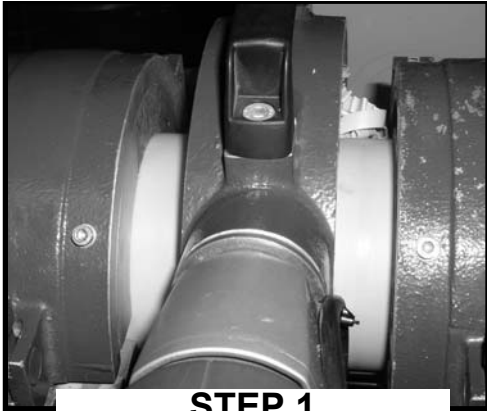




Floguard II Butt Fusion Installation Instructions

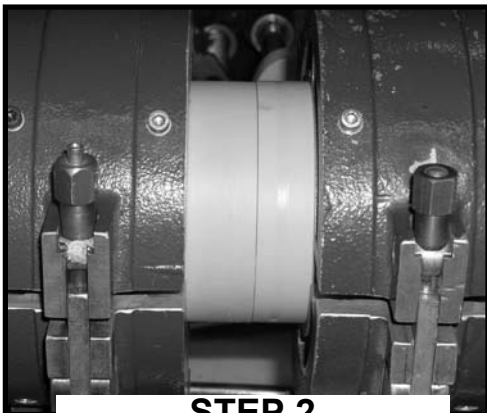
The below instructions are based on using Technodue PL125/PL160 butt fusion tools. Although the procedures for butt fusion are similar, welding pressures may vary when using other manufacturers tools.



STEP 1

Step 1- Plane/Face pipe

Secure the pipe into clamps, bring down the facing tool and apply pressure towards the cutting tool to shave pipe. Continue facing until full contact is made on both pipe ends. A good way to tell that proper facing is achieved is when you get long continuous shavings. Short shavings indicate facing is not complete.



STEP 2

Step 2- Confirm Pipe ends are Square

Remove planer and bring pipes together to check alignment. If mis-aligned by more than 10%, then re-align and re-face if necessary.



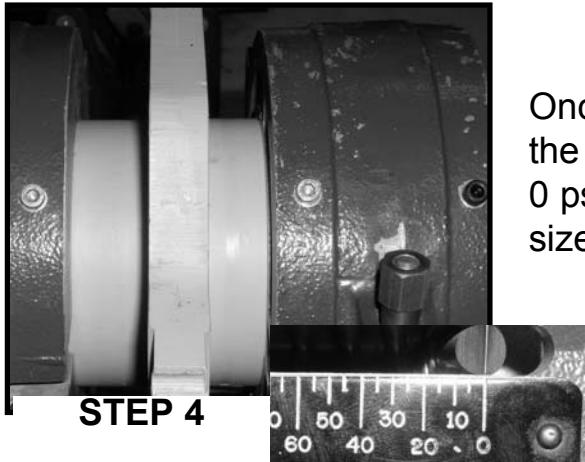
STEP 3

Step 3- Heat Pipe ends

Put heater plate between pipes and apply the pre-determined pressure(force) until bead forms around the entire circumference of the pipe. The welding pressure is determined by pipe size and wall thickness.

Charts are located on the last 2 pages of instructions.

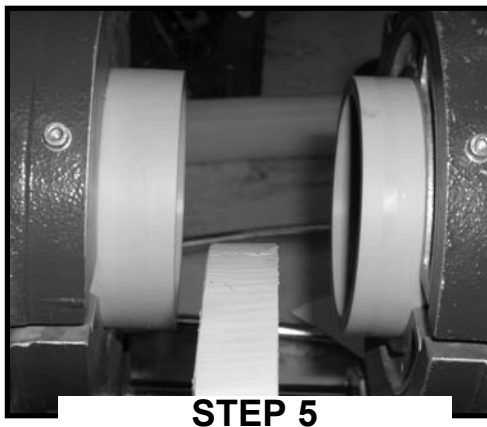




Step 4- Heat Soak

Once the bead has formed around the pipe, release the pressure on the Butt Fusion machine (as close to 0 psi as possible). Heat soak time depends on the size and the wall thickness of the pipe.

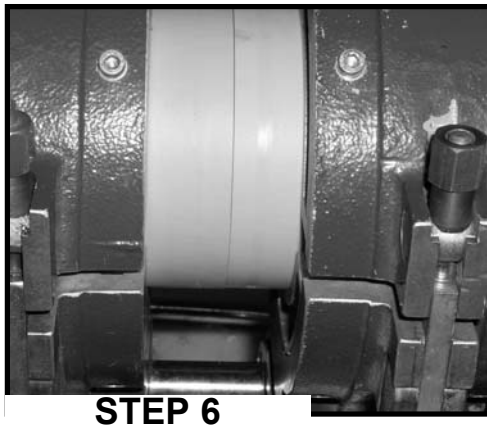
Charts are on pages 3 & 4 of the instructions



Step 5- Separate pipes from heater plate

After proper heat soak time has elapsed, separate the heater plate from the pipe and remove the heater plate as QUICKLY as possible. The pipe has a very limited time of separation while remaining hot enough for proper fusion.

Charts are on pages 3 & 4 of the instructions

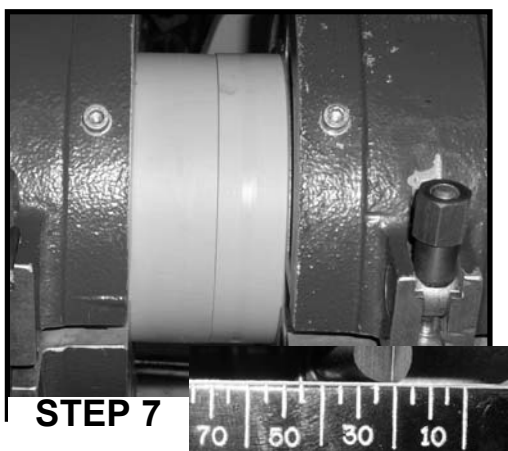


Step 6- Butt Weld pipes together

After the heater plate is removed, bring the pipe ends together. FULL PRESSURE SHOULD BE ACHIEVED GRADUALLY.

If you bring pipes together and apply all the pressure to quickly you will force the melted material out of the fusion surface, resulting in a **cold weld**.

Charts are on pages 3 & 4 of the instructions



Step 7- Cooling time

It is very important to allow proper cooling time under pressure with the pipes still in clamps.

Cooling times depend on the size and thickness of the pipe. If the pressure is released from the joint before it is fully cooled, the joint strength will be greatly decreased and could even separate due to stress from shrinkage using the cooling process.

Cooling should be done naturally, not with water or cold air.

Weld pressures and times charts for Simultaneous Butt Fusion

floguard II Simultaneous Butt Fusion

Floguard II Combination	Int'l Melt pressure (lbs)	Melt pressure (lbs)	Heat soak time (sec)	Max. change over time	Reach full weld (sec)	Welding pressure (lbs)	Cooling time (min)
	A	B	C	D	E	F	G
1" class 150 x 3" class 150	52	4	80	3	4	52	10
1-1/2" class 150 x 4" class 150	83	4	100	4	5	83	13
1-1/2" class 45 x 4" class 45	40	2	45	4	5	40	6
2" class 150 x 4" class 150	92	5	100	5	6	92	13
2" class 150 x 4" class 45	49	3	60	5	6	49	7
2" class 150 x 6" class 150	171	12	130	5	6	171	16
3" class 150 x 6" class 150	194	13	130	8	9	194	16
3" class 150 x 6" class 45	100	7	80	5	6	100	10
4" class 150 x 8" class 150	299	18	180	9	10	299	23
4" class 150 x 8" class 45	151	8	100	8	9	151	13
4" class 45 x 8" class 45*	108	6	60	5	6	108	8
6" class 150 x 10" class 150	507	40	230	10	11	507	29
6" class 150 x 10" class 45	280	20	130	8	9	280	16
6" class 45 x 10" class 45*	186	14	80	5	6	186	10
8" class 150 x 12" class 150	799	55	290	10	12	799	37
8" class 150 x 12" class 45	439	30	180	8	9	439	23
8" class 45 x 12" class 45	291	20	100	8	9	291	12
10" class 150 x 14" class 150	1080	85	325	10	11	1080	42
10" class 150 x 14" class 45	625	50	230	8	9	625	29
10" class 45 x 14" class 45	398	30	110	8	9	398	14
10" class 150 x 16" class 150	1275	100	370	10	11	1275	47
12" class 150 x 18" class 150	1727	125	410	12	13	1727	53
12" class 150 x 16" class 45	903	65	290	8	9	903	37
12" class 150 x 18" class 45	991	70	290	8	9	991	37
12" class 45 x 16" class 45	543	40	125	8	9	543	16
12" class 45 x 18" class 45	631	45	140	8	9	631	18
14" class 150 x 18" class 150	1879	140	410	15	16	1879	53
14" class 150 x 18" class 45	1143	85	325	8	9	1143	42
14" class 45 x 18" class 45	688	50	140	8	9	688	18
16" class 150 x 20" class 45	1435	110	370	12	13	1435	47
16" class 45 x 20" class 45	854	65	155	8	9	854	20
18" class 150 x 24" class 45	1974	145	410	12	13	1974	53
20" class 45 x 24" class 45	1336	100	200	12	13	1336	25
1" pvdf x 3" pvdf**	29	4	40	4	5	29	6
1-1/2" pvdf x 4" pvdf**	46	5	50	4	5	46	7
2" pvdf x 4" pvdf**	50	6	50	4	5	50	7
3" pvdf x 6" pvdf**	92	8	70	4	5	92	10
4" pvdf x 8" pvdf**	142	14	90	4	5	142	12
6" pvdf x 10" pvdf**	242	20	120	4	5	242	14
8" pvdf x 12" pvdf**	380	30	150	6	5	380	20

*Indicates that simultaneous welding is very difficult due to thin wall nature of the inner pipe. All fittings and discs must be prefabricated at the factory to insure proper alignment. Staggered fusion using electrofusion closure coupling is recommended as a more efficient means of working with these sizes.

**Indicates that simultaneous welding is very difficult due to thin wall nature of the inner pipe. All fittings and discs must be prefabricated at the factory to insure proper alignment. Staggered fusion using electrofusion closure coupling is recommended as a more efficient means of working with these sizes.

NOTES: These weld pressures are for general guidance only. Different machines vary in performance due to differences in spring or hydraulic efficiency and gage accuracy. Therefore, actual fusion pressures/forces should be adjusted to produce bead shape and sizes that are satisfactory according to the accompanying page.



Weld pressures and times charts for Single Wall Butt Fusion
SDR 17.6 POYLPROPYLENE PIPING

Approx. Weld Pressures	
SDR 17.6 polypropylene pipe	
Size	psi / bar
1"	7 psi / 1/2bar
1-1/2"	10 psi / 3/4bar
2"	10 psi / 3/4bar
3"	20 psi / 1.5bar
4"	31 psi / 2 bar
6"	40 psi / 3 bar
8"	85 psi / 6 bar
10"	130 psi / 9 bar
12"	200 psi / 14 bar

Heat Soak Times	
under NO pressure	
(after initial bead has formed)	
Size	Time
1"	1 min.
1-1/2"	1 min.
2"	90 sec.
3"	90 sec.
4"	2 min.
6"	2 min.
8"	2 min.
10"	2-1/2 min.
12"	3 min.
14"	3 min.

Cooling Times under	
FULL weld pressure	
(in clamps)	
Size	Time
1"	6 min.
1-1/2"	6 min.
2"	6 min.
3"	8 min.
4" -12"	10 min.
14"	12 min.

Note: pressures for 1"-6" are for hand units and 8"-14" are for Hydraulic Technodue units and will vary based on different fusion units.



Weld pressures and times charts for Single Wall Butt Fusion
SDR 11 POYLPROPYLENE PIPING

<u>Approx. Weld Pressures</u>	
SDR 11	
polypropylene pipe	
Size	psi / bar
1"	9psi / 1/2bar
1-1/2"	14 psi / 3/4bar
2"	23 psi / 3/4bar
3"	44 psi / 2.2bar
4"	69 psi / 2.6bar
6"	80 psi / 3.6bar
8"	110 psi/7.5bar
10"	145 psi / 10 bar
12"	220 psi / 15 bar

<u>Heat Soak Times</u>	
under NO pressure	
(after initial bead has formed)	
Size	Time
1"	1 min.
1-1/2"	1 min.
2"	90 sec.
3"	90 sec.
4"	2 min.
6"	2 min.
8"	2 min.
10"	2-1/2 min.
12"	3 min.
14"	3 min.

<u>Cooling Times under</u>	
FULL weld pressure	
(in clamps)	
Size	Time
1"	7 min.
1-1/2"	7 min.
2"	7 min.
3"	9 min.
4" -12"	11 min.
14"	14 min.

Note: pressures for 1"-6" are for hand units and 8"-14" are for Hydraulic Technodue units and will vary based on different fusion units.

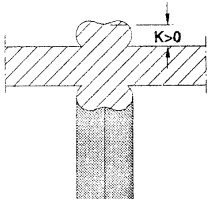


Weld pressures and times charts for Single Wall Butt Fusion
FLUOROSTAR PVDF PIPING

<u>Approx. Weld Pressures</u> <i>Fluorostar PVDF pipe</i>	
Size	psi / bar
1"	7psi / 1/2bar
1-1/2"	12 psi / 3/4bar
2"	16 psi / 3/4bar
3"	22 psi / 2.2bar
4"	34 psi / 2.6bar
6"	52 psi / 3.6bar
8"	95 psi / 6.6bar
10"	145 psi / 10 bar
12"	220 psi / 15 bar

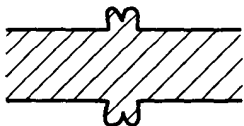
<u>Heat Soak Times</u> <u>under NO pressure</u> (after initial bead has formed)	
Size	Time
1"	30 sec
1-1/2"	40 sec
2"	45 sec
3"	45 sec
4"	45 sec
6"	70 sec
8"	90 sec
10"	120sec
12"	150 sec

<u>Cooling Times under</u> <u>FULL weld pressure</u> (in clamps)	
Size	Time
1"	4 min.
1-1/2"	5 min.
2"	5 min.
3"	6 min.
4"	7 min.
6"	10 min
8"	12 min
10"	14min
12"	20 min



This is an example of an even and completely rounded bead without notches or displacement.

EXAMPLES OF BUTT WELD DEFICIENCIES



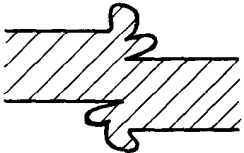
Bulge too narrow and too high. The connection can still be sufficient, an additional examination is however recommended.



Bulge too flat. The connection can still be sufficient, an additional examination is however recommended.



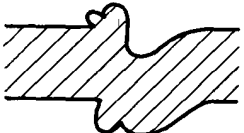
Bad tie-in weld with sharp notch in the bulge hollow. Notch is deep with in the wall thickness.



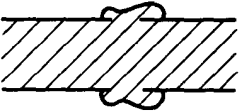
Bad tie-in weld with strong misalignment.



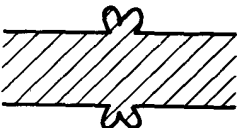
Bad tie-in weld with different thickness of the welded parts



Bad tie-in weld with deformation in the adjacent material zone.


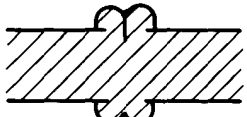
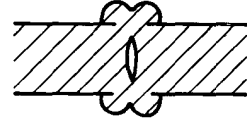
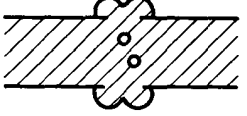



Welding from materials with different fusing temperatures and/or different heat soak temperatures.



Welding at too low of a welding temperature.

EXAMPLES OF BUTT WELD DEFICIENCIES CONTINUED

- *  Cold area in a welding seam; a) schematically represented
- *  Tear in a welding seam; a) schematically
- *  Void in a welding seam; a) schematically
- *  Pores in a welding seam; a) schematically
- *  Inclusion in a welding seam; a) schematically

****These deficiencies can be identified only through ultrasonic or x-ray examination, or by destructive sectioning (visual exam) of the welded materials.***

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