

824EP Butt Fusion System

Operator's Manual



CONNECTRA[®]
equipment

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Description

The purpose of this manual is to provide operating and maintenance instructions for the 824EP Butt Fusion System. The 824EP Butt Fusion System fuses polyethylene pipe quickly and accurately with the assistance of an electrically driven hydraulic system.

A hydraulic driven facing tool performs fast, square, butt joint facing, and pivots, hydraulically, in and out of the joining area of the jig.

Four hold down clamps precisely position the pipe. Two clamps are stationary, and two clamps are mounted on a traveling carriage. These clamps can position straight pipe lengths as well as tees, elbows, stub ends and other fittings.

The heating plate has coated non-stick replaceable skins and adjustable thermostatic controls to heat the pipe ends to a molten state. It pivots in and out hydraulically and is protected by an insulated shield.

The electric hydraulic system consists of a 5 horsepower electric motor coupled directly to a hydraulic piston pump. The operator interface consists of three pressure control adjustments and a selector to control the hydraulic flow through one of three pressure controls. The three pressure adjustments control the hydraulic force transmitted to the carriage assembly during the facing cycle, heat soak cycle, and the fusion/cooling cycle.

Two hydraulic pipe lifters with rollers eases pipe handling.

The 824EP Butt Fusion System has four wheels with pneumatic tires, and features front-end steering by a trailer-type tongue.

Features

- * Powerful ball bearing facing unit provides quick facing of heavy wall pipe, design driven by a durable hydraulic motor.
- * Proprietary hydraulic manifold allows presetting of three individual pressure zones for facing, heating and fusion cycles.
- * Thrust bearings in the speed handles and brass bushings at most hinge points.
- * Electrical design includes heavy-duty contractor, circuit breakers, volt meter and hour meter.
- * Ported for DataConnect or other competitive data recorders.
- * Rugged design with no "bells and whistles" means less maintenance expense.
- * A superior piece of equipment at an extraordinary price.
- * Limited three-year warranty.

Copy information listed on your Warranty Card for your records:

Model No. _____

Serial No. _____

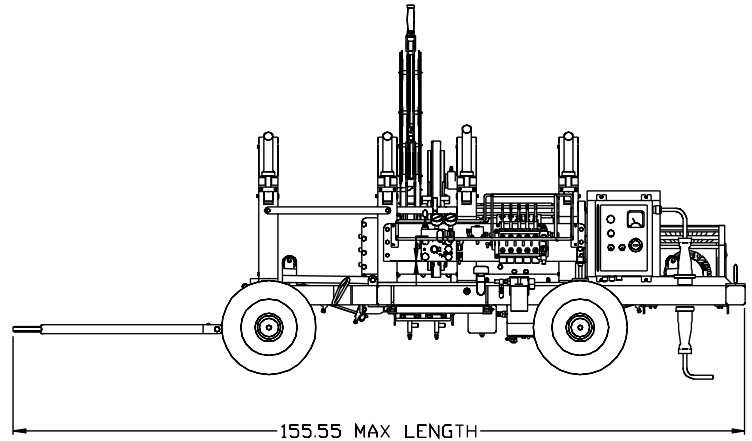
Date Received _____

Distributor _____

Specifications

Carriage Unit Dimensions

Length	112.95 inches	2,869 mm
Width	63.50 inches	1,613 mm
Height	53.24 inches	1,354 mm
Weight	2,700 pounds	1,225.5 kg
Ground Clearance	7.10 inches	180 mm



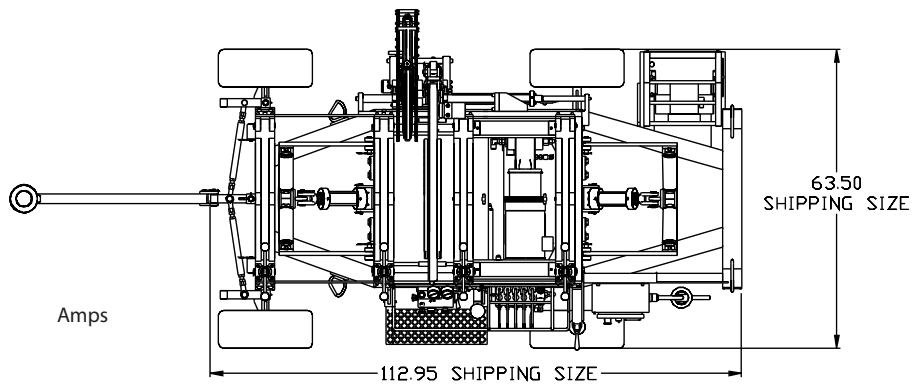
Capacities

Model 824EP - 8" IPS thru 24" IPS*

Model 824EP-630mm - 225mm thru 630 mm*

Electrical data

	Watts	Amps
240 VAC Three Phase		
Electric Motor	3,036	13.0
Heater	6,000	14.0
Total Power Consumption	9,036	27.0

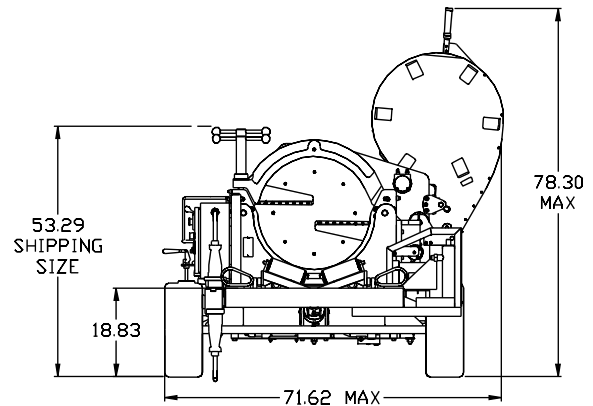


Generator Requirements

240VAC 3Phase 12K - 15K continuous operation depending on altitude and working conditions. (Please consult your generator supplier.)

* With the use of optional reducing liners.

Specifications are subject to change without notice.



Equipment Information

Controls

Before connecting this machinery to power, please read fully this manual and understand all of the machine functions.

This machinery is equipped with a PFI (Phase Fault Interrupt) which monitors for under voltage/over voltage and also phase reversal. Connect this machine to 240VAC 3 Phase power only. If after connecting this machine to power and you have the correct voltage (240VAC), the red PFI light, which is located on the front of the electrical control cabinet, is lit then the phases are reversed and you will need to swap two leads of the power cord at the source. This protection is in place to protect the hydraulic pump from turning in reverse direction and destroying the hydraulic pump.

The control box mounts on the cart. It contains the on/off switches for the hydraulic pump motor and the heater. The hour meter logs time in service and the volt meter indicates incoming voltage.

The numbering below corresponds to the numbering as shown on the hydraulic manifold.



1. Operating Knob: Turned to the “set drag” position when determining pressure required to overcome pipe drag. Returned to “operate” when ready to begin fusion operations.
2. Drag Control Knob: With Operate Knob (1) turned to “set drag”, this knob is turned clockwise to compensate for drag caused by weight of pipe or other operating conditions.
3. Function Selector Switch: Used to select the functions of facing, heating and fusion for purposes of setting desired working pressures.
4. Facing Pressure Knob: Used to set desired facing pressure.
5. Heating Pressure Knob: Used to set desired heating pressure.
6. Fusion Pressure Knob: Used to set desired fusing pressure.
7. Facer Motor Control: This lever is used to operate the facer
8. Directional Control Lever: Used to move the moveable carriage. Movement to the left brings the stationary and moveable clamps together. Movement to the right separates the clamps.
9. Carriage Pressure Gauge: Indicates pressure in the function selected by the Function Selector Switch (3).
10. System Pressure Gauge: This gauge indicates system operating pressure.

11. Carriage Speed Control: This control is used to set the high speed or low speed necessary to join different brands of pipe.

Safety Precautions

Read this manual carefully before attempting to operate this machine. Working with extreme temperatures and sharp facer blades can be dangerous if proper procedures are not followed. Know proper fusion techniques. Recommendations of pipe manufacturers regarding fusion temperatures, pressure, and techniques must be known to ensure proper fusion joints.

Only responsible, qualified, trained personnel should operate this equipment. Operating personnel should be familiar with the equipment, its functions, its potential hazards and proper precautionary measures.

To prevent tip-over, the fusion machine must be in a stable position. The equipment operator should be aware that potentially dangerous lateral and horizontal forces could exist within a length of pipe and should take precautions to guard against these forces. Apply hand break to prevent rolling.

Additionally, if the machine is positioned at an angle exceeding 15 degrees uphill from the operator side, there is the possibility that oil will drain from the hydraulic sump and cause damage to the pump. **USE OF THE MACHINE IN THIS POSITION IS AGAINST OPERATING PROCEDURES AND DAMAGE CAUSED BY SUCH USE IS NOT COVERED BY THE WARRANTY.**

Do not wear loose clothing, jewelry, or long loose

hair near operating machinery. Recommended safety apparel includes gloves, safety glasses, safety shoes, and hat or hair net.



Warnings and Cautions

The purpose of Warnings and Cautions in this manual is to call the operator's attention to the possible danger of injury to personnel and damage to equipment. The hazard alert sign above appears in this manual. When you see this sign, carefully read what it says, **YOUR SAFETY IS AT STAKE.**

Warning: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury and/or damage to equipment.

Caution: Indicates a potentially hazardous situation which, if not avoided, may result in personal injury and damage to equipment. It may also be used to alert against unsafe practices.



Electrical Safety Precautions

User power cords sized for the required amperage. Maintain power cords in good condition. Repair or replace worn or broken cords and connectors. The power system is four-wire grounded electricity. The electrical power source must be grounded to ensure personnel safety. Check power voltage at machine input, not generator output. Take appropriate precautions in wet or damp conditions. Protect wiring from hot surfaces and moving parts.

Always check rotation of electric hydraulic pump motor. Running the hydraulic pump in reverse will void the warranty.

Machine Operation Safety

Heating plate temperature reaches 450°F. (232° C.). Use caution when handling the plate to avoid burns. Gloves are recommended. Do not lift or pull the heating plate by its power cord. This heater is not explosion proof. Use ground fault devices with this (and all) electrical equipment.



Caution: Facer blades are extremely sharp.



Keep away from facing tool blades while equipment is in operation and during positioning and retracting the facing tool.

Note: Machine should be covered when used in inclement weather.

Do not force machine. It will work better if operated within design limits. Apply only slight pressure when facing. Excessive pressure will damage facer motor and drive chain. Maintain machine in top condition.

Use sharp facer blades and keep machine clean for best and safest performance. Follow lubrication instructions contained in this manual.

Before moving unit, secure the clamps and latch facer in the down position. If facer is not properly latched, damage to machine and/or personal injury could result.



Warning: Make sure facer is latched before turning on motor. If not, it may jump unexpectedly when turned on and could cause personal injury and/or damage to the equipment.

Make sure all hydraulic hoses and electrical cords are connected. Check hydraulic fluid level.

Operating Procedures

Preparation

Connect the machine to a proper power source: This equipment is designed to operate on **ALTERNATING CURRENT ONLY!** Operation on any other current will damage the heater and void the warranty.



Caution: Check rotation of the electric hydraulic pump motor. Operating this equipment with the hydraulic pump running in reverse will damage the equipment and void the warranty.

Connect heater to AC power source. Temperature was set at the factory to 450°F. Permit sufficient heating time to stabilize temperature reading on heater thermometer. This heater plate has two temperature controlled heating zones.



Caution: Use on AC power source only. If used on direct current (DC) power, the thermostat in the heater tool will be damaged.

Proper heating temperature is important in making a good fusion joint. The thermometer built into the heater tool indicates internal temperature and should be used only for reference. To assure the pipe manufacturer's temperature specifications are met, it is recommended that the surface temperature of the heater be measured prior to initial use and at reasonable intervals thereafter.

A hand-held surface pyrometer, [Connectra® part number 28-8554-1200-10], can be used for measuring this temperature. Several areas should be checked to ensure even heat distribution.



Warning: DISCONNECT electrical power BEFORE adjusting heater temperature. If not, the thermostick could be shorted out, resulting in severe electrical shock. Heater is not explosion proof.



Use the pyrometer to check temperature in the center and at several points around the edges. (Do not use temperature crayons.) Each reading should be +/- 5° of each other.

Temperature adjustments can be made by inserting a flat blade screwdriver into the thermostick adjusting screw. Turning clockwise will lower temperature and counterclockwise will raise temperature. One complete revolution will adjust temperature about 100°F. Do not turn the screw more than a ¼ revolution at a time, letting heater come to the new temperature before additional adjustments.



Caution: Do not adjust heater above 550°F. This may result in damage to heater components and cause deterioration of non-stick surface coating on face of the heater, which can result in contaminated fusion joints.

For butt-fusion of 24-inch IPS pipe and/or fittings, no liners are required. For fusion of smaller pipes and/or fittings, reduce liner size accordingly

To calculate proper gauge pressure, use the following formula:

Where

OD = Outside diameter (actual pipe diameter)

ID = Inside diameter

SDR = Standard dimensional ratio

WT = Wall thickness

IP = Interfacial Pressure (use pipe manufacturer's recommendation)

PA = Combined effective piston area (in²) for both cylinders

PA for the 824EP is 6.283 (in²).

*Drag Factor = Hydraulic fusion pressure required to move the carriage holding the pipe. 30 psi is generally accepted as a minimum.

To find wall thickness:

$$WT = \frac{OD}{SDR}$$

To find ID:

$$ID = OD - (WT \times 2)$$

To find carriage hydraulic gauge pressure (psi):

$$\text{Hydraulic Gauge Pressure} = \frac{(OD^2 - ID^2) \times .7854 \times IP}{PA} + \text{Drag Factor}$$

* The drag factor is an important parameter easily overlooked. If two long pieces of pipe are being fused the drag factor can easily reach several hundred psi.

Note: This data is provided as a guide only and is believed to be accurate and reliable. However, the user should always use the recommendations and procedures of the pipe manufacturer and/or the owner of the pipeline. Due to the variability of applications and service conditions, no warranty or guarantee, expressed or implied, is

given in conjunctions with the use of this data.



Caution: Make sure the directional control lever is in the neutral or centered position before starting up the hydraulic motor. If hydraulics are engaged, carriage could move unexpectedly and damage the heater shroud or result in personal injury.

Load Pipe or Fittings

Turn hydraulic motor and heater on/off switch on the control box to the “on” position.

Move the directional control lever to the right to open the carriage assemblies.



Open all of the hold down clamps.

Place two lengths of pipe into the fusion jig so that each end protrudes about two inches (5 cm) past the inside hold-down clamps. Load the shorter pipe section in the moveable clamps (carriage) so that, during joining, the hydraulic system moves the shorter pipe section.

Place the two pipe ends on suitable pipe supports and adjust to the level of the hold-down clamps. Care should be taken that pipe is not dragged across reducing inserts. Breakage of the insert

tang caused by such use is not covered by warranty. The pipe should always be raised by the pipe lifter or other mechanical means before being moved into, through, or out of the machine.

Close the hold-down clamps.

Hydraulic Flow/Pressure

The pressure gauge reading is affected by oil flow through the system. Normally, without the facer motor running, the pump is in a low flow condition, which has a minimal effect on the pressure settings in the system. When the facer motor is running, there is a higher flow rate in the system and a corresponding increase in return line pressure can be seen in the carriage pressure gauge.

It is important to set the following pressures with the factor motor not running. During facing operations there will be an increase in the carriage pressure due to the higher flows in the system. Carriage force is not affected since the increase in pressure is applied on both sides of the hydraulic cylinder.

Setting Fusion Pressure

Set the operating knob to “Operate”.

Turn the drag control knob all the way counter-clockwise.

Set the function selector switch to “Fusing”.

Refer to pipe manufacturer's specifications for proper interfacial pressure necessary to fuse the pipe. The fusion pressure chart, provided with

this manual, is designed to compute the appropriate pressure settings for the 824EP Butt Fusion System.

Setting Heating Pressure

Set the function selector switch to "Heating".

Turn the heating pressure knob all the way counterclockwise.

Setting Facing Pressure

Set the function selector switch to "Facing".

Turn the facing pressure knob clockwise to set about 50 - 100psi indication on the carriage pressure gauge. This may vary depending on pipe diameter and SDR.

Establish Drag

Set the operating knob to "Set Drag".

With the directional control lever held to the left, turn the Drag Control Knob clockwise until carriage starts to move toward facer, and overcome any drag due to pipe or other operating condition.

Return the operating knob to the "Operate" position.

Drag pressure will now be automatically added to fusing, heating, and facing functions.

Except for drag, these settings will not require change as long as the same type, SDR and size of pipe, are being fused. Drag may have to be re-

set, or at least checked, depending on changes in length of pipe in carriage or other field conditions.

Facing the Pipe

Clean the pipe ends, making sure they are free of foreign material. Inspect facer blades for sharpness. Replace if necessary.

When replacing blades, make sure facer plates are free of dirt and foreign material so that the blades will seat properly.



Caution: Facer blades are extremely sharp. Handle with care when replacing.

Lower the facing tool into place between the pipe ends. Make sure it locks the facing tool in place.

Set the function selector switch to the "Facing" position. Pull the facer motor control toward you to operate facer.

Move the pressure control lever to the left to bring the pipe ends to the facer.

As the pipe faces, adjust facing pressure up or down by turning the facing pressure knob clockwise or counterclockwise to achieve a continuous facing ribbon. Use no more pressure than the minimal amount required to produce this ribbon.

Facing is complete when the carriage and stationary clamp come into contact with the facer stops.

Turn off the facer. Do not open until facer stops rotating. Unlock and pivot the facing tool out of the machine.

Pipe/Fitting Alignment

Remove all shavings and inspect the pipe ends to see that they are completely faced. Bring the pipe ends together, and verify that alignment and squareness meet the pipe manufacturer's recommendations.

Note: Do not touch faced surface of the pipe or fittings. These surfaces must be kept free of dirt, water, body oil and other contaminants, which may cause defects in the fusion.

If necessary, repeat the facing operation and/or adjust the pipe in the fusion jig until alignment meets the pipe manufacturer's recommendations.

Check pipe alignment by closing the clamps to bring the pipe ends together. Carefully check pipe alignment and the fit of the faced surfaces. This can be done by running a straight edge across the seam to determine if one edge is raised above the other.

- If one pipe end is slightly higher than the other, lower it to the aligned position by tightening the hold-down clamp on that section of pipe. Do not loosen hold-down clamps to obtain alignment.
- If misalignment is side-to-side, slight rotation of the shorter section will help bring them into alignment.
- When joining coiled pipe, it may be necessary to rotate each end of pipe to make an "S" or "U" shape and re-clamp the pipe to provide acceptable alignment. Re-face pipe ends.

If any of the above adjustment are necessary, the facing operation must be repeated.

Bring pipe ends together, applying force equal to or greater than the fusion force to be used. Make sure the pipe does not slip.

When satisfactory alignment has been achieved, separate the clamp assemblies to make room for insertion of the heater.

Fusing the Pipe

Recheck heater for proper temperature recommended by pipe manufacturer. Use surface pyrometer to check temperature of heater face surface. If pyrometer indicates that temperature is not as recommended, refer to instructions for setting temperature before proceeding

Wipe both faces of the heater body with heater face towel or a soft clean cotton cloth to remove any contaminants. Do not use polyester material to clean heater faces. Place heater in position between two pipe ends.

NOTE: The heater is coated with a non-stick coating to minimize sticking and contamination of the molten plastic. This coating should be wiped clean before fusing each joint, using a clean, soft rag.



Caution: Heater tool is extremely hot and will burn exposed skin and damage clothing.

Set the function selector switch to "Fusing". Place the heater in position between two pipe ends.

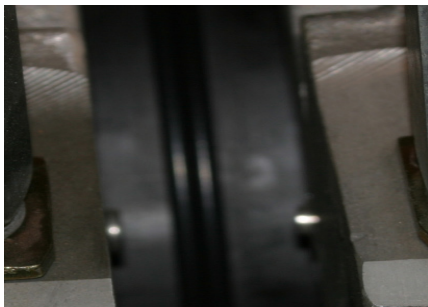
Move the directional control lever to bring the pipe ends against the heater.

Observe pipe ends. Once the melt pattern begins to occur, move the function selector valve to the "Heating" position, then return the directional control lever to the center position.

The 824EP comes with a carriage speed control knob located on the left side of the manifold. It can be used to adjust carriage speed depending on fusion conditions.

When the melt area conforms to what the pipe manufacturer recommends, move the function selector switch to the "Fusing" position.

Note: As pipe ends reach proper temperature, a melt bead will form where the pipe ends contact the heater. The "size of the bead" is often referred to by pipe manufacturers to determine if proper melt has been reached.



Move the directional control valve to the right to open the clamp assemblies.

Pivot the heater out of the machine.



Caution: Let heater cool in its protective shield.

Quickly inspect pipe ends to ensure melt is uniform. If melt is not uniform and does not meet pipe manufacturer's recommendations, the pipe must be re-faced, repeating at the facing operation.

Move the directional control lever to the left to close the carriage assemblies and to bring the melted pipe ends into contact, forming a double rollback bead as specified by the pipe manufacturer.

Check the carriage pressure meets the pipe manufacturer's requirements. If it does not meet the pipe manufacturer's requirement, the fusion joint will have to be cut out and a new fusion made. Fusion pressure should be maintained on the fusion joint throughout the cooling cycle.

Note: The exact amount of pressure to apply during fusion is determined by following pipe manufacturer's recommended procedures. Check pipe manufacturer's literature to determine how the bead should appear.

- Over-pressuring the fusion joint will cause the bead to be too large and could result in an inferior fusion. The melt can be pushed to the OD and into the ID of the fusion bead, creating a possible "cold joint" in the center section of the fusion.
- Under-pressuring the fusion joint could result in an inferior fusion due to insufficient interfacial contact in the melt area.
- Extreme care should be exercised to

maintain pressure during the fusion operation even if bead exceeds desired width. Reversing pressure can cause porosity in the fused area.

Allow the pipe to cool under pressure for the length of time recommended by the pipe manufacturer.

Move the directional control lever to the center position to release pressure.

Removing the Pipe

Note: It is best not to test, stress, pull, or rough-handle newly fused pipe until the minimum cooling time specified by the manufacturer has been reached.

Position facer/heater assembly between sliding clamps to minimize potential damage to equipment.

Open all of the clamps. Raise the pipe lifters on each end of the machine. This will raise the pipe out of the clamps enabling the pipe to be pulled through the machine or the machine to be pulled along under the pipe.

Fusing of Valves/Elbows

Full bore valves or elbows can be fused to pipe with the 824EP with no modifications to the machine.

Valves or elbows can be installed in either the movable or stationary clamp.

Maintenance

Guide Rods

Wipe clean daily to assure smooth travel of the carriage.

Hydraulic System

The system holds approximately 7 gallons of hydraulic fluid. Check the fluid daily and change the fluid after each 500 operating hours. Operation in an extremely dusty environment necessitates more frequent fluid changes.

Use only Chevron Premium ISO 68 hydraulic fluid.

To Bleed Air From the Hydraulic System

(Each Cylinder has two bleeder screws one on top at the front end and one on top at the rear end.)

- Loosen the bleeder screws on the front of both cylinders.
- Set the selector valve to the facing position and reduce the pressure for the facing operation to the lowest pressure by turning the adjustment knob counterclockwise until it reaches its stop. Advance the pressure slightly until the carriage starts to move slowly.
- Advance the carriage to the left and right using the carriage direction valve, until air bubbles are no longer present in the fluid coming from the bleeder screws.
- Tighten the bleeder screws.
- Loosen the bleeder screws at the rear of both cylinders.

- Set the selector valve to the facing position.
- Advance the carriage to the right until air bubbles are no longer present in the fluid coming from the bleeder screws.
- Tighten the bleeder screws.
- Repeat this bleed procedure as needed for smooth operation.

NOTE: Be sure to maintain oil level in the hydraulic reservoir.

Facer Assembly

Slow facing operation and rough pipe ends indicate dull blades. Replace dull blades.

The facer should be disassembled every three months and inspected. If needed, the bearing should be repacked with Mobil 28 grease or an equivalent.

Disassembly of Facer

Before disassembly, make sure all power is disconnected.

- Remove cutter blades.
- Remove left cutter plate.
- Remove cover, tension assembly, and chain.
- Remove sprocket, mount ring, and right cutter plate.
- Remove bearing retainers and bearing.
- Assemble in reverse order.

When changing blades, make sure facer plates are

free of dirt and foreign materials to ensure proper blade seating. Should other problems occur with the facer, consult the factory for repair.

Heater Assembly

Read these instructions before performing any maintenance on the 824EP heater assembly. Only a qualified technician should perform tool repair to assure work is done in accordance with approved electrical standards.

Should the heater fail to heat properly, it must be returned to the factory for repairs.

Some causes of heater plate malfunction include:

- Improper power source.
- Extension cord(s) too long.
- Extension cord(s) of inadequate load size.
- Generator running too slowly.

RECOMMENDATION: For servicing and /or re-application of the non-stick coating, return the heater to Connectra Fusion Technologies, LLC

Routine Maintenance

824EP heaters are normally set at 450°F at the factory. An information card accompanies the heater and specifies exactly what temperature is set. The temperature can be adjusted with a screwdriver. Clockwise rotation lowers the temperature and counterclockwise rotation raises it. One complete revolution will adjust temperature

about 100°F. Temperature should not be changed more than ¼ of a revolution at a time.

Should the heater plates become scratched or otherwise marred, remove them and return them to the factory for re-coating. Always disconnect power cord from power source before adjusting the temperature. This will eliminate the possibility of injury due to electric shock.

Keep the heater face clean with a cotton cloth. Do not use polyester material, it will stick to the surface.

Check filters and fluid level. Check all fittings for leaks.

Note: Chevron Premium ISO 68 hydraulic fluid is required - approximately seven (7) gallons.

Replacement/Accessory Parts

Facer Assembly	500225
Heater Assembly - 240VAC 3 PH	600215
Facer Blade Set	500301
Heater Butt Plate Set	600263
Heater Blanket	600160
Thermoswitch	V00169
Heater Element	V00651
Thermometer	V00168
Stub End Holder	800038
Pipe Stands	800150
Hydraulic Cylinder Seal Kit	300339

CONNECTRA FUSION
BUTT FUSION GAUGE PRESSURES
824 EP MACHINE--6.283 sq. in. CECA

IPS PIPE ONLY

IPS	IPS						SDR						
Nominal	Actual	7.0	7.3	9.0	9.3	11.0	1 1.5	13.5	15.5	17.0	21.0	26.0	32.5
8.000	8.625	341	330	275	268	230	221	191	168	154	126	103	83
10.000	10.750	530	512	428	416	358	344	297	261	240	196	160	129
12.000	12.750	746	720	602	585	504	484	418	368	337	276	225	182
14.000	14.000	900	869	726	705	607	583	504	443	407	333	272	219
16.000	16.000	1175	1134	948	921	793	762	658	579	531	435	355	286
18.000	18.000	1487	1436	1199	1165	1004	964	833	733	672	551	449	362
20.000	20.000	1836	1772	1481	1439	1239	1190	1028	905	830	680	554	447
22.000	22.000	2221	2145	1792	1741	1499	1440	1244	1095	1004	823	671	541
24.000	24.000	2644	2552	2132	2072	1784	1714	1481	1303	1195	979	798	644

Interfacial Pressure 75

Combined Effective Cylinder Area 6.283

You must also add drag pressure. This is the hydraulic pressure required to move the carriage while holding the pipe, and is easily overlooked. If two long pieces of pipe are being fused, the drag factor can reach several hundred pounds.

This data is provided as a guide only and is believed to be accurate and reliable. However, the user should always use the recommendations and procedures of the pipe manufacturer and/or the owner of the pipeline. Due to the variability of applications and service conditions, no warranty, expressed or implied, is given in conjunction with the use of this data.

CONNECTRA FUSION
BUTT FUSION GAUGE PRESSURES
824 EP MACHINE--6.283 sq. in. CECA

DIPS PIPE ONLY

DIPS	DIPS						SDR						
Nominal	Actual	7.0	7.3	9.0	9.3	11.0	11.5	13.5	15.5	17.0	21.0	26.0	32.5
8.000	9.050	376	363	303	295	254	244	211	185	170	139	114	92
10.000	11.100	565	546	456	443	382	367	317	279	256	209	171	138
12.000	13.200	800	772	645	627	540	519	448	394	362	296	242	195
16.000	17.400	1390	1342	1121	1089	938	901	778	685	628	515	420	338
18.000	19.500	1745	1685	1408	1368	1178	1132	978	860	789	646	527	425
20.000	21.600	2141	2067	1727	1678	1445	1388	1199	1055	968	793	647	522
24.000	25.800	3055	2950	2464	2394	2062	1981	1711	1506	1381	1132	923	744

Interfacial Pressure 75

Combined Effective Cylinder Area 6.283

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BUTT FUSION GAUGE PRESSURES
824 EP MACHINE--6.283 sq. in. CECA

IPS PIPE ONLY

IPS	IPS						SDR						
Nominal	Actual	7.0	7.3	9.0	9.3	11.0	1 1.5	13.5	15.5	17.0	21.0	26.0	32.5
8.000	8.625	273	264	220	214	184	177	153	135	123	101	82	67
10.000	10.750	424	410	342	333	286	275	238	209	192	157	128	103
12.000	12.750	597	576	481	468	403	387	334	294	270	221	180	145
14.000	14.000	720	695	580	564	486	467	403	355	325	267	217	175
16.000	16.000	940	908	758	737	634	609	526	463	425	348	284	229
18.000	18.000	1190	1149	960	932	803	771	666	586	538	441	359	290
20.000	20.000	1469	1418	1185	1151	991	952	823	724	664	544	444	358
22.000	22.000	1777	1716	1433	1393	1199	1152	995	876	803	658	537	433
24.000	24.000	2115	2042	1706	1657	1427	1371	1185	1042	956	783	639	515

Interfacial Pressure 60

Combined Effective Cylinder Area 6.283

You must also add drag pressure. This is the hydraulic pressure required to move the carriage while holding the pipe, and is easily overlooked. If two long pieces of pipe are being fused, the drag factor can reach several hundred pounds.

This data is provided as a guide only and is believed to be accurate and reliable. However, the user should always use the recommendations and procedures of the pipe manufacturer and/or the owner of the pipeline. Due to the variability of applications and service conditions, no warranty, expressed or implied, is given in conjunction with the use of this data.

CONNECTRA FUSION
BUTT FUSION GAUGE PRESSURES
824 EP MACHINE--6.283 sq. in. CECA

DIPS PIPE ONLY

DIPS	DIPS						SDR						
Nominal	Actual	7.0	7.3	9.0	9.3	11.0	11.5	13.5	15.5	17.0	21.0	26.0	32.5
8.000	9.050	301	290	243	236	203	195	168	148	136	111	91	73
10.000	11.100	452	437	365	355	305	293	253	223	205	168	137	110
12.000	13.200	640	618	516	501	432	415	358	315	289	237	193	156
16.000	17.400	1112	1073	897	871	750	721	623	548	503	412	336	271
18.000	19.500	1396	1348	1126	1094	942	905	782	688	631	517	422	340
20.000	21.600	1713	1654	1382	1343	1156	1111	960	844	775	634	517	417
24.000	25.800	2444	2360	1971	1915	1650	1585	1369	1205	1105	905	738	595

Interfacial Pressure 60

Combined Effective Cylinder Area 6.283

You must also add drag pressure. This is the hydraulic pressure required to move the carriage while holding the pipe, and is easily overlooked. If two long pieces of pipe are being fused, the drag factor can reach several hundred pounds.

This data is provided as a guide only and is believed to be accurate and reliable. However, the user should always use the recommendations and procedures of the pipe manufacturer and/or the owner of the pipeline. Due to the variability of applications and service conditions, no warranty, expressed or implied, is given in conjunction with the use of this data.

Statement of Warranty

Warranty/Disclaimers – Georg Fischer Central Plastics, LLC (“Seller”) warrants for a period of three (3) years from the date of invoice that the products sold under the order invoiced (the “Products”) will be free from defects in materials and workmanship, except for items supplied to Seller by other vendors in connection with the order. The items to which the warranty does not extend (the “Excluded Items”) include, without limitation, electrical devices, pumps, controls, and similar items. Seller assigns to the buyer of the Products, without recourse, any warranty on the Excluded Items which is provided by manufacturer thereof.

The warranty provided hereby does not apply to any product or component that has been repaired or altered by anyone other than Seller, and does not cover any failure of the Products which Seller determines to have been caused due to abuse, misuse, negligence or normal wear and tear.

As a condition to the buyer's exercise of its rights under this warranty, the Products must be returned to Seller's dock, freight prepaid, in Shawnee, Oklahoma, within ten (10) days of the date of failure, accompanied by a Return Goods Authorization (available from Seller) and information related to the claim. Buyer's REMEDIES UNDER THIS WARRANTY ARE LIMITED to, at Seller's sole option, the replacement or repair of the Products determined by Seller to be defective, or a refund of the purchase price, less an allowance for services rendered by the Product prior to the warranty claim. IN NO EVENT SHALL SELLER BE LIABLE FOR LOSS OF USE, DAMAGE TO OR LOSS OF PRODUCTS OR SERVICES, FAILURE TO REALIZE EXPECTED SAVINGS, FRUSTRATION OF ECONOMIC OR BUSINESS EXPECTATIONS, LOST REVENUE OR PROFITS, OR FOR ANY OTHER SPECIAL, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, EVEN IF THEY WERE FORESEEABLE OR SELLER WAS INFORMED OF THEIR POTENTIAL. Products repaired or replaced pursuant to this warranty will be delivered to buyer FOB Seller's dock in Shawnee, Oklahoma.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, WHICH ARE EXPRESSLY DISCLAIMED. SELLER NEITHER ASSUMES NOR AUTHORIZES ANY OTHER

PERSON TO MODIFY THESE TERMS AND CONDITIONS, WARRANT SPECIFIC APPLICATIONS, OR ASSUME FOR SELLER ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF ANY SELLER'S PRODUCT OTHER THAN AS PROVIDED IN THIS WARRANTY.

Recommendations - Any recommendations and suggestions provided by Seller concerning its products and the use thereof are based on tests and data believed to be reliable but are not intended to be complete or exhaustive. The user is responsible for determining the applicability of governmental regulations relating to the use of the products and for all other aspects of the use of Seller's products.

Actual use of the products by others is beyond the control of Seller and Seller makes no warranty or other agreement, expressed or implied, regarding any aspect of such use. Seller shall have no liability arising from the use of Seller's products by a third party.

Modifications – Seller may improve or otherwise modify its products without any obligation to improve or otherwise modify in any way any products (including any parts or accessories) previously sold by Seller.

Distributors – Seller's products are sold through authorized distributors, who determine the price, terms and conditions of sale.

Other – No partial invalidity of this agreement shall affect the remainder. This agreement shall be governed and construed in accordance with the laws of Oklahoma, excluding its laws relating to conflicts-of-law.

The sole purpose of the exclusive remedy contained in the limited Warranty shall be to provide repair or replacement of failed products, or to refund the purchase price of the failed product as explained above. This exclusive remedy shall not be deemed to have failed of its essential purpose so long as Seller agrees to repair or replace the failed product or to refund the purchase price as explained above.

Notes
