Infra-Red (IR) 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.

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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

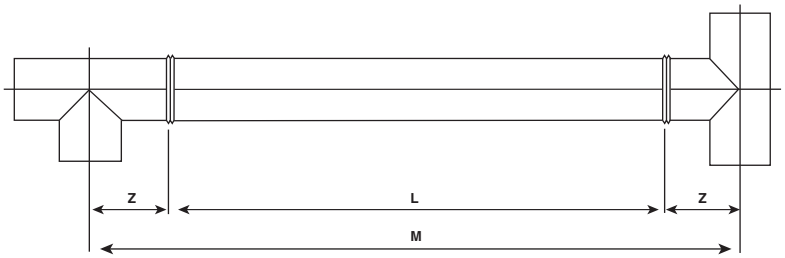
Before cutting, pipes should be conditioned to reach the ambient working temperature under which installation and jointing will take place.

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 deburing 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-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.

Infra-Red (IR) fusion welding of polypropylene

Making an IR fusion joint-introduction

IR welding of polypropylene is similar in many ways to the principle of heating element butt-welding, however in IR welding the components to be joined do not make contact with the infrared radiant heat source. The advantages of non-contact IR heating are reduced bead sizes, the elimination of contamination from the heating element, extremely high reproducibility of the welding process, and computer control of the welding process.

IR welding equipment is semi-automatic and requires observation and input from trained and certified operators at various stages in the welding process. The key parameters of pressure, temperature and time are all monitored, regulated and recorded by the welding machine.

SP110 IR fusion welding machine

A welding log is maintained within the memory of the welding equipment, recording the details of up to one thousand welds. These records can be downloaded to a personal computer, allowing the creation of detailed welding reports. Permanent self-adhesive welding record labels may be produced for each welding operation giving full traceability for quality assurance purposes

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IR welding machines are presently available from IPS to cover pipe outside diameters 20mm to 250mm.

Welding parameters

The welding parameters for IR welding are stored within the computer of the welding system, and cannot be altered by the operator.

Under these strictly controlled conditions, it is possible to make significant reductions in the weld cooling time, without the need for forced cooling by air blowers. This significantly reduced cooling time, coupled with the speed and repeatability of the IR welding process can lead to major time and cost savings on projects.

The touch-screen display on the welding machine displays information about the material as well as the welding conditions and a graphical display of the weld progress.

Welding controls

Only personnel that are trained and technically qualified for this welding method are allowed to operate the IR welding equipment. Secure access to the computer system is only available to operators who are in possession of a valid PCMCIA card. This card functions as both a security access card and a data storage device for the welding machine. The card contains a unique serial number that is traceable to each trained welding operator, providing a high degree of control at site.

The heating element utilizes a special alloy, which is fully resistant against corrosion. The heater cartridge and temperature sensors are controlled independently and automatically compensate for the smallest temperature deviations. Any alteration in temperature across the heating element is detected and adjusted automatically, to adhere to the welding machine parameters.

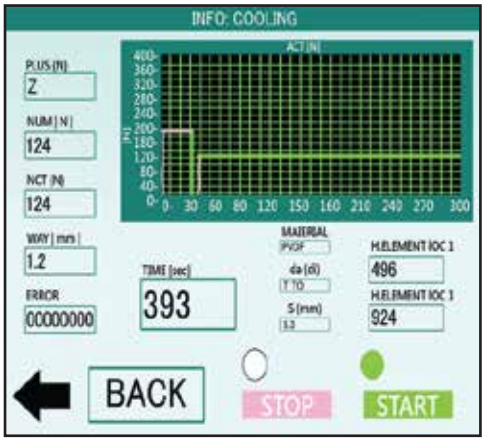
Infra-Red (IR) fusion welding of polypropylene

Making an IR fusion joint-procedure

The fusion procedure is completely controlled and regulated by the welding computer, and is displayed on the touch screen with easy to follow systematic instructions. Each process step is shown in both pictures and symbols, with each step being monitored. At each process step the operator must complete the relevant procedure, before moving to the next phase. Because of this 'validate as you proceed' system, the ability of the operator to deviate from the pre-programmed welding parameters is eliminated, thereby ensuring that welding is consistent and highly reproducible.

Once the welding process is completed, a plastic welding record label is automatically generated which carries full details of the welding protocols. This information includes the date, time, welding machine number, piping material, dimension, and confirmation (or rejection) of the welding process. In addition, each weld is given a unique reference number, providing traceability for the welding process.

A correctly made joint will have two parallel beads around its circumference, which should be almost equally sized, with smooth bead surfaces. Possible differences in the formation of the beads may be attributed to the different flow behavior of the parts being joined (e.g. pipe to fitting).



SP110 touch screen view

Completed IR weld and printed label