen®

The experience of more than twenty years in manufacturing and application of PP-R sanitary and heating pipes and the simultaneous endeavor to continuous development led to numerous improvements in the aquatherm-system-technology.

The priority of the product-development was the constant extension of the product range as well as the development of stabilized pipes - first as stabi-composite-pipe later as fibre-composite-pipe. On doing this special importance was attached with the producer of the raw material to optimize the material characteristics.

The increasing globalization of the market and the resulting competitive pressure challange to highest independence concerning the choice of material and its development.

Especially for this purpose aquatherm`s management came up with a team specialized on product, process and material engineering which had the objective of developing an own innovative raw material.

This raw material should correspond to the national and international standards of the sanitary and heating technology, as well as to the demands of industry, agriculture, private households, etc.

It was very important to set such a high standard for the raw material development that the characteristics of former material are surpassed.

So in an unequaled teamwork aquatherm developed a raw material, which now under the brand-name **fusiolen®** is the basis of our pipe and fitting production and - refering to its excellent material characteristics - won worldwide recognition.

Advantages

RESISTANCE AGAINST CHEMICALS

SMELL- AND TASTE NEUTRALITY

PHYSIOLOGICAL SAFENESS

HIGH ENVIRONMENTAL COMPATIBILITY

HIGH IMPACT RATE

LESS PIPE ROUGHNESS

HEAT- AND SOUNDINSULATING CHARACTERISTICS

VERY GOOD WELDING PROPERTIES

HIGH HEAT-STABILIZED

EQUIPPED WITH METAL DEACTIVATION

Health & Safety notice when installing aquatherm products.

aquatherm NZ Ltd, encourages installers to wear protective clothing as required on site, take recommended industry and Worksafe NZ approved measures to ensure the safety of the installer, co-workers and the public when working with aquatherm products.

It is essential that only trained aquatherm installers use the welding devices.

No one under any circumstances should use the welding device that is Under the influence of alcohol, illegal substance or any prescribed medication that may affect performance do not use the welding devices.

It is essential to be aware that as the welding device can reach temperatures of 300 degrees celsius, because of this there is a risk of burns. First Aid treatment should be sought immediately in the case of any burns injury, by holding the burnt area under running cold water for a minimum of 20 minutes. It is recommended a first aid kit is kept on site with the welding team.
Advise the site office when you are welding on site so as this can be noted on the site Hazard board as Plumber welding on site stay clear!

Please take proper electrical safety precautions when working in an installation setting, a circuit breaker / RCD / isolating transformer is recommended for use with any power tool.

When the welder is not in use and or you are not with the welder it is recommended to return it to the protective metal box, note when doing so please ensure the electrical cord does not come into contact with the heating element.
Devices pre 2004 do not have heat proof leads in which case replacement of the cord by aquatherm NZ Ltd is suggested if the plastic coating becomes damaged or the internal wires are exposed.

Please arrange for your welding device to be checked and certified for 'fitness` by aquatherm NZ Ltd every 6 months.

Precautions check list:

1. Loose clothing, jewellery and long hair.
2. Wearing protective glasses when using welding device.
3. Use of supplied brackets to stabilise the welding device.
4. When changing heads on an operational welder, ensure heat proof gloves are worn.
5. DO not handle the tool by the cord to raise or lower when working in an elevated position.
6. Hazard identification prior to commencement of the installation.

In accordance with Occupational Safety and Health Department recomendations we advocate prefabrication of pipe work on the ground or at a suitable work bench prior to installation. Particularly when pipe is to be installed above head height.

Transport and Storage

fusiotherm®-pipes may be stored outside at any temperature. A flat solid base for the pipe is very important, to avoid a deformation of the pipe while in transport and storage.

At temperature below 0ºC it is possible to damage the pipe through impact The material has to be treated with caution at low temperatures.
Although fusiotherm®-pipes are extremely robust it is recommended to treat the material with care.

UV-radiation has effects on all high polymer plastics. Do not store exposed to UV for long periods.

fusion

Product Description

aquatherm green pipe PP-R 80 / Colour – Green

Markings

aquatherm® 20x2.8mm ART 10808 Fusiolen PP-R80
DIN 8077/8078 Lic 2437 |>>>>>| SKZ A 175 SDR 7,4 NSF
PW SE CSA B137.11 1126/92 NORM 5174 TW ASTM F2389
NSF 51 ICC ESR-1613 20.07.06
14:40 M-3 A230 Made in Germany —

Requirements & Limitations of green pipe

Must be installed to the requirements of the New Zealand Building Code (all relevant clauses) and in accordance with manufacturers` technical requirements

Must be installed by an aquatherm Registered Installer.

Can be used for flow and return hot water ring mains within the parameters of temperature and pressure chart.

Can be laid directly in concrete/plaster and solid walls in accordance with installation procedures and New Zealand Building Code.

All in ground services & in slab installations must be installed to AS/NZS 3500.5.2000 Clause 2.13.2.

Pipe must be clipped as to aquatherm support intervals using brand matched clips. Ensure all pipe work is installed to New Zealand Building Code requirements.

Bending radius on aquatherm green pipe shall not be greater than 20 x d. Where possible use proprietory fittings.

aquatherm fibre pipe shall not be radiused.

Pipes & fittings shall not be used within 1 metre of the inlet or outlet of a water heater.

Pipe & fittings shall not be used when exposed to direct sunlight, unless protected.

Pipe must not be used on the flow & returns from solar panels, wetbacks or relief drains of an uncontrolled heat source.

When connecting to other piping systems always use thread connector.

When used as an alternative non potable supply, ensure pipes are clearly & permanently labeled in accordance with AS1345 & AS1319.

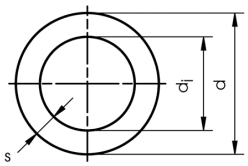
Pipe and fittings must be brand matched.

These are examples of pipe sizes relevant to SDR.

For further information refer to the technical manual available from aquatherm NZ Ltd

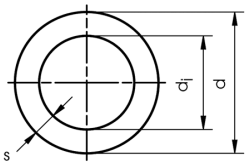
aquatherm green pipe SDR 11

Material:	fusiolen PP-R (80)
Pipe series:	SDR11
Standards:	DIN 8077, DIN 8078, DIN EN ISO 15874
Colour:	green with 4 blue stripes
Application:	Cold portable water



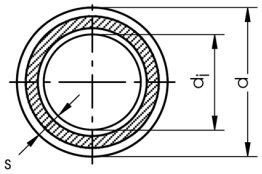
aquatherm green pipe SDR 7.4

Material:	fusiolen PP-R (80)
Pipe series:	SDR7.4
Standards:	DIN 8077, DIN 8078, DIN EN ISO 15874
Colour:	green
Application:	Potable water, heating, general pressure pipe



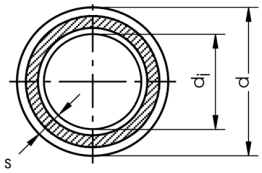
aquatherm green pipe MF SDR 9 RP

Material:	fusiolen PP-RP with fibre reinforced
Pipe serie:	SDR 9
Standards:	SKZ HR 3.28, ASTM F 2389, ISO 21003
Colour:	green with 4 dark green stripes
Application:	Potable water, heating, general pressure pipe



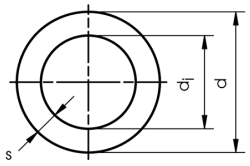
aquatherm green pipe faser-composite-pipe SDR 7,4

Material:	fusiolen PP-R (80) joint with fibres
Pipe serie:	SDR7,4
Standard:	SKZ HR 3.28
Colour:	green with 4 moss-green stripes
Application:	Potable water, heating, general pressure pipe



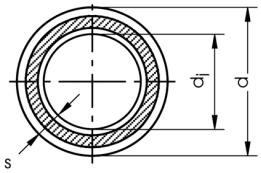
aquatherm lilac pipe SDR 11

Material:	PP-R (80)
Pipe series:	SDR11
Standards:	NSF 14, ISO 15874, ASTM F 2389, CSA B 137.11
Colour:	lilac / marked recycled/reclaimed water DO NOT DRINK
Application:	Recycled / reclaimed water



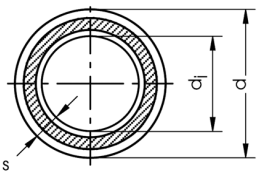
aquatherm blue pipe faser composite pipe SDR 7,4 / 11

Material:	fusiolen PP-R (80) C
Pipe series:	SDR11
Standard:	DIN 8077. DIN 8078, DIN EN ISO 15874
Colour:	blue / 4 green stripes
Applications:	HVAC, non portable water applications



aquatherm blue pipe faser composite pipe SDR 17.6

Material:	fusiolen PP-R; fibre reinforced
Pipe serie:	SDR17.6
Standards:	SKZ HR 3.28, ASTM F2389, CSA B 137.11, NSF 14
Colour:	blue with 4 wider green stripes
Application:	HVAC, non-potable water applications



Mounting of the tools

1. **green** pipe, **blue** pipe, **lilac** pipe & **red** pipe are processed identically.

IMPORTANT!

Only use original aquatherm - welding devices and aquatherm - welding tools.

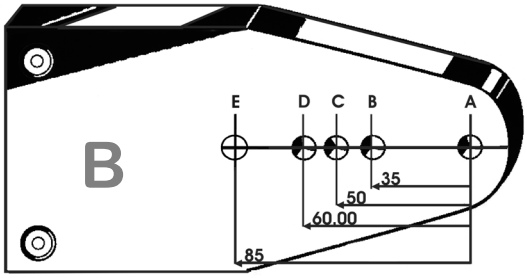
2. Assemble and tighten the cold welding tools manually.

3. Before fusing the distribution block, in which two connec tions are fused simultaneously,The welding tools have to be placed into the respective and drawing B.

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

Art #	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

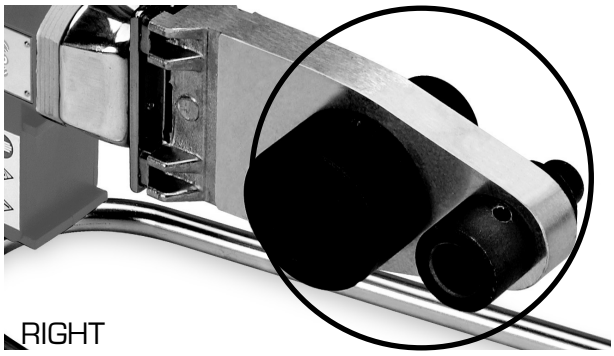
5. Place the welding tools on the welding device so that there is full surface contact between the welding tool and the heating plate. Welding tools over Ø 40 mm must always be fitted to the rear position of the heating plate.

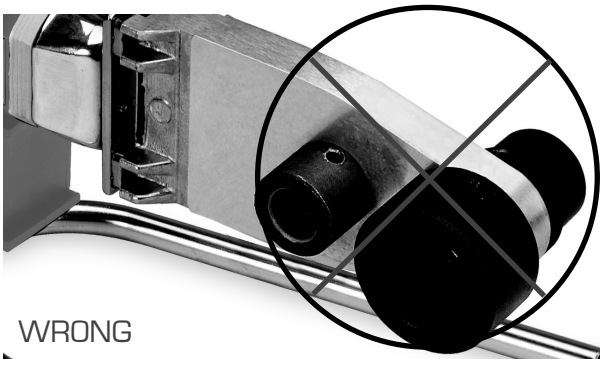


Electric supply:

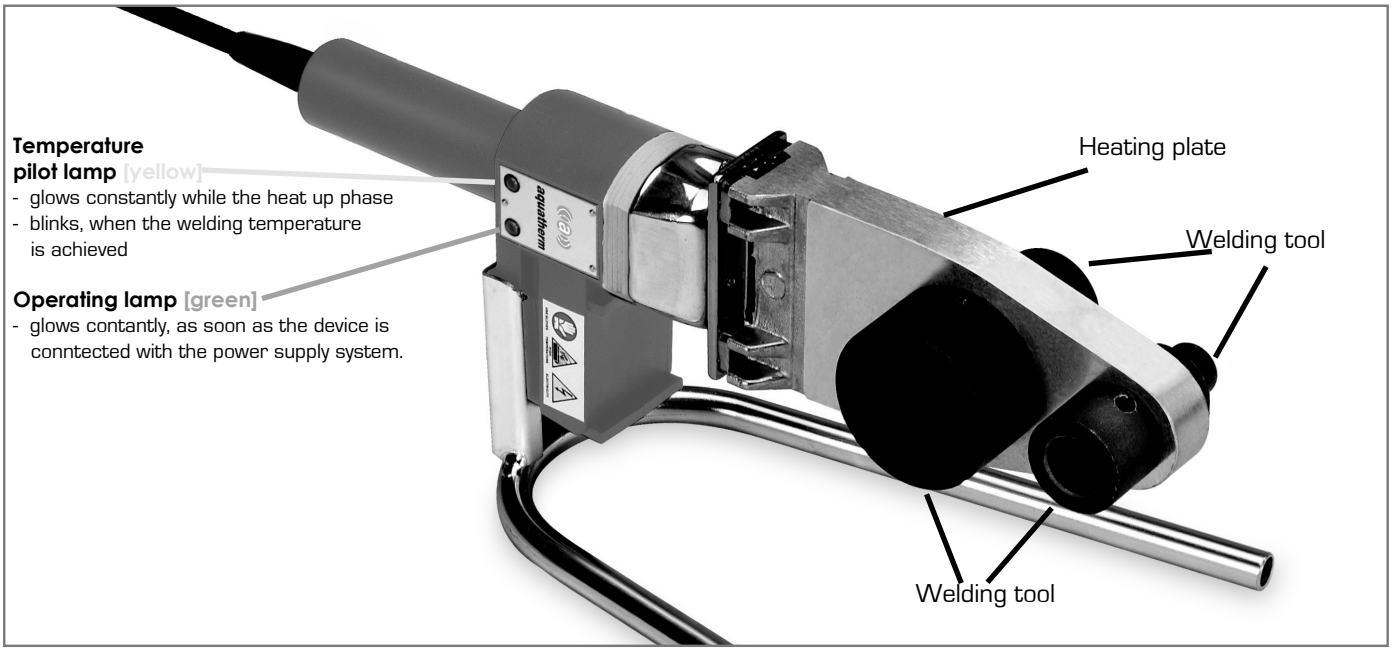
The power supply must coincide with the data on the type plate of the welding device and must be protected according to the local regulations. To avoide high power loss, the conductor cross-section of the used extension cables must be selected according to the power input of the welding devices.

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


RIGHT


WRONG

Heating up phase / Handling



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.

6. 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 thermom eter.

ATTENTION
First welding - soonest 5 minutes after reaching of the welding temperature. DVS 2207,

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.

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 aquatherm - welding devices and tools against impurities. Burnt particles may lead to an incorrect fusion. The tools may be cleaned with aqautherm - 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 tool must be replaced, as only impeccable tools guarantee a per fect connection.

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

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

Guidelines
Checking of devices and tools

Heating up phase

Guidelines

17. For the correct handling of welding machines the follow ing must be observed:

    General Regulations for Protection of Labour and Pre vention 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 aquatherm - 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.

Checking of devices and tools

1. Check, if the aquatherm - welding devices and tools com ply with to the guidelines "Fusion Part A".

2. All used devices and tools must have reached the neces sary operating temperature of 260C. 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 tempera-tureof up to 350 C with a high accuracy.

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


aquatherm Temperature - measuring device Art# 50188

Never attempt to open or repair a defective device, return the defective device for repair along with your contact details, return address and clearly state what the fault is with the device on a tool service sheet (download from the website) to:

aquatherm NZ Ltd.
36 Rockridge Avenue
Auckland

Attn: Service Department
Via your local Plumbing World Branch

Preparation for the fusion

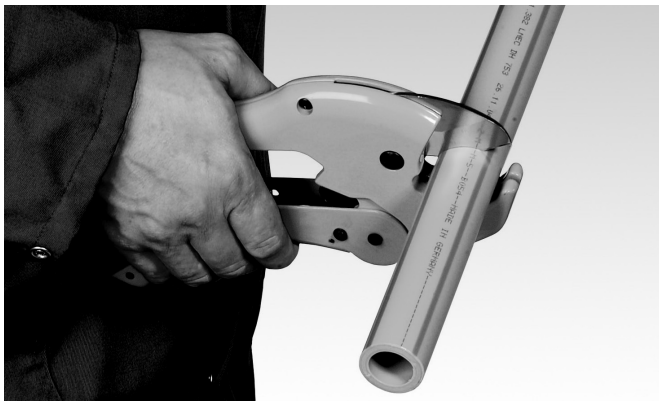
3. Cut the pipe at right angles to the pipe axis. Only use fusiotherm®- pipe cutters or other suitable cutting pliers. Take care that the pipe axis is free from burrs or cutting debris and remove where necessary.

Cautionery Note

When cutting fibre pipes in cold conditions care must be taken.

Note

Advisable to use a Wheel cutter such as a RothenBurger PRO 42.



Cutting of the pipe

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 uninterupted line on the pipe may be used as a guide.

Marking of the welding depth

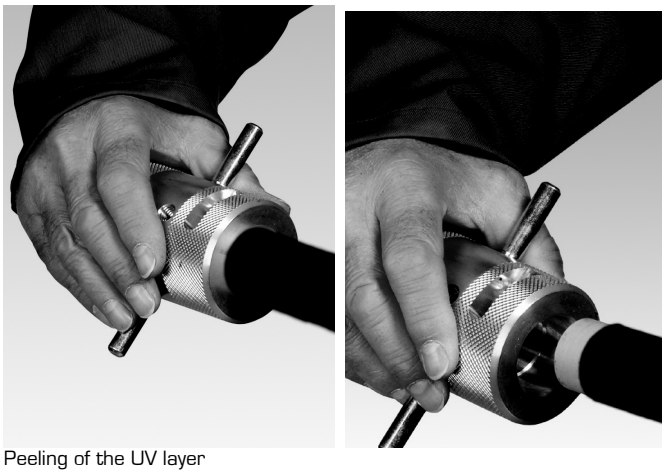
6. When welding UV pipe peel off the UV layer off the aquatherm pipe before fusion.

   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, 50520 and 50526 can be applied.

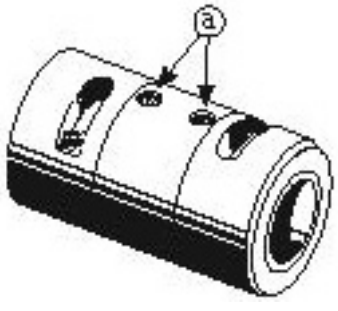
7. Only use original aquatherm - peeling tools with undam aged peeling blades. Blunt peeling blades have to be re placed by original ones. It will be necessary to make trial peelings to check the correct setting of the new blade. It should not be easier than usual to push the peeled aquatherm UV-pipe into the welding tool.

8. Push the end of the UV pipe into the guide of the peeling



Peeling of the UV layer

Peeling depth can be varied by turning the adjusting screw



Preparation for the fusion/ Heating of pipe and fitting

The fusion is subject to the following data.

Pipe external -Ø	Welding Depth	Heating Time	Welding Time	Cooling Time	WARNING
mm	mm	sec.AEQ	sec.	min.	
16	13.0	8	4	2	
20	14.0	8	4	2	
25	15.0	11	4	2	
32	16.5	12	6	4	
40	18.0	18	6	4	
50	20.0	27	6	4	
63	24.0	36	8	6	
75	26.0	45	8	8	
90	29.0	60	8	8	
110	32.5	75	10	8	
125	40.0	90	10	8	

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

Dimension 160 - 355 mm:

The dimension 160 - 355 are joined by butt-welding.

Observing Bead formation can also be used as a time indicator.

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

Heating up of pipe and fitting

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 aquatherm - welding machine Art.-No. 50147 a 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. NOT BEFORE!

Setting and alignment weld-in saddles

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

Weld-in saddles

aquatherm - weld-in saddles are available for pipe outer diameter of 40 - 355 mm.

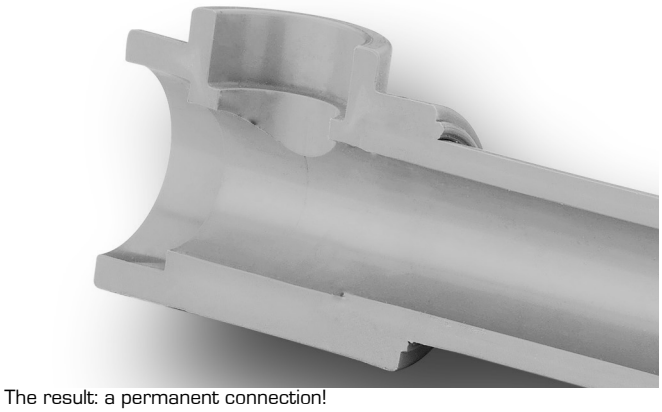
Weld in saddles are used for

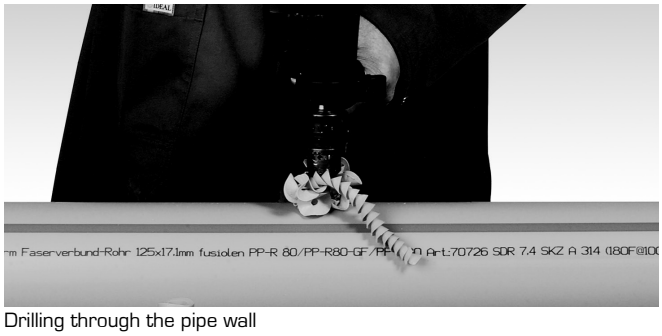
- branch connections in existing installations
- the substitution of a reduction-tee
- branch connections in risers
- sensor wells, etc.

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 intend ed outlet point by using the fusiotherm®- drill (Art.-No. 50940-50960).


The result: a permanent connection!


Drilling through the pipe wall

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

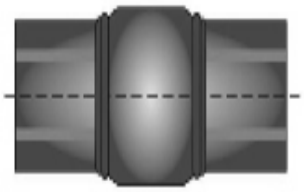
PAY ATTENTION TO THE BEADS!

colours of innovation | aquatherm green pipe | aquatherm blue pipe | aquatherm red pipe | aquatherm orange system | aquatherm black system | aquatherm grey pipe | aquatherm lilac pipe | colours of innovation

Visual inspection of fusion seam

Visual inspection of fusion seam

Normally on fusioning a bead is formed around the entire circumference at the edge of the socket. This bead is an indication of proper welding.

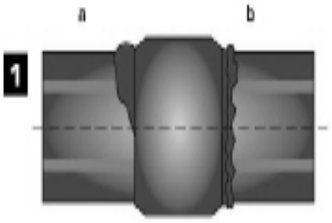


correct fusion welding

Incorrect shape of bead

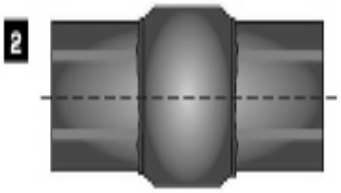
1 Different shape of bead (b) or non-existent bead at one or at both ends (a) (partial or total extent), resulting from:

- temperature of heating tool is too low (a)
- heat-up time too short (a)
- unacceptable tolerances (a and b)
- excessive temperature of heating tool (b)
- heat-up time too long (b)



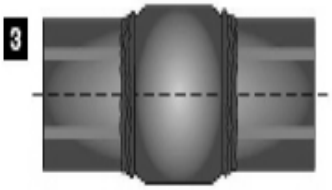
2 Single shape of bead, resulting from:

- heat-up time too short
- temperature of heating tool is too low
- unacceptable tolerances
- heat-up of only one welding-part



3 Excessive melting, resulting from:

- temperature of heating tool is too high
- misaligned movement of welding-part, e.g. by inadequate fixing
- unacceptable tolerances

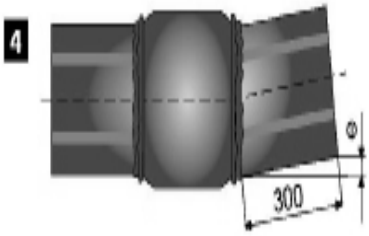


4 Elbow variance

Partially or double-sided inclined welded pipe into the socket without or with slight bracing, resulting from:

- machinery defect
- false installation

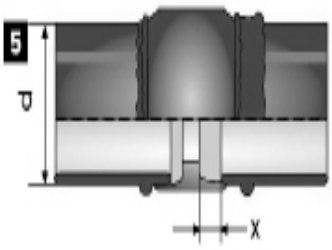
Acceptable, if e ≤ 2 mm



5 Mistake of bonding by improper pipe insertion, resulting from:

- heat-up time too short
- pipe ends not at 90° (right-angled)
- heating temperature too low
- axial movement during cooling time
- change-over time too long

Acceptable up to 0.1 x d and 0.15 x socket depth



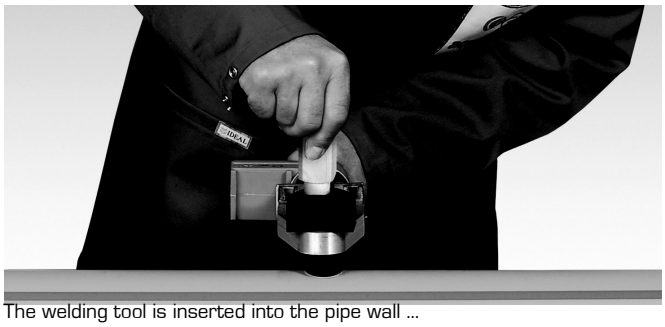
The visual inspection may be only a first indication of the welding seam quality.

But it is not a replacement for the leak test, which has to be carried out after the completion of the installation.

weld-in saddles

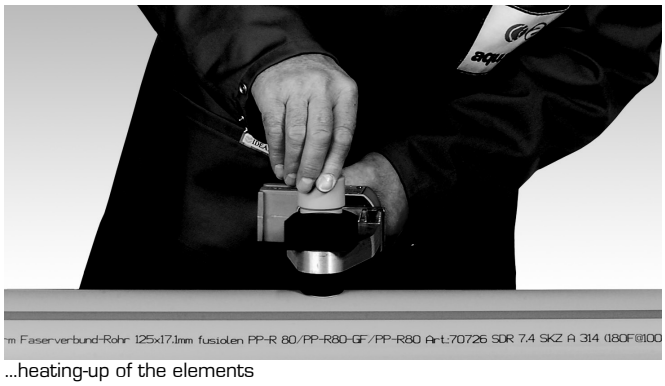
Weld-in saddles

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”).

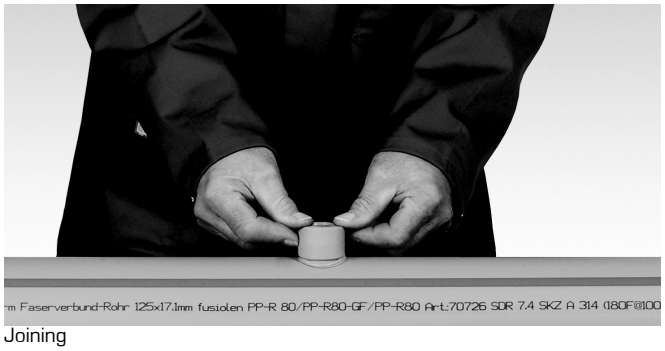

The welding tool is inserted into the pipe wall ...

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

6. Insert the heating tool on the concave side of the welding 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.


...heating-up of the elements

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 minute the connection can be exposed to its full loading.

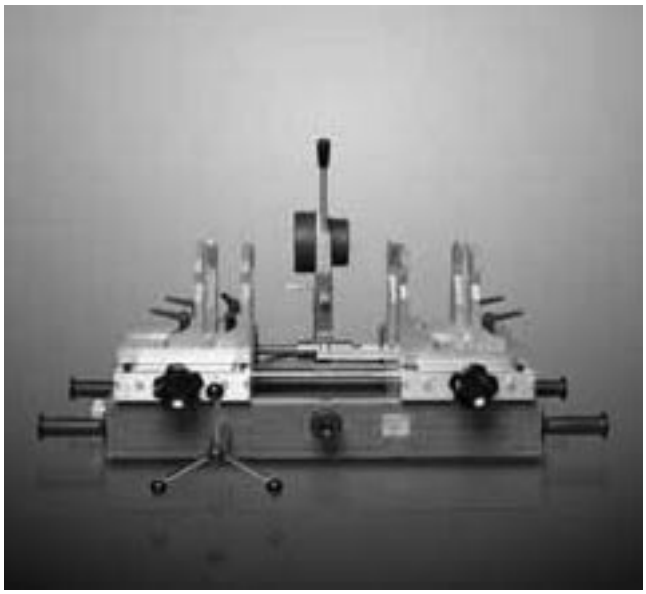

Joining

The appropriate branch pipe is fitted into the sleeve on the aquatherm - weld-in saddle us using conventional fusion technology.


Ready!

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

aquatherm - 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.

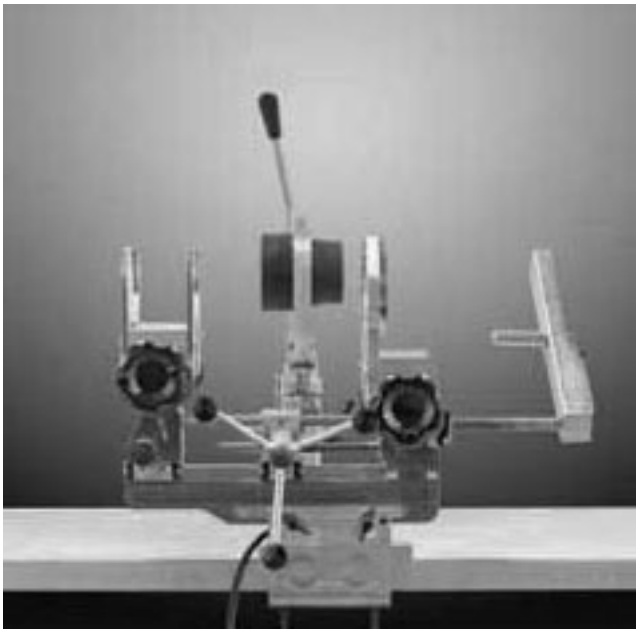
More detailed information can be taken from the enclosed operating manuals.

The fusion is subject to the following data

Pipe external-Ø	Welding depth	Heating time		Welding time	Cooling time	WARNING
mm	mm	sec.DVS	sec.AQE*	sec.	min.	
50	20.0	18	27	6	4	*heating times recommended by aquatherm at ambient temperatures below + 5 C **Dimension 160-355 mm:** The dimension 160-355 mm are joined by butt- welding.
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	

aquatherm - welding machine prisma-light

aquatherm - welding machine prisma-light



» with heating plate without welding 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. 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 12, 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 table on page 11.

aquatherm
electrofusion device

fusion

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

The fusion of 160-250 mm aquatherm green and aquatherm blue fibre composite 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.

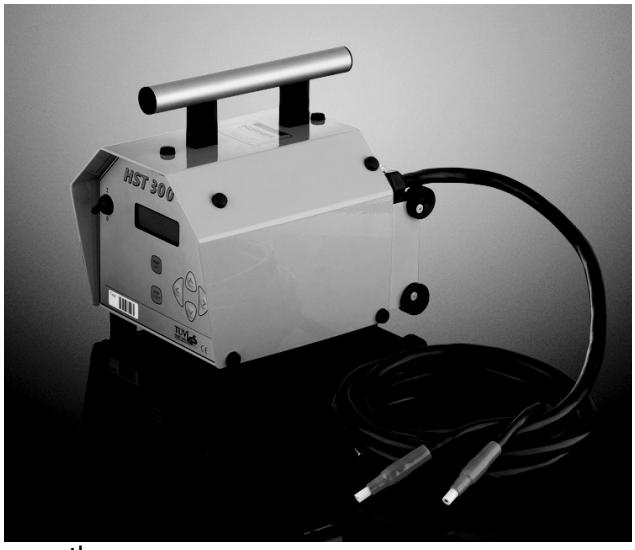
The pipe surface must also be clean and undamaged. Deformed pipe ends must be cut off.

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 aquatherm - electro - fusion - socket on the end of the pipe.



aquatherm - electrofusion device Ø 20-250 mm


aquatherm - electricfusion socket


aquatherm - peeling tool [art# 50558-70 up to 75mm]

Welding depth up to 250 mm [in 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

aquatherm - electrofusion device

fusion

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

IMPORTANT!
Before the fusion peel off the UV-layer of the fibre 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

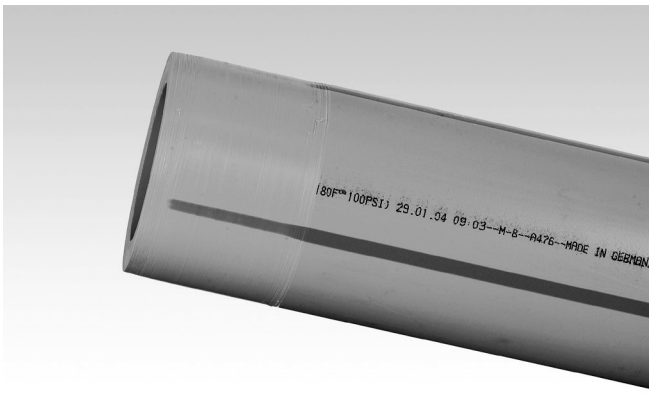
Without complete peeling of the fusion surface a homogeneous and tight welding connection is not assured. Damages of the surface like axial grooves and scratches are not accepted in the fusion zone. Never touch peeled surfaces and protect them against dirt and grease. Start the fusion process within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

3. assembling the aquatherm electrofusion sockets

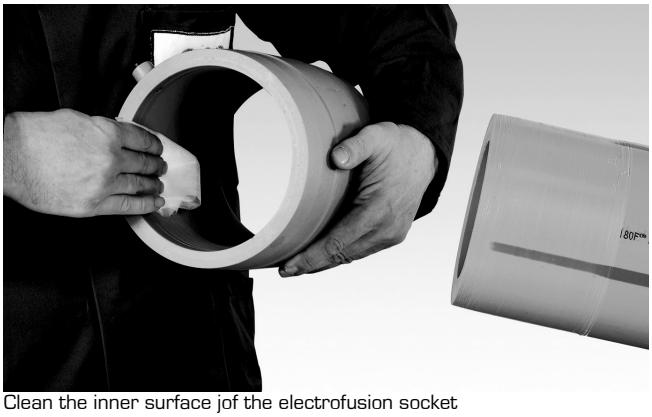
Avoid soiling and fix all parts securely!

1. Open the protective wrapping of the aquatherm 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 acetone.
   Assemble the fitting within 30 mins after opening of the protective foil.

2. Push the aquatherm - 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 jof the electrofusion socket

Push the electrofusion socket onto the pipe end

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 aquatherm - 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 circumfer ence.

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

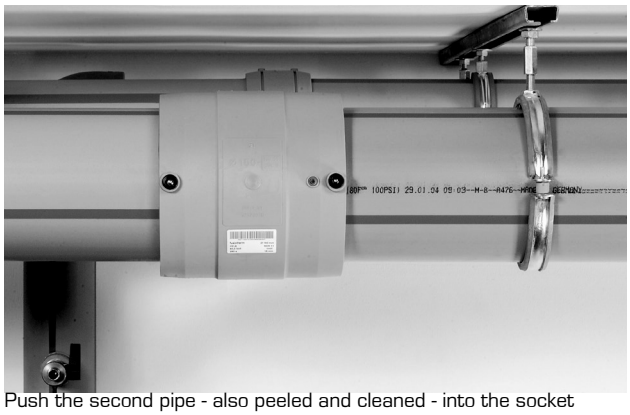
A fused pipe-joint shall not be moved (no release of the fixation) or stressed before complete cooling.

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

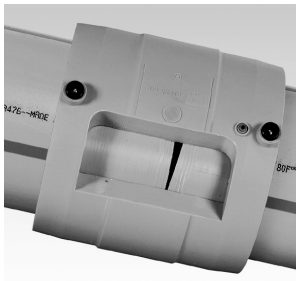
Working pressure

aquatherm - 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 aquatherm - 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 unpressureized pipes		20 minutes
Test- or working pressure of pipes pressurized	up to 0.1 bar[1.5psi] 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

aquatherm - electrofusion device
additional possibilities of repair

aquatherm - electrofusion device

Pipe repairs with the aquatherm 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.

Additional possibilities of repair

Damaged pipes may be repaired - as already mentioned - by means of fusion electrofusion socket
In addition to this the aquatherm - system offers the possibility of the pipe repair stick.

The necessary welding tool (Art.-No. 50307 / 11) and repair stick (Art.-No. 60600).

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

repair plug

Note: Repair Plug has two sizes; 7mm and 11mm. The 7mm repair plug reuires drilling a 6mm hole and the 11mm repair plug requires drilling

Heat up

Repair Stick

Cutting

aquatherm - Butt - welding of pipe dimension 160 - 355 mm

Butt-welding of pipe dimension 160 - 355 mm

The following aquatherm - pipes series are available:

aquatherm green pipe - SDR 11 for cold water

aquatherm green pipe - faser- composite pipe SDR 7.4 (Pat.-No. 10018324, trademark protection no. 39926599 for green/dark green).

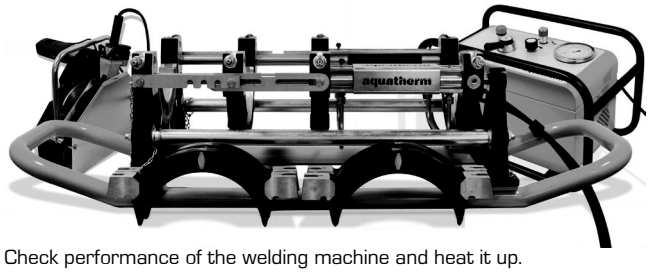
aquatherm blue pipe - faser composite pipe 17.6

aquatherm blue pipe - faser- composite pipe SDR 11

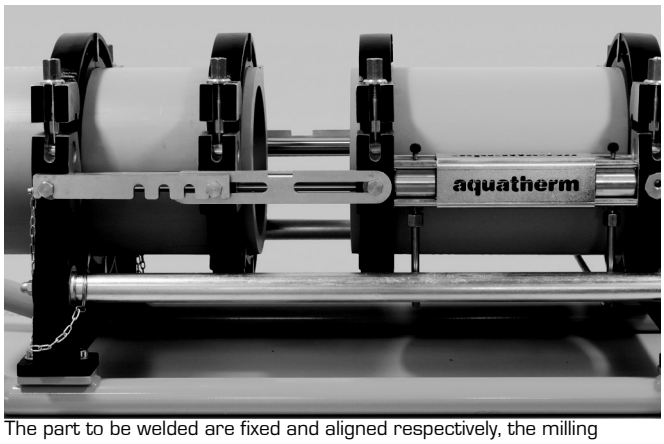
Pipes and fittings are fused, as explained below, by butt welding:

1. Protect your place of work from weather influences
2. Check, if welding machine works properly and heat it up
3. Cut pipes into required length
4. Plastic pipes are aligned and fixed by means of the clamping elements
5. Use the milling machine for planing the pipe end to be plane-parallel
6. Remove the debris and clean the pipe ends with acetone.
7. Check if pipes match (tolerance: max. 0.1 x wall thickness)
8. Check width of gap between the two pipes to be welded (tolerance: max. 0.5 mm)
9. Check the temperature of the heating element (210 C +/- 10 C)

Before welding, pipes are cut into the required lengths



Check performance of the welding machine and heat it up.



The part to be welded are fixed and aligned respectively, the milling machine is used

aquatherm - Butt - welding of pipe dimension160 - 355 mm

11. After the heating element has been positioned, the pipes are pushed onto the heating plate with a defined adjusting pressure.

12. After reaching the specified bead height (see tablet) the pressure is reduced. This process marks the beginning of the heating time. This time is for heating up the pipe ends up to the right welding temperature.

    Specified bead height in mm:

	SDR 7.4	SDR 11
160 mm	1.5	1.0
200 mm	2.0	1.0
250 mm	2.0	1.5
315 mm	-	2.0
355 mm	-	2.0

13. When heating time has expired, divide the machine slide, remove heating element quickly and join the pipes (by putting both parts of the slide together).

14. The pipes are fused with the required welding pressure and cooled down under pressure.

15. The welded connection can be unclamped - the welding process is finished.

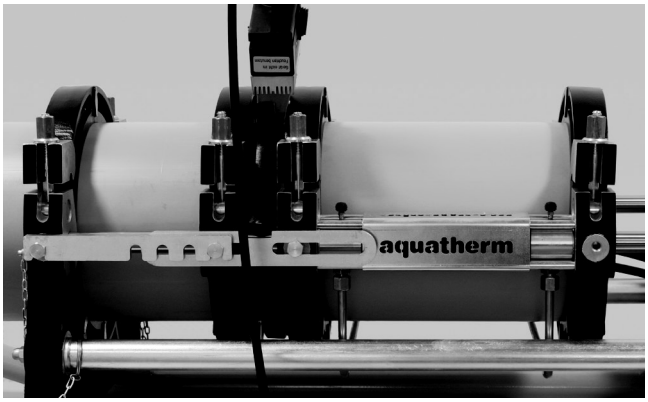
    Additionally please follow the instructions given in the oper ating manual of the welding machine and observe guideline DVS 2207.

Important Note

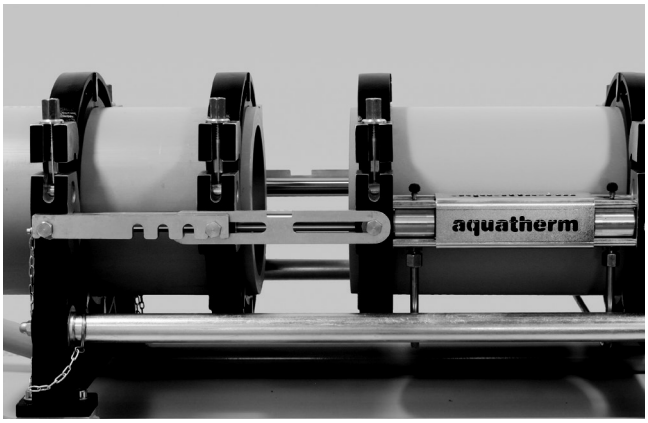
1. The welding machines have to be suitable for the welding of pipes with a diameter/wall thickness ratio of up to SDR 7.4
   aquatherm recommends the following suitable welding machines for butt welding:

   Company Ritmo: DELTA „DRAGON“250
   Company Rothenberger: ROWELD P 250 B
   Company Widos: WIDOS 4001 / 4002

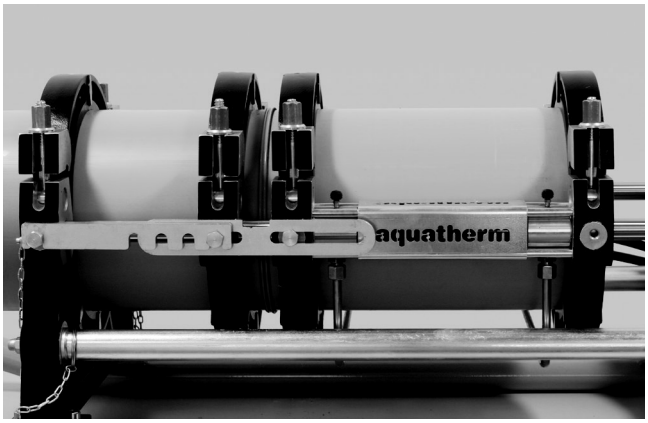
2. For hydraulically operated welding machines, the real manometer pressure has to be calculated in consideration of the hydraulic piston area. This value can be taken from the respective operating manuals.



Positioning of heating element



Divide the machine slide, remove heating element



Join the pipes, cool down under pressure

Unclamp and work on...

aquatherm - Installation principles
Fastening technique / Fixed points / Silding points

Fastening technique

Pipe clamps for aquatherm - 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 (aquatherm - 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 aquatherm- 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.

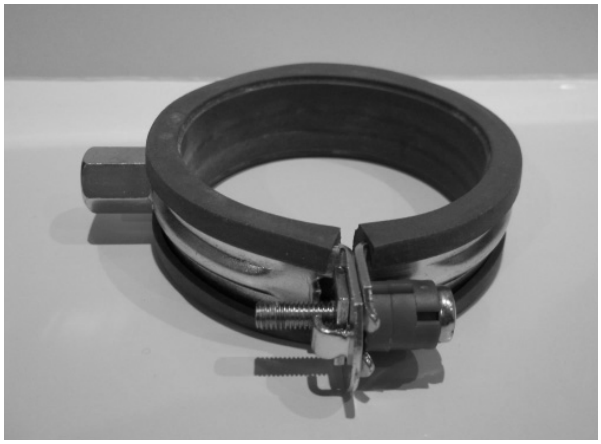
To compensate the forces arising from the linear expansion of the pipe there must be sufficient and stable clamps and mountings.

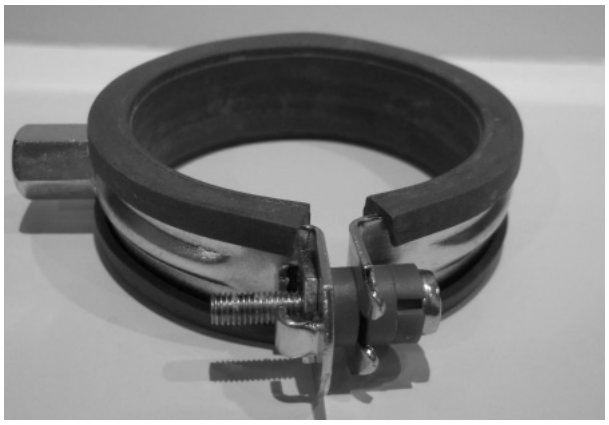
aquatherm - pipe clamps meet all mentioned requirements and - when considering the following installation instructions - are perfect for fixed point installations.

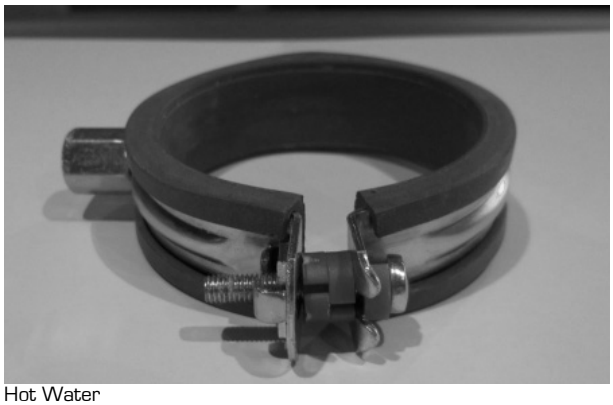
Sliding points

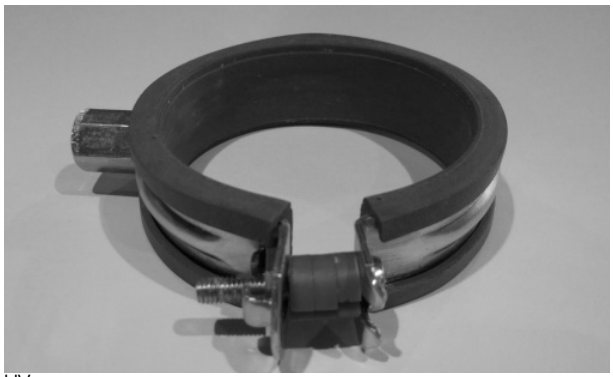
Sliding clamps have to allow axial pipe movements without damaging the pipe.

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.


Fixed Point


Cold Water


Hot Water


UV

linear expansion

The linear expansion of pipes depends on the difference of operating temperature to installation temperature:

$\triangle = T_{\text{operating temperature}} - T_{\text{installation temperature}}$

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.

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.

aquatherm green pipestabi/fibre composite

The linear expansion of aquatherm green pipe - stabi-composite and aquatherm green pipe- fibre composite in vertical risers can be ignored.

The positioning of a fixed point directly before each branch take 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.

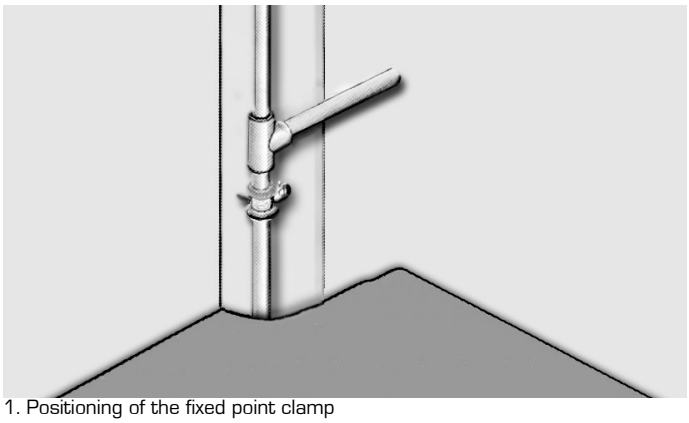
aquatherm green pipe

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

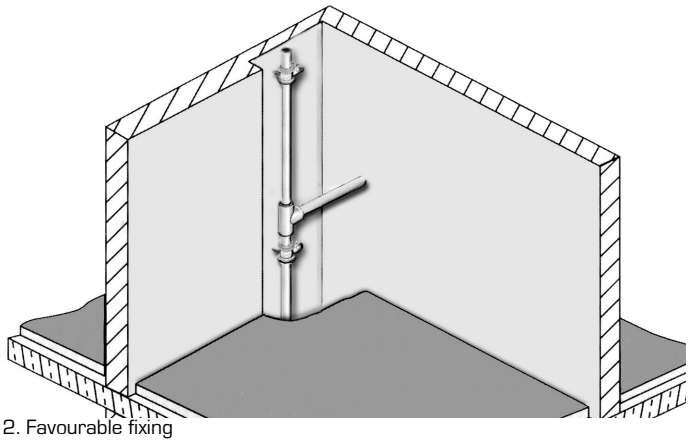
⇒This can be ensured by a favourable fixing of the riser in the duct (see 2).

⇒An adequate large pipe liner also gives sufficient elasticity to the branch-off pipe (see 3).

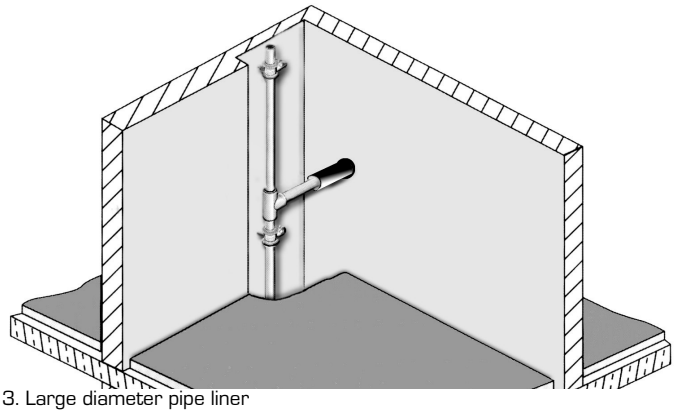
⇒Furthermore the installation of a spring leg gives the appropriate elasticity (see 4).



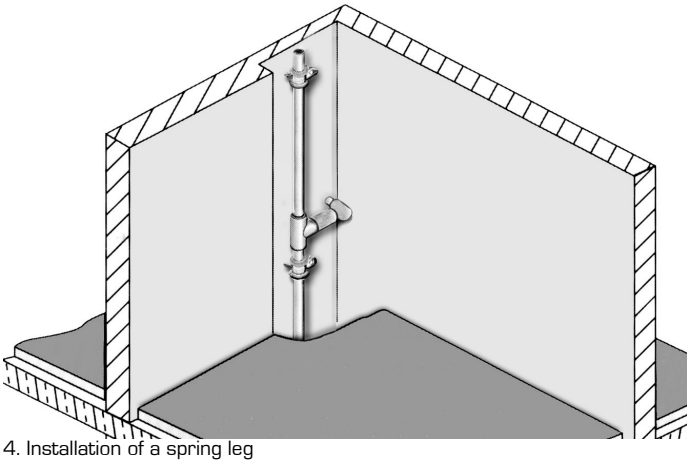
1. Positioning of the fixed point clamp



2. Favourable fixing



3. Large diameter pipe liner



4. Installation of a spring leg

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. aquatherm PP-R - pipes for cold water and aquatherm PP-R 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
α stabi composite = 0.030 mm / mK
α faser composite = 0.035 mm / mK

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

The coefficient of linear expansion of aquatherm PP-R -pipes without stabilizing components is
α fusiotherm = 0.150 mm / mK

aquatherm - stabi / -faser composite pipes must have enough space to expand (see page 60 u. 61). An expansion control must is required for long and straight stabi composite / faser composite pipes (over 40 m).
aquatherm - pipes without the stabilizing compound

aquatherm - 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.

Calcuation of the linear expansion

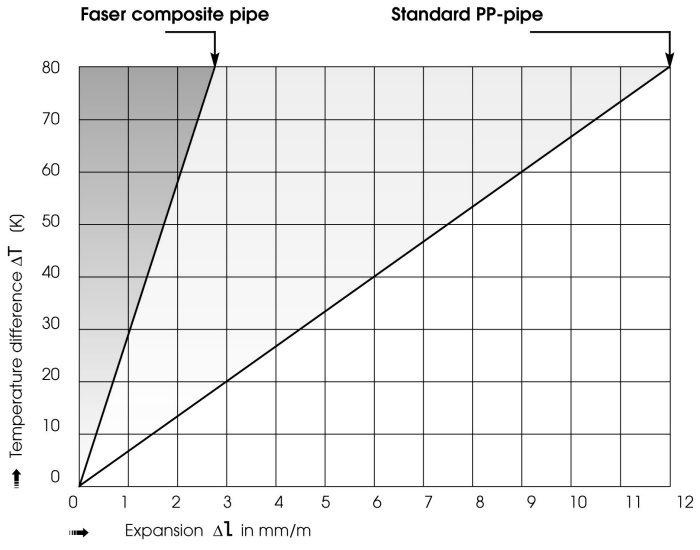
Calculation example: Linear expansion

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 fusitherm®-faser composite pipe	0.035	mm/mK
$\alpha 3$	Linear expansion coefficient	0.15	mm/mK
L	Pipe length	25.0	[m]
Tw	Working temperature	20.0	°C
Tm	Installation temperature	20.0	°C
ΔT	Temperature difference between working and installation temperature [ΔT = Tw - Tm]	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 (a = 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 pipe



aquatherm green pipe / aquatherm lilac pipe

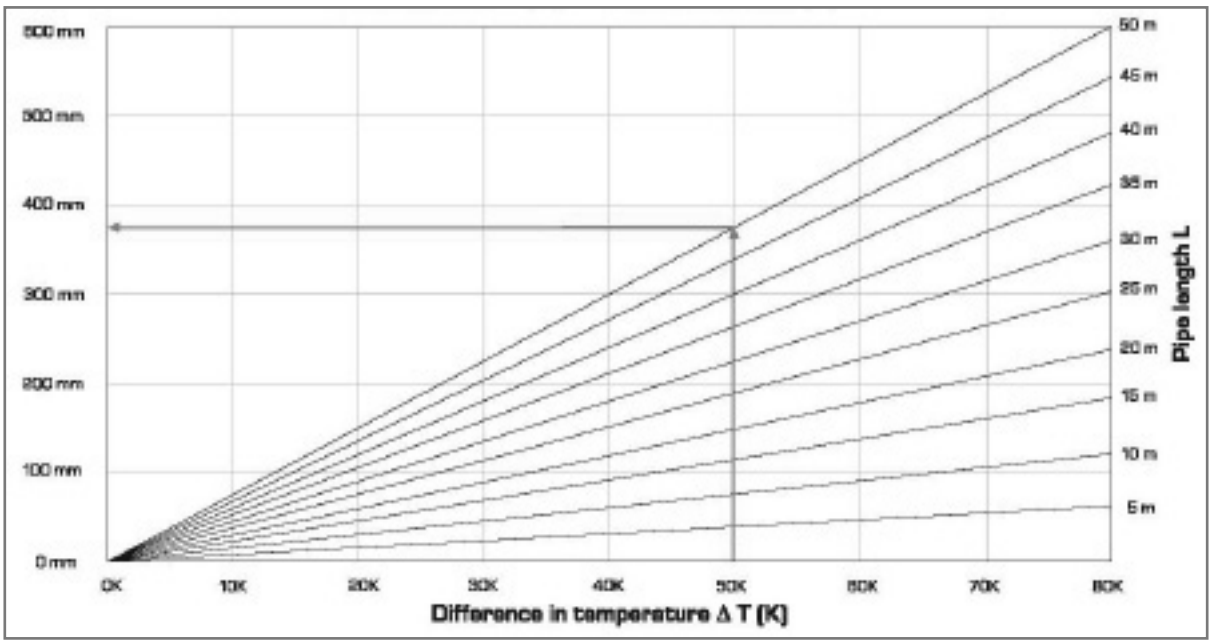
(with out fibre)

The linear expansion, described on the preceding pages, can be taken from the following tables and graphs.

Linear expansion ΔL in [mm]: fusiotherm®- pipe and climatherm- pipe - α = 0,150 mm /m

Pipe length	Difference in temperature $\Delta T = T_{\text{operating temperature}} - T_{\text{installation temperature}}$							
	10 ΔT	20 ΔT	30 ΔT	40 ΔT	50 ΔT	60 ΔT	70 ΔT	80 ΔT
	Linear expansion ΔL (mm)							
5 m	8	15	23	30	38	45	53	60
10 m	15	30	45	60	75	90	105	120
15 m	23	45	68	90	113	135	158	180
20 m	30	60	90	120	150	180	210	240
25 m	38	75	113	150	188	225	263	300
30 m	45	90	135	180	225	270	315	360
35 m	53	105	158	210	263	270	368	420
40 m	60	120	180	240	300	360	420	480
45 m	68	135	203	270	338	405	473	540
50 m	75	150	225	300	375	450	525	600

aquatherm green pipe & aquatherm lilac pipe



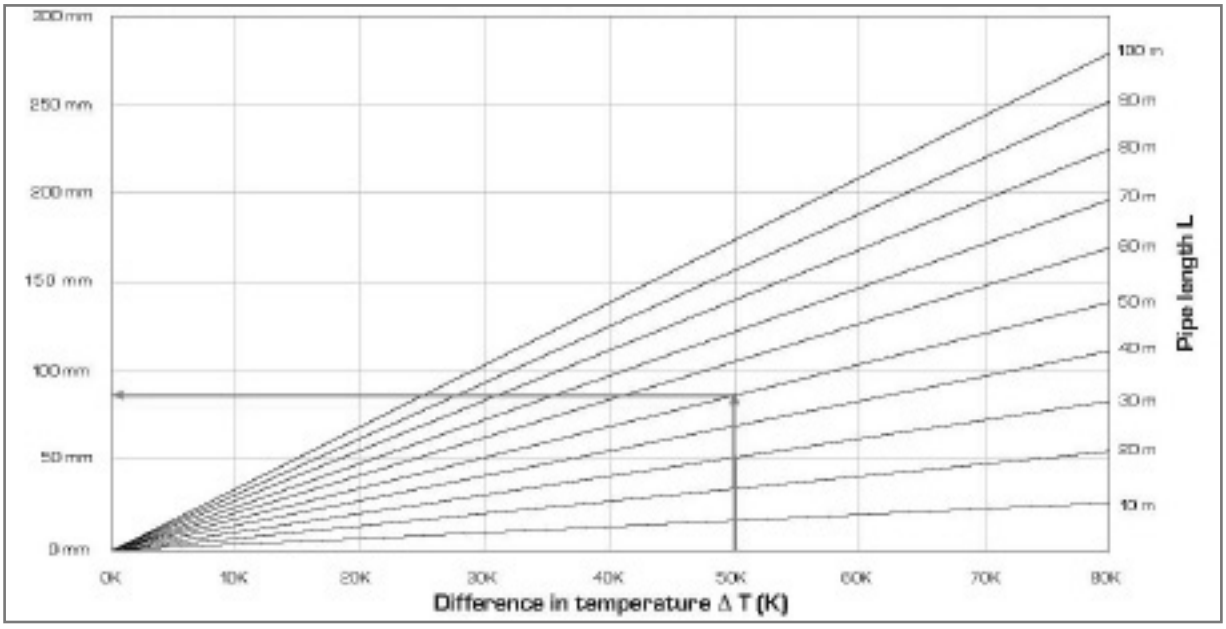
aquatherm green pipe – fibre composite pipe
aquatherm blue pipe – fibre composite pipe

Due to the integration and positive bond of the different materials, aquatherm green and aquatherm blue - fibre composite pipe offers much higher stability.
The linear expansion reduces its value to 1/5 of the non-fibre PP-pipes.

Linear expansion ΔL in [mm]: aquatherm green - faser composite pipe and aquatherm blue fibre composite pipe - a = 0.035 mm / m

Pipe length	Difference in temperature ΔT = T operating temperature - T installation temperature							
	10 ΔT	20 ΔT	30 ΔT	40 ΔT	50 ΔT	60 ΔT	70 ΔT	80
	Linear expansion ΔL (mm)							
10 m	4	7	11	14	18	21	25	28
20 m	7	14	21	28	35	42	49	56
30 m	11	21	32	42	53	63	74	84
40 m	14	28	42	56	70	84	98	112
50 m	18	35	53	70	88	105	123	140
60 m	21	42	63	84	105	126	147	168
70 m	25	49	74	98	123	147	172	196
80 m	28	56	84	112	140	168	196	224
90 m	32	63	95	126	158	189	221	252
100 m	35	70	105	140	175	210	245	280

aquatherm green - faser compsite pipe & aquatherm blue - faser composite pipe



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

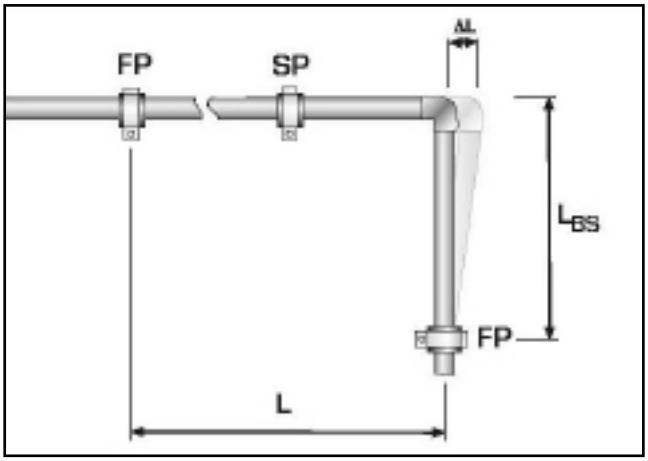
In most cases direction changes can be used to compensate for linear expansion in pipes.

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.

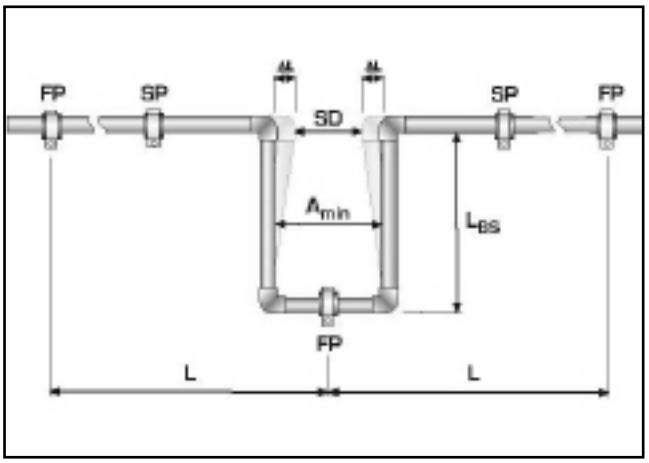
In addition to the length of the bending side LBS the width of the pipe bend Amin must be considered.

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

The pipe bend Amin is calculated acc. to the following formula:

$$Amin = 2 \times \Delta L + SD$$

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 Amin 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.

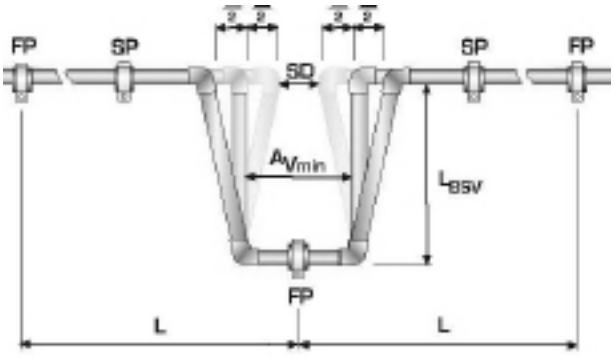
The side length L_{SV} is calculated acc. to the following calculation example:

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:

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

2



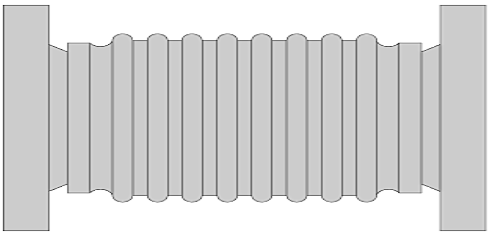
Bellow expansion joint

All corrugated metal ezpansions are nsuitable for aquatherm PPR pipes.

When using axial expansion joints observe the manufacturers instructions.

Note

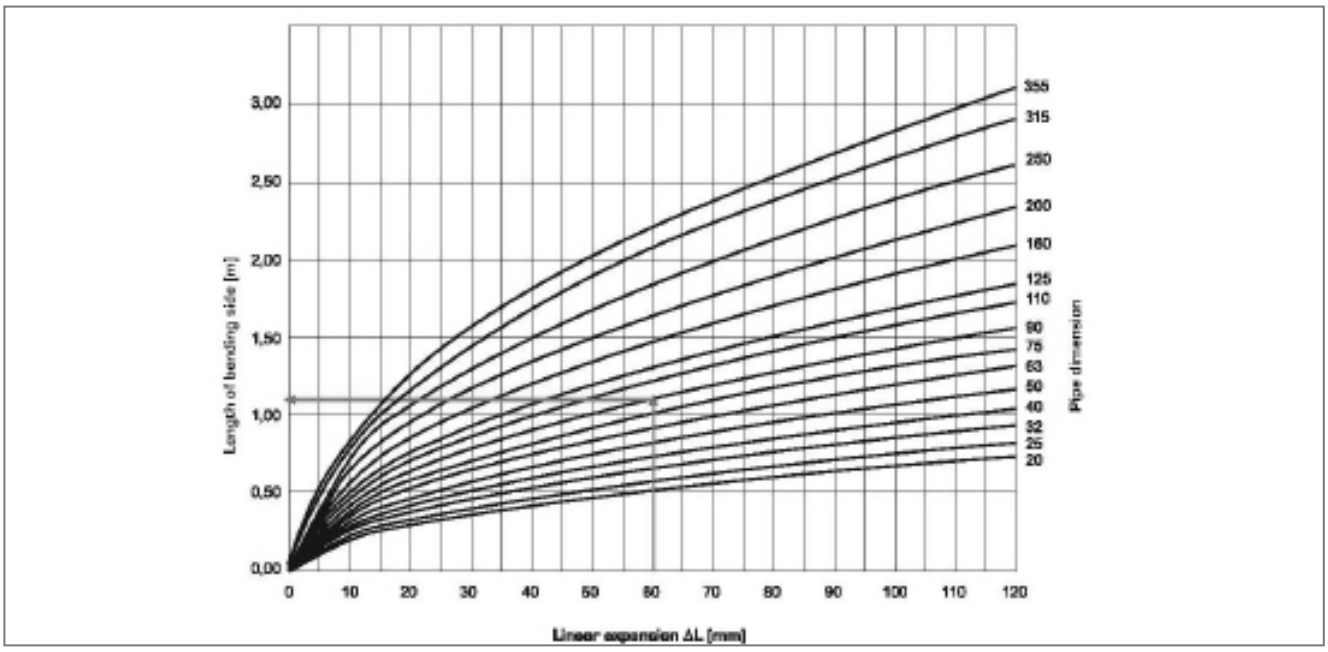
Fibre pipes do not require expansion loops for vertical risers.



Length of bending side

Length of bending side for aquatherm green, aquatherm green - fibre composite pipe and for aquatherm green - stabi composite pipe, aquatherm blue - pipe and aquatherm blue - fibre composite pipe.

Pipe Dimension	Linear expansion (mm)											
	10	20	30	40	50	60	70	80	90	100	110	120
	Length of bendig side (mm)											
20 mm	210	300	370	420	470	520	560	600	640	670	700	730
25 mm	240	340	410	470	530	580	630	670	710	750	790	820
32 mm	270	380	460	540	600	660	710	760	800	850	890	930
40 mm	300	420	520	600	670	730	790	850	900	950	990	1.040
50 mm	340	470	580	670	750	820	890	950	1.010	060	1.110	1.160
63 mm	380	530	650	750	840	920	1.000	1.060	1.130	1.190	1.250	1.300
75 mm	410	580	710	820	920	1.010	1.090	1.160	1.230	1.300	1.360	1.420
90 mm	450	640	780	900	1.010	1.100	1.190	1.270	1.350	1.420	1.490	1.560
110 mm	500	700	860	990	1.110	1.220	1.320	1.410	1.490	1.570	1.650	1.720
125 mm	530	750	920	1.060	1.190	1.300	1.400	1.500	1.590	1.680	1.760	1.840
160 mm	600	850	1.040	1.200	1.340	1.470	1.590	1.700	1.800	1.900	1.990	2.080
200 mm	670	950	1.160	1.340	1.500	1.640	1.770	1.900	2.010	2.120	2.22	2.320
250 mm	750	1.060	1.300	1.500	1.680	1.840	1.980	2.120	2.250	2.370	2.490	2.600
315 mm	840	1,190	1,460	1,680	1,880	2,060	2,230	2,380	2,530	2,660	2,790	2,920
355 mm	890	1,260	1,550	1,790	2,000	2,190	2,360	2,530	2,680	2,830	2,960	3,100

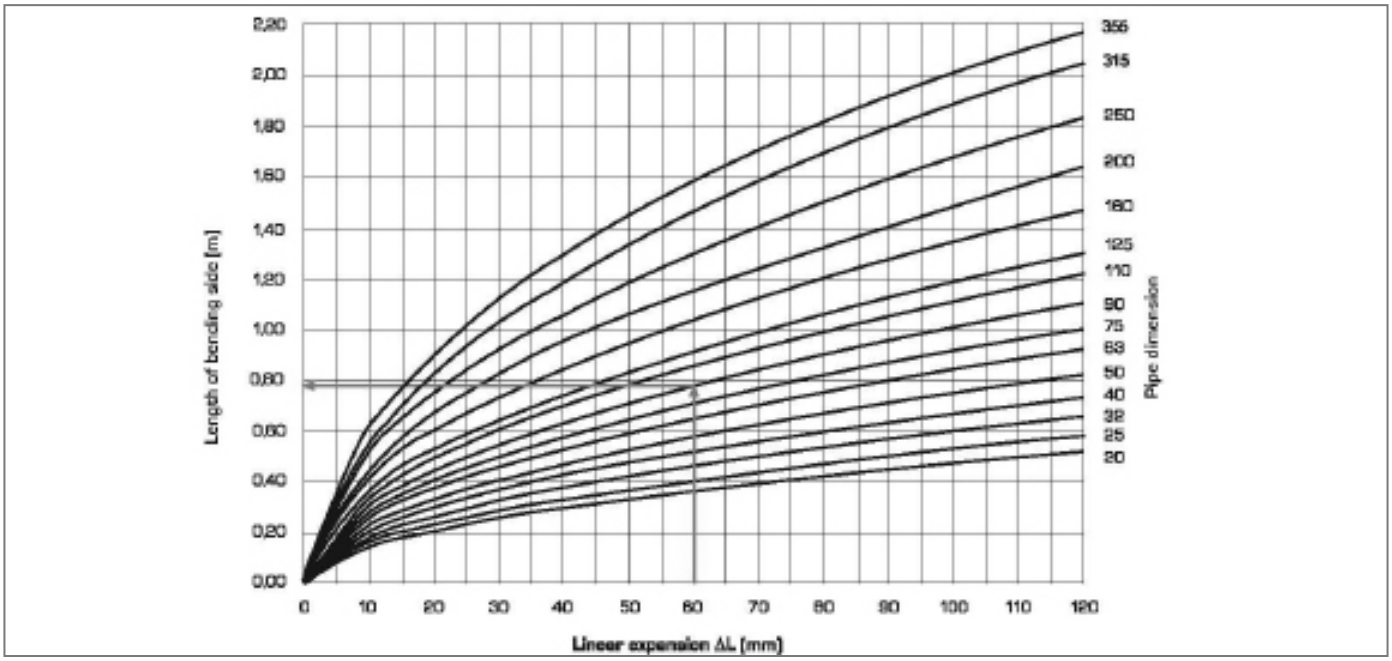


The length of the bending side LBS can be taken from the tables and graphs in consideration of the applied pipe dimensions and determined linear expansion.

Length of bending side with pre - stress

Length of bending side with pre-stress for aquatherm green, aquatherm green - fibre composite pipe and for aquatherm green - stabi composite pipe, aquatherm blue - pipe and aquatherm blue - fibre composite pipe

Pipe Dimen-sion	Linear expansion (mm)											
	10	20	30	40	50	60	70	80	90	100	110	120
	Length of bendig side with pre - stress (mm)											
20 mm	150	210	260	300	340	370	400	420	450	470	500	520
25 mm	170	240	290	340	380	410	440	470	500	530	560	580
32 mm	190	270	330	380	420	460	500	540	570	600	630	660
40 mm	210	300	370	420	470	520	560	600	640	670	700	730
50 mm	240	340	410	470	530	580	630	670	710	750	790	820
63 mm	270	380	460	530	600	650	700	750	800	840	790	0.920
75 mm	290	410	500	580	650	710	770	820	870	920	960	1.010
90 mm	320	450	550	0.640	710	780	840	900	950	1.010	060	1.100
110 mm	350	500	610	0.700	790	860	930	990	1.060	1.110	170	1.220
125 mm	380	530	650	0.750	840	920	990	1.060	1.130	1.190	1.240	1.300
160 mm	420	600	730	0.850	950	1.040	1.120	1.200	1.270	1.340	1.410	1.470
200 mm	470	670	820	0.950	1.060	1.160	1.250	1.340	1.420	1.500	1.570	1.640
250 mm	530	750	920	1.060	1.190	1.300	1.400	1.500	1.590	1.680	1.760	1.840
315 mm	600	840	1,030	1,190	1,330	1,460	1,580	1,680	1,790	1,880	1,970	2,060
355 mm	630	890	1,090	1,260	1,410	1,550	1,670	1,790	1,900	2,000	2,100	2,190



The length of the bending side with pre-stress L_{BSV} can be taken from the tables and graphs in consideration of the applied pipe dimensions and determined linear expansion.

Support intervals

Support intervals

aquatherm green pipe-pipe SDR 11
aquatherm lilac pipe-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	355
Support intervals in mm														
600	750	900	1000	1200	1400	1500	1600	1800	2000	2200	2300	2400	2500	2500

Support intervals

aquatherm green pipe -pipe 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 mm									
0	700	850	1050	1250	1400	1650	1900	2050	2200	2500
20	500	600	750	900	1000	1200	1400	1500	1600	1800
30	500	600	750	900	1000	1200	1400	1500	1600	1800
40	500	600	700	800	900	1100	1300	1400	1500	1700
50	500	600	700	800	900	1100	1300	1400	1500	1700
60	500	550	650	750	850	1000	1150	1250	1400	1600
70	500	500	600	750	800	950	1050	1150	1250	1400

aquatherm green pipe -fibre composite pipe SDR 7.4 &
aquatherm blue pipe-fibre 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	355
	Support intervals in mm														
0	1200	1400	1600	1800	2050	2300	2450	2600	2900	3200	3400	3450	3500	3550	3600
20	900	1050	1200	1350	1550	1750	1850	1950	2150	2400	2700	2750	2800	2850	2900
30	900	1050	1200	1350	1550	1750	1850	1950	2100	2250	2450	2500	2550	2600	2650
40	850	950	1100	1250	1450	1650	1750	1850	2000	2150	2350	2400	2450	2500	2550
50	850	950	1100	1250	1450	1650	1750	1850	1900	1950	2050	2100	2150	2200	2250
60	800	900	1050	1200	1350	1550	1650	1750	1800	1850	1950	2000	2050	2100	2150
70	700	800	950	1100	1300	1450	1550	1650	1700	1750	1850	1900	1950	2000	2050

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.

PERMISSIBLE WORKING PRESSURE

Potable water (Fluid transported: water acc. to DIN 2000)

Temperature	Service life	aquatherm green pipe SDR 11 S aquatherm lilac pipe SDR 11 S		aquatherm green pipe SDR 7,4 S		aquatherm green pipe SDR 6 S aquatherm green pipe SDR 7,4 MS		aquatherm green pipe SDR 7,4 MF		aquatherm green pipe SDR 9 MF RP	
		Permissible working pressure in bar and (psi)									
		bar	(psi)	bar	(psi)	bar	(psi)	bar	(psi)	bar	(psi)
20 C 68 F	1	15,0	(218)	23,8	(345)	30,0	(435	28,6	(415)	25,0	(363)
	5	14,1	(205)	22,3	(323)	28,1	(408	26,8	(389)	24,2	(351)
	10	13,7	(199)	21,7	(315)	27,3	(396	26,1	(379)	23,9	(347)
	25	13,3	(193)	21,1	(306)	26,5	(384	25,3	(367)	23,5	(341)
	50	12,9	(187)	20,4	(296)	25,7	(373	24,5	(355)	23,1	(335)
30 C 86 F	1	12,8	(186)	20,2	(293)	25,5	(370	24,3	(352)	21,7	(315)
	5	12,0	(174)	19,0	(276)	23,9	(347	22,8	(331)	21,0	(305)
	10	11,6	(168)	18,3	(265)	23,1	(335	22,0	(319)	20,6	(299)
	25	11,2	(162)	17,7	(257)	22,3	(323	21,3	(309)	20,2	(293)
	50	10,9	(158)	17,3	(251)	21,8	(316	20,7	(300)	20,0	(290)
40 C 104 F	1	17,1	(248)	21,5	(312	20,5	(297)	18,7	(271)		
	5	16,0	(232)	20,2	(293	19,2	(278)	18,0	(261)		
	10	15,6	(226)	19,6	(284	18,7	(271)	17,7	(257)		
	25	15,0	(218)	18,8	(273	18,0	(261)	17,4	(252)		
	50	14,5	(210)	18,3	(265	17,5	(254)	17,0	(247)		
50 C 122 F	1	14,5	(210)	18,3	(265	17,5	(254)	15,9	(231)		
	5	13,5	(196)	17,0	(247	16,2	(235)	15,3	(222)		
	10	13,1	(190)	16,5	(239	15,7	(228)	15,1	(219)		
	25	12,6	(183)	15,9	(231	15,2	(220)	14,8	(215)		
	50	12,2	(177)	15,4	(223	14,7	(213)	14,5	(210)		
60 C 140 F	1	12,2	(177)	15,4	(223	14,7	(213)	13,5	(196)		
	5	11,4	(165)	14,3	(207	13,7	(199)	13,0	(189)		
	10	11,0	(160)	13,8	(200	13,2	(191)	12,8	(186)		
	25	10,5	(152)	13,3	(193	12,6	(183)	12,5	(181)		
	50	10,1	(146)	12,7	(184	12,1	(175)	12,3	(178)		
65 C 149 F	1	11,6	(168)	14,6	(212	13,9	(202)	12,4	(180)		
	5	10,8	(157)	13,6	(197	12,9	(187)	11,9	(173)		
	10	10,4	(151)	13,1	(190	12,5	(181)	11,7	(170)		
	25	10,0	(145)	12,6	(183	12,0	(174)	11,4	(165)		
	50	8,8	(128)	11,1	(161	10,6	(154)	11,2	(162)		
70 C 158 F	1	10,3	(149)	13,0	(189	12,4	(180)	11,4	(165)		
	5	9,5	(138)	11,9	(173	11,4	(165)	10,9	(158)		
	10	9,3	(135)	11,7	(170	11,1	(161)	10,7	(155)		
	25	8,0	(116)	10,1	(146	9,6	(139)	10,5	(152)		
	30	7,0	(102)	8,8	(128	9,3	(135)	10,3	(149)		
	50	6,7	(97)	8,5	(123	8,1	(117)	10,2	(148)		

Potable water (cold)

Potable water (warm)

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

SDR = Standard Dimension Ratio (diameter/wall thickness ratio)
S = single layer
MS = multilayer stabi - integrated aluminium-layer
MF = multilayer faser
MF RP = multilayer faser - raised pressure (resistance)

The determination of the allowable pressures resulted from the specific conditions to which pipe system components in the drinking water domestic installation are exposed to. Limiting factors such as increased flow rates, the use of disinfectants, increased content of oxygen, etc. were considered by the use of the appropriate safety factors.
For fittings of butt-welded pipe segments a reduction factor of 0.75 (reduction of the table values by 25%) is effective.

aquatherm pipe installation procedures
check list for installers and certifiers

Concrete, plaster and solid walls

Fusiolen PPR-80 manufactured by aquatherm GmbH offers us special features for concealed installations. aquatherm PP-R pipes and fittings are manufactured from Fusiolen PP-R can be installed directly into concrete floors, walls, plaster and solid block work. The comprehensive strain and stress arising from a temperature dependant linear expansion is not critical as they are absorbed through the material. It is however, important to consider the following procedures and guidelines.

In Slabs and Footings

- Ensure that all pipe work is installed to the requirements of the New Zealand Building Code and/or Local Authorities.
- It is not necessary to sleeve pipe work when installed directly in the slab or block work apart from in expansion joints and penetrations, which are covered in the text.
- Hot water pipes embedded in concrete or buried underground shall be thermally insulated in accordance with the New Zealand Building Code requirements.
- Where possible, we recommend the installation of pipe work underneath the steel mesh. This keeps the pipe work deep in the concrete slab, reducing risk of dynabolts and saw cut penetrations. Secure pipe work with cable ties of plastic or steel to reinforcing chairs and mesh where applicable, is acceptable practice.
- When installing without mesh on to polythene or polystyrene, consideration must be given to securing the pipe work from floating or lifting.
- All pipe work passing through expansion joints in concrete slabs or walls, or block walls, must be sleeved with an impermeable flexible plastic material of no less than 6mm thickness and 10mm gap around the pipe that you are sleeving and must extend a minimum of 300mm each side of the expansion joint.

Under Concrete Slabs and Floors

- Ensure that all pipe work is installed to the requirements of the New Zealand Building Code and/or Local Authorities.
- Fusiotherm® pipes shall be laid in a narrow trench of sand or fine-grain soil and compacted in a manner that will not damage the pipe. We recommend a minimum distance of 75mm between the pipe and the underside of the floor.
- Hot water pipes embedded in concrete or buried underground shall be thermally insulated as per the New Zealand Building Code requirements.
- Any piping that penetrates the slab shall be at right angles to the surface of the slab and shall be lagged with an impermeable, flexible plastic material of not less than 6mm thickness for the full depth of the slab penetration as per clause 2.13.3 AS/NZS 3500.5:2000.
- In addition, aquatherm GmbH confirms that the lifetime of the system is 50 years and longer for the above installations.

Underfloor Heating Considerations

If underfloor heating is to be installed in the concrete slab, it is recommended that you insulate all hot and cold pipes within the slab. Liaise with your local building authority or certifier for local authority procedures.Contact our Techni cal Department for any installation procedure enquiries

Warranty & life time statement

aquatherm orange system	aquatherm green pipe	aquatherm lilac pipe	aquatherm blue pipe	aquatherm red pipe
underfloor heating	pipe system	pipe system for recycled reclaimed water	pressure pipe system for chilled and hot applications	sprinkler pipe system

aquatherm GmbH manufacture all pipes and fittings in accordance with the German DIN confirming a 50 year guarantee of service life in accordance with the permissible working pressure / temperature of their technical product manuals. Within the scope of this, aquatherm will supply replacement material pipe and fittings if damages are traceable to materials faults and defects.

Liability Warranty

furthermore within the scope of the aquatherm GmbH gives a 10 year guarantee which compensates for material damage to third persons, for investigation, removal, replacement, acceptance, dismounting or laying bare of all defective goods.

aquatherm Gmbh guarantee is conditional on:

- The fusion of joining of pipe and fittings using only aquatherm GmbH welding tools and devices.
- Installation of pipe and fittings are certified aquatherm installers and adherence to aquatherm GmbH technical rules and guidelines for correct installation principles.

Limits of Liability

- **For bodily injury** 15.000.000 Euro
- **For property damage [per occurrence]** 15.000.000 Euro

Installation Address: .....

Description of Installation: .....

Name of Plumber: .....

Signature: .....

Date of Completion: .....

Reg. Installer Number: .....

This warranty must be fully completed, signed and returned with the completed test sheet within three months of the completion of the project installation to the New Zealand Agent.

aquatherm® NZ limited, P.O. Box 99 393, Newmarket, Auckland, New Zealand. Phone 09 5707204, Fax 09 570 7206

aquatherm NZ Test record - aquatherm green pipe installation principles

Description of the Installation		
Street Address		
Suburb		
City		
Type of Installation	Domestic	
	Commercial	
Type of Pipe	aquatherm green pipe	
	aquatherm blue pipe	
	aquatherm lilac pipe	
	aquatherm red pipe	
	aquatherm grey pipe	
	aquatherm orange system	
Time testing Started		
Time testing finished		
Test period (minutes)		
Client:		
Contractor:		
Installers #:	Date:	
Declaration: I declare that I have installed the above product in accordance with aquatherm specifications with no branding mix		
Signature:		

aquatherm® NZ limited must recieve this information within 3 months of the installation for the waranty to be valid. Please consult with your local area Council as the may require a copy of the test results for the records.

Preliminary Test
[Testing procedure NZ January 2001]
Test pressure - 20 bar:

1. Test pressure 20 bar 10 minutes.
2. Unpressurise for 1 minute.
3. Test pressure 20 bar 5 minutes.
4. Unpressurise for 1 minute.
5. Test pressure 20 bar for 5 minutes.
6. Unpressurise.

WARNING

It is imperative to have movement during test period. Tight clips or damaged pipes in frame work will result in an incomplete test which will result in the warranty being invalid.

Result preliminary test:
The test is to be conducted as a continuous test as 20 bar with the five steps noted above.

The system MUST be pressurised THREE TIMES with a minimum rest of one minute between re-pressurising.

If leaking occurs, please replace the part and re start the testing procedure.

The test is complete and acceptable when the above has been undertaken and no leaks are present.

Finally, complete all parts for the test sheet and return a copy to:

aquatherm NZ Limited

P.O. Box 99393,
Newmarket ,
Auckland 1149

Low Pressure test / Test control / Measuring of the 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 aquatherm PPR - 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 aquatherm PPR - 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 36 . 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

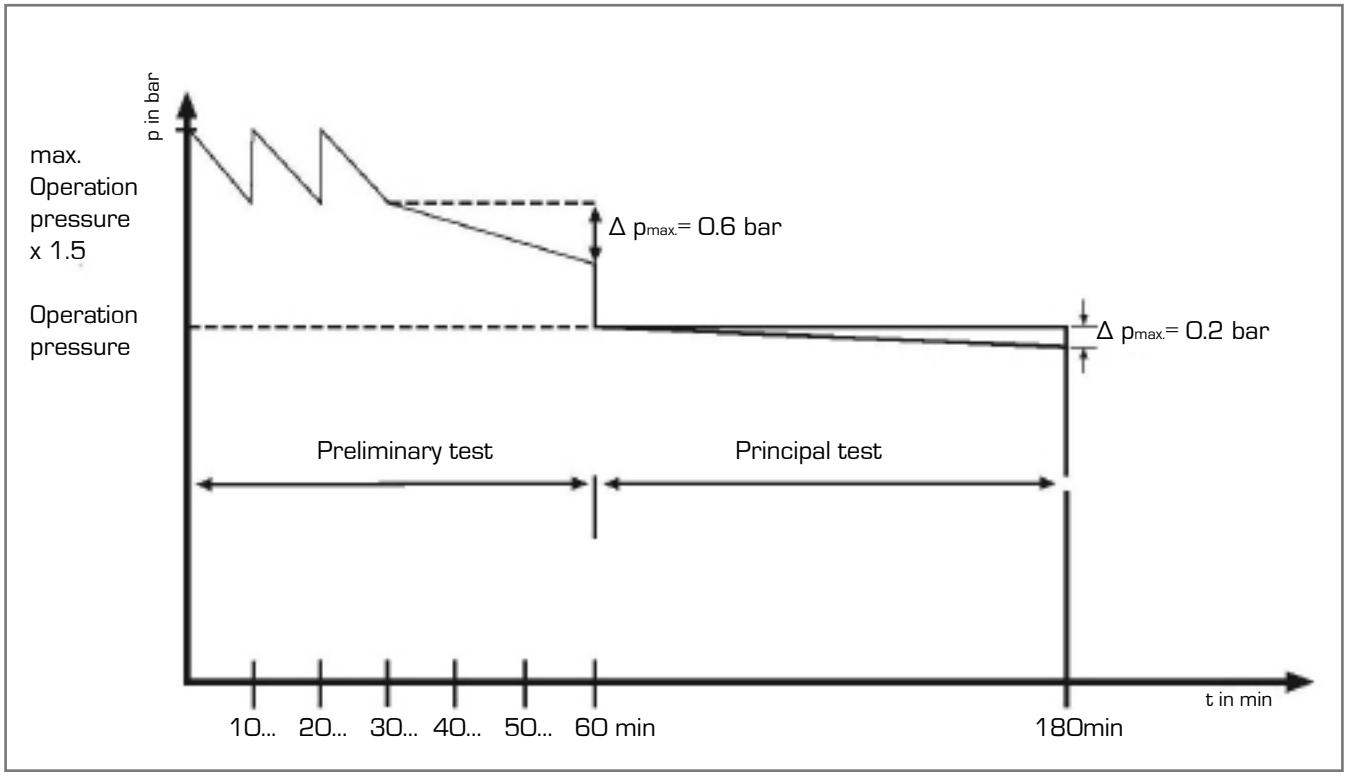
Measuring has to be done with a manometer allowing a perfect reading of a pressure change of 0.1 bar. The manometer has to be placed at the deepest point of the installation.

Test record

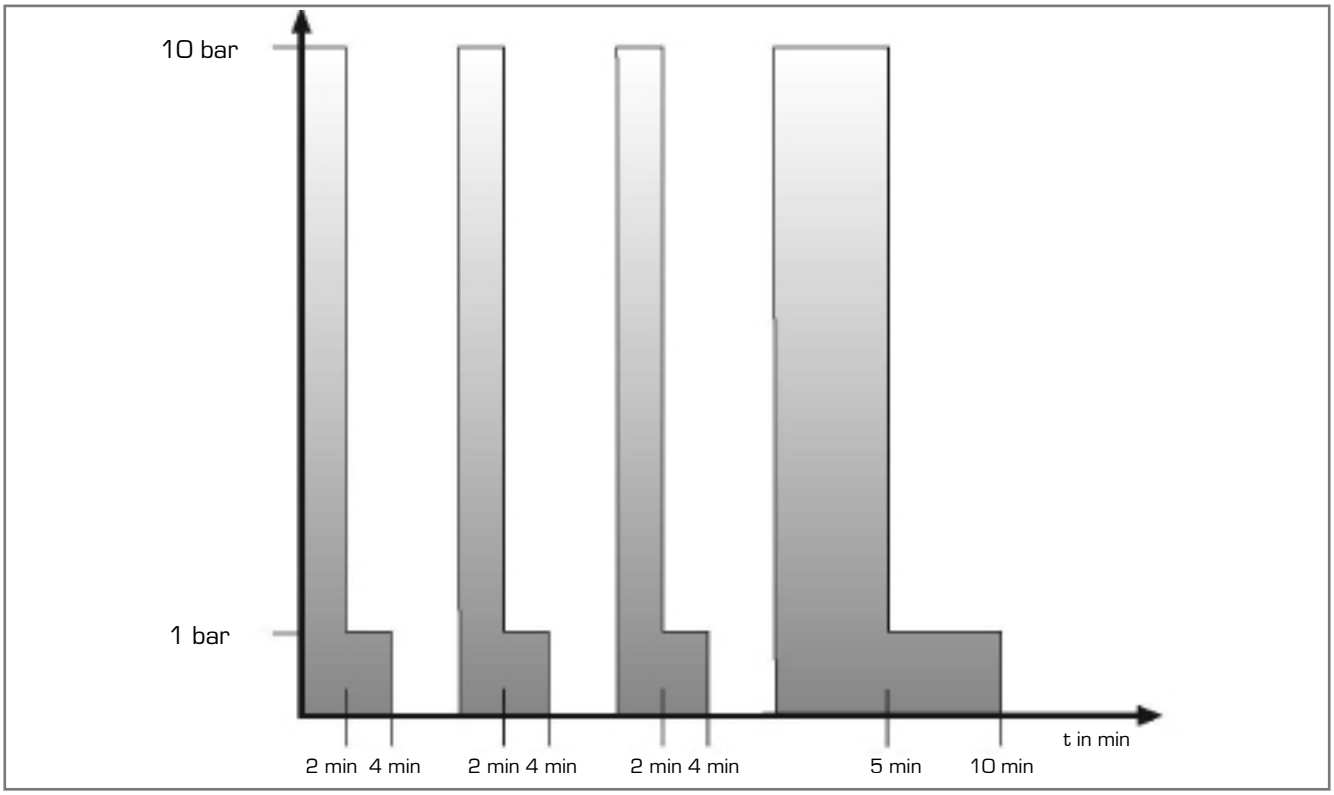
A record of the hydraulic pressure test has to be prepared and signed by the client and contractor stating place and date.

Low Pressure test / Test control

Preliminary - and principal test



Final test



Test record - aquatherm PPR - pipe installation

Low pressure

Description of the Installation		
Street Address		
Suburb		
City		
Type of Installation	Domestic	
	Commercial	
Type of Pipe	aquatherm green pipe	
	aquatherm blue pipe	
	aquatherm lilac pipe	
	aquatherm red pipe	
	aquatherm grey pipe	
	aquatherm orange system	
Pipe Length		
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
Ø 355 mm		m
Highest Point		m
[over manometer]		
Time testing Started		
Time testing finished		
Test period (minutes)		

Preliminary test		
max working pressure x 1.5:		bar
Pressure drop after 30 minutes:		bar
	[max 0.6 bar]	
Results premiminary test:		
Principal test		
Working pressure		bar
	[result preliminary test]	
Pressure after 2 hours		bar
	[max 0.2 bar]	
Results principal test		
Final test		
1.	Working pressure 10 bar at least 2 minutes then	bar
	Working pressure 1 bar at least 2 minutes	bar
2.	Working pressure 10 bar at least 2 minutes then	bar
	Working pressure 1 bar at least 2 minutes	bar
3.	Working pressure 10 bar at least 2 minutes then	bar
	Working pressure 1 bar at least 2 minutes	bar
4.	Working pressure 10 bar at least 5 minutes then	bar
	Working pressure 1 bar at least 5 minutes	bar
* Unpressurise the pipe between each cycle		
Client:		
Contractor		
Stamp/Signature		

Permissible working pressure

aquatherm blue pipe

Permissible working pressure

Temperature	service life	aquathem blue pipe faser-compsite SDR 11 aquathem blue pipe SDR 11	aquathem blue pipe faser - composite SDR 7.4	aquathem blue pipe faser - composite SDR 17.6
		Permissible working pressure in bar		
		bar	bar	bar
10°C	1	27,8	43,2	12.8
	5	26,2	40,7	12.0
	10	25,6	39,7	11.7
	25	24,7	38,3	11.4
	50	24,1	37,4	11.1
	100	23,5	36,4	10.8
15°C	1	25,7	39,9	11.8
	5	24,2	37,5	11.1
	10	23,6	36,6	10.8
	25	22,8	35,3	10.5
	50	22,2	34,4	10.2
	100	21,6	33,5	9.9
20°C	1	23,8	36,8	10.9
	5	22,3	34,6	10.3
	10	21,7	33,7	10.0
	25	21,0	32,5	9.6
	50	20,4	31,7	9.4
	100	19,9	30,9	9.1
30°C	1	20,2	31,3	9.3
	5	18,9	29,4	8.7
	10	18,4	28,6	8.5
	25	17,8	27,5	8.2
	50	17,3	26,8	7.9
	100	16,8	26,0	7.7
40°C	1	17,1	26,6	7.9
	5	16,0	24,9	7.4
	10	15,6	24,1	7.2
	25	15,0	23,2	6.9
	50	14,6	22,6	6.7
	100	14,1	21,9	6.5

Temperature	service life	aquathem blue pipe faser - compsite SDR 11 aquathem blue pipe SDR 11	aquathem blue pipe faser - composite SDR 7.4	aquathem blue pipe faser - composite SDR 17.6
		Permissible working pressure in bar and [psi]		
		bar	bar	bar
50°C	1	14,5	22,5	6.7
	5	13,5	21,0	6.2
	10	13,1	20,4	6.0
	25	12,6	19,6	5.8
	50	12,2	19,0	5.6
	100	11,9	18,4	5.5
60°C	1	12,2	19,0	5.6
	5	11,4	17,7	5.2
	10	11,0	17,1	5.1
	25	10,6	16,4	4.9
	50	10,3	15,9	4.7
70°C	1	10,3	16,0	4.7
	5	9,6	14,8	4.4
	10	9,2	14,3	4.2
	25	8,0	12,5	3.7
	50	6,8	10,5	3.1
75°C	1	9,4	14,6	4.3
	5	8,7	13,5	4.0
	10	8,0	12,5	3.7
	25	6,4	10,0	3.0
	50	5,4	8,4	2.5
80°C	1	8,6	13,4	4.0
	5	7,7	11,9	3.5
	10	6,5	10,0	3.0
	25	5,2	8,0	2.4
90°C	1	7,2	11,2	3.3
	5	5,1	7,8	2.3
	10	4,3	6,6	2.0

SDR = standard dimension ratio (diameter / wall thickness ratio)
SDR = 2 x S + 1 d / s (s = Pipe series index from ISO 4065)

State of the pipe

aquatherm NZ

36 Rockridge Avenue
Penrose,
Auckland, 1061

09 570 7204

www.aquatherm.co.nz

°edition June 2015

aquatherm green pipe

aquatherm blue pipe

aquatherm orange system

aquatherm red pipe

aquatherm black system

aquatherm grey pipe

aquatherm lilac pipe

colours of innovation