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Jointing Methods

Vinidex PE pipes are produced in a range of sizes between 16 mm to 1000 mm diameter, and these pipes can be joined by a variety of methods.

Methods include mechanical joints and a range of thermal fusion procedures. The nature of the PE materials precludes the use of adhesive based systems.

Thermal Fusion Processes

Thermal fusion proceeds by melting the PE material at the joint surfaces, bringing the molten surfaces together under closely controlled pressures, and holding the surfaces together until the joint has cooled.

In all thermal fusion processes, the field pipe jointing should only be performed by trained fusion operators using properly maintained and calibrated fusion machines.

The fusion compatibility of PE materials must be established before welding, and if doubts exist then the advice of Vinidex engineers should be sought.

Butt Fusion

Butt fusion is generally applied to PE pipes within the size range 90 mm to 1000 mm for joints on pipes, fittings, and end treatments. Butt fusion provides a homogeneous joint with the same properties as the pipe and fittings materials, and ability to resist longitudinal loads.

Butt fusion machines need to be sufficiently robust to align and pressurise the pipe ends within close tolerances, and to provide heating and pressurisation of the jointing surfaces within required parameter tolerances.

All butt fusion should be performed under cover, and the ends of the PE pipes blocked off to assist with temperature control and prevent contamination of the joints.

The butt fusion process consists of the following steps which are shown in principle in Figure 6.2.

1. The pipes must be installed in the welding machine, and the ends cleaned with non depositing alcohol to remove all dirt, dust, moisture, and greasy films from a zone approximately 75 mm from the end of each pipe, on both inside and outside diameter faces.
2. The ends of the pipes are trimmed using a rotating cutter to remove all rough ends and oxidation layers. The trimmed end faces must be square and parallel.
3. The ends of the PE pipes are heated by contact under pressure against a heater plate. The heater plates must be clean and free from contamination, and maintained within a surface temperature range of 190°C to 225°C (depending on the size of the pipe). Contact is maintained until even heating is established around the pipe ends, and the contact pressure then reduced to a lower value called the heat soak pressure. Contact is then maintained until the appropriate heat soak time elapses.

4. The heated pipe ends are then retracted and the heater plate removed. The heated PE pipe ends are then brought together and pressurised evenly to the welding pressure value. This pressure is then maintained for a period to allow the welding process to take place, and the fused joint to cool down to ambient temperature and hence develop full joint strength. The pressure adopted in this phase should be in the range 0.15MPa to 0.18MPa on the ends of the pipes. During this cooling period the joints must remain undisturbed and under compression. Under no circumstances should the joints be sprayed with cold water.

The combinations of times, temperatures, and pressures to be adopted depends on the PE material grade, the diameter and wall thickness of the pipes, and the brand and model of fusion machine being used. Vinidex engineers can provide guidance in these parameters.

The final weld beads should be fully rolled over, free from pitting and voids, correctly sized, and free from discolouration.

When correctly performed, the minimum long term strength of the butt fusion joint should be 90% of the strength of the parent PE pipe.

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Socket Fusion

Socket fusion of Vinidex PE systems is available in the diameter range 20mm to 110mm.

Socket fusion consists of jointing couplings, and fittings with a close tolerance moulded socket section into which the pipe or fitting spigot is inserted.

The fusion process is achieved by heating the spigot, and socket jointing surfaces above the crystalline melt point temperature of PE by insertion into a heated element tool. The heated joint sections are then assembled, and held until cooling to ambient temperature takes place. See Figure 6.4.

The heater elements are PTFE coated, and at all times must be kept clean and free from contamination. The heater tools need to be set and calibrated to maintain a surface temperature range of 260°C +/- 5°C. All jointing must be performed under cover to prevent contamination of the joints by dust, dirt, or moisture.

1. Cut the pipes square, clean the spigot section with a clean cloth and a non depositing alcohol to the full depth of the socket. Mark the length of the socket. Clean the inside of the socket section.
2. Scrape the outside of the pipe spigot to remove the oxidised layer from the pipe. Do not scrape the inside of the sockets.

3. Confirm the temperature of the heating elements, and ensure that the heating surfaces are clean.
4. Push the spigot, and socket sections on to the heating elements to the full length of engagement, and allow to heat for the appropriate period. See Table 6.1.
5. Pull the spigot and socket sections from the heating elements, and push together evenly to the full length of engagement without distortion of the joints. Clamp the joints and hold until fully cooled. The weld flow bead should then appear evenly around the full circumference of the socket end.

The completed joints must be allowed to cool fully to ambient temperature before performing pressure tests.

Figure 6.4
Schematic Sketch of the Fusion Welding Process

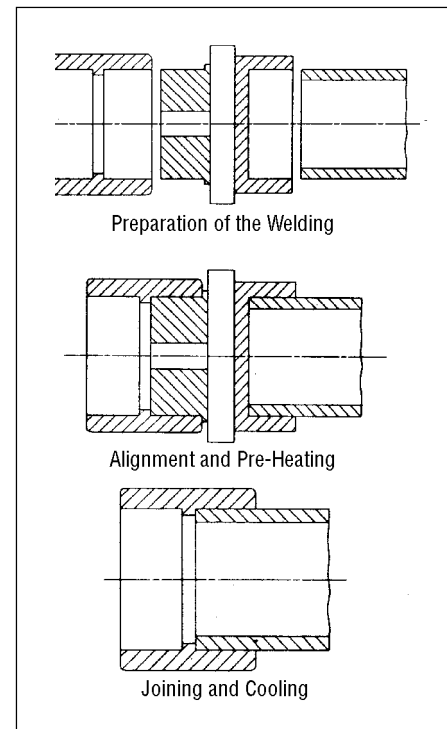


Table 6.1 Socket Fusion Times

Pipe Diameter DN mm	Tool Heating Time seconds	Assembly Time seconds	Cooling Time minutes
16	5	4	2
20	5	4	2
25	8	4	2
32	10	6	4
40	15	6	4
50	20	6	4
63	25	8	6
75	30	8	6
90	40	8	6
110	50	10	8

Notes:

1. Heating times are for PN12.5 wall sections.
2. Cooling times are the times for the assembly to be held within the clamps.
3. Socket fusion not recommended for pipes SDR17 and below.

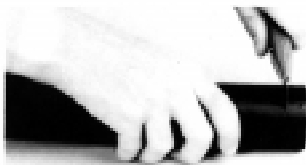
Mechanical Joint Fitting Plasson Assembly Instructions

General instructions for all sizes.

Before assembly – ensure that end of pipe to be inserted in fittings is free of scratches and other imperfections and that both the pipe and the fitting are clean of mud, stones, etc.

Do not overtighten nut when closing. NEVER use wrenches or spanners with handle lengths longer than 46cm — excessive torque during tightening can spread nut cone and result in pull outs. PTFE tape should be used in threaded connections. If fittings are reused ensure split ring is sharp and bites into pipe to avoid pull outs.

Plasson Rural Fittings for Rural Pipe 1/2-2"



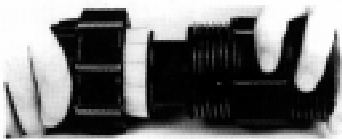
1. Cut pipe square, deburr, chamfer internal edge of pipe with knife.



2. Separate components of fitting and mount them on pipe, first the nut, followed by the split ring. Make sure the large end of the split ring faces towards the fitting.



3. Insert barbed end of tail into pipe so that flange is hard against pipe face. If necessary, use a rubber mallet or a piece of timber and hammer.



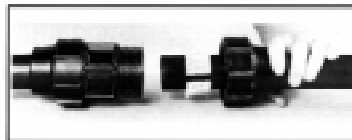
4. Insert spigot end of tail into body of fitting until it passes through rubber O-ring and flange butts against shoulder of fitting. Lubricate with silicone lubricant if necessary.



5. Push split ring hard against flange and firmly hand tighten nut onto fitting body.

Plasson compression fittings for metric polyethylene pipe (OD Series) AS4130 or AS1159

Sizes 16mm to 63mm



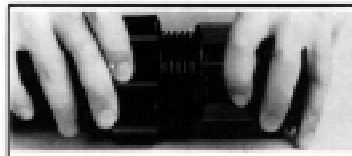
1. Chamfer the end of the pipe with a file or chamfering tool.

2. Separate the components of the fitting and mount them on the pipe, first the nut, followed by the split ring. Make sure the large end of the split ring faces towards the fitting.

Note: For sizes 16 to 63mm it is not essential to 'separate the components' – just loosen nut slightly, push lubricated pipe firmly into fitting so it passes through the O-ring to the interior step inside the fitting. If using this method it is wise to place a witness mark on the pipe to ensure the pipe passes correctly through O-ring and up to the fitting step. Hand tighten nut.

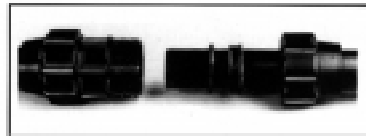
3. Twist the pipe into the body of the fitting until it passes through the rubber O-ring and butts up against the interior step of the fitting body. Fitting is made easier by lubricating with silicone lubricant.

4. Push up split ring to the body of the fitting (split ring can be opened with a screwdriver if necessary).



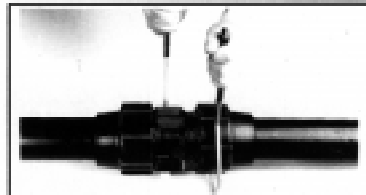
5. FIRMLY hand tighten the nut onto fitting body (note: nut should be closed firmly but nut does not need to actually meet the body). If a chain wrench is used for tightening maximum handle length is 46cm. (sizes 50 and 63mm).

Sizes 75mm to 125mm



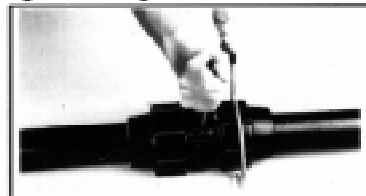
1. Draw the nut, bushing and O-ring onto the end of the pipe to a distance of about twice the pipe diameter. Fitting is made easier by lubricating pipe, O-ring and inside of fitting with silicone lubricant.

2. Insert pipe into the fitting until stopped by the step. Push O-ring and bushing forward until they reach the fitting.



3. Tighten nut with chain wrench or Plasson spanner until O-ring and bushing enter the fitting, and reach end position.

4. Unscrew nut from fitting. Open the split ring and mount on pipe with large end against bushing.



5. Tighten the nut by means of two chain wrenches with maximum handle length 40-46cm or with Plasson wrench (note: nut should be closed firmly but nut does not need to actually meet the body).

160mm fittings

Undo and take out bolts and nuts. ■ Take the two shell halves apart. ■ Remove the exposed sleeve and O-ring and place over the pipe end. ■ Push fitting completely home over pipe end. ■ Push O-ring and sleeve into original position. ■ Place the two shell halves with grip rings inserted over pipe and fitting body. Now insert bolts, washers and nuts and tighten until the shells are in contact with each other.

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jointing

Flanged Ends

Vinidex PE pipes are provided with flange connections by using PE stub ends jointed to the ends of the pipes by either electrofusion or butt welding.

These are used in conjunction with metal backing plates, and rubber sealing gaskets in order to provide a demountable joint. Sealing gaskets are made from natural rubber or polychloroprene depending on the fluid being carried.

Where hot fluids or chemical reagents are carried, the suitability of the sealing gasket material must be determined, and the advice of Vinidex engineers obtained. The sealing gaskets must be clean and free from creases when fitted to the flange assembly.

Flanges are available across the full size range of Vinidex PE pipes (up to 1000mm diameter), and to the same pressure PN rating as the pipes.

Metal backing plates are available in hot dip galvanised form, and thickness to AS 2129, and AS 4087 as required. The thickness of the metal backing plate must be assessed for the operating pressures in each particular pipeline using the requirements of AS 2129 and AS 4087.

The fixing bolts must be tightened evenly around the flange. Bolts must not be over tightened, and a torque wrench should be used to prevent buckling of the metal backing plate.

Hugger Bolted Couplings

Bolted couplings are fitted directly to the ends of the PE pipes, and the serrated inside section of the coupling grips the outside diameter of the PE pipe, providing longitudinal restraint.

The central rubber sealing ring provides a pressure seal.

The ends of the PE pipes must be cut square, and be free from all dirt and grease when pushed together, without a gap between the pipe ends.

The seal ring must be clean, and fitted evenly over the ends of the pipe. The coupling housing must be fitted evenly over the rubber ring, and the bolts tightened fully.

Threads

The cutting of threads is not recommended.

Where threaded fittings are used then :

1. Only PTFE tape should be used as a sealant. Hemp, paste, and petroleum compounds must not be used.
2. The joint should be made firm by hand, or by strap wrench to prevent over straining of the joint. Serrated jaw wrenches must not be used.
3. Where possible, the pipeline system should be designed so as to ensure that PE/metal thread joints are such that the male thread is PE, and the female thread form is metal.

Figure 6.5
Stub Flanges & Backing Plates

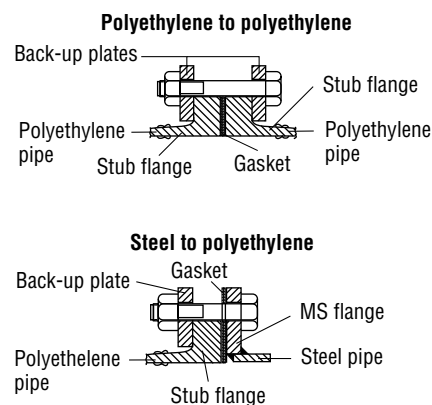


Figure 6.6
Hugger Bolted Couplings

