

Good Practice Guide to Butt Fusion Jointing




**Fusion
Equipment**

Pioneers in
Automatic
Butt Fusion



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Introduction

This good practice guide to Butt Fusion Jointing provides basic information to enable the operative to:

- 1 Understand equipment required.
- 2 Understand the principles of polyethylene (PE) pipe butt fusion jointing.
- 3 Identify pipe and appropriate fitting markings.
- 4 Site of equipment.
- 5 Carry out pre-jointing machine and equipment checks.
- 6 Make satisfactory butt fusion joints across a range of pipe sizes.
- 7 Inspect for and identify acceptable quality joints including de-beading.



The butt fusion machine featured is the Gator2 250. The principles outlined in the guide are applicable to all butt fusion machines manufactured by Fusion Equipment Limited.



Getting Started

Equipment

- Generator of suitable size to power butt fusion machine – refer to manufacturer's literature for power requirement.
- Butt fusion machine of suitable size and liners (if required).
- Pipe support rollers.
- Welding tent/shelter and ground sheet.
- External / internal de-beading tool.
- Pipe end covers.
- Pipe cutter.
- Indelible marker pen for marking beads.

Principles

The pipes to be joined are held in clamps which grip and re-round the pipe. Clamps are hydraulically operated by hand pumps or electrically driven pumps. Clamp movement is controlled by the operator in the case of manual / semi-automatic machines, in automatic machines the computer controls clamp movement during the automatic cycle.

Pipe ends are prepared by planing with an electrical driven trimmer, then heated using an electrically powered non-stick heater plates. When molten, the pipe ends are brought together and held under pressure until cooled.

Pipe Selection ID

Check that both pipes to be joined are of the same size, SDR (standard dimension ratio) and material. Only compatible sizes and material should be joined together. If in doubt, seek advice from the pipe manufacturer. Pipe information is marked on the pipe at approximately one metre intervals.

Siting Equipment

The butt fusion machine should be placed on a suitable clean, dry base board or ground sheet inside a tent / shelter to minimise contamination and wind chill. Lay out machine so there is enough room to get around the machine to carry out the work, route the cables and hoses so they don't cause a trip hazard.

Pre-jointing Checks

Use only equipment which has been regularly serviced and is in good condition. Ensure the correct jointing parameters for the machine and pipe being welded are known and understood. Ensure that the generator is maintained and serviced to the manufactures requirements, has sufficient fuel to carry out the work to be done. Ensure that the generator has been suitably earthed to the generator manufactures requirements. Check that the heater plate coating is not damaged and is clean – wash only when cold with clean water and dry with a clean lint-free cloth or paper towel.

Check that the trimmer is clean and that the blades are not damaged and are in good condition. Ensure clamp liners and securing screws of the correct size are available for the size of pipe to be jointed. Liners must be clean and sit fully in the pipe clamps thus ensuring correct alignment. Check that the heater plate is at the correct temperature. Ensure correct parameters are selected for pipe to be jointed.

Dummy Joint

To make dummy welds follow the jointing procedures or abort the cycle after the full soak time has elapsed then open the machine and remove the heater. The first print out should read 'Error 20: Abort during Fusion.' Alternatively, allow the joint to complete and cut out the joint(s) once cooled. Some welding standards will force one or two dummy welds.



Making The Joint

Automatic Welding Procedure

The welding procedure detailed below has been summarised from Fusion Equipment Limited comprehensive operating instructions and is only intended as a guide. Always familiarise yourself fully with the manufactures operating instruction, safety operation and controls before commencing work.

Stop / Reset Button

In an emergency press the Emergency Stop Button on the back of the controller, when pressed it will immediately cut the generator supply to the machine.

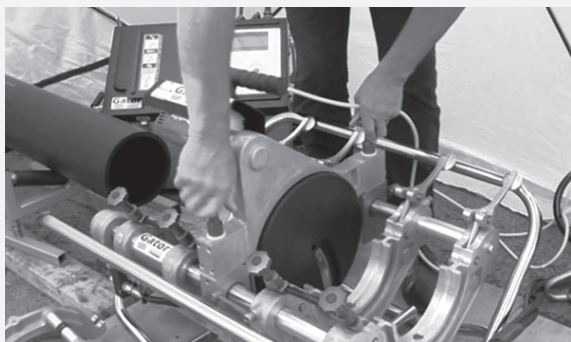
Dummy welds should be made (to remove any fine particles from the heater plate) before every welding session, after changing from one pipe size to another and also if the heater has been allowed to cool.

Connection and Pipe Selection

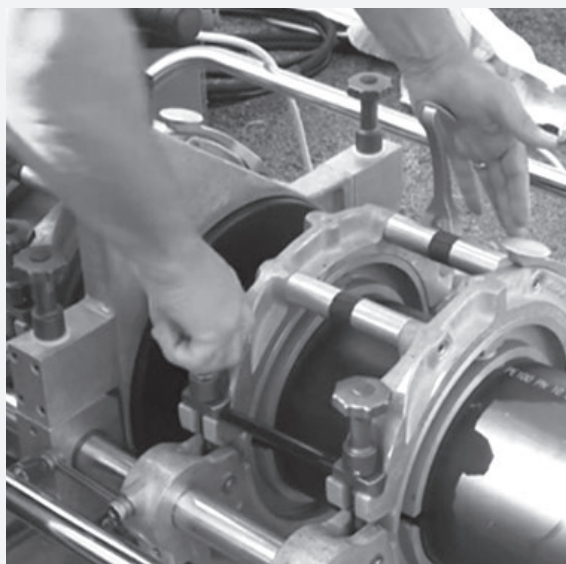
1. Connect heater, chassis and trimmer cables to the computer.
2. Ensure the hydraulic connections are clean and then connect to the controller.
- 3 Start the generator and then connect the controller to the generator.
4. Select the pipe size and type to be jointed.
5. Confirm data.

Pipe Preparation

1. Load and secure trimmer into machine using the fast clamp system. Push down knobs and turn clockwise to lock.



2. Place pipes to be joined on the pipe support roller to reduce drag.
3. Cover pipe ends that are to not being jointed to prevent draughts.
4. Clean pipe ends inside and out (approx. 300mm) then load and position pipes lightly against trimmer discs.
5. Position toggle lever into place and use adjustment knob (clockwise to tighten and anti-clockwise to loosen). Snap shut the fast clamps around the pipe.



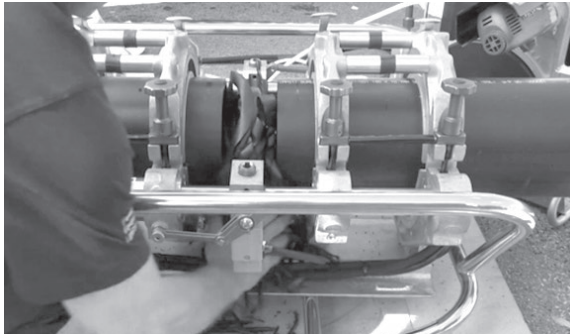
6. Press 'Green' button on controller. Trimming will continue up to its programmed stop, but as soon as a running swarf strip of full pipe thickness is visible, the 'feathering off' phase can be initiated by pressing the 'Green' button again. Without operator intervention, the machine will automatically enter the 'feathering off' phase of the trimmer cycle.





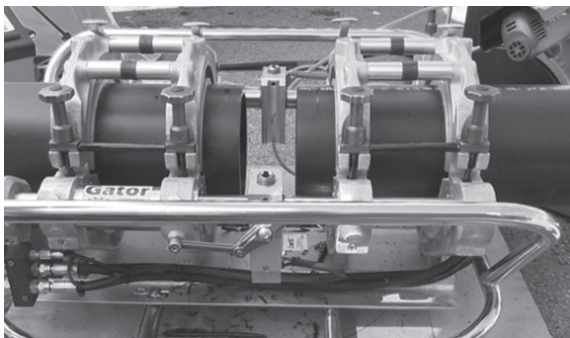
Making The Joint

7. When trimming cycle is completed and carriage has opened, remove trimmer and swarf. Be careful not to touch pipe ends.

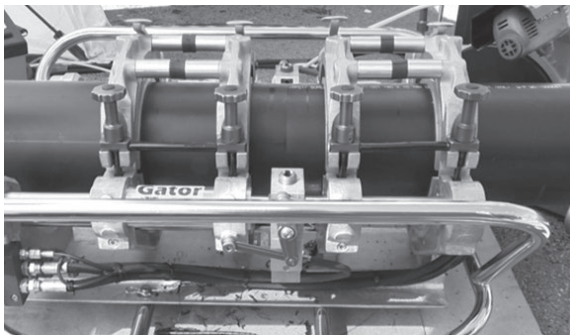


Do not pull swarf up through trimmed pipe ends, as this may contaminate the pipe faces

8. Visually check pipe ends for completeness of trimming.

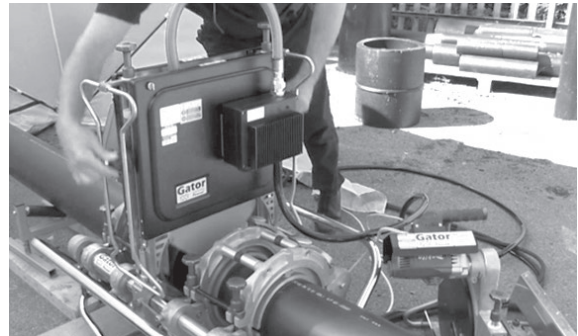


9. Press 'Green' button to close carriage then visually check pipe alignment, adjust clamps removing ONLY one toggle clamp at any one time to adjust alignment if required then re-check and re-trim if necessary.



Making the Weld

1. After the 'check' and prior to the 'join' phase secure the heater to the chassis. Push down knob and turn clockwise to lock.
2. Press 'Green' button on computer this checks heater temperature if the heater is correct temperature then the chassis will open. The chassis will not open until the correct temperature has been achieved.
3. Insert the heater into the chassis, push home until fully locked.



4. Press 'Green' button again. Fusion cycle will be carried out automatically. Display will give 'relevant' information at all times.
5. When controller display shows 'JOINT COMPLETE', press 'Green' button.



6. Remove the heater from the chassis, place in heater / trimmer stand.
7. Allow pipe to cool properly (in accordance with specification) before releasing from the clamps.
8. Un-clamp pipe and remove carefully.



Butt Fusion Do's and Don'ts

Quality Checks

- Check visually for excessive irregularity in bead formation and pipe mismatch.
- Externally de-bead the weld.
- Visually check the underside of the removed bead for contamination, then bend back at several positions and inspect for slit defects.
- Check for cleanliness around joint area.
- Print out or download the joint data from the controller using Data Printer, USB stick or Mini Tran. Check the results and verify the details for correct compliance.

Butt Fusion Do's

- In cold temperatures the chassis should be opened and closed manually approx. 10 times in quick succession following the automatic warm up routine.
- Always ensure that the equipment is calibrated and properly maintained.
- Always weld inside a shelter on a suitable baseboard or ground sheet.
- Where possible, site the equipment on clear level ground.
- Always ensure pipes are aligned correctly and supported on pipe rollers to minimise drag.
- Cover open pipe ends to eliminate wind chill to the heater and joint interface.
- Clean pipe surfaces (inside and out), pipe ends and clamps before inserting pipe into the machine.
- Position pipes into the clamps with the pipe marking uppermost and aligned.
- Wash the heater plate when cold before every welding session and perform dummy welds when hot to remove fine particles from the heater surface. On pipe sizes above 180mm, two dummy welds should be made at the start of each session.
- Perform dummy welds after changing from one pipe size to another, also if the heater plate has been allowed to cool.

- Clean trimmer discs and blades before use.
- Ensure that when trimming, a continuous ribbon of material, of complete pipe wall thickness is produced from both pipe ends before stopping the trimmer and advancing to the feathering operation.
- Always wait for the trimmer to stop rotating before removing it from the machine.
- Replace the trimmer in the stand provided.
- Remove shavings from pipe ends and chassis.
- Check visually that both pipe ends are completely trimmed.
- Always check pipes for alignment ensuring no gaps exist between the two pipe ends around the entire circumference of the abutted pipes.
- On completion of satisfactory alignment checks, proceed with the welding cycle without delay.
- Number/code the joint and bead using an indelible marker.
- After FULL cooling time has elapsed, remove either external or internal bead and carry out quality checks.

Butt Fusion Don'ts

- Do not attempt to open the computer enclosure – there are no user serviceable parts inside.
- Do not use damaged equipment.
- Do not attempt to weld pipes of different material, diameter or SDR.
- Do not leave shavings inside pipe or on the chassis.
- Do not introduce dirt onto trimmed pipe ends whilst removing swarf.
- Do not touch trimmed pipe or fitting ends.
- Do not remove pipes from the machine before the complete cooling time has elapsed.
- Do not cut corners in any part of the welding cycle.
- Do not attempt to install pipe until fully cooled.



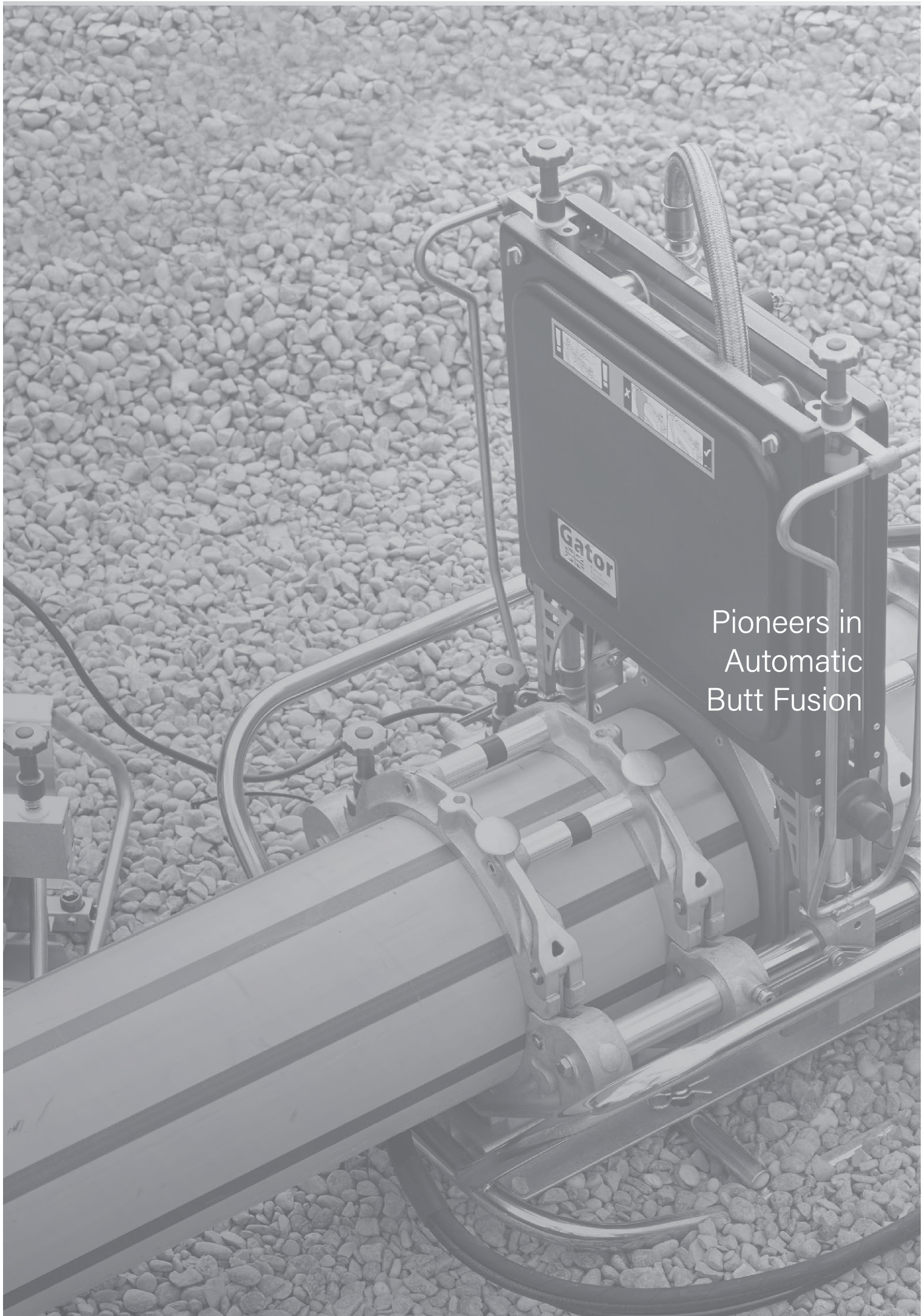
Safety Notice

Although we make every effort in the design of our equipment to ensure operator safety, it is worth bearing in mind the following precautions.

- Do not touch heater plate when hot.
- Never allow molten or semi-molten polyethylene to come into contact with the skin. In the event of such an occurrence it is recommended that cold water should be used to flush the affected area and expert medical advice sought.

Do not under any circumstances attempt to pull material from the skin as this will invariably remove the skin as well

- Avoid contact with the trimmer blades when cleaning discs and especially when in motion. These can be sharp and cause cuts to fingers etc.
- Do not attempt to operate the trimming device whilst out of the machine chassis or attempt to by-pass the safety switch.
- Keep fingers and hands away from the pipe ends, chassis, trimmers and heaters whilst operating the machine.
- Do not attempt to lift heavy equipment or long lengths of pipe without assistance or mechanical aid.
- An audible alarm is fitted to automatic butt fusion machines to warn of impending movement.
- Remove all traces of polymer from the heater face(s) to prevent the production of fumes from degraded residues (at normal jointing temperatures the production of fumes will be slight, however these will be more pronounced at higher temperatures). Advice regarding Health & Safety in reference to the pipe material can be obtained from the pipe supplier.
- Normal precautions should be observed when handling electrical equipment and for safety reasons, all 110V portable generator sets should be "Centre Tapped" for site use 55V-0V-55V volts.
- To afford protection against unforeseen circumstances occurring during jointing it is advisable to wear protective workwear such as gloves safety glasses and safety boots.



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