28EP Butt Fusion System

Operator's Manual

CONNECTRA®
simply fusion

Toll Free: 877.776.7100 Tel: 940.612.7100 Fax: 940.612.7105 Web Site: www.connectrafusion.com
Address: PO Box 1319 4400 West Hwy 82 Gainesville, Texas 76241.1319 USA

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Copy information listed on your Warranty Card for your records:

Modle No. _____

Serial No. _____

Date Received _____

Distributor _____

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Description

The purpose of this manual is to provide operating and maintenance instructions for the 28EP Butt Fusion System. The 28EP Butt Fusion System fuses polyethylene pipe quickly and accurately.

The 28EP Butt Fusion System uses centerline applied fusion force to butt fuse 2" IPS through 8" DIPS polyethylene pipe. Clamping jaws are sized for 8" DIPS pipe (9.05" OD). Easily insertable liners are used for pipe sizes down to 2".

Clamp liners are available for 11.25° mitered fusions, permitting fabrication of a 90° elbow in 4", 6" and 8" IPS and DIPS pipe sizes. Without modification, the clamping unit will also handle a full size 8" valve.

By removing one clamp, a section of pipe with a side outlet can be inserted into a stationary clamp and an extension can be fused to the side outlet.

True centerline fusion force provides even loading around the circumference of the pipe ends for symmetrical bead formation.

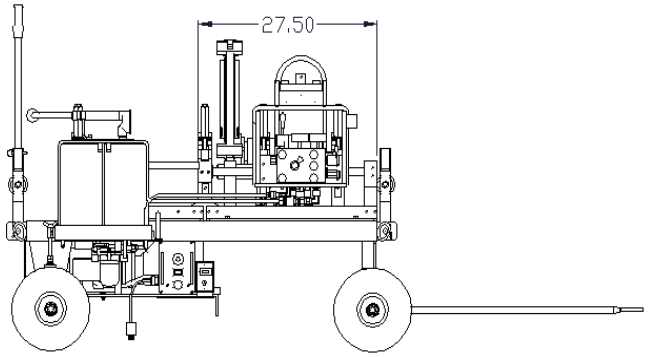
Features

* *Accommodates an impressive range of pipe sizes - from 2" through 8" and 63mm through 225mm.*
* *Miter joint capability handles up to 8" IPS and DIPS sizes.*
* *Three and four clamp in-ditch capabilities.*
* *Modular design cart with locking wheel comes standard and delivers excellent field maneuverability.*
* *Lightweight, hydraulic facer.*
* *Lightweight, narrow-profile heater for easy, one-handed operation.*
* *Incorporates a proportionally controlled heating element for maintaining heating temperatures within +/- 5°.*
* *Automatic carriage priority feature provides adequate pressure during the facing operation.*
* *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.*

Specifications

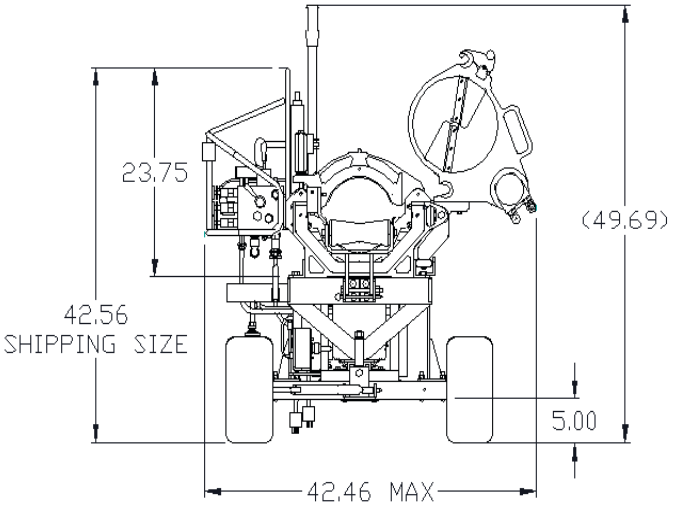
Carriage Unit Dimensions

Length	*28.88 inches*	*734 mm*
Width	*31.06 inches*	*784 mm*
Height	*23.75 inches*	*603 mm*
Weight	*173 pounds*	*78.5 kg*



Carriage Mounted on Frame

Length	*62.25 inches*	*1,581 mm*
Width	*36.88 inches*	*937 mm*
Height	*42.56 inches*	*1,081 mm*
Total Weight (all components)	***590 pounds***	***267.6 kg***



Capacities

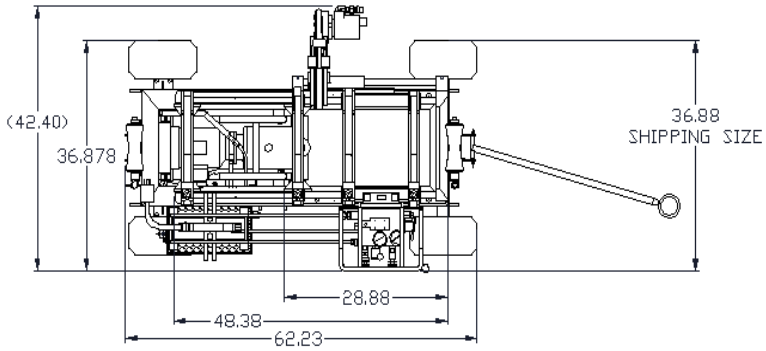
*Model 28EP - 2" IPS thru 8" DIPS**

*Model 28EP-225mm - 63mm thru 225 mm**

Electrical data

120 VAC Single Phase	***Watts***	***Amps***
Facer Motor	*2,200*	*18.3*
Heater	*2,047*	*17.0*
Total Power Consumption	***4,247***	***35.3***

240 VAC Single Phase	***Watts***	***Amps***
Facer Motor	*2,200*	*9.2*
Heater	*2,047*	*8.5*
Total Power Consumption	***4,247***	***17.7***



** With the use of optional reducing liners.*

Specifications are subject to change without notice.

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.

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

Use 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 a three-wire grounded system electricity. The electrical power source must be grounded to ensure personnel safety. Take appropriate precautions in wet or damp conditions. Protect wiring from hot surfaces and moving parts.

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. Do not operate heater in the presence of combustible atmosphere or in damp or wet conditions. In this case, heater should be brought to desired temperature then unplugged before taken into areas with a combustible atmosphere. Be careful not to scratch the non-stick coating on heater.

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

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 could damage equipment. 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. Torque generated by the turning of the facer motor may cause it to move unexpectedly if not latched. Secure heater carrier.

Operating Procedures

Preparation

Connect control box power cord to main power. Make sure power meets minimum specifications stated in the previous section.

Connect heater to receptacle on the control box. Permit sufficient preheating time to stabilize temperature reading on heater thermometer. This thermometer will indicate approximate surface temperature of the heater plates.

Set temperature recommended by the pipe manufacturer on the control dial.

Caution: Use on AC power source only. If used on direct current (DC) power, the heater conrtoler of 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.

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 +/- 10° of each other.

Adjust temperature dial on control box as necessary to obtain required surface temperature.

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.

Install correct liners as required when pipe smaller than 8" DIPS is to be fused. Snap liners into position. Liners are stamped upper and lower on the side. The stamped side goes toward facer.

If 4" IPS or smaller pipe is being fused, 4" DIPS liners will have to be installed in the clamps first, before installing the desired size liners.

Inspect facer blades for nicks, scratches, etc., that might affect facing. Replace if necessary. Disconnect unit from power source before replacing blades.

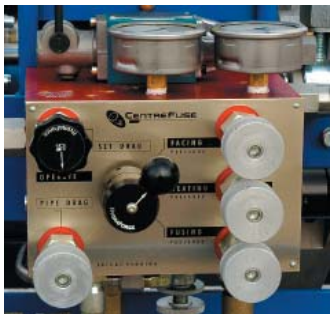
When replacing facer blades, make sure blade slots are free of dirt and foreign material so that the blades will seat properly.

Caution: Facer blades are extremely sharp.

Load Pipe or Fittings

Turn on/off switch on the control box to the "on" position.

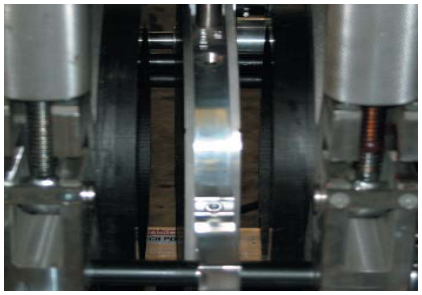
Move the directional control lever to the right to open the carriage assemblies.



Unlock the facing tool by lifting the catch at the lower front of the facing tool. Swing the facing tool out of the fusion jig.

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 other two pipe ends on suitable pipe supports and adjust to the level of the hold-down clamps. Close the hold-down clamps.

Hydraulic Flow/Pressure

Hydraulic oil flows continually 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".

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 ($in^{2)}$ for both cylinders
PA for the 28EP is 4.712 (in^2).
**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: $ID = OD - (WTx2)$

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.*

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given in conjunction with the use of this data.

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 50psi indication on the carriage pressure gauge.

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 reset, 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.***

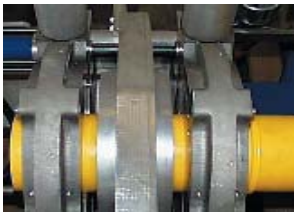
Lower the facer into facing position. Make sure it locks in position. Set the function selector switch to the "Facing" position.

Pull the facer motor control toward you to operate facer.

Move the directional 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, located on the guide rails.



Turn off the facer. Do not open until facer stops rotating. Then, raise the facer clear of the pipe.

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.

It is important to remove all shavings from pipe ends and machine base. Accumulated shavings can cause difficulty in proper operation of the unit and result in a faulty fusion of pipe.

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. Reface pipe ends.*

If any of the above alignments 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.

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

Set the function selector switch to "Fusing".

Place the heater in position between two pipe ends. The heater is supported by a pull off plate located at the top of the heater.

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 switch to the "Heating" position, then return the directional control lever to the center position.

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.

Remove the heater. The heater pull-off plate will help unstick the heater tool from the pipe ends.

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

Quickly inspect pipe ends to ensure melt is uniform. If melt is not uniform and does not meet pipe manufacturer's recommendations, replace the heater in its holder. The pipe must be refaced, repeating at the facing operation.

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

Check carriage pressure gauge to make sure fusion pressure meets manufacturer's requirements. If it does not meet manufacturer's requirements, the fusion will have to be cut out and a new fusion made.

Place heater in its holder.

⚠ ***Caution: Let heater cool in atmosphere. Do not submerge into water for cooling. Internal components will be damaged.***

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 out of 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.*

Maintain specified pressure until pipe cools. Do not adjust controls until cooling time has elapsed.

Note: Should power/pressure be lost during the cooling period, the fusion should be cut out and redone.

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

Remove 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.

Open clamps. Use the operating handle on both ends to raise pipe rollers under pipe. Relocate lock pins to make sure the pipe rollers stay in the "up" position. This raises the pipe out of the clamp area, permitting the pipe to be pulled out, or the fusion machine to be pulled along under the pipe.

Fusing of Valves/Elbows

Full port valves or elbows can be fused to pipe with the 28EP with no modifications to the machine.

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

In the Ditch Pipe Fusion

If working in tight quarters, such as a ditch, the facer can be removed and the top clamps can be removed by pulling a pin in each.

Mitered Fusions

Using special 4, 6, and 8" IPS and DIPS liner sizes, mitered fusions can be made. Pipe ends are faced at 11.25°.

4 and 6" pipe is handled with just a change in the liners in the inner two clamps (one stationary and one moveable). For 4 AND 6", the top and

bottom liners must be changed. On 8", the top clamp is changed as well.

Mitered liners are accessory items.

Maintenance

Keeping the 28EP Butt Fusion System clean and lubricated is the most important part of field maintenance. Mechanical linkages must operate freely for the unit to work properly.

Guide Rods and Clamps

Wipe clean daily to assure smooth travel of the carriage.

Guide Rods are lubricated by the hydraulic system. Keep guide rods clean and free from contaminants.

Hydraulic System

Inspect the hydraulic hoses periodically for leaks. Change the hydraulic fluid and filter every 6 months or after each 500 operating hours, whichever comes first. Operation in an extremely dusty environment necessitates more frequent changes.

When the hydraulic system requires changing, drain as follows:

- *Remove the drain plug on the bottom of the reservoir and dispose of the fluid properly.*
- *Replace the drain plug and inspect the sealing o-ring to determine that it has not been damaged.*
- *Fill the reservoir with clean fluid and replace filter.*

Facer Assembly

Keep hydraulic connections clean to avoid contamination, especially when hoses are disconnected.

Slow facing operation and rough pipe ends indicate dull blades. Replace dull blades. Inspect facer blades regularly and replace as necessary.

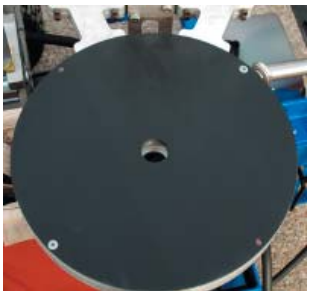
When changing blades, make sure blade slots are free of dirt and foreign material to ensure proper blade seating.

⚠ ***Warning: Facer blades are sharp and can cause a severe cut. Handle blade and cutting head with great care.***

Heater Assembly

Read these instructions before performing any maintenance on the 28EP heater assembly. Only a qualified technician should perform tool repair to assure work is done in accordance with approved electrical standards.

Keep the heater face clean with a cotton cloth. Do not use polyester material. It will stick to the surface and damage the coating.



Should the heater plates become scratched or otherwise marred, remove them and return them to the factory for recoating. They can be removed by removing screws around the perimeter. 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.*

Cart Assembly

Check air in tires periodically and maintain at 14 psi. Lubricate wheel fittings periodically.

Replacment/Accessory Parts

Facer Assembly	*28-8208-9500-30*
Heater Assembly - 120V	*28-8208-3500-30*
Heater Assembly - 240V	*28-8208-3110-30*
Facer Blade Set	*28-0208-4560-40*
Heater Butt Plate Set	*28-0208-3570-40*
Heater Bag	*28-8208-3520-10*
Heater Frame	*28-8208-3510-20*
RTD Temperature Sensor	*00-6978-0001-00*
Heater Controller/Dial	*00-6973-0001-00*
Heater Element	*28-8208-3540-20*
Thermometer	*28-8559-0410-10*
Stub End Holder	*800030*
Pipe Stands	*800161*
Hydraulic Extension Hose - 25 ft	*28-8208-5100-30*
Hydraulic Extension Hose - 50 ft	*28-8218-5100-30*
Hydraulic Cylinder Seal Kit	*28-0208-9750-40*
Hydraulic Power Unit	*28-8208-5400-30*

CONNECTRA FUSION
BUTT FUSION GAUGE PRESSURES
28 EP MACHINE--4.712 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
2.000	2.375	35	33	28	27	23	22	19	17	16	13	10	8
3.000	3.500	75	72	60	59	51	49	42	37	34	28	23	18
4.000	4.500	124	120	100	97	84	80	69	61	56	46	37	30
5.000	5.375	177	171	143	139	119	115	99	87	80	65	53	43
5.000	5.563	189	183	153	148	128	123	106	93	86	70	57	46
6.000	6.625	269	259	217	211	181	174	150	132	121	99	81	65
7.000	7.125	311	300	251	243	210	201	174	153	140	115	94	76
8.000	8.625	455	440	367	357	307	295	255	224	206	169	137	111

Interfacial Pressure	75
Combined Effective Cylinder Area	4.712

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
28 EP MACHINE--4.712 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
4.000	4.800	141	136	114	111	95	91	79	69	64	52	43	34
6.000	6.900	291	281	235	228	197	189	163	144	132	108	88	71
8.000	9.050	501	484	404	393	338	325	281	247	227	186	151	122

Interfacial Pressure 75

Combined Effective Cylinder Area 4.712

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BUTT FUSION GAUGE PRESSURES
28 EP MACHINE--4.712 sq. in. CECA

IPS PIPE ONLY

IPS	IPS						SDR						
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2.000	2.375	28	27	22	22	19	18	15	14	12	10	8	7
3.000	3.500	60	58	48	47	40	39	34	30	27	22	18	15
4.000	4.500	99	96	80	78	67	64	56	49	45	37	30	24
5.000	5.375	141	137	114	111	95	92	79	70	64	52	43	34
5.000	5.563	152	146	122	119	102	98	85	75	69	56	46	37
6.000	6.625	215	207	173	168	145	139	120	106	97	80	65	52
7.000	7.125	249	240	200	195	168	161	139	123	112	92	75	61
8.000	8.625	364	352	294	285	246	236	204	180	165	135	110	89

Interfacial Pressure	60
Combined Effective Cylinder Area	4.712

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BUTT FUSION GAUGE PRESSURES
28 EP MACHINE--4.712 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
4.000	4.800	113	109	91	88	76	73	63	56	51	42	34	27
6.000	6.900	233	225	188	183	157	151	131	115	105	86	70	57
8.000	9.050	401	387	323	314	271	260	225	198	181	149	121	98

Interfacial Pressure 60

Combined Effective Cylinder Area 4.712

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 *– Connectra Fusion Technologies, 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 Gainesville, Texas, within ten (15) 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 Gainesville, Texas.

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 Texas, 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

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