GenFlex Roofing Systems

WELDING EQUIPMENT GUIDE

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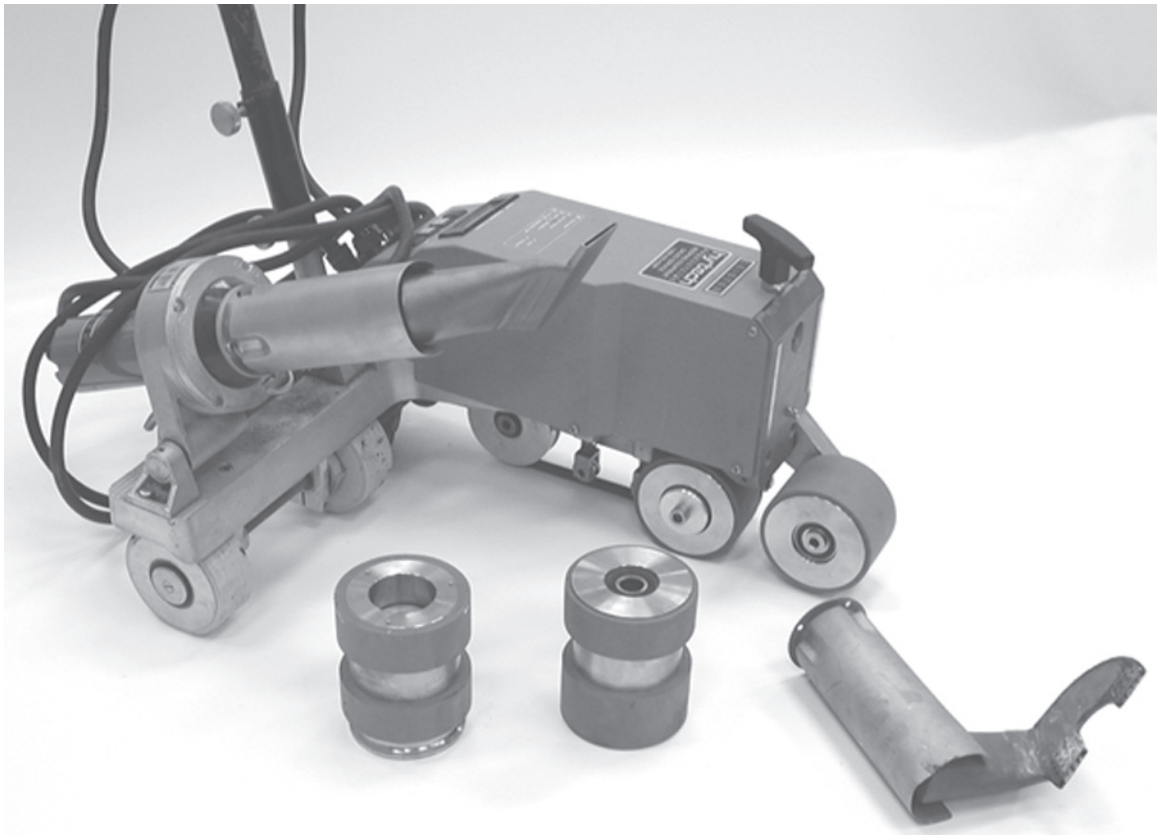

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I. EQUIPMENT RECOMMENDATIONS

Welding equipment shall be the type intended for hot air welding of thermoplastic roofing membranes with the following minimum performance requirements:

A. HAND HELD WELDER

Recommended Equipment		
Leister	Model 1A-Triac Hand Welder	
Voltage	Volts	120 V
Capacity	Watts	1400 W
Temperature	Centigrade	20° C-700° C, Infinity Control

WELDING NOZZLES

Wide-slot nozzle—40 mm
Wide-slot nozzle—40 mm, 60° bend
Narrow-slot nozzle—20 mm
Round nozzle—8 mm diameter

PORTABLE POWER GENERATORS

Minimum Power Rating	3000 W
Continuous Power Rating	2800 W
AC Output Voltage	120 V
Continuous Current Rating	23.3 amps
120V Full Power	23.3 amps

ACCESSORIES

Extension / power cords—12 gauge, 30.48 m (100') maximum length, no splices or connections
Rollers— one-arm, silicon pressure roller, 40 mm width, ball bearings on both sides
Cleaning Brush—brass bristle

B. AUTOMATIC WELDER

Recommended Equipment		
Leister	Varimat Automatic Welder	
Voltage	Volts	220 V
Capacity	Watts	4000 W
Temperature	Centigrade	20° C-1200° C, Infinite Control
Airflow	liters per minute	400-600 l/min. (manual air-slide)
Drive Speed	meters per minute	Up to 12 m, Infinite Control

NOTE: An oversized press wheel accessory available from Hy-Tech Products aids in the sealing of the encapsulated edge of thermoplastic membrane panels.To inquire about, or to purchase this accessory contact a Hy-Tech Products sales representative at 800-635-0384.

AUTOMATIC WELDER NOZZLES

40 mm seam width
80 mm seam width – (Dual Weld)

PORTABLE POWER GENERATOR

Electrical Specifications:	
Minimum Power Rating	7500 watts
Continuous Power Rating	5500 watts
AC Output Voltage	240 volts
Continuous Current Rating	45/23 amps

ACCESSORIES

Extension / power cords - 10 gauge, 3 conductor, 30.48 m (100') maximum length, no splices or connections
Rollers - One-arm, silicon pressure roller, 40 mm width, ball bearings on both sides
Cleaning Brush - brass bristle

II. SEAMING

A. SEAMING APPLICATION

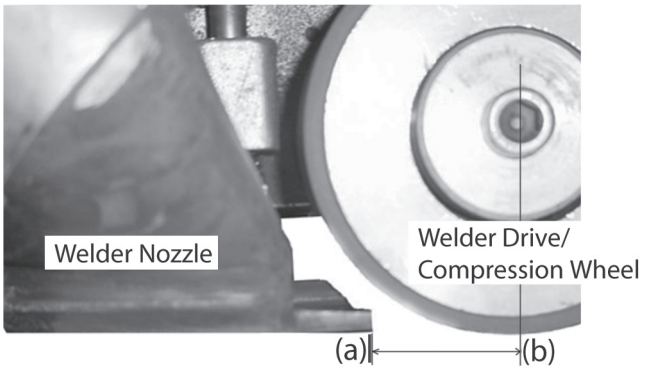
1. Layout membrane in accordance with current product specifications and allow the membrane to relax.
2. Be certain the seaming area of membrane is laying flat without wrinkles and positioned as required to achieve the desired seam width.
3. Set up automatic welder in accordance with the start-up settings listed below. Test welds should be performed on scrap material at the beginning of every day and again following each break in welding in excess of 30 minutes to be certain settings are correct for the changing ambient conditions. To confirm proper welder set-up the Peel Test of the sample weld must result in the destruction of either the bottom surface of the top membrane or the top surface of the bottom membrane. A properly welded seam sample when peeled apart will fully reveal the scrim (fabric reinforcement) on either the top or bottom membrane panel, or break the membrane reinforcement scrim.
4. Position automatic welder as close to the membrane panel end as possible and insert the welder nozzle into the seaming area to start the automatic welding process.

NOTE: Any membrane laid out but not welded the same day requires cleaning with the appropriate cleaner just prior to welding to remove any contaminants that may have come into contact with the seaming surfaces.

AUTOMATIC WELDER START-UP RECOMMENDATIONS (STANDARD MEMBRANES)

	TPO
Temperature	1000° F
Speed	10-14 ft/min
Airflow	100%
Front end weight	2 weight plates
Nozzle location	1 1/8”-1 3/8”*

CAUTION: Welding conditions will change due to a variety of factors. Ambient temperature, wind speed, thickness of membrane and color of membrane can all have an affect on your ability to correctly weld thermoplastic membranes.



Distance between leading edge of hot air welder nozzle (a) and centerline of drive/compression wheel (b) should be between 1 3/8″ and 1 5/8″.

NOTE: See photo above for proper alignment of leading edge of nozzle to centerline of primary drive wheel of robotic welder.

B. SEAM QUALITY VERIFICATION

To verify the quality of your seams, the following steps are required:

1. Destructive Seam Analysis

a) At the beginning of each day’s seam welding, the automatic welder operator should always perform a destructive seam analysis by cutting out a 1” x 6” (25 mm x 152 mm) cross section of the seam and perform a Peel Test of the seam sample. This test must result in the destruction of either the bottom surface of the top membrane or the top surface of the bottom membrane. A properly welded seam sample, when peeled apart will fully reveal the scrim (fabric reinforcement) on either the top or bottom membrane panel, or break the membrane reinforcement scrim.

b) This type of testing should be performed every time there is an interruption in the welding process (e.g. power failure, welder shut down, job site conditions change, or after lunch).
c) Always store membrane and flashing in its original unopened packaging away from sources of moisture and damage. Shipping wrappers are **not intended** to serve as long term weather protection or to be fully waterproof. Do not expose edges of un-welded seams to moisture.
d) Provide proper protection for stored products.
e) Do not phase the construction of the roof system. Finish seaming operations and flashing application daily on areas of membrane installed.

2. SEAM PROBING

ALL HOT AIR WELDED SEAMS MUST BE PHYSICALLY PROBED with a cotter key extractor (that has been filed down to a dull point). Below are tips for the correct probing of hot air welded seams to identify cold welds, voids, or other application deficiencies:

a) Allow seam to cool at least 30 minutes.
b) Run the probing tool at the edge of the seam while applying constant pressure.
c) Mark all voids and open welds.
d) Repair all open welds per current specifications by the end of each day.

As the installation contractor you are responsible for your own quality control. Do not wait for the field technical representative to identify workmanship deficiencies during the final inspection. The GenFlex technical inspection is performed for GenFlex benefit alone to be certain the roof system is in an acceptable condition before activating warranty coverage on the project.

NOTE: GenFlex Roofing Systems recommends that all contaminated seam areas be cleaned prior to starting the welding process.

III. CLEANING & PREPARATION

A. MEMBRANES

Cleaning Newly Installed Thermoplastic Membranes

Newly installed membrane may need to be cleaned. To remove light surface dirt wipe off with a clean cotton rag saturated with the appropriate GenFlex membrane cleaner. For TPO membranes use GenFlex Cleaner. Always allow membrane cleaners to properly flash-off prior to any hot air welding operations.

Cleaning Weathered or Contaminated Thermoplastic Membranes

Weathered membrane will require the use of a mild cleaner and water to remove the build-up of contaminants from the membrane surface. Mild soap cleaners suitable for use on GenFlex Roofing Systems thermoplastic membranes include Simple Green©, 409© , or Fantastic©. Use the following process.

1. Broom or brush any loose debris prior to cleaning the welding area of the membrane.
2. Wet the area of membrane to be cleaned and allow the membrane to soak for five minutes.
3. Mix one of the mild soap cleaners listed above with water in accordance with the manufacturers recommendations.
4. Using a soft bristle brush, dip the brush into the mixed solution and brush the area to be cleaned to loosen any dirt bonded to the roofing membrane.
5. Thoroughly rinse the area being cleaned with clean water to remove any residue before the cleaner is allowed to dry on the membrane.
6. Repeat as necessary until there is no contamination on the membrane to be welded. Several light cleanings are preferential to heavy duty scrubbing of the membrane which could cause abrasion damage to the roofing membrane.
7. Allow the cleaned area to thoroughly dry.
8. After the cleaned membrane has dried, use the appropriate GenFlex Roofing Systems solvent based cleaner to remove any soap residue.
9. Always allow membrane cleaner to properly flash-off prior to any hot air welding operations.

B. WELDER NOZZLE

Whenever there is a build-up of charred material on the tip of the welding nozzle or within the edge of the finished welded seam, it is recommended that you wire-brush the nozzle to remove all charred residue. Any charred material trapped within the completed seam must be repaired per current specifications.

IV. SAFETY INFORMATION FOR HOT AIR WELDING EQUIPMENT

A. Always follow the equipment manufacturer's safety recommendations.
B. Always disconnect the power source before servicing your equipment.
C. Keep clear of the hot air nozzle. Exposed skin will burn upon contact with the nozzle or direct air flow.
D. Always weld in a well-ventilated area. Do not inhale fumes caused by the heat seaming process.
E. Do not operate near flammable materials
F. Always cool the welder down before turning off. This will prolong the life of the heat element within the nozzle.

V. TROUBLESHOOTING TIPS

No Heat

1. Check electrical supply.
2. Check the heat setting on the welder for proper temperature.
3. Check the heating element.

Cold Weld

1. Check electrical supply.
2. Check for contamination in the seam area and follow cleaning instructions.
3. Check for heat and the heat setting on the welder for proper temperature.
4. Check for weights on the welder.
5. Adjust the temperature upward and or speed settings downward (slower) to increase the membrane temperature at the point of weld.
6. Check the nozzle position in relation to the press wheel (refer to section IIA for proper nozzle position).
7. Check to verify round belt or air dam is in place and operating correctly forming an air seal at rear of weld.
8. Possible clogged nozzle. Check nozzle for obstructions or debris.
9. Increase air flow.

Burning / Charring

1. Check for contamination in the seam area that is burning.
2. Adjust the temperature downward and or speed settings upward (faster) to decrease the membrane temperature at the point of weld.
3. Check for charred material on nozzle.
4. Check the nozzle position in relation to the press wheel (refer to section II-A for proper nozzle position).
5. Decrease air flow.

Selvage Edge Not Welded

1. Check electrical supply.
2. Check for contamination in the seam area.
3. Verify the machine is not running off track under the leading edge or membrane. The edge of the nozzle should be visible outside of the leading edge of membrane when the hot air welder is tracking properly.
4. Check nozzle position on welder. The edge of the nozzle should extend 1-2 mm beyond edge of press wheel and be visible while welding when properly positioned on welder.
5. Incorporate an oversized press wheel into your welding operation (see the note below section I-B).

Wrinkles When Welding

1. Adjust the machine tracking screw.
2. Check for fullness of membrane before welding. If the membrane panel exhibits signs of fullness prior to anchoring the membrane to the substrate, install mechanical securement on the appropriate panel layout mark near the panel end, go to opposite end of panel and pull the membrane edge taunt and apply another fastener assembly on the appropriate layout mark to secure the membrane in the taunt position. Then proceed to install the remaining fastener assemblies along the printed layout marks on the panel edge at the appropriate spacing interval.
3. While standing on the top of the unfastened membrane, the welder operator should apply positive foot pressure to the membrane panel in front of the welder to keep the leading edge of the membrane taunt until the welder passes that location.

Blisters In The Seam Area

1. Check for contamination in the seam area.
2. Check for a repeating pattern of blisters. If the blister pattern repeats itself, examine the press wheel to determine if the wheel is excessively worn or has contamination stuck to it. Clean or replace as required.
3. Cut into the blister to look for foaming or a honeycomb appearance. If identified, this would indicate that the membrane was not properly stored and was allowed to wick moisture into the reinforcement scrim. In some cases the blistering can be overcome by reducing the heat, speed and airflow to the minimum amount necessary to achieve a correct weld. Destructive testing is required to confirm settings after any adjustment to the welding equipment.

Unwelded Areas at T-Joints

1. Using a silicone hand roller, roll the membrane immediately behind the welder perpendicular to the seam direction and turn the roller onto its edge at the T-joint step downs to fully mate the membranes at the step off depression while the membrane is still molten.

Narrow Weld

1. Check for contamination in the seam area.
2. Check nozzle for obstructions or debris.
3. Check to verify round belt or air dam is in place and operating correctly forming an air seal at rear of weld.
4. Check nozzle alignment with the press wheel.
5. Confirm correct temperature / speed settings on welder.
6. Check nozzle position distance from press wheel (refer to set up settings in section II-A), the nozzle may need to be moved closer to the press wheel.
7. Inspect press wheel for damage or excessive wear.
8. Check airflow by conducting a heat element test (see below) with a piece of cardboard to verify obstruction free air flow.

Greasing (TPO)

1. This is the result of the material getting too hot but not burning. The adjustment to correct this issue is the same as Burning / Charring above.

Heat Element Testing

With the hot air welder set to the start-up settings, allow the welder to warm up to operating temperature. Position and hold a piece of cardboard, wood or a suitable material 2” (50.80 mm) in front of the welder nozzle at a 45° angle and observe the char pattern.

The cardboard should burn or char within 5 to 8 seconds and should be glowing within 10 to 12 seconds. Observation of the char pattern will indicate if there is an obstruction in the barrel or nozzle of the air tube. The char pattern will also indicate if there is a variation of air flow for any other reason.

If you are unable to generate heat with the welder, contact the welding equipment manufacturer or supplier for troubleshooting and diagnostic instructions.

VI. Tools and Accessories for Thermoplastic Membrane Welding

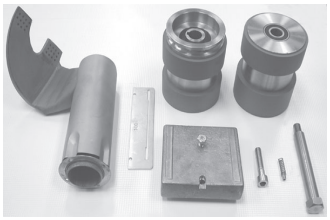
- Adequate and constant electrical roof top power source (240 volts)
- Leister automatic hot air welder
- Leister hand held hot air welder
- 40 mm silicon / teflon rollers
- Brass wire brush
- Probing tool and file
- Screw guns with clutch attachment
- Gloves (cotton or leather)
- Scissors
- Appropriate cleaning solvents and mild cleaning agents
- Cotton rags
- Measuring tape
- Chalk line
- Aluminum or duct tape
- Metal shears

VII. LEISTER VARIMAT DUAL WELD CONVERSION INSTRUCTIONS

Prior to Conversion: Please read entire conversion section to famailiarize yourself with the components included in the conversion kit, the tools required to conduct the conversion and the proper conversion method. Once the conversion is complete keep the instructions for future reference.

TOOLS REQUIRED (NOT INCLUDED)

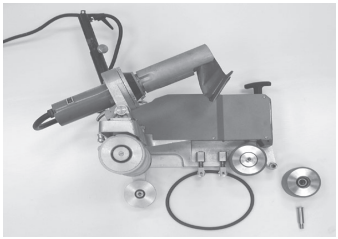
1. Flat Tip Screwdriver
2. 5/16” Allen Wrench
3. Slip Joint Pliers
4. 1” Socket
5. Socket Rachet



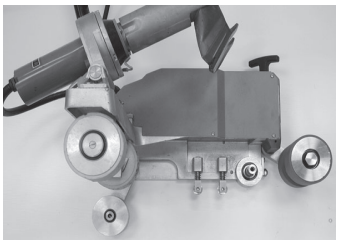
LEISTER VARIMAT DUAL WELD KIT CONTENTS (INCLUDED)

1. Dual Weld Nozzle
2. Weight
3. Primary Dual Weld Wheel
4. Secondary Dual Weld Wheel
5. Guide Stop
6. Primary Wheel Bolt
7. Threaded Spring
8. Secondary Wheel Bolt

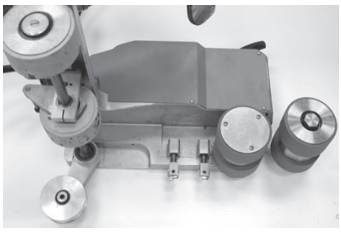
INSTRUCTIONS



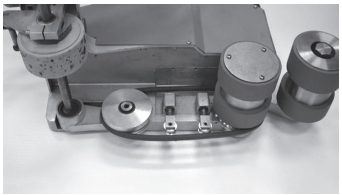
Step 1: Unplug Varimat from electrical source.
Step 2: Remove weight plates.
Step 3: Place Varimat on flat surface, laying it on it’s side.
Step 4: Remove green belt by slipping it over the left side rocker arm wheel.
Step 5: Using the 5/16” Allen Wrench remove secondary wheel from the rocker arm assembly.



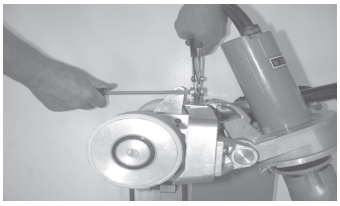
Step 6: Install secondary dual weld wheel with the narrow silicone band facing the wheel rocker arm. Using the 1” socket and rachet, tighten the secondary dual weld wheel bolt.
Step 7: Using the 5/16” allen wrench remove the primary wheel bolt washer and primary wheel from drive axle.



Step 8: Using a flat tip screwdriver, remove the three (3) screws from the primary dual weld wheel cover plate and then remove the plate.
Step 9: Place primary dual weld wheel with narrow silicone band facing bearing housing onto the drive axle. Place washer onto wheel with beveled side up. Using the 5/16” allen wrench tighten primary dual weld wheel bolt. Reinstall the cover palte removed during step 8.
Step 10: Swing left side rocker arm down, locate threaded hole for threaded spring and install spring hand tight into the hole.

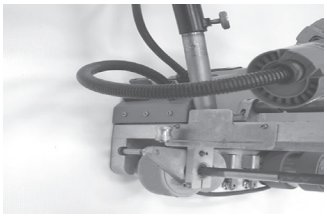


Step 11: Reinstall Belt by first placing it around the primary dual weld wheel and then around left side of rocker arm. Make certain belt is centered in all roller grooves.

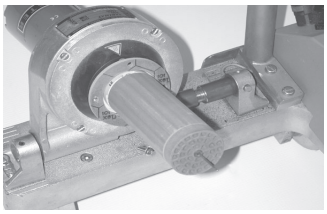


Step 12: Using pliers, firmly grasp slide knob and unscrew the guide knob screw using the flat tipped screwdriver.

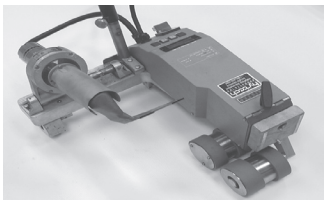
Step 13: Using the flat tipped screwdriver remove the two guide stop screws. Remove the guide stop.



Step 14: Install the dual weld guide stop and guide knob.



Step 15: Place Varimat in upright position. Remove the four nozzle screws and carefully pull zozzle toward you to remove nozzle from Varimat. Remove fiber tube insulator.



Step 16: Install dual weld nozzle. Ensure that the new fiber tube Insulator is inside dual weld nozzle. Attach ground wire.

Step 17: Reinstall weights. Reattach Varimat to power source and warm up to welding temperature and assemble a test weld to determine proper Varimat settings prior to seam welding in the roof system.