



Manufacturer

TLV CO., LTD.
Kakogawa, Japan
is approved by LRQA Ltd. to ISO 9001/14001



Instruction Manual

**Automatic Air Vent
(Clean Air Vent)**

VS3-E / VS3-P / VS3-EP

Manufacturer

TLV CO., LTD.

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TLV CORPORATION

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Introduction

Thank you for purchasing the TLV automatic air vent (clean air vent).

This product has been thoroughly inspected before being shipped from the factory. When the product is delivered, before doing anything else, check the specifications and external appearance to make sure nothing is out of the ordinary. Also be sure to read this manual carefully before use and follow the instructions to be sure of using the product properly.

The automatic air vent (clean air vent) is designed to automatically discharge/release air trapped in water-carrying pipes during water transport. It also automatically discharges the air that was entrained in the water during operation and has subsequently been separated and collected in specific locations in the piping.

For products with special order specifications or options, if detailed instructions for the special order specifications or options are not contained in this manual, please contact TLV for full details.

This instruction manual is intended for use with the model(s) listed on the front cover. It is necessary not only for installation but for subsequent maintenance, disassembly/reassembly and troubleshooting. Please keep it in a safe place for future reference.

Safety Considerations

- Read this section carefully before use and be sure to follow the instructions.
- Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.
- The precautions listed in this manual are designed to ensure safety and prevent equipment damage and personal injury. For situations that may occur as a result of erroneous handling, three different types of cautionary items are used to indicate the degree of urgency and the scale of potential damage and danger: DANGER, WARNING and CAUTION.
- The three types of cautionary items above are very important for safety: be sure to observe all of them as they relate to installation, use, maintenance, and repair. Furthermore, TLV accepts no responsibility for any accidents or damage occurring as a result of failure to observe these precautions.

Symbols

	Indicates a DANGER, WARNING or CAUTION item.
 DANGER	Indicates an urgent situation which poses a threat of death or serious injury
 WARNING	Indicates that there is a potential threat of death or serious injury
 CAUTION	Indicates that there is a possibility of injury or equipment / product damage

 WARNING	DO NOT use for toxic, flammable or otherwise hazardous fluids. This product is an air vent that discharges air from water piping systems. Use only for water and/or air. This product is for intended use only. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents.
	NEVER apply direct heat to the float. The float may explode due to increased internal pressure, causing accidents leading to serious injury or damage to property and equipment.
 CAUTION	Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.
	DO NOT use this product in excess of the maximum operating pressure differential. Such use could make discharge impossible (blocked).
	Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.

Continued on the next page

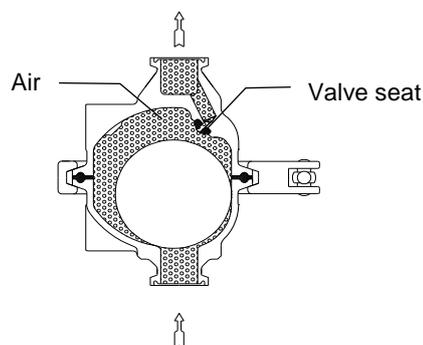
 CAUTION	When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature.
	Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.
	Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way.
	Failure to observe these precautions may result in damage to the product and burns or other injury due to malfunction or the discharge of fluids.
	Use only under conditions in which no freeze-up will occur.
	Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.
	Use only under conditions in which no water hammer will occur.
	The impact of water hammer may damage the product, leading to fluid discharge, which may cause burns or other injury.

Features

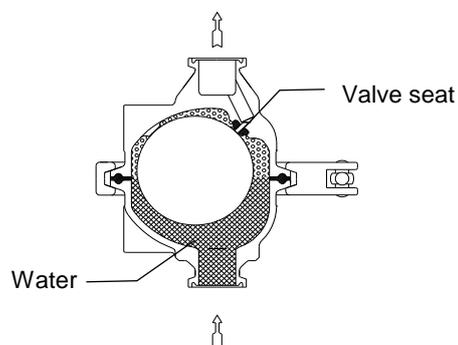
1. Precision-ground float and 3-point seating provide the tightest seal.
2. All stainless steel construction provides outstanding corrosion resistance.
3. The air vent has no hinges or levers: the only moving part is the polished float, which eliminates concentrated wear and provides long service life.
4. Simple construction with few parts allows for easy maintenance.
5. The air vent is small and light.

Operation

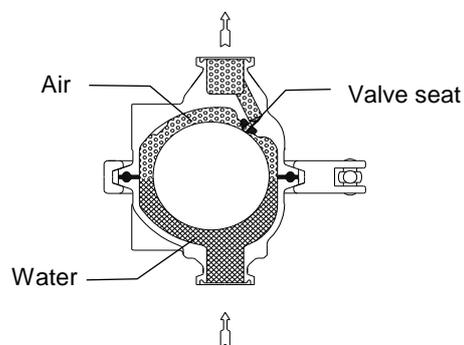
1. When water starts to flow through the piping, air trapped within the piping is pushed along by the water pressure and enters the air vent. At first, because the float is positioned in the lower part of the air vent, the valve is fully open and the air passes through the valve seat and is discharged rapidly through the vent.



2. When the air has been discharged and water begins to enter the air vent, the float starts to rise due to buoyancy. This pushes it upwards against the valve opening, thus closing the air vent. If there is a rapid rise in water level (caused by rapidly opening a shut-off valve, etc.), a small amount of water may leak with discharged air immediately before the air vent closes.



3. When more air is trapped in the air vent due to the inflow of water having closed the valve, the water level in the air vent is forced down and consequently the level of the float falls, opening the valve. Air can now again escape through the air vent, and as it does so the level of the water rises, pushing the float upwards again to close the valve. In this way the VS3 series automatically adjusting air vents constantly respond to the flow of air.



4. When draining the piping, the air vent automatically opens to introduce air and remove water more easily (preventing a vacuum from forming in the piping).

Specifications



WARNING

DO NOT use for toxic, flammable or otherwise hazardous fluids. This product is an air vent that discharges air from water piping system. Use only for water and/or air. This product is for intended use only. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accident.



CAUTION

Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions which may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.



CAUTION

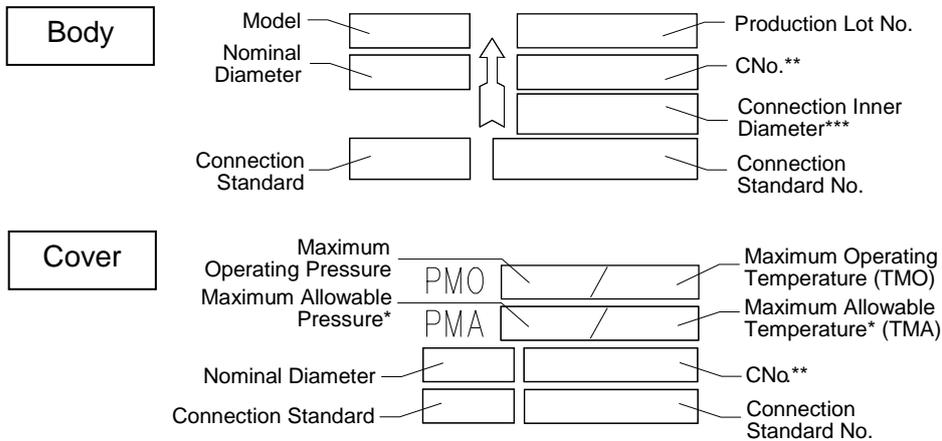
DO NOT use this product in excess of the maximum operating pressure differential; such use could make discharge impossible (blocked).



CAUTION

Use only under conditions in which no freeze-up will occur. Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.

Refer to the indications on the body and the cover for detailed specifications.

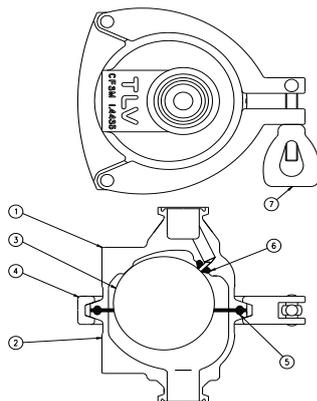


* Maximum allowable pressure (PMA) and maximum allowable temperature (TMA) are PRESSURE SHELL DESIGN CONDITIONS, **NOT** OPERATING CONDITIONS.

** CNo. (Charge / Mill No.) is displayed for products with options. This item is omitted when there are no options.

*** Connection inner diameter is displayed for products with options. This item is omitted when there are no options.

Configuration



No.	Name
1	Body
2	Cover
3	Float
4	Body Clamp
5	Cover Gasket
6	Valve Seat
7	Wing Nut

Installation



WARNING

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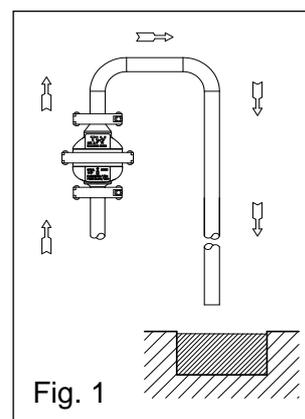


CAUTION

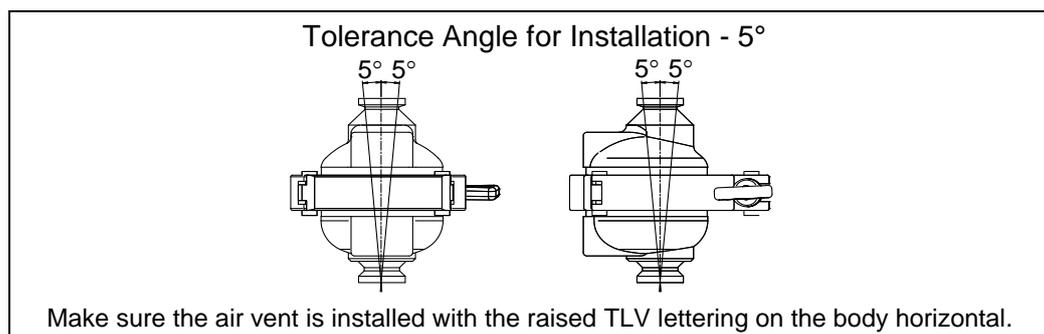
Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.

Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.

1. As this air vent is for the discharge of air from water-carrying pipes, it must not be used for the discharge of air from steam spaces.
2. Before installation, be sure to remove all protective seals.
3. Before installing the product, open the inlet valve and blow out the inlet piping to remove any piping scraps, dirt and oil. Close the inlet valve after blowdown.
4. This product must be installed vertically, with the inlet at the bottom and the outlet at the top, and should be inclined no more than 5° horizontally and front-to-back.
5. Install the product in a location where air is likely to collect such as a bend in the piping.
6. Install the product so that the outlet pipe reaches a drainage vessel or ditch. Make sure the end of the pipe is above the waterline, so that dirt and water can not be sucked up by vacuum when the system shuts down (Fig. 1).
7. For the inlet connection, use a pipe/fitting, etc. with an inner diameter of at least 16 mm ($\frac{5}{8}$ in), such as a schedule 40 pipe or pipe nipple with a nominal diameter of 15 mm ($\frac{1}{2}$ in). A smaller pipe may prevent water/air displacement.



If there is a problem, determine the cause using the “Troubleshooting” section in this manual.



Maintenance



Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.



Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product or burns or other injury due to malfunction or the discharge of fluids.

Operational Inspection

A visual inspection of the following items should be done on a daily basis to determine whether the product is operating properly or has failed.

If the air vent should fail, it may cause water leakage or hindrance to water flow.

Normal	: Air is discharged as it accumulates, with the air vent closing (with no leakage) when no air is present in the piping.
Blocked (Discharge Impossible)	: No air is discharged though air accumulates in the air vent.
Leakage	: Water is discharged or leaks through the product outlet during closed position.

Parts Inspection

When parts have been removed, or during periodic inspections, use the following table to inspect the parts and replace any that are found to be defective.

Procedure	
Cover Gasket:	Check for warping and damage
Valve Seat:	Check for scratches or wear
Float:	Check for scratches or dents

Disassembly/Reassembly



NEVER apply direct heat to the float. The float may explode due to increased internal pressure, causing accidents leading to serious injury or damage to property and equipment.



Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.



When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.



Be sure to use only the recommended components when repairing the product, and **NEVER** attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product or burns or other injury due to malfunction or the discharge of fluids.

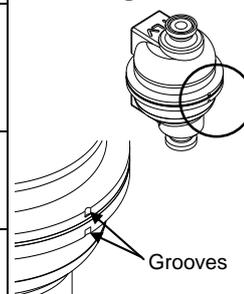
Use the following procedures to remove components. Use the same procedures in reverse to reassemble.

(Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.)

Detaching / Reattaching the Body and the Cover

Part	During Disassembly	During Reassembly
Wing Nut Body Clamp	Loosen the wing nut with a tool such as an adjustable wrench, then remove the body clamp	Tighten the wing nut to the proper torque
Body / Cover	Remove, being careful not to scratch the surface	With the gasket in place, align grooves and gently place the body on the cover (Fig. A)
Cover Gasket	Remove the gasket and clean sealing surfaces	Replace with a new gasket if damaged

Fig. A



Detaching / Reassembly of Components Inside the Body / Cover

Part	During Disassembly	During Reassembly
Float	Remove, being careful not to scratch the polished surfaces of the float	Insert into body/cover, being careful not to scratch its polished surface, take care not to scratch or damage the seating surface of the valve seat (Fig. B)

Fig. B

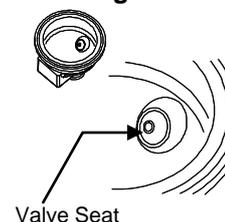
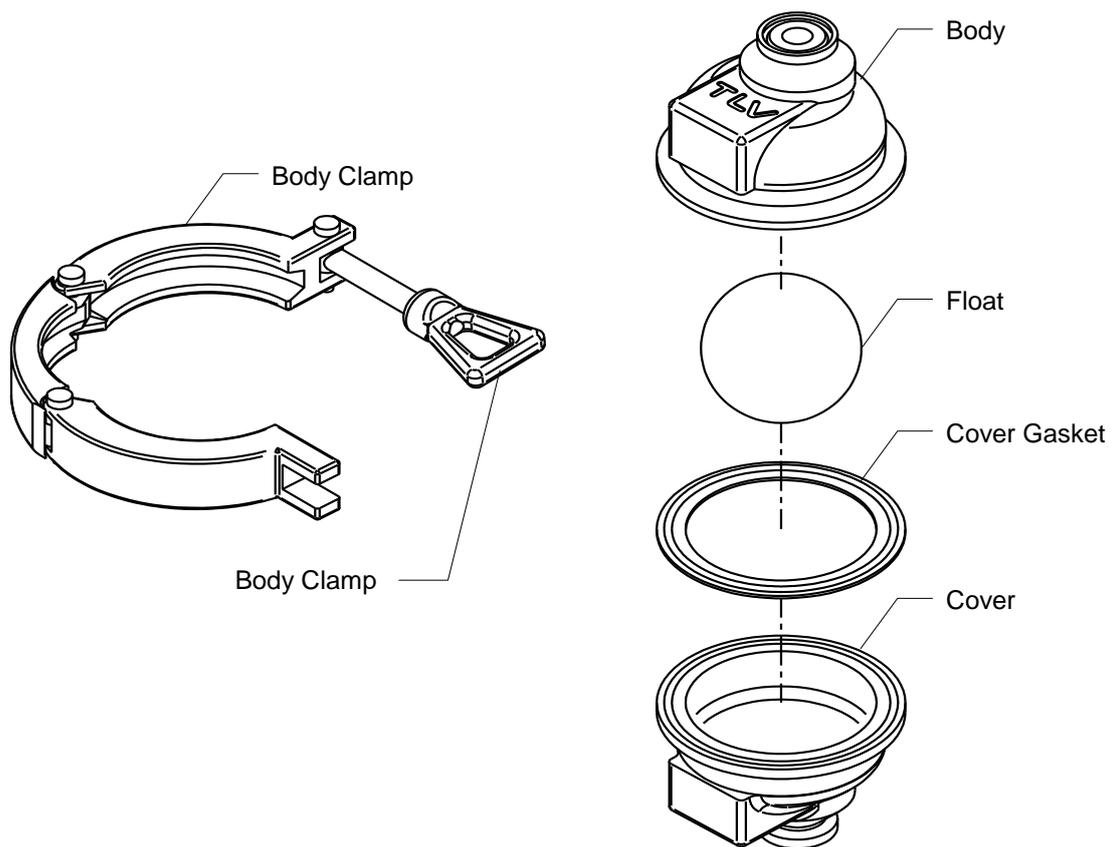


Table of Tightening Torques

Part Name	Torque	
	N·m	(lbf·ft)
Wing Nut	10	(7)

(1 N·m ≈ 10 kg·cm)

Exploded View



Troubleshooting



When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.

When the product fails to operate properly, use the following table to locate the cause and remedy.

Problem	Cause	Remedy
No air is discharged or discharge is poor	The trapped air cannot displace the water in the piping	Correct the inlet piping (Inner diameter should be at least 16mm (5/8 in))
	The valve seat is clogged with dirt or foreign matter	Clean the valve seat
	The inlet or outlet piping is clogged	Clean the piping
	The operating pressure exceeds the maximum specified pressure for this product	Replace the air vent with a model that has a suitable operating pressure rating
Water leaks when the vent is closed	There is a build-up of rust or scale on the valve seat or the valve seat is damaged	Clean the valve seat or replace with a new valve seat
	The float is misshapen, dirty or has a film build-up	Clean the float or replace with a new float
	The installation angle of inclination is incorrect	Correct the installation
The vent does not close and water is blowing	The float is damaged or filled with water	Replace with a new float
	The specific gravity of the liquid is outside the specifications for this product (this product is for water systems)	Select a product with suitable specifications for the operating conditions

TLV EXPRESS LIMITED WARRANTY

Subject to the limitations set forth below, TLV Corporation, a North Carolina corporation (“**TLV**”) warrants that products which are sold by it, TLV CO., LTD., a Japanese corporation (“**TLVJ**”) or TLV International, Inc., a Japanese corporation (“**TII**”), (hereinafter the “**Products**”) are designed and manufactured by TLVJ, conform to the specifications published by TLV for the corresponding part numbers (the “**Specifications**”) and are free from defective workmanship and materials. With regard to products or components manufactured by unrelated third parties (the “**Components**”), TLV provides no warranty other than the warranty from the third party manufacturer(s), if any.

Exceptions to Warranty

This warranty does not cover defects or failures caused by:

1. improper shipping, installation, use, handling, etc., by other than TLV or service representatives authorized by TLV; or
2. dirt, scale or rust, etc.; or
3. improper disassembly and reassembly, or inadequate inspection and maintenance by other than TLV or service representatives authorized by TLV; or
4. disasters or forces of nature or Acts of God; or
5. abuse, abnormal use, accidents or any other cause beyond the control of TLV; or
6. improper storage, maintenance or repair; or
7. operation of the Products not in accordance with instructions issued with the Products or with accepted industry practices; or
8. use for a purpose or in a manner for which the Products were not intended; or
9. use of the Products in a manner inconsistent with the Specifications; or
10. use of the Products with Hazardous Fluids (fluids other than steam, air, water, nitrogen, carbon dioxide and inert gases (helium, neon, argon, krypton, xenon and radon)); or
11. failure to follow the instructions contained in the TLV Instruction Manual for the Product.

Duration of Warranty

This warranty is effective for a period of the earlier of: (i) three (3) years after delivery of Products to the first end user in the case of sealed SST-Series Products for use in steam pressure service up to 650 psig; (ii) two (2) years after delivery of Products to the first end user in the case of PowerTrap® units; or (iii) one (1) year after delivery of Products to the first end user in the case of all other Products. Notwithstanding the foregoing, asserting a claim under this warranty must be brought by the earlier of one of the foregoing periods, as applicable, or within five (5) years after the date of delivery to the initial buyer if not sold initially to the first end user.

ANY IMPLIED WARRANTIES NOT NEGATED HEREBY WHICH MAY ARISE BY OPERATION OF LAW, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ANY EXPRESS WARRANTIES NOT NEGATED HEREBY, ARE GIVEN SOLELY TO THE INITIAL BUYER AND ARE LIMITED IN DURATION TO ONE (1) YEAR FROM THE DATE OF SHIPMENT BY TLV.

Exclusive Remedy

THE EXCLUSIVE REMEDY UNDER THIS WARRANTY, UNDER ANY EXPRESS WARRANTY OR UNDER ANY IMPLIED WARRANTIES NOT NEGATED HEREBY (INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE), IS **REPLACEMENT**; PROVIDED: (a) THE CLAIMED DEFECT IS REPORTED TO TLV IN WRITING WITHIN THE APPLICABLE WARRANTY PERIOD, INCLUDING A DETAILED WRITTEN DESCRIPTION OF THE CLAIMED DEFECT AND HOW AND WHEN THE CLAIMED DEFECTIVE

PRODUCT WAS USED; AND (b) THE CLAIMED DEFECTIVE PRODUCT AND A COPY OF THE PURCHASE INVOICE IS RETURNED TO TLV, FREIGHT AND TRANSPORTATION COSTS PREPAID, UNDER A RETURN MATERIAL AUTHORIZATION AND TRACKING NUMBER ISSUED BY TLV. ALL LABOR COSTS, SHIPPING COSTS, AND TRANSPORTATION COSTS ASSOCIATED WITH THE RETURN OR REPLACEMENT OF THE CLAIMED DEFECTIVE PRODUCT ARE SOLELY THE RESPONSIBILITY OF BUYER OR THE FIRST END USER. TLV RESERVES THE RIGHT TO INSPECT ON THE FIRST END USER'S SITE ANY PRODUCTS CLAIMED TO BE DEFECTIVE BEFORE ISSUING A RETURN MATERIAL AUTHORIZATION. SHOULD SUCH INSPECTION REVEAL, IN TLV'S REASONABLE DISCRETION, THAT THE CLAIMED DEFECT IS NOT COVERED BY THIS WARRANTY, THE PARTY ASSERTING THIS WARRANTY SHALL PAY TLV FOR THE TIME AND EXPENSES RELATED TO SUCH ON-SITE INSPECTION.

Exclusion of Consequential and Incidental Damages

IT IS SPECIFICALLY ACKNOWLEDGED THAT THIS WARRANTY, ANY OTHER EXPRESS WARRANTY NOT NEGATED HEREBY, AND ANY IMPLIED WARRANTY NOT NEGATED HEREBY, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, DO NOT COVER, AND NEITHER TLV, TII NOR TLVJ WILL IN ANY EVENT BE LIABLE FOR, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO LOST PROFITS, THE COST OF DISASSEMBLY AND SHIPMENT OF THE DEFECTIVE PRODUCT, INJURY TO OTHER PROPERTY, DAMAGE TO BUYER'S OR THE FIRST END USER'S PRODUCT, DAMAGE TO BUYER'S OR THE FIRST END USER'S PROCESSES, LOSS OF USE, OR OTHER COMMERCIAL LOSSES. WHERE, DUE TO OPERATION OF LAW, CONSEQUENTIAL AND INCIDENTAL DAMAGES UNDER THIS WARRANTY, UNDER ANY OTHER EXPRESS WARRANTY NOT NEGATED HEREBY OR UNDER ANY IMPLIED WARRANTY NOT NEGATED HEREBY (INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) CANNOT BE EXCLUDED, SUCH DAMAGES ARE EXPRESSLY LIMITED IN AMOUNT TO THE PURCHASE PRICE OF THE DEFECTIVE PRODUCT. THIS EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES, AND THE PROVISION OF THIS WARRANTY LIMITING REMEDIES HEREUNDER TO REPLACEMENT, ARE INDEPENDENT PROVISIONS, AND ANY DETERMINATION THAT THE LIMITATION OF REMEDIES FAILS OF ITS ESSENTIAL PURPOSE OR ANY OTHER DETERMINATION THAT EITHER OF THE ABOVE REMEDIES IS UNENFORCEABLE, SHALL NOT BE CONSTRUED TO MAKE THE OTHER PROVISIONS UNENFORCEABLE.

Exclusion of Other Warranties

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY DISCLAIMED.

Severability

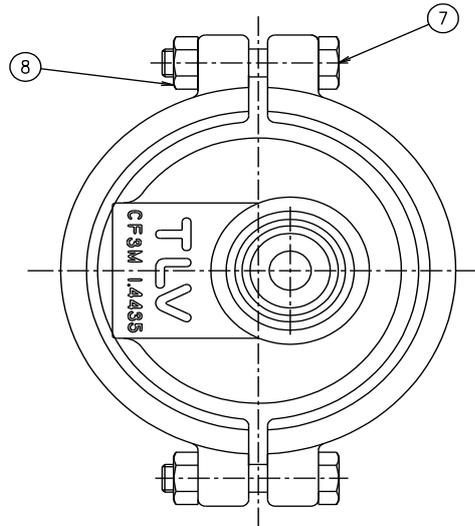
Any provision of this warranty which is invalid, prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such invalidity, prohibition or unenforceability without invalidating the remaining provisions hereof, and any such invalidity, prohibition or unenforceability in any such jurisdiction shall not invalidate or render unenforceable such provision in any other jurisdiction.

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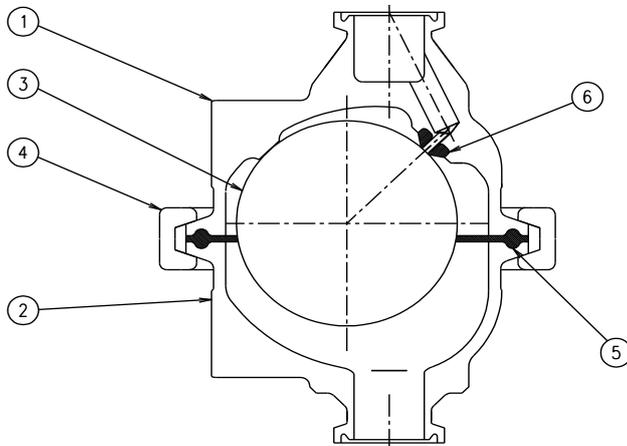
13901 South Lakes Drive, Charlotte, NC 28273-6790, U.S.A.
Tel: [1]-704-597-9070 Fax: [1]-704-583-1610

Option (2-piece Clamp for Bolts and Nuts)

Configuration



No.	Name
1	Body
2	Cover
3	Float
4	Body Clamp
5	Cover Gasket
6	Valve Seat
7	Clamp Nut
8	Clamp Bolt



Disassembly/Reassembly



NEVER apply direct heat to the float. The float may explode due to increased internal pressure, causing accidents leading to serious injury or damage to property and equipment.



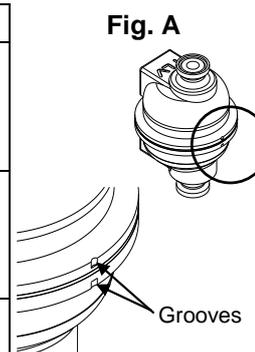
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Use the following procedures to remove components. Use the same procedures in reverse to reassemble.

(Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.)

Detaching / Reattaching the Body and the Cover

Part	During Disassembly	During Reassembly
Clamp Bolts / Nuts Body Clamp	Loosen clamp nuts with a tool such as an adjustable wrench, then remove the body clamp	Tighten clamp nut to the proper torque
Body / Cover	Remove, being careful not to scratch the surface	With gasket in place, align grooves and gently place the body on the cover (Fig. A)
Cover Gasket	-	Replace with a new gasket if damaged



Detaching / Reassembly of Components Inside the Body / Cover

Part	During Disassembly	During Reassembly
Float	Remove being careful not to scratch the polished surfaces of the float, the body and the cover	Insert into body/cover, being careful not to scratch its polished surface, take care not to scratch or damage the seating surface of the valve seat (Fig. B)

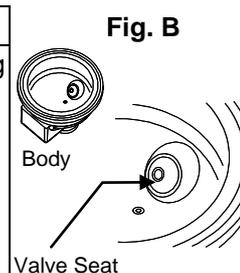


Table of Tightening Torques

Part Name	Torque		Distance Across Flats	
	N·m	(lbf·ft)	mm	(in)
Clamp Bolts / Nuts	10	(7)	13	(1/2)

(1 N·m ≈ 10 kg·cm)

Exploded View

