

+GF+ PPro-Seal Natural Polypropylene Piping System



Pipe, Fittings, Valves
Electrofusion
Mechanical Joint

Not for Use with Compressed Air or Gases

George Fischer, Inc. DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above or below ground locations. The use of George Fischer, Inc. products in compressed air or gas systems automatically voids George Fischer, Inc. warranty for such products, and their use against our recommendation is entirely the responsibility and liability of the installer. George Fischer, Inc. will not accept responsibility for damage or impairment from its products, or other consequential or incidental damages caused by misapplication, incorrect assembly, and/or exposure to harmful substances or conditions.

Threaded fittings are not recommended for pressure applications.

For more information about any of our product lines, please call (800) 854-4090.

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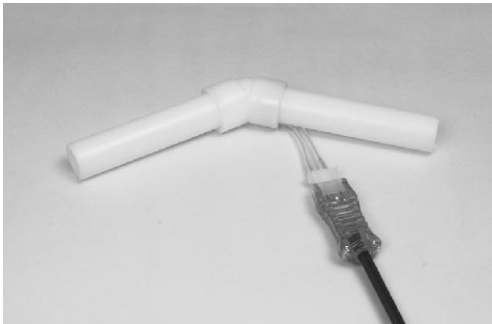
+GF+ PPro-Seal — Easy and Reliable Solution for Natural Polypropylene Piping Systems

Electrofusion

The +GF+ PPro-Seal system utilizes the patented +GF+ Fuseal joining method, using electrical resistance coils and state of the art power units. +GF+ PPro-Seal joints are made quickly, surely and economically.

Dimensions

Fittings, Pipe and Ball Valves 1/2" - 2".



+GF+ PPro-Seal — Electrofusion

Mechanical Joints

Threaded fittings are the ideal solution if future disassembly is needed.

MSA 250SE/MSA 250EX Fusion control Units

The MSA 250SE/MSA 250EX represent the most advanced fusion units in the industry, featuring advanced transformer technology. These units can be used to join all George Fischer Sloane polypropylene products including Fuseal II, Fuseal Squared, and PPro-Seal, as well as, Fuseal 25/50 PVDF.

The MSA 250SE has the capability to run on both network (110V/60Hz) and generator power sources.

The MSA 250EX operates on 220V/50Hz power sources.

All required fusion parameters are programmed into MSA 250SE/MSA 250EX by simply scanning a barcode specific to each fitting. Barcodes also provide the capability to perform program updates from new products in the field.

The MSA 250SE/MSA 250EX have multiple joint capability as well as a built in fail-safe mode.

- Developed using proven technology with a global partner – Bruetsch Electronic, Inc.
- Advanced transformer technology allows light weight design
- Fuses on both network and generator power sources
- Easy operation based on scanning barcodes
- Program updates for new products performed in the field
- Built in fail-safe mode
- Multiple joint capability
- Digital read-out for all pertinent operating parameters



MSA 250SE — Fusion Machine

The Perfect Union

An engineer or contractor can combine the benefits of the +GF+ PPro-Seal electrofusion joint and the mechanical joint in a single system. The same MSA 250SE/MSA 250EX units can be used to fuse the +GF+ Fuseal Corrosive Waste Piping System. +GF+ Fuseal is a drainage system made of flame retardant polypropylene which can handle basically the same fluids as +GF+ PPro-Seal.



+GF+ PPro-Seal Offers:

- Sized to fit standard IPS dimensions
- About 1/8 the weight of steel for greater ease of handling and faster installation
- Handles corrosive fluids up to 176°F (80°C)
- Will not rust, pit, scale or corrode and never needs painting
- Lower installed costs than lined steel, nickel, steel alloys or any other performance competitive material

Rugged

+GF+ PPro-Seal has excellent impact strength at ambient temperatures and retains much of its impact resistance down to 0° F (-32° C).

Applications

+GF+ PPro-Seal's excellent chemical and physical properties make it ideal for water treatment, chemical processing, and other applications where purity and corrosion resistance is required.

Natural Polypropylene

+GF+ PPro-Seal pipe, fittings and valves are manufactured from a virgin polypropylene copolymer compliant with FDA requirements. Like all thermoplastic products +GF+ PPro-Seal will not rust, pit, scale or corrode. +GF+ PPro-Seal is not subject to electrolysis, providing years of maintenance-free, leak-free service. Natural Polypropylene is only about 1/8 the weight of steel, for greater ease of handling and faster installation. To prevent contamination in transit, all +GF+ PPro-Seal pipe, fittings and valves are specially wrapped and protected.

Specification for +GF+ PPro-Seal Piping Systems

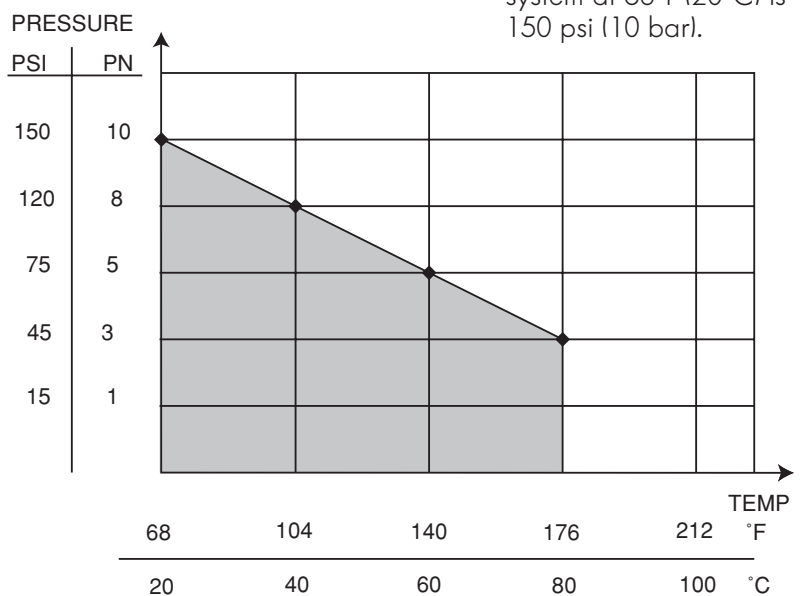
All +GF+ PPro-Seal (Natural Polypropylene) fittings shall be as manufactured by George Fischer, Inc. so that they are compatible with +GF+ PPro-Seal pipe. All +GF+ PPro-Seal pipe shall conform to the dimensional requirements of ASTM D-1785 for schedule 80 pipe as produced by George Fischer, Inc. The +GF+ PPro-Seal system shall be joined by the use of electrical fusion coils energized by a variable low voltage supply.

Excellent Chemical and Corrosion Resistance

+GF+ PPro-Seal has excellent resistance to attack by most organic and inorganic chemicals in common use. In general, it is attacked only by strong oxidizing acids and is weakened by certain organic solvents and chlorinated hydrocarbons.

Temperature and Pressure Rating

Handles corrosive fluids up to 176°F (80°C), beyond the range of many thermoplastics. The maximum pressure for the electrofusion system at 68°F (20°C) is 150 psi (10 bar).



PPro-Seal Installation and Engineering Data

Thermal Expansion Compensation

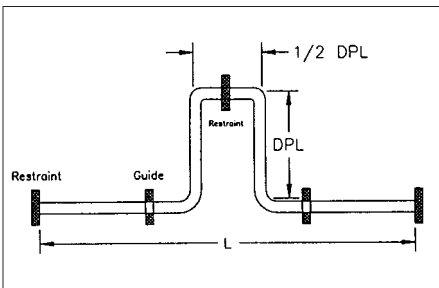
PPro-Seal Expansion Loop

| Polypropylene PPro-Seal | | Length of Run (feet) | | | | | | | | | |
|----------------------------|--------------|--|----|----|----|-----|-----|-----|-----|-----|-----|
| | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| Pipe Size | O.D. of Pipe | Minimum Deflected Pipe Length (inches) | | | | | | | | | |
| 1 1/2" | 1.900 | 22 | 31 | 37 | 43 | 48 | 53 | 57 | 61 | 65 | 68 |
| 2" | 2.375 | 24 | 34 | 42 | 48 | 54 | 59 | 64 | 68 | 72 | 76 |
| 3" | 3.500 | 29 | 41 | 51 | 59 | 66 | 72 | 78 | 83 | 88 | 93 |
| 4" | 4.500 | 33 | 47 | 58 | 67 | 74 | 81 | 88 | 94 | 100 | 105 |
| 6" | 6.625 | 40 | 57 | 70 | 81 | 90 | 99 | 107 | 114 | 121 | 128 |
| 8" | 8.625 | 46 | 65 | 80 | 92 | 103 | 113 | 122 | 130 | 138 | 146 |

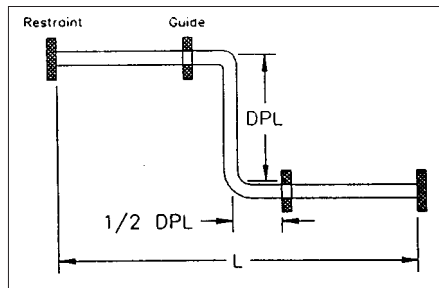
PPro-Seal Offsets and Change of Directions

| Polypropylene PPro-Seal | | Length of Run (feet) | | | | | | | | | |
|----------------------------|--------------|--|----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| Pipe Size | O.D. of Pipe | Minimum Deflected Pipe Length (inches) | | | | | | | | | |
| 1 1/2" | 1.900 | 31 | 43 | 53 | 61 | 68 | 75 | 81 | 86 | 92 | 97 |
| 2" | 2.375 | 34 | 48 | 59 | 68 | 76 | 84 | 90 | 97 | 103 | 108 |
| 3" | 3.500 | 41 | 59 | 72 | 83 | 93 | 102 | 110 | 117 | 124 | 131 |
| 4" | 4.500 | 47 | 67 | 81 | 94 | 105 | 115 | 124 | 133 | 141 | 149 |
| 6" | 6.625 | 57 | 81 | 99 | 114 | 128 | 140 | 151 | 161 | 171 | 180 |
| 8" | 8.625 | 65 | 92 | 113 | 130 | 146 | 160 | 172 | 184 | 195 | 206 |

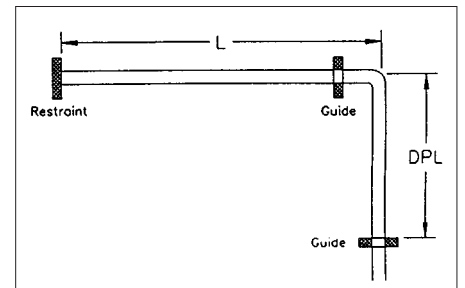
Expansion Loop and Offset Configuration for Polypropylene



Expansion Loop



Expansion Offset



Change of Direction

Pressure Rated System

The PPro-Seal Electrofusion piping system is pressure rated at 150 psi (10 bar) @ 72°F (23°C). The derating factors for elevated temperatures are as follows:

Derating Factor for PPro-Seal Electrofusion

| | | |
|-------|-------|-------|
| 106°F | 142°F | 178°F |
| 0.7 | 0.5 | 0.25 |

PPro-Seal Valve Pressure Ratings

Valves are pressure rated at:

| Size | 1/2" | 3/4" | 1" | 1 1/2" | 2" |
|-----------|------|------|-----|--------|-----|
| psi (bar) | 150 | 140 | 140 | 120 | 150 |

Surge Pressure

The following table gives the surge pressure (water hammer) in copolymer polypropylene pipe for various velocities at 73°F (23°C). The surge pressure should be added to the static line pressure to determine the maximum system operating pressure. In no case should this be over 1 1/2 times the recommended working pressure. This will, under normal conditions, ensure adequate safety to absorb the shock of closing valves.

Surge Pressure, Ps (psi) – Schedule 80 PP

$$P_s = V \left(\frac{E t}{E t + 3 \times 10^5 D_i} \right)^{1/2}$$

Where:

V = Water Velocity,
ft./sec.

E = Modulus of Elasticity
1.5 x 10⁵ psi

t = Wall Thickness, in.

| Water Velocity (ft./sec.) | Nominal Pipe Size (in.) | | | | |
|---------------------------|-------------------------|-------|-------|-------|------|
| | 1/2 | 3/4 | 1 | 1 1/2 | 2 |
| 1 | 23.5 | 20.9 | 20.0 | 17.1 | 15.9 |
| 2 | 47.0 | 41.8 | 40.0 | 34.2 | 31.6 |
| 3 | 70.5 | 62.7 | 60.0 | 51.3 | 47.4 |
| 4 | 94.0 | 83.6 | 80.0 | 68.4 | 63.2 |
| 5 | 117.5 | 104.5 | 100.0 | 85.5 | 79.0 |
| 6 | 141.0 | 125.4 | 120.0 | 102.6 | 94.8 |

Support Spacing

When thermoplastic piping systems are installed above ground, they must be properly supported to avoid unnecessary stresses and possible sagging. On horizontal runs, hangers of the various types should be used at approximately the spacing given in the following chart. Note that additional support is needed as temperatures increase. At elevated temperatures, continuous support, in the form of a smoothly textured structural angle or channel, is required.

Support Spacing, (ft.), Copolymer Polypropylene – Schedule 80

| Pipe Size (in.) | 1/2 | 3/4 | 1 | 1 1/2 | 2 |
|-----------------|-------|-------|-------|-------|-------|
| 73°F | 3 3/4 | 4 | 4 1/2 | 5 | 5 1/2 |
| 120°F | 3 1/2 | 3 3/4 | 4 | 4 3/4 | 5 |
| 140°F | 3 | 3 1/2 | 3 3/4 | 4 1/4 | 4 1/2 |
| 160°F | 3 | 3 | 3 1/2 | 4 | 4 1/4 |
| 180°F | 2 3/4 | 3 | 3 1/4 | 3 3/4 | 4 |

Table based on .100 in. sag between supports.

Short Term Collapse Pressure

Polypropylene pipe is often used for suction lines or in applications where external pressures are applied to the pipe, such as in heat exchangers or underwater loading conditions. The differential pressure rating of the pipe is determined by derating the short term collapse pressures. Collapse pressure must be adjusted for temperature differences other than for room temperature. The Short-Term Collapse Pressure chart used to adjust pipe pressure rating may be used for this purpose (see note below table).

Short Term Collapse Pressure (psi), Pressure Polypropylene – Schedule 80

| Pipe Size (in.) | 1/2 | 3/4 | 1 | 1 1/4 | 1 1/2 | 2 |
|-----------------|------|-----|-----|-------|-------|-----|
| | 1011 | 876 | 823 | 612 | 412 | 278 |

Note: These are short term ratings, long term should be reduced by 1/3 to 1/2 of the short term ratings.

Soil Load – Schedule 80 Pipe

Underground pipe is subjected to external loads caused by the weight of the backfill material and by loads applied at the surface of the fill. These can range from static to dynamic loads.

Static loads comprise the weight of the soil above the top of the pipe and any additional material that might be stacked above ground. An important point is that the load in a flexible pipe will be less than on a rigid pipe buried in the same manner. This is because the flexible conduit transfers part of the load to the surrounding soil and not the reverse. Soil loads are minimal with narrow trenches until a pipe depth of 10 feet is attained.

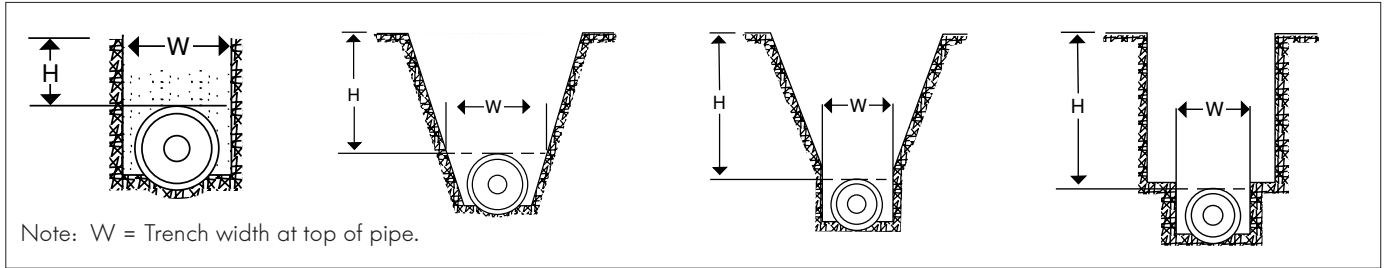
Dynamic loads are loads caused by moving vehicles such as trucks, trains and other heavy equipment. For shallow burial conditions, live loads should be considered and added to static loads, but at depths greater than 10 feet, live loads have very little effect.

Live Loads for Buried Flexible Pipe (lb./in.ft.)

| Pipe Size (in.) | H 20 Wheel Loads for Various Depths of Pipe (lb./in. ft.) | | | | |
|-----------------|---|-----|-----|-----|----|
| | 2 | 4 | 6 | 8 | 10 |
| 2 | 309 | 82 | 38 | 18 | 16 |
| 3 | 442 | 118 | 56 | 32 | 21 |
| 4 | 574 | 154 | 72 | 42 | 27 |
| 6 | 837 | 224 | 106 | 61 | 40 |
| 8 | 1102 | 298 | 141 | 82 | 53 |
| 10 | 1361 | 371 | 176 | 101 | 66 |
| 12 | 1601 | 440 | 210 | 120 | 73 |

Note: H 20 wheel load is 16,000 lb./wheel

Trench Widths for Polypropylene



Soil Load and Pipe Resistance for Flexible Thermoplastic Pipe – Schedule 80 Polypropylene Pressure Pipe

| Nom Size (in.) | Wc' = Load Resistance of Pipe (lb./ft.) | | H (ft.) | Wc = Soil Loads at Various Trench Widths at Top of Pipe (lb./ft.) | | |
|----------------|---|----------|---------|---|-------|-------|
| | E' = 200 | E' = 700 | | 2 ft | 3 ft. | 4 ft. |
| 1½ | 1050 | 1233 | 10 | 106 | 125 | 136 |
| | | | 20 | 138 | 182 | 212 |
| | | | 30 | 144 | 207 | 254 |
| 2 | 895 | 1131 | 10 | 132 | 156 | 170 |
| | | | 20 | 172 | 227 | 265 |
| | | | 30 | 180 | 259 | 317 |
| 2½ | 1223 | 1506 | 10 | 160 | 191 | 210 |
| | | | 20 | 204 | 273 | 321 |
| | | | 30 | 216 | 306 | 377 |
| 3 | 1097 | 1451 | 10 | 196 | 231 | 252 |
| | | | 20 | 256 | 336 | 392 |
| | | | 30 | 266 | 384 | 469 |
| 4 | 996 | 1462 | 10 | 252 | 297 | 324 |
| | | | 20 | 328 | 432 | 504 |
| | | | 30 | 342 | 493 | 603 |
| 6 | 1063 | 1765 | 10 | 371 | 437 | 477 |
| | | | 20 | 484 | 636 | 742 |
| | | | 30 | 503 | 725 | 888 |
| 8 | 1082 | 2011 | 10 | 483 | 569 | 621 |
| | | | 20 | 630 | 828 | 966 |
| | | | 30 | 656 | 945 | 1156 |
| 10 | 1227 | 2393 | 10 | 602 | 710 | 774 |
| | | | 20 | 785 | 1032 | 1204 |
| | | | 30 | 817 | 1177 | 1405 |
| 12 | 1396 | 2784 | 10 | 714 | 842 | 918 |
| | | | 20 | 931 | 1225 | 1429 |
| | | | 30 | 969 | 1397 | 1709 |

Note 1: Figures are calculated from minimum soil resistance values (E' = 200 psi for uncompacted sandy clay loam) and compacted soil (E' = 700 for side-fill soil that is compacted to 90% or more of Proctor Density for a distance of two pipe diameters on each side of the pipe). If Wc' is less than Wc at a given trench depth and width, then soil compaction will be necessary.

Note 2: These are soil loads only and do not include live loads.