

**Saunders**<sup>®</sup>  
*the science inside* 

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## Aseptic Diaphragm Valves Overview

**CRANE**<sup>®</sup>

ChemPharma Flow Solutions

[www.cranechempharma.com](http://www.cranechempharma.com)

# Aseptic Diaphragm Valves The Saunders Story

## PK Saunders invented the diaphragm valve concept

PK Saunders invented and patented the diaphragm valve concept long before the emergence of the Life Science industry. However, the design features present in the original weir type diaphragm valve remain the reasons the aseptic diaphragm valve is recognized as the valve of choice for aseptic applications.

Saunders has led the way in the development of diaphragm valve to meet ever increasing demands for hygienic performance and regulatory compliance. These innovations have included the introduction of forged stainless steel bodies, the first compact pneumatic actuators, the first traceable diaphragms, the first modified PTFE diaphragms, and first controlled sulfur stainless steel bodies.

Today, CRANE ChemParma, Saunders is a global supplier to bio-tech, pharmaceutical, and other related markets with design and manufacturing on three continents.

## Global Compliance

Aseptic Diaphragm Valves are supplied into critical process applications in the world's most closely regulated industries. Full compliance to all relevant Global Standards is an essential element of the product and cannot be taken for granted.

Saunders complies with all applicable Global Standards for diaphragm valves in the Life Science market, including:

FDA CFR 177.1550 (PTFE), 177.2600 (Elastomer)  
USP Class VI, <87>, <88>  
Traceable to EN 10204 3.1  
3A Certification  
Traceability EN  
ASME BPE 2009 Edition  
Testing to BS 6755-1  
ISO 9001  
CE and PED 97/23/EC  
TUV-Merkblatt HPO Qualification



Additional Engineering Data and Information is available at [www.cranchempharma.com](http://www.cranchempharma.com), including:

- Product Data Sheets
- Actuator Sizing Charts
- Welded Tandem Orientation Charts
- Temperature/Pressure Performance
- Cv and Pressure Drop Data
- Installation Guidelines
- O&M Manuals

Dimensional Information and 2D/3D Model Files available at [www.drawings.craneflow.com](http://www.drawings.craneflow.com).

New Product Introductions and Information available at [www.whatsnew.craneflow.com](http://www.whatsnew.craneflow.com).

# Aseptic Diaphragm Valves Features

## Handwheel

High integrity handwheel with ergonomic design ensures comfortable, precise control.

## Position Indication

Highly visible from a distance with positive indication of valve position.

## FDA Conforming

Both PES bonnet shell and internal components are fully FDA conforming.

## Top Entry

Designed for in-line maintenance essential for welded systems.

## End Connections

Body is machined from single forging with integral ends. Butt weld ends have sufficient turnback for orbital weld installation.

## Contoured

Contoured design to optimise external washdown and cleanability.

## Sealed Bonnet

'O' Ring sealed bonnet as standard to prevent ingress from external environment.

## Performance Bonnet Assembly

Polyethersulphone (PES) suitable for wash-down with detergents, sodium hydroxide, hypochlorite, alcohols, dilute acids and autoclaving at up to 160°C.

## Shrouded

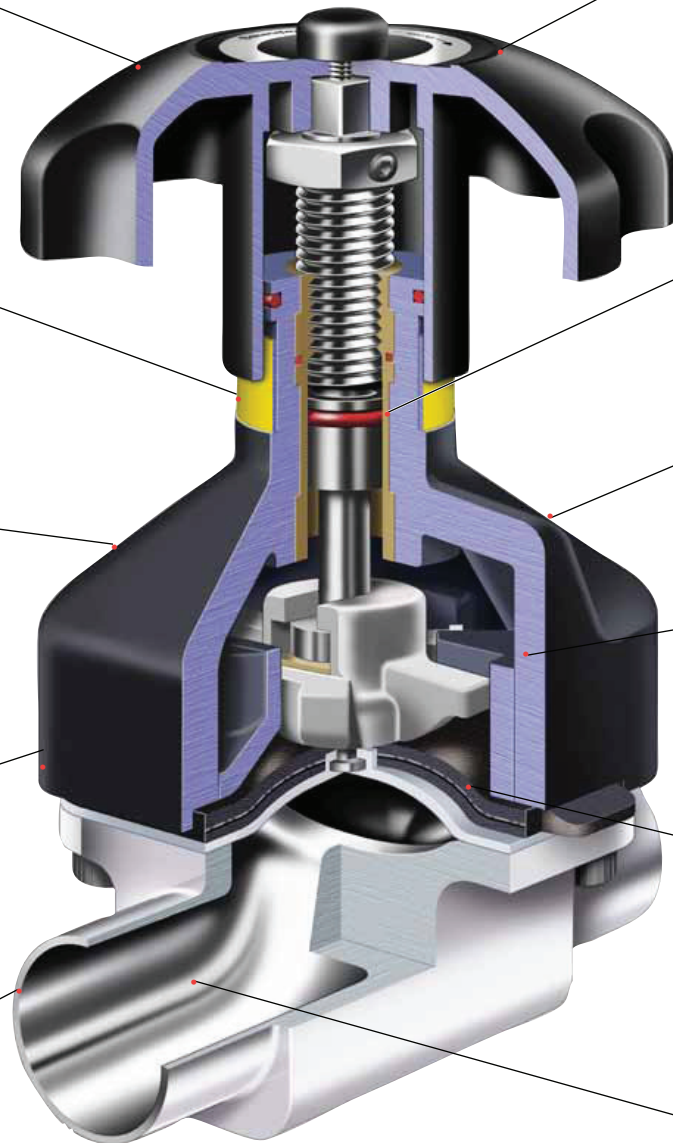
Shrouded bonnet construction covers body fasteners for clean exterior profile.

## Diaphragms

Saunders unique FDA/USP conforming diaphragms are all manufactured from raw polymer in-house. All diaphragms are fully traceable back to physical characteristics of the rubber blend.

## Forged Bodies

All aseptic valve bodies are profiled for low turbulence flow. Forged in 316L/1.4435 stainless steel to maximum ferrite content level 0.5%. Cavity free design eliminates entrapment areas and enhances diaphragm life.

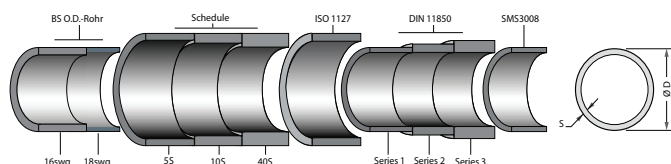


NOTE: Alternative modular options are available including padlocking facility, proximity sensors and limit open stop versions.

# Aseptic Diaphragm Valves Body Ranges

## Saunders Body Range

CRANE ChemPharma, Saunders offers valves with bore and end specifications compliant to the full range of global pipe standards. The dimensions of outside diameter and wall thickness differ according to the tube specification as illustrated in the example shown below for nominal size DN25 (1.00”).



Different tube standards have different bore diameters. This results in changes to the internal geometry of the valve body and causes drain angles to vary based on both tube standards and also nominal valve size. All CRANE ChemPharma, Saunders bodies are modeled using 3D software that identifies optimum drain angle for each valve size and tube specification.

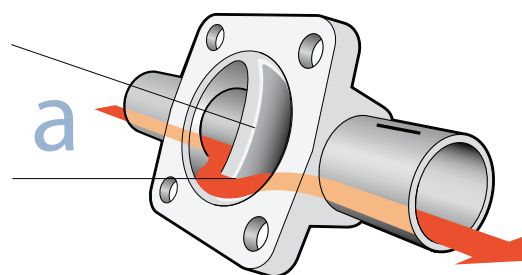
Standard body material for all forged bodies is stainless steel dual certified to 316L (ASTM A-182) & DIN1.4435 with the additional specification for controlled sulfur, 0.0017%-0.05%. This provides conformity with most major international specification requirements and compatibility with bio-pharm piping systems. Controlled sulfur provides enhanced weldability and meets the requirements of the ASME BPE Standard.

DIN1.4435/316LEN10222-SASTMA-182	
Material	
Element	%
Carbon	0.03 max.
Silicon	1.00 max.
Manganese	2.00 max.
Phosphorus	
Sulphur	0.03 max
Chromium	17.0/19.0
Nickel	12.5/15.0
Molybdenum	
Nitrogen	0.11

Cast bodies are available from 316L stainless steel. Bodies produced from alternate materials such as Hastelloy®, AL6XN, 904L and Titanium are also available.

## Drainability

The diaphragm valve has outstanding self-draining characteristics and is capable of draining in both vertical and horizontal orientations.



Factors which affect drainability include:

- Valve size and end specification
- Internal surface finish
- Drain orientation (as shown)
- Surface tension and viscosity of media
- Pipe run angle – generally recommended at 2 to 3 degrees

Drainability in a process system is ultimately the responsibility of the system designer and end user as a result of the factors denoted above.

ASME BPE Table DT-3	
Material	
Element	%
Carbon	0.03 max.
Silicon	1.00 max.
Manganese	2.00 max.
Nickel	12.50 min.
Chromium	17.00 min.
Molybdenum	2.50 min.-3.0 max
Nitrogen	.0110 max.
Phosphorus	0.040 max.
Sulfur	12.50 min.-0017 max.

# Aseptic Diaphragm Valves Body Ranges

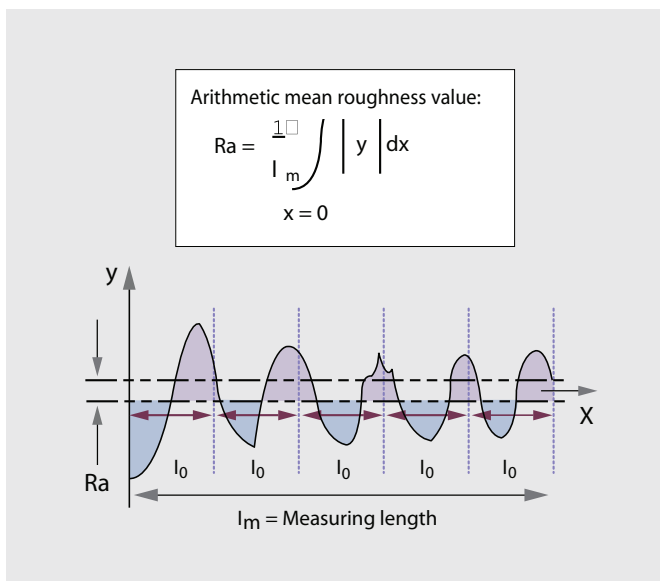
## Surface Finish

CRANE ChemPharma, Saunders valve bodies are available in all mechanically polished and electropolished surface finish options to match piping system specification. Saunders valve bodies are also available in a complete range of ASME BPE compliant internal surface finishes.

Objectives in specifying the appropriate surface finish:

- Result in a defect-free and consistent surface free of anodic contamination
- Minimize product adhesion to the interior surface of the valve and pipe works
- Achieve a surface which is readily cleanable by SIP/CIP (Steam in Place/Clean in Place) consistently, and in a minimum amount of time
- Enhance corrosion resistance

Surface finish is best described using roughness average (Ra) value and is now the current industry standard of measurement. Previous measures, such as grit are less objective and more difficult to quantify. All Saunders product contact surface finishes are measured in Ra and as a maximum value – not an average.



## Electropolishing

Electropolishing of mechanically polished product contact surfaces improves surface finish smoothness and corrosion resistance. Mechanical polishing or machining may leave numerous microscopic surface imperfections which can cause areas of differing electrical potential due to surface stresses.

Electropolishing can result in up to 50% improvement in surface finish of machined or mechanically polished surfaces. The inherent benefits of electropolishing subsequent to mechanical polishing can be summarized as follows:

- Superior surfaces for cleaning and sterilization
- Superior passivated surfaces for corrosion resistance by virtue of enhanced chrome oxide surface layer
- Superior high lustre aesthetic appearance
- Superior elimination of smeared or torn surfaces caused by abrasive finishing
- Superior removal of inclusions and entrapped contaminants such as lubricants and grit particles

## Certification

Typical surface parameters available through Certificate of Conformity on customer request. Actual surface finish readings are available upon customer request.

Conversion – micro metres to micro inches

1 micro meter	=	39.3701 micro inches
1 micro inch	=	0.0254 micro meters

## Aseptic Diaphragm Valves Standard 2-Way Bodies

### Standard 2-Way Bodies

The standard 2-way valve body is the basic building block of diaphragm valve technology. CRANE ChemPharma, Saunders 2-way forged bodies are manufactured from wrought 316L/1.4435 stainless steel bar.

The forging process results in a homogeneous surface that is free of defects such as porosity, inclusions, or shrinkage cavities. This defect-free surface is an ideal substrate for the high levels of mechanical and electropolished surfaces demanded by the clean processing industries to maintain sterility and optimize cleaning processes. CRANE ChemPharma, Saunders forged bodies are manufactured to achieve low ferrite levels of less than 0.5% maximum. This reduces the potential for migration of oxides through a high purity water system.

### Forged Stainless Steel 2-Way Bodies (DN15-DN80 – 0.50”-3.00”)

These bodies meet all existing ASME BPE (American Society of Mechanical Engineers Bioprocessing Equipment) standards and cGMP (current Good Manufacturing Practice) principles and are ideal for high purity applications.

### Forged Stainless Steel 2-Way Bodies for use on ISO, DIN, SMS and other international piping specifications (DN15-DN80 – 0.50”-3.00”)

These bodies are fully PED compliant, meet cGMP principles and are ideal for high purity applications.



#### Valve Body Features:

- Cavity-free and self-draining
- Readily incorporated into valve cluster and access valve fabrications
- Materials of construction and surface finish compatible with industry standards system requirements
- Bi-directional flow path
- Full traceability to EN 10204 3.1 and ASME BPE

#### Forged Body Features:

- Hash marks to indicate self drain angle
- Integral weld and hygienic clamp ends
- Controlled sulfur, 0.005%-0.017 per ASME BPE Standard

Please visit our Web-Based Drawing Library at <http://drawings.craneflow.com> for current data base of drawings in PDF, 2D DWG, and 3D STP formats.



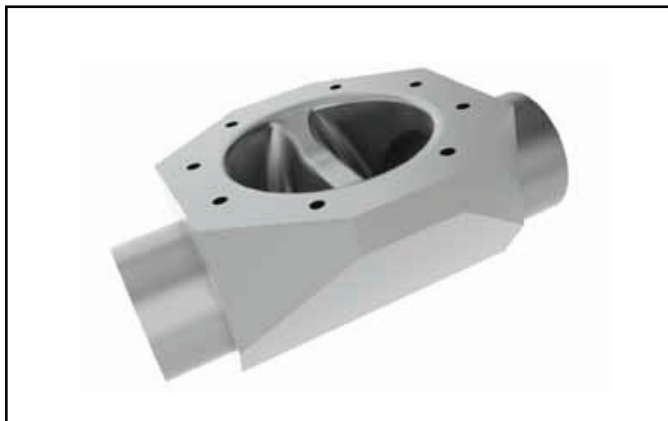
## Aseptic Diaphragm Valves Standard 2-Way Bodies

### Pure Performance (Bio-Seal) Forged Bodies (DN8-DN15/0.25"-0.50")

CRANE ChemPharma, Saunders Pure Performance fractional valve bodies offer a compact, space saving, high integrity solution for critical applications. Manufactured from a 316L/1.4435 stainless steel forging, the valve is used widely as a process valve, sample, or drain port in hygienic system design. All major tube designations (Tube O.D., DIN/ISO, Hygienic Clamp) are machined integrally from the forging and cover end sizes, DN8 (0.25"), DN10 (0.375"), and DN15 (0.50") (This flexibility is achieved by utilization of the same DN8 body design and DN8 diaphragm and top works but machining ends as required).



### Machined from Block 2-Way Valve Bodies (DN100-DN150/4.00"- 6.00")



Larger size designations are machined from solid wrought stainless steel bar stock. This construction brings the same high level of surface integrity and metallurgical security as available with the 2-Way forged bodies.

Please visit our Web-Based Drawing Library at <http://drawings.craneflow.com> for current data base of drawings in PDF and in 2D DWG and 3D STP formats.

### Investment Cast Stainless Steel 2-Way Bodies (DN8-DN100/0.25"- 4.00")

The CRANE ChemPharma, Saunders investment cast range uses high quality materials and selective casting processes to provide an economical solution for the food, beverage, dairy, and bio-process industries. Available in all major international tube designations including, O.D. tubing, ISO, Schedule pipe end. Stringent quality control is employed to minimize any risk of porosity and ensure a finished product of the highest integrity.



## Aseptic Diaphragm Valves Custom Valve Solutions

### Custom Valve Solutions

Custom valve types may be welded tandem valve assemblies, machined from solid block types or manifolds that incorporate both technologies.

The primary benefits of these solutions are reduced wetted area, reduced deadlegs, improved drainability and reduced design envelope over arrangements using individual 2-way valve bodies. Machined from solid bodies also offer increased security due to the lack of internal fabrication welds.

### Tandem Valves (Sterile Access Valves)

The first customized valve concept is the welded tandem combination. A main valve is ported and a second access valve is welded to the main valve to create a tandem cluster. Tandem valves are designed to optimize drainability and meet process design requirements for minimum deadlegs.



The following rules help define the possible orientation of tandem valves:

- The main valve and access valve may be installed to drain in either the horizontal or vertical position. When installed in a horizontal run the valve must be rotated into the self-drain position to drain.
- Allowance must be made to permit access to bonnet or actuator fasteners and for diaphragm maintenance.
- The access valve can be any size including the same size as the main valve.
- The amount of deadleg between main and access valves will vary depending on respective valve sizes and orientation. Virtually all combinations fall within cGMP requirements.
- “Handwheel opposite” designs generally have reduced deadlegs in comparison to configurations with the handwheel of the main and access valves in the same quadrant.
- All CRANE ChemPharma, Saunders welded valve fabrications are 100% hydro-tested before and after all welding and polishing processes to ensure mechanical integrity.
- Full material certification of all tube and fittings used is standard.
- CRANE ChemPharma, Saunders bonnets, actuators, and diaphragms fit fabricated valve assemblies without adaptors or distance pieces.



## Aseptic Diaphragm Valves Valve Manifold / Clusters

### Valve Manifold / Clusters

Configuration of optimum process fabrication presents system designers with an ongoing challenge. Minimum space envelope, reduced hold up areas, reduced cost, and facilitating ease of installation are all key considerations.

Our expert customization service is designed to create the optimum valve configuration for customer's specific processes. Working from Piping and Instrumentation Drawings (P&ID's), our engineers will propose the solution, realized in a fully detailed 3D drawing for customers to verify and approve. All CRANE ChemPharma, Saunders process fabrications utilize either forgings or machined barstock components to ensure process integrity.

The benefits of such fabrications include:

- Manufactured under stringent ISO 9001-2000 quality control
- Tailor-made solutions to customer requirements
- Fully-tested assembled units manufactured under controlled conditions
- Full traceability of all components
- Reduced on-site fabrication time and costs



Customized 5-way diverter  
fabricated manifold



Manifold consisting  
of four 2-way forgings

# Aseptic Diaphragm Valves **Bio-Block Valves**

## Bio-Block Valves

CRANE ChemPharma, Saunders Bio-Block valves offer the foremost expression of aseptic diaphragm valve technology. Bio-Block designs are machined from solid bar or billet to create tee configurations or clusters of two or more weirs with shared chambers that result in a single design with reduced wetted area, optimum drainability and the highest level of integrity.

Bio-Block valves are machined from solid technology and permit a wide range of standard and custom designs. Engineered and manufactured using state of the art 3D design and manufacturing software that utilize direct tool interface to produce exacting designs while minimizing manufacturing lead times.

The wide variation in possible machined from solid valve types has created challenges for system designer, fabricator, installer, and end user. Saunders has worked to create a resource that enables enhanced selection and communication of both standard and custom machined from solid designs.

CRANE ChemPharma, Saunders unique comprehensive Bio-Block Design Manual is a proven and invaluable resource for the selection and specification of both standard and custom Bio-Block Valves. This interactive tool can reduce design and process lead time required to develop custom designs and integrate these valves into overall system design.

The Bio-Block Design Manual contains an overview of the technology involved in designing and manufacturing machined from solid Bio-Blocks. The manual also includes glossaries of terms and symbols, and descriptive categories based on primary design feature: Zerostatic Weir, Serial Weir, Multiple Weir, Tank Weir and Compound Bio-Blocks. Finally, a user-friendly P&ID section links to over 100 specific selections.

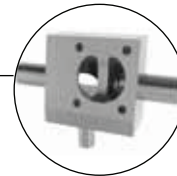
Saunders Sales and Engineering is pleased to work with you to identify and select the ideal valve design to optimize the performance of your system. Please contact your local distributor or CRANE ChemPharma sales office for support.

## Bio-Block Categories Machined From Solid Options

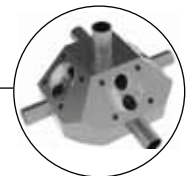
Zerostatic Weir: Tee fitting and weir combined



Serial Weir: Two weirs sharing a common chamber



Multiple Weir: Three or more weirs with a common chamber



Tank Weir: Weir integrated into bottom of tank



Compound Bio-Block: Combination of Bio-Block types into one assembly



# Aseptic Diaphragm Valves Zero Deadleg Valves

## Zero Deadleg 'Tee' Pattern range

The Zerostatic Tee valve combines a single weir with a tee pattern body. This design eliminates the deadleg present when a 2-way valve is welded or clamped to a tee fitting and has become a bio-pharm standard. Essential for the elimination of deadlegs in recirculating loops and designed to ease installation and validation, CRANE ChemPharma, Saunders Zerostatic Tee Valve enhances the integrity of critical systems.

Major benefits of the Zerostatic Tee Valve include:

- Compact design providing excellent drainage characteristics and absence of deadleg
- Machined block construction with no internal fabrication welds offer optimum security
- Sampling/injection points on high purity water systems
- Mainline sizes DN8-DN150 (0.25"-6.00");  
Branch DN8-DN150 (0.25"-6.00")



Optional integral sample ports can be included to permit realtime sampling of WFI without breaking a sterile use point connection. Valves for point of use service can be fitted with a wide variety of end connections and orientations to meet specific system requirements. Alternate use point designs can be manufactured to accommodate special center lines, reduced envelope requirements or other design considerations.

PDF drawings, 2D AutoCAD and 3D IGES Files of Saunders Tee Valves are available at <http://drawings.craneflow.com>.

## Point-of-Use Options (Zerostatic Valve with 'U' Bend)

One of the most sensitive applications in a WFI loop is the use point valve. These valves represent the barrier between the safety of the re-circulating loop and the potential hazards of the environment and function as the take off point for consumption of WFI. Valves for this application need the highest level of design security, integrity, and cleanliness. CRANE ChemPharma, Saunders point-of-use valves are engineered to minimize dead areas and fully drain all associated tubing.

### Saunders Point-of-Use Valve



Horizontal or vertical drain port significantly reduces the hold-up volume and necessary site welds associated with conventional 'U' bends and branch tee assemblies. Application options include sampling or injection on high integrity systems.

**Sample quality directly from water loop with integral back sample option.**

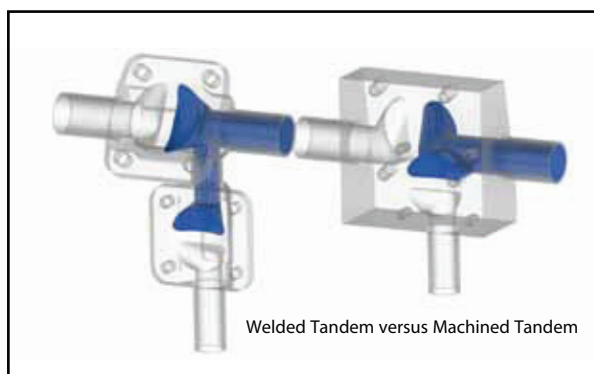
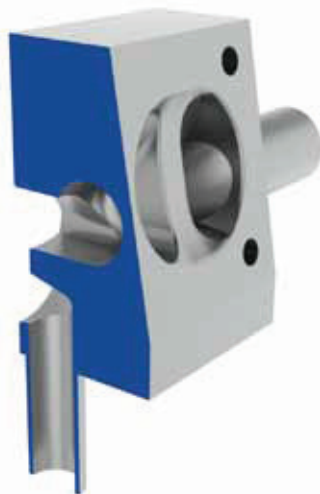
## Aseptic Diaphragm Valves Serial Weir Options

### Machined Tandem Valves

The Machined Tandem is a variation of the Serial Weir family. This group of valve designs is defined as having two weirs with a common chamber. When produced in the "handwheels opposite" configuration the Machined Tandem offers the ultimate in reduced deadleg for a two valve cluster.

This machined from solid Tandem Valve type offers several advantages over the welded tandem:

- Increased security – no internal fabrication welds
- Reduced deadleg – depending on orientation
- Greater structural integrity



### Multi-Port Diverter Valves - Zero Deadleg Options

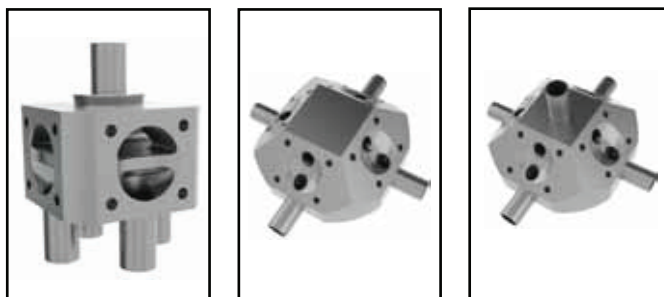
The family of Multi-Port valves includes the Diverter Valve range. These valves include 2-way diverters on through to clusters that have up to eight outlets.

Modern machining technology is employed in the design and manufacture of CRANE ChemPharma, Saunders range of Bio-Block diverter valves. The result is a single valve without internal fabrication welds for maximum strength, with reduced holdup volumes and without stagnant areas.

On one side of the weir there is a common chamber and on the other side of the weir the flow is divided and split into multiple control points. Diverter valve designs are ideal solutions whenever a process line needs to be divided into two or more process streams or when multiple lines are combined into one.

This provides a number of key process advantages:

- Machined block construction, free from fabrication welds to enhance structural integrity
- Minimal deadleg design to reduce risk of process contamination
- Excellent drainage characteristics for quick and effective sterilization
- Reduced space requirement provides greater flexibility in system design and simplified installation
- Fully-certified range, with comprehensive validation support documentation on request



Selecting the right multi-port includes orienting ports and weirs to reduce deadlegs and also to conform to overall system design. Piping can be arrayed in horizontal, vertical, or combined planes.

# Aseptic Diaphragm Valves Tank Valve Options

## Tank Bottom Valves

The CRANE ChemPharma, Saunders tank bottom valve incorporates the performance and features of a diaphragm valve into a machined from solid tank outlet design.

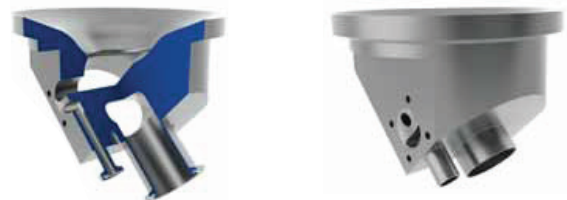
These valves are free from fabrication welds and deadlegs, enhancing structural integrity and reducing the potential for process contamination. The absence of deadlegs also improves drainability, and facilitates effective mixing.



Tank bottom valve weld installation at low point of vessel base enabling optimum drainage, cleaning and sterilization

Sample valves, purge valves and ports are easily incorporated into the tank bottom design to achieve the desired performance.

The resulting valve types are a hybrid or compound solution that entails the use of more than one valve concept; for example, combining a tank bottom valve with an access valve, a multi-port valve with access valves to perform as steam and condensate port or a point-of-use valve together with a sample valve. This process, combined with our manufacturing expertise, results in custom valve configurations that combine utility and performance.



Internal purge options available either on vessel side or outlet side depending on system requirements

## Bio-Block Compound Solutions

Almost every process system includes a unique piping challenge that does not lend itself to conventional solutions. CRANE ChemPharma, Saunders custom designed Bio-Block valves replace welded clusters, manifolds, and valve/fitting combinations and offer the most compact, minimum deadleg design for optimum process integrity.

### Bio-Block Controlled Inlet Options (Multiple Weir and Serial Weir)

Generally associated with multi-port designs, this option involves machining a weir at the inlet to the common chamber of a Bio-Block valve. This design permits control of flow entering into the multi-port valve. The controlled inlet option can be included in any number of compound Bio-Block solutions to comply with specific system requirements.

## Bio-Block Chromatography Valves (Multiple Weir and Standard 2 Way)

This Bio-Block option incorporates a central control weir to permit the division of flow into distinct process streams or to allow flow to pass through the valve as required during resin regeneration or cleaning cycles.



### Bio-Block Customized Solutions

Our design teams work closely with customers to create unique machined valve designs called call Bio-Blocks. These 'outside of the box' solutions may be driven by process, space constraints, regulatory issues or other specific requirements.

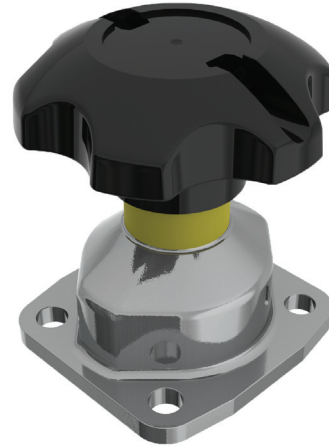
Machined Bio-Blocks have the advantages of reduced wetted area and deadlegs, no internal fabrication welds and reduced documentation for installation and validation. Faster and easier installation of process manifolds can be achieved using advanced "machined from solid" valves.

## Aseptic Diaphragm Valves **Manual Bonnets**

### Manual Bonnets

The CRANE ChemPharma, Saunders Bio-Pharm range of manual bonnets provides industry-leading features including:

- Clean external profile to facilitate wash down and cleaning regimes
- Suitable materials, corrosion resistant polymer and stainless construction
- FDA conforming lubricants
- Compact design easily integrated into process system
- Autoclavable types for valves subject to repeated autoclaving
- Modular options including limit open and limit closed stops, padlocking device and switches



### Stainless Steel Non-Sealed Bonnet Assembly

Constructed from FDA conforming materials, this bonnet offers the best possible levels of security, durability and corrosion resistance and features:

- Stainless steel shell and polymer hand wheel
- Smooth contours and a bright electropolished surface
- Supplied with PES (polyethersulphone) hand wheel to offer high temperature performance and excellent chemical resistance
- Polymer hand wheel reduces heat transfer
- Stainless steel spindle and compressor
- High visibility yellow indicator sleeve
- Available in size range DN15-DN150 (0.50" – 6.00")



## Aseptic Diaphragm Valves Bio-Pharm Top Works



### Para Bonnet Assembly

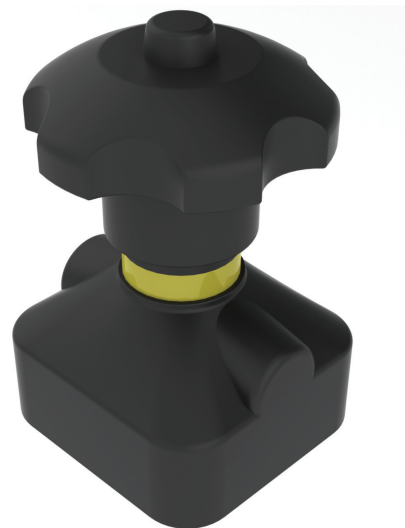
The Para Bonnet represents an excellent value in design and construction and features:

- FDA conforming Polyaryl amide bonnet shell and hand wheel
- Smooth exterior contour
- Resistance to wash down chemicals
- Suitable for process lines subject to Steam-in-Place (SIP)
- Polymer hand wheel reduces heat transfer
- Stainless steel compressor
- High visibility yellow indicator sleeve
- Available in size range DN15-DN50 (0.50" – 2.00")

### Black PES (Polyethersulphone) Performance Bonnet

The PES bonnet features high tech materials and aesthetics and is available with a complete range of modular options:

- PES Shell and hand wheel, stainless spindle and compressor
- Shrouded base for ultimate hygienic profile on 2-way bodies and optional flanged base for use on block bodies
- 'O' Ring seal prevents both the escape of product and the potential ingress of contaminants
- Skirted bonnet construction provides maximum containment and diaphragm support for critical applications
- Limit closing stop to reduce risk of over closure
- High visibility yellow indicator sleeve
- Modular options available including padlocking facility, proximity sensors and limit open stop version
- Available in size range DN15-DN80 (0.50" – 3.00")



## Aseptic Diaphragm Valves Tank Valve Options



### Stainless Steel Sealed Bonnet Assembly

For applications requiring all stainless steel construction

- Stainless steel, hand wheel, compressor and spindle
- Fully sealed, with a primary seal that provides absolute containment for critical applications
- Electropolished finish
- Operational at temperatures up to 160°C - Suitable for Steam-in-Place (SIP)
- Fully autoclavable up to 140°C
- Available in size range DN15-DN80 (0.50" – 3.00")

### Pure Performance (Bioseal) Bonnet Assembly

The Pure Performance Bonnet is for use on DN8 (0.25") bodies – note Pure Performance (Bioseal) bodies have DN8 (0.25") weir but are available with bore and ends in sizes DN8-DN10-DN15 (0.25"- 0.375" – 0.50")

- FDA conforming PPS (Poly-phenylenesulphide) bonnet shell and hand wheel
- Optional stainless steel shell
- Features smooth exterior contour
- O-ring sealed
- Resistant to wash down chemicals
- Suitable for process lines subject to Steam-in-Place (SIP)
- Polymer hand wheel reduces heat transfer
- Fully autoclavable to 140°C
- Stainless steel compressor
- High visibility yellow indicator sleeve





## Aseptic Diaphragm Valves Pneumatic Actuators

CRANE ChemPharma, Saunders EC and SSC pneumatic actuators permit remote operation of the valve, either as an alternative to manual operation or as an integral part of a control system. Both are compact piston-style actuators with excellent chemical and temperature resistance.



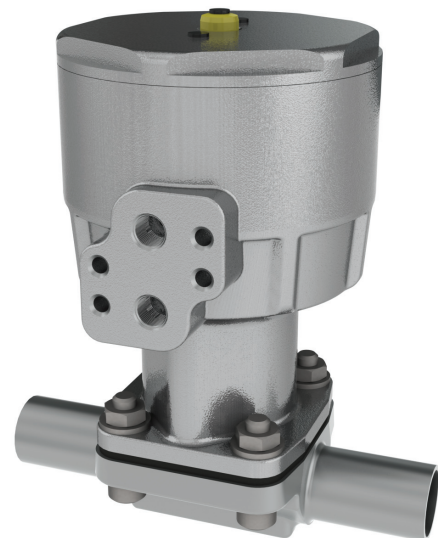
### EC Actuator

The EC is a compact, lightweight piston-type pneumatic actuator developed specifically for bio-pharm applications. The housing is manufactured from PES (polyethersulphone), a high performance thermoplastic. PES has outstanding strength, chemical resistance and thermal properties. The EC features compact size and a smooth exterior profile that includes shrouded fastener design for 2-way bodies and slotted base for use on block type bodies.

*The compact size of the EC and SSC actuators permit the easy integration of automated valves into congested piping designs. The small EC and SSC also facilitate reduction in wetted area and deadlegs of multiport valves.*

The EC is suitable for temperatures from -10°C to + 100°C ambient (autoclave maximum 150°C) and can withstand typical wash down chemicals.

EC actuators are available in sizes DN8 – DN50 (0.25" – 2.00"). The EC is a reliable piston-type design that offers reliable performance and long life. All three operating modes: double acting, spring to close and spring to open use the same housing and share the same reduced overall size. Bright yellow visual position indication is standard on all EC actuators.



### SSC Actuator

The CRANE ChemPharma, Saunders SSC actuator is the stainless steel version of the EC. This actuator features an electropolished stainless steel housing for a robust design that matches the appearance of stainless steel piping systems. The SSC is sizes DN8 – DN50 (0.25" – 2.00") and is available in all three operating modes and shares the same compact size as the EC.

Field conversions of manual valves to pneumatic actuation can be readily achieved 'in-line' without special tools or modification.

# Aseptic Diaphragm Valves Pneumatic Actuators

## ECX Actuator

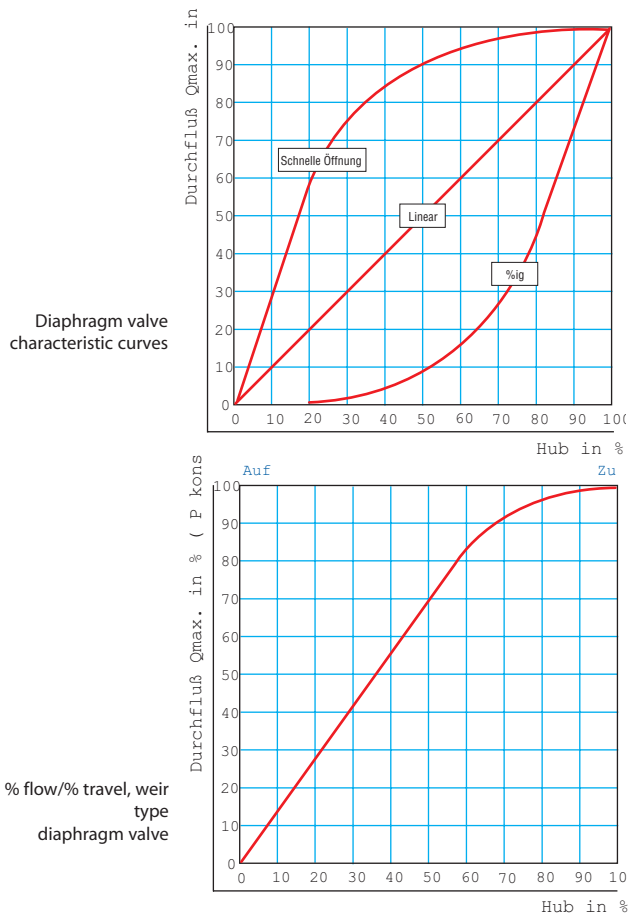
CRANE ChemPharma, Saunders ECX type actuators are designed to offer an extension to the EC size range while maintaining a compact envelope size. The ECX is available in sizes DN65 – DN150 (2.50" – 6.00"). The housing is manufactured in coated silicon aluminum for optimum chemical resistance and long life. With an extensive range of spring packs available, Saunders offers an actuator to suit a wide range of pressure and flow variations.

Available in spring close, spring open, and double acting modes of operation to suit process needs. A wide range of options including switches, positioners, limit stop and visual open/close indication are also available.

Sizing charts for CRANE ChemPharma, Saunders pneumatic actuators are available at: [www.cranchempharma.com](http://www.cranchempharma.com).



ECX Actuator with Module Switchbox  
Size range: DN65 – DN150



Saunders diaphragm valves offer excellent control capabilities within a broad range of pressure, flow or level control applications.

Rangeability (ratio of maximum flow vs. minimum control flow) of Saunders weir type valves is 35:1 extending beyond the range of most process and service control systems.

The positive shut-off characteristics of the valve can, in many instances, eliminate the need for independent block valves, a major component in the piping system cost.

The inherent flow characteristics illustrated shows linearity up to 60% of travel (80% of flow).

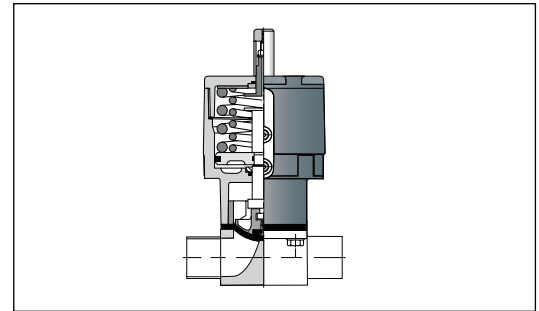
The chart illustrates installed characteristics affected by the dynamic friction loss for the remainder of the piping system. Equal % characteristics can be obtained through the use of characterised positioners.

Pressure recovery factor = 0.7.

## Aseptic Diaphragm Valves Accessories

### Limit Open Stop

Adjustable limit open stops can be supplied for all CRANE ChemPharma, Saunders actuators. This feature is available with the actuator on order or as a retrofit on existing installations.



### Opti-SET Switchbox

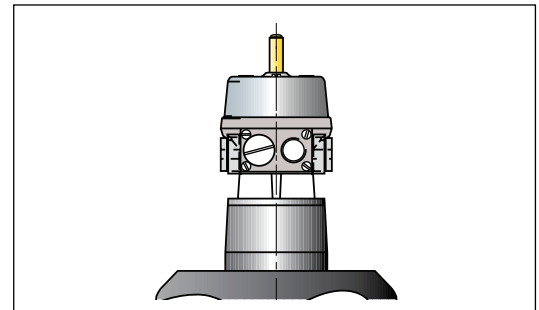
The Opti-SET switchbox is a compact option for valves sizes DN8- DN50 (0.25" – 2.00") that features:

- Lightweight Nylon 66 housing
- NEMA 4X enclosure, ATEX approvals
- Self-setting with mechanical switches and proximity sensor options
- Networking capable with AS-i option
- Bright yellow visual position indication



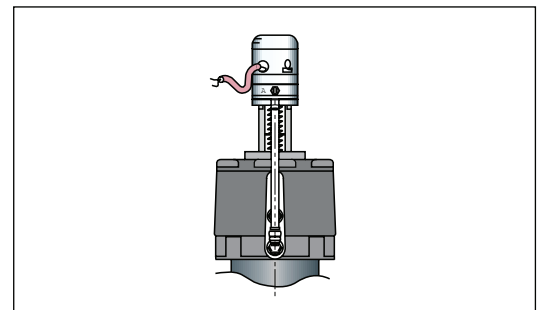
### Module Switchbox

This highly modular switchbox option is available for EC and ECX actuator ranges. The switchbox offers a wide range of V3 mechanical and proximity sensors with space for up to 4 switch, integral solenoid valve & ASI interface.



### Mini Positioner

For control application on the EC and SSC, the VIAPOS mini offers pneumatic, electro-pneumatic and digital inputs with sensor feedback options and linear mounting design providing a compact control solution.



### Other control options

To compliment and complete control systems using feedback and control designs supplied by third parties CRANE ChemPharma, Saunders actuation will accept proprietary solutions. This includes valve positioners manufactured by Moore, BLX and others. Switchboxes supplied by major suppliers such as StoneL, ASCO and Westlock are easily mounted on CRANE ChemPharma, Saunders range of pneumatic actuators.

## Aseptic Diaphragm Valves Life Science Diaphragms

CRANE ChemPharma, Saunders not only invented the diaphragm valve concept, but has been involved in the early stages of the application of the elastomer sealing technology that the design depends upon. This experience dates back to the late 1930s and development of the first synthetic elastomers which involved CRANE ChemPharma, Saunders.

### All Saunders diaphragms are developed and manufactured entirely in-house.

The diaphragm is the key performance component within a diaphragm valve. The diaphragm forms both the differential seal and atmospheric seal and isolates the topworks from the process media. This is especially significant in the bio-pharm industry that requires reliable seals for both flow control and also to maintain system integrity and sterility.

Sealing performance must be balanced with strict regulatory compliance. All CRANE ChemPharma, Saunders Life Science Diaphragms comply with global industry standards including FDA, CFR Chapter 1 Title 21, USP Class VI, <87> and <88> and ASME BPE Part SG

Saunders Life Science Diaphragms are also are ADCF (Animal Derived Component Free) and are fully lot traceable to EN10204 3.1

Saunders manufactured the first PTFE diaphragms - only six months after the commercialization of PTFE. Saunders is proud to be fully self-sufficient in rubber and polymer technology for over 50 years.



# Aseptic Diaphragm Valves Diaphragm Construction

CRANE ChemPharma, Saunders offers a full-range of diaphragm selections engineered to meet the exacting demands of the Pharmaceutical industry. PTFE, modified PTFE, and elastomer types are available to suit individual system requirements. The Life Science Diaphragm program is under constant development as our design engineers working with our rubber and polymer technologists strive to create improved solutions to the critical applications found in the bio-pharm market.

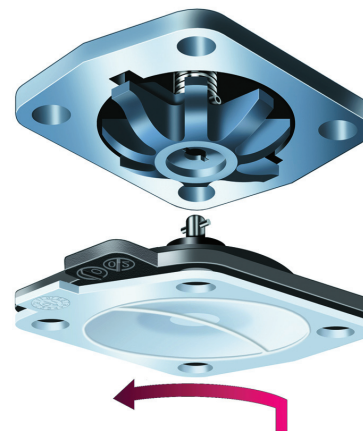
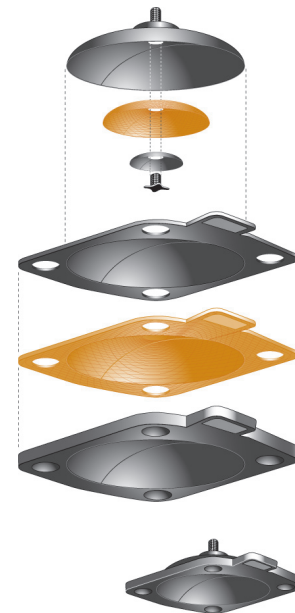
## Elastomer Diaphragms

The CRANE ChemPharma, Saunders diaphragm is a complex design and not a simple injection molded part. Layers of proprietary blended and calendared (rolled into sheet form) rubber is vulcanized with high strength woven reinforcement and metal stud attachment to ensure maximum strength and durability.

Selected elastomers must be suitable for bio-process media, including cleaning agents and clean steam, capable of withstanding the range of temperatures encountered in typical applications and also have good flex and recovery (resistance to compression set) properties to perform duties as both a static and dynamic seal. CRANE ChemPharma, Saunders Life Science elastomer diaphragms use a threaded compressor attachment for simple installation and reliable performance.

## PTFE Diaphragms

CRANE ChemPharma, Saunders Life Science PTFE diaphragms are robust two piece leaf type. This design uses a wetted PTFE face backed with a fabric reinforced rubber diaphragm. This elastomer backing provides support for the PTFE face and also the necessary resiliency to create a positive seal. The performance of the elastomer backing cushion is critical to successful performance of a PTFE-faced diaphragm. PTFE-faced diaphragms use bayonet-type compressor attachment to ensure reliable installation without point loading the PTFE face for maximum sealing performance and cycle life.



## Aseptic Diaphragm Valves Elastomer Diaphragms

CRANE ChemPharma, Saunders Life Science elastomer diaphragms offer superior sealing capability and low costs. Properly selected and applied elastomer diaphragms can handle a wide range of process media typical of bio-pharm applications. CRANE ChemPharma, Saunders proprietary compounds offer industry leading levels of performance.

Ethylene propylene (EP) based elastomer is the most commonly used diaphragm material in the Pharmaceutical industry. This material offers excellent physical properties, including chemical compatibility (ionic fluids), thermal resistance, and physical strength. CRANE ChemPharma, Saunders EPM diaphragms offer enhanced performance for the demanding application criteria found in the bio-pharm environment.

### Type 425 Grade EPM Diaphragms

Manufactured from inherently stable EPM (a copolymer of Ethylene and Propylene monomers)

- Organic peroxide-cured for reduced extractables and leachables
- Enhanced temperature performance and chemical resistance due to fully saturated hydrocarbon backbone with no double bonds
- Excellent flex performance
- Available post cured variation designated as grade E3

### Type PV Grade Passivation Diaphragms

This diaphragm has been developed specifically for single use during the passivation of stainless steel piping systems. This elastomer diaphragm has a bayonet type attachment for use in valves intended for service with PTFE-type diaphragms. The Passivation Diaphragm features a bright yellow tag to identify the diaphragm as for passivation use only.

### Type EE Grade EPDM Diaphragms

The EE grade diaphragm is constructed from Ethylene propylene diene (EPDM) base polymer. Originally developed to meet bio-pharm customer requirements for an EPDM grade, this diaphragm has demonstrated excellent performance on the full range of bio-process applications. The EE grade diaphragm has full industry compliance. Available post cured variation designated as grade E5.

### Type 500 Grade Silicone Diaphragms

The 500 grade diaphragm uses a dicumyl cured silicone that is fabric reinforced to optimize flex life. This is a white grade of diaphragm which offers very low levels of extractables and leachables. Silicone is ideal for low temperature environments and applications. Like all Life Science Diaphragms, the 500 grade Silicone Diaphragm is FDA conforming and USP Class VI tested and certified.



## Aseptic Diaphragm Valves PTFE Diaphragms

CRANE ChemPharma, Saunders Life Science PTFE diaphragms offer the highest possible level of product security due to the inert properties of PTFE. PTFE can withstand all media used in the bio-process industries while offering very low levels of extractables and leachables. Modified PTFE diaphragms offer excellent performance on intermittent steam applications typical of SIP service.

### Type 214/425 PTFE Diaphragms

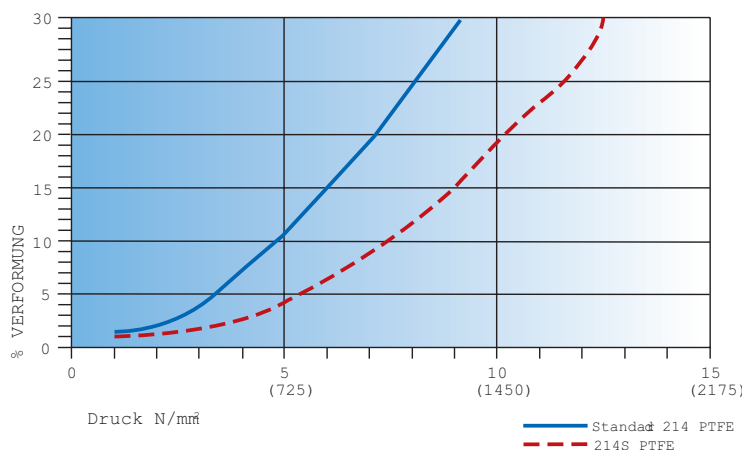
- 100% virgin PTFE product contact face
- Inert and unaffected by media common to bio-process applications
- Extremely low levels of extractables and leachables
- Very smooth, hydrophobic surface cleans easily
- Manufactured from raw resin in-house
- Fabric reinforced EPM backing



### Type 214S/425 Modified PTFE Diaphragms

The 214S diaphragm offers outstanding performance on the most critical bio-processing applications, especially on intermittent steam. The addition of a small amount of a PTFE co-polymer increases the ratio of crystalline to amorphous microstructure. This results in greatly improved resistance to creep over PTFE, especially when subject to heat and load. Modified PTFE offers the same features of PTFE, plus:

- Significant reduction in cold flow deformation typically associated with conventional PTFE components present in bio-pharm systems
- Significant performance improvement under aggressive steam sterilization and pure water-based media
- Manufactured in-house from raw resin
- Fabric reinforced EPM backing





CRANE ChemPharma Flow Solutions™

Saunders ADV Sales Office  
9860 Johnson Road  
Montgomery, TX 77316  
Tel: (936) 588-8360  
Fax: (936) 588-8302

[www.cranecchempharma.com](http://www.cranecchempharma.com)



ChemPharma Flow Solutions

Crane Process Flow Technologies Ltd.  
Grange Road  
Cwmbran, Gwent NP44 3XX  
UNITED KINGDOM  
Tel: +44 163 348 6666  
Fax: +44 163 348 6777



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CRANE ChemPharma Flow Solutions Include: Pipe - Valves - Fitting - Actuators - Pumps



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