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# *Industry Guidelines*

## **BUTT FUSION JOINTING OF PE PIPES AND FITTINGS - RECOMMENDED PARAMETERS**

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*Pipelines Integrity For a Cleaner Environment*



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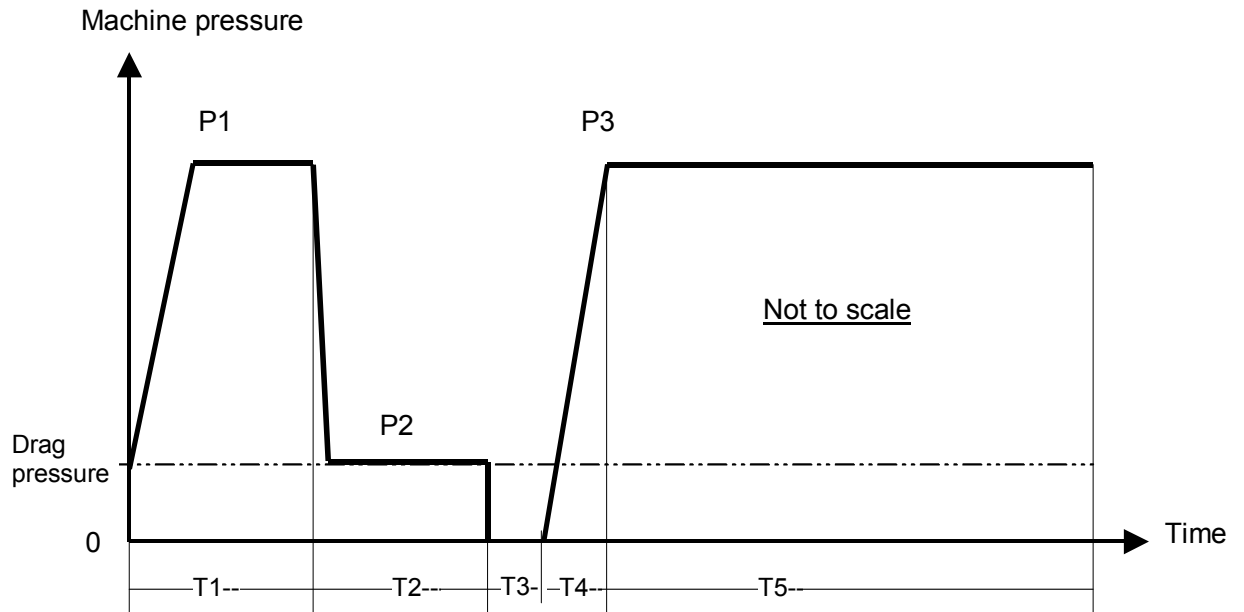
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## **BUTT FUSION JOINTING OF PE PIPES AND FITTINGS - RECOMMENDED PARAMETERS**

The PIPA Technical Committee has prepared this publication as a guide to the butt fusion of polyethylene pipe using AS/NZS 4130 material as a basis.

The user should always check the applicability of the parameters to any given project and whether the version on hand is current. As the conditions of use of welding equipment are outside the control of the Committee, no liability can be accepted by PIPA in connection with the use of this table.

<b>Butt Fusion Parameter</b>		<b>Units</b>	<b>Value</b>	<b>Comments</b>
Heater plate temperature		degrees C	220 ± 15	
Pressure value: Bead up	P1	kPa	175 ± 25	Insert this value in the formula (note 6), and add drag pressure
Approx. bead width after bead up		mm	0.5 + 0.1t	t = wall thickness (see note 4)
Bead up time	T1	second	Approx. 6t	Varies with ambient temp.
Pressure value: Heat soak	P2	kPa	Drag only	
Heat soak time	T2	second	15t	
Max. changeover time	T3	second	3 + 0.01D	D = pipe diameter (see note 5).
Max. time to achieve welding pressure	T4	second	3 + 0.03D	Pressure should be increased smoothly using most of the time allowed to reach weld pressure.
Pressure value: Welding & Cooling	P3	kPa	175 ± 25	Insert this value in the formula (note 6), and add drag pressure
Welding & cooling time: t<15mm	T5	minute	10 + 0.5t	Time in clamps
Welding & cooling time: t>15mm	T5	minute	1.5t	Time in clamps
Min. bead width after cooling		mm	3 + 0.5t	Typical. (See note 2)
Max. bead width after cooling		mm	5 + 0.75t	Typical. (See note 2)



**Notes:**

1. These parameters apply to the butt fusion of PE80 or PE100 polyethylene materials as specified in AS/NZS 4131.
2. These parameters may also apply to the butt fusion of PE80 to PE100. This may result in slightly different bead formation without reducing weld quality. If in doubt refer to the pipemaker.
3. Only pipes and fittings of the same diameter and wall thickness should be butt fused together.
4.  $t$  = mean pipe wall thickness calculated from AS4130 min/max values, rounded to the nearest mm.
5.  $D$  = mean pipe outside diameter calculated from AS4130 min/max values, rounded to the nearest mm.
6. Pressure calculation formula:

$$\frac{\text{pipe annulus area (mm}^2\text{)}}{\text{hydraulic cylinder area (mm}^2\text{)}} \times \text{pressure value (kPa)}$$

where pipe annulus area =  $\pi (D - t)t$

7. For ambient temperature  $> 25^{\circ}\text{C}$ , cooling time must be increased by 1 minute per  $^{\circ}\text{C}$  above  $25^{\circ}\text{C}$ .
8. For ambient temperature  $< 5^{\circ}\text{C}$ , cooling time may be decreased by 1 minute per  $^{\circ}\text{C}$  below  $5^{\circ}\text{C}$ .

**References:**

**ISO 11414 - 1996** "Plastics pipes and fittings - Preparation of polyethylene (PE) pipe/pipe or pipe/fitting test piece assemblies by butt fusion"

**UK Water Industry "WIS 4-32-08** "Specification for site fusion jointing of PE 80 and PE 100 Pipe and Fittings" August 1994: Issue 2

**Jansson** "Plastic Pipes for Water Supply and Sewage Disposal" 1996

**Borealis A/S** "Welding of Large Diameter PE Pipes" ART 399 03.04.1998 Ed. 1

**SP Swedish National Testing and Research Institute** "Report - Determination of HE 2492 PE-pipe weld factor"