



Economical and simplified solutions that offer quality and optimum steam trap service.

It All Comes Down To Protection

Regardless of the temperature and pressure characteristics of steam line drips or tracers, there's one absolute requirement for any steam trap you choose – protection. Whether your system includes steam lines, turbines, control valves, risers, expansion loops, steam jacketed pipes, valves, and pumps – or simply companion piping – a steam trap must offer protection day after day. More often than not, that also means consistent performance in less-than-perfect conditions.

That's why it's important to understand your application in as much detail as possible before you select a drip or tracer steam trap. Variables such as: steam pressure, condensate load, ambient conditions, air venting, shock, vibration, water hammer, dirt, and corrosion must be considered when making your trap selection for steam line drip, process line tracer, winterization tracer, instrumentation tracer, and steam jacketed tracing, as well as small process application.



Contents

Typical Profile – Steam Line Drip 2-3

Typical Profile – Winterization Tracer, Process Line Tracer, Instrumentation Tracer, and Steam Jacketed Tracing 3-5

The Right Trap for the Right Application

Thermostatic 6

Thermodynamic 7

Thermostatic Traps

Series PB 8-9

Thermodynamic Traps

Series 29 10

Series 129Y-3 and 29S 11

Typical Profile – Steam Line Drip

Purpose: To remove condensate from piping to prevent damage to the piping and control valves, while assuring that production steam users receive dry steam.

Steam Trap Requirement: Adequately sized drip pockets on the bottom of piping or upstream of heat exchanges, collect condensate which then flows to the steam trap. The trap should discharge the condensate quickly.

Steam Pressures and Temperatures: Generally constant, with some seasonal variation. Of all industrial steam trapping applications, these are the higher pressures often exceeding 600 psi. Design pressures and operating pressures can be different and superheat is frequently encountered.

Condensate Loads: Relatively small and constant while in normal operation,

typically to 50 or 100 lb/hr. Startup loads can be heavier. Boiler carry-over produces slugs of condensate which are unpredictable in magnitude and frequency. Desuperheaters that are malfunctioning can produce unexpectedly high loads.

Drainage to Trap: Usually by gravity with the steam trap installed below the steam line. Occasionally piping in trenches or underground have steam traps installed above the pipe, but the condensate collecting point is below the pipe. This is called lift drainage and requires a lift fitting.

Ambient Conditions: Variable. Freezing is the more common concern.

Air Venting: Need is minimal. Pipe lines frequently have separate vents. Startup may present the most common need. Under running conditions, CO₂ may be a problem.

Shock, Vibration, Water Hammer:

Generally from inadequate drainage of condensate, which moves at high velocity (5,000 - 10,000 fpm). Thermal ratcheting may also occur at startup.

Dirt and Corrosion: If dirt and corrosion exist at the steam trap, consider what may be happening at the equipment being protected. A common source of foreign matter is packing used to seal leaks. The use of some amines and hydrazine can present “dirt” problems.

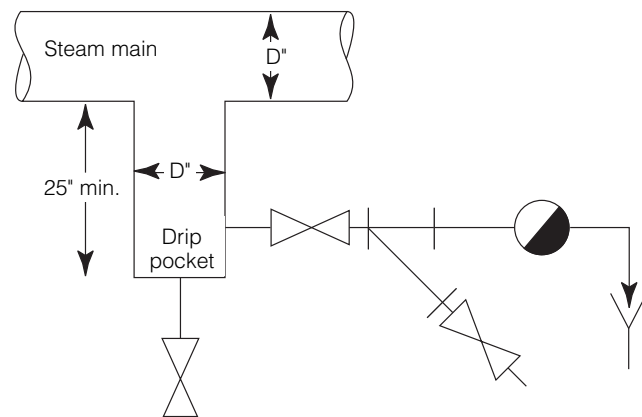
Steam Trap Installation: If bypasses around a trap station are installed and utilized during warm-up, consider installing a trap downstream of the steam blow if the bypass is left open.

Drip Pocket Size

Steam Main Size (in.)	Drip Pocket Diameter (in.)	
	Recommended	Range Use in Industry
1	1	1
2	2	1 - 2
4	4	1½ - 4
6	6	2 - 4
8	8	3 - 6
10	10	4 - 8
12	12	4 - 10
14	14	5 - 12
16	16	5 - 14
18	18	6 - 16
20	20	6 - 18
24	24	8 - 18

Drip Pocket, 20% - 100% of Steam Main Area.
8800 fpm = 100 mph.

Steam Line Drains



Condensate Load, Steam Line Drip, (normal) lb/hr per 100 ft. of Pipe

Nominal Pipe Size (in.)	Operating Steam Pressure, psi					
	10	100	200	300	400	600
1	3	5	7	9	10	13
1½	4	8	11	13	15	19
2	5	10	13	16	19	24
3	8	15	20	24	28	35
4	10	19	26	31	36	45
6	15	29	38	46	53	66
8	20	38	50	60	69	87
10	25	47	62	75	87	108
12	30	56	74	89	103	128
14	33	62	81	98	113	141
16	38	70	93	112	129	161
18	43	79	105	126	145	181
20	48	88	116	140	161	202
24	57	106	140	168	194	242

Assumed Conditions: Ambient, 0 deg. F; Saturated Steam, Zero(0) Wind Velocity; Pipe surface temperature same as steam temperature. Insulation 85% efficient. Ambient temperature, wind and rain can influence loads.

Steam Trap Recommendation

Designed to fail open, self-draining, and installed in any position. Since condensate backup can be dangerous, a steam trap that responds quickly to condensate should be selected also. Tolerance to superheat must be considered. Operating capabilities over wide range of operating pressures is important to standardization.

Condensate Load, Steam Line Drip, (warming up) lb/hr per 100 ft. of Pipe

Nominal Pipe Size (in.)	Operating Steam Pressure, psi					
	10	100	200	300	400	600
1	14	16	17	19	19	20
1 1/2	17	20	22	24	26	29
2	30	35	38	40	46	48
3	60	69	74	78	81	92
4	93	99	107	113	126	131
6	166	185	198	208	220	239
8	250	277	298	313	329	357
10	315	352	375	395	415	449
12	337	419	448	472	495	541
14	416	461	493	519	545	591
16	478	532	578	592	628	681
18	536	596	638	670	703	763
20	605	673	719	757	793	860
24	721	802	857	900	945	1024

Assumed Conditions: Warm-up rate, 400F/hr Ambient, 0 deg. F; Insulation 85% efficient; Extra strong pipe; Extra strong pipe; Wind, 0 mph; 10% additional load for warming insulation; 59% of running load Ambient temperature, wind and rain can influence loads.

Typical Profile – Process Line Tracer, Winterization Tracer, Instrumentation Tracer, and Steam Jacketed Tracing

Process Pipe Lines and Winterization Tracing

Before installing any trap, make sure you consider these potential problems:

Ambient Conditions outdoors, freezing wind and rain are considerations.

Drainage to Trap usually by gravity. Lift is sometimes encountered and this requires special treatment.

Air Venting modest need, only on startup, which is infrequent.

Shock, Vibration, Water Hammer modest. If severe, it usually comes from the return system, or improperly trapped team supply.

Dirt and Corrosion generally modest unless using copper tubing. Then the plating of dissolved solids is a frequent problem.

Product Line Diameter (in.)	Load per 100 ft. of Pipe Line
	Condensate Load, lb/hr per 100 ft.
1	1.50
1 1/2	2.00
2	2.26
2 1/2	2.65
3	3.00
4	3.68
6	5.10
8	6.43
10	7.80
12	9.20
16	11.36
20	14.03
24	16.71

Base Conditions: dry

- Steam Pressure, P_s 100 psi
- Steam Temperature, T_s Sat.
- Ambient temperature, T_a 0F
- Wind Velocity 0 mph
- Insulation Efficiency, E 85%
- Pipe Material Steel
- Heat Transfer Coefficient, $U = 3$

Suggested Maximum Steam Tracer Length for Varying Pressures, Condensate Loads and Tracer Sizes, Process and Winterization Tracing

Load #/hr per 100 ft	Tracer Length (ft) for 1/2" Tubing @ Various Pressures						
	10 psi	30 psi	50 psi	100 psi	150 psi	200 psi	300 psi
10	76	113	144	211	268	320	413
20	49	72	92	135	172	206	266
40	30	44	57	83	106	127	163
60	23	34	43	64	81	97	125

Typical Profile – Winterization Tracer, Process Line Tracer

Winterization

Purpose: The heat of steam is used to protect water lines from freezing in cold weather. The water lines are those that are out of doors, and frequently have no flow, making them vulnerable to freezing. Examples include safety showers, eye washes, fire equipment, stand-by pumps, and domestic water supplies. Can include seasonal process tracing in warmer climates.

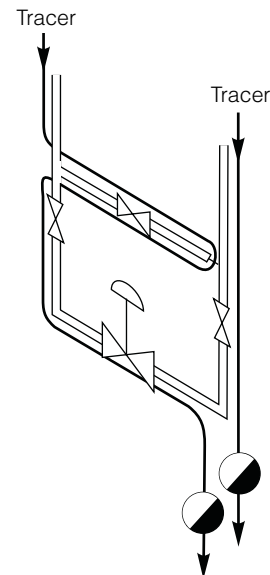
Application: Usually tubing is mounted on the water line, pump or valve to be protected. The system may or may not be insulated. Overheating may be a concern.

Steam Pressures: Usually in the range of 40-150 psi. Lower pressures may be encountered. Pressures may change seasonally with on-off operation of the steam supply, which can produce the need for air-venting and heavier start-up loads.

Condensate Loads: Generally low with normal running loads on the order of 20 lb/hr. Heavier loads may be encountered due to start-ups, lack of insulation, or long runs of tracing.

Steam Trap Recommendation

Fail open, self draining, small and light-weight: capable of being installed in any position desirable. This is due to the fact that tubing is frequently used for tracing and is left free to “dangle.” There can be many traps installed on this application, so a trap that is easily checked and maintained is desirable. A hot, fast responding trap or a subcooled, slow responding trap can be used dependent upon the specific application. The quality of the insulation, length of run, and standardization to prevent application errors may be the deciding factor. If subcooled traps are used, consider the potential for freezing.



Process Line Tracer

Purpose: Steam is used to maintain heat in a process line. The heat is needed at or in a pipe line carrying some process material like asphalt, sulfur, wax, chemical, or gas. The heat is needed to maintain viscosity, prevent congealing, solidification or separation. Rarely is the heat used for warming up lines, but mostly for maintaining a temperature.

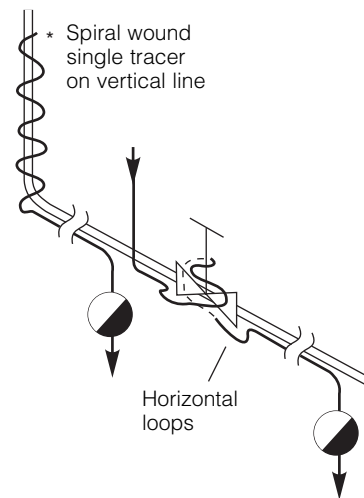
Application: Small diameter pipe(s) or tube(s) external to and parallel to a product line that requires heat. The heat of steam flows from the tracer to the product line. Steam condenses in the tracer and runs out the end of the small pipes or tubes into a steam trap. The trap discharges the condensate.

Steam Pressures: Generally, the highest of steam tracing with 150 psi typical. Pressures to 400 psi are possible. Pressures are constant with possible season variations. Insulation quality may be a significant factor.

Condensate Loads: Generally low and constant with changes due to seasonal and/or insulation quality. Typical loads are 10-50 lb/hr. depending on tracer diameter, length, installation, insulation, and ambient conditions.

Traced Valve and Piping

Steam trap recommendation: Fail open, self draining, small and light-weight, since traps are frequently attached to tubing. The trap should be capable of being installed in any position because the tubing is frequently allowed to “dangle.” A hot trap with fast response is desired to maintain the usually high temperatures needed for the product within the process line. Because there can be many traps in this application, a trap that is easily and quickly checked and maintained is desirable.



Typical Profile – Instrumentation Tracer, and Steam Jacketed Tracing

Instrumentation Tracer

Purpose: To maintain a uniform temperature for instruments and controls.

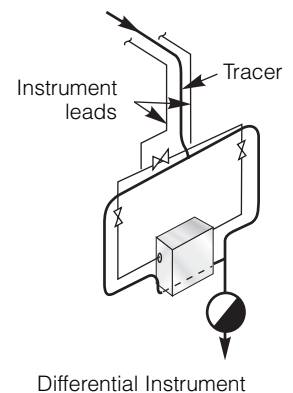
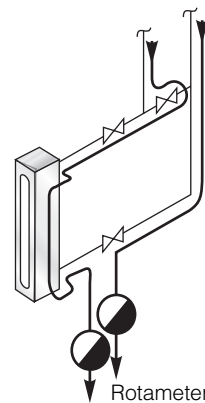
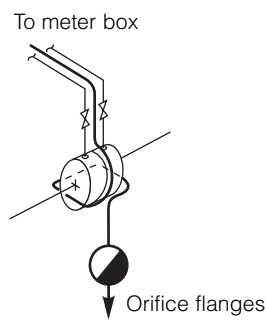
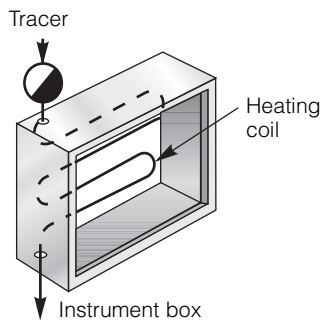
Application: Generally, 1/4" or 3/8" tubing containing steam parallel to impulse lines to meters and/or the tubing is run inside of meter boxes.

Steam Pressures: Generally constant and lower pressures. Typical pressures are 10-150 psi. The steam supply can experience start-ups and shutdown seasonally or within the freezing season.

Condensate Loads: Generally very small, with 10 lb/hr being a typical load. The exception may be start-up.

Steam Trap Recommendation

Because of small bore tubing and installations, a small, lightweight steam trap that can be placed in any position is needed. The steam trap should fail open and be self draining. A subcooled steam trap is frequently desirable since overheating of the instrument system is a common concern. When subcooled traps are used, consider the threat of condensate freezing on the trap discharge piping.



Steam Jacketed Tracing

Purpose: A metal jacket surrounds a component (pipe, valve, pump, vessel). Steam is supplied for the purpose of heating both the component and the material in the component with steam. The steam is usually supplied to maintain a temperature but can be supplied to warm up the component and product, in which case the applications is comparable to a process heat exchanger.

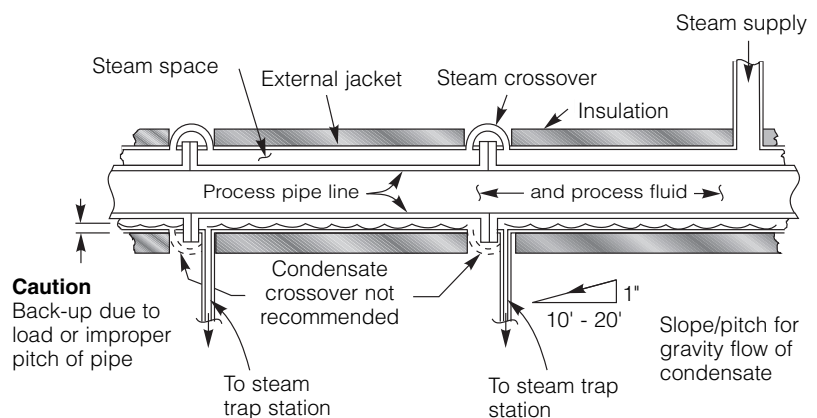
Application: Steam is supplied to some "external pipe" and comes in contact with some "internal pipe." The external pipe is the jacket. Successive sections of the jacket are connected to promote steam and condensate flow for a great length of internal pipe.

Steam Pressures: Tend to be in the 25-150 psi range with some higher pressures. Superheat is also a consideration. Connections to the jacket should be ample and not produce a pressure drop.

Condensate Loads: Can be relatively small and constant when maintaining heat. Loads can be large and variable depending if warm-up of the process line is required. Start-up load calculations should include weight of jacket, product pipe, product within pipe and insulation. Running loads should include heat transmitted into product pipe and losses to ambient.

Steam Trap Recommendation

A hot discharge properly sized, fail-open, self-draining type of trap. Condensate back-up can produce serious erosion and corrosion. Tolerance for superheat is to be considered because jacketed tracing is usually selected to maintain relatively high temperatures and /or subject to "reverse heating" as when tracing thermal fluid lines.



The Right Trap for the Right Application

It is important to use the correct technology to match your application criteria, so Yarway has developed a full

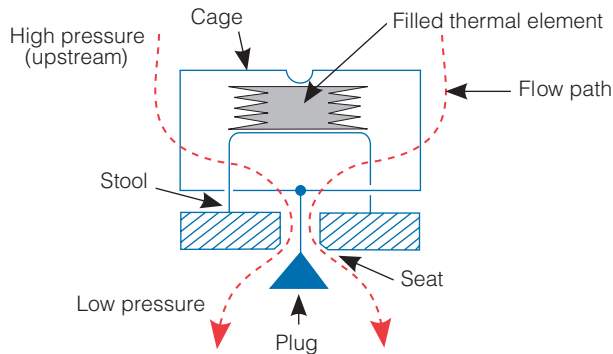
line of non-renewable drip and tracer steam traps, designed to solve your special application needs. Featuring

both thermostatic and thermodynamic designs, these two models offer a full range of operating capabilities.

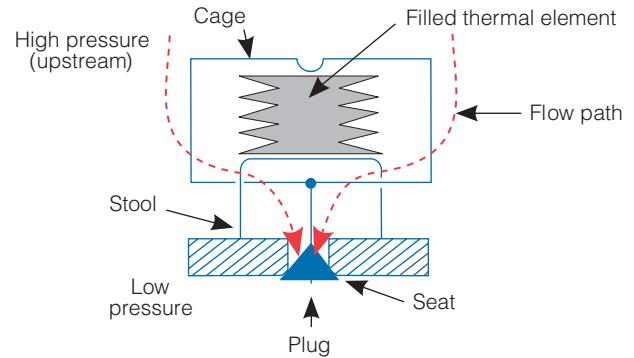
Thermostatic

Yarway offers two thermostatic steam traps for drip and tracer applications:

- Series PB-5
- Series PB-40



Valve Open to Non-condensibles and Cool Condensate



Valve Closed to Hot Condensate or Steam

All Yarway thermostatic traps deliver consistent features such as:

- Three-year warranty
- Pressure assisted fail-open design
- Freeze proof
- Easy-to-check cyclic operation
- Discharge Temperature follows the saturation curve
- Subcooled discharge provides energy efficiency
- Integral check valve and screen
- Hardened stainless steel valve and seat
- Installation in any position
- Withstands superheat
- Operates against 99% back pressure

How it Works

The thermostatic filled thermal element actuator opens or closes the internal valve as condensate temperature changes. Steam is prevented from discharging through the trap and only condensate is discharged. The trap discharges condensate with a cyclic action under moderate load. Under certain conditions of low load and/or low pressure, the trap may discharge continuously. The valve also acts as a check valve against reverse flow.

These thermostatic steam traps are Filled Thermal Element (FTE) actuated. Unlike most thermostatic traps which provide a modulating response, the PB traps tend to operate in an on-off cyclic mode. This makes operation of these traps easy to check visually and by sound.

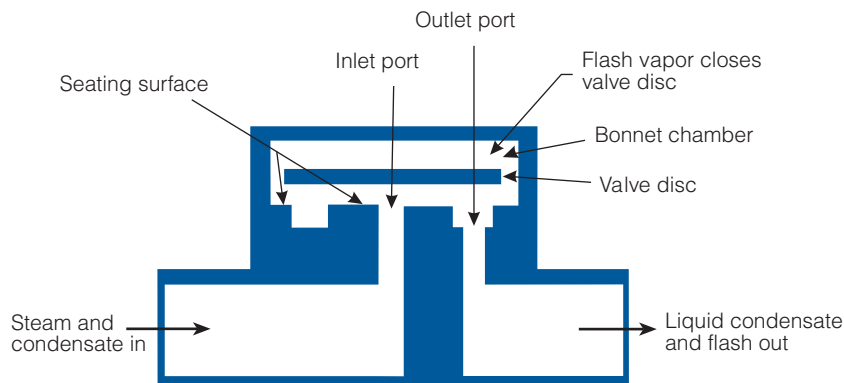
The patented design which promotes cyclic action also helps keep the plug and seat of the trap clear of debris, thus minimizing the opportunity for either the seat or plug to become wiredrawn. Failure of the actuator from any cause results in a pressure-assisted, permanent fail-open position of the plug. Unlike other thermostatic traps, this condition cannot be subsequently compromised by line pressure. The piping system therefore gains reliable protection.

The Right Trap for the Right Application

Thermodynamic

Yarway offers three Disc traps for drip and tracer applications:

- Series 29
- Series 129Y (Y Strainer)
- Series 29S (T Strainer)



All Yarway thermodynamic traps deliver consistent features such as:

- Easy to check cyclic operation
- Designed to fail open
- Self-draining (vertically mounted)
- Energy efficient subcooled operation
- Hardened, rugged stainless steel internals
- Installation in any position
- One moving part
- Stainless steel body
- Unaffected by freezing
- Unaffected by water hammer
- Designed for superheat

How it Works

Disc traps use the energy in hot condensate and steam to open and close the valve disc. The trap senses the difference between cool and hot liquid, and gases or vapors. During initial start-up, pressure created by cold condensate pushes the valve disc off the seating surface. This uncovers the inlet and outlet ports, allowing discharge. As condensate reaches the inlet port, it experiences a decrease in pressure and an increase in velocity. As the condensate is very close to steam temperature, the lower pressure will cause it to flash into steam. The resulting high velocity flow beneath the disc, with its attendant localized pressure reduction under the disc, causes it to snap shut. Flow through the trap then stops until the pressure in the chamber over the disc decays sufficiently to allow the inlet pressure to force the disc off its seat. Condensate then flows through the trap until once again it reaches such a velocity and lowering of pressure that flashing occurs and the disc can snap shut. This cycle continuously repeats itself. A key feature is the closing on flashed condensate, maintaining a water seal and preventing steam loss.

Series PB Thermostatic Traps

Series PB traps are available in two different preset temperature ranges: PB-5 traps which operate near steam temperature for drip and critical tracer applications when maximum drainage of condensate is required and PB-40 trap operates 35°F to 45°F subcooled for winterization and instrumentation tracer applications when the sensible heat of the condensate will be employed for heating. In such situations, condensate backed up ahead of the valve becomes a barrier against the loss of steam.

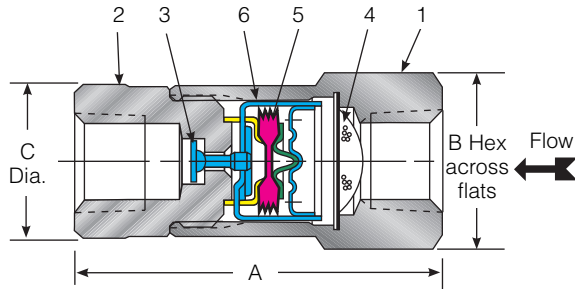
How to Specify and Order

Typical Specification – Traps shall be a thermostatic type with Filled Thermal element actuator and with opening action of plug in a downstream direction, away from seat, to provide a pressure assisted fail-safe open operation. Trap shall have integral check valve.

Ordering – Specify trap size (1/2", 3/4"), Series number PB-5 (for drips and tracers) or PB-40 (for tracers).

Applicable Codes and Standards

Pressure ratings per ANSI/FCI-69.1.
Performance testing per ANSI/ASME PTC-39.1. End connections per ANSI B1.20.1 for threaded ends.



Dimensions and Weights

Connection Size – NPT in. (DN)*	Nominal Dimensions, in. [mm]			Weight lb. (kg)
	A	B	C	
1/2 [15]	3 [76]	1 1/4 [32]	1 1/4 [32]	3/4 (0.3)
3/4 [20]	3 3/16 [81]	1 1/2 [38]	1 3/8 [35]	1 (0.5)

*(DN) expresses metric equivalent.

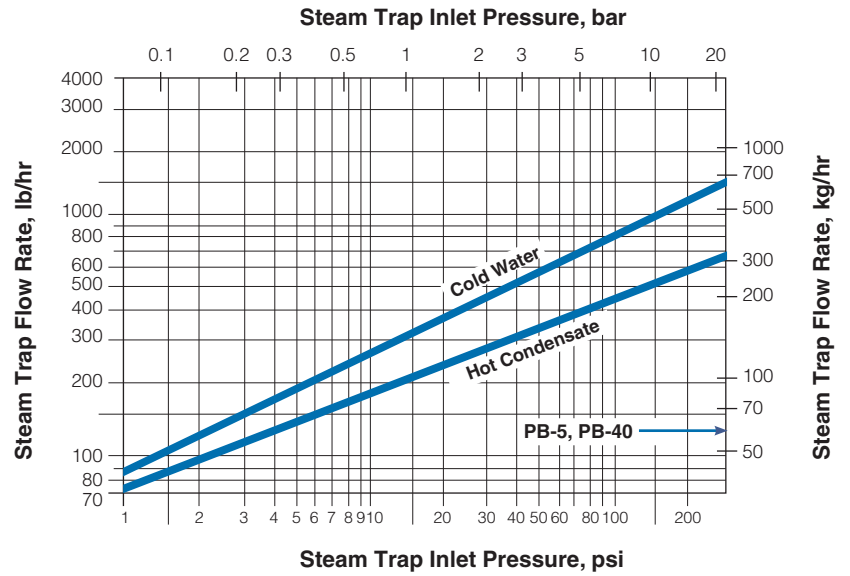
Parts and Materials

Item	Part	Materials
1	Body	ASTM A582 416 Stainless Steel
2	Outlet Fitting	ASTM A582 416 Stainless Steel
3	Valve Plug	ANSI 431 Stainless Steel
4	Screen	AISI 304 Stainless Steel
5	Filled Thermal Element	Stainless Steel
6	Cage Assembly	AISI 304 Stainless Steel

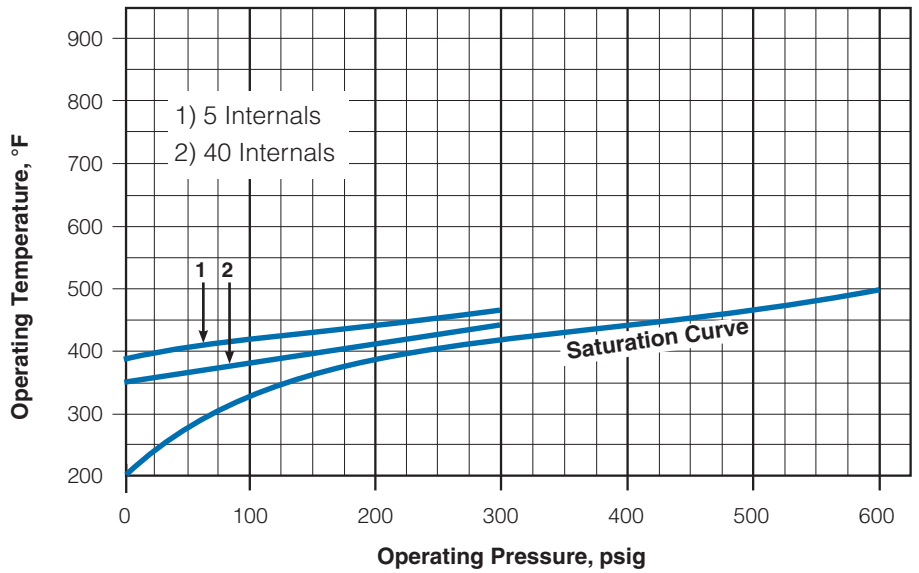
Pressure/Temperature Ratings (all pressures are gage)

PB-5, PB-40	
Shell ANSI Class	600
Max. Design Temp.	750°F [400°C]
Oper. Press.	1-300 psi [0.07-21 bar]
Oper. Temp.	

Capacities (for steam trap sizing)



Functional Superheat Design Limits

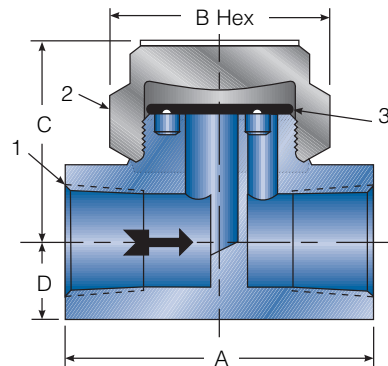


Integral Seat – Series 29 Disc Trap

Series 29 traps retain all the essential benefits of disc trap performance – they are compact, easy to install, self-draining and unaffected by water hammer or freezing, while providing the economy of integral seat design. Constructed of all stainless steel, the trap has only three parts; disc, body and bonnet. Simplification, made possible by incorporating the trap seat in the body, results in lowest possible cost per unit.

Generally recommended for application with open discharge, where the trap is easily installed on the pipe line. The 3/8" size is recommended for steam tracing; the 1/2" 29 and 3/4" 29A sizes for steam line drips and 1" traps are recommended for heavier process loads.

The time tested thermodynamic principle of the Series 29 disc trap makes it highly efficient. Because the trap closes on flashed condensate, live steam is NOT consumed during normal operation.



Parts and Materials

Item	Part	Materials
1	Body and Seat	Series 400 Stainless Steel Seat area heat treated
2	Bonnet	Stainless Steel ASME SA-582 Type 416
3	Disc	Stainless Steel HT

Dimensions and Weights

Connection Size – NPT in. [DN]*	Nominal Dimensions, in [mm]				Weight lb. (kg)
	A	B	C	D	
3/8 [10]	2 [50]	1 1/2 [38]	17/16 [37]	1/2 [13]	3/4 (0.3)
1/2 [15]	2 1/4 [57]	1 1/2 [38]	19/16 [40]	5/8 [16]	1 (0.5)
3/4-A [20]	2 7/8 [73]	1 1/2 [38]	15/8 [41]	3/4 [19]	2 (1)
3/4 [20]	2 7/8 [73]	1 3/4 [44]	1 15/16 [49]	3/4 [19]	2 (1)
1 [25]	3 3/8 [86]	2 1/4 [57]	2 [50]	7/8 [22]	3 1/2 (2)

*[DN] expresses metric equivalent.

Ratings

Operating:

4-600 psi, 750°F. Recommended for optimum service life limit to 300 psi operation.

Allowable Back Pressures:

3/8", 1/2" 29 and 3/4" 29A to 70% of inlet psia.
3/4", 1" 29 to 50% of inlet psia.

Applicable Codes and Standards

Pressure rating per FCI-69-1. Performance testing per ANSI/ASME PTC-39.1. End connections per ANSI B1.20.1 for threaded ends.

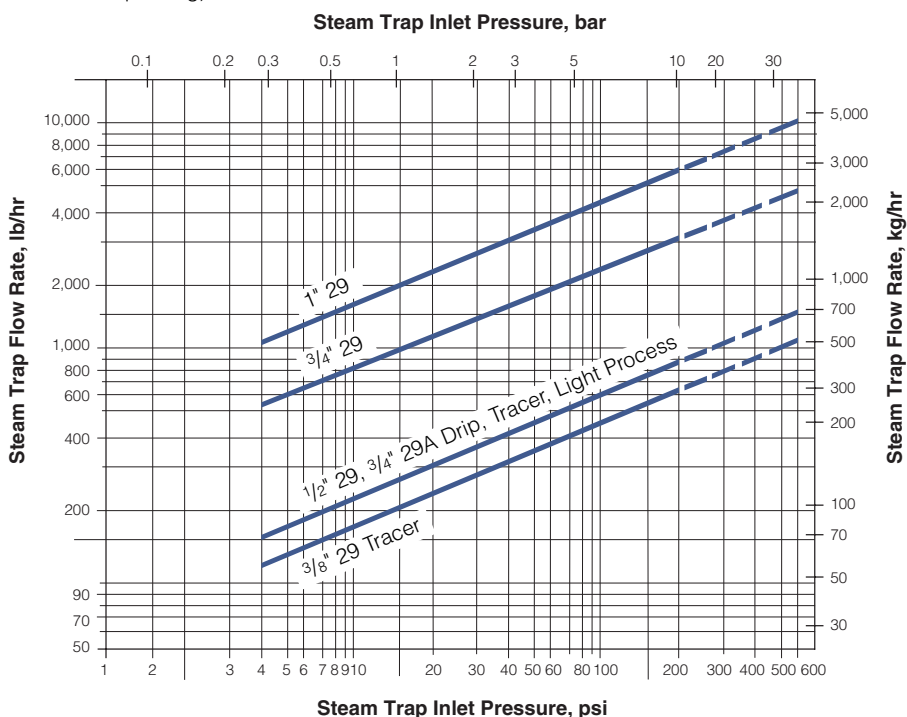
How to Specify and Order

Typical Specification – Traps shall be all stainless steel constructions, tilting disc type, thermodynamic trap.

Ordering – Designate size and series number of trap.

Condensate Capacity Near Steam Temperature

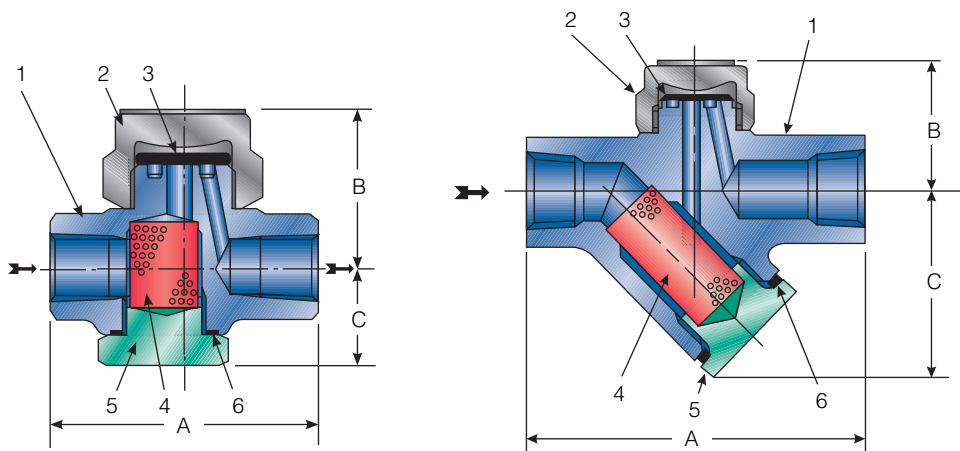
(For steam trap sizing)



Integral Seat – Series 129Y-3 and 29S Disc Traps

The series 129Y-3 and 29S disc traps are designed for light loads such as steam tracing and steam line drip. The 129Y-3 trap may also be used for small process applications.

The 129Y-3 is a straightway body and has an integral wye strainer. The 29S is a straightway body with an integral T strainer.



Series 29S

Series 129Y-3

Parts and Materials

Item	Part	Materials
1	Body	Series 400 Stainless Steel (Heat Treated)
2	Bonnet	Series 400 Stainless Steel
3	Valve Disc	Series 400 Stainless Steel (Heat Treated)
4	Screen	304 Stainless Steel
5	Screen Cap	Carbon Steel
6	Cap Gasket	Monel®

Dimensions and Weights

Series Number	Connection Size – NPT in. [DN]*	Nominal Dimensions, in [mm]			Weight, lb. (kg) Threaded Series
		A	B	C	
29S	1/4 [8]	2 [50]	13/16 [30]	3/4 [19]	1/2 (2)
	3/8 [10]	3 15/16 [100]	17/16 [37]	2 [50]	1 (0.5)
129Y-3	1/2 [15]	3 15/16 [100]	17/16 [37]	2 [50]	1 (0.5)
	3/4 [20]	3 15/16 [100]	1 5/8 [41]	2 [50]	1 1/2 (0.7)
	1 [25]	4 2 1/64 [110]	1 7/8 [48]	2 3/4 [70]	2 (1)

* [DN] expresses metric equivalent.

Ratings

Operating:

3/8", 1/2", 3/4" 129Y 4-400 psi, 750°F

1" 129Y 6-400 psi, 750°F

1/4" 29S 4-300 psi, 750°F

Allowable Back Pressures:

1/2", 3/4" 129Y and 1/4" 29S to 70% of inlet psia.

1" 129Y to 50% of inlet psia.

Applicable Codes and Standards

Pressure rating per ANSI/FCI-69-1.

Performance testing per ANSI/ASME

PTC-39.1. End connections per ANSI

B1.20.1 for threaded ends.

How to Specify and Order

Typical Specification – Trap shall be all stainless steel construction, tilting disc type, thermodynamic trap.

Ordering – Designate size and series number of trap.

Condensate Capacity Near Steam Temperature (for steam trap sizing)

