

5900 FlexBalance and 5900 FlexBalance~Plus Series Separators

Taco's patented 5900 FlexBalance and FlexBalance~Plus Separators act as a hydraulic bridge between the primary and secondary circuits in hydronic heating and cooling applications. The FlexBalance~Plus product line incorporates Taco's patented Pall Ring technology for deep micro-bubble and dirt removal. All Taco FlexBalance Separators are designed, manufactured and tested to the requirements of ASME Section VIII, Div I. This Green Building friendly series provides improved system energy efficiency, allowing the use of smaller pumps for each system circuit.



FlexBalance Separator



The FlexBalance Series features Internal Baffles



5900 FlexBalance~Plus Separator



5900 FlexBalance~Plus Series features Pall Rings



Features and Benefits

Improve comfort and reduce cost.

Improve comfort and system performance.

- Achieve hydraulic separation between primary and secondary circuits.
- Prevent hydraulic coupling of pumps or pumps in series in primary secondary configurations.
- Prevent unanticipated or ghost flows in connected primary and secondary circuits.
- Control system is not affected by flow in a connected circuit.

Reduce installed costs

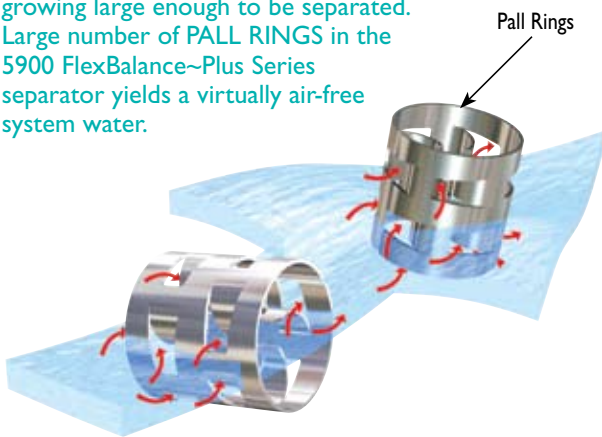
- Integral PALL RING microbubble high efficiency air and dirt separator in the Plus series eliminates separate air separator.
- Requires less mechanical room space than separate components.
- Integral air vent.
- Optional ½" temperature/pressure ports on all nozzles.

Reduce operating costs

- Pressure drop of FlexBalance is less than separate field installed components.

Patented Pall Ring micro-bubble separation technology

When water is brought into contact with a PALL RING, the stream is deflected in many directions. Microbubbles attach to the ring surface by coalescence growing large enough to be separated. Large number of PALL RINGS in the 5900 FlexBalance~Plus Series separator yields a virtually air-free system water.

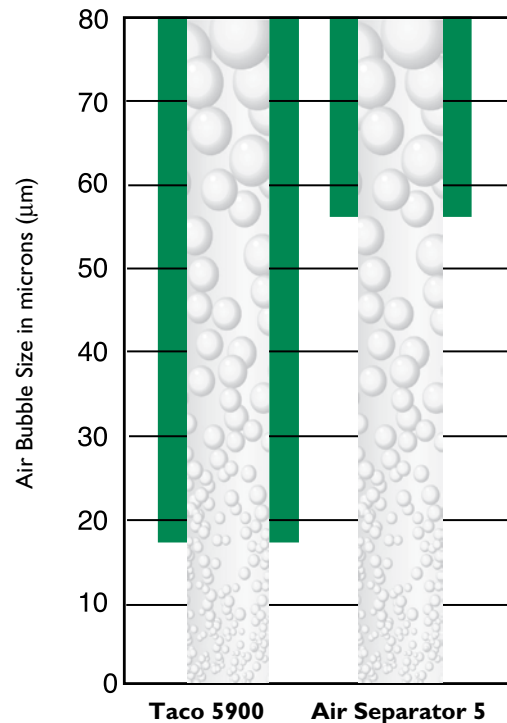


The 5900 series separators remove up to 99.6% of the dissolved air through the action of coalescence. This feature is especially beneficial in correcting problems in air entrained systems.

High efficiency cleaning of air and dirt.

PALL ring technology has been used for many years in the processing industry. Taco's application of PALL rings to hydronic air and dirt separation is new to the HVAC industry. While air bubbles are separated by the PALL rings through a process known as coalescence, dirt particles are actually caught and sifted to the bottom of the tank, where they can be removed through a blowdown valve. The 5900 Series provides higher efficiency, with reduced pressure drops, so a somewhat smaller pump may be used for maximum efficiency.

Superior air bubble removal



Primary Secondary Pumping

Primary secondary pumping is used extensively in HVAC systems to hydraulically isolate different circuits in the same hydronic system.

This can be useful to save energy by shutting off or reducing the speed of pumps in areas of the system with no or low loads. This can also be useful to increase comfort by supplying areas of a system with different water temperatures or different flow rates.

To successfully accomplish these tasks the flow rates of these different circuits must be independent of each other, i.e., the flow in one circuit must not affect the flow in another circuit. This is known as decoupling or hydraulic separation.

To decouple or hydraulically separate one circuit from another, an area of very low pressure drop must be created in the common piping between the two circuits. This pipe sometimes referred to as the decoupler or hydraulic separator. This decoupler must be as short (tee to tee) as possible to insure that the path of least resistance for the flow of water of one circuit is through the decoupler and not through the opposing connected circuit.

This decoupler or common pipe is shown in Figure 1 in red.

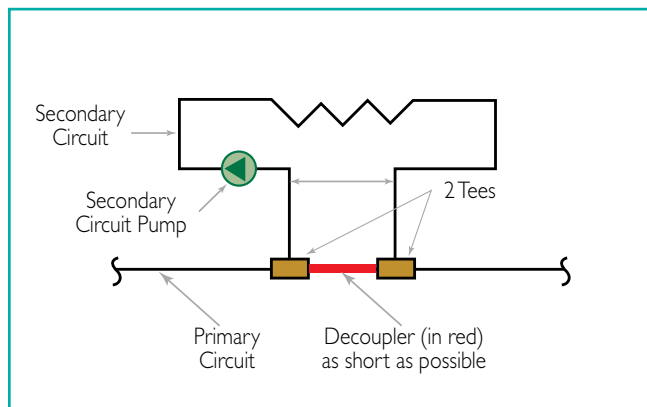


Figure 1 — Decoupler

If this decoupler is installed correctly then the flow in one circuit does not affect the flow in the other circuit. The flow in each circuit is only a function of the pump head in its circuit. This flow is not influenced by the pumps in the opposing circuit being in series with the pumps in its circuit.

There are 3 combinations of flow and temperature possible depending on the relationship of the primary and secondary flow rates.

Figure 2 shows the relationship for the primary (Q_{primary}) and secondary ($Q_{\text{secondary}}$) flow equal.

In this instance the secondary circuit supply temperature is equal to the primary circuit supply temperature. For example a building secondary circuit supply water temperature will be the same as a boiler or chiller primary circuit supply water temperature.

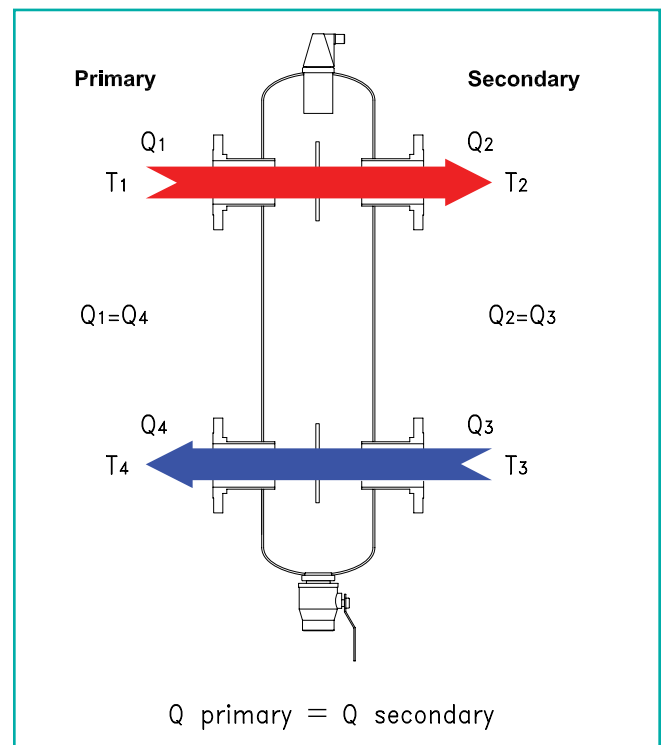


Figure 2

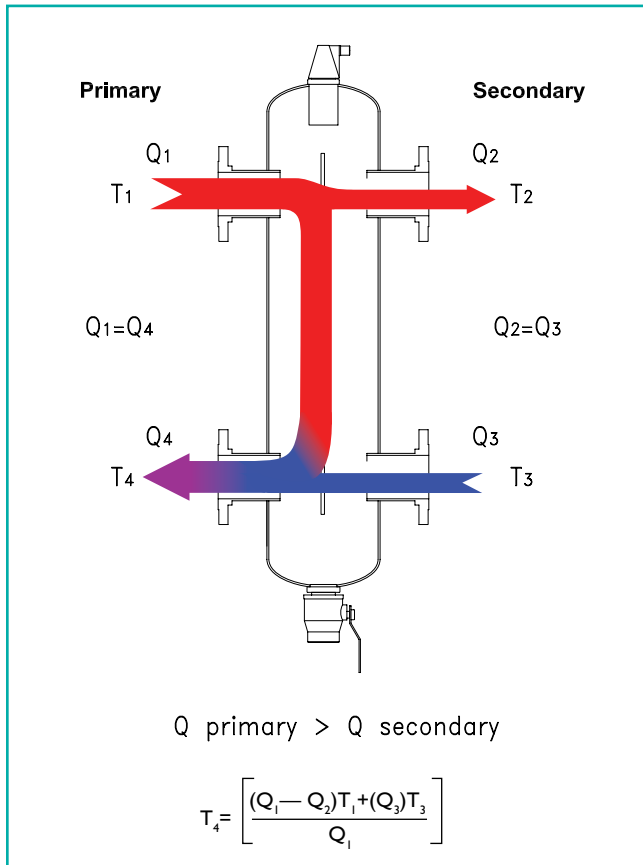


Figure 3

Figure 3 shows the relationship if the primary flow (Q primary) is greater than the secondary flow (Q secondary).

In this instance the secondary circuit supply temperature is the same as the primary circuit temperature. For example a building secondary circuit supply water temperature will be the same as a boiler or chiller primary circuit supply water temperature.

Figure 4 shows the relationship if the primary flow (Q primary) is less than the secondary flow (Q secondary).

In this instance the secondary circuit supply temperature is less than the primary circuit temperature. For example a building secondary circuit supply water temperature will be lower than a boiler and higher than the chiller primary circuit supply water tem-

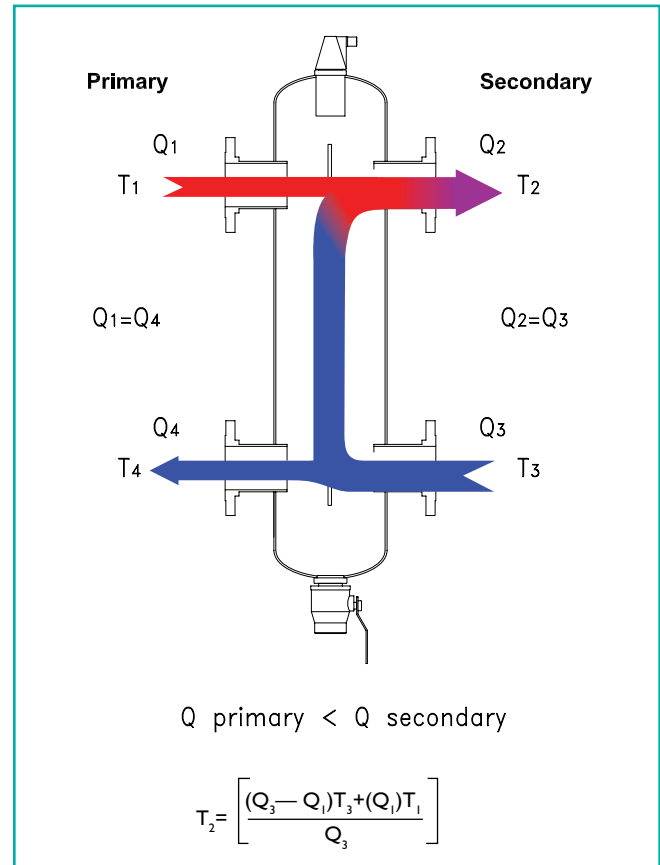


Figure 4

perature. This is because some of the secondary flow mixes with the primary flow and dilutes the supply water temperature to the secondary circuit.

This can cause system performance problems, especially in chilled water systems, since the building secondary supply water temperature cannot be maintained at the chiller primary supply water temperature.

This can result from staging off of multiple boiler or chillers while maintaining a constant volume building secondary circuit flow rate.

This application can also be used for low mass boilers that have flow limits below the building secondary flow rate. In this application system water is bypassed around the boiler to limit the boiler flow to manufacturer's maximum flows.

Types of Pre-Manufactured Decouplers/Hydraulic Separators

Taco has developed several pre-manufactured decouplers or hydraulic separators that insure hydraulic isolation of connected hydronic circuits. Use of manufactured units insures not only hydraulic isolation of connected circuits from improperly field installed tees, but also saves installation and field labor costs.

Twin Tee®

For smaller pipe up to 6" in diameter when connecting terminal units up to 2-1/2" branch circuits to single pipe systems Taco offers our patented Twin Tee as shown in Figure 5.

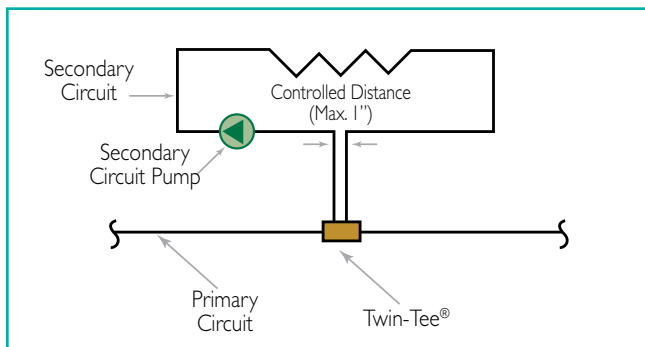


Figure 5 — Twin-Tee Decoupler

5900 FlexBalance Separator

We offer our patented 5900 FlexBalance Series Separator for larger pipe beyond the capability of a Twin Tee. In addition it can be used for connecting generation equipment such as boilers and chillers to primary piping systems. It can also be used for applications where air removal is desired.

This separator offers a low pressure decoupler or common pipe between two circuits. To achieve this low pressure region the optimum velocity of the flow entering the Separator should be 6.6 fps and the velocity in the Separator should be .66 fps.

A typical piping schematic for the Hydraulic Balancer Separator in a multiple chiller application is shown in Figure 6.

Our 5900 FlexBalance Separator meets this configuration. The system water passes directly through to the chiller circuit without impacting into a Bull Head tee. In addition, the distance between the connections in the bypass is at least 10 pipe diameters.

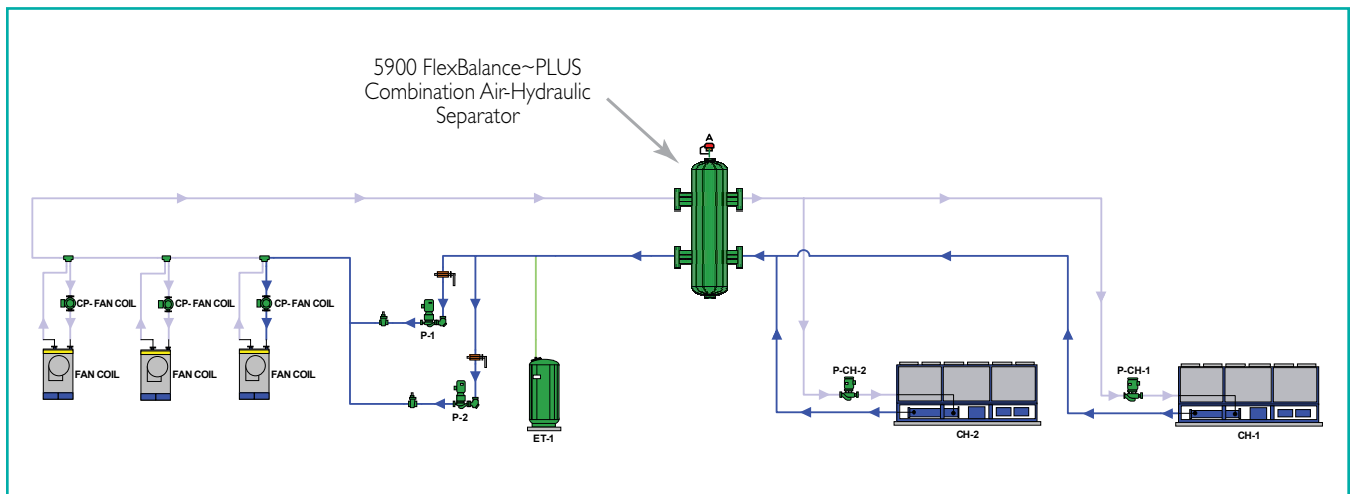


Figure 6 — Multiple Chillers

Applications

With any primary secondary piping arrangement the piping of the common or decoupler bypass pipe between the primary and secondary circuits is of importance.

For chilled water systems this piping is of prime importance to maintain system performance.

A common problem in large chilled water systems is bypassing of warm return water to mix with the supply water from the chillers. This results in chilled water supply water temperatures to the system above the chiller supply water temperature. (See Figure 7)

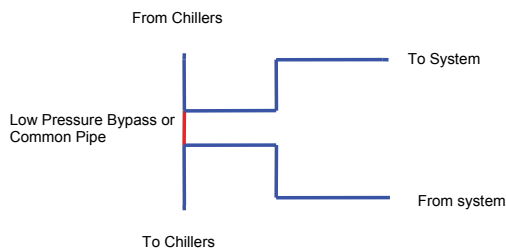


Figure 7 — Low Pressure Bypass

This is the classic low pressure bypass for a primary secondary piping connection. In this case the arrangement results in a Bull Head tee configuration for the system return water.

In larger pipe, especially over 8", the system water impacts forcefully with the Bull Head tee. As a result some of the return water is forced backwards through the bypass. This is sometimes referred to as diffusion. This is illustrated in figure 8.

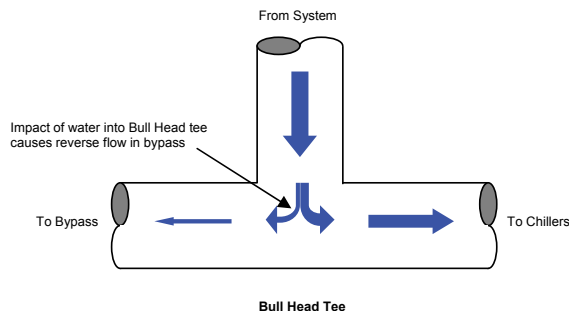


Figure 8 — Reverse Flow or Diffusion in Bypass

The mixing of warm return water with supply water from the chillers will result in chilled water supply water temperatures to the system above the chiller supply water temperature.

In one larger system the chillers' supply temperature was 40°F. However, the supply water temperature to the system was 46°F.

The solution to this problem is to abandon the classic low pressure bypass arrangement and connect the bypass as shown in figure 9. In this case the tee is rotated so that the system water passes directly to the chiller circuit and not into a Bull Head tee. In addition it is recommended that the distance between the tees in the bypass be at least 10 pipe diameters.

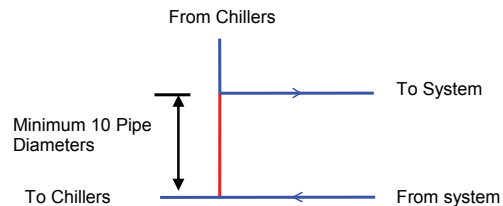
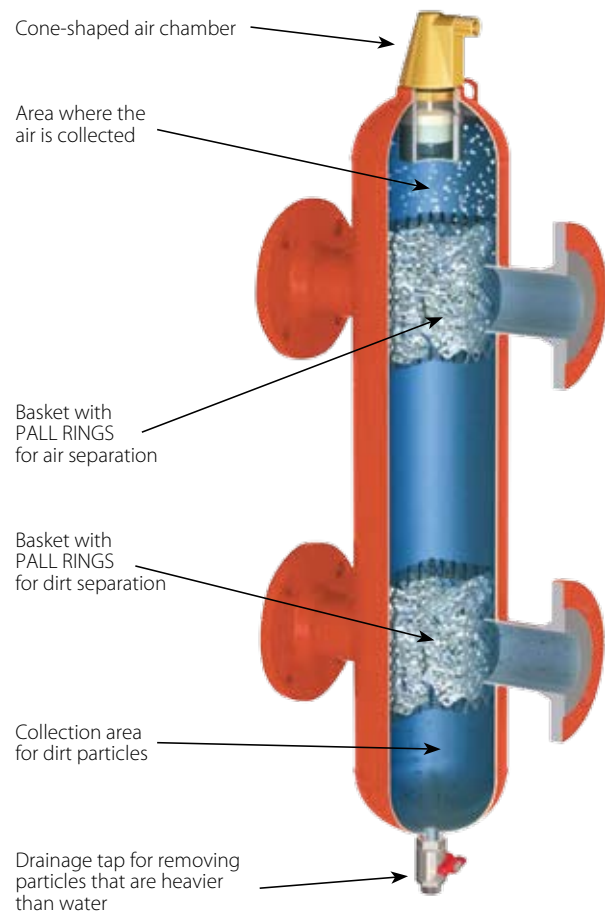


Figure 9 — Recommended Bypass Piping

5900 FlexBalance ~ Plus Separator

5900 FlexBalance Plus Separator includes the use of PALL RINGS for the coalescence of micro air bubbles around the PALL RINGS to separate frefrom a system fluid. The 5900 Plus series incorporates the highest available coalescence surface area available on the market today. This enhanced surface area allows the removal of microbubbles as small as 18 microns in diameter.



Selection Examples

Example 1:

Problem:

Select a hydraulic separator for a new installation. The hydraulic separator will be installed between a chiller primary pumping circuit and a building loop secondary pumping circuit

Conditions:

Flow rate = 700 gpm

Pipe size = 6"

Pipe Velocity = 7.8 fps

Selection Procedure:

1. Determine the type of hydraulic separator required. If no air removal is required this would require a Taco 5900 Series FlexBalance Separator.
2. Determine the pipe velocity range of the 5900 Series that is suitable for these conditions. The optimal pipe velocity range for the 5900 is 6.6 fps. The velocity in the 6" specified pipe size is 7.8 fps. This exceeds the recommended pipe velocity of 6.6 fps. Therefore, select an 8" pipe size unit. This pipe velocity = 5.5 fps.
3. Determine the shell velocity range of the 5900 Series that is suitable for these conditions. The recommended shell velocity range for the 5900 is .66 fps. The shell diameter for an 8" pipe size unit is 24". The shell velocity at 24" shell diameter is .5 fps. This is within the recommended shell velocity. Therefore, select an 8" pipe size unit model 5908A.

Example 2:

Problem:

Select a hydraulic separator for an existing installation with air entrainment and dirt problems. The system has less than average maintenance.

Conditions:

Flow rate = 150 gpm

Pipe size = 3"

Pipe Velocity = 6.5 fps

Selection Procedure:

1. Determine the type of hydraulic separator required. For removal of micro air bubbles and dirt this would require a Taco 5900 Series FlexBalance Plus Separator with integral PALL RINGS for air and dirt removal
2. Determine the pipe velocity range of the 5900 Series that is suitable for these conditions. The recommended pipe velocity range for the 5900 is 6.6 fps. The velocity in the 3" specified pipe size is 6.5 fps. This is within the recommended pipe velocity of 6.6 fps. Therefore, select a 3" pipe size unit.
3. Determine the shell velocity range of the 5900 Series that is suitable for these conditions. The recommended shell velocity range for the 5900 is .66 fps. The shell diameter for a 3" pipe size unit is 10 3/4". The shell velocity at 10 3/4" shell diameter is .5 fps. This is within the recommended shell velocity. Therefore, select a 3" pipe size unit model 5903P Plus.

Features

US Patent# 7,117,888
Manufactured to ASME Section VIII Div. I
Energy Saving Green Product

Specifications

Working Pressure: 125 psi @ 270°F
(150 psi @ 270°F Option Available)

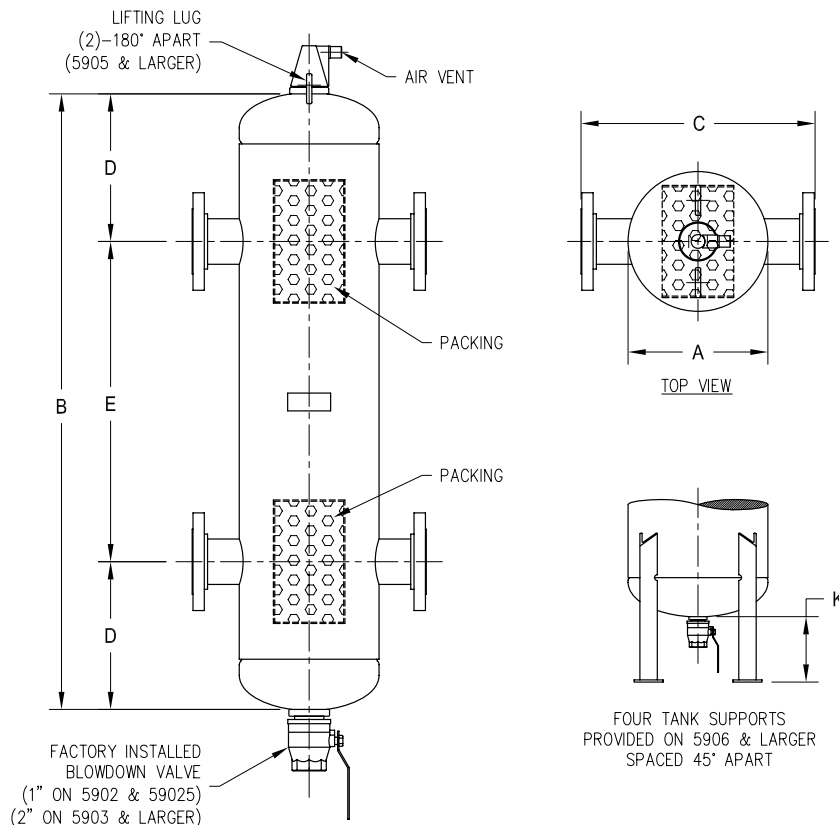
Internal Body Diameter:
3X the cross-sectional area of the
combined entering nozzle area.

Connection Options:
Flanged, threaded (up to 3") and Victaulic
available.

Available Sizes: 2" thru 12"



Each separator is
equipped with a
brass conical shaped
air venting chamber
designed to minimize
system fluid from
fouling the venting
assembly.



5900 FlexBalance ~ Plus Series Dimensions & Weights:

Pipe Size	Model Number	A	B	C	D	E	K	Optimum Flow (GPM)	Surface Area* (Sq. Ft.)	Approx. Weight (LBS.)
		Dia. (Inch)	Max. (Inch)	(Inch)	(Inch)	(Inch)	(Inch)			
2	5902P	6-5/8	33	13-3/4	8-5/8	15-3/4	---	63	7.7	130
2-1/2	59025P	6-5/8	33	13-1/4	8-5/8	15-3/4	---	63	7.7	140
3	5903P	10-3/4	50	17-1/2	12-3/4	24-1/2	---	173	33.9	240
4	5904P	10-3/4	50	20	12-3/4	24-1/2	---	173	33.9	265
5	5905P	14	75	23	21-1/4	32-1/2	---	293	58.7	460
6	5906P	18	88	27	23-1/2	41	14	499	129.5	650
8	5908P	24	119	34-1/2	32	55	14	896	282.4	1210
10	5910P	30	153	41-1/4	40-1/8	72-3/4	14	1409	455.5	1880
12	5912P	30	153	42-3/4	40-1/8	72-3/4	14	1409	455.5	1980

Designed and constructed per ASME Section VIII Div. I

* Total Coalescence (Pall Ring) Surface Area

All dimensions shown are subject to change and should not be used for pre-piping. Contact your local Taco representative should certified dimensional drawings be required.