

## Engineering Specification

Job Name \_\_\_\_\_

Contractor Signature \_\_\_\_\_

Orion Representative \_\_\_\_\_

Approval Date \_\_\_\_\_

Quantity Required \_\_\_\_\_

Contractor's P.O. No. \_\_\_\_\_

# Plenum Plus PVDF Piping Systems

## No Hub PVDF Sch 40

### Specification

Orion Plenum Plus PVDF chemical waste piping systems will be manufactured to the dimensions and tolerances of ASTM F1673 from PVDF material in 10 ft lengths. Pipe will be cylindrical, straight and supplied with factory grooves. The PVDF material will conform to ASTM D3222.

Call customer service if you need assistance with technical details.



B 181.3



Full Listing

### NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

### Pipe & Fitting Availability

Pipe & Fittings	Sizes
Pipe	1 1/2" - 6"
45° Elbows - 45E 1/8 Bend	1 1/2" - 6"
90° Elbows - 90E 1/4 Bend	1 1/2" - 6"
Long Sweep 90° Elbow - LS90E	1 1/2" - 6"
Sanitary Tee - 90T	1 1/2" - 4"
Reducing Sanitary Tee - R90T	2 x 1 1/2" x 4" x 3"
Double Sanitary Tee - D90T	1 1/2" x 4"
Reducing Double Sanitary Tee - RD90T	2" x 1 1/2" - 4" x 3"
45° Lateral Wyes - 45Y	1 1/2" - 6"
Reducing Lateral Wye - R45Y	2" x 1 1/2" - 6 x 4"
Double Lateral Wye - D45Y	1 1/2" - 6"
Reducing Double Lateral Wye - RD45Y	2" x 1 1/2" - 6" x 4"
Long Turn Wye - LTY	1 1/2" - 6"
Reducing Long Turn Wye - RLTY	2" x 1 1/2" - 6" x 4"
Double Long Turn Wye - DLT	1 1/2" x 6"
Reducing Double Long Turn Wye - RDLTY	2" x 1 1/2" - 6" x 4"
Male Adapter - MA	1 1/2" - 6"
Female Adapter - FA	1 1/2" - 6"
Cleanout Adapter w/Plug - COA	1 1/2" - 6"
Cleanout Adapter - COA	1 1/2" - 6"
Countersunk Cleanout Plug - COPLUGCSK	2" - 4"
CAP	1 1/2" - 6"
Reducer	2" x 1 1/2" - 6" x 4"
P-Trap - UTP - Adj. Trap	1 1/2" - 2"
Running Trap - UTR - Adj. Trap	1 1/2" - 2"
P-Trap RBP - Non-Adj. Trap	1 1/2" - 4"
Sink Tailpiece Loose Nut Adapter - RLNS	1 1/2" - 2"
Sink Tailpiece Loose Nut Adapter w/Ext. - RLNS x 12"	1 1/2" - 2"
Sink Tailpiece Slip Joint Adapter - SJA	1 1/2" - 2"
Sink Tailpiece Slip Joint Adapter w/12" Ext. - SJA x 12"	1 1/2" - 2"
Swivel Drum Trap - DT-1	1 1/2" - 2"
Floor Drain - FD-1	2" - 6"

**Note:** All dimensions are +/- 0.25". All weights are approximate.

### Joining Methods:

No Hub Mechanical Joint

Rionfuse CF (Clamp-Free) Electrofusion

Socket Fusion

Orion product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Orion Technical Service. Orion reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Orion products previously or subsequently sold.



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# Physical Properties

PROPERTY	UNIT	PP VALUE	FRPP VALUE	PVDF VALUE	TEST METHOD STANDARD *
Nominal Melt Flow (at 230°C / 2.16 kg)	g / 10 min.	0.75	0.75	7.0 - 28.0	ASTM D 1238
Specific Gravity	-	0.91	0.91	1.78	ASTM D 792
Tensile Strength at Yield	psi	4,200	4,200	6,500	ASTM D 638
Elongation at Yield	%	12.5	12.5	20 - 100	ASTM D 638
Modulus of Elasticity	psi	175,000	175,000	210,000	ASTM D 790A
Izod Impact, Notched (at 73°F - 1/8" bar)	ft-lb / in	1.3	1.3	3.8	ASTM D 256
Rockwell Hardness	R scale	78	78	-	ASTM D 785
Hardness	Shore D	-	-	78	ASTM D 2240
Melting Point	°F / °C	324 / 162	324 / 162	330 / 166	ASTM D 789 ASTM D 3418
Limiting Oxygen Index	%	17	17	44	ASTM D 2863
Water Absorption (24 hrs at 73°F)	%	0.02	0.02	0.03	ASTM D 570
Coefficient of Thermal Expansion	in / in °F x 10 <sup>-5</sup>	6.1	6.1	7.4	ASTM D 696
Flame Spread	-	-	62	5	ASTM E 84
Smoke Developed	-	-	373	35	ASTM E 84
Underwriters Lab Rating	-	SLOW BURNING	V-2	V-0	UL 94
Material	cell class	PP 0438	PP 0438	Type I, Grade II	ASTM D 4101 ASTM D 3222
Corrosive Waste Drainage Suitability	system	COMPLIES	COMPLIES	COMPLIES	ASTM F 1412 ASTM F 1673

\* Where test method standards differ between materials, the standard for PP and FRPP appears above the standard for PVDF.

## Maximum Service Temperatures

This general guide is based on water as the medium.

Maximum service temperature factors: piping material, joining type, chemical exposure.

For specific applications please consult our chemical resistance charts.

Maximum Service Temperatures for Orion Drainage Systems			
Joining Method	Type of Flow	Polypropylene	PVDF
Thermal Socket Fusion	Intermittent	220°F	285°F
	Constant	220°F	285°F
Rionfuse Thermal Coil Fusion	Intermittent	220°F	285°F
	Constant	220°F	285°F
No-Hub Mechanical Joint Coupling	Intermittent	220°F	180°F
	Constant	220°F	160°F

**Note:** For systems susceptible to temperatures over 170-220°F, system needs to be fully supported.

# Assembly

## Joint Assembly

Many of the questions you may have about assembling Orion No-Hub, Rionfuse CF and Socket Fusion systems are answered in this section. Should you have further questions requiring a more detailed response, please contact our Technical Department at [oriontechs@wattswater.com](mailto:oriontechs@wattswater.com) or phone (910) 865 7530.

## Cold Weather Assembly

As with all types of plastic piping systems, installation in cold weather can be difficult and therefore is not recommended at temperatures below 40°F unless proper precautions are taken.

In cold weather installations, the area being installed must be shielded from the wind and other outside elements and the joints must be covered with heating blankets, prior to being installed.



# Orion No-Hub Corrugated Couplings - Grooving Pipe

## Polypropylene and PVDF Chemical Waste Systems

### ⚠ WARNING



Please read carefully before proceeding with installation. Your failure to follow any attached instructions or operating parameters may lead to the product's failure. Keep this Manual for future reference.

## Installation Guidelines - Grooving Pipe

### STEP 1

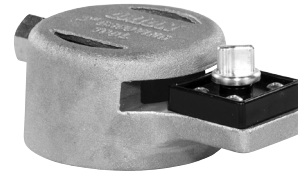
Material preparation is essential to achieving satisfactory No-Hub coupling assembly. Pipe must be free of scoring or other surface damage, and should be wiped down with a clean cloth sprayed with 90% isopropyl alcohol before cutting to remove cement dust, mud, or other debris that will interfere with the cutter, pipe grooving tool, or interfere with assembly integrity and cause a leak.

### STEP 2

Cut the cleaned pipe with a thin-wheel plastic pipe cutter to assure a clean, square cut. Deburr and bevel the cut end of the pipe with a deburring tool. This must be done prior to grooving the pipe.

### STEP 3

The grooving tool blade must be fully retracted before use. With the grooving tool handle pointing up, turn the small knob on the handle counter-clockwise to the 12:00 position to retract the blade inside the grooving chamber. If unsure whether the blade is retracted, visually check inside the grooving chamber while turning the knob: the blade will visibly extend or retract as the knob is turned. Once the blade is retracted, push the grooving tool onto the pipe end, making sure that the pipe end bottoms out inside the grooving chamber. The roller ball opposite the blade assembly can be adjusted using the hex nut, to ensure that the pipe presses tightly against the blade aperture; this is essential to ensure that the groove is uniform and cut to full depth.



### STEP 4

Turn the blade adjustment knob another 1/2 turn clockwise to the 6:00 position on the handle, remembering not to over-torque the knob. Maintaining firm pressure to keep the pipe bottomed out inside the tool, rotate the grooving tool clockwise twice around the pipe or until no more material is removed from the groove.

### STEP 5

Return the blade adjustment knob to the 12:00 position then remove the tool from the pipe. If the blade is not fully retracted before removing the tool it will score the pipe end, creating a leak path that will prevent the joint from sealing.

### STEP 6

Remove all burrs or other material from the groove edges and interior. Ensure that all excess material is removed from the grooving tool and that the blade is clean and free of plastic debris before grooving the next piece of pipe.

# Orion No-Hub Corrugated Couplings - Joint Assembly

## Polypropylene and PVDF Chemical Waste Systems

### ⚠ WARNING



Please read carefully before proceeding with installation. Your failure to follow any attached instructions or operating parameters may lead to the product's failure. Keep this Manual for future reference.

**THINK  
SAFETY  
FIRST**

## Installation Guidelines - Joint Assembly

### STEP 1

Loosen no-hub coupling outer band bolts until the inner plastic body moves freely.

### STEP 2

Inspect coupling inner plastic body; clean out all cement dust, mud or other debris from the inner body surface with a clean cloth sprayed with 90% isopropyl alcohol.

### STEP 3

Insert the pre-grooved pipe or fitting end into the coupling inner body until the coupling ridge can be felt snapping into place in the groove. Sliding the outer band back from the inner body may make this easier. The ridge must seat into the groove to ensure proper fit, seal the joint, and prevent pullout.

### STEP 4

Position the coupling outer steel band such that it is centered over the inner coupling body; the inner body should be equally visible at each edge of the outer band.



### STEP 5

Using a 5/16" socket with a torque wrench, or using the Orion supplied T-handle torque wrench, torque each band to 60 in/lbs making sure to alternate between all bands keeping pressure even. After torquing, check each band. Check the torque by applying the wrench and clicking once more. Each band should be double checked. Alternate tightening each bolt to ensure even pressure is applied to both sides of the coupling; fully tightening one side before tightening the other, especially if using a power tool like an impact wrench, can cause the resulting joint to leak.

### STEP 6

If during testing a leak is found, loosen the outer band and turn 90 degrees and re-tighten following previous applicable steps.

### NOTES

Satisfactory installation requires careful measurement.

Cheating on pipe lengths will cause a bind, allowing joints to leak even when fully tightened.

All No-Hub joint components must be kept clean prior to and during assembly. Mud, dirt, cement dust or other foreign matter in joints is the most common cause of failure.

Both over-tightening and under-tightening No-Hub couplings can result in leaks.

For any questions or concerns about product or installation, please contact [oriontechs@wattswater.com](mailto:oriontechs@wattswater.com) or call (910) 865-7530.



# Rionfuse CF

## Polypropylene and PVDF Chemical Waste Systems

### STEP 1

#### Confirming RF-3000LE is Calibrated

Start up your RionFuser RF-3000LE and it will perform a Self Test. If the Cal Due date has passed or is within the life of your project, then STOP, and contact your Orion Representative for instructions on how to get your machine recalibrated. Watts disclaims all liability for installations performed with a RionFuser past its calibration date.

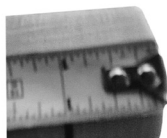
For additional information reference the RF-3000LE Instruction Manual included in the carrying case.

### STEP 2

#### Preparing the Pipe

Material preparation is essential to achieving satisfactory fusion results. Deburr all field-cut pipe ends. Following the coupling insertion depth chart, mark the coupling insertion depth from the end of the pipe/fitting to insure that the coupling is properly positioned during the fusion cycle. Then, using 60 grit emery cloth, abrade the marked ends of the pipe and fitting to remove the natural "sheen" of the plastic. After abrading, clean all joint surfaces thoroughly with isopropyl alcohol to remove any dirt, grease and the contaminants left from the sandpaper and any other foreign matter from the surface. We suggest using a spray bottle with 90% or higher isopropyl alcohol to soak a lint resistant cloth to thoroughly wipe the joint surface clean.

Coupling Insertion Depth Marking	
Pipe Diameter in.	Mark Distance from Pipe End in.
1½	1
2	1
3	1¾
4	1¾
6	2
8	2½
10	2½
12	2½



Mark coupling depth

Abrade surface



Insert into coupling and verify proper seating

### STEP 3

#### Joint Assembly

Insert the prepared ends of the pipe/fitting into both hubs of the Rionfuse CF coupling. Double check the markings to verify proper seating of the pipe.

### STEP 4

#### Connecting Lead Cables

The installer must make sure the joint is properly supported during the fusion cycle and afterwards as the joint cools to ambient. For underground installation the joint must be protected from soil falling into the fusion assembly area. If ambient temperature has dropped below 60F in the last 24 hrs, we recommend the use of warming blankets to support, wrap, and protect the pipe during the fusion process. With the Rionfuser unit connected to a dedicated power source and powered ON, connect the lead cables to the coupling.

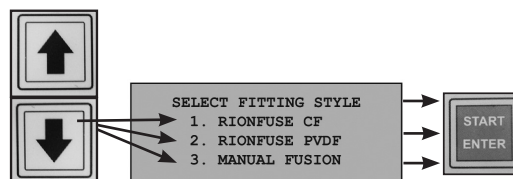


Connect lead cables

### STEP 5

#### Selecting Fitting Style

The unit will now prompt the installer to "SELECT FITTING STYLE". Scroll UP or DOWN to highlight the proper fitting style being fused, then press START to select the fitting style.



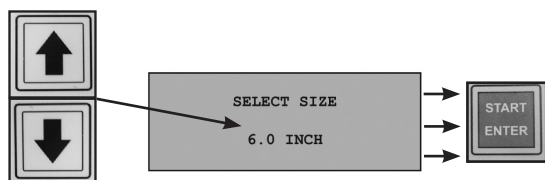
Fitting style selection screen



## STEP 6

### Selecting Pipe Size

Next the unit will prompt the installer to select the size of the joint being fused. Scroll UP or DOWN to highlight the correct size, then press START to select size.

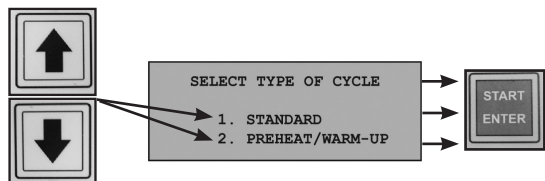


Fitting size selection screen

## STEP 7

### Selecting Heat Cycle

The unit will ask if a pre-heat cycle is needed for the joint. If fusion will be performed where pipe temperatures are outside the range of 60 - 90 degrees F, please consult Orion Technical department at (910) 865-7530 before proceeding. All other fusions should be performed using the STANDARD cycle, which is selected by pressing the START button.



Fusion cycle type selection screen

## STEP 8

### Verifying Welding Parameters

The screen will display "VERIFY WELDING PARAMETERS" and an audible beep will sound to indicate the fusion unit is ready to begin welding. Verify the welding data displayed on the screen matches the joint being fused. If the information is incorrect, press the STOP/BACK button to return to any of the menu options to correct the fusion parameters. Once the parameters have been verified, press START to begin the fusion weld.



Fusion cycle type selection screen

## STEP 9

### Successful Weld Completion

After pressing START, the Rionfuser will begin the weld. After the welding cycle has completed, another audible beep will sound to indicate that the fusion weld is complete. If the beeping pattern is an equal, consistent beeping, the joint was successful. If the beeping pattern is irregular, it indicates that an error has occurred during the fusion cycle (if an error code is received during fusion, please contact your local Orion rep for troubleshooting information). Once the joint is completed, the lead cables can be removed and the process repeated for the next joint.

To download completed fusion data please see our IS-OR-RF-3000LE-DataDownload for instructions.

### NOTICE

Do not stress newly-fused joints until fully cooled to ambient, typically 10-20 minutes depending on size. Successful weld completion screen does not eliminate need for system leak testing.

### Successful weld completion screen

DISCONNECT  
OUTPUT LEADS  
WELD COMPLETED  
Successfully

Polypropylene Rionfuse CF Coupling		
Pipe Size <i>in.</i>	Fusion Time <i>min.</i>	Fusion Current <i>amps</i>
1 - 1/2	2:00	8.25
2	2:00	8.25
3	3:00	14.25
4	3:00	14.25
6	4:30	19.00
8	4:45	19.00
10	7:20	17.00
12	8:00	16:50

PVDF Rionfuse CF Coupling		
Pipe Size <i>in.</i>	Fusion Time <i>min.</i>	Fusion Current <i>amps</i>
1 - 1/2	2:00	8.25
2	2:00	8.25
3	3:00	14.25
4	3:00	14.25
6	4:45	18.00

Multiple Jointing Rionfuse CF	
Pipe Size <i>in.</i>	Maximum number of couplings <i>num.</i>
1 - 1/2	4
2	3
3	3
4	2
6	1
8	1
10	1
12	1

# Orion Thermal Socket Fusion

## Polypropylene and PVDF Chemical Waste Systems

### ⚠ WARNING



Please read carefully before proceeding with installation. Your failure to follow any attached instructions or operating parameters may lead to the product's failure. Keep this Manual for future reference.



### ⚠ DANGER



Electricity, electrocution and shock hazards.

### STEP 1

Remove the socket fusion tool and stand from their case and inspect for any obvious signs of damage, especially the power cord and plug. Should the tool appear damaged, do not continue: if new and purchased from Orion, contact [oriontechs@wattswater.com](mailto:oriontechs@wattswater.com) or phone (910) 865 7530; if rented, contact the owner for assistance. With the tool in good working order, attach the required size of tool heads (one male, one female) to either side of the tool heating plate by means of the nut and bolt provided. When properly secured, the tool heads should not be able to rotate on the heating plate.

### STEP 2

Mount the tool onto the stand provided, or secure the tool to a bench vise, taking care to protect the tool from damage by padding vise jaws and not overtightening. Plug the tool in and allow it to heat up to fusion temperature, typically about 20 minutes. Orion socket fusion tools are thermostatically controlled and factory set; however, settings can vary due to factors such as weather, current variances, cord lengths, type of power source, etc. These variables should be checked on site, and if necessary compensated for by adjusting the tool thermostat control.

### STEP 3

Fusion temperature should be verified by using Tempilstiks®, which are crayons having specific melt temperatures. After plugging in the fusion tool, make a mark on the outside of the female tool head with the 488°F Tempilstik® if fusing PP, or the 525°F Tempilstik® if fusing PVDF. When the Tempilstik® mark discolors and melts, the tool is ready for fusion.



### STEP 4

Material preparation is essential to achieving satisfactory results. Both pipe and fitting socket ends should be cleaned with a lint-free cloth sprayed with 90% isopropyl alcohol before fusing to remove cement dust or any other adhering dirt or debris that will interfere with the fusion process. Once the pipe has been cleaned, cut it with a thin-wheel plastic pipe cutter. Deburr and bevel the cut end of the pipe with a deburring tool. A beveled end will minimize the amount of bead on the inside of the fitting socket when fused.

### STEP 5

Measure the depth of the fitting socket to be fused. Subtract  $\frac{1}{16}$ ".

### STEP 6

Transfer the fitting socket measurement less  $\frac{1}{16}$ " to the end of the pipe to be fused. Mark the pipe so the measurement will be seen when inserting the pipe into the tool head.

### STEP 7

Push the fitting socket end onto the male tool head, applying firm even pressure as the socket interior softens and progresses onto the head. Then insert the pipe end into the female tool head, taking care not to push the pipe in past the mark made in the previous step. If the pipe is pushed past the mark, it can result in a large obstructive bead forming in the bore of the joint. Keep both pipe and fitting perfectly straight on the tool as they are heating: letting them sag downwards, or pulling them slightly towards you will deform the connecting surfaces, which can result in a poor fusion.



## STEP 8

Typical fusion times are shown in the chart below. These times should be used as a guide only; the same site variables listed in STEP 2 can affect fusion times also. Pipe and fitting are ready to be removed from the tool once a bead  $\frac{1}{32}$ "- $\frac{1}{16}$ " in diameter is visible all around the circumference of the pipe where it enters the female head, and around the circumference of the socket mouth. Checking for this bead while the components are heating will also indicate if they are being held straight on the tool: if the bead is of uniform diameter all the way around, the component is properly aligned on the tool; if there is a thicker and a thinner area on the bead, the component is out of alignment and must be straightened. Push away slightly from the thicker area of the bead toward the thinner area to realign.

Typical Thermal Socket Fusion Times In Seconds

Material	Pipe Size				
	1-1/2"	2"	3"	4"	6"
PP	20	25	30	35	45
PVDF	25	30	35	45	55

## STEP 9

When a uniform bead is visible on both components, pull them both straight back from the tool with firm even pressure, then immediately push the pipe straight into the fitting socket until the bead on the pipe meets the bead at the fitting socket mouth. Do not twist the pipe into the socket; do not over-insert. As the pipe is inserted, check to see that axial alignment is being maintained and adjust only as necessary. The melted surfaces will begin to fuse within 5-7 seconds of being removed from the tool; any attempts to straighten or otherwise alter the joint after this time will break the weld, resulting in a leak. Once inserted, hold the joint under slight pressure for 15 seconds to ensure the surfaces fuse together well. Do not stress the joint until fully cooled to ambient. Do NOT douse cooling joints with cold water.

## STEP 10

**Clean any melted material from the tool heads with a cotton rag. Do NOT use any abrasive materials or tools like screwdrivers to clean off tool heads. Doing so will damage the teflon coating and the heads themselves, making subsequent fusions more difficult. Using Tempilstiks®, confirm that the tool heads are the correct temperature before fusing the next joint.**

## NOTES

Satisfactory installation requires careful measurement.

All thermal socket fusion joint components must be kept clean prior to and during assembly. Mud, dirt, cement dust or other foreign matter in joints is the most common cause of failure.

Successful thermal socket fusion is the result of the correct combination of heat and time. Attempts to speed up the process by cheating on how long components remain on the tool heads, fusing before the tool is up to the correct temperature, or trying to cool joints rapidly, will all result in poor fusions with a greater likelihood of failure when pressure tested.

Always protect the fusion tool from external factors that will strip heat from it: cold weather, wind, heating plate/tool head contact with cold surfaces.

Trying to cool down the fusion tool by immersing in water will destroy the tool and void the warranty.

For any questions or concerns about product or installation, please contact [oriontechs@wattswater.com](mailto:oriontechs@wattswater.com) or call (910) 865 7530.



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USA: T: (800) 334-6259 • [OrionFittings.com](http://OrionFittings.com)

Canada: T: (888) 208-8927 • [OrionFittings.ca](http://OrionFittings.ca)

Latin America: T: (52) 55-4122-0138 • [OrionFittings.com](http://OrionFittings.com)