

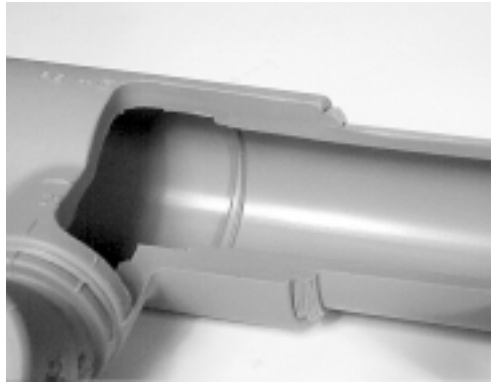
# Fusion Jointing

## Introduction

A fusion joint is where two pieces of plastic (usually the pipe and the fitting) have been heated by a heating tool until their surfaces melt. Then the two molten surfaces are brought together and joined. As they cool the two molten surfaces join together into one homogeneous component.

This can be accomplished with either hand held fusion tools, which are suitable for pipe sizes 16 to 63mm

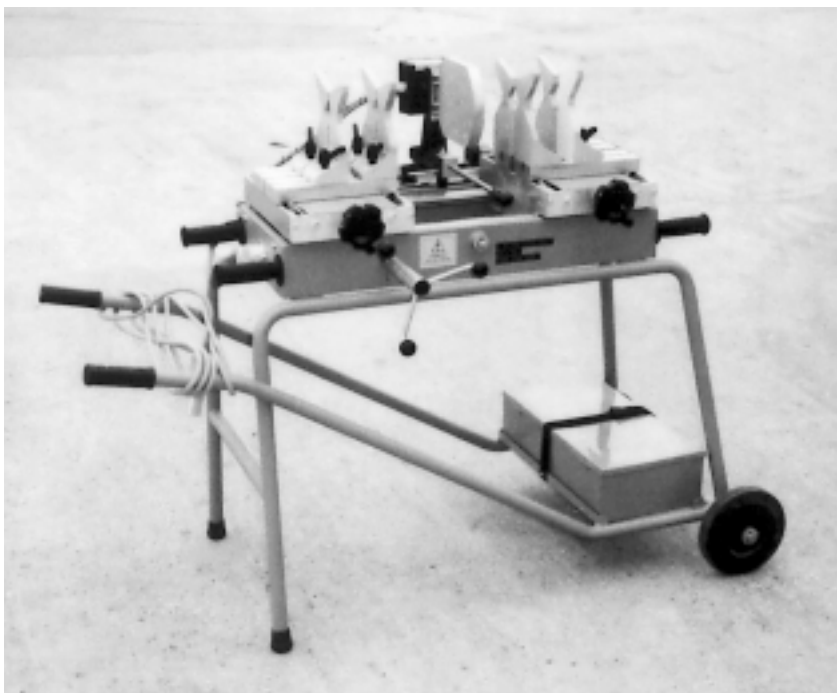
*Cross section through a fusion joint*



*Both pipe and fitting are heated on a heater tool.*



*They are then brought together and held for a preset time*

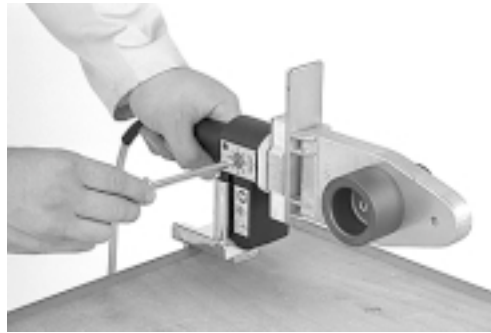


Or bench mounted fusion machines which are suitable for pipe sizes 25 to 110mm but normally only used on 75-110mm sizes.

Red temple stick is used to check the element has not exceeded the correct temperature. It should not melt



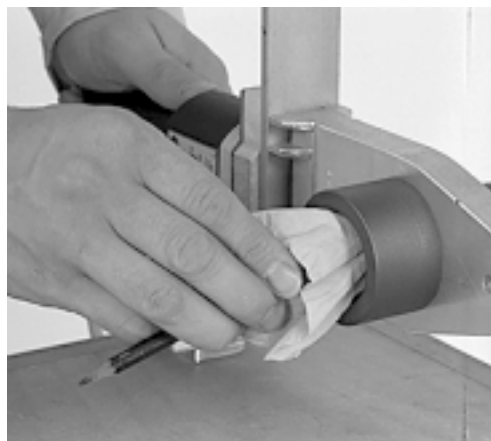
Adjust if necessary



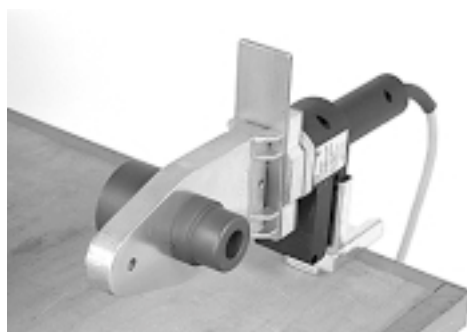
Clean outside of bush



Clean inside of bush



Fusion tool ready for jointing



The **red** temple stick is gently marked on the outside of the bush, the wax will melt at 253°C. If the wax does not melt the bush is within the correct working temperature.

If the wax is left on the bushes for more than 5 seconds it will start to bake. This is not an indication that the temperature is too high.

If the wax melts quickly and maybe smokes a little, then the fusion tool is above the correct working temperature.

The thermostatic control on the side of the fusion tool needs to be turned down a fraction (one millimetre anti-clockwise on the scale).

Allow the tool about 5 mins to cool a little and check the temperatures again with both the yellow and red temple sticks.

If the above steps is performed several times and the thermostatic control cannot be further adjusted, there may be a fault with the fusion tool and George Fischer should be contacted Tel: 01203 535535

Check the bushes are clean, using a piece of dry lint free cloth to rub off any debris. To clean inside the smaller bushes the cloth can be wrapped around a piece of dowelling or wooden pencil.

**Warning**  
**Do not use a screwdriver or metal object as this will damage the Teflon coating on the bushes.**

The hand held fusion tool should now be firmly fastened on the working surface, the heater bushes in place and the tool at the correct working temperature.

The fusion tool is now ready to begin fusion jointing.

Moisten cloth with cleaning fluid



Clean inside of fitting



## Preparing the fitting

Clean the polybutylene fittings internally with Tangit KS. Reiniger, cleaning fluid.

Apply the cleaning fluid to a clean, dry lint free cloth.

Rub the moist cloth firmly around the inside of the fitting on all faces to be fusion joined.

Place the cleaned fitting carefully on the working surface, avoid any moisture or dirt getting inside the fitting.

### Note:

**Do not touch the inside of the fitting with your hands since this will dirty the fitting and it will need to be cleaned again.**

Several fittings can be pre-cleaned in this way, so long as the cloth is dampened with fluid and clean, and the assembly area is not dusty or wet.

Use pipe shears to cut pipe up to 25mm



Use roller cutters on pipe above 25mm



## Preparing the pipe

The pipe must be cut at right angles using the appropriate pipe cutters. Shears for pipes from 16 to 25mm.

Roller cutter for cutting pipes from 25 to 63mm.

The pipe should not be cut with a hacksaw or similar serrated blade as this will leave unacceptable burrs.

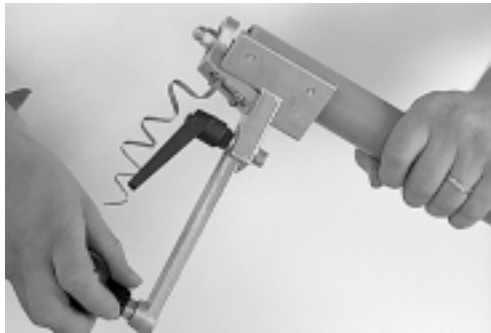
*Push and turn chamfering tool*



The chamfering tool spindle is inserted into the pipe, and then pushed firmly against the end of the pipe.

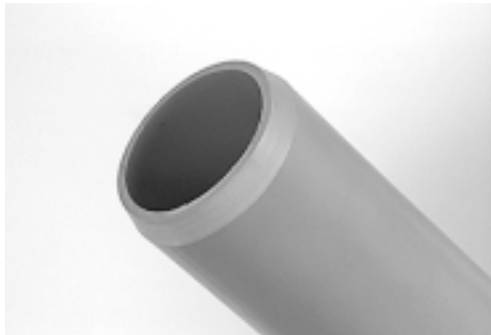
Whilst still pushing the chamfering tool firmly onto the end of the pipe, rotate the tool clockwise

*Remove swarf*



As the tool rotates, pipe swarf should start to be peeled from the pipe, if the pipe is not being peeled the chamfering tool must be pressed more firmly onto the end of the pipe.

*Chamfer pipe to 1/2 wall thickness*

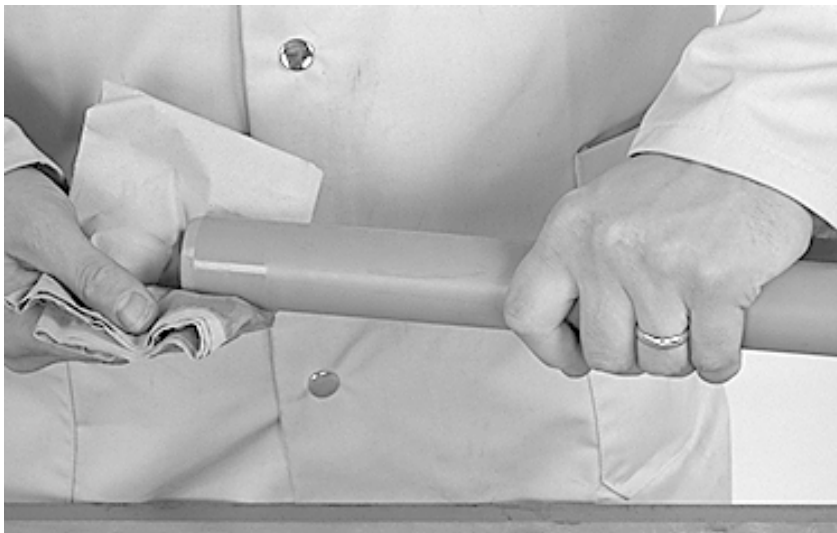


The pipe must be chamfered until the end of the pipe wall is down to about half its original thickness. The chamfer should be at an angle of about 15°.

Moisten the cloth with cleaning fluid



The chamfered pipe now needs to be cleaned externally with Tangit K.S Reiniger, cleaning fluid. Apply the cleaning fluid to a clean, dry, lint free cloth.



Rub the moist cloth firmly around the outside of the pipes about 50mm up the pipe. This should remove any dirt and the printed markings on the pipe (if it does not you may be using the wrong cleaning fluid).

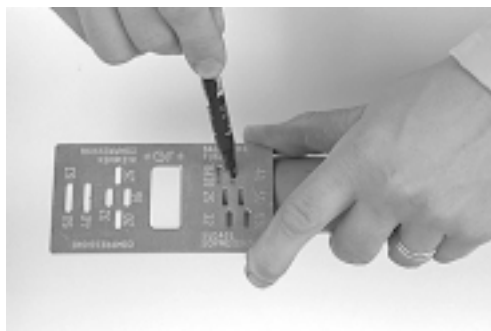
**Note:**  
**Remember not to handle the outside of the cleaned pipe with your hands as it will require cleaning again.**

Clean the pipe



If you have to put the pipe down, ensure the clean end does not come into contact with the surface.

Support the pipe ends



Mark the insertion depth

Mark the insertion depth of the pipe with a template after the pipe has been cleaned.

Pipe size o.d.	Insertion depth
16mm	17mm
20mm	17mm
25mm	20mm
32mm	22mm
40mm	24mm
50mm	28mm
63mm	32mm

The pipe is now ready for fusion jointing

Long lengths of pipe will need to be supported during the fusion process, approximately at the same height of the fusion tool, to keep them straight as the joint is made. This can be achieved with a bench or boxes or similar support. This will be required on both sides of the fusion tool.



The timer has to be set for the required fusion time according to the pipe size being jointed. (See the times listed to the left).

The timer can be reset to zero by pressing both the second and the minutes buttons simultaneously, the seconds button is then pressed to set the correct fusion time on the timer.

The fusion time varies for the pipe size being used

Pipe Size o.d.	Time
16mm	6 secs
20mm	7 secs
25mm	7 secs
32mm	10 secs
40mm	14 secs
50mm	18 secs
63mm	22 secs

**Note**

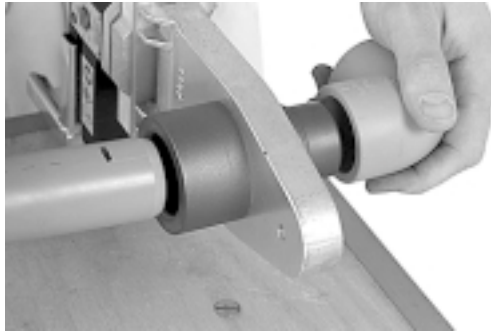
**These times are critical and should always be measured with a timer**

The start button will start the timer and also stop the alarm, although the alarm will automatically stop after 10 seconds. The timer will then return to the original time (just set) for repeats of the same pipe size, do not reset the timer.

Check the fusion temperature of the bushes is within limits with the temple sticks, described earlier.

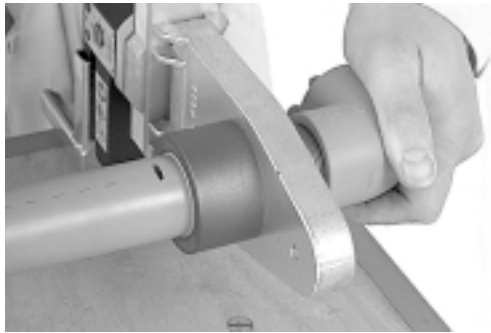
The pipe is held in one hand and the fitting is held in the other hand. The alignment of the pipe and fitting must be checked before you start jointing.

*Simultaneously push the pipe*



The pipe and fitting are pushed **simultaneously** onto the heater bushes, in a steady motion. Larger pipe sizes will require more effort and the pipe will be harder to push onto the bush than the fitting.

*and the fitting onto the heater bush*



As they are pushed onto the bushes they will start to melt.

*2-3mm short of the mark on the pipe*



The pipe is pushed into the bush socket until the insertion depth mark is about 2mm short of the bush socket. If you push any further, the mark will disappear under the bead of the melting PB.

*and up to the edge of the fitting*



The fitting is pushed onto the bush until it reaches the first ridge on the bush.

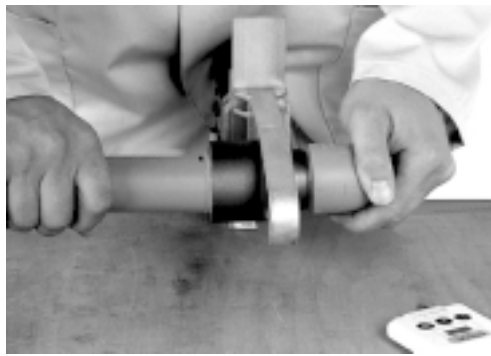
*Start timer*



The timer is started when both the pipe and fitting are fully inserted onto the bushes.

The operator will have to briefly take one hand off either the pipe or the fitting to press the start button on the timer. It is normal to take your hand off the fitting.

*Pipe & fitting fully on heater being held in position*



*Simultaneously withdraw both pipe and fitting from heater bushes*



*Quickly insert pipe into the fitting*



*Push together without twisting*



*Push up to the insertion mark*



The pipe and fitting must both be held in place throughout the fusion process. Gentle pressure should be maintained to help them stay fully inserted onto the fusion tool. Also keeping them straight and level.

When the timer beeps withdraw the pipe and fitting from the fusion tool, this should be done in a fluid movement not too fast or slow.

It will be difficult to withdraw the pipe and fitting at first as they will tend to stick to the bushes, as they are withdrawn further they will move more freely, so less pressure will be required. It is important to withdraw them in a gradual movement as this reduces the amount of molten material left on the bushes and results in better joints (this will come with practice).

Quickly align the pipe and fitting and bring them together.

**Note:**  
**It is important to bring the pipe and fitting together quickly to prevent their surfaces cooling and drying**

As you bring the pipe and fitting together you will have to push the pipe into the fitting. This must be done quickly and firmly.

**Note:**  
**Do not twist the pipe when pushing together as this will weaken the bond and may lead to failures.**

Push the pipe into the fitting up to the end of the weld. i.e. Where the insertion mark is, stopping just short of the insertion mark.

Normally there will be two beads of soft P.B one on the fitting and one on the pipe. This demonstrates a perfect joint.

You need to maintain slight pressure holding them together otherwise they will tend to push apart.



Maintain pressure on joint for holding time



Lay joint on a flat surface for cooling time



Clean both bushes with a dry lint free cloth



Inspect joint



You will have to maintain this pressure for the holding time which is listed below for different pipe sizes.

Pipe o.d.	Holding Time in secs
16mm	15
20mm	15
25mm	15
32mm	20
40mm	20
50mm	30
63mm	30

After the holding time has elapsed the pipe and fitting can be put gently to one side, on a level surface, to cool.

**Note:**

**It is important to handle the newly made joint with care, to avoid putting a strain on it, as it is still very soft, until the cooling time has elapsed.**

The newly made joint must be left undisturbed for minimum of the times listed below to cool

Pipe o.d.	Cooling Time in mins.
16mm	2
20mm	2
25mm	2
32mm	4
40mm	4
50mm	4
63mm	6

After each joint is made rub a dry/clean cloth over the bush and socket to check they are free from any deposits of P.B.

After the joint has been made, especially when you are using INSTAFLEX for the first time, check your workmanship. Learn from any mistakes and improve your jointing techniques.

A reference list is given at the end of the section of common fusion jointing faults to check and learn from.

After the cooling time the pipe and fitting are strongly fused together and can be handled normally. After 1 hour after the last joint has been made a full system pressure test up to 15 bar can be undertaken.