



Installation Manual

MVIP™ Python® Vacuum Insulated Pipe



Designed and Built by:

Chart Inc.

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Revision Log

Revision Level	Date	Description
B	07/14/2014	Convert to new layout



Safety

MVIP Python pipe is intended to be used with pressurized, ultra-cold cryogenic liquids and gases. Only properly trained personnel should handle, install and/or operate this pipe system. Please review the Safety section in the MVIP™ Product Manual (PN 14736238 available on www.chartparts.com) along with the Warnings stated here. If there are any questions about the proper handling or use of this equipment, stop immediately and contact the factory for proper methods.



Warning! EXTREME TEMPERATURES AND PRESSURES: *This equipment uses extreme temperatures and pressurized fluids. Failure to follow instructions and use proper safety precautions can cause severe injury or death.*



Warning! ASPHYXIATION HAZARD: *This equipment uses cryogenic fluids / gases that can displace oxygen and cause severe injury or death due to lack of oxygen. ALWAYS ensure proper ventilation of environment to maintain proper oxygen levels. Chart always recommends the use of an oxygen monitor where the risk of reduced oxygen levels exist.*



Warning! RAPID PRESSURE RISE HAZARD: *Any time a cryogenic liquid or cold gas is trapped between any two valves, rapid pressure rise can occur. It is extremely important that a pressure relief valve is installed in any such point in the system where liquid / cold gas can become trapped. Severe injury or death can occur due to failure to comply with this warning.*



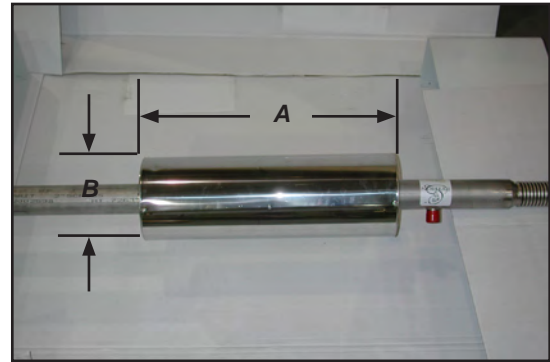
Warning! DO NOT USE MVIP Python piping for oxygen or hydrogen service. *Python pipe is NOT compatible with oxygen or hydrogen.*

MVIP Python pipe is rated to 400 psig pressure. Pressures above this should not be used.

General Instructions

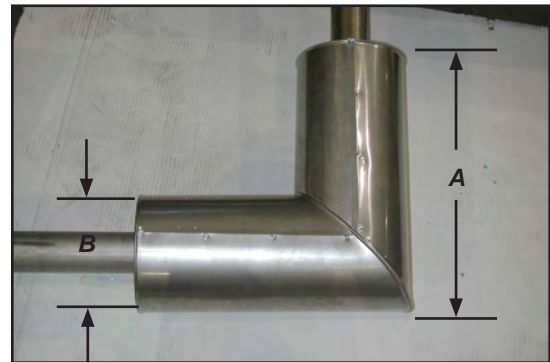
1. Inspect all pipes to ensure no shipping damage has occurred. If any section of pipe is damaged or missing contact the shipping carrier and Chart immediately.
2. Set up clamps, hangers, and/or rollers to the designed layout. Listed below are the recommended maximum support spans.

Inner Pipe	Jacket Outer Diameter	Weight w/o Joint Kits	Recommended Support Span	Max. Pipe Support Span
1" NPS	2.375"	2.5 lbs/ft	10 feet	12 feet
2" NPS	3.500"	4.7 lbs/ft	10 feet	12 feet
3" NPS	5.563"	9.6 lbs/ft	8 feet	10 feet



Straight Joint Kit		
MVIP Python Size	'A' Dimension	'B' Dimension
1"	19-1/2" (49.5 cm)	6-3/4" (11.1 cm)
2"	25-3/8" (64.5 cm)	8" (20.3 cm)
3"	25" (63.5 cm)	9-1/2" (24.1 cm)

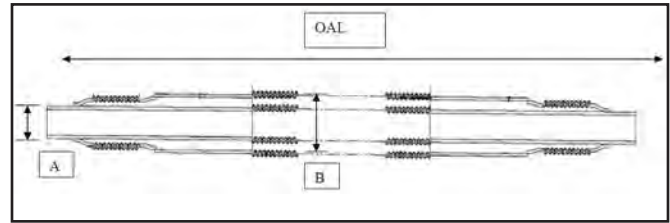
3. Place pipe in or onto the clamps, hangers and/or rollers. Commonly used setups are pictured under the mounting section in this manual. These support styles are just examples and other styles can be used, but be sure that the mounting style allows for the contraction and expansion of the pipe. With liquid nitrogen running through the system, the pipe can contract as much as 3.3" in every 100' of pipe.
4. Pressure relief valves should be installed in any sections where liquid can be trapped. When the process fluid is a cryogen, relief valves must be installed on a riser 10" - 12" long so that it remains warm. Relief valves must be positioned or vented in a safe manner away from personnel, equipment, and/or other safety concerns. Relief valves located outside should be designed to prohibit moisture from resting on the seat or discharge surface.
5. Once all pipe sections are in place refer to the pages in this manual that involve the necessary joint installations for your system. Care should be taken to allow space for the insulation joints. The following tables give dimensions of the joint kits.



Elbow Joint Kit		
MVIP Python Size	'A' Dimension	'B' Dimension
1"	15-1/2" (39.4 cm)	6-3/4" (11.1 cm)
2"	23-1/4" (59.0 cm)	8" (20.3 cm)
3"	24" (61.0 cm)	9-1/2" (24.1 cm)



- Custom flex expansion / contraction transition joints should not exceed the recommended bend radius. The following table gives dimensions of the flex transition joints.

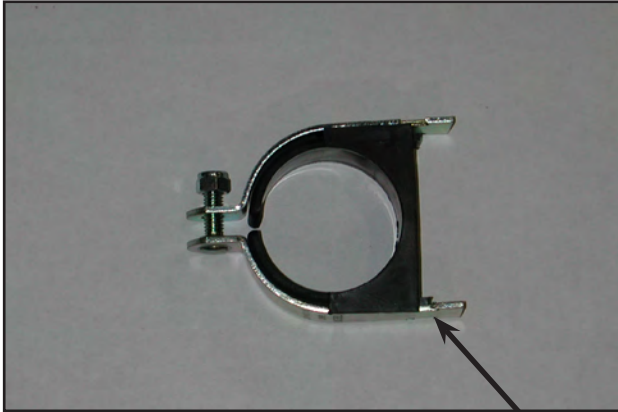


Tee Joint Kit			
MVIP Python Size	OAL	Diameter	T
1"	19-1/2" (49.5 cm)	6-3/4" (11.1 cm)	10" (25.4 cm)
2"	24-1/4" (61.6 cm)	8" (20.3 cm)	12-1/4" (31.1 cm)
3"	25" (63.5 cm)	9-1/2" (24.1 cm)	12-1/2" (31.8 cm)

MVIP Python Size	Outer Pipe 'A' Diameter	Outer Flex 'B' Diameter	OAL	Minimum Recommended Bend Radius
1"	1.315"	2.60"	8' - 6"	12 inches
2"	2.375"	5.00"	9' - 0"	20 inches
3"	3.500"	5.00"	9' - 0"	20 inches

Mounting

The photo below shows one type of clamp that can be used to support / mount the pipe. This type of clamp provides the pipe with a snug fit that also allows it to expand and contract along its axis.

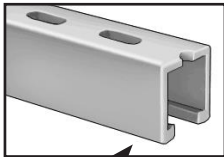


Overlapping metal pieces

J-style hangers are another type of support that can be used. Attach the J-hanger to a ceiling support and then remove the bolt and place pipe onto the hanger. Tighten the nut until pipe is being supported. Do not over tighten which would prohibit the pipe from expanding and contracting.



- To install this clamp a strut is needed (see photo below). The overlapping metal pieces on the clamp slide into the strut (see photo below). The pipe then slides into the clamp.



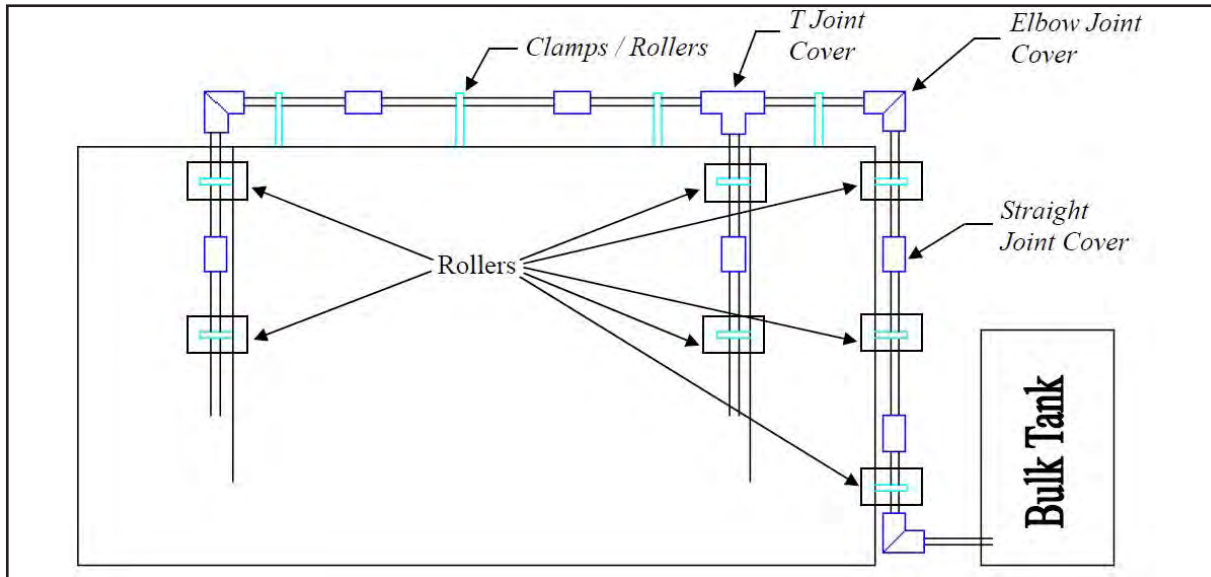
Strut



Installation

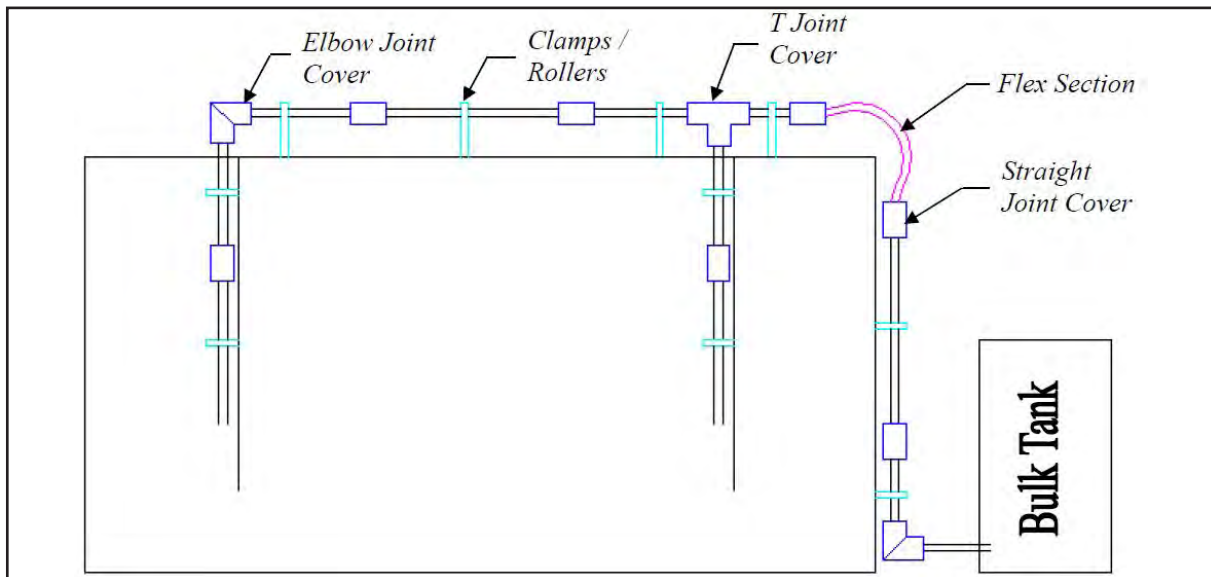
Sample System Installation

Sample System #1: No Flex Section



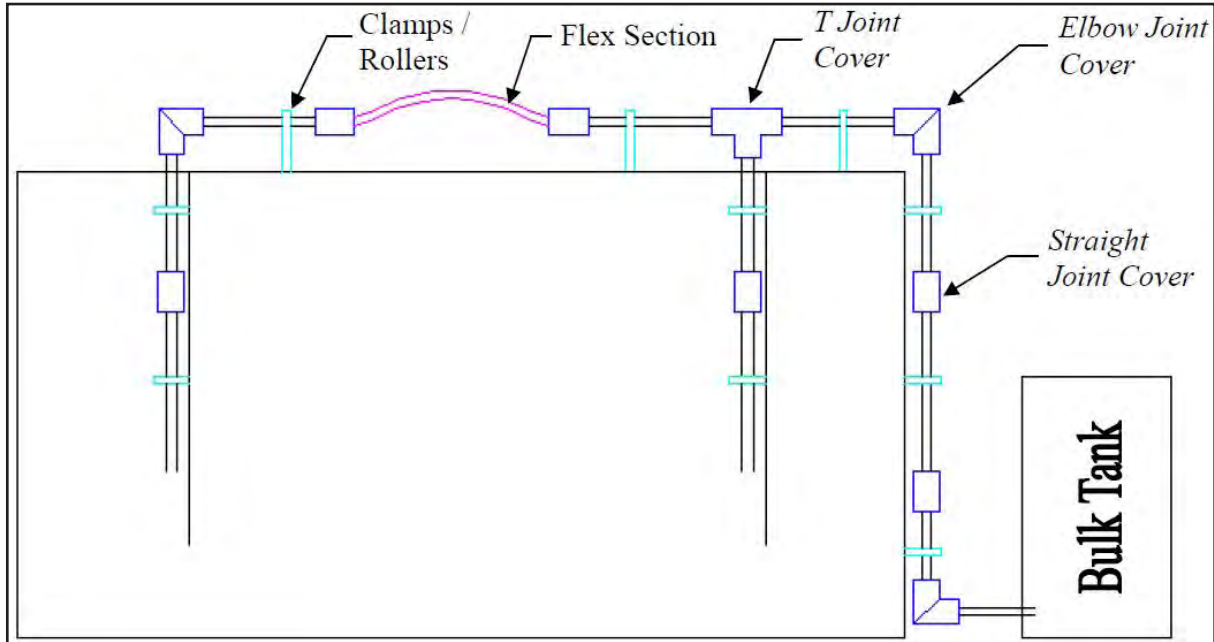
- In this sample system rollers must be used on vertical pipe because the cryogenic temperatures will cause the pipe to contract. If rollers are not used pipe will be damaged.

Sample System #2: Flex Section at Elbow



- In this sample system a flex section is used to make the elbow connection. This works well because if installed correctly, the flex section allows the expansion and contraction of the pipe caused by cryogenic temperatures.
- Clamps or rollers can be used on the roof. If using clamps do not over tighten because the pipe system will still move in the axial direction. If clamps are over tightened damage could occur to the pipe.

Sample System #3: Flex Section at Straight



- In this sample system a flex section is used but not at the corner. This is also a good option as the flex section allows the pipe to expand and contract.
- The flex section must be installed so that the pipes have enough room to expand and contract. In order to allow for this expansion / contraction, bow the flex section out (in any direction) so that there is room for the pipe to move.
- Clamps or rollers can be used on roof. If using clamps do not over tighten because pipe system will still move in the axial direction. If clamps are over tightened damage to pipe could occur.

Installation Kit

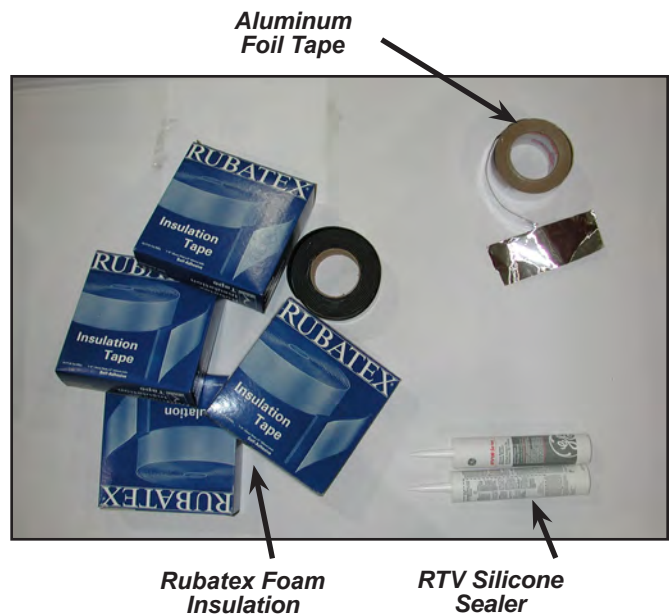
PN 11002861 includes:

- 4 Boxes of Rubatex Foam Insulation Tape
- 2 Tubes of RTV Silicone Sealer
- 1 Roll Aluminum Foil Tape

If any part is missing, wrong or damaged please contact Chart as soon as possible.

The table below shows how many pipe joints can be completed with each kit based on the pipe diameter.

Pipe Diameter	Number of Joints Completed
1"	8 Joints per kit
2"	6 Joints per kit
3"	4 Joints per kit



Straight Joints

Straight Joint Kit

- 1" - PN 11019209
- 2" - PN 11050530
- 3" - PN 11824831

Included in the kit:

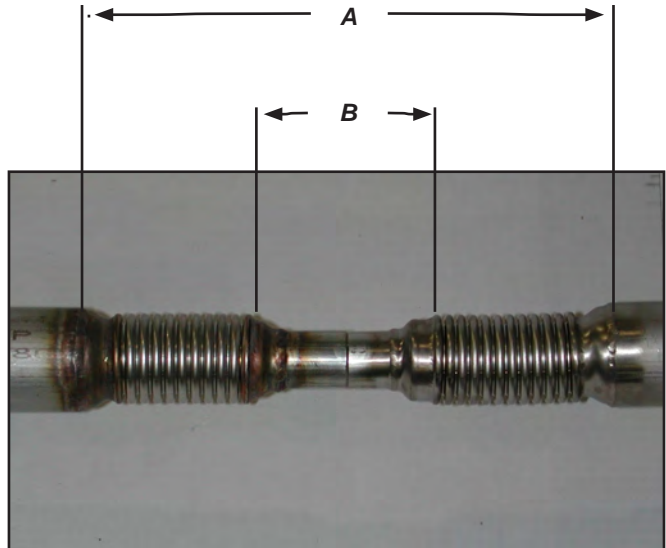
- Stainless Steel Straight Joint Cover
- Multi-Layer Insulation (MLI) 40 inches



If any part is missing, wrong or damaged please contact Chart as soon as possible.

Straight Pipe Sections

When installing a straight joint kit refer to this page for sections A and B of the pipe.



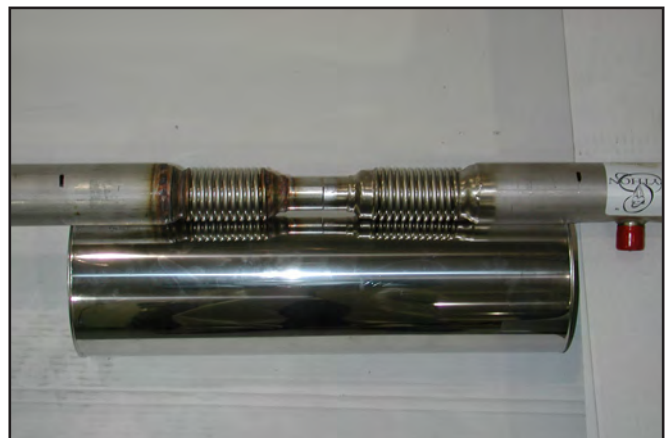
Straight Joint Installation Procedure



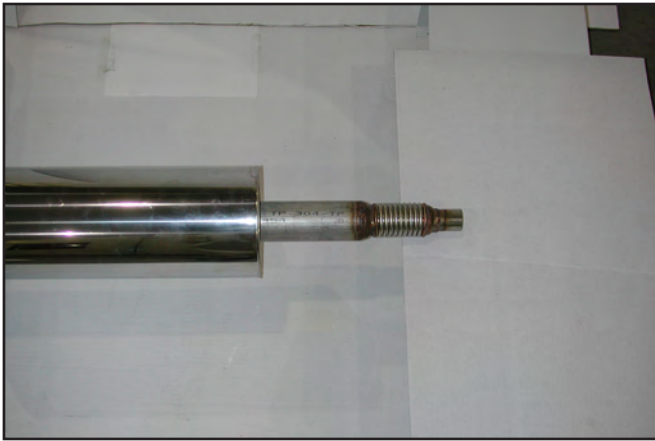
Caution! Stainless steel edges of joint cover and aluminum foil tape are extremely sharp; use caution when handling.



Warning! Excess heat may cause vacuum loss in pipe.



1. Measure and mark pipe to be certain joint insulation cover is centered about the joint.



- Slide stainless steel joint cover and foam on either pipe section.



- Wrap MLI (supplied in kit shown on page 9) over section B of pipe. All 40 inches should be applied. Do not exceed diameter of bellows (section A). Use a small piece of aluminum foil tape to keep it from unwrapping.

- Optional after MLI - One layer of aluminum foil tape can be wrapped over section A to aid in the removal of foam insulation (applied in next step) if it is not applied correctly.



- TIG weld the two ends together.

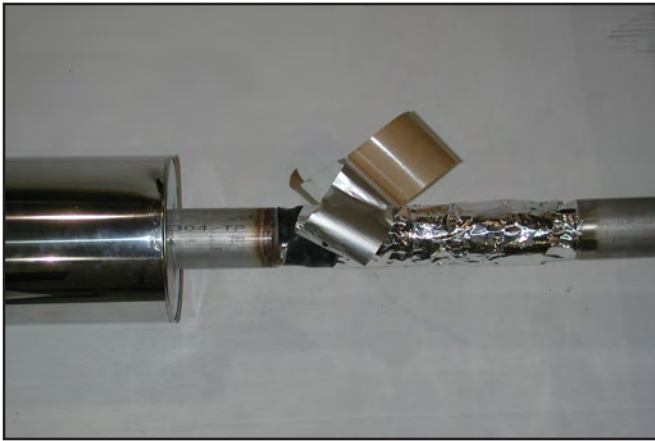


Warning! Excess heat may cause vacuum loss in pipe.

- After welding, a bubble test should be completed to determine if the weld was successful. If unsuccessful, the joint must be re-worked. If no bubbles are present move on to step 5.



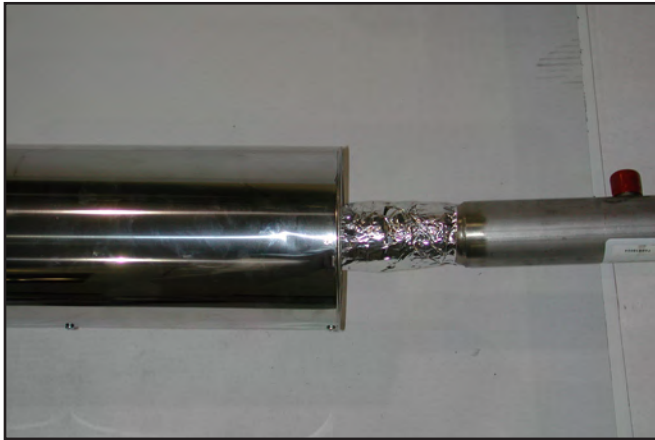
- Wrap foam insulation over section A. Do not wrap too tightly because insulation will not be as effective. Also do not exceed outer diameter of pipe. If outer diameter of pipe is exceeded, disassembly of the steel joint cover is required.



7. Wrap a layer of aluminum foil tape over section A over the foam insulation.



9. Slide or place cover over aluminum tape and insulation to the marks on pipe (made in step 1) or until cover is centered over joint.

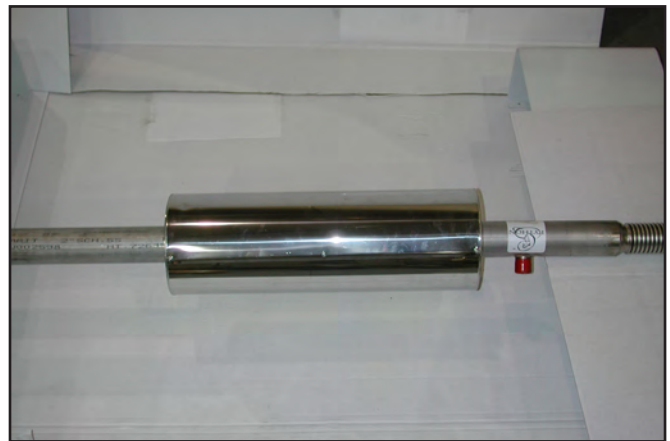


8. Slide steel joint cover and foam over the joint. If cover does not slide over insulation wrap disassembly of the steel joint kit is required.

- a. Disassembly and reassembly of the straight steel joint kit involves:
- Taking screws out
 - Taking ends off
 - Slipping the joint kit over the insulation
 - Putting ends back on
 - Putting screws back into same holes



10. Caulk all edges with silicone sealer. (Sides and seams where metal cover overlaps itself.)



11. Completed joint installation should look like this.

Elbow Joints

Elbow Joint Kit

1" - PN 11021430
 2" - PN 11050521
 3" - PN 11824849

Included in the kit:

- Stainless Steel Elbow Joint Cover
- Elbow Joint Connector
- Multi-Layer Insulation (MLI) 40 inches

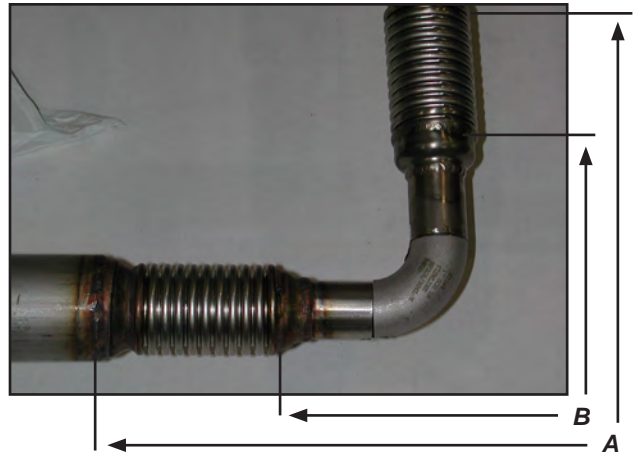


If any part is missing, wrong or damaged please contact Chart as soon as possible.

* Remove three screws to slide up cover on each leg before welding.

Elbow Pipe Sections

When installing an elbow joint kit refer to this page for sections A and B of pipe.



Elbow Joint Installation Procedure



Caution! Stainless steel edges and aluminum foil tape are extremely sharp; use caution when installing.



Warning! Excess heat may cause vacuum loss in pipe.

1. TIG weld pipe ends together using supplied elbow connector (see heat warning above). Make sure elbow is 90° or insulation kit will be difficult to install.



2. After welding, a bubble test should be completed to determine if the weld was successful. If unsuccessful, the joint must be re-worked. If no bubbles are present move on to step 3.



3. Wrap MLI (supplied in kit) over section B of pipe. All 40 inches should be applied. Do not exceed diameter of bellows (section A). Use a small piece of aluminum foil tape to keep it from unwrapping.
 - Optional after MLI - one layer of aluminum foil tape can be wrapped over section A to aid in the removal of foam insulation (applied in next step) if it is not applied correctly.

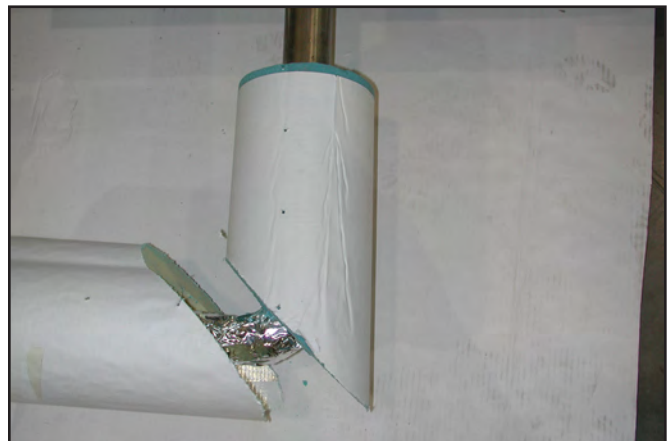


4. Wrap foam insulation over section A. Do not wrap too tightly because insulation will not be as effective. Also do not exceed outer diameter of pipe. If outer diameter of pipe is exceeded, disassembly of steel joint cover is required.
 - a. Disassemble steel elbow joint cover:
 - Take screws out
 - Take ends off

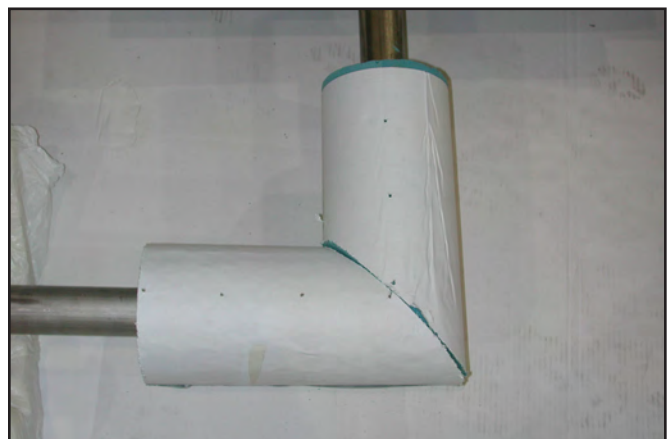
5. Wrap a layer of aluminum foil tape over section A over the foam insulation.



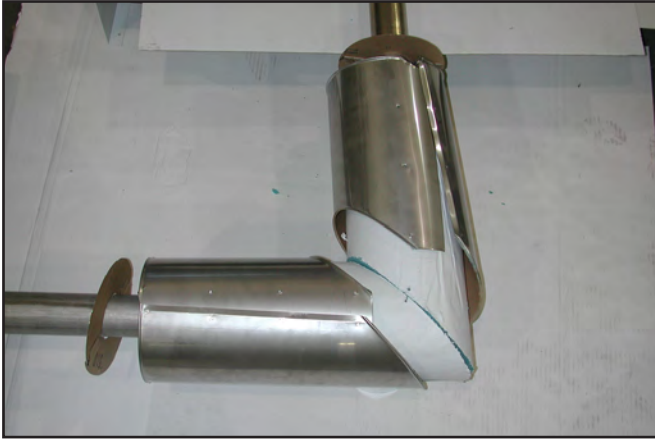
6. Put one side of insulation in place. Then use tape to hold the foam together. This will make it easier to slide metal covers into place.



7. Put other section of insulation on and tape foam together.



8. Slide steel cover and ends into place.
- Pay attention to which cover needs to go on first. Directly at the elbow one cover overlaps the other cover. The section that does not overlap is going to be called the first cover section.



9. Put the first cover section in place.
- Put the end on
 - Line up the holes
 - Screw together



10. Put the other cover into place. Make sure that the metal edge goes over the first cover section.
- Put the end on
 - Line up the holes
 - Screw together



11. Caulk all edges, including the seams where the metal overlaps.



12. Completed elbow joint after installation should look like this.



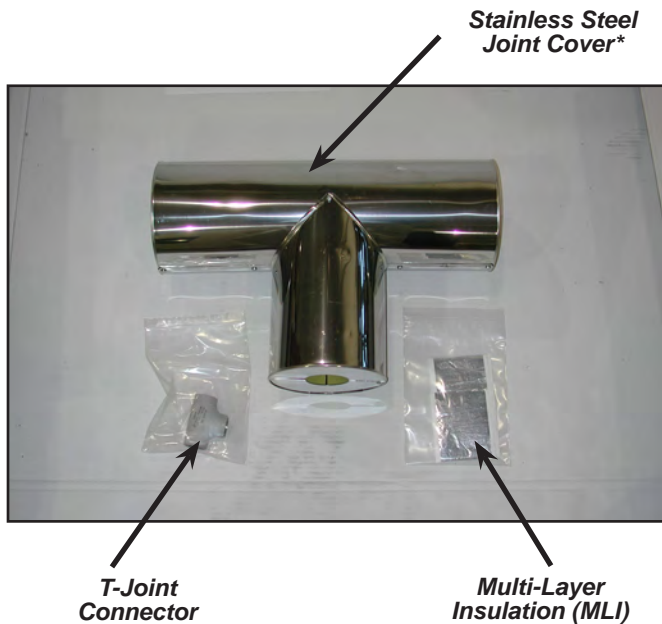
T-Joints

T-Joint Kit

- 1" - PN 11018855
- 2" - PN 11050548
- 3" - PN 11824857

Included in the kit:

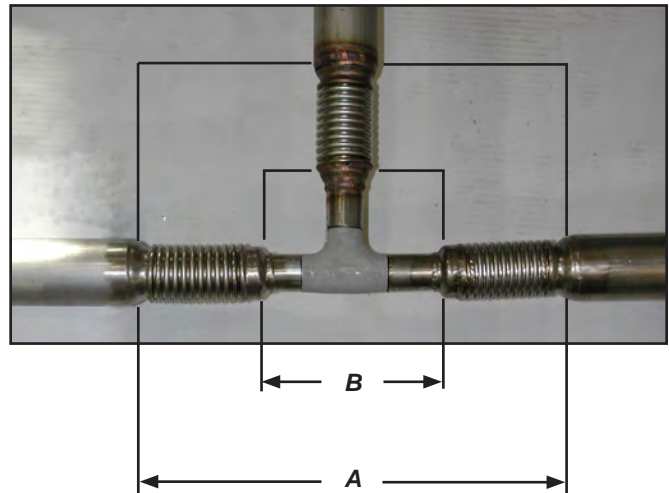
- Stainless Steel T-Joint Cover
- T-Joint Connector
- Multi-Layer Insulation (MLI) 40 inches



If any part is missing, wrong or damaged please contact Chart as soon as possible.

T-Pipe Sections

When installing a T-joint kit refer to this page for sections A and B of the pipe.



T-Joint Installation Procedure



Caution! *Stainless steel edges and aluminum foil tape are extremely sharp; use caution when installing.*



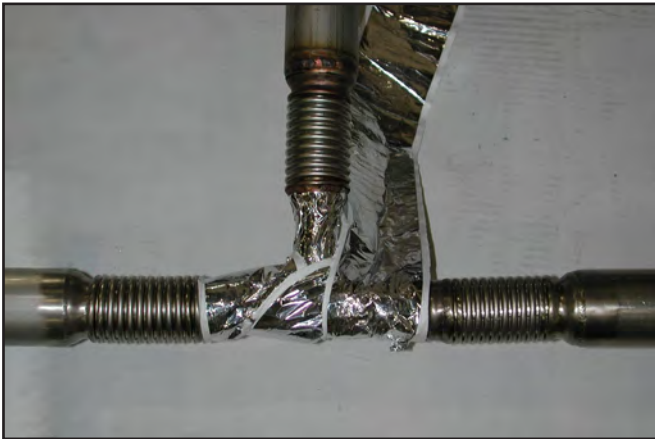
Warning! *Excess heat may cause vacuum loss in pipe.*

1. Using provided T-connector, TIG weld pipes together (see heat warning above). Make sure angles are 90° or insulation kit will be difficult to install.



* Remove two screws to slide branch leg onto pipe before welding.

2. After welding, a bubble test should be completed to determine if the weld was successful. If unsuccessful, the joint must be re-worked. If no bubbles are present move on to step 3.



3. Wrap MLI (supplied in kit) over section B of pipe. All 40 inches should be applied. Do not exceed diameter of bellows (section A). Use a small piece of aluminum foil tape to keep it from unwrapping.
 - Optional after MLI - one layer of aluminum foil tape can be wrapped over section A to aid in the removal of foam insulation (applied in next step) if it is not applied correctly.



4. Wrap foam insulation over section A. Do not wrap too tightly because insulation will not be as effective. Also do not exceed outer diameter of pipe. If outer diameter of pipe is exceeded, disassembly of steel joint cover is required.



5. Completed foam insulation should look like this.



6. Wrap a layer of aluminum foil tape over section A over the foam insulation.



7. Take steel T-joint insulation cover apart.
 - Take screws out
 - Take ends off
 Put small section of T-joint (metal cover and insulation) onto pipe by slipping it around the pipe. Put long T-joint ends on also, as seen in picture.

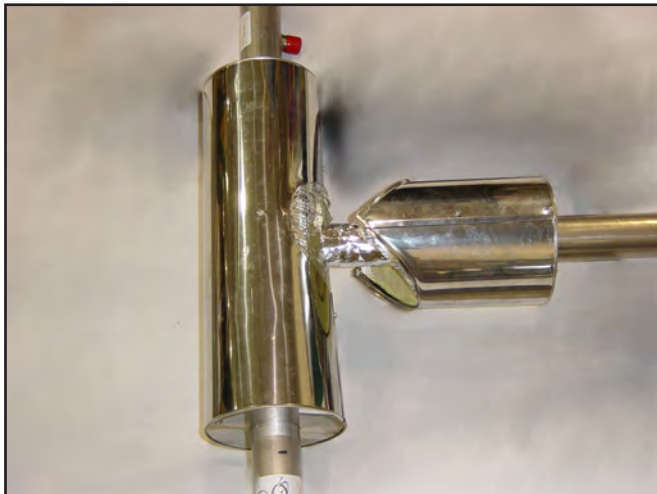


8. Put longer T-joint section (metal cover and insulation) over aluminum foil tape by sliding it around pipe.



10. Slide small T-joint cover over aluminum tape and attach it to longer T-joint cover.

- Put end on
- Line up holes
- Put screws in



9. Attach longer T-joint cover and insulation.

- Put ends in place
- Line up holes
- Put screws in



11. Caulk all edges, including seams where metal meets.



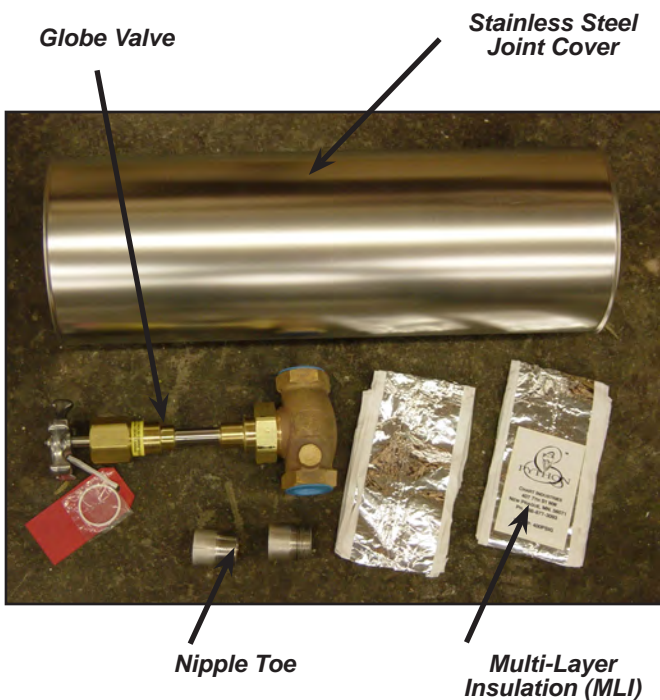
12. After completion, T-joint should look like this.

Valve Kit

1" - PN 11749789
 2" - PN 11749797
 3" - PN 11826158

Included in the kit:

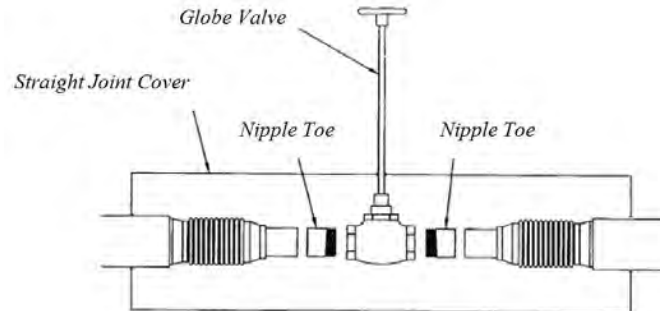
- 2 - Stainless Steel Nipple Toes
- Brass Globe Valve
- Stainless Steel Straight Joint Cover
- 2 - Multi-Layer Insulation (MLI) 40 inches



If any part is missing, wrong or damaged please contact Chart as soon as possible.

Valve Kit Installation Procedure

1. MVIP Python pipes are welded to the supplied nipple toes, while following the procedure outlined on page 9 “Straight Joint Sections” and “Straight Joint Installation Procedure.”



2. After welding, a bubble test should be completed to determine if the weld was successful. If unsuccessful, the joint must be re-worked.
3. Use Teflon tape to seal all threaded joints.
4. Assemble by threading the two welded nipple toes to the globe valve.
5. Apply super-insulation to unjacketed areas.
6. Apply foam insulation tape (from installation kit) to fill voids between the assembly and the foam insulation in the cover.
7. Install straight joint cover. There may be excess insulation tape or foam insulation that needs to be trimmed back. The inside foam of the straight joint cover will also need to be trimmed to allow the globe valve and nipple toes to fit accordingly.

CryoVent Kit

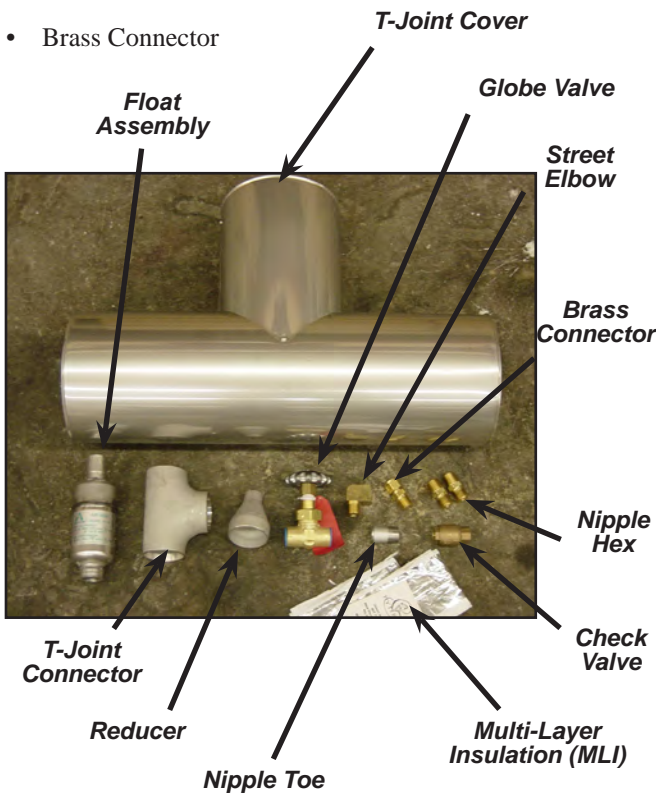
1" - PN 11749762

2" - PN 11749771

3" - PN 11826174

Included in the kit:

- 2 - Brass Nipple Hex
- Stainless Steel Reducer
- Stainless Steel T-Joint Cover
- T-Joint Connector
- 2 - Multi-Layer Insulation (MLI) 40 inches
- Stainless Steel Nipple Toe
- Brass Street Elbow
- Float Assembly
- Brass Globe Valve
- Brass Check Valve
- Brass Connector

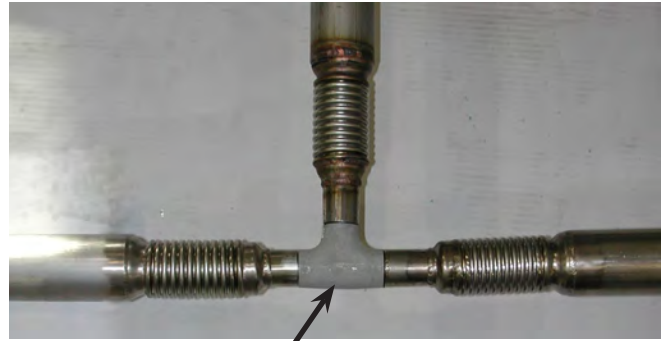


CryoVent Kit Installation Procedure



Warning! In LN₂ service, the CryoVent will leak if used at pressures above 150 psig.

1. MVIP Python pipes are welded using the supplied tee, while following the procedure outlined on page 15 “T-Pipe Sections” and “T-Joint Installation Procedure.”



T-Joint Connector

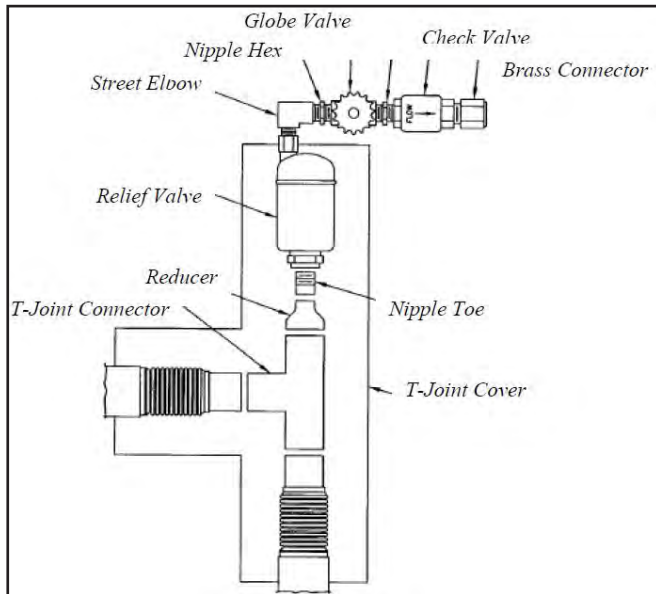
2. The stainless steel nipple toe is welded to the reducer.



3. After welding, a bubble test should be completed to determine if the weld was successful. If unsuccessful, the joint must be re-worked.
4. Use Teflon tape to seal all threaded joints.

If any part is missing, wrong or damaged please contact Chart as soon as possible.

5. Assemble the gas vent and plumbing components according to the following drawing:



6. Apply super-insulation to unjacketed areas.
7. Apply foam insulation tape (from insulation kit) to fill voids between the CryoVent assembly and the foam insulation in cover.
8. Install T-joint cover. There may be excess insulation tape or foam insulation that needs to be trimmed back. The inside foam of the T-joint cover will also need to be trimmed to allow the plumbing components to fit accordingly.

Relief Valve Kit

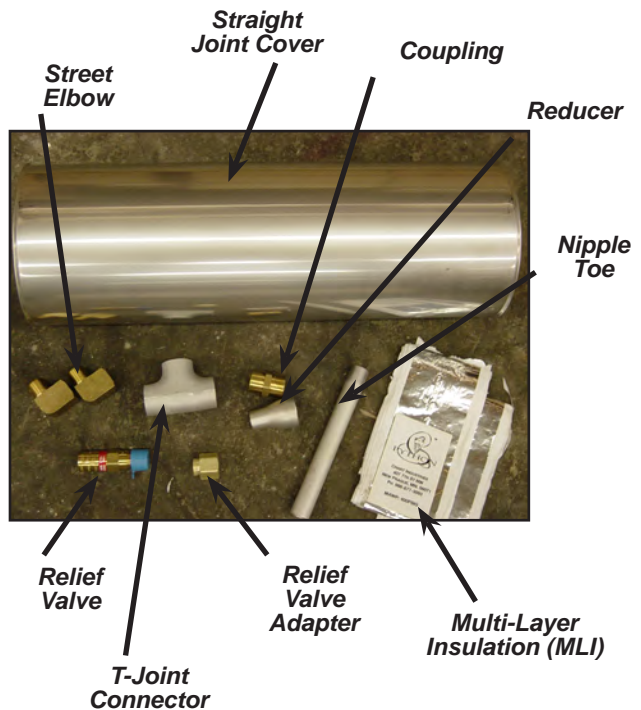
1" - PN 11749800

2" - PN 11749818

3" - PN 11826140

Included in kit:

- T-Joint Connector
- Stainless Steel Reducer
- Stainless Steel Nipple Toe
- Brass Coupling
- 2 - Multi-Layer Insulation (MLI) 40 inches
- Brass Relief Valve Adapter
- 2 - Brass Street Elbow
- Stainless Steel Straight Joint Cover
- Brass Relief Valve (150 psig)



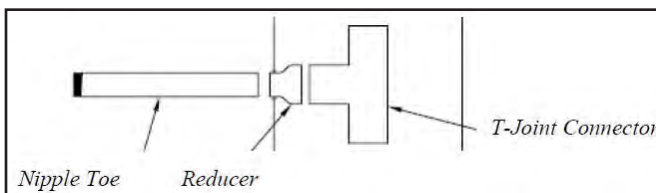
If any part is missing, wrong or damaged please contact Chart as soon as possible.

Relief Valve Kit Installation Procedure

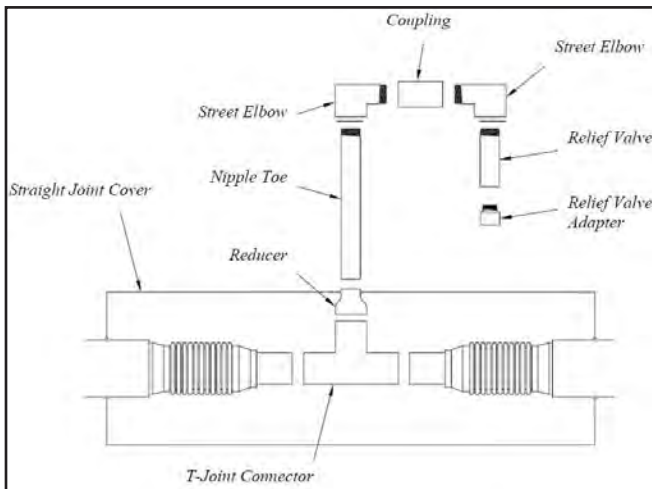


Note: The relief valve kit is supplied with a relief valve rated to 150 psig. If the application requires a different relief valve setting, contact Chart for assistance.

1. MVIP Python pipes are welded using the supplied tee while following the procedure outlined on page 9 “Straight Joint Sections” and “Straight Joint Installation Procedure.”
2. The stainless steel nipple toe is welded to the reducer.



3. After welding, a bubble test should be completed to determine if the weld was successful. If unsuccessful, the joint must be re-worked. If no bubbles are present move on to step 4.
4. Use Teflon tape to seal all unthreaded joints.
5. Assemble the plumbing components by the following drawing:



6. Apply super-insulation to unjacketed areas.

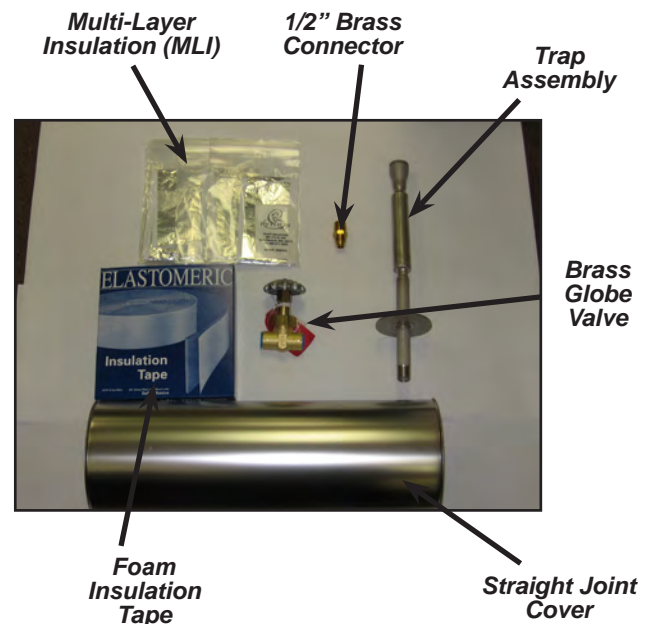
7. Apply foam insulation tape (from installation kit) to fill voids between the assembly and the foam insulation cover.
8. Install straight joint cover. There may be excess insulation tape or foam insulation that needs to be trimmed back. The inside foam of the straight joint cover will also need to be trimmed to allow the plumbing components to fit accordingly.

Trap Kit

1” - PN 11014934

Included in kit:

- Stainless Steel Trap Assembly
- 1/2” Brass Connector
- 5 - Multi-Layer Insulation (MLI) 40 inches
- 1 Box of Rubatex Foam Insulation Tape
- Stainless Steel Straight Joint Cover
- 1/2” Brass Globe Valve



If any part is missing, wrong or damaged please contact Chart as soon as possible.

Trap Installation Procedure

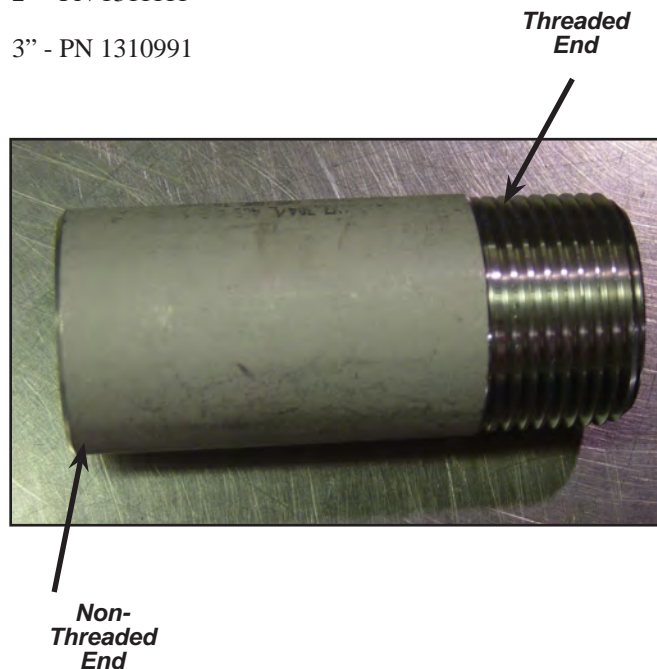
1. Trap must be installed in a vertical, downward run with 1/2" FPT at bottom.
2. TIG weld the reducer end of the stainless steel trap assembly to the end of the existing MVIP Python section.
3. After welding, a bubble test should be completed to determine if the weld was successful. If unsuccessful, the joint must be re-worked.
4. Wrap the pipe from and including the bellows of the existing MVIP Python piece down to the disc with at least two layers of the multi-layer super insulation.
5. Wrap the foam insulation tape over the multi-layer insulation until all air space inside the foam cover will be filled.
6. Install the straight foam insulation sleeve over the hand-insulated pipe section such that the foam insulation and stainless steel cover ends at the disc location.
 - a. Trim foam insulation as required to fit over the insulated trap assembly.
 - b. Silicone all joints to prevent moisture leaks into insulation kit.
7. Thread the brass globe valve onto the 1/2" male pipe thread at bottom of stainless steel trap assembly. Use Teflon tape on the pipe threads.
8. Thread the brass connector into the 1/2" female pipe thread fitting on the brass globe valve. Use Teflon tape on the pipe threads.



Warning! PRESSURIZED SYSTEM: A pressure relief valve should be installed anywhere cryogenic liquid or cold gas can be trapped between two points. If the system contains a component or valve that would allow cryogenic liquid or cold gas to be trapped between the globe valve or the trap kit and the valve / component, the installer must install a pressure relief valve for safety purposes. Contact Chart for any clarifications.

Nipple Toe

- 1" - PN 1310761
- 2" - PN 1311111
- 3" - PN 1310991



The nipple toes supplied are 3" long. Alternate nipple toe sizes are available upon request.

If any part is missing, wrong or damaged please contact Chart as soon as possible.