



TITAN FLOW CONTROL, INC.

PREFACE:

This manual contains information concerning the installation, operation, and maintenance of Titan Flow Control (Titan FCI) Tee Type Strainers. To ensure efficient and safe operation of Titan FCI Tee Strainers, the instructions in this manual should be thoroughly read and understood. This manual is general in nature and is not meant to take the place of an on-site, process engineer or pipe fitter. As such, Titan FCI recommends that only experienced, skilled personnel be allowed to install and maintain Titan FCI Tee Strainers. Please retain this manual in a location where it is readily available for reference.

GENERAL INFORMATION:

A Tee Strainer is installed into a pipeline system to remove unwanted debris from the pipeline flow. In comparison to WYE Strainers, Tee Strainers are commonly used in pipelines where debris loading is high and the collection of solids is required. Straining of the pipeline flow is accomplished via a perforated or mesh lined screen, internal to the strainer. In general, the size of the screen perforation should be slightly smaller than the smallest debris particle to be removed. If the screen perforation is undersized, the screen may require excessive cleaning. Consequently, if the screen perforation is oversized, unwanted debris may be permitted to flow through the pipeline; possibly damaging downstream equipment.

Titan FCI Tee Type Strainers are custom fabricated units, uniquely designed to the customer's specified requirements. Additional data, not contained in this manual, may be found within the "Fabricated Tee Type" Specification Sheet. For exact dimensional and performance data, please refer to the certified engineering drawing for that unit.

Prior to selection of a Titan FCI Startup Strainer, the following factors must be determined:

- Material construction requirements of the Tee Strainer.
- Design and working pressure/temperature requirements.
- Operating conditions (throttling, pressure drop, condensation, flow reversal, operation frequency, etc.).
- Service media type (liquid, gas, abrasive, corrosive, dirty, etc).
- Pipeline Media Flow-rate and Viscosity.
- Clean Start-up Pressure of the Pipeline.
- Space availability for installation.

Please contact a Titan Design Engineer to assist in the determination of these requirements prior to selection and purchase.

INSTALLATION, OPERATION, AND MAINTENANCE

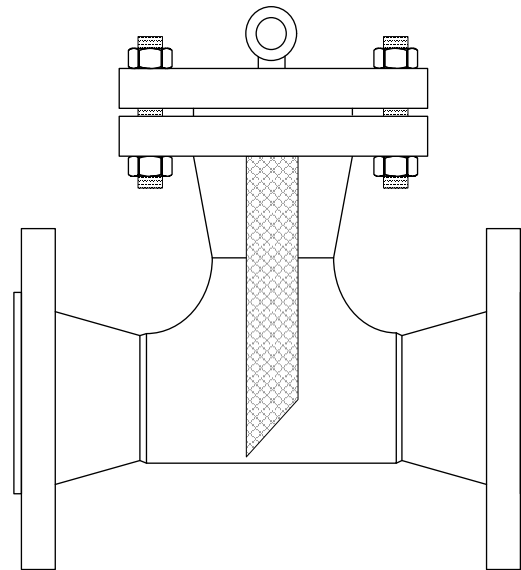


Figure 1: Tee Strainer ~ Bolted Cover

UNPACKING AND INSPECTION:

Upon receipt of product, it is important to follow these unpacking and inspection procedures.

All Titan FCI Tee Strainers are shipped in specialized shipping containers designed to prevent damage during transportation. If external damage to the shipping container is evident upon receipt of product, please request that a representative of the shipping carrier be present before unpacking the product.

- Carefully open the shipping container, following any instructions that may be marked on the container. Remove all packing material surrounding the Tee Strainer and carefully lift it from the container. It is recommend to keep the shipping container and all packing material for reuse in storage or reshipment.

CAUTION:

For large or heavy Tee Strainers, the appropriate material handling equipment must be used to prevent injury and possible damage to the Tee Strainer.

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UNPACKING AND INSPECTION: Continued...

- Visually inspect the Tee Strainer for any signs of damage including scratches, loose parts, broken parts or any other physical damage that may have occurred during shipment. If damage is observed, immediately file a claim with the shipping carrier. Tee Strainers that are damaged during transportation are the responsibility of the customer. For information regarding Titan FCI's warranty policy, please refer to the last page of this document.
- Before installation, the Tee Strainer's cover should be removed and inspected internally for any loose or foreign materials that may have become trapped in the screen during transportation. After inspection, ensure sealing surfaces are clean and replace the gasket and cover. Make sure the gasket is seated correctly before tightening the cover bolts.
- If the Tee Strainer is not required to be installed immediately, it should be stored indoors in a clean, dry, consistent temperature environment. It is also recommended to utilize the original shipping container and packing materials to properly store the Tee Strainer. If long term storage is required, a desiccant may be necessary. This would be based upon the local, environmental storage conditions. Please consult a Titan FCI Design Engineer to assist in this determination.
- When ready to install, remove any preservatives with solvent dampened cloths. Remove any loose material and protective packing material.

INSTALLATION:

Pre-Installation Checklist

- Ensure Working conditions (pressure and temperature) are within the specified capacity of the product being installed. Please refer to the certified Engineering drawings to assist in determining these values.
- Make sure that the construction material of the Strainer is chemically compatible with the media flowing in the pipeline.

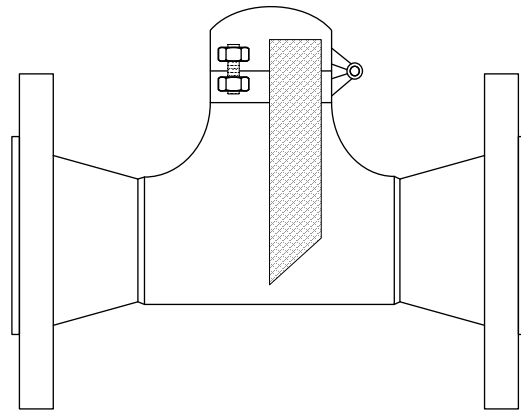


Figure 2: Tee Strainer ~ Hinged Cover

Pre-Installation Checklist continued...

- Inspect the Tee Strainer's flange ends and the pipeline's mating flanges to ensure gasket surfaces are free of defects. The pipeline should also be checked for proper alignment. Titan FCI Tee Strainers should never be utilized to realign an existing piping system.
- Ensure that the pipeline's mating flanges are the same type as the Tee Strainer being installed. Raised face flange ends cannot be mated to flat face flange ends.
- If pipeline strain is a concern when installing larger Tee Strainers (6" and above), a concrete or steel pad should be used to provide additional support. Larger Tee Strainers can also be fitted with legs to assist in reducing strain on the pipeline.
- If the Tee Strainer is to be located on the discharge side of a pump, then a safety release valve must be installed between the Tee Strainer and the pump.

Installation Procedure

- Step 1:
Titan Tee Strainers must be positioned in the pipeline ahead of the equipment requiring protection. If the equipment requiring protection is a pump, the Tee Strainer must be placed on the suction side of the pump.

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Installation Procedure continued...

Step 2:

To provide for easier maintenance, the Tee Strainer should be located where the drain plug can be removed and where there is ample space above the Tee Strainer for screen removal. Refer to the certified engineering drawing to determine the screen clearance requirements.

Step 3:

Before placing the Tee Strainer into place, support the existing pipeline with pipe supports near the inlet and outlet connections of the Tee Strainer.

Step 4:

Place the Tee Strainer into the pipeline, ensuring that the flow arrow on the body of the Tee Strainer is pointing in the direction of the pipeline flow. For large or heavy Tee Strainers, lift the Tee Strainer into place using slings positioned underneath the inlet and outlet connections.

Step 5:

Install a standard, ANSI (1/8" thick) flange gasket between the Tee Strainer and pipeline flanges, on both sides. Install lubricated flange bolts and hand tighten. Flange bolts should then be tightened, using a star or crisscross pattern to evenly load the bolts, in accordance with established piping standards. This is illustrated in Figure 3.

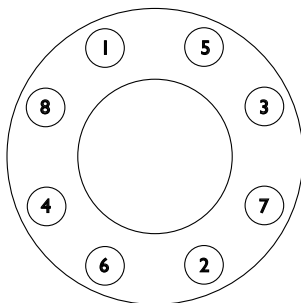


Figure 3: Bolting Sequence Pattern

CAUTION:

Excessive bolt torque may damage flanges. Please refer to established flange bolt torques for guidelines.

OPERATION:

Once proper installation has been successfully completed, start the system gradually, at start up as well as after shut down. This eliminates sudden shock to the strainer and other equipment in the line.

Start-up Procedure:

Step 1:

Remove air from the pipeline by opening the blow-down valve or other vent near the Tee Strainer.

CAUTION:

With piping systems that contain fluids other than water or when the working temperature is above 120° F, fluid must be drained to safe area, away from the operator. Operators should always be fitted with appropriate protective equipment when venting is performed.

Step 2:

Start the piping system by opening the outlet valve nearest the Tee Strainer's outlet first. Then gradually open the inlet valve nearest the Tee Strainer's inlet, approximately 25% of normal operational flow. It is important to start the system gradually to avoid displacing or damaging the Startup Strainer.

Step 3:

Continue to open the inlet valve until the desired service flow has been reached.

Step 4:

Close blow-down valve or other pipeline vent.

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MAINTENANCE:

Titan Flow Control Tee Type Strainers require little monitoring once they are properly installed. The pressure differential across the strainer should be checked periodically to determine if the screen needs to be cleaned or replaced. If the pressure differential goes unchecked and the screen becomes completely clogged, the screen will break and require replacing.

CAUTION:

Tee Strainer screens are not designed to withstand the same pressure ratings as the housings. If a screen becomes completely clogged, it will be exposed to the same pressure as the housing. In most cases, this will cause the screen to fail and potentially damage downstream equipment.

Titan Flow Control Tee Strainers are designed to require very little maintenance. Regular maintenance involves:

- Periodically checking for leaks.
- Timely cleaning or replacement of screen.

During normal use, the screen will become clogged with foreign matter, causing the differential pressure to increase. Once the differential pressure has increased to an unacceptable value, typically by 5 psi to 10 psi, it is time to clean or replace the screen. It is not advisable to let the differential pressure increase by 20 psi. This may cause the screen to fail and possibly damage downstream equipment.

A convenient and safe way to determine when the screen needs to be replaced is to install pressure gauges on the inlet and outlet sides of the Tee Strainer. The maximum acceptable pressure drop across the Tee Strainer will indicate when the screen needs to be replaced. Screen size and construction determine the maximum pressure drop a Tee Strainer screen can withstand. Please consult factory for exact pressure ratings.

Strainer Element Cleaning

CAUTION:

Before removing the cover of the Tee Strainer, the pressure inside the vessel must be reduced to atmospheric via suction or venting. Failure to do so may result in serious bodily injury.

Strainer Element Cleaning: continued...

CAUTION:

Before removing the Tee Strainer's cover, ensure that the media that is flowing in the pipeline is known and any special handling precautions are understood. Please review the Material Safety Data Sheet (MSDS) for that specific fluid.

Step 1:
Isolate the Tee Strainer by closing the inlet and outlet valve connections on either side of the Tee Strainer.

Step 2:
Open vent or drain plug to relieve pressure inside the Tee Strainer. Drain fluid up to screen seat level.

Step 3:
Once pressure is relieved, remove the cover.

Step 4:
Remove screen and clean. Avoid banging or hitting the screen to remove stubborn debris. It is recommended to use a high pressure water or air stream to clean screen.

Step 5:
Inspect screen and cover gasket for damage. If either is damaged, replace. Always ensure there is a spare gasket and screen on hand prior to maintenance.

Step 6:
Remove any debris or sludge from within the Tee Strainer.

Step 7:
Replace clean screen into its original position, ensuring it is squarely positioned on the screen seat.

Step 8:
Replace cover gasket and replace and tighten cover.

Follow the Start-up procedure outlined within the OPERATION section of this manual.



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INSTALLATION, OPERATION, AND MAINTENANCE

SPARE PARTS LIST:

For the bill of materials and spare parts listing of each Tee Strainer model, please refer to the corresponding Engineering Specification Sheet. For special or fabricated units, please refer to the certified engineering drawing for that unit.

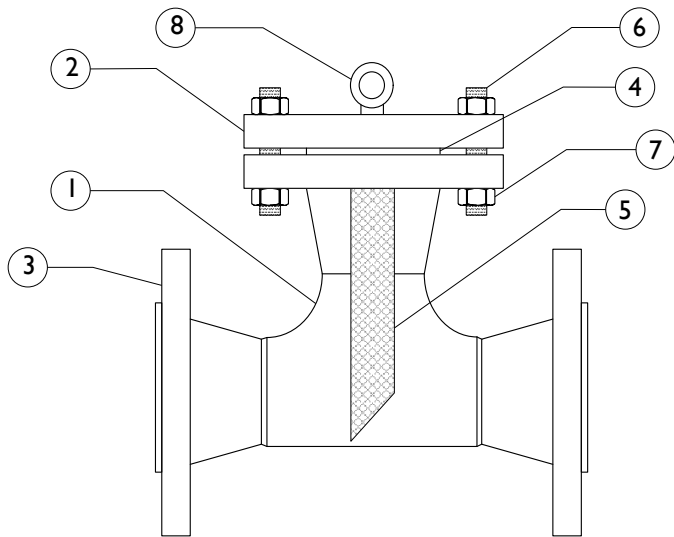


Figure 4: CAD Illustration

PARTS LIST	
No.	TEE Type Strainer
1	BODY
2	COVER
3	FLANGE
4*	GASKET
5*	BASKET
6	BOLTS
7	NUTS
8	LIFTING HOOK

* Denotes recommended spare parts

WARRANTY:

Seller warrants each of the products and parts sold hereunder, under normal use of service, and subject to user's compliance with any operating instructions and other directions given by seller, to be free from defects in materials or workmanship for a period of one year from date of shipment from seller's plant. Seller's liability, under this warranty, shall be limited to, at the seller's option, to repairing or replacing any such defective product FOB seller's plant in Lumberton, NC, and reimbursing purchaser for shipping costs, subject to the following: (1) Timely receipt of purchaser's written notice that such products are defective. (2) Seller's written authorization to purchaser for the return of such products, (3) the return of such products to seller with shipping charges prepaid and (4) seller's inspection of and confirmation that such products are defective in materials or workmanship. If seller's inspection shows that the products returned are defective due to dirt, rust or any foreign material not attributable to seller: improper usage, over tightening on threads, abuse or incorrect assembly in the field, or other cause not due to seller's improper manufacture, seller will, subject to purchaser's written authorization, repair or replace such products at cost. Seller's factory inspection and testing reports will be made available to purchaser upon request.

THIS WARRANTY IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF FITNESS OR MERCHANTABILITY. SELLER SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES. NO REPRESENTATIVE OR SELLER HAS AUTHORITY TO MAKE ANY REPRESENTATIONS OR WARRANTIES, EXCEPT AS STATED HEREIN.

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