



SPARTAN

FUSION MACHINE

Owner's Manual

Record the Serial Number of your

Fusion Machine

and give the number to the factory
when ordering parts.

Serial Number



SPARTAN TOOL L.L.C.

800.435.3866

www.spartantool.com



Warning



— Read the safety and operating instructions before using any Spartan Tool product. Drain and sewer cleaning or pipe replacement can be dangerous if proper procedures are not followed and appropriate safety gear is not utilized.

— Before starting unit, be sure to wear personal protective equipment such as safety goggles or face shield and protective clothing such as gloves, coveralls or raincoat, hard hat, rubber boots with metatarsal guards, and hearing protection.

— Drains and sewers can carry bacteria and other infectious micro-organisms or materials which can cause death or severe illness. Avoid exposing eyes, nose, mouth, ears, hands and cuts and abrasions to waste water or other potentially infectious materials during drain and sewer cleaning or pipe replacement operations. To further help protect against exposure to infectious materials, wash hands, arms and other areas of the body, as needed, with hot, soapy water and, if necessary, flush mucous membranes with water. Also, disinfect potentially contaminated equipment by washing such surfaces with a hot soapy wash using a strong detergent.

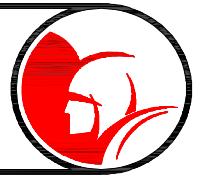
“California Prop. 65: This product may contain an extremely small amount of lead in the coating. Lead is a material known to the State of California to cause cancer or reproductive toxicity.”

— For any questions contact the company at the address shown below.

SPARTAN TOOL L.L.C.
1506 W. Division Street
Mendota, IL 61342
800.435.3866 ♦ Fax 888.876.2371
www.spartantool.com



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Introduction



The Spartan Fusion Machine has been designed and manufactured with high quality materials and care in workmanship. The instructions in this manual have been prepared to ensure that, when followed, the Spartan Fusion Machine will provide long and efficient service.



WARNING: It is the responsibility of the operator to read and understand the Operator's Manual and other information provided and use the correct operating procedure. Machines should be operated only by qualified operators and trained helpers. Failure to do so can result in personal injury, death or machine damage.

Read the entire manual before the initial start-up of the machine. It is important to know the correct operating procedures of the machine and all safety precautions to prevent the possibility of property damage and/or personal injury.

NOTE: Information in this manual is current at the time of printing. Spartan Tool reserves the right to make changes and improvements to its products at any time without notice or obligation.



Service Information



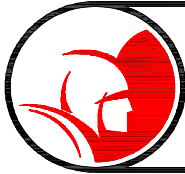
All requests for information, service or parts should include machine serial number. Additional copies of this Owner's Manual can be ordered from Spartan Tool or downloaded at www.spartantool.com

For more information contact: Spartan Tool L.L.C., Customer Service
1506 W. Division Street
Mendota, IL 61342-2234
Phone (800)435-3866
Fax (888)876-2371

Record below and retain product model and serial number which are located on nameplate.

Model: 4/6 Inch Fusion Machine

Serial Number: _____



Machine Features



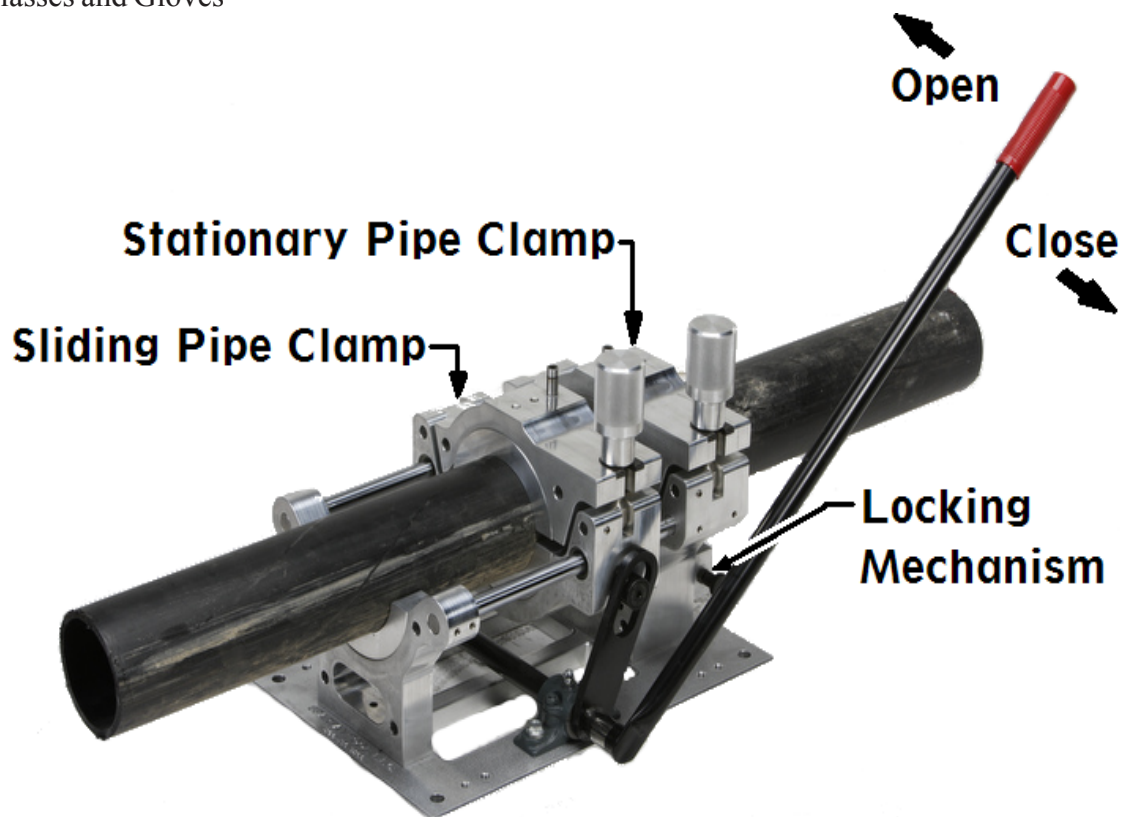
EQUIPMENT REQUIRED:

4"/6" Fusion Machine with appropriate Pipe Clamp inserts.

Facing Tool with appropriate Facing Tool Guide Plugs

Heating Iron and Hot Box

Safety Glasses and Gloves



CLAMP MOVEMENT:

The sliding clamp assembly can retract outward and close inward. For closing motion, move the torque bar towards the stationary clamps. To retract clamps, move torque bar away from the stationary clamps.

QUALIFICATION VERIFICATION:

Melting times, bead sizes and cooling times vary depending on material, pipe diameter, wall thickness, ambient temperature and operator technique. It is vitally important to confirm the operators' procedure for each type and size of pipe by testing fused samples to assure the quality of joints prior to an installation. Refer to the "qualification testing" section for information on how to test a fused sample.

INITIAL PREPERATION:

- Clean inside and outside of both sections of pipe to be fused (a minimum of one foot from the pipe ends). The pipe and fitting surfaces where tools and equipment are fitted must be clean and dry. Use CLEAN, dry, non-synthetic (cotton) cloths or paper towels to remove dirt, snow, water and other contamination.
- Ensure that all equipment is clean and in good operating condition. Use only clean, dry, natural fiber rags to clean the heating iron to avoid damage to the non-stick coating.
- Plug approved heating iron into 120V service and place into hot box to warm up.
- Install appropriate pipe clamp inserts and facing tool guide plugs for the specific pipe size and type of pipe to be joined.



Machine Features



STEP 1:

Insert the longer length of pipe into the fixed pipe clamps and tighten the lockdown knobs. 3/4" to 1" of pipe should extend inwards from the inboard clamp.

STEP 2:

Insert the other pipe section into the sliding clamps on the other side and tighten. Again, 3/4" to 1" of pipe should extend inboard from the clamp. Both pipes should be supported and level for approximately 4 feet from pipe clamps to ensure a straight feed into the Fusion Machine.



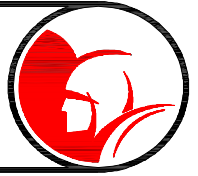
STEP 3:

On the stationary clamp side of the machine bed is a locking mechanism. If the lock plate is not flush with the body of the lock mechanism, push it until it clicks. Retract the sliding clamps (move torque bar away from the stationary clamps) until the "arrow" mark on the plate lines up with the "FACER" mark on the frame. Place the facing tool between the pipe ends. The bracket on the facing tool will fit over the guide pins located on top of each clamp. Clamp stops on the facing unit control the amount of pipe faced off by limiting the advancement of the sliding pipe assembly.





Machine Features



STEP 4:

Close sliding clamp assembly (move torque bar toward the stationary clamps) until the pipe ends are lightly touching the facing tool. Turn on facing tool and begin to apply pressure on the torque bar until desired pressure is reached. Do not apply so much force that the facing unit starts to stall. Long continuous shavings will indicate proper facing of pipe. While facing the pipe ends, maintain constant pressure until clamp stops are reached.

DO NOT PUT EXCESS FORCE ON THE FACING UNIT!

STEP 5:

When the facing operation is complete, retract the sliding clamp assembly (move torque bar away from the stationary clamps) and turn off facing tool. (Turning the facing tool off before retracting the clamp may leave ridges on the ends of the pipe where the blades were when it stopped turning.) Be careful not to touch the newly shaved pipe ends. Remove the facing unit and all shavings from the work area. Bring the pipe ends together (move torque bar toward the stationary clamps) and inspect for misalignment, a gap, or pipe out of roundness. If any of these defects are apparent, loosen pipe clamps and extend each pipe end a further 1/8" to 1/4". Check the pipe level and alignment as explained in step 2. Repeat the facing operation.

DO NOT TOUCH FRESHLY FACED PIPE ENDS WITH HANDS OR ANY FOREIGN OBJECT.





Machine Features

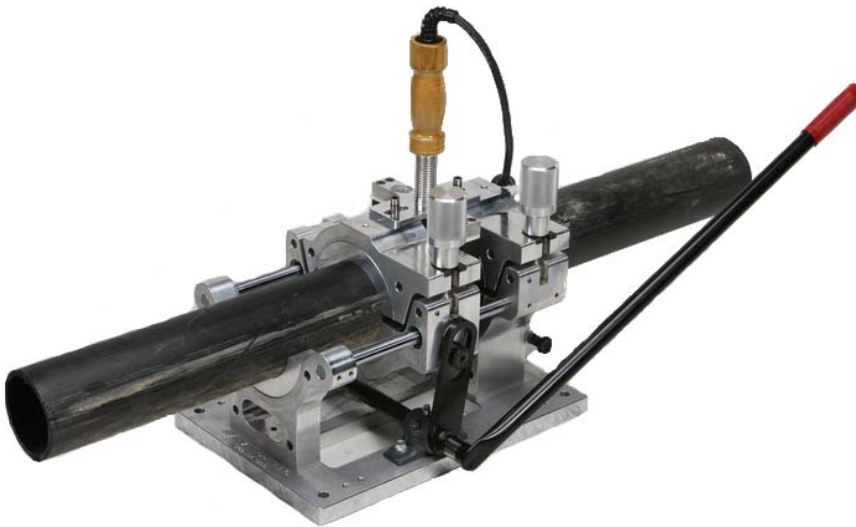


STEP 6:

Check the heating iron temperature. Gauge should indicate that the iron has warmed up to 500 degrees¹ F. Retract the sliding clamp (move torque bar away from the stationary clamps) to “IRON” mark on frame and carefully place the heating iron between the pipe ends so that the bracket on the heating iron fits over the guide pins on top of the clamps. Be careful not to touch the pipe with the iron before the iron is in position.

STEP 7:

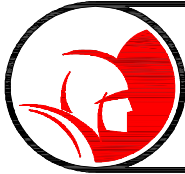
Bring the pipe ends together (move torque bar toward the stationary clamps) against the iron with a limited amount of force to produce a small bead around the circumference of the pipe ends. **EXCESSIVE PRESSURE SHOULD BE AVOIDED.** Once the initial bead is formed completely and uniformly around both ends of the pipe, reduce the pressure exerted on the torque bar to nearly zero and begin timing the heat cycle according to the specified times given by the pipe manufacturer. The following chart is intended only as a guide. Adjust melting time as required to achieve visual verification of adequate melt swell bead width. Failure to reduce pressure of the pipe against the heater during the heating period will squeeze away the melt from the pipe ends causing a concave effect. This will result in a weakened joint after fusing.



Size	440° Melt time (seconds)	500° Melt time (seconds)	Melt Swell Bead Width
1-1/4 IPS	25-42	5-22	ABOUT 1/16"
1-1/2 IPS	35-60	15-31	
2 IPS	40-66	15-34	
3 IPS	50-78	15-36	
4 IPS	55-90	15-42	1/16" TO 1/8"
6 IPS	90-126	20-66	1/8" TO 3/16"

The above table is intended only as a guide. Melt time will increase in cold weather.

¹ Some types of pipes may require a fusion temperature of 340° to 425°F. Consult pipe manufacturers specifications to adjust heating iron to appropriate operating temperature as required.



Machine Features



STEP 8:

Remove the heating iron from the Fusion Machine by first retracting the clamps (move torque bar away from the stationary clamps). Be careful not to displace melt when removing heater. Pull small knob on locking mechanism - a click will be heard. Quickly observe the pipe ends to be joined to ensure sufficient and uniform melting pattern. (If melted plastic is stuck to the heating iron, don't join the two ends - discontinue making the joint, let cool and start over.) Place

heating iron in the hot box, then immediately bring the pipe ends together (move torque bar toward the stationary clamps.) DO NOT SLAM - this may cause excessive displacement of the melt and result in a poor quality fusion. Apply sufficient force² to form a double roll back of each bead onto the pipe. (Insufficient force may result in inadequate fusion due to insufficient contact in the melt area. Excessive force may result in the melt being pushed to the ID and OD of the fusion, creating a "cold ring" in the center section of the fusion. Failure to engage the locking mechanism and then reducing the fusion pressure while cooling may result in porosity in the fusion.) Maintain this pressure for the recommended cooling time as per the chart below or as recommended by the pipe manufacturer, whichever is greater.

Size	O. D.	Cooling Time (seconds)	Bead Thickness
1-1/4 IPS	1.660	120-130	1/16" to 1/8"
1-1/2 IPS	1.900	120-150	1/16" to 1/8"
2 IPS	2.375	120-150	1/16" to 1/8"
3 IPS	3.500	135-180	1/8"
4 IPS	4.500	150-170	1/8"
6 IPS	6.625	240	3/16"

The above table is intended only as a guide. Cooling times and bead thickness are dependant on material, pipe diameter, wall thickness and ambient temperatures and must be validated by tests before use.

It is possible to operate this machine with a pointer type torque wrench instead of the supplied torque bar. To calculate a torque wrench reading from interfacial pressure given by a pipe manufacturer, use the formula below:

$$\text{Torque Reading (Ft-lbs)} = (OD - T) \times T \times \pi \times IFP \quad \text{where:}$$

$OD = \text{Outside Diameter}$
 $T = \text{Wall Thickness}$
 $\pi = 3.1416$
 $SDR = \text{Side/Diameter Ratio}$
 $IFP = \text{Interfacial Pressure}$
 $2.5 = \text{Correction Constant}$

² Visual observations should be used in conjunction with recommended heat cycle times to obtain a consistent, proper pipe fusion joint. It is important to consult with the pipe manufacturer for specific recommendations.

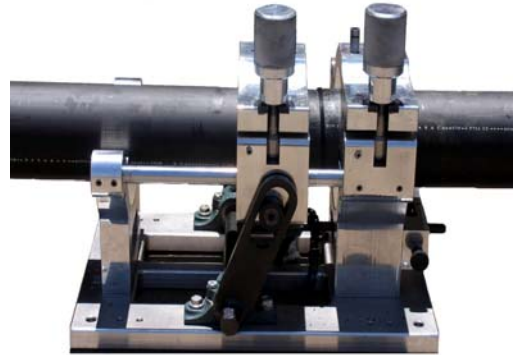


Machine Features



STEP 9:

Release pressure and allow the joint assembly to stand for at least 3 minutes before removing the pipe clamps from the pipe. The lock plate should still be protruding from the body of the lock mechanism, push it in until it clicks after the three minutes have elapsed.



STEP 10:

After completing the required cooling cycle in the machine, remove the pipe from clamps. Visually inspect the joint for proper melt pattern and bead formation. Make sure the pipe is properly aligned. If the fusion appears faulty in any respect, cut out the fusion, and start over. Allow an additional 20 to 60 minutes for the pipe to cool before subjecting joint to any bending stresses, pressure testing, burying, or rough handling.

BUTT FUSION TIME CYCLES

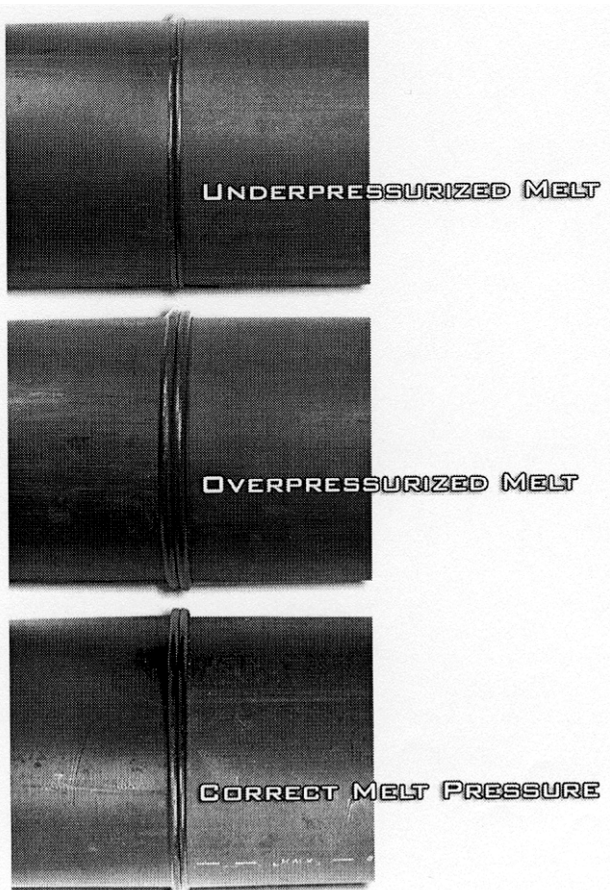
Spartan Tool recommends that heating and cooling cycles outlined by pipe manufacturers or local utilities be followed. Exact times will depend on environmental conditions. See "Cold Weather Procedures".

HEATING IRON TEMPERATURE SETTING

All irons are pre-set at the factory to operate at 500°F. Pipe fusion operations that require a fusion temperature of 340° to 425°F will require adjustment of the heating iron. (See pages 11-12).

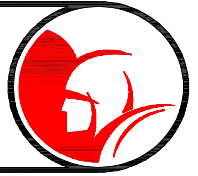
COLD WEATHER PROCEDURES

Butt fusions have been successfully executed in rain under a canopy and in near arctic conditions. In cold weather, remove all frost, ice or snow from the ID and OD of areas to be fused. To obtain proper melt patterns, increase melt time cycles - do not increase temperature or pressure of pipe on heating iron faces. Heating cycle begins after the initial bead has formed around the entire circumference of the pipe.





Iron temperature set up procedure



Iron temperature set up procedure - for all Spartan Tool irons.

1. With iron plugged in and upright, remove tamper proof screw (with special bit) and Allen screw plug (3/16" Allen key).
2. Look into hole from the removed plug and screw to orient the position of the thermal switch setup screw. It will be about a 1/4" in diameter with a screwdriver slot in the top of it.
3. With a narrow standard slot screwdriver (blade width of 1/4"), insert it with caution (THE IRON IS PLUGGED IN AND THEREFORE THERE IS A RISK OF ELECTRICAL SHOCK IF CARE IS NOT TAKEN) into the hole, so that it makes up with the slot on the thermal switch setup screw.
4. Only turn the thermal switch setup screw a maximum of an 1/8" of a turn at a time. One complete turn will result in a temperature increase/decrease of approximately 85 to 115 degrees. After turning setup screw (for temperature increase or decrease), wait for about 5 minutes for the irons temperature to adjust to desired temperature range.
5. Turning thermal switch setup screw.
Clockwise will decrease the temperature.
Counter clockwise will increase the temperature.



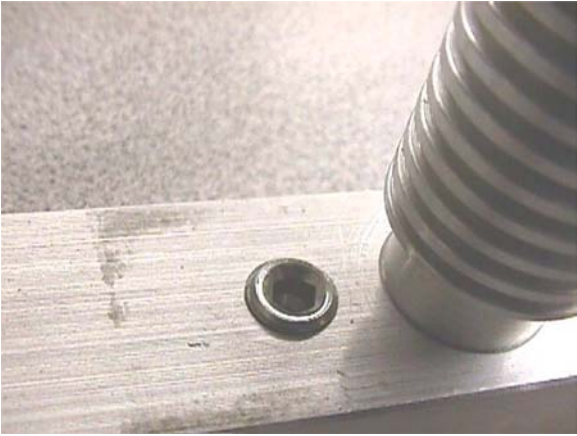
Tamper Proof Screw



Drilled Spanner Bit (Part # 80012600)



Iron temperature procedure (cont.)



3/8" Hex Screw



Thermal Switch Tube



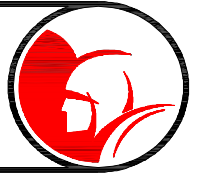
3/16" Allen Key



Thermal Switch Screw



Qualification Testing

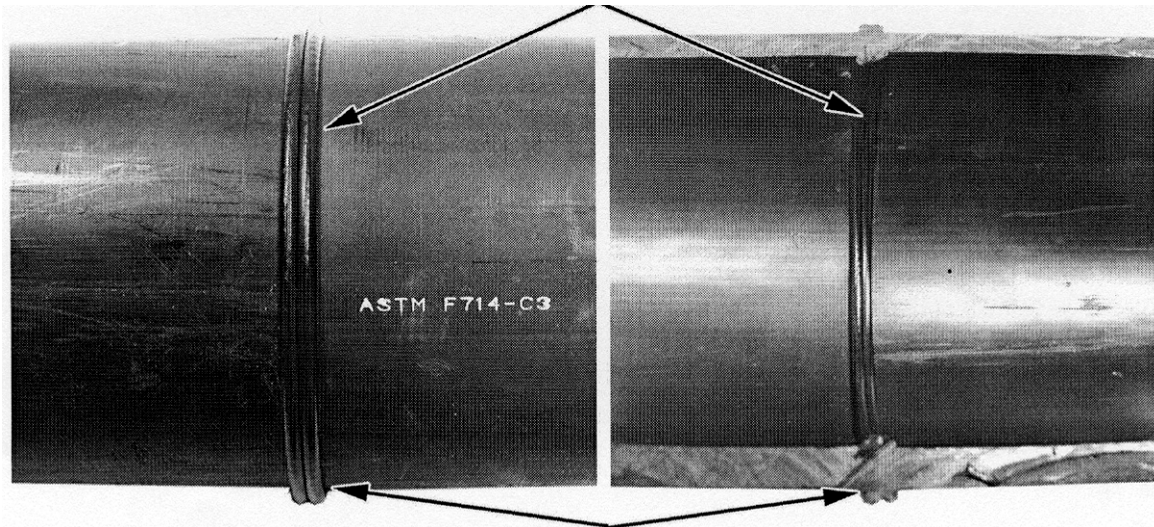


BUTT FUSION QUALIFICATION TESTING

It is important to confirm the operators' procedure, pressures and times for each type and size of pipe by testing fused samples to assure the quality of joints used for an installation.

1. Allow the joint to cool for at least one hour before subjecting to a bend test.

UNIFORM DOUBLE MELT BEAD ROLLED BACK ON BOTH SIDES NO GAPS OR VOIDS



NO MISALIGNMENT OF PIPE ENDS

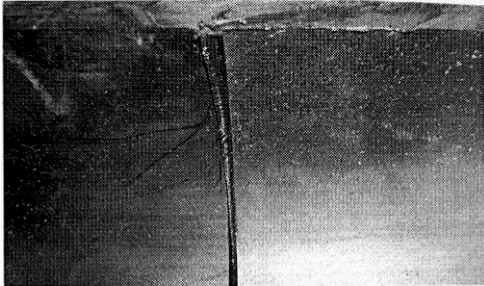
2. Cut at least 3 strips 1" wide lengthwise through the butt fusion so that about 8" of pipe remains on each side of the joint.
3. Hold each strip at the ends, and bend the sample as shown.
4. Continue to hold each sample in the bent position, and thoroughly examine the entire fusion area. If any separation, cracks, or voids are observed, the fusion is not satisfactory.
5. A joint is considered satisfactory if it is completely free of cracks or voids in the fusion area.



Qualification Testing



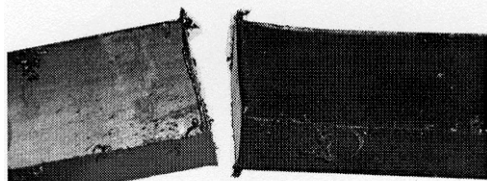
PIPE ENDS MISALIGNED
BEADS MELTED ON ONE SIDE ONLY



If the pipe was not correctly faced prior to fusion, instead of a uniform double melt bead rolled back on both sides of the joint, the melt bead will only be on one side of the joint. Bend test samples will break when bent.

If the pipe was not properly aligned prior to fusion, the joint will also be mis-aligned. Bend test samples will break when bent.

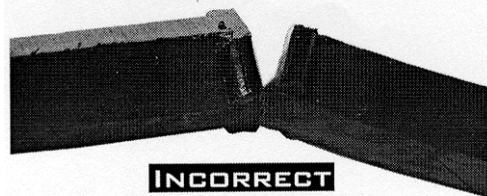
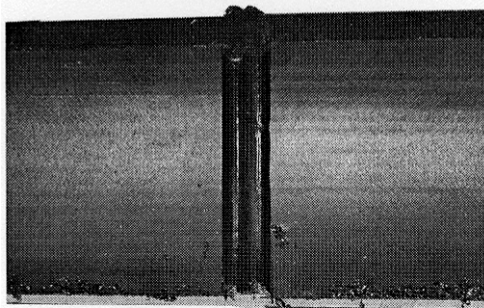
If excessive pressure was applied during the melting cycle, the joint will appear to be satisfactory with a uniform double melt bead rolled back on both sides of the joint. Bend test samples will break when bent.



INCORRECT

BREAKS WHEN BENT

BEAD MORE THAN 1/8" WIDE



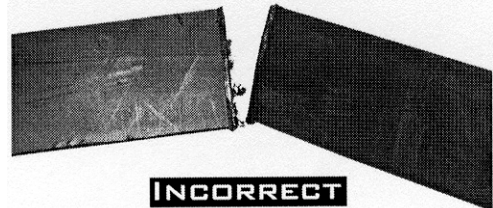
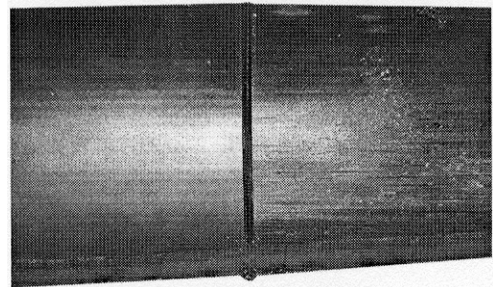
INCORRECT

BREAKS WHEN BENT

If excessive fusion pressure was used, the bead will be oversize. Bend test samples will break when bent.

The technical data contained herein has been provided as a guide to the operation of the Spartan Tool Fusion Machine. Many types of polyethylene pipe are manufactured today, Spartan Tool strongly recommends that specific fusion instructions from the pipe manufacturer be followed along with these instructions.

BEAD LESS THAN 1/16" WIDE

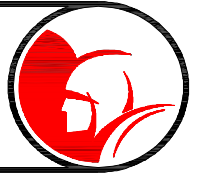


INCORRECT

BREAKS WHEN BENT



Maintenance



MAINTENANCE

This section contains maintenance instructions for this tool. Do not attempt any maintenance which you do not fully understand, nor that you cannot do accurately and safely with the tools and equipment available to you. If you encounter a problem that you do not understand or cannot solve, contact your Spartan Tool salesman or The Spartan Tool main office.

Ensure the Fusion Machine is in good operating order by routinely:	
Inspect sliding clamp mounting plate for "jerky" or uneven movement.	Turn machine over and clean the sliding clamp guides of any debris adhering to the surface.
Inspect pipe clamp assemblies.	Replace pipe clamp assembly if it slips on pipe with lock-down knobs fully tightened. Replace the lock-down knob assembly if the bearing, screw or nut is damaged.

Ensure the heating iron is in good operating order by routinely:	
Inspect heating iron plate for plastic deposits.	Heat up iron and remove plastic deposits with a natural fiber cloth or a small piece of wood.
Inspect heating iron plate for damage to non-stick coating.	If any damage can be seen in the non-stick coating it must be re-coated.



Specifications



Ensure the power facing tool is in good operating order by routinely:

Inspect shavings from facing pipe. If the shavings are not long and continuous or excessive pressure is required in facing, the facing blades are dull.

Contact Spartan Tool to purchase a new set of replacement facer blades.

SPECIFICATIONS

GENERAL		80010500
Max. Pipe Diameter:		6"
Net Weight (not including pipe inserts, iron, or facing tool):		69 lbs.
Unit Dimensions:		15 1/2" L x 17" W x 18 1/2" H
Power Facing Tool:		550 rpm, 7A, 120 Volts
Heating Iron:		1500 W, 60 Hz, 120 Volts
Heating Iron Temperature:		Pre-set to 500°F (260°C)

FUSION MACHINE	
Fusion Machine	80010500
Heating Iron	80011200
Power Facing Tool	80011300
Torque Bar	80011400
Hot Box	80011500

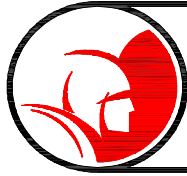


Optional Accessories



Description	Part Number
3" INSERT, LOWER CLAMP	82022200
3" INSERT, UPPER CLAMP	82022300
3" INSERT, REAR SUPPORT	82022400

*** (2 OF BOTH THE LOWER & UPPER INSERTS ARE REQUIRED FOR OPERATION)



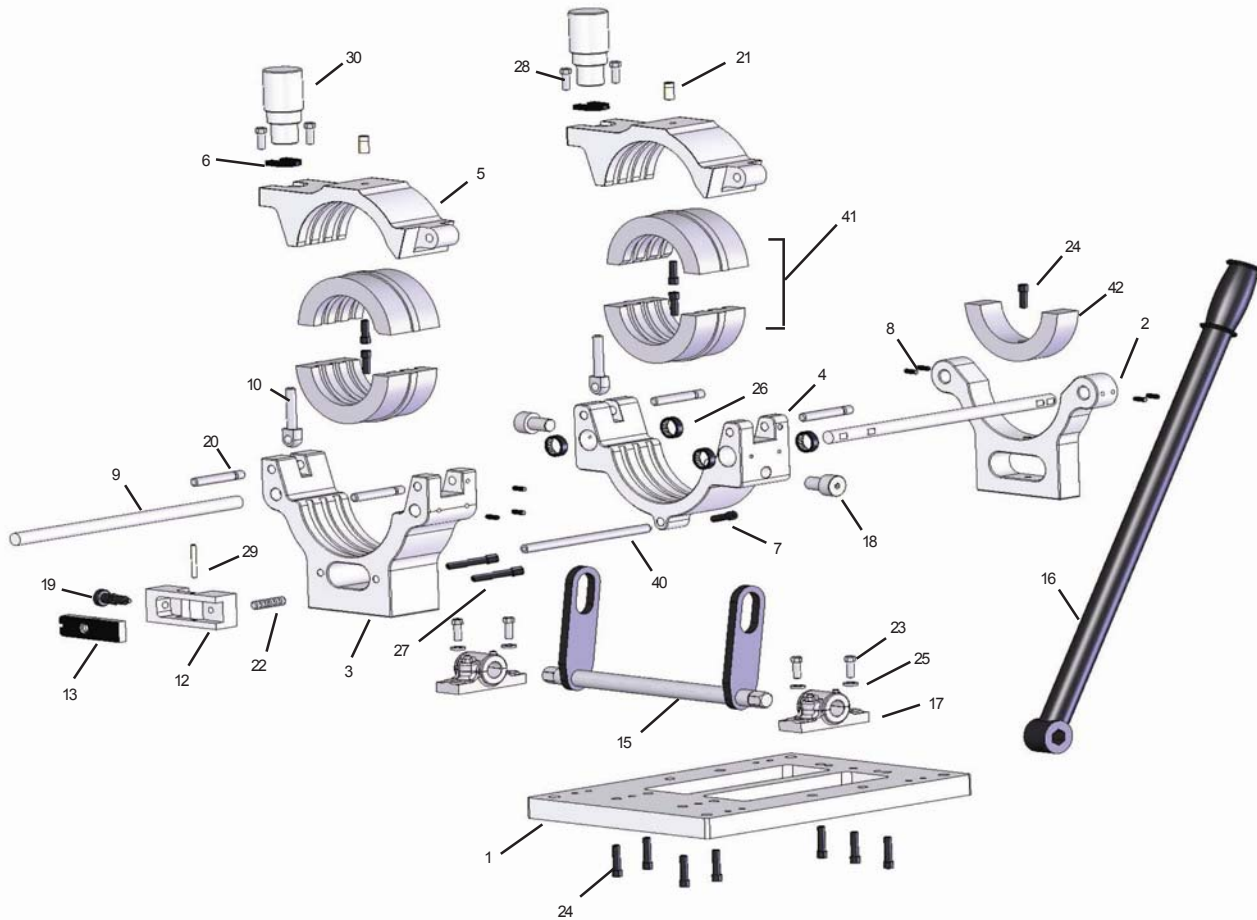
Final Assembly - 80010500



Item	Qty	Part Number	Description
1	1	80010501	BASE PLATE
2	1	80010502	REAR SUPPORT
3	1	80010503	RIGID LOWER CLAMP
4	1	80010504	SLIDING LOWER CLAMP
5	2	80010505	UPPER CLAMP
6	2	80010506	KNOB CLAMP PAD
7	1	80010507	BUTTON HEAD CAP SCREW
8	12	80010508	SET SCREW
9	2	80010509	CLAMP SHAFT
10	2	80010510	SWING BOLT
12	1	80010512	LOCK BODY
13	1	80010513	LOCK PLATE
15	1	80010515	CRANK SHAFT ASSEMBLY
16	1	80010516	CRANK HANDLE
17	2	80010517	SPLIT SLEEVE BEARING
18	2	80010518	CAM ROLLER
19	1	80010519	SHOULDER PLUNGER
20	4	80010520	PIN, HINGE
21	2	80010521	GUIDE PIN
22	1	80010522	SPRING
23	4	80010523	SERRATED HEX BOLT
24	12	80010524	SOCKET HEAD CAP SCREW
25	4	80010525	WASHER
26	4	80010526	LINEAR ROLL BEARING
27	2	80010527	LOCK KNOB BOLT
28	4	80010528	KNOB CLAMP SCREWS
29	1	80010529	DOWEL PIN
30	2	80010530	CLAMP KNOB
40	1	80010140	ROD, LOCKING MECHANISM
41	2	82022900	4" INSERT, UPPER & LOWER CLAMP
42	1	82023000	4" INSERT, REAR SUPPORT
43	1	80011200	HEATING IRON
44	1	80011300	POWER FACING TOOL
45	1	80011500	HOT BOX

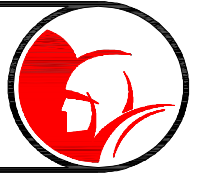


Final Assembly - 80010500





Final Assembly - 80010500



80011200 Heating Iron



80011500 Hot Box



80010550 Blade Set with Shims

80011300 Power Facing Tool



ONE YEAR WARRANTY



Spartan Tool warrants its equipment to be free from defects in material and workmanship for one year from the date of purchase. To obtain warranty service, a purchaser should notify Spartan Tool in writing, at the address provided below, within the warranty period, and Spartan Tool will direct where to take or send the equipment for service. If the defect is covered by the warranty, Spartan Tool will repair or replace, at its option, the defective equipment, without charge for labor or materials. (Freight and insurance are the purchaser's responsibility.)

This warranty is limited to the original retail purchaser and is not transferable. Spartan Tool assumes no responsibility for damage due to accident, neglect, abuse, tampering or misuse, nor damage from repairs or alterations by others. This warranty does not cover damage to the equipment resulting from the use of replacement parts other than Spartan Tool parts.

Spartan Tool's sole obligation and the original retail purchaser's exclusive remedy under this warranty shall be for repair or replacement as described above. ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL SPARTAN TOOL BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

SPARTAN TOOL L.L.C.
MENDOTA, ILLINOIS 61342

Spartan Tool L.L.C. reserves the right to make changes at any time, without notice, to specifications and models and also discontinue models. The right is also reserved to change specifications or parts at any

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