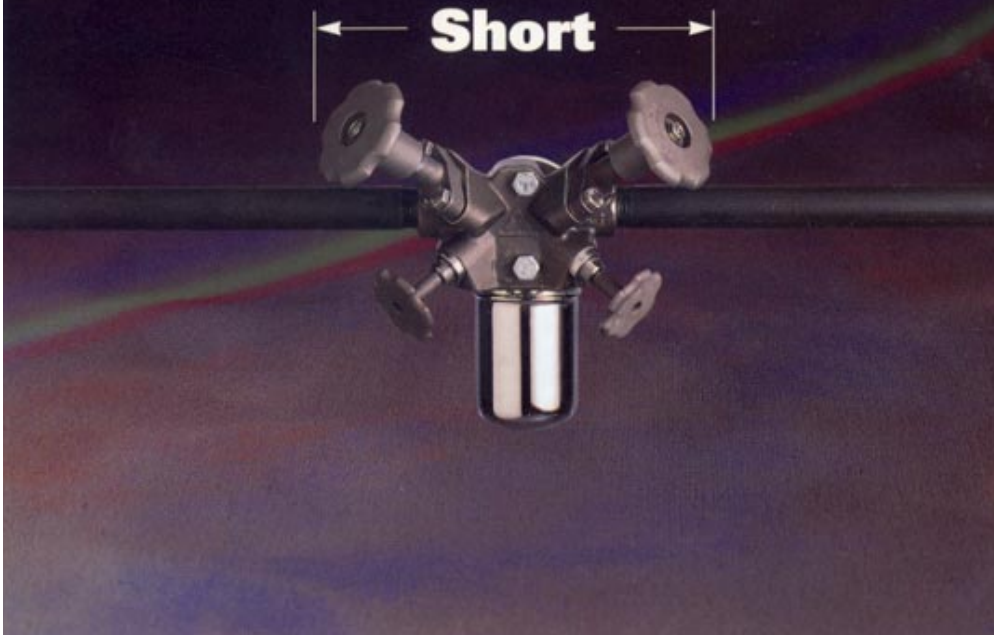


# The New Armstrong Stainless Steel Trap Valve Station

**Makes A Long Story**



**Short**



A steam trap and valves in one space-saving package that reduces costs for energy, installation and maintenance.



# Armstrong

# The innovation is *integration*

The patented Armstrong stainless steel Trap Valve Station\* (TVS) makes what used to be long, complicated steam installation stories simple and compact. It shortens by integrating components—specifically an inverted bucket steam trap and two or more valves.

In other words, the TVS makes it all one, delivering the functions of multiple components in a dramatically smaller unit. It integrates two products of proven quality in a package of revolutionary versatility.

## A revolution 85 years in the making

Armstrong invented the inverted bucket steam trap in 1911. In the years since, the energy-saving performance of steam traps applying its principle is legendary. It's little wonder, given its benefits:

- Longest service life of any type steam trap
- Proven energy conservation

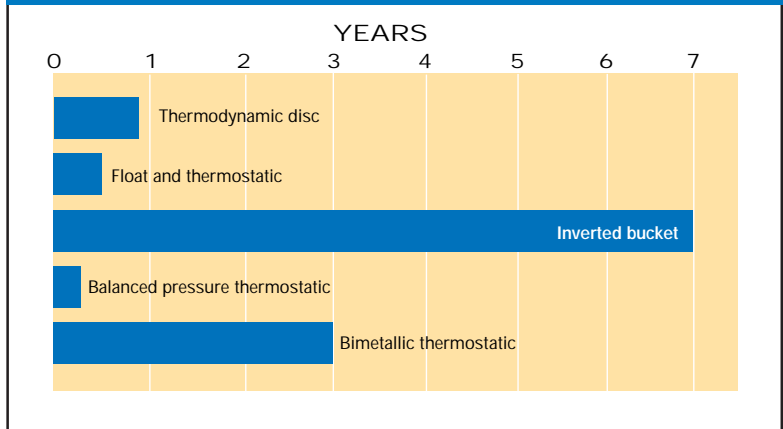
- Dependable operation because there's nothing to stick, bind or clog
- Purging action due to snap opening of the valve
- Continuous automatic air and CO<sub>2</sub> venting
- Excellent operation against back pressure
- Resistance to damage from water hammer
- Freedom from dirt problems

Armstrong inverted bucket steam traps conserve energy even in the presence of wear.

They operate more efficiently longer because the inverted bucket is the most reliable steam trap operating principle known. It is the *principle* that matters—year after energy-saving year.

Tests, installations and third-party proof from around the world prove the superiority of the inverted bucket steam trap. Now, the TVS multiplies its energy benefits by teaming it with an energy-efficient *piston* valve and merging these two star performers into a package that eliminates many of the potential leak points in piping.

Average Service Life for Different Trap Types 200 PSI (14 BAR)



Above data from "ICI Engineer" January 1993 special issue with permission from ICI Engineering.



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# Armstrong gives you a new handle on energy conservation, installation and maintenance costs

The Armstrong stainless steel inverted bucket steam trap simply carries a good idea to its logical conclusion by sealing all the proven IB advantages in a tamperproof, corrosion-resistant package. Lightweight and compact, Armstrong inverted buckets can withstand freeze-ups without damage. In fact, we're so sure of their performance we guarantee them for *three years* against leaks.

With the introduction of the 360° connector several years ago, Armstrong added even greater utility to this stainless steel workhorse. The universal connector made it possible to install inverted bucket efficiency and long service life in any piping configuration with little or no repiping.

**TVS:**  
**New role for the connector**  
Now the concept of the Series 3000 stainless steel Trap Valve Station gives the universal connector another job: match-maker. It brings together a stainless steel inverted bucket steam trap and piston valves

in a variety of practical combinations. In fact, we can meet the specifications for any type of steam trap. The piston valves are of the same design as those used on the cast iron TVS—with the same benefits: dual sealing action, automatic retightening and in-line repairability.

The standard version of the stainless steel TVS uses the connector block to merge a steam trap and two shutoff valves into one integrated unit. The connector block can also accommodate two additional valves. One option is for a bleed valve to depressurize the trap before removing it from the connector block. The second is for a test valve to test and evaluate trap operation.

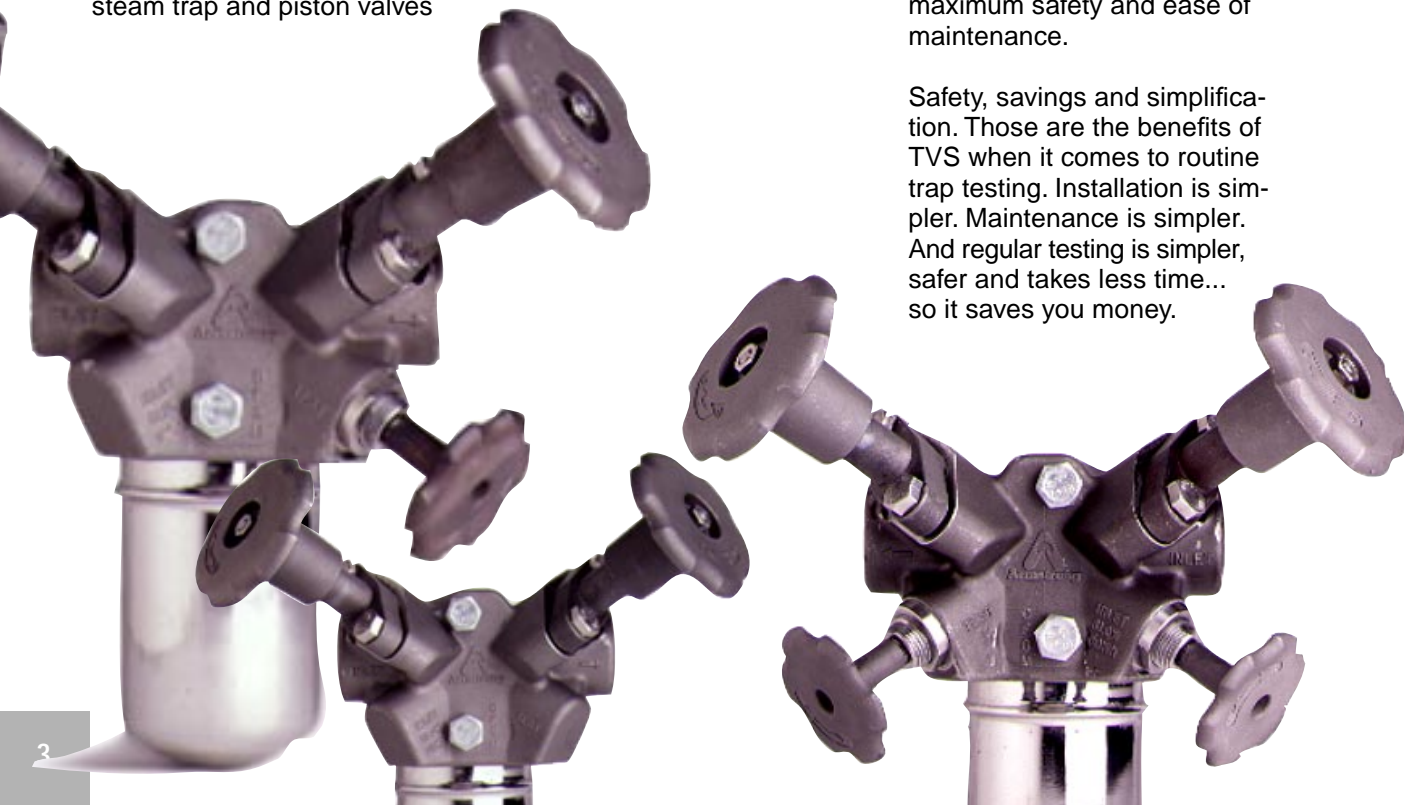
**Test... and save**  
Steam trap testing is a well-accepted component of aggressive energy management. Certainly, it's essential to the efficiency of a well designed and properly maintained steam system.

The Trap Valve Station allows you to test with greater safety and accuracy as well as substantial savings in time and labor cost.

Consider this example: A 3/16" (4.8 mm) orifice leaking 100 lb (45 kg) of steam per hour at 50 psi (3.4 bar) will squander \$4,380 worth of energy in one year, assuming a steam cost of \$5/1,000 lb (450 kg). Numbers like these make it easy to see the importance of reliable trap monitoring.

Most experts agree that testing steam traps with test valves is the most reliable of available methods because it permits you to check trap discharge visually. With test valves you can see evidence of trap failure that is difficult to detect with other test methods. And the quicker you see what you *may* be missing now, the quicker you can begin saving the precious energy failed traps waste. The TVS enhances your capability to check trap operation. It also gives you a built-in way to block and bleed traps for maximum safety and ease of maintenance.

Safety, savings and simplification. Those are the benefits of TVS when it comes to routine trap testing. Installation is simpler. Maintenance is simpler. And regular testing is simpler, safer and takes less time... so it saves you money.



# The proof is in the piston

Armstrong met half the challenge of the TVS decades ago by inventing the inverted bucket steam trap. Its long service life and energy-saving potential are unquestioned. When it came to integrating a valve with the inverted bucket in the Trap Valve Station, we chose a *piston valve*. It's the only type of valve capable of matching the inverted bucket in reliability and energy efficiency.

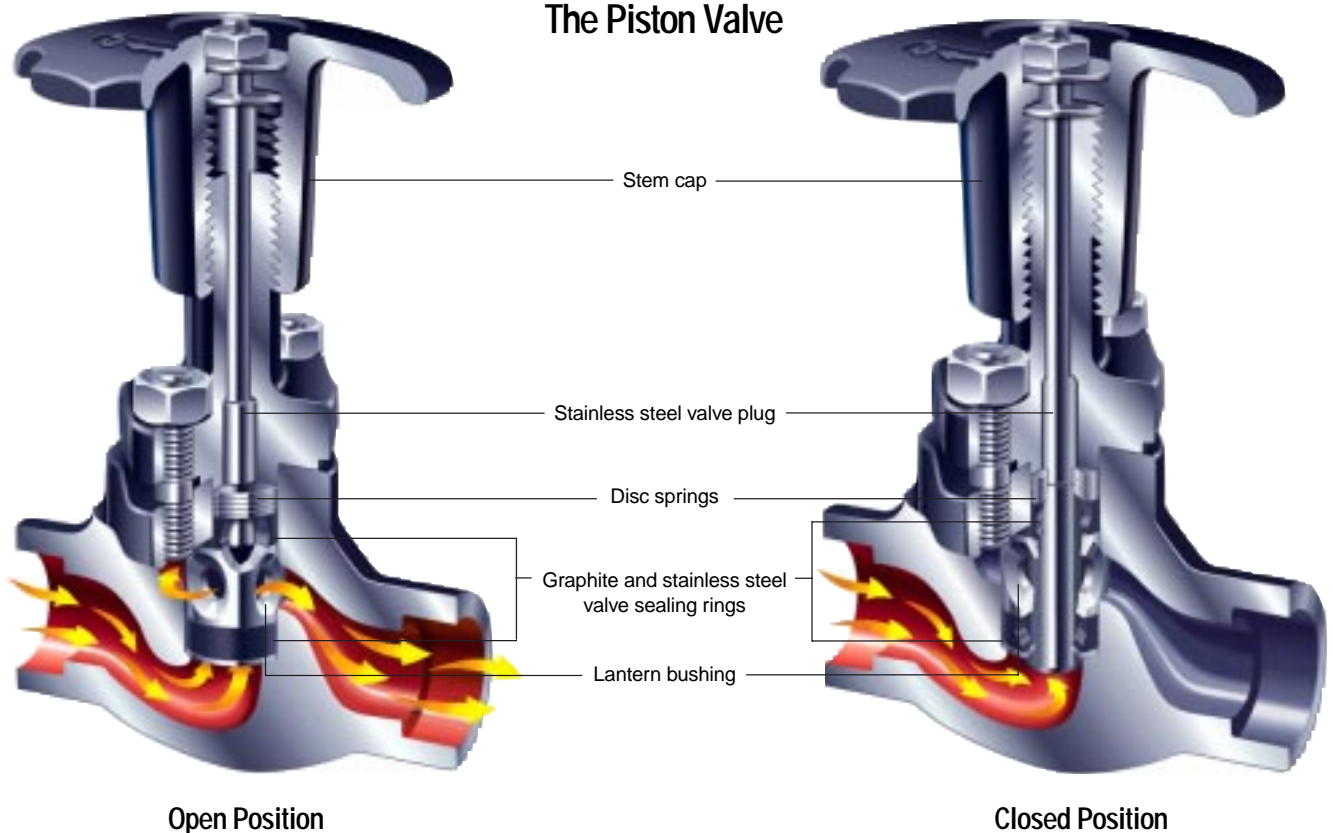
All types of valves—plug valves, gate valves, piston valves and even ball valves—have been

summoned for duty in steam service. Due to its excellent sealing characteristics in steam service and because it has no gland packing, the piston valve is frequently selected for steam systems.

People who have used it over the past 20 years can testify that leakage to atmosphere is extremely rare, even without any maintenance. The elastic contact between piston and valve sealing rings provides a perfect tightness, both in-line and to atmosphere.

Steam system valves, whatever their design, are used to isolate steam and condensate lines or when a faulty steam trap needs to be removed from the line. This means the valves stay in the open position for long periods and are nearly always in contact with the atmosphere. It is not surprising therefore that when the valves need to be closed, they can often prove difficult to operate. Our experience and the demands from end users for energy efficiency have led us to a sealing system designed especially for steam service.

## The Piston Valve



Open Position

Closed Position

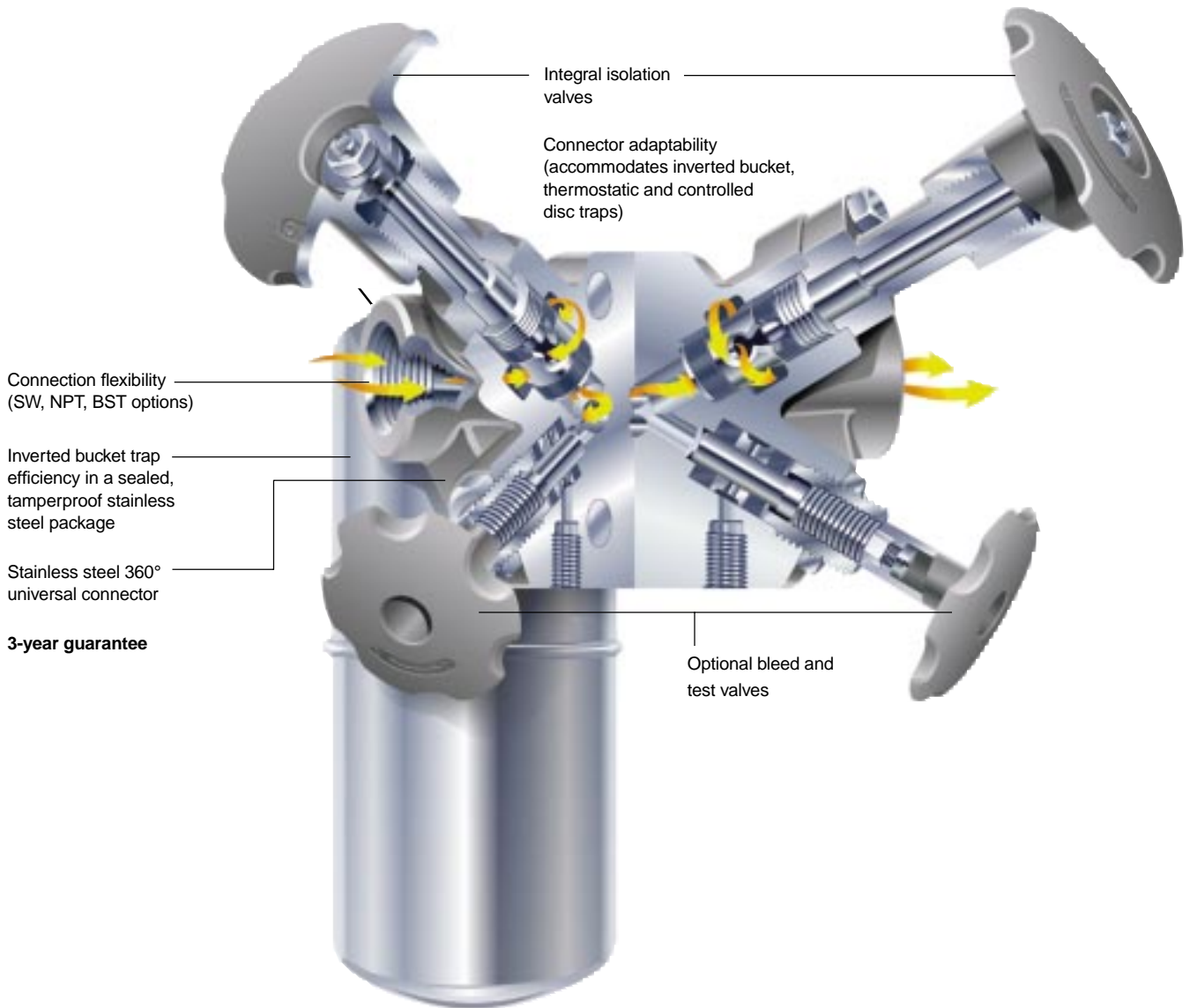
- **Dual sealing action.** The piston valve is a seatless valve which includes two graphite and stainless steel valve sealing rings that seal the stem and function as a valve seat. This combination provides long-term protection against leaks to the atmosphere and downstream piping.
- **Self-cleaning action.** Stainless steel piston slides without rotating between the two valve sealing rings, preventing dirt from damaging the sealing surfaces.

- **Sealing integrity.** Flexible disc springs automatically provide leak tightness by exerting pressure which keeps the upper and lower valve sealing rings compressed at all times. Sealing tightness is assured by the compression of the sealing rings against the piston and the valve body. This combination of disc springs and dual valve seal rings protects against expansion and contraction due to heating and cooling. This assures dependable operation, even after years of service.

- **Protected valve stem.** The valve stem and sealing surfaces are completely protected from dirt and corrosion by the stem cap, whether in an open or closed position.
- **In-line repairability.** All valve components may be easily replaced in-line.
- **Long-term operation.** Piston valve design assures actuation even after many years without operation.

\*External on TVS812 and TVS813

# TVS 3000 Series Stainless Steel Trap Valve Station



## Trap Valve Station

- **Reduced costs.** TVS saves on these fronts: energy, installation and maintenance.
- **Integration of trap and valves.** Inverted bucket long life and energy efficiency plus the savings and convenience of components merged by the 360° connector.
- **A full range of options.** TVS will accommodate optional test and bleed valve, the Armstrong pop drain and TrapAlert™ and RF (Radio Frequency) scan—remote diagnostic systems for steam traps.
- **Reduced design time.** Permits combining products with exact face-to-face dimensions.
- **Three-year guarantee.** The TVS 3000 is guaranteed for three years when it's used with an Armstrong stainless steel inverted bucket trap.
- **Easy, in-line reparability.**
- **Installation versatility.** The 360° universal connector makes the TVS adaptable to any piping configuration.
- **Simplified trap testing.** TVS enhances your capability to check trap operation and offers a built-in method to block and bleed traps.
- **Elimination of potential leak points.**

# TVS 3000 Series Stainless Steel Trap Valve Station

For pressures to 400 psig (28 bar) and capacities to 860 lb/hr (391 kg/hr)

Same principle. Different package. Now the energy-saving performance and reliability of the inverted bucket steam trap are available in

a versatile new package. You'll still enjoy all the familiar benefits. And the same efficient condensate drainage from virtually every kind

of steam-using equipment. But what you'll find new are all the benefits of a piston valve integrated into the same space-saving package.

Figure 6-1. Series 2010 Trap Capacities

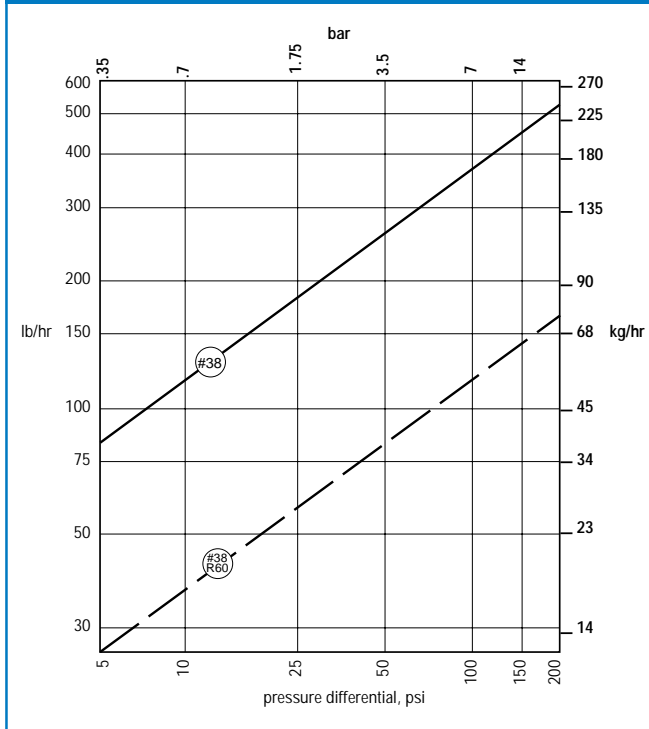


Figure 6-2. Series 2011 Trap Capacities

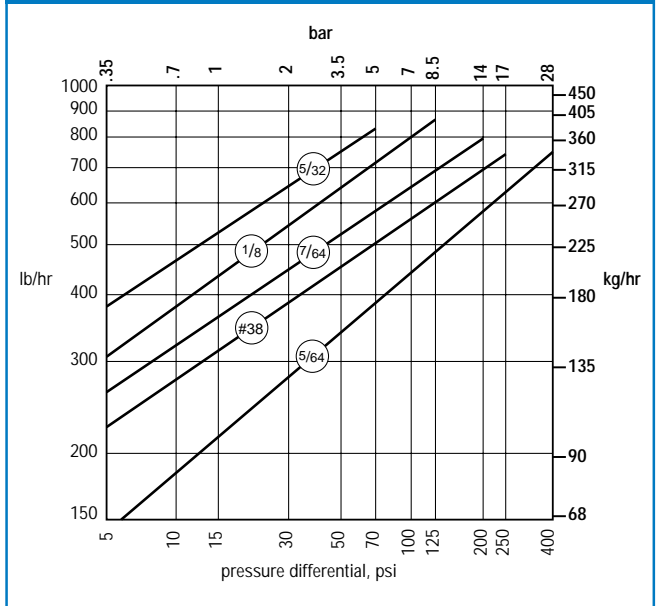


Table 6-1. Materials – TVS 3000 Series

Name of Part	Material
Connector	ASTM A351 Gr. CF8M
<b>Isolation Valve Components</b>	
Handwheel	ASTM A351 Gr. CF8M
Nut	Stainless Steel
Stem, Washers	Stainless Steel
Bonnet	ASTM A351 Gr. CF8M
Bonnet, Bolts	SS Gr. A2 per ISO 898/1-1988
Valve Plug	Stainless Steel
Disc Springs	Stainless Steel
Valve Sealing Rings	Graphite and Stainless Steel
Lantern Bushing	Stainless Steel
Valve Washers	Stainless Steel
<b>Test &amp; Bleed Valve Components</b>	
Handwheel & Screw - Optional	Stainless Steel
Packing Gland	Stainless Steel
Valve Plug	Stainless Steel
Washer	Stainless Steel
Lantern Bushing	Stainless Steel
Valve Sealing Rings	Graphite and Stainless Steel

Table 6-2. Materials – Series 2010 Traps

Name of Part	Material
Body	304-L Stainless Steel
Connections	304 Stainless Steel
Valve Seat	Stainless Steel
Valve	Stainless Steel
Valve Retainer	Stainless Steel
Lever	Stainless Steel
Guide Pin Assembly	Stainless Steel
Bucket	Stainless Steel
Connector	304-L Stainless Steel
Connector Gasket	304 SS Non-asbestos
Retaining Ring	Carbon Steel
Flange	Carbon Steel
Flange Retainer	304 Stainless Steel
Max. Allowable Pressure (Vessel Design)	400 psig @ 800°F (28 bar @ 427°C)
Maximum Operating Pressure (psi)	Model 2010 200psi (14 bar) Model 2011 400psi (28 bar)

# TVS 3000 Series Stainless Steel Trap Valve Station

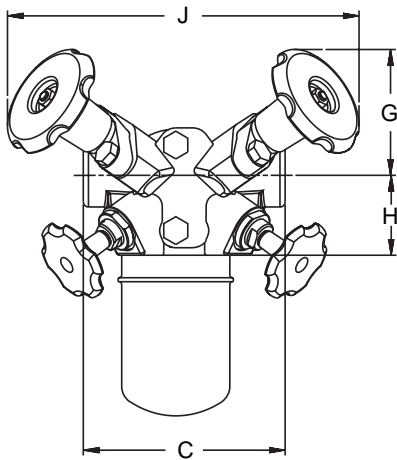


Figure 7-1.  
Model TVS 3000 with Series 2010 SS Trap  
Front View

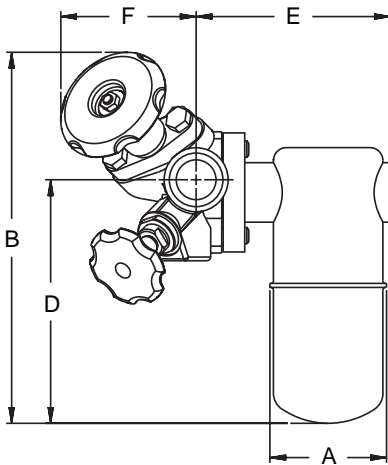


Figure 7-2.  
Model TVS 3000 with Series 2010 SS Trap  
Side View

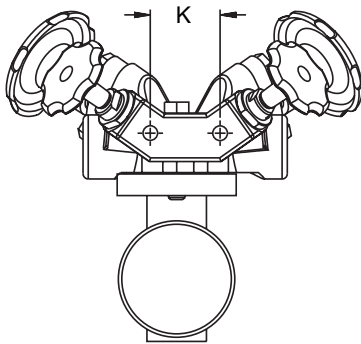


Figure 7-3.  
Model TVS 3000 with Series 2010 SS Trap  
Bottom View



Table 7-1. Physical Data – TVS 3000 Series with 2010 Series Trap

Model Number	2010		2011	
	in	mm	in	mm
Pipe Connections	1/2, 3/4	15, 20	1/2, 3/4	15, 20
"A" Trap Diameter	2 11/16	68	2 11/16	68
"B" Height - Valve Open	8	203	9	229
"C" Face to Face	4 3/4	120	4 3/4	120
"D" Connection $\varnothing$ to Bottom	4 3/4	120	5 3/4	146
"E" Connection $\varnothing$ to Outside of Trap	4 1/2	114	4 1/2	114
"F" Connection $\varnothing$ to Front of Handwheel - Valve Open	3 1/2	89	3 1/2	89
"G" Connection $\varnothing$ to Top of Handwheel - Valve Open	3 1/4	83	3 1/4	83
"H" Connection $\varnothing$ to Bottom of Connector	1 7/8	47	1 7/8	47
"J" Width Across Handwheels - Valve Open	9 1/4	235	9 1/4	235
"K" $\varnothing$ to $\varnothing$ Test/Bleed Ports	1 5/8	41	1 5/8	41
Bleed/Test Port Connections	1/8 NPT	3	1/8 NPT	3
Weight lb (kg) - 2 Valves	8 1/4	4.1	8 1/2	4.3
3 Valves	8 1/2	4.3	8 1/2	4.4
4 Valves	8 3/4	4.4	9	4.5
Maximum Operating Pressure	200 psi (14 bar)		400 psi (28 bar)	
Maximum Allowable Pressure	400 psi (28 bar) @ 750° F (399°C)			

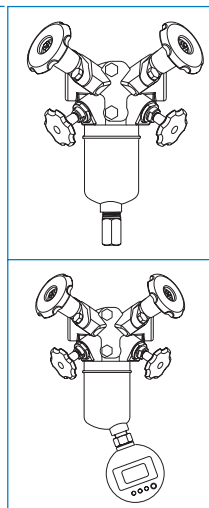
All weights and dimensions are approximate. See certified print for exact dimensions.

## Options

### For Traps

**Pop Drain.** Simple but effective against freeze-up. Properly installed and maintained at low points in your system, the simple, pressure-actuated pop drain opens for condensate drainage at 5 psig (6.35 bar).

**TrapAlert™** Simplifies trap testing to save energy and maintenance dollars. Activated by magnetic impulse (indoor/outdoor applications) or a beam of high-intensity light (indoors), TrapAlert can reach the most remote or hard-to-get-at traps and provide feedback on four separate trap conditions.



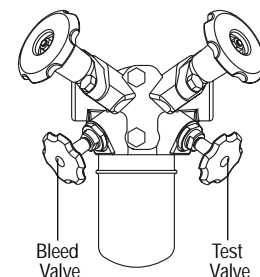
**RF (Radio Frequency) Scan.** Takes remote monitoring and diagnostics of steam traps to the ultimate level: radio signals. It is a completely wireless system. (not shown)

### For Valves

**Test Valve.** Used to test and evaluate trap operation.

**Bleed Valve.** Depressurizes the trap before removal from the connector block.

Note: Test and Bleed valve handles optional



# TVS 2000 Series Stainless Steel Trap Valve Station

The Armstrong stainless steel inverted bucket steam trap simply carries a good idea to its logical conclusion by sealing all the proven IB advantages in a tamper-proof, corrosion-resistant package. Lightweight and compact, Armstrong inverted buckets can withstand freeze-ups without damage. In fact, we're so sure of their performance we guarantee them for three years against leaks.

With the introduction of the 360° connector several years ago, Armstrong added even greater utility to this stainless steel work-horse. The universal connector made it possible to install inverted bucket efficiency and long service life in any piping configuration with little or no repiping.

## TVS: New role for the connector

Now the concept of the Trap Valve Station gives the universal connector another job: matchmaker. It brings together a stainless steel inverted bucket steam trap and plug valves.

Armstrong also gives you another way to combine steam traps and valves. The plug valve TVS 2000 integrates stainless steel inverted bucket traps and plug valves into preassembled trap test units. The net result? Reduced purchasing and design time, lower installation costs and savings in piping space. Plus the energy savings that are dividends of regular trap testing.

## Test... and save

Steam trap testing is a well-accepted component of aggressive energy management. Certainly, it's essential to the efficiency of a well-designed and properly maintained steam system.

Consider this example: A 1/8" (3.2 mm) orifice leaking 45 lb (20.4 kg) of steam per hour at 100 psi (6.9 bar) will squander \$2,102 worth of energy in one year, assuming a steam cost of \$5.00/1,000 lb (450 kg). Numbers like these make it easy to see the importance of reliable trap monitoring.

Most experts agree that testing steam traps with test valves is the most reliable of available methods because it permits you to check

trap discharge *visually*. With test valves you can see evidence of trap failure that is difficult to detect with other test methods. And the quicker you see what you *may* be missing now, the quicker you can begin saving the precious energy failed traps waste.

Simplification. That's the greatest contribution of the TVS to routine trap testing. Installation is simpler. Maintenance is simpler. And regular testing is simpler.

## TVS makes a long story... short.

Figure 8-1. Typical Steam Trap Installation

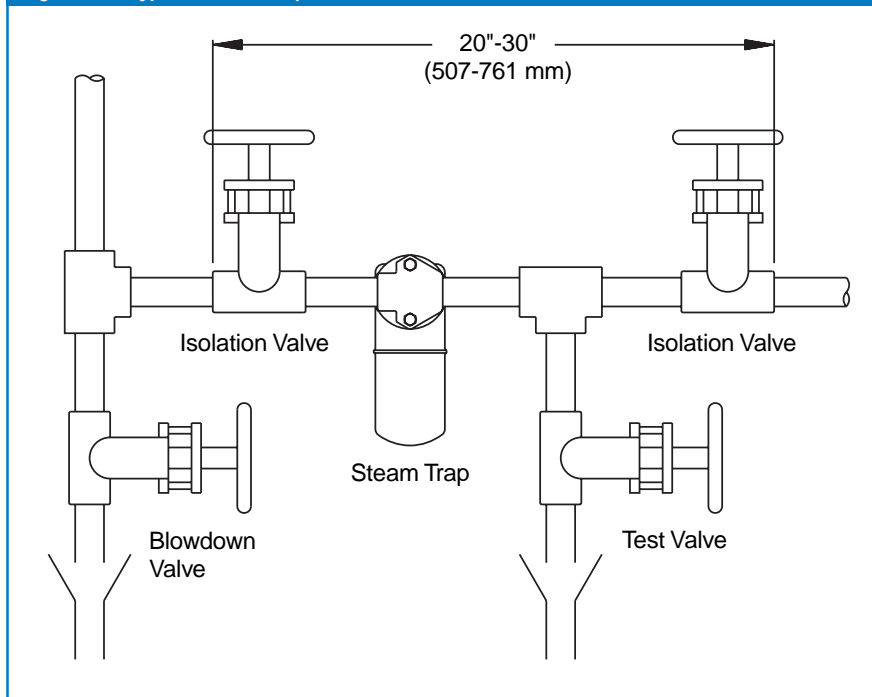
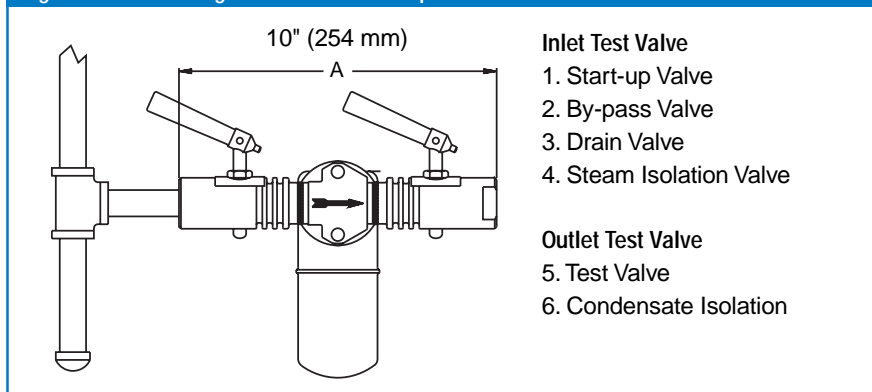


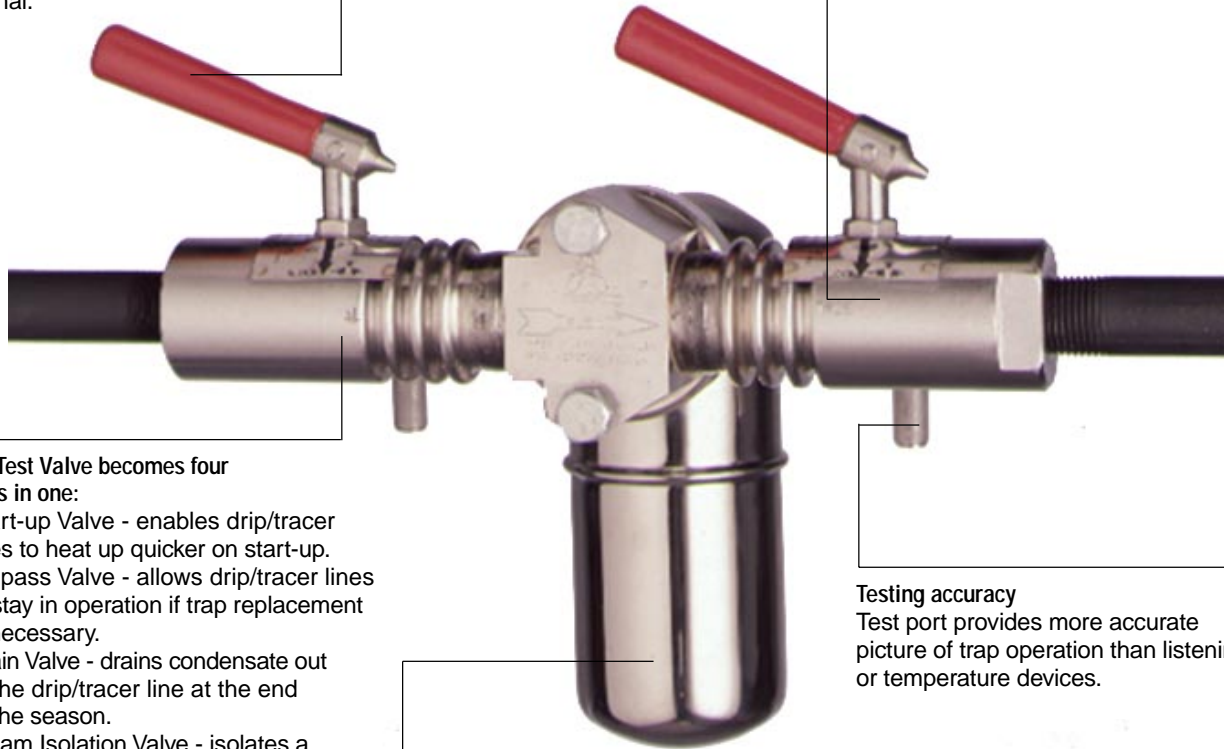
Figure 8-2. Armstrong TVS 2000 Series Trap Valve Station





# TVS 2000 Series Stainless Steel Trap Valve Station

**Easy opening and positive stop**  
Corrosion-resistant stainless steel handle offers increased leverage for easy opening. Safety handles are optional.



**Inlet Test Valve becomes four valves in one:**

- Start-up Valve - enables drip/tracer lines to heat up quicker on start-up.
- By-pass Valve - allows drip/tracer lines to stay in operation if trap replacement is necessary.
- Drain Valve - drains condensate out of the drip/tracer line at the end of the season.
- Steam Isolation Valve - isolates a steam trap for repair or replacement.

**Outlet Test Valve provides two valuable system checks:**

- Test Valve - a visual test is the best method for determining a steam trap's operation.
- Condensate Isolation Valve - isolates a steam trap for repair or replacement and bleeds pressure from the trap before it is removed for replacement.

**Testing accuracy**

Test port provides more accurate picture of trap operation than listening or temperature devices.

**Corrosion resistant**

All stainless steel materials maximize corrosion resistance and increase valve and trap life.

# TVS 2000 Series Stainless Steel Trap Valve Station

Table 10-1. TVS 2000 Series Trap Valve Stations

Model Number	2010		2011		2010 IS		2011 IS	
	in	mm	in	mm	in	mm	in	mm
Connection Size	1/2, 3/4	15, 20	1/2, 3/4	15, 20	1/2, 3/4	15, 20	1/2, 3/4	15, 20
"A" Face to Face	10 1/8	257	10 1/8	257	12 5/16	312	12 5/16	312
"B" Connection $\varnothing$ to Bottom	4 5/8	117	5 9/16	141	4 5/8	117	5 9/16	141
"C" Connection $\varnothing$ to Outside of Trap	4 5/8	117	4 5/8	117	4 3/4	120	4 3/4	120
"D" Connection $\varnothing$ to Top of Handle	3 1/2	89	3 1/2	89	3 1/2	89	3 1/2	89
Weight lb (kg)	7 1/2	3.4	8	3.4	9 1/2	4.2	10	4.5
Press. at Max. Temp.	400 psi (28 bar) @ 500°F (260°C)							

Note: For steam capacities and materials, please refer to page 6. Consult factory for dimensions for other TVS 2000 configurations.

Figure 10-1. TVS 2000 Series Trap Valve Station with Lever Handles

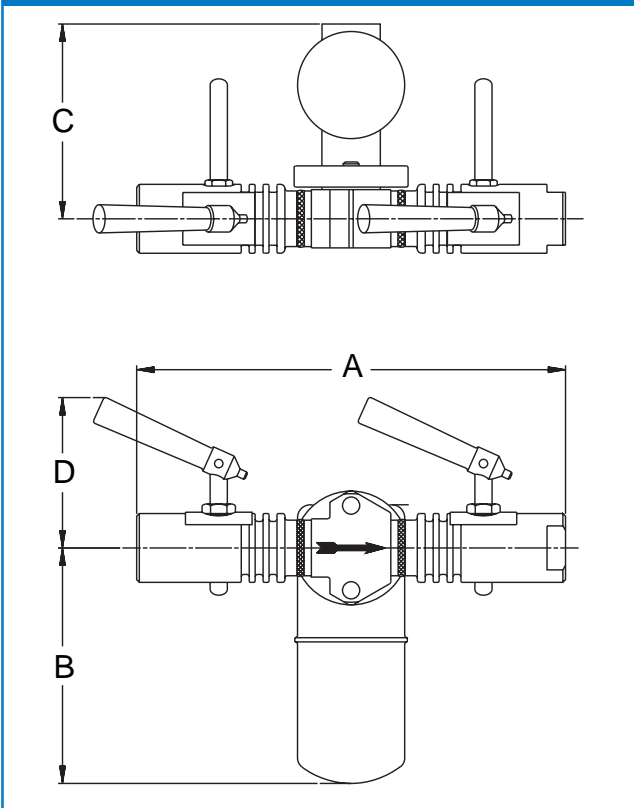


Figure 10-2. TVS 2000 Series Trap Valve Station with Integral Strainer

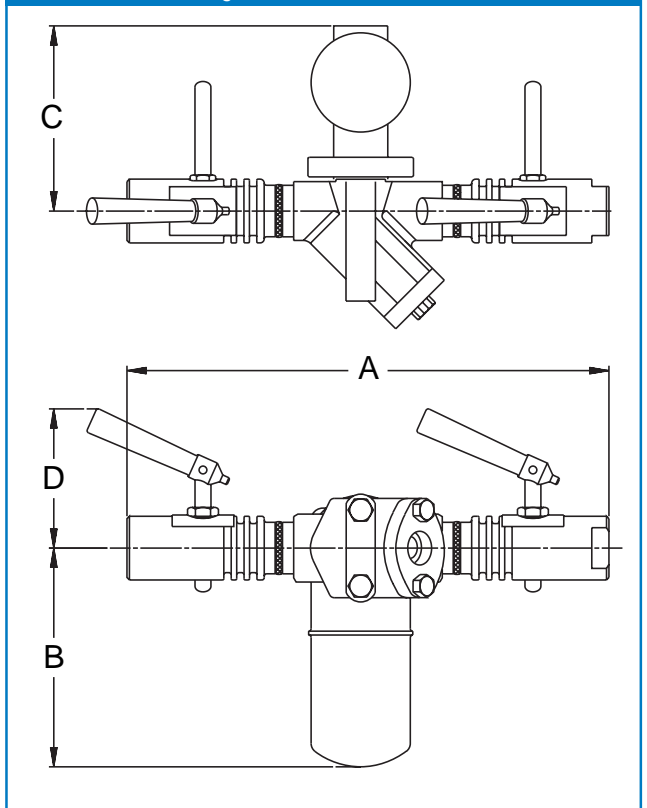


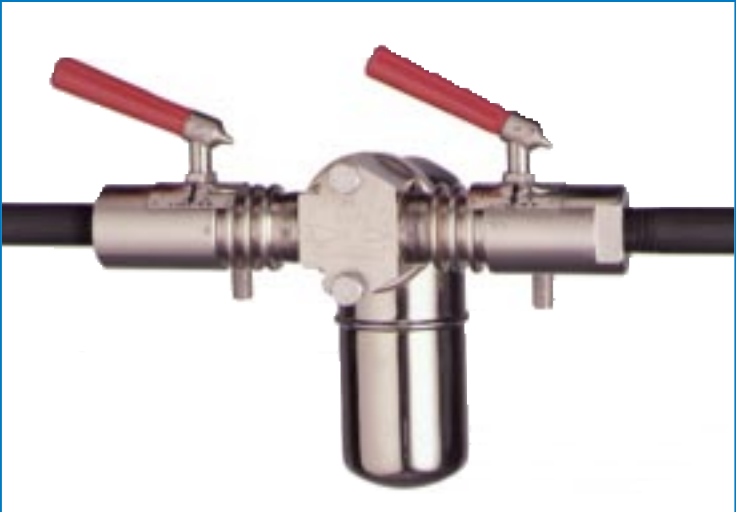
Table 10-2. Materials – TVS 2000 Series – Valves Only

Name of part	Material
Body	303/304 Stainless Steel
Plug	316 Stainless Steel
Packing Nut	316 Stainless Steel
Valve Seat	Ryton
Washer	Teflon Packing
Washer	Ryton
Handle	Stainless Steel
Handle Sleeve	PVC Coated
Test Port Pipe	304 Stainless Steel
Test Port Nut	304 Stainless Steel
Pressure at Maximum Temperature	600 psi - 500°F 41.0 bar - 260°C

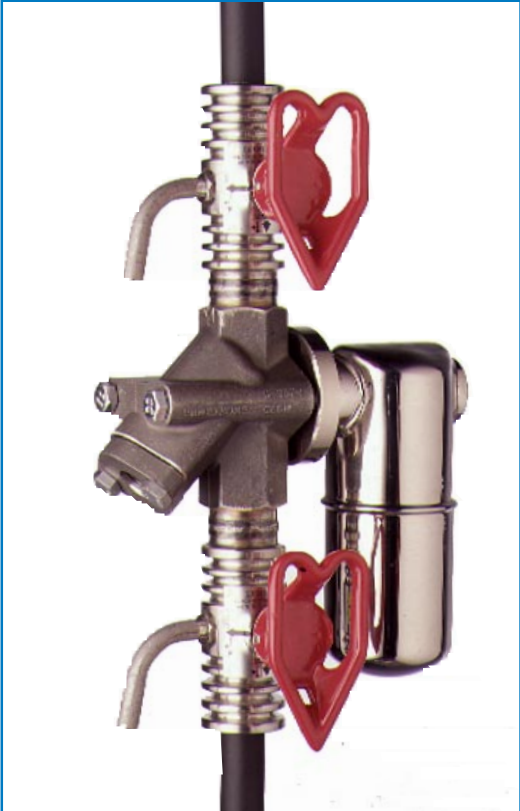
All weights and dimensions are approximate. See certified print for exact dimensions.

# Armstrong's TVS 2000 Series Flexibility Can Handle Any Piping Specification

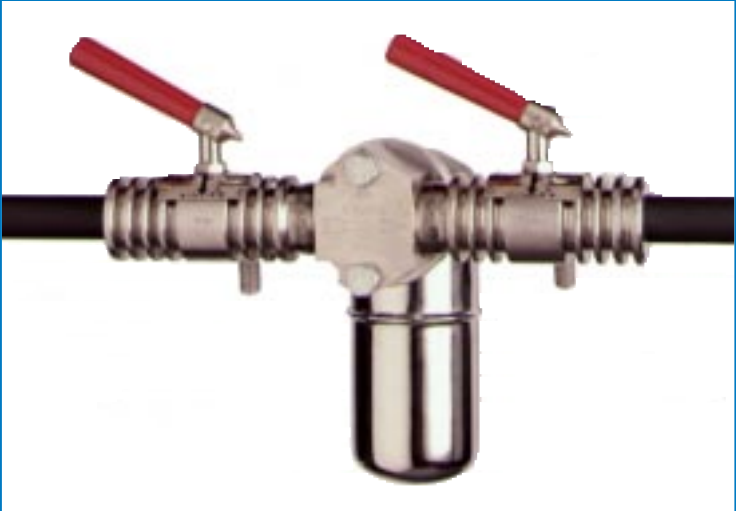
TVS 2000 Series Trap Valve Station With Threaded Connections (2011 W4HL)



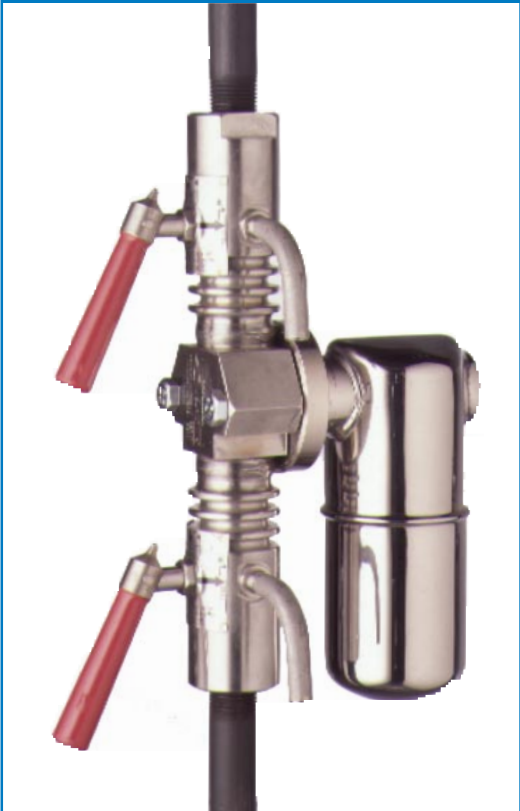
TVS 2000 Series Trap Station With Strainer (2011 W2VI)



TVS 2000 Series Trap Valve Station With Socket Weld Connections (2011 W2HL)



TVS 2000 Series Vertical Trap Valve Station (2011 W4VL)



TVS 2000 Series Trap Valve Station With Thermostatic Trap or Controlled Disc (TT20 W4HL)



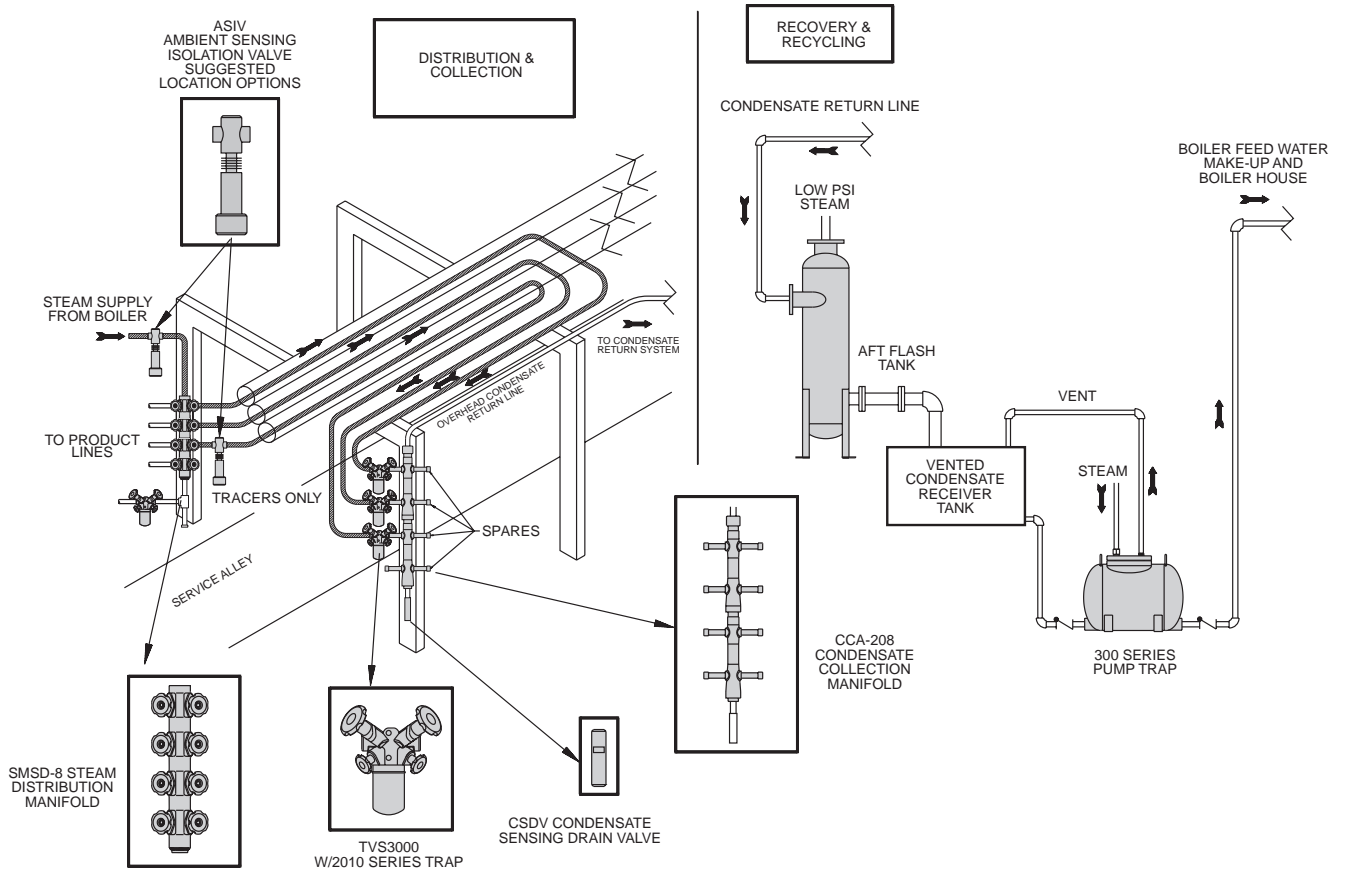
# How to Order

Model	Connection	Type of Connection Inlet/Outlet	Valve Configuration	Flow Direction	Bleed/Test Optional Handles
TVS 3000	1/2" 3/4"	NPT SW BS SW/NPT NPT/SW SW/BS BS/SW	STD=2 Main Isolation Valves Only TST=2 Main Isolation Valves + Test Valve BL=2 Main Isolation Valves + Bleed Valve ALL= All (4) Valves	R= Right to Left L= Left to Right	H

**Example #1:** TVS 3000 1/2 NPT STD L is a TVS 3000 Connector with 1/2" NPT Inlet and Outlet with the (2) main valves only and Left to Right Flow Direction.

**Example #2:** TVS 3000 3/4 BS/SW All R H is a TVS 3000 Connector with a 3/4" British Standard Inlet and Socket Weld Outlet with all (4) valves and Right to Left Flow, with handles on bleed and test valves.

# Other Armstrong Products to Help Optimize Your Steam System



Shaded products are available from Armstrong. Call or consult your Armstrong representative if additional product details are required.