

## Electro-fusion welding of polypropylene

### Installers and installation equipment

Installation personnel should be trained and technically competent for this jointing method. Training for installers is available free of charge on request from our technical department.

The tools required for the job should be assembled and checked prior to commencing any work. When assembling longer runs or large size Polypropylene pipes, the use of guides, pipe rollers or supports, is recommended to reduce the drag forces involved.

The work crew should be equipped with equipment to enable safe handling of the pipes on site, together with appropriate hand tools. In addition, it is recommended that the following tools are used during the jointing process. Using tools designed specifically for plastic piping systems greatly improves the performance of the installation team and reduces the risk of bad joints being made.

### Pipe Cutting

Item	Pipe Diameter	Part Number
Rotary Cutter	6 - 63mm	04124
Rotary Cutter	10 - 90mm	04134
Rotary Cutter	48 - 114mm	04144
Rotary Cutter	102 - 168mm	04164
Rotary Cutter	159 - 254mm	04170
Rotary Cutter	160 - 315mm	04470
Saw	Up To 75 mm	04512
Saw	Up To 100mm	04510
Saw	Up To 150mm	04517
Saw	Up To 200mm	04519



In addition to everyday pipe fitters tools the installation of Polypropylene piping requires a fusion-welding machine of the appropriate size and type. Care should be taken to consider the advantages and disadvantages of each jointing method prior to commencement on site. In some cases, a combination of welding methods may prove to be the most cost-effective solution. Our technical department can advise on suitable jointing methods.

Details of the 'Requirements for Machines and Equipment Used for Fusion Jointing Thermoplastics' can be found in DVS 2208 Instructions Part 1.

## Electro-fusion welding of polypropylene

### Preparation of the work area

Assemble the welding equipment according to the manufacturer's instructions, with due provision for safe working practices. When working outdoors, the area used for jointing must be protected from rain, snow and wind. The preferred ambient working temperature for welding is in the range of +5°C to +45°C. Protecting the fusion welding area with a tent or similar device can help maintain an even temperature in the work area.

### Pipe cutting and preparation

Before cutting, pipes should be conditioned to reach the ambient working temperature under which installation and jointing will take place.

Pipe should always be cut to length using tools specifically designed for use with plastic pipe. A rotary pipe cutter with the correct blade or wheel appropriate for the pipe wall thickness is recommended, as they provide a high degree of accuracy in the finished cutting length, and also produce a square cut to the pipe. Power tools such as band saws or circular saws may also be used - however they should have blades that are specifically designed for use with plastic pipe. Handsaws with blades suitable for use with plastic pipe may be used, however it is recommended that a mitre box be used to ensure a square cut is achieved.

Once the cutting process is completed, the pipe length should be checked for accuracy, and any internal or external burrs should be removed using a deburring tool specifically designed for use with plastic pipe. Any plastic chips or swarf should also be removed from the inside of the pipe. The jointing area of the parts to be welded must be free from damage or contamination.

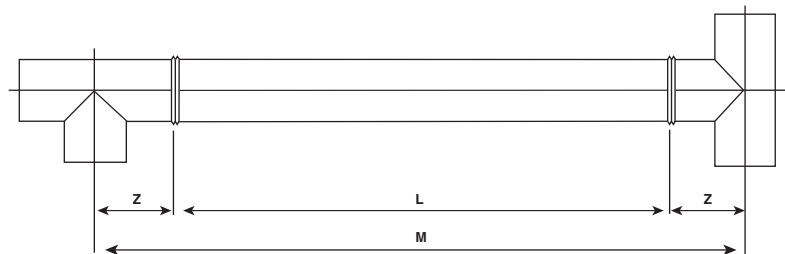
The installation of Polypropylene piping systems makes use of so-called "Z" dimension of the fitting. An explanation of the use of the "Z" dimension is shown in the following example:-

Explanation:

M = Distance mid-mid fitting

L = Cutting length of pipe

Z = Z-dimension of fitting



The Z dimension for Polypropylene pipe fittings that is used to calculate pipe cutting lengths can be found in the detailed dimensional information.

## Electro-fusion welding of polypropylene

### Making an electro-fusion joint - introduction

An electrofusion socket contains wires that are energized to generate heat to melt the materials to be welded. This method is especially useful for complex piping layouts in confined spaces, or when jointing is needed in a remote location, where the use of other welding equipment may be difficult because of access or weight. Electro-fusion couplings are available in sizes from 20mm to 225mm.

During the welding process, heat is generated causing the electrofusion socket to shrink and fuse on to the joining area. Shrinking stresses, are designed into the tolerances of the fittings themselves, and thereby guarantee that the joining pressure necessary for welding will be applied.

The welding transformer used in the electrofusion process is compact, lightweight and portable. The fully automatic bar-coded system controls and monitors the welding process as well as providing the power source for the electrofusion coupling.

The welding area needs to be protected against unfavorable environmental conditions such as rain, snow, intensive UV or wind. Electrofusion welding is permissible within the temperature range +5°C to +50°C.

Before cutting, pipes should be conditioned to reach the ambient working temperature under which installation and welding will take place. Cut pipe lengths should be checked for accuracy, and any internal or external burrs should be removed using a deburring tool specifically designed for use with plastic pipe. Any plastic chips or swarf should also be removed from the inside of the pipe.

For successful jointing, the pipe ends must be prepared by means of a peeling tool or pipe scraper knife. At the same time, it removes the oxidised layer that forms naturally on the outside surface of the pipe. This oxidised layer can have a detrimental effect upon the final joint strength, and it is essential that it be removed prior to welding. The outside surfaces of the parts to be fused must be free from dirt and contamination, if necessary clean with a suitable cleaning agent.

In order to control axial movement of the parts to be joined and to assist with alignment and the centralizing of pipes and fittings within the electrofusion socket, the use of specially designed clamping devices is recommended. Clamping devices should be used continuously during the welding and cooling phases of electrofusion welding.



The PF electro-fusion control box

## Electro-fusion welding of polypropylene

### Making an electro-fusion joint - joint preparation

- Assemble the welding equipment, and verify that it is functioning correctly.
- Cut the pipe ends squarely using tool suitable for plastic pipe. A wheel-type cutter is ideal. If a saw is used, a mitre box is recommended to ensure a square cut. Power saws may be used with care. Mark the insertion depth on the pipe (insertion depth = socket length  $\div$  2).
- Peel the parts to be joined (pipe or fitting), using a pipe-peeling tool or scraper. Once prepared do not touch the prepared surface. Minimise the delay before assembling the joint.
- Remove the electrofusion coupling from its protective packaging without touching in the inside of the fitting.
- Slide the electrofusion socket (without force or hammering) onto the prepared pipe end until the centre stop is reached and the insertion depth is verified against the mark on the pipe.
- Assemble the second half of the joint in the same manner, taking care that no stresses (bending or flexing) are transmitted into the joint. At this point, it should be possible to smoothly rotate the electrofusion socket. Check that the alignment marks corresponding to the insertion depth are visible, and correctly located.



Using the peeling tool to chamfer the pipe



Peeling the pipe end prior to jointing



Measuring the fitting insertion depth



Marking the insertion depth on the pipe

## Electro-fusion welding of polypropylene

### Making an electro-fusion joint - welding

- Whenever possible, rotate the terminal connections on the electrofusion socket upward, and connect to the welding cable. Take care that the weight of the welding cable does not cause the terminal connections to disengage.
- Using the light pen scan the bar code on the fitting to read the welding parameters, or scan the bar code card. An audio signal will confirm and acknowledge the data input. For control purposes the equipment will request acknowledgement that the pipe has been worked (peeled using the proprietary tools).
- Pressing the green 'start' key starts the welding process. The display will show the desired welding time, as well as the welding voltage. During the complete welding period, the clamping device must remain installed.
- At the end of the welding time, the cooling time begins automatically during which the clamping device must remain in position.
- The welding indicator on the electrofusion socket performs visual control of the welding process. In addition, all welding parameters are stored in the memory of the welding device, and can be printed out in the form of a welding protocol. **Do not pressurize the joint for a minimum of one hour.**

Note: In the event of a power failure interrupting the welding-cycle, it is not permissible to reuse the electrofusion socket. It must be cut out and the process re-started with a new coupling.



Assembling the joint



Scanning the bar code with a light pen



Welding in progress



Once cooled, the joint can be removed