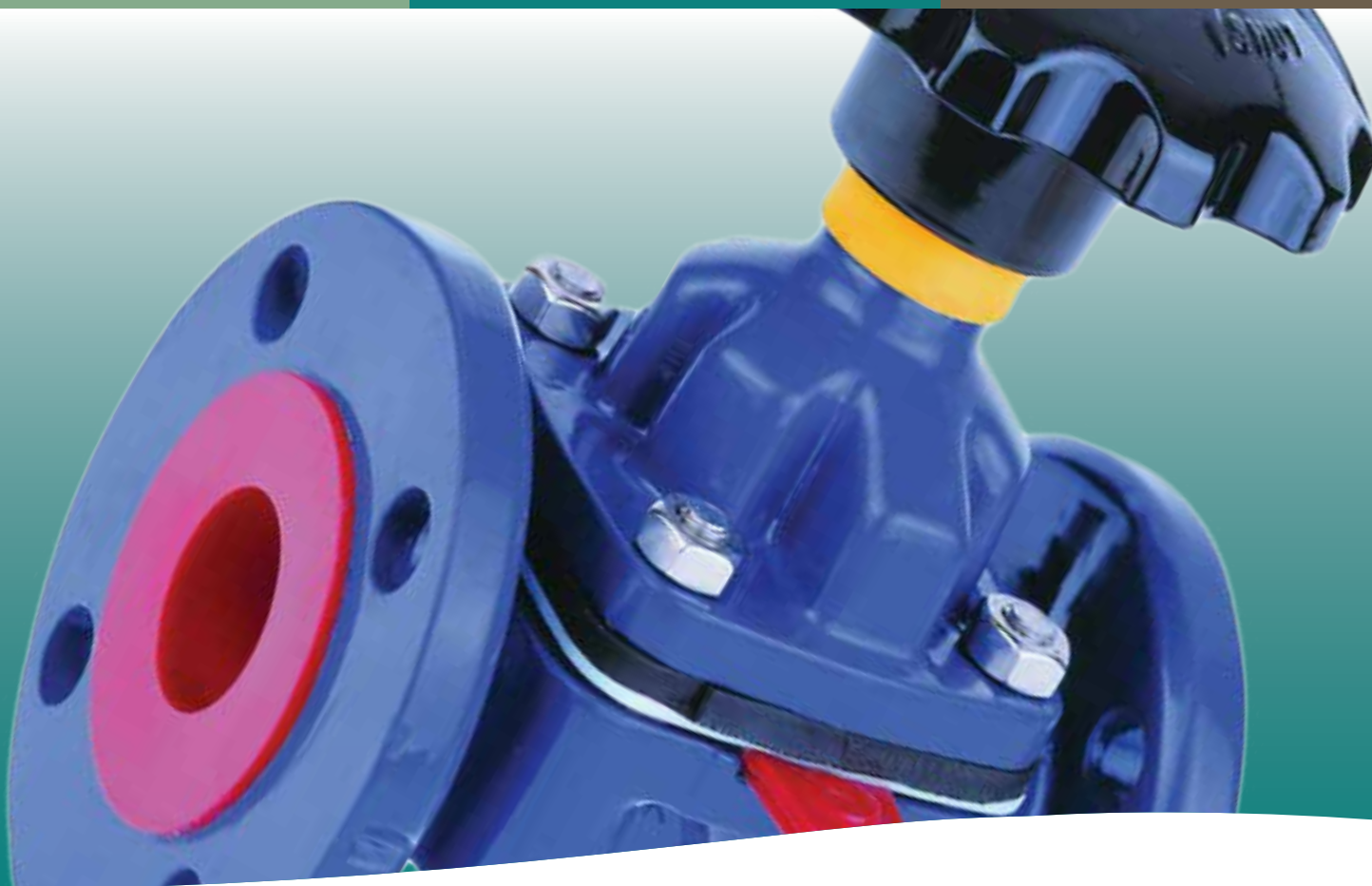


brands you trust.



Industrial Diaphragm Valves

OVERVIEW

Pioneers in Diaphragm Valve Technology

Since P.K. Saunders invented the original diaphragm valve in 1928, Saunders® has led the way in providing solutions to industries where flawless operation and resistance to corrosion, abrasion and contamination are imperative. Simplicity of design coupled with more than 85 years of innovation has resulted in the Saunders® diaphragm valve's ability to handle a wider range of fluids than any other valve type. As a result, Saunders® diaphragm valves have gained an excellent reputation for versatility and reliability, establishing a presence in every process industry sector.

Today, Saunders® is an international leader in the design, development and manufacture of diaphragm valves. As part of Crane Co, a diversified global manufacturer of engineered industrial products, Saunders® has a strong worldwide presence via dedicated sales companies and distribution partners.

History of Innovation

Saunders® has led the way in the development of the diaphragm valve to meet the ever-increasing demands of industrial applications:

- PTFE and modified PTFE diaphragms
- Glass and fluorocarbon valve linings
- Non-bonded PTFE diaphragm
- Compact pneumatic actuators
- Three layer diaphragm for corrosive-gas applications
- Diaphragm resistant to both chemical and abrasive attack (XA grade)



Saunders site circa 1939, Cwmbran, UK



Saunders site today, Cwmbran, UK

CONTENTS

A Continuing Story of Success

Millions in Service

Saunders® diaphragm valves are used in every process industry. Millions of Saunders® diaphragm valves are currently installed in process plants around the world and they are renowned for versatility and reliability.

Dependable Operation

Engineers know they can trust Saunders® Valves. They set the industry standard for dependable, consistent operation, even in the most adverse conditions with years of trouble-free performance.

Customer Service

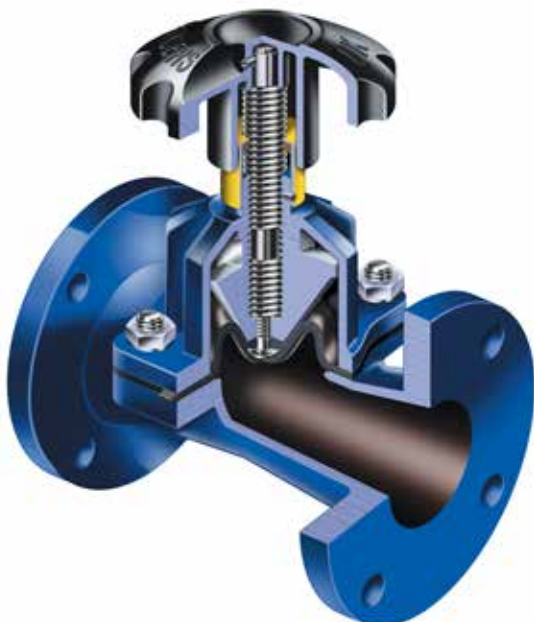
Customers know they can depend on Saunders® for after sales service and technical support from one of our many locally-based sales associates and distribution partners.

The Science Inside

Backed by more than 80 years of experience in polymer technology, Saunders® proudly develops and manufactures its own polymer compounds. It is "The Science Inside™" our valves which sets us apart.

Global Compliance

Saunders® diaphragm valves are fully compliant to all relevant global standards.



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FEATURES & BENEFITS

Superior Sealing for Chemical and Abrasive Processing Applications.

- 1 **The Science Inside®:** Proprietary diaphragm technology provides exceptional sealing solution and complete emissions control.
- 2 **Unmatched Expertise & Innovation:** A comprehensive selection of polymers delivers superior corrosion and abrasion resistance for a wide range of demanding applications, since 1928.
- 3 **Efficient Operation:** Top-entry design enables in-line maintenance to reduce plant downtime.



KEY PRODUCTS

A Type Weir Design for Corrosive Media and Utilities

- Versatile and extensively used in industrial applications
- Can handle up to 15% solids (depending on process conditions)
- Perfect valve for on/off or control applications on corrosive processes

KB and K Type Straight Through Designs for Solids Handling

- Smooth, straight-through design
- High flow capacity
- Can handle highly abrasive fluids

WFB For Marine and Fire Applications

- Weir type valve for fire fighting, tank cleaning or wash down on land or sea
- Guaranteed operation even after years of being static
- Fire tested diaphragm

NX Check Valve

- Low pressure and vacuum duties
- Unidirectional full flow design
- Corrosion resistant linings

Actuation - Modular or Compact Actuators

- Different actuator types that cover up to 10"
- Wide range of line and operating pressure options
- Conceived to withstand the most adverse conditions

In-house Manufacture of All Diaphragms

- Vulcanized layers with high strength woven reinforcement in elastomer-based diaphragms
- Range of PTFE-type diaphragms for critical applications
- Innovative compounding based on extensive polymer knowledge

"We are pleased to inform that we are using Saunders in our Runcorn chlor-alkali and chlorine derivatives plants. We are very satisfied with the product's reliability, low maintenance costs and with the quality of the technical service. We hope to get the same support in all our future supplies/requirements"

INEOS ChlorVinyls (UK)

"We specified Saunders WFB 65mm nominal bore fire-mains hydrant valves for our ferries and cruise liners. Significant factors behind this choice are the excellent reliability and the low maintenance costs."

P&O Cruises (UK) Ltd

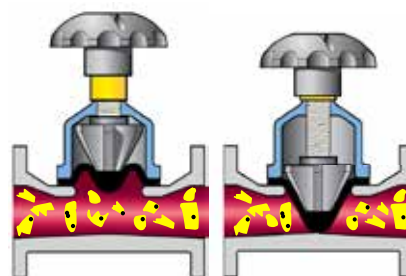
WHY DIAPHRAGM VALVES?

1 Corrosion Resistance

Saunders lined valves are the first choice for highly corrosive applications. We offer an extensive range of linings and diaphragms to suit most applications. This wide selection of body lining and diaphragm materials provides an effective and economical solution by eliminating the need for exotic alloys. Our extensive range of valve options include elastomer and fluoropolymer linings, designed especially to combat corrosion.

2 Abrasion Resistance

Saunders polymer technology provides superior abrasion resistance. The KB straight through valve will handle up to 100% solids and ensure leak-free shut off with a soft rubber diaphragm.

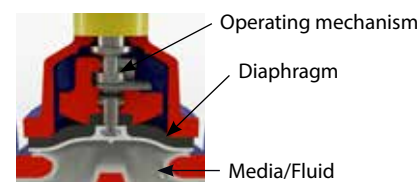


3 Leak Tight

In pressure and vacuum services, Saunders diaphragm valves deliver 100% leak-tight shutoff in accordance with standards MSS SP-88 and BS EN 12266-1, even after thousands of operations. This reduces processing and handling costs by eliminating emissions commonly associated with other valve designs.

4 Operating Mechanism Isolated from Line Media

All working parts of the valves are isolated from the line media and positive closure is obtained even on frequent cycling or with entrained particulates in the line, unlike other valve types.



5 Easy Maintenance

A three-part design allows maintenance and actuator retrofitting without removing the valve body from the pipeline. Overall, this results in lower cost of ownership compared to other valve types.



6 Suitable for Control

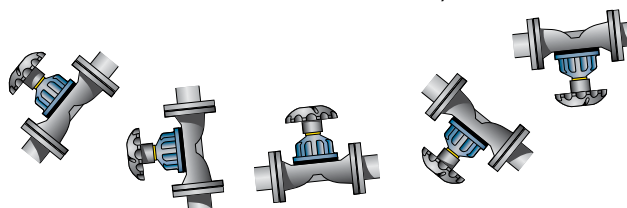
Throttling and control characteristics are enhanced by a streamlined flow path that is cavity free and provides excellent flow control capabilities.

7 Linear Operation

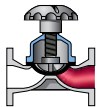

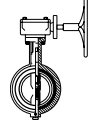
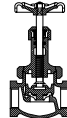


Linear movement of the valve eliminates the rotational seat wear that is characteristic of quarter-turn valves, resulting in a longer service life and reduced total cost of ownership. This results in a longer service lifetime.

8 Installation Versatility

The Saunders valve can be installed in any position without affecting its operation. However, we recommend installation to be at least six times the pipe diameter from a bend or pump (ten times the pipe diameter if the valve is used for control).



VALVE COMPARISON

Valve/Service Feature	 Diaphragm	 Ball	 Butterfly	 Globe	 Gate	 Lubricated Plug
Leak tight* shut-off against gases, liquids and solids	Green	Yellow	Yellow	Yellow	Yellow	Yellow
Resistance to abrasion and erosion	Green	Yellow	Yellow	Red	Yellow	Yellow
Wide choice of materials to match service conditions	Green	Green	Green	Yellow	Yellow	Yellow
Non-turbulent flow path	Green	Green	Yellow	Red	Green	Green
Low fluid friction loss	Green	Green	Yellow	Red	Green	Green
Resistance to corrosion	Green	Green	Green	Yellow	Yellow	Yellow
Vacuum capability	Green	Green	Yellow	Yellow	Red	Yellow
In-line maintenance, low cost spares	Green	Yellow	Yellow	Red	Red	Yellow
Resistance to seat wear	Green	Red	Red	Green	Yellow	Red
High purity	Green	Yellow	Yellow	Red	Red	Red
Control applications	Green	Yellow	Yellow	Green	Red	Yellow
On/off applications	Green	Green	Green	Yellow	Yellow	Yellow
Temperature range	Yellow	Green	Green	Green	Green	Yellow
Pressure range	Yellow	Green	Green	Green	Green	Green
Weight/size ratio	Yellow	Yellow	Green	Yellow	Yellow	Yellow

Suitable

Not Suitable

Saunders® offers a comprehensive range of diaphragm valves for use in any industry. They encompass the full spectrum of corrosive and abrasive applications that require reliable valve operation. Easily maintained to ensure many years of trouble-free operations, Saunders® diaphragm valves have become a standard in industries such as chemical production, mining, water treatment, fertilizers and marine.

*in accordance with standards MSS SP-88 and BS EN 12266-1

APPLICATIONS

CORROSIVE

Chlor-alkali
Sulfuric Acid
Hydrochloric Acid
Nitric Acid
Aromatics
Effluent Treatment
Potable Water
Pulp & Paper
Organics
Toxic Fluids
Iron and Steel
Fine Chemicals



"We are pleased to inform that we are using Saunders in our Runcorn chlor-alkali and chlorine derivatives plants. We are very satisfied with the product's reliability, low maintenance costs and with the quality of the technical service. We hope to get the same support in all our future supplies/requirements."
INEOS ChlorVinyls (UK)

Corrosion is estimated to cost worldwide industry more than \$300 billion dollars every year, affecting every process industry sector. Saunders® lined diaphragm valves are the best option to handle these media and therefore reduce the cost of ownership.

Strong Acids

Saunders® Industrial Diaphragm Valves are available in a wide range of linings and are used to handle strong acids such as sulfuric acid, hydrochloric acid, acetic acid and nitric acid. In the most demanding applications, Saunders® valves offer the highest resistance and durability.

Diaphragm reliability, results in long life and simplified maintenance. Saunders® diaphragms achieve this through using the best materials and stringent quality controls.



ETFE lined valve with PTFE diaphragm
Page 15



PFA lined A Type body
Page 15



Glass lined A type body
Page 15



PFA lined valve with PTFE diaphragm and EC actuator

Type	Applications	Body/lining	Diaphragm
C	Strong Acids	ETFE, PVDF, PFA, glass ¹	PTFE
C	Fine Chemicals and Chlor-alkali	Hard natural rubber, glass ¹ , ETFE, PFA	Fluoroelastomer, Chlorosulfonated polyethylene, PTFE

C = Corrosive

¹ Glass is not suitable for applications with thermal cycling. Chemical etching may occur when in contact with hydrofluoric acid or highly concentrated alkali solutions. Please contact Saunders® for precise recommendations.

APPLICATIONS

ABRASIVE

Fertilizers
Titanium dioxide
Phosphate
Copper mining
Gold mining
Sand
Coal slurry
FGD
Cement
Ceramics
Sewage
Sugar

The secret to the reliability and durability of Saunders® valves lies in the careful selection of lining and diaphragm material, according to the application.



The Ultimate XA diaphragm was specially developed for highly corrosive and abrasive applications. Page 25

Applications requiring a combination of corrosion and abrasion resistance, such as phosphate rock/sulfuric acid, together with reliability and long service life are ideal applications for Saunders® KB Valves



Type	Applications	Body/lining	Diaphragm
C / A	Mineral processing	Butyl, soft rubber	Butyl, natural rubber, ultimate XA
C / A	Gypsum (FGD)	Butyl	Butyl, ultimate XA
C / A	Titanium dioxide	Glass, butyl, soft rubber	Butyl, natural rubber
C / A	Fertilizers	Butyl, polychloroprene	Butyl, polychloroprene, ultimate XA
C / A	Paper & pulp	Glass, butyl	EPM, butyl, polychloroprene, ultimate XA
A	China clay	Butyl, soft rubber	Natural rubber, polychloroprene

C = Corrosive, A = Abrasive



Glass lined KB type body
Page 25



Butyl lined KB type body
Page 25

APPLICATIONS

GENERAL INDUSTRY

Water demineralization
Marine
Vegetable oils
Paints
Fire fighting
Tanning
Oil production
Automobile
Air
Effluent
Gases, fuels
Dye fluids
Food & beverage
Wastewater
HVAC

Type	Applications	Body/lining	Diaphragm
G	Water demineralization, desalination, sewage treatment	Hard rubber, soft rubber, butyl	EPM, butyl, polychloroprene, butadiene acrylonitrile
G	Marine, fire fighting ¹	SG iron and gunmetal	Chlorosulfonated polyethylene (fabric reinforced)
G	HVAC, utilities (air, water and gas lines) ² , drinking water	Screwed/flanged unlined valves in iron, stainless steel or gunmetal	EPM, butyl, polychloroprene

G = General Industry

¹ Used primarily as water hydrant valves.

² Used in copper or stainless steel piping in water, oxygen and other gases.

Water treatment

Water demineralization, desalination and basic treatment are ideal applications for diaphragm valves. Valves typically used include unlined cast iron or stainless steel bodies, as well as hard, soft or butyl rubber lined bodies, combined with natural rubber, EPDM or butyl diaphragms.



Marine

We offer a specialized range of valves for marine and fire fighting applications, 100% reliable in adverse conditions even after long idle periods. Available with unique fire resistant diaphragm design.

"We specified Saunders WFB 65mm nominal bore fire-mains hydrant valves for our ferries and cruise liners. Significant factors behind this choice are the excellent reliability and the low maintenance costs."

P&O Cruise (UK) Ltd



Saunders®
WFB valves.
Page 35



HVAC and Utilities

Saunders® valves are widely used on utility (air, water and gas) service lines. Screwed unlined valves both A and KB types in cast iron and gunmetal, are used in several water applications – screwed end connections result in a lower valve cost.

Saunders® offers FDA and WRAS approved A and KB type diaphragms and valve linings.

WRAS approval ensures our valves are suitable for potable (drinking) water use.



POLYMER SCIENCE

At Saunders®, we apply rigorous quality control measures at every manufacturing step of our polymer materials. For many years, we have increased our expertise and accumulated experience in the production of our own **diaphragms** and valve **linings**. As a result, our valves can handle the most challenging fluids with total security. The name Saunders® is synonymous with innovation, continuous product development and the highest standards of quality control.



A type, butyl diaphragm



PTFE diaphragm with butyl rubber backing



KB type, soft natural rubber diaphragm



214K diaphragm for high performance in chlorine applications

Fitments Features



Rubber diaphragms Screw fitment



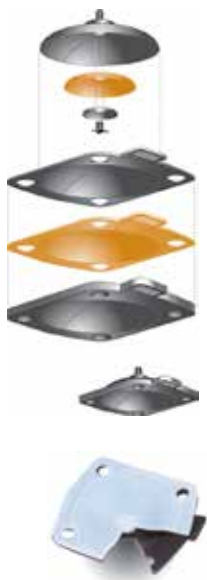
PTFE diaphragms Bayonet fitment

BEST MATERIALS

STRINGENT QUALITY CONTROLS

RELIABILITY, LONG LIFE AND SIMPLIFIED MAINTENANCE

Diaphragm Construction



PTFE Diaphragm

Feature	Benefit
Premium grade raw materials and fabric reinforcement in a multi-layer construction	Maximum performance and durability in the most demanding applications
Studs attached with bonding adhesive and mechanical anchorage	Strength and durability for intensive and systematic mechanical operation
Dual sealing ribs (across the weir and around the diaphragm periphery)	Enhanced leak tight sealing capabilities and lower closure torques
Two-piece diaphragm construction - PTFE face and reinforced rubber backing	Increased pressure rating and durability

Expected shelf life of diaphragm (from manufacturing dates)

10 years	425
	237
	286 Fire
	XA
	226
	214/425, 214S/425, 214/226, 214K/425
7 years	214/300
	300
	C
	HT
5 years	Q
	AA

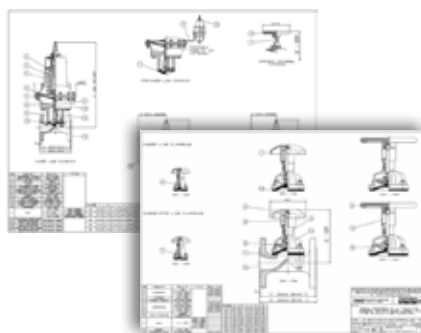
SUPPORTING DATA AND CERTIFICATION

Saunders® Data Sheets

Digital copies of technical data sheets, which provide detailed information on the Saunders® IDV range, can assist with valve selection and are available upon request. Contact your local sales office or distributor for more details on how to obtain the data sheet package.



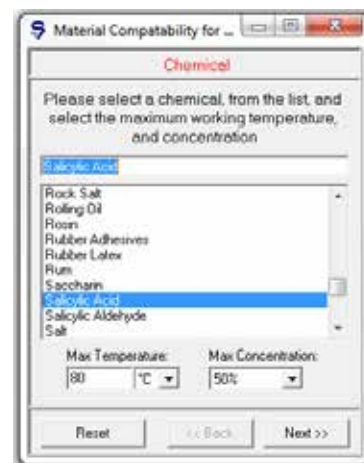
Data sheet index and typical valve information



Example of 2D Drawings available on Saunders® website.

Material Compatibility Database

Saunders® has a database of over 800 chemicals, which can be used to aid lining and diaphragm material selection. By selecting the process fluid, temperature and concentration, the suitable material options are identified.



Screenshot of Saunders® Material Compatibility Database

Saunders® 2D Drawings

A library containing technical drawings of the Saunders Industrial Diaphragm Valve and Actuator range is available online at www.saundersdrawings.com.

Quality Statements And Approvals

CERTIFIED QUALITY FROM SAUNDERS®

- Quality Management system registered to ISO 9001 standard in which our R&D and manufacturing process are optimized to maintain our product quality and service
- Certified compliance to the European Pressure Equipment Directive 97/23/EC, authorizing Saunders® to CE mark relevant valve products
- TUV-Merkblatt HPO Qualification for our product manufacturing and certification
- International product approval from authorities such as Bureau Veritas, Lloyds, ABS, RINA and TSG
- Polymer materials certified as meeting the requirements of FDA, USP and WRAS

EXAMPLES OF PRODUCT AND SYSTEM APPROVALS

- ISO 9001
- PED 97/23/EC
- WRAS (Water Regulations Advisory Scheme)
- Lloyds Register of Shipping
- Bureau Veritas
- ATEX Directive (94/9/EC)
- Food & Drug Administration (FDA)
- United States Pharmacopeia (USP)
- Registro Italiano Navale (RINA)

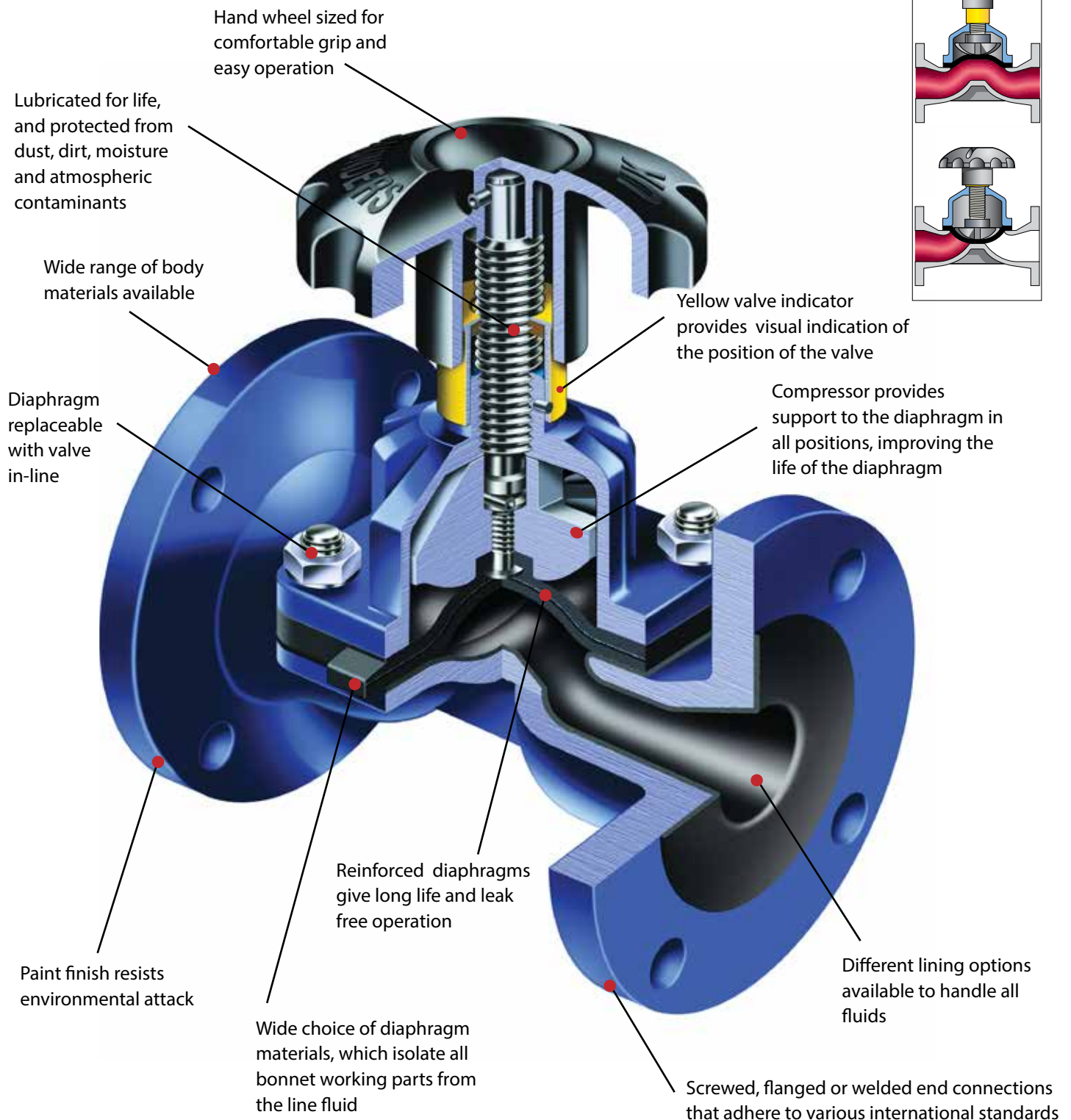


RWTV

Compliance WITH
FDA Code 21
TNO CERTIFICATION 3A
cGMP USP 23

A TYPE – FEATURES

Original Saunders® Design



Saunders® A type Diaphragm Valve:
the valve of choice to handle highly corrosive media

A TYPE – STANDARDS



Top Works

- Manual
- Actuated

Diaphragm

- Rubber
- PTFE

Body

- Flanged and screwed design
- Lined and unlined
- Cast iron, SG iron, cast steel, stainless steel or gunmetal

As well as meeting the overall lengths specified in EN 558-1 Series 1, Series 7* and MSS SP-88, Saunders® valves are manufactured to the following standards:

Flanged	
American	ASME B16.1 Class 125
	ASME B16.24 Class 150
	ASME B16.5 Class 150
British	BS 10 Tables D and E
British/European ¹	BS EN 1092-1 PN10/16
	BS EN 1092-2 PN10/16
	BS EN 1092-3 PN10/16
Japanese	JIS B 2220 10K
	JIS B 2239 10K
	JIS B 2240 10K

¹ Replaces BS 4504 PN10/16

Screwed	
American ²	ASME B1.20.1
British/European ³	BS EN 10226-1 Parallel
	BS EN 10226-1 Taper
European ⁴	EN ISO 228-1
International	ISO 7-1 Parallel
	ISO 7-1 Taper

² Replaces ANSI 2.1

³ Replaces BS 21 Parallel and Taper

⁴ Replaces DIN 259

* Series 7 is the original IDV standard from when PK Saunders invented the diaphragm valve.

A TYPE – BODY

Lined and Unlined Options

Our metal bodies provide simultaneous mechanical support for the lining and protection against Ultraviolet (UV) attack. The nominal bore thicknesses of Saunders® linings range from 1 to 5.5 mm, depending on lining material and valve size: glass 1 mm, rubber 2-4.5 mm and plastic 4-5.5 mm.

Unlined Bodies

Material	Connection	Standard	Material Grade*	Size	Temperature
Cast Iron	Flanged	BS EN1561	GJL-250	½"-20"	14°F to 347°F
SG Iron	Screwed	BS EN1563	GJS-450-10	¼"-2"	14°F to 347°F
	Flanged		GJS-400-18 ¹	½"-14"	
Cast Steel	Flanged	ASTM A216	WCB	½"-10"	-22°F to 347°F
Bronze	Screwed	BS EN1982	CC491K-GS	¼"-3"	-22°F to 347°F
	Flanged		CC492K-GS	½"-8"	
Stainless Steel	Screwed	BS EN10283	1.4408 ²	¼"-3"	-22°F to 347°F
	Flanged			½"-8"	

¹ For some sizes GJS-400-18-LT grade is available with a low temperature limit of -4°F

² Replaces the standard BS3100 316C16

* Please contact Saunders® for information on comparable/equivalent material grades.

Lined Options - Flanged Bodies Only

Lining	Body Material	Size	Temperature
PFA	SG Iron	½"-8"	14°F to 347°F
ETFE	SG Iron	½"-6"	14°F to 302°F
PVDF	SG Iron	¾"-6"	14°F to 257°F
PP	SG Iron	¾"-6"	14°F to 185°F

Glass	Cast Iron	½"-8"	14°F to 347°F
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Butyl (Isobutylene Isoprene)	Cast Iron	¾"-20"	14°F to 230°F
	SG Iron		14°F to 230°F
	Cast Steel		-22°F to 230°F
Neoprene (Polychloroprene)	Cast Iron	¾"-20"	14°F to 221°F
	SG Iron		14°F to 221°F
	Cast Steel		-22°F to 221°F
HRL (Hard Natural Rubber)	Cast Iron	¾"-20"	14°F to 185°F
	SG Iron		14°F to 185°F
	Cast Steel		-22°F to 185°F

Standard material grade fasteners:

Stainless steel fasteners - All stainless steel, plastic lined and glass lined valves

Aluminium Bronze fasteners - Gunmetal flanged valves

Carbon Steel fasteners - All remaining valves.

Special material grade fasteners available upon request

Plastic Lining



PFA Perfluoroalkoxy – Excellent suitability for concentrated strong acids at high temperature, aromatics, aliphatic and chlorinated solvents. (White colour)



ETFE Ethylene Tetrafluoroethylene – Suitable for strong acids, salts in water, solvents at medium temperature. ETFE has the highest abrasion resistance of all the fluorocarbon linings. (Red colour)



PP Polypropylene – Economic solution for mineral acids, salts in water, de-ionised water and effluent treatment chemicals. (Light grey colour)



PVDF Polyvinylidene Fluoride – Suitable for mineral acids, salts in water, water and effluent treatment, additionally it is the best solution for wet chlorine gas or chlorine in water. (Black colour)

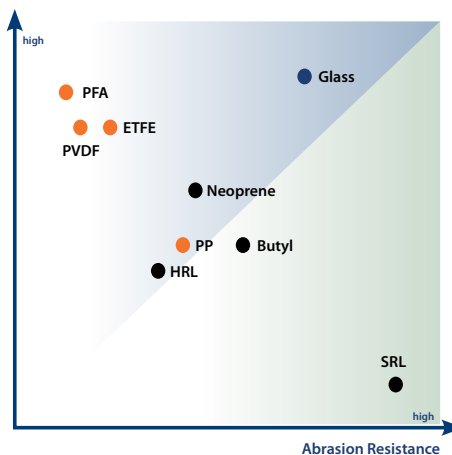


Glass Lining



Used in many different applications, including strong acids. Very high corrosion and abrasion resistance within a wide range of temperature. *Note that glass is not suitable for applications where thermal cycling occurs.* (Blue colour)

Corrosion & Chemical Resistance



Rubber Lining



HRL Hard Natural Rubber – Used for salts in water, diluted acids, de-ionised water, plating solutions and potable water. HRL has better chemical resistance than SRL. (Black)

Butyl Isobutylene Isoprene – Great for corrosive & abrasive slurries, and acidic slurries. Additional applications are salts in water, dilute acids and alkalis, and lime. (Black)

Neoprene Polychloroprene – Perfect solution for a combination of abrasive slurries containing hydrocarbons, sludge oils and also sea water. (Black)

The temperature ranges above are given for general reference purposes only. Service conditions, such as media being handled and concentration of solids, will determine the highest possible working temperature. Additionally, the performance of the valve will also depend on the diaphragm material.

A TYPE – DIAPHRAGM

A Type Diaphragm

Diaphragm	Composition	Size	Temperature
425	EPM (Ethylene Propylene)	All Sizes	-40°F to 226°F
300	Butyl (Isobutylene Isoprene)	All Sizes	-40°F to 226°F
237	CSM (Chlorosulfonated Polyethylene)	All Sizes	14°F to 212°F
XA	EPDM (Ethylene Propylene Diene)	All Sizes	-40°F to 266°F
HT	Neoprene (Polychloroprene)	All Sizes	-22°F to 212°F
226	FKM (Fluoroelastomer)	All Sizes	23°F to 302°F
C	Nitrile (Butadiene Acrylonitrile)	All Sizes	-4°F to 212°F
Q	Natural Rubber	All Sizes	-58°F to 212°F

214/300	PTFE/Butyl	¼"-10"	-4°F to 302°F
214/425	PTFE/EPM	¼"-10"	-4°F to 320°F
214/226	PTFE/FKM	¼"-10"	23°F to 347°F
214S/425	TFM/EPM	¼"-6"	-4°F to 320°F
214K/425	PTFE/PVDF/EPM	½"-6"	-4°F to 212°F

In the range of PTFE diaphragms, Saunders offers both moulded open and closed options for your convenience. The 214S is available as moulded closed and was designed specifically to reduce polymeric creep, therefore increasing the sealing properties and life of the diaphragm.



Moulded closed



Moulded open

PTFE Diaphragm

214/300 - Used in strong acids and alkalis, and salts in water at high temperature. Sulfuric acid is a good example with temperatures up to 230°F and concentrations up to 96 %.

214/425 - Typical applications are strong acids, alkalis and salts in water at high temperature. Constant steam is also another important application.

214/226 - Strong acid, diluted chlorine, bromine solutions at low concentration.

214S/425 - Strong acids, alkalis and salts in water at high temperature. Constant steam applications where the valve is mainly closed (diaphragm is moulded closed).

214K/425 - Three layer diaphragm with PTFE/PVDF/425, the best option for chlorine, bromine gas and chlorinated solutions.

Rubber Diaphragm

425 - Salts in water, acids and alkalis, ozone, water, intermittent steam. Great solution for food and beverages applications. FDA and USP approved¹.

300 - Chemicals, diluted acids and alkalis, drinking water. Additional abrasive applications like phosphoric acid in low concentrations. FDA, USP and WRAS approved¹.

237 - The best solution for sodium hypochlorite. Great with strong acids and low concentration chlorine gas. It is also oil resistant.

XA - Specifically designed for both abrasive and corrosive applications such as phosphoric acid, metal treatment, mining applications.

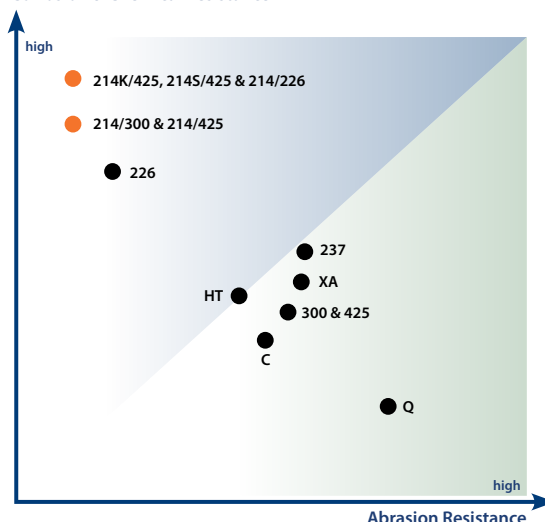
HT - Suitable for abrasive slurries containing hydrocarbons.

226 - Great solution for hydrogen at high temperature, concentrated acids, aromatic solvents, low concentrated chlorine solutions, ozone, unleaded petroleum.

C - Lubricating oil, cutting oils, paraffin, animal vegetable oils, aviation kerosene at low temperatures. Cv is ideal for vacuum applications, where oils are present, e.g. (compressed air, acetylene gas, LPG).

Q - Salts in water, diluted acids and alkalis, and abrasive applications.

Corrosion & Chemical Resistance



¹ FDA - Food and Drug Administration

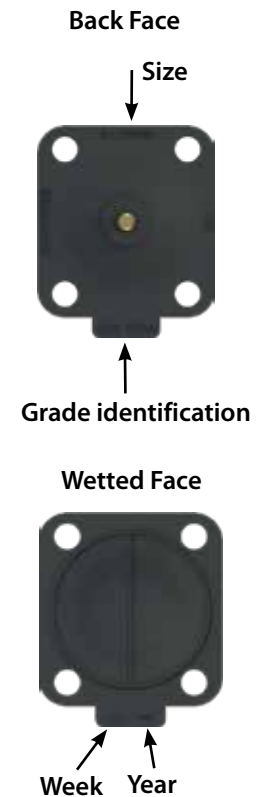
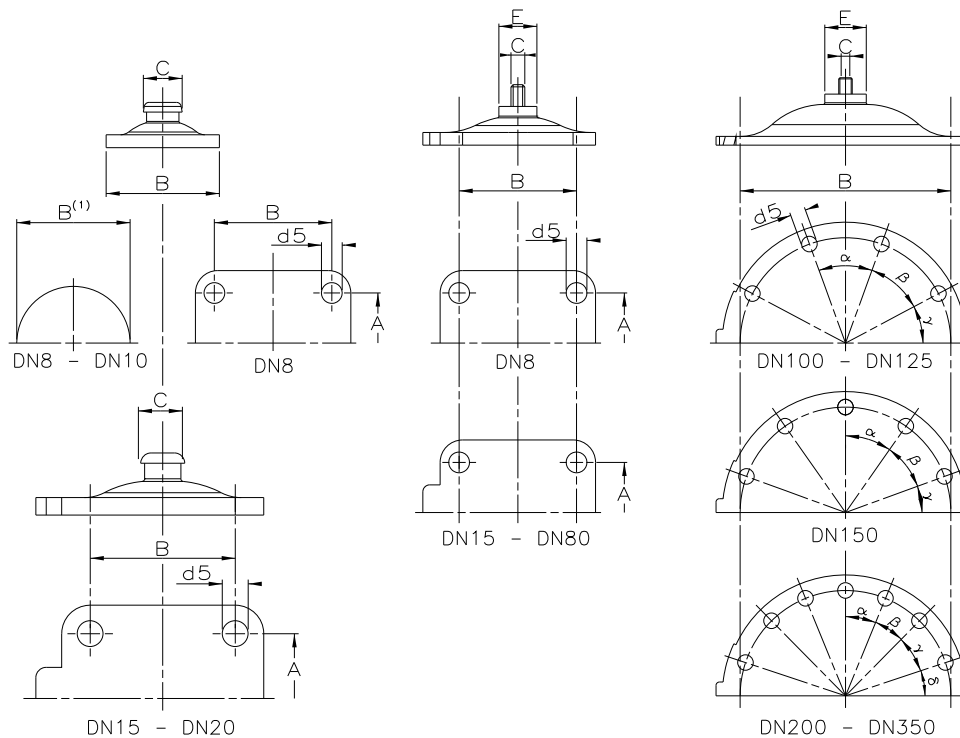
USP - United States Pharmacopeia

WRAS - Water Regulations Advisory Scheme

All rubber diaphragms have threaded brass fixings, except vacuum diaphragm (Cv, 300v, 425v), which have steel fitments. PTFE diaphragms have a stainless steel bayonet fitments.

A TYPE – DIAPHRAGM DIMENSIONS

Diaphragm Identification

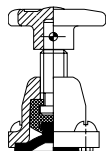


Size (IN)	Principal Diaphragm Dimensions							Angles from the holes			
	A	B	C	D (thickness)	E	d5	Number of Holes	α	β	γ	δ
¼"	1.38	1.10	0.37	0.13	-	0.20	2	-	-	-	-
3/8"	1.69	1.38	0.39	0.16	-	0.24	2	-	-	-	-
½"	1.30	1.46	0.51	0.20	-	0.24	4	-	-	-	-
¾"	1.57	1.73	0.51	0.21	-	0.28	4	-	-	-	-
1"	1.81	2.13	1/4" BSW	0.22	0.69	0.39	4	-	-	-	-
1 ¼"	2.36	2.64		0.28	0.75	0.39	4	-	-	-	-
1 ½"	2.56	2.76		0.24	0.87	0.43	4	-	-	-	-
2"	3.07	3.27		0.24	1.00	0.51	4	-	-	-	-
2 ½"	3.74	4.02	5/16" BSW	0.31	1.13	0.55	4	-	-	-	-
3"	4.49	5.00		0.28	1.26	0.67	4	-	-	-	-
4"	-	7.64		0.31	1.50	0.55	8	40°	42°	56°	-
5"	-	8.74	3/8" BSW	0.44	1.75	0.67	8	43°20'	43°20'	50°	-
6"	-	10.75		0.47	1.97	0.67	10	35°	35°	40°	-
8"	-	15.00	7/8" BSW	0.39	2.50	0.75	14	22°30'	22°30'	27°	36°
10"	-	17.24		0.55	2.99	0.87	14	22°30'	22°30'	22°30'	45°
12"	-	20.00		0.60	3.50	0.98	14	24°	24°	24°	36°
14"	-	20.75		0.63							

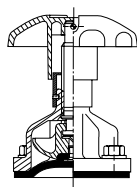
BSW=British Standard Whitworth thread
Note: Dimensions in inches

A TYPE – TOP WORKS

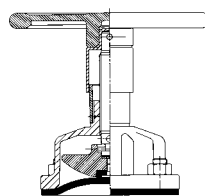
Standard Range



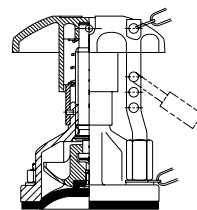
Rising handwheel (2 bolt)
1/4" - 3/8"



Cast iron bonnet with rising plastic handwheel
1/2" - 2"

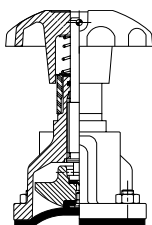


Cast iron bonnet with rising metal handwheel
1/2" - 6"

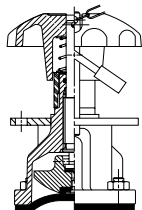


Rising handwheel with indicator (simple padlocking)
1/2" - 6"

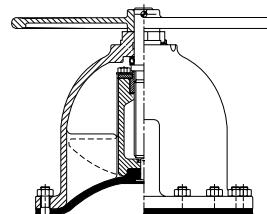
High Performance



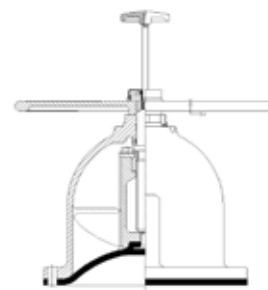
Fluoroelastomer sealed bonnet
1/2" - 6"



Fluoroelastomer sealed with padlocking
1/2" - 6"

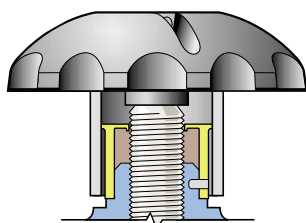


Standard non-rising handwheel without indicator
8" - 14"



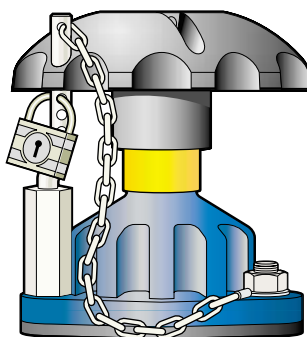
Non-Rising handwheel with indicator
8" - 14"

Note: Designs may vary across size range



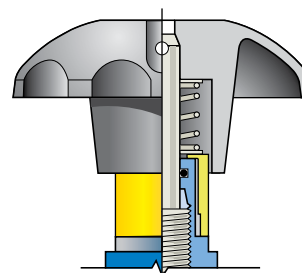
Lubrication

Bonnet assembly lubricated for life. Needs no additional grease. The indicator lip seal stops the ingress of dust, dirt and atmospheric contaminants.



Padlock Bonnet

Restricted valve operation can be achieved by utilizing the padlocking bonnet option.



Sealed Bonnet

In cases where hazardous liquids or gases are being handled and where additional safety features are considered to be necessary.

A TYPE – PRESSURE & TEMPERATURE LIMITS

Maximum manual working pressures for Saunders® A type diaphragm valves.
For actuated valves, please refer to the appropriate datasheets.

Bonnet pressure limits

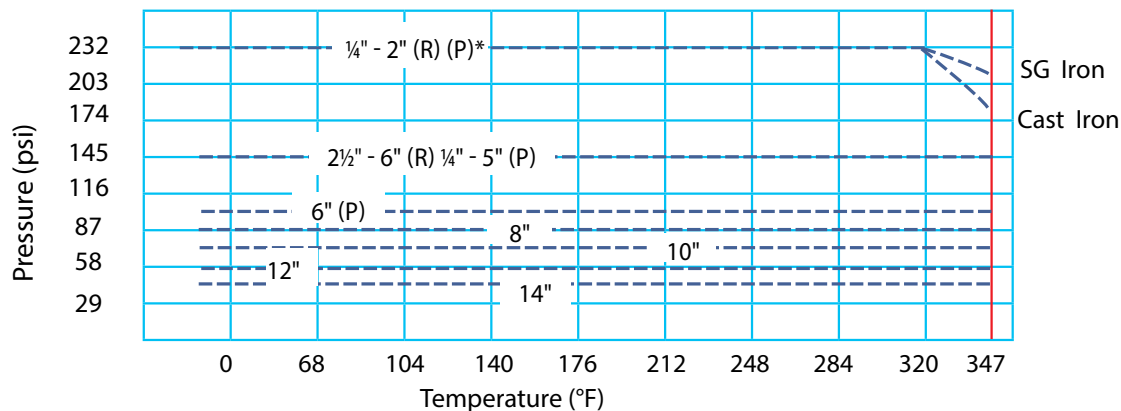
		Size (IN)	¼"	3/8"	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"	10"	12"	14"
Pressure (psi)	Diaphragm	Handwheel																	
	PTFE	Rising	145	145	145	145	145	145	145	145	145	145	145	145	102	-	-	-	-
		Non-rising	-	-	-	-	-	-	-	-	-	-	-	-	-	87	73	-	-
	Rubber	Rising	232	232	232	232	232	232	232	232	145	145	145	145	145	-	-	-	-
		Non-rising	-	-	-	-	-	-	-	-	-	-	-	-	-	87	73	58	51

All Saunders® valves are pressure tested in accordance with BS EN12266-1 standard.

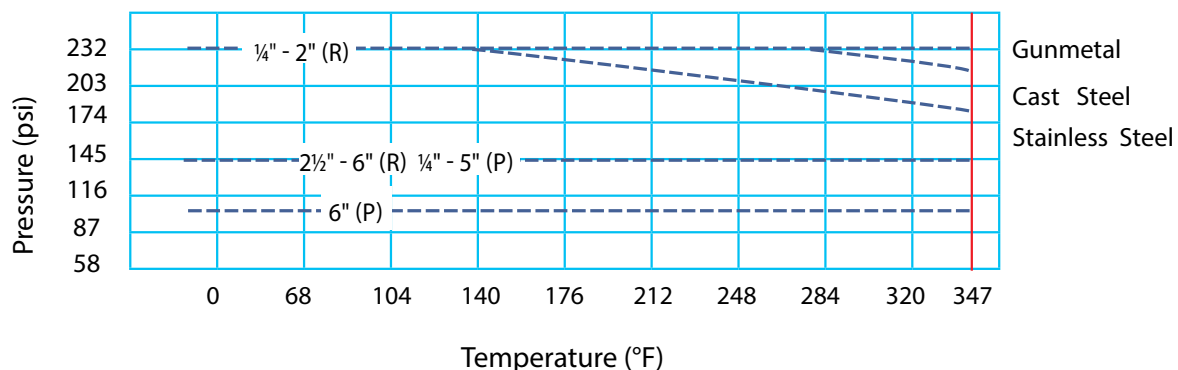
- Shell test: 1.5 times maximum rated working pressure
- Seat test: 1.1 times maximum rated working pressure

Pressure/Temperature Relationships

Cast Iron and SG Iron



Carbon Steel, Stainless Steel & Gunmetal

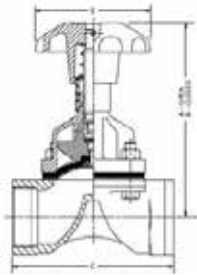


(R) = Rubber diaphragm

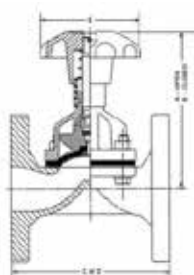
(P) = PTFE diaphragm

* 214S Moulded closed version only.

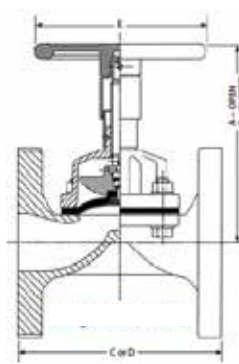
A TYPE – ASSEMBLED VALVE DIMENSIONS



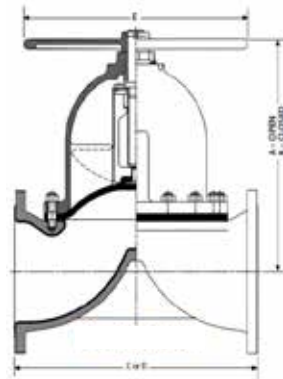
Screwed ¼" - 3"



Flanged ½" - 2"



Flanged 2½" - 6"



Flanged 8" - 14"

Size (IN)		¼"	3/8"	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"	10"	12"	14"
Screwed Unlined	A	2.12	2.62	3.50	3.70	4.69	6.06	6.46	7.40	9.50	10.38	-	-	-	-	-	-	-
	B	2.06	2.40	3.25	3.46	4.25	5.59	5.81	6.50	8.22	8.88	-	-	-	-	-	-	-
	C	1.94	1.94	2.50	3.25	4.38	4.88	5.62	6.62	8.12	10.12	-	-	-	-	-	-	-
	Weight	0.2	0.3	1.0	2.0	2.5	4.0	6.0	11	20	29	-	-	-	-	-	-	-
Flanged Unlined	A	-	-	3.94	3.58	4.25	5.63	6.18	6.89	8.90	9.57	12.12	15.28	17.40	19.50	22.88	26.75	25.98
	B	-	-	3.66	3.35	2.86	5.16	5.55	5.98	7.64	8.19	10.31	12.68	14.45	19.50	22.88	26.75	25.98
	C	-	-	4.00	4.60	5.00	5.80	6.30	7.50	8.50	10.00	12.50	14.00	16.00	20.50	25.00	29.50	36.26
	Weight	-	-	4.4	4.4	6.6	8.8	11	18	31	42	71	106	139	335	595	794	1116
Flanged Rubber Lined	A	-	-	-	3.82	4.37	5.75	6.30	6.97	9.02	9.69	12.24	15.39	17.52	19.62	23.03	26.90	26.12
	B	-	-	-	3.58	3.98	5.28	5.67	6.06	7.76	8.35	10.43	12.80	14.57	19.62	23.03	26.90	26.12
	C	-	-	-	4.85	5.25	6.05	6.55	7.75	8.75	10.25	12.75	14.38	16.38	20.88	25.38	29.38	36.62
	Weight	-	-	-	6.6	8.8	11	13	20	33	46	71	110	139	340	602	805	1129
Flanged Glass/Halar	A	-	-	3.98	3.62	4.29	5.67	6.22	6.93	8.94	9.61	12.17	15.31	17.44	19.53	22.91	26.77	26.02
	B	-	-	3.70	3.38	3.90	5.20	5.59	6.02	7.68	8.27	10.35	12.72	14.50	19.53	22.91	26.77	26.02
	C	-	-	4.36	4.66	5.06	5.86	6.36	7.56	8.56	10.06	12.56	14.06	16.06	20.56	25.08	29.57	29.57
	Weight	-	-	4.4	4.4	8.8	11	13	20	33	44	73	108	139	337	600	798	1120
Flanged Plastic Lined	A	-	-	-	3.82	4.41	5.75	6.38	6.93	9.02	9.69	12.36	15.39	17.72	-	-	-	-
	B	-	-	-	3.52	4.02	5.25	5.71	6.10	7.76	8.31	10.51	12.80	14.72	-	-	-	-
	C	-	-	-	5.75	5.75	6.25	6.75	7.75	8.75	10.25	12.75	14.38	16.38	-	-	-	-
	Weight	-	-	-	6.6	8.8	11.0	13	20	33	46	75	110	139	-	-	-	-
E		1.50	1.97	2.44	2.44	3.15	4.72	4.72	4.72	6.69	9.06	11.02	11.02	14.50	18.90	22.90	27.50	-

Note: Dimensions in inches. Weights in lbs. Weight may vary with materials, lining and standards. For exact weights please contact Saunders.®

C valve length = U.S. Length ANSI 125/150

Glass lining is typically available in the size range 1/2" - 8" for A Type valves. Contact Saunders® for further requirements.

A TYPE – FLOW COEFFICIENTS

½"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	5.5	4.8	-	-	6.0	5.2	-	-
90	5.3	4.6	-	-	5.8	5.0	-	-
80	5.1	4.4	-	-	5.5	4.8	-	-
70	4.8	4.2	-	-	5.3	4.6	-	-
60	4.6	4.0	-	-	5.0	4.4	-	-
50	3.8	3.3	-	-	4.2	3.6	-	-
40	3.1	2.7	-	-	3.4	2.9	-	-
30	2.3	2.0	-	-	2.5	2.2	-	-
20	1.5	1.3	-	-	1.7	1.4	-	-
10	0.8	0.7	-	-	0.8	0.7	-	-
0	0	0	-	-	0	0	-	-

¾"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	12	9.9	9.2	8.0	12	10	6.5	6
90	11	9.5	9.0	7.8	12	10	6.2	5
80	11	9.1	8.8	7.6	11	9.5	6.0	5
70	10	8.8	8.4	7.3	11	9.1	5.7	5
60	9.7	8.4	7.7	6.7	10	8.7	5.5	5
50	8.1	7.0	6.7	5.8	8.4	7.3	4.5	4
40	6.4	5.6	5.5	4.8	6.7	5.8	3.6	3
30	4.8	4.2	4.1	3.5	5.0	4.4	2.7	2
20	3.2	2.8	2.5	2.2	3.4	2.9	1.8	2
10	1.6	1.4	1.0	0.9	1.7	1.4	0.9	1
0	0	0	0	0	0	0	0	0

1"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	18	15	14	12	18	16	11	9.7
90	16	14	14	12	17	15	11	9.3
80	16	14	13	12	17	14	10	8.9
70	15	13	13	11	16	14	9.9	8.5
60	15	13	12	10	15	13	9.4	8.1
50	12	11	10	9	13	11	7.8	6.8
40	9.9	8.5	8.4	7.3	10	8.7	6.3	5.4
30	7.4	6.4	6.3	5.4	7.6	6.5	4.7	4.1
20	4.9	4.3	3.8	3.3	5.0	4.4	3.1	2.7
10	2.5	2.1	1.5	1.3	2.5	2.2	1.6	1.3
0	0	0	0	0	0	0	0	0

1¼"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	28	24	22	19	28	24	17	14
90	26	23	21	18	27	23	16	14
80	25	22	20	18	26	22	15	13
70	24	21	19	17	25	21	15	13
60	23	20	18	16	24	20	14	12
50	19	17	15	13	20	17	12	10
40	15	13	12	11	16	14	9.4	8.1
30	12	10	9.2	8.0	12	10	7.0	6.1
20	7.7	6.7	6.2	5.3	7.8	6.8	4.7	4.0
10	3.8	3.3	3.1	2.7	3.9	3.4	2.3	2.0
0	0	0	0	0	0	0	0	0

1½"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	43	37	35	30	45	39	31	27
90	41	36	34	29	43	37	30	26
80	40	34	34	29	41	36	29	25
70	38	33	32	28	40	34	27	24
60	36	31	29	25	38	33	26	23
50	30	26	26	22	32	27	22	19
40	24	21	21	18	25	22	17	15
30	18	16	16	14	19	16	13	11
20	12	10	9.5	8.2	13	11	8.7	7.5
10	6.0	5.2	3.9	3.4	6.3	5.4	4.3	3.7
0	0	0	0	0	0	0	0	0

2"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	80	69	64	55	88	76	59	51
90	77	66	63	54	84	73	56	48
80	74	64	61	53	81	70	54	47
70	70	61	58	50	77	67	52	45
60	67	58	53	46	74	64	50	43
50	56	48	47	41	62	53	41	35
40	45	39	38	33	49	43	33	29
30	34	29	29	25	37	32	25	22
20	22	19	17	15	25	21	16	14
10	11	9.7	7.0	6.1	12	11	8.0	6.9
0	0	0	0	0	0	0	0	0

2½"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	127	110	102	88	132	114	83	72
90	121	105	98	85	126	109	80	69
80	116	100	94	81	121	105	76	66
70	111	96	90	78	116	100	73	63
60	106	92	86	74	110	95	70	60
50	89	77	71	62	92	80	58	50
40	71	62	57	49	74	64	47	40
30	53	46	43	37	55	48	35	30
20	36	31	29	25	37	32	23	20
10	18	15	14	12	19	16	12	10
0	0	0	0	0	0	0	0	0

3"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	185	160	148	128	186	161	148	128
90	177	153	145	125	178	154	142	123
80	170	147	142	123	171	148	136	118
70	162	140	135	117	163	141	130	113
60	155	134	123	106	156	135	124	107
50	129	112	108	93	130	113	103	89
40	103	89	89	77	104	90	83	72
30	78	67	67	58	78	68	62	54
20	52	45	40	35	52	45	41	36
10	26	22	16	14	26	23	20	18
0	0	0	0	0	0	0	0	0

4"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	315	273	252	218	336	291	270	234
90	302	261	247	214	322	279	259	224
80	289	250	242	203	309	267	248	215
70	277	240	229	198	295	255	237	205
60	264	228	209	181	282	244	226	196
50	220	190	184	159	235	203	189	164
40	176	152	151	131	188	163	151	131
30	132	114	113	98	141	122	113	98
20	88	73	68	59	94	81	76	65
10	44	38	28	24	47	41	38	33
0	0	0	0	0	0	0	0	0

Cv = flow in US gal/min through a valve with $\Delta P = 1$ psi

Kv = flow in m³/hr through a valve with $\Delta P = 1$ bar

$$1.156 \text{ Kv} = \text{Cv}$$

Note: All Kv and Cv values shown here refer to flanged valves. Valves with screwed ends demonstrate different Kv/Cv values. For more information contact Saunders®.

A TYPE – FLOW COEFFICIENTS

5"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	420	363	363	314	440	381	-	-
90	403	349	348	301	422	365	-	-
80	386	334	333	288	404	349	-	-
70	369	319	319	276	387	335	-	-
60	352	304	304	263	369	319	-	-
50	294	254	254	220	308	266	-	-
40	235	203	203	176	246	213	-	-
30	176	152	152	131	184	159	-	-
20	117	101	101	87	123	106	-	-
10	59	51	51	44	62	54	-	-
0	0	0	0	0	0	0	-	-

6"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	605	523	484	419	630	545	505	437
90	580	502	474	410	604	522	484	419
80	556	481	465	402	579	501	464	401
70	532	460	440	381	554	479	444	384
60	508	439	402	348	529	458	424	367
50	423	366	353	305	441	381	353	305
40	338	292	290	251	352	304	282	244
30	254	220	218	189	264	228	212	183
20	169	146	131	113	176	152	141	122
10	85	74	53	46	88	76	71	61
0	0	0	0	0	0	0	0	0

8"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	1300	1125	1309	1132	1320	1142	-	-
90	1248	1080	1256	1087	1267	1096	-	-
80	1196	1035	1204	1042	1214	1050	-	-
70	1144	990	1151	996	1161	1004	-	-
60	1092	945	1099	951	1108	958	-	-
50	910	787	916	792	924	799	-	-
40	728	630	733	634	739	639	-	-
30	546	472	549	475	554	479	-	-
20	364	315	366	317	369	319	-	-
10	182	157	183	158	184	159	-	-
0	0	0	0	0	0	0	-	-

10"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar ¹		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	1980	1713	2000	1730	2100	1817	-	-
90	1900	1644	1920	1661	2016	1744	-	-
80	1821	1575	1840	1592	1932	1671	-	-
70	1742	1507	1760	1522	1848	1599	-	-
60	1663	1439	1679	1452	1763	1525	-	-
50	1386	1199	1400	1211	1470	1272	-	-
40	1108	958	1120	969	1176	1017	-	-
30	831	719	839	726	881	762	-	-
20	554	479	560	484	588	509	-	-
10	277	240	280	242	294	254	-	-
0	0	0	0	0	0	0	-	-

12"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar ¹		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	2550	2206	2600	2249	2700	2336	-	-
90	2448	2118	2496	2159	2592	2242	-	-
80	2346	2029	2392	2069	2484	2149	-	-
70	2244	1941	2288	1979	2376	2055	-	-
60	2142	1853	2184	1889	2268	1962	-	-
50	1785	1544	1820	1574	1890	1635	-	-
40	1428	1235	1456	1260	1512	1308	-	-
30	1071	926	1092	945	1134	981	-	-
20	714	618	728	630	756	654	-	-
10	357	309	364	315	378	327	-	-
0	0	0	0	0	0	0	-	-

14"								
% Open	Body Material / Lining							
	Cast (Unlined)		Rubber Lined		Glass / Halar ¹		Plastic Lined	
	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv
100	3700	3201	3750	3244	3880	3356	-	-
90	3552	3073	3500	3028	3724	3221	-	-
80	3404	2945	3450	2984	3569	3087	-	-
70	3256	2817	3300	2855	3414	2953	-	-
60	3107	2688	3149	2724	3259	2819	-	-
50	2590	2240	2625	2271	2716	2349	-	-
40	2072	1792	2100	1817	2172	1879	-	-
30	1553	1343	1574	1362	1629	1409	-	-
20	1036	896	1050	908	1086	939	-	-
10	518	448	525	454	543	470	-	-
0	0	0	0	0	0	0	-	-

¹ Glass lining is typically available in the size range 1/2" - 8" for A Type valves. Contact Saunders® for further requirements.

Cv = flow in US gal/min through a valve with $\Delta P = 1$ psi

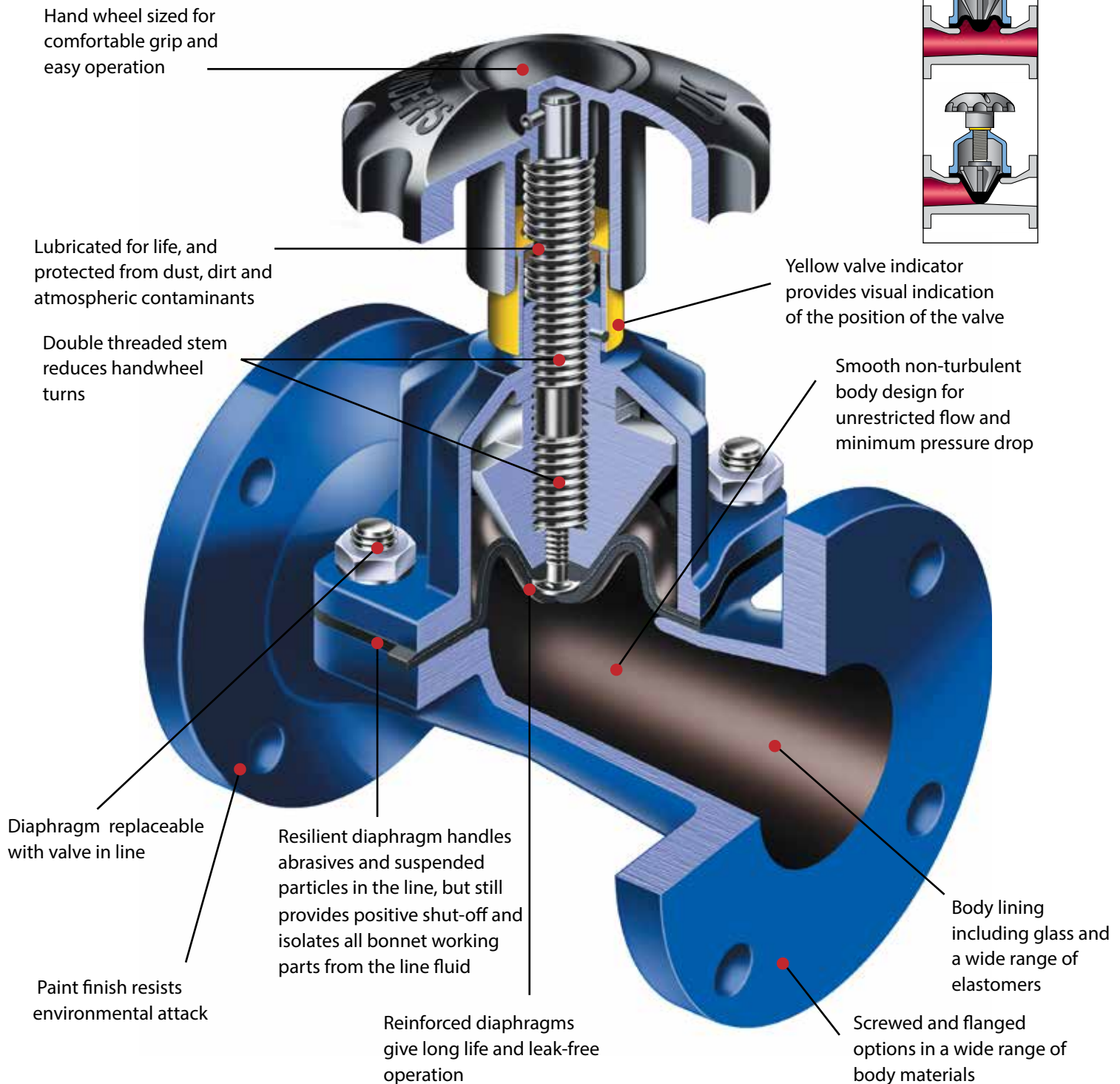
Kv = flow in m³/hr through a valve with $\Delta P = 1$ bar

$$1.156 \text{ Kv} = \text{Cv}$$

Variations in Flow Coefficients (Cv and Kv) ratings can be derived depending on the test method used. The flow coefficient provides a measure of the flow capacity of a valve. It is defined as the volume flow of water at a controlled temperature and a given pressure drop across the valve. This coefficient allows engineers to compare flow capacities of valves of different sizes, types and manufacturers.

KB/K TYPE – FEATURES

Saunders® KB and K Design



**Saunders® KB and K type (higher flow) valves:
the choice for corrosive slurry applications**

TYPE KB/K – STANDARDS



Top Works

- Manual
- Actuated

Diaphragm

- Rubber

Body

- Flanged and screwed design
- Lined and unlined
- Cast iron, SG iron, cast steel, stainless steel or gunmetal

As well as meeting the overall lengths specified in EN 558-1 Series 1, Series 7* and MSS SP-88, Saunders® valves are manufactured to the following standards:

Flanged	
American	ASME B16.1 Class 125
	ASME B16.24 Class 150
	ASME B16.5 Class 150
British	BS 10 Tables D and E
British/European ¹	BS EN 1092-1 PN10/16
	BS EN 1092-2 PN10/16
	BS EN 1092-3 PN10/16
Japanese	JIS B 2220 10K
	JIS B 2239 10K
	JIS B 2240 10K

¹ Replaces BS 4504 PN10/16

Screwed	
American ²	ASME B1.20.1
British/European ³	BS EN 10226-1 Parallel
	BS EN 10226-1 Taper
European ⁴	EN ISO 228-1
International	ISO 7-1 Parallel
	ISO 7-1 Taper

² Replaces ANSI 2.1

³ Replaces BS 21 Parallel and Taper

⁴ Replaces DIN 259

* Series 7 is the original IDV standard from when PK Saunders invented the diaphragm valve.

KB/K TYPE – BODY

Lined and Unlined Options

Saunders® full bore KB type diaphragm valves, with their smooth non-turbulent body design, have proven to be outstanding in resisting the erosion effect of abrasive media, providing low pressure drop and high flow characteristics.

Unlined Bodies

Material	Connection	Standard	Material Grade*	Size	Temperature
Cast Iron	Screwed	BS EN1561	GJL-250	½"-2"	14°F to 347°F
	Flanged			½"-14"	
SG Iron ¹	Screwed	BS EN1563	GJS-450-10	½"-2"	14°F to 347°F
	Flanged		GJS-400-18 ¹	¼"-14"	
Gun Metal	Screwed	BS EN1982	CC491K-GS	½"-2"	-22°F to 347°F
	Flanged		CC492K-GS	½"-4"	
Stainless Steel	Flanged	BS EN10283	1.4408 ²	½"-10"	-22°F to 347°F

¹ For some sizes GJS-400-18-LT grade is available with a low temperature limit of -4°F

² Replaces the standard BS3100 316C16

* Please contact Saunders® for information on comparable/equivalent material grades.

Standard material grade fasteners:

Stainless steel fasteners - All stainless steel, plastic lined and glass lined valves

Aluminium Bronze fasteners - Gunmetal flanged valves

Carbon Steel fasteners - All remaining valves.

Special material grade fasteners available upon request

The flexible diaphragms ensure consistent leak tightness even when solids, powders and dry media are present. The wide range of lining materials make the valve suitable for many corrosive/abrasive applications up to a maximum pressure of 10 bar.

Lined Options - Flanged Bodies Only

Lining	Body Material	Size	Temperature
Butyl (Isobutylene Isoprene)	Cast Iron	1"-14"	14°F to 230°F
	SG Iron		14°F to 230°F
	Cast Steel		-22°F to 230°F
Neoprene (Polychloroprene)	Cast Iron	1"-14"	14°F to 221°F
	SG Iron		14°F to 221°F
	Cast Steel		-22°F to 221°F
HRL (Hard Natural Rubber)	Cast Iron	1"-14"	14°F to 185°F
	SG Iron		14°F to 185°F
	Cast Steel		-22°F to 185°F
SRL (Soft Natural Rubber)	Cast Iron	1"-14"	14°F to 185°F
	SG Iron		14°F to 185°F
	Cast Steel		-22°F to 185°F

Glass	Cast Iron	½" - 6"	14°F to 347°F
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Glass Lining

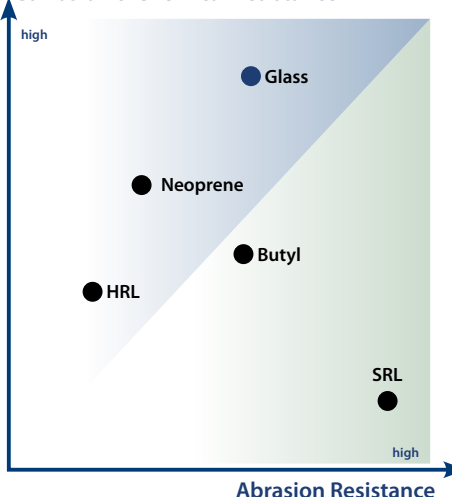
Used in many different applications, including strong acids, salts and halogenated gases. Superior corrosion and abrasion resistance within a wide range of temperatures and concentrations. *Note that glass is not suitable for applications where thermal cycling occurs.* (Blue)

Rubber Lining

Butyl Isobutylene Isoprene — Great for corrosive and abrasive slurries, and acidic slurries. Additional applications are salts in water, dilute acids and alkalis, and lime. WRAS approved. (Black)

Neoprene Polychloroprene — Perfect solution for a combination of abrasive slurries containing hydrocarbons, sludge oils and also sea water. (Black)

Corrosion & Chemical Resistance



Rubber Lining

HRL Hard Natural Rubber — Used for salts in water, diluted acids, de-ionised water, plating solutions and potable water. HRL has better chemical resistance than SRL. (Black)

SRL Soft Natural Rubber — High abrasion resistance on powders, abrasive slurries, clays, coal dust, dry fertilizers, gypsum, as well as titanium dioxide and sewage. (Brown)

The temperature ranges above are given for general reference purposes only. Service conditions, such as media being handled and concentration of solids will determine the highest possible working temperature. Additionally, the performance of the valve will also depend on the diaphragm material.

The nominal bore thicknesses of Saunders® linings range from 1 to 5.5 mm, depending on lining material and valve size: glass 1 mm, rubber 2-4.5 mm and plastic 4-5.5 mm.

KB/K TYPE – DIAPHRAGM

Diaphragm

Many factors can accelerate the aging of polymer compounds. Temperature and abrasion have a significant impact on the effect of chemicals on rubber compounds. At Saunders®, we are proud of our core competence, the in-house manufacture of Saunders® diaphragms. Our expertise in polymer science assures the best range of diaphragms to suit the most challenging duties with total security. This explains why Saunders® diaphragms are a synonym of longer life, reduced maintenance and higher plant operating efficiencies.

Energising ribs allow efficient shut-off in wide-bore applications



Rubber Diaphragm

226 - Great solution for hydrogen at high temperature, concentrated acids, aromatics solvents, low concentrated chlorine solutions, ozone, unleaded petroleum.

300 - Chemicals, diluted acids and alkalis, drinking water. Additional abrasive applications like phosphoric acid with low concentration. FDA, USP and WRAS approved¹.

HT - Suitable for abrasive slurries containing hydrocarbons.

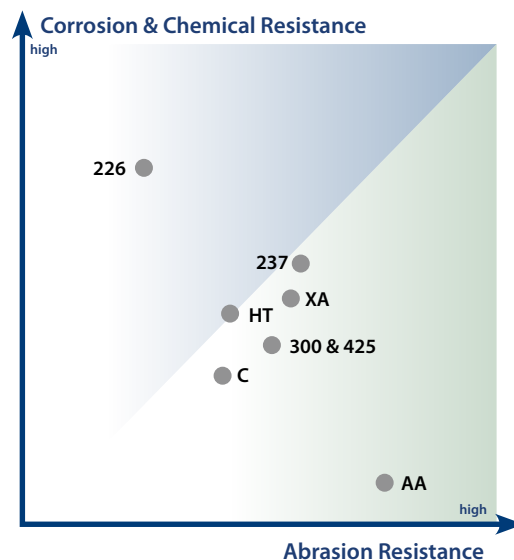
425 - Salts in water, acids and alkalis, ozone, water, intermittent steam. Great solution for on food and beverages applications. FDA and USP approved¹.

237 - The best solution for sodium hypochlorite. Great with strong acids and low concentration chlorine gas. It is also oil resistant.

XA - Specifically designed for both abrasive and corrosive application such as phosphoric acid, metal treatment and mining applications.

C - Lubricating oil, cutting oils, paraffin, animal vegetable oils and aviation kerosene at low temperatures.

AA - Excellent choice on abrasive applications such as slurries. The diaphragm has a light brown colour, and is sulfur cured.



KB/K Type Diaphragm

Diaphragm	Composition	Size	Temperature
226	FKM (Fluoroelastomer)	1/2" to 12"	23 °F to 302 °F
425	EPM (Ethylene Propylene)	All Sizes	-40 °F to 226 °F
AA	Natural Rubber	All Sizes	-40 °F to 194 °F
HT	Neoprene (Polychloroprene)	All Sizes	-22 °F to 212 °F
237	CSM (Chlorosulfonated Polyethylene)	All Sizes	14 °F to 212 °F
300	Butyl (Isobutylene Isoprene)	All Sizes	-40 °F to 266 °F
C	Nitrile (Butadiene Acrylonitrile)	All Sizes	-4 °F to 212 °F
XA	EPDM (Ethylene Propylene Diene)	All Sizes	-40 °F to 266 °F

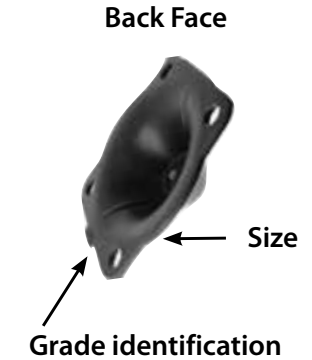
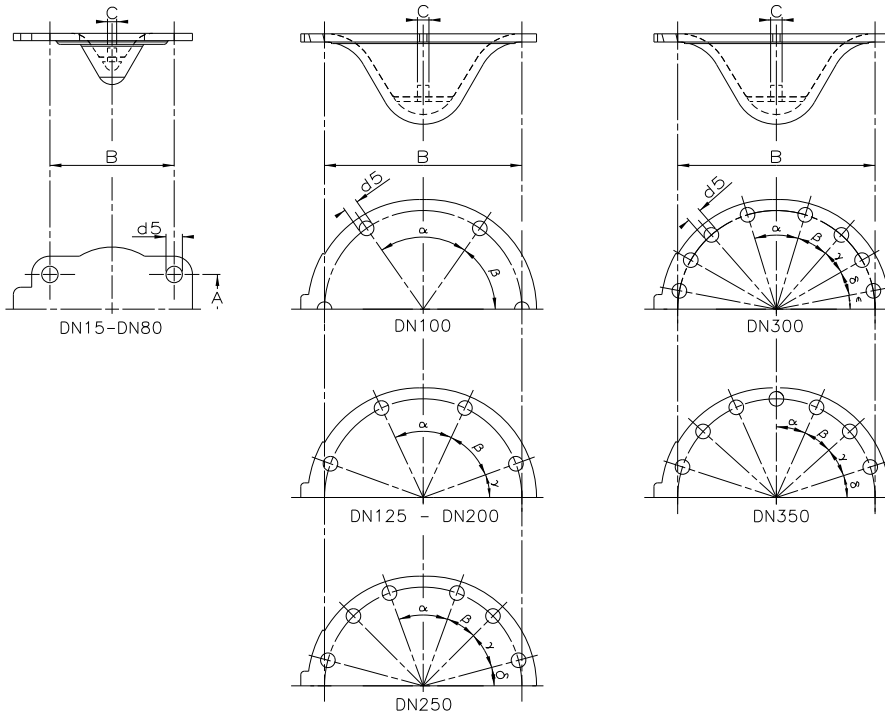
¹ FDA - Food and Drug Administration USP - United States Pharmacopeia

WRAS – Water Regulations Advisory Scheme

KB/K TYPE – DIAPHRAGM DIMENSIONS

Diaphragm Identification

KB Diaphragms (For K Type diaphragms, refer to one size larger KB diaphragms)



Size (IN)	Principal Diaphragm Dimensions						Angles From the Holes				
	A	B	C	D (Thickness)	d5	Number of Holes	α	β	γ	δ	ε
½"	1.18	2.13	3/16" BSW	0.20	2/7	4	-	-	-	-	-
¾"	1.18	2.13		0.20	2/7	4	-	-	-	-	-
1"	2.01	2.52	1/4" BSW	0.20	1/3	4	-	-	-	-	-
1 ¼"	2.01	2.52		0.20	1/3	4	-	-	-	-	-
1 ½"	2.01	2.52		0.20	1/3	4	-	-	-	-	-
2"	2.52	3.50		0.20	1/2	4	-	-	-	-	-
2 ½"	3.27	4.02	5/16" BSW	0.22	7/16" UNC	4	-	-	-	-	-
3"	4.02	5.39	3/8" BSW	0.25	5/8" UNC	4	-	-	-	-	-
4"	-	6.73		0.22	7/16" UNC	6	70°	55°	-	-	-
5"	-	8.07		0.31		8	50°	45°	40°	-	-
6"	-	10.00	5/8" BSW	0.31	1/2" UNC	8	60°	40°	40°	-	-
8"	-	12.01		0.31	5/8" UNC	8	60°	40°	40°	-	-
10"	-	15.00		0.37		12	40°	25°	30°	45°	-
12"	-	17.76	1" BSW	0.41	7/8" UNC	16	34°	24°20'	19°	19°	21°20'
14"	-	20.75		0.41		14	24°	24°	24°	36°	-

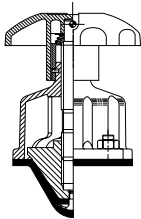
BSW = British Standard Whitworth Thread

UNC = Unified Coarse Thread

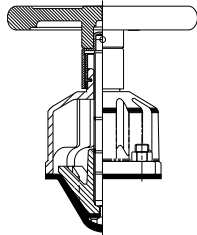
Note: Dimensions in inches

KB/K TYPE – TOP WORKS

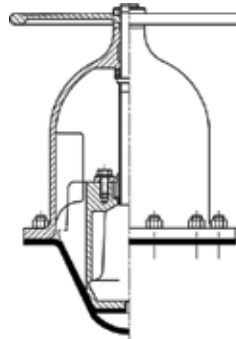
Standard Range



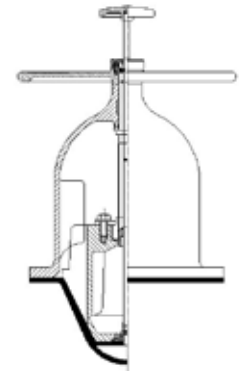
**Standard plastic rising
handwheel with indicator**
½" - 2"



**Metal rising handwheel
with indicator**
2½" - 6"

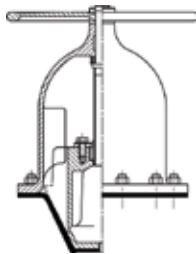


**Standard non-rising
handwheel without
indicator**
8" - 14"

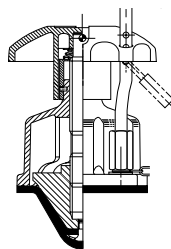


**Non-rising handwheel
with indicator**
8" - 12"

High Performance



**Non-rising handwheel
(fluoroelastomer sealed)**
½" - 12"



**Rising handwheel with
indicator
(simple padlocking)**
½" - 6"

KB/K TYPE – PRESSURE AND TEMPERATURE LIMITS

Maximum manual working pressures for Saunders® KB type diaphragm valves.

For actuated valves, please refer to the appropriate datasheets.

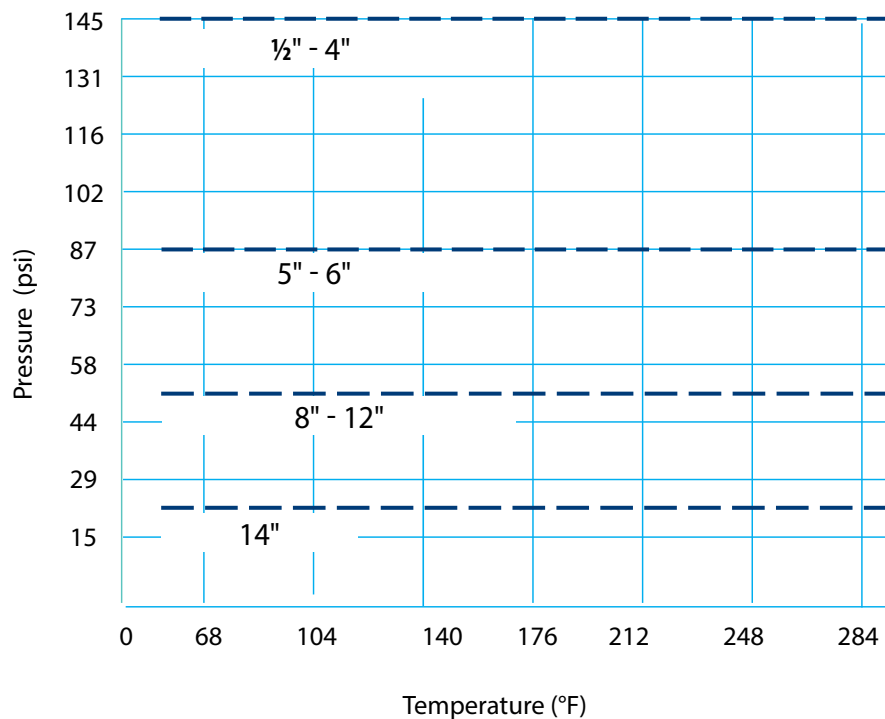
Bonnet pressure limits

Size (IN)		¼"	3/8"	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"	10"	12"	14"
Handwheel																		
Pressure (psi)	Rising	145	145	145	145	145	145	145	145	145	145	145	87	87	-	-	-	-
	Non-rising	-	-	-	-	-	-	-	-	-	-	-	-	-	51	51	51	22

All Saunders® valves are pressure tested in accordance with BS EN12266-1 standard.

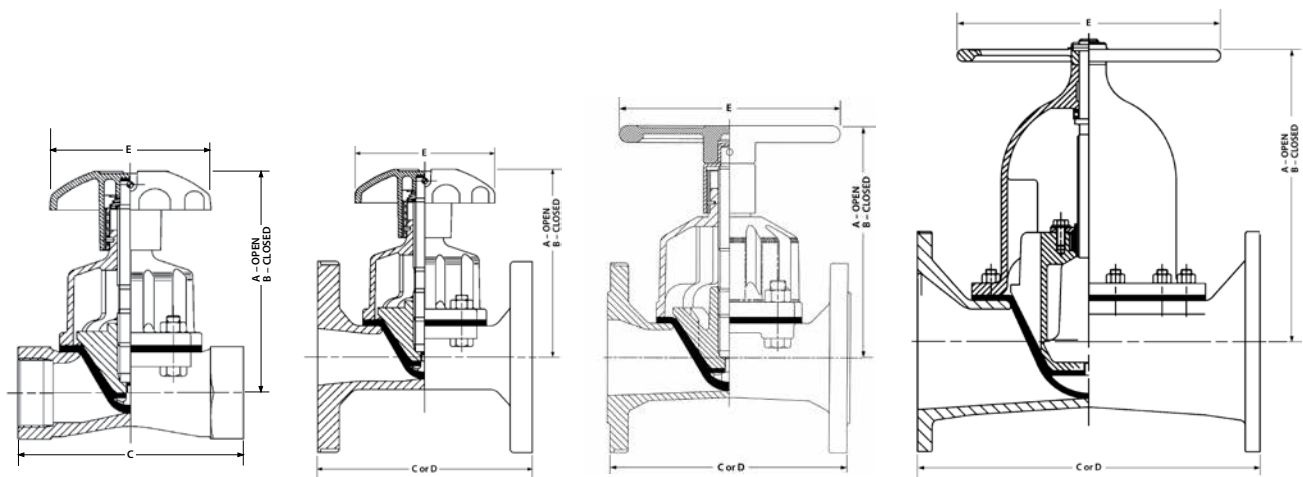
- Shell test: 1.5 times maximum working pressure
- Seat test: 1.1 times maximum working pressure

KB Valve Pressure/Temperature Relationship*



* For K Type valves, refer to one size larger KB valve.

KB TYPE – ASSEMBLED VALVE DIMENSIONS



Screwed ½" – 2"

Flanged ½" – 2"

Flanged 2½" – 6"

Flanged 8" – 14"

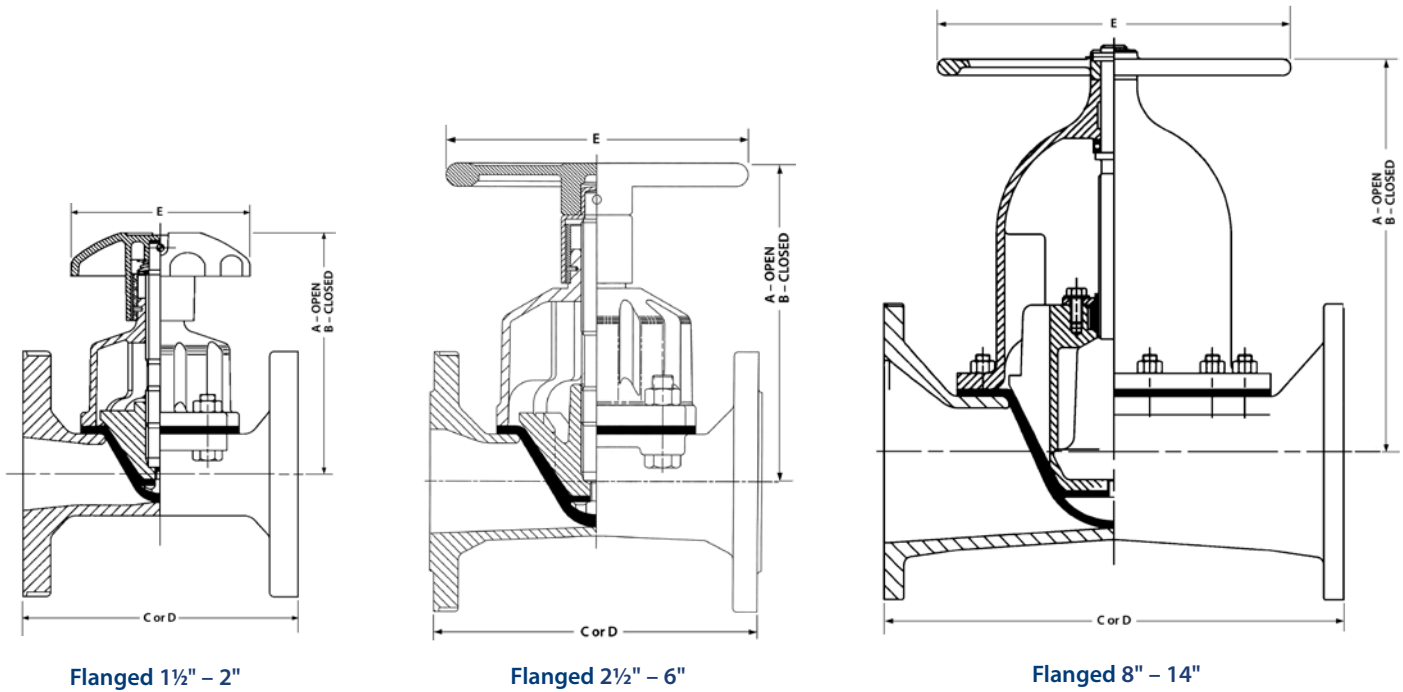
Size (IN)		½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"	10"	12"	14"
Screwed Unlined	A	4.21	-	6.50	-	6.50	7.22	-	-	-	-	-	-	-	-	-
	B	3.88	-	6.31	-	6.31	6.44	-	-	-	-	-	-	-	-	-
	C	2.50	-	4.38	-	5.62	6.62	-	-	-	-	-	-	-	-	-
	Weight	2.2	-	4.4	-	6.6	11.0	-	-	-	-	-	-	-	-	-
Flanged Unlined	A	4.12	4.12	6.50	6.50	6.50	6.88	9.22	10.62	12.31	13.21	17.12	16.03	21.91	24.72	26.22
	B	3.81	3.81	6.31	6.31	6.31	6.12	8.31	9.41	10.91	11.50	14.90	16.03	21.91	24.72	26.22
	C	4.30	4.60	5.00	5.80	6.30	7.50	8.50	10.00	12.50	14.00	16.00	20.50	25.00	29.50	36.25
	Weight	6.6	6.6	11	11	13	24	26	40	71	104	150	240	430	648	1019
Flanged Rubber Lined	A	-	-	6.62	6.62	6.62	6.94	9.22	10.62	12.31	13.21	17.12	16.12	22.00	24.81	26.31
	B	-	-	6.38	6.38	6.38	6.12	8.31	9.41	10.91	11.50	14.90	16.12	22.00	24.81	26.31
	C	-	-	5.25	6.05	6.55	7.75	8.75	10.25	12.75	14.38	16.38	20.88	25.38	29.88	36.62
	Weight	-	-	11	11	13	24	26	40	71	104	150	240	430	648	1019
Flanged Glass* / Halar Lined	A	4.22	4.22	6.53	6.53	6.53	7.00	9.31	10.69	12.38	13.21	17.19	16.00	22.00	24.76	26.22
	B	3.88	3.88	6.31	6.31	6.31	6.22	8.31	9.41	10.91	11.62	14.97	16.00	22.00	24.76	26.22
	C	4.36	4.66	5.06	5.86	6.36	7.56	8.56	10.06	12.56	14.06	16.06	20.56	25.06	29.57	36.34
	Weight	4.4	6.6	11	13	15	24	26	46	75	104	159	260	443	648	1019
E		3.50	3.50	4.72	4.72	4.72	4.72	6.69	9.16	11.02	11.02	14.50	14.50	19.00	23.00	27.50

Note: Dimensions in inches. Weights in lbs. Weight may vary with materials, lining and standards. For exact weights please contact Saunders.®

C valve length = U.S. Length ANSI 125/150

*Glass lining is typically available in the size range 1/2" - 6" for KB Type valves. Contact Saunders® for further requirements.

K TYPE – ASSEMBLED VALVE DIMENSIONS



Size (IN)		1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"	14"
Flanged Unlined	A	6.38	7.75	9.13	10.38	11.00	14.50	16.50	22.38	25.13	26.63	26.13
	B	6.19	6.95	8.22	9.16	9.60	12.81	16.50	22.38	25.13	26.63	26.13
	C	6.50	7.50	8.50	10.00	12.50	14.00	16.00	20.50	25.00	29.50	36.25
	Weight	13.0	19.0	33.0	49.0	65.0	142.0	158.0	300.0	460.0	670.0	1000.0
Flanged Rubber Lined	A	6.38	7.75	9.13	10.38	11.00	14.50	16.50	22.38	25.12	26.62	26.12
	B	6.12	6.95	8.22	9.16	9.60	12.79	16.50	22.38	25.12	26.62	26.12
	C	6.75	7.75	8.75	10.25	12.75	14.25	16.38	20.88	25.38	29.88	36.63
	Weight	14.0	20.0	33.0	50.0	67.0	142.0	160.0	303.0	463.0	674.0	1004.0
E		4.72	6.69	9.06	11.02	11.02	14.50	14.50	19.00	23.00	27.50	27.50

Note: Dimensions in inches. Weights in lbs. Weight may vary with materials, lining and standards. For exact weights please contact Saunders®. C valve length = U.S. Length ANSI 125/150

KB TYPE – FLOW COEFFICIENTS

½"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar	
	Cv	Kv	Cv	Kv	Cv	Kv
100	8.6	7.4	-	-	9.0	7.8
90	8.0	6.9	-	-	8.4	7.3
80	7.3	6.3	-	-	7.7	6.7
70	6.6	5.7	-	-	6.9	6.0
60	6.0	5.2	-	-	6.3	5.4
50	5.2	4.5	-	-	5.4	4.7
40	4.3	3.7	-	-	4.5	3.9
30	3.2	2.8	-	-	3.3	2.9
20	2.1	1.8	-	-	2.2	1.9
10	1.0	0.9	-	-	1.1	1.0
0	0	0	-	-	0	0

1"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar	
	Cv	Kv	Cv	Kv	Cv	Kv
100	38	33	31	26	39	34
90	35	30	28	25	36	31
80	32	28	26	23	33	29
70	29	25	24	20	30	26
60	27	23	21	19	27	24
50	23	20	18	16	23	20
40	19	16	15	13	20	17
30	14	12	11	9.8	14	12
20	9.1	7.9	7.3	6.3	9.4	8.1
10	4.5	3.9	3.7	3.2	4.7	4.1
0	0	0	0	0	0	0

1¼"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar	
	Cv	Kv	Cv	Kv	Cv	Kv
100	56	48	46	40	58	50
90	52	45	42	36	54	47
80	48	42	39	34	50	43
70	44	38	36	31	46	40
60	40	35	32	28	42	36
50	34	29	28	24	35	30
40	28	24	23	20	29	25
30	22	19	18	16	23	20
20	16	14	13	11	16	14
10	8.0	6.9	6.0	5.2	8.0	6.9
0	0	0	0	0	0	0

1½"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar	
	Cv	Kv	Cv	Kv	Cv	Kv
100	75	65	66	57	79	68
90	70	61	61	53	73	63
80	64	55	56	48	67	58
70	58	50	51	44	61	53
60	52	45	46	40	55	48
50	45	39	40	35	47	41
40	38	33	33	29	40	35
30	28	24	24	21	29	25
20	18	16	16	14	19	16
10	9.0	7.8	7.9	6.8	9.5	8.2
0	0	0	0	0	0	0

2"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar	
	Cv	Kv	Cv	Kv	Cv	Kv
100	128	111	107	93	138	119
90	119	103	99	86	128	111
80	109	94	91	79	117	101
70	99	86	82	71	106	92
60	90	78	75	65	97	84
50	77	67	64	55	83	72
40	64	55	53	46	69	60
30	47	41	40	35	51	44
20	31	27	26	22	33	29
10	15	13	13	11	17	14
0	0	0	0	0	0	0

2½"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar	
	Cv	Kv	Cv	Kv	Cv	Kv
100	238	206	195	169	254	220
90	221	191	181	157	236	204
80	202	175	166	144	216	187
70	183	158	150	130	196	170
60	167	145	136	118	178	154
50	143	124	117	101	152	132
40	119	103	97	84	127	110
30	88	76	72	62	94	81
20	57	49	47	40	61	53
10	29	25	23	20	20	17
0	0	0	0	0	0	0

3"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar	
	Cv	Kv	Cv	Kv	Cv	Kv
100	330	285	264	228	342	296
90	307	266	246	213	318	275
80	281	243	224	194	291	252
70	254	220	203	176	263	228
60	231	200	185	160	239	207
50	198	171	159	138	205	177
40	165	143	132	114	171	148
30	122	106	98	85	127	110
20	79	68	63	54	82	71
10	40	35	32	28	41	35
0	0	0	0	0	0	0

4"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar	
	Cv	Kv	Cv	Kv	Cv	Kv
100	588	509	480	415	618	535
90	547	473	446	386	575	497
80	500	433	408	353	525	454
70	453	392	370	320	476	412
60	412	356	336	291	433	375
50	353	305	288	249	371	321
40	294	254	240	208	309	267
30	218	189	178	154	229	198
20	141	122	115	99	148	128
10	71	61	58	50	74	64
0	0	0	0	0	0	0

5"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar	
	Cv	Kv	Cv	Kv	Cv	Kv
100	924	799	720	623	960	830
90	859	743	670	580	893	772
80	785	679	612	529	816	706
70	711	615	554	479	739	639
60	647	560	504	436	672	581
50	555	480	432	374	576	498
40	462	400	360	311	480	415
30	342	296	266	230	355	307
20	222	192	173	150	230	199
10	111	96	86	74	115	99
0	0	0	0	0	0	0

Note: All Kv and Cv values shown here refer to flanged valves. Valves with screwed ends demonstrate different Kv/Cv values. For more information contact Saunders®.

Cv = flow in US gal/min through a valve with $\Delta P = 1$ psi

Kv = flow in m³/hr through a valve with $\Delta P = 1$ bar

1.156 Kv = Cv

KB TYPE – FLOW COEFFICIENTS

6"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar ¹	
	Cv	Kv	Cv	Kv	Cv	Kv
100	1680	1453	1260	1090	1800	1557
90	1562	1351	1172	1014	1674	1448
80	1428	1235	1071	926	1530	1324
70	1294	1119	970	839	1386	1199
60	1176	1017	882	763	1260	1090
50	1008	872	756	654	1080	934
40	840	727	630	545	900	779
30	622	538	466	403	666	576
20	403	349	302	261	432	374
10	202	175	151	131	216	187
0	0	0	0	0	0	0

8"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar ¹	
	Cv	Kv	Cv	Kv	Cv	Kv
100	2580	2232	2196	1900	2724	2356
90	2399	2075	2042	1766	2533	2191
80	2193	1897	1867	1615	2315	2003
70	1987	1719	1691	1463	2097	1814
60	1806	1562	1537	1330	1907	1650
50	1548	1339	1318	1140	1634	1413
40	1290	1116	1098	950	1362	1178
30	955	826	813	703	1008	872
20	619	535	527	456	653	565
10	310	268	264	228	327	283
0	0	0	0	0	0	0

10"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar ¹	
	Cv	Kv	Cv	Kv	Cv	Kv
100	4020	3478	3420	2958	4296	3716
90	3739	3234	3181	2752	3995	3456
80	3417	2956	2907	2515	3652	3159
70	3095	2677	2633	2278	3308	2862
60	2814	2434	2394	2071	3007	2601
50	2412	2087	2052	1775	2578	2230
40	2010	1739	1710	1479	2148	1858
30	1487	1286	1265	1094	1590	1375
20	965	835	821	710	1031	892
10	482	417	410	355	516	446
0	0	0	0	0	0	0

12"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar ¹	
	Cv	Kv	Cv	Kv	Cv	Kv
100	6060	5242	4884	4225	6200	5363
90	5636	4875	4542	3929	5800	5017
80	5151	4456	4151	3591	4500	3893
70	4666	4036	3761	3253	5000	4325
60	4242	3670	3419	2958	4500	3893
50	3636	3145	2930	2535	3900	3374
40	3030	2621	2442	2112	3200	2768
30	2242	1939	1807	1563	2600	2249
20	1454	1258	1172	1014	1900	1644
10	727	629	586	507	1000	865
0	0	0	0	0	0	0

14"						
% Open	Body Material / Lining					
	Cast (Unlined)		Rubber Lined		Glass / Halar ¹	
	Cv	Kv	Cv	Kv	Cv	Kv
100	10300	8910	9950	8607	-	-
90	9579	8286	9253	8004	-	-
80	8755	7574	8457	7316	-	-
70	7931	6861	7661	6627	-	-
60	7210	6237	6965	6025	-	-
50	6180	5346	5970	5164	-	-
40	5150	4455	4975	4304	-	-
30	3811	3297	3681	3184	-	-
20	2472	2138	2388	2066	-	-
10	1236	1069	1194	1033	-	-
0	0	0	0	0	-	-

Cv = flow in US gal/min through a valve of $\Delta P = 1$ psi

Kv = flow in m³/hr through a valve of $\Delta P = 1$ bar

$$1.156 \text{ Kv} = \text{Cv}$$

¹ Glass lining is typically available in the size range 1/2" - 6" for KB Type valves. Contact Saunders® for further requirements.

Note:

The flow coefficient provides a measure of the flow of a valve. It is defined as the volume flow of water at a controlled temperature and a given pressure drop across the valve. This coefficient allows engineers to compare flow capacities of valves of different sizes, types and manufacturers.

K TYPE – FLOW COEFFICIENTS

1½"				
% Open	Body Material / Lining			
	Cast (Unlined)		Rubber Lined	
	Cv	Kv	Cv	Kv
100	138	33.9	130	32
90	128	31.5	121	29.8
80	117	28.8	111	27.3
70	106	26.1	100	24.6
60	97	23.8	91	22.4
50	83	20.4	78	19.2
40	69	19.4	65	18.3
30	51	14.3	48	13
20	33	9.2	31	8.7
10	16.6	4.6	15.6	8.3

2"				
% Open	Body Material / Lining			
	Cast (Unlined)		Rubber Lined	
	Cv	Kv	Cv	Kv
100	275	67.7	260	64
90	256	63	242	59.6
80	234	57.6	221	54.4
70	212	52.2	200	49.2
60	193	47.5	182	44.8
50	165	40.6	156	38.4
40	138	33.9	130	32
30	102	25.1	96	23.6
20	66	18.5	62	17.4
10	33	9.2	31	8.7

2½"				
% Open	Body Material / Lining			
	Cast (Unlined)		Rubber Lined	
	Cv	Kv	Cv	Kv
100	450	111	420	103
90	419	103	391	96.3
80	383	94.3	357	87.9
70	347	85.4	323	79.5
60	315	77.5	294	72.4
50	270	66.5	252	62
40	225	55.4	210	51.7
30	167	41.1	155	38.1
20	108	26.6	101	24.8
10	54	15.2	50	14

3"				
% Open	Body Material / Lining			
	Cast (Unlined)		Rubber Lined	
	Cv	Kv	Cv	Kv
100	530	130	480	118
90	493	121	446	110
80	451	111	408	100
70	408	100	370	91.1
60	371	91	336	83
50	318	78	288	71
40	265	65	240	59
30	196	48	178	44
20	127	31	115	28
10	64	18	58	16

4"				
% Open	Body Material / Lining			
	Cast (Unlined)		Rubber Lined	
	Cv	Kv	Cv	Kv
100	755	186	720	177
90	702	173	670	165
80	642	158	612	151
70	581	143	554	136
60	529	130	504	124
50	453	111	432	106
40	378	93	360	87
30	279	69	266	66
20	181	45	173	43
10	91	22	86	21

5"				
% Open	Body Material / Lining			
	Cast (Unlined)		Rubber Lined	
	Cv	Kv	Cv	Kv
100	1360	335	1300	320
90	1265	311	1209	297
80	1156	285	1105	272
70	1047	258	1001	246
60	952	234	910	224
50	816	201	780	192
40	680	167	650	160
30	503	124	481	118
20	326	80	312	77
10	163	40	156	38

6"				
% Open	Body Material / Lining			
	Cast (Unlined)		Rubber Lined	
	Cv	Kv	Cv	Kv
100	2360	581	2250	554
90	2195	541	2093	515
80	2006	494	1913	471
70	1817	447	1733	427
60	1652	407	1575	387
50	1416	349	1350	332
40	1180	291	1125	277
30	873	215	833	205
20	566	139	540	133
10	283	70	270	67

8"				
% Open	Body Material / Lining			
	Cast (Unlined)		Rubber Lined	
	Cv	Kv	Cv	Kv
100	4420	961	4250	924
90	4111	894	3953	859
80	3757	817	3613	785
70	3403	740	3273	711
60	3094	673	2975	733
50	2652	653	2550	628
40	2210	544	2125	523
30	1635	403	1573	387
20	1061	261	1020	251
10	530	130	510	126

10"				
% Open	Body Material / Lining			
	Cast (Unlined)		Rubber Lined	
	Cv	Kv	Cv	Kv
100	7550	1641	7250	1576
90	7021	1526	6743	1466
80	6418	1395	6163	1340
70	5813	1264	5583	1214
60	5285	1149	5075	1103
50	4530	985	4350	946
40	3775	821	3625	788
30	2794	688	2683	661
20	1812	446	1740	428
10	906	223	870	214

12"				
% Open	Body Material / Lining			
	Cast (Unlined)		Rubber Lined	
	Cv	Kv	Cv	Kv
100	10100	2196	9800	2130
90	9393	2042	9114	1981
80	8585	1866	8330	1811
70	7777	1691	7546	1640
60	7070	1537	6860	1491
50	6060	1317	5880	1278
40	5050	1098	4900	1065
30	3737	812	3626	788
20	2424	597	2352	579
10	1212	298	1176	290

14"				
% Open	Body Material / Lining			
	Cast (Unlined)		Rubber Lined	
	Cv	Kv	Cv	Kv
100	10300	2239	9950	2163
90	9579	2082	9254	2012
80	8755	1903	8458	1839
70	7931	1724	7662	1666
60	7210	1567	6965	1514
50	6180	1343	5970	1298
40	5150	1119	4975	1081
30	3811	828	3682	800
20	2472	608	2388	588
10	1236	304	1194	294

Cv = flow in US gal/min through a valve of ΔP = 1 psi

Kv = flow in m³/hr through a valve of ΔP = 1 bar

¹ Glass not available in this size

1.156 Kv = Cv

Note: The flow coefficient provides a measure of the flow of a valve. It is defined as the volume flow of water at a controlled temperature and a given pressure drop across the valve. This coefficient allows engineers to compare flow capacities of valves of different sizes, types and manufacturers.

WFB TYPE – FEATURES

Saunders® WFB Design

Hand wheel sized for comfortable grip and easy operation

Lubricated for life, and protected from dust, dirt and atmospheric contaminants.

Yellow valve indicator provides visual indication on the position of the valve

Diaphragm replaceable with the valve inline

Compressor provides support to the diaphragm in all positions, improving the life of the diaphragm

Different end connections available

Special diaphragm material designed to withstand temperatures up to 1000°F

Reinforced diaphragms give long life and leak free operation

Different screwed combinations available

Saunders® WFB valves provide a reliable solution for fire and marine applications.

With fire you only get one chance!

WFB TYPE-STANDARDS

Saunders® WFB valves are utilized as fire mains hydrants and in tank cleaning services for marine and offshore oil installations. Available in 1½ and 2½ sizes, these are highly specialised valves that have been tested and approved by the world's leading safety agencies, and are designed to work up to a maximum pressure of 218 psi.



"We specified Saunders WFB 65 mm nominal bore fire-mains hydrant valves for our ferries and cruise liners. Significant factors behind this choice are the excellent reliability and the low maintenance costs."

P&O Cruises (UK) Ltd

Valve Standards

Saunders® WFB valves are manufactured to the following standards:

Flanged	
American	ASME/ANSI B16.24 Class 150 (Gunmetal)
	ASME/ANSI B16.34 Class 150 (SG iron)
British	BS 10 Tables D & E (Gunmetal and SG iron)
British/ European ¹	BS EN 1092-2 PN10/16 (SG iron)
	BS EN 1092-3 PN10/16 (Gunmetal)
Japanese	JIS 2239 10K (SG iron)
	JIS 2240 10K (Gunmetal)

¹ Replaces BS 4504 PN10/16

Screwed	
American	NFPA ² 1963 1.5-9 NH (DN40)
	NFPA ² 1963 2.5-7.5 NH (DN65)
British/ European ³	BS EN 10226-1 Parallel
	BS EN 10226-2 Taper

² National Fire Protection Association

³ Replaces BS 21 Parallel and Taper



Lloyds Register of Shipping
LR Type Approval Certificate
Certificate No: 97/00047
Model: DN40, DN65



Bureau Veritas
Type Approval Certificate
Certificate No: 2207 3457 C10 H
Model: DN40, DN65



Registro Italiano Navale
Rina
Type Approval
Certificate No: MAC/057/94
Model: DN65



American Bureau of Shipping
List of Type Approved Equipment
Page 25.
Certificate No: 96-WM10305-X
Model No: DN40, DN65

Product Approvals

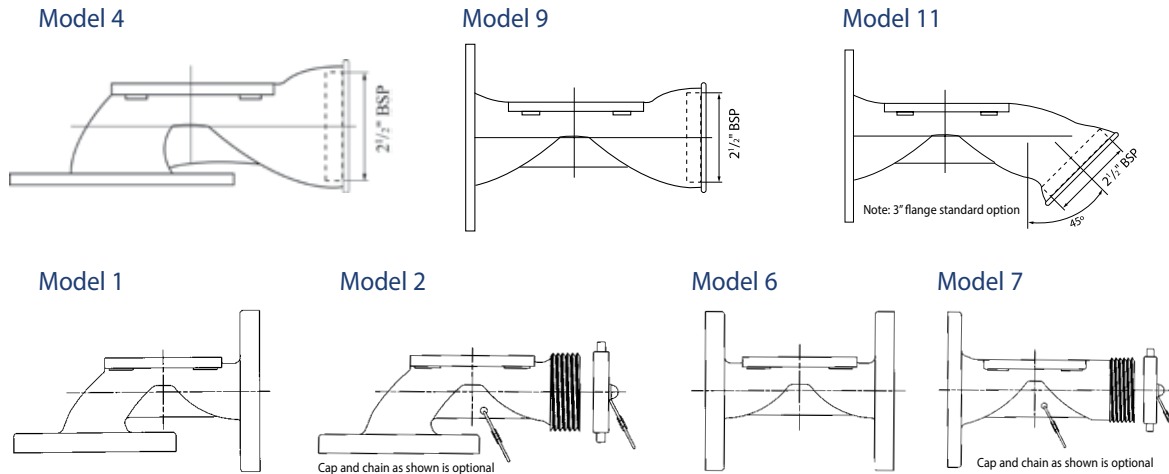
The whole fire hydrant valve has successfully undergone a high-temperature resistance test (1000°F for 20 minutes), BS 5041 Part 1, audited by a Lloyds Surveyor.

WFB TYPE - BODY AND DIAPHRAGM

Body

WFB valves are available in SG iron or gunmetal providing high mechanical strength and resistance to accidental impact. Gunmetal bodies provide superior corrosion resistance, even on highly-demanding applications.

Saunders® provides different WFB valve designs with both female and male end connections for different applications. Additionally, couplings and chains e.g. Morris Instantaneous coupling for the female screwed ends, are available.



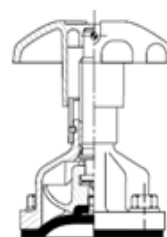
Diaphragm

The diaphragm separates the working parts of the valve from the line media, so there is no chance of internal corrosion of the valve, which is the main cause of fire valve failure.



Diaphragm	Composition	Applications
286	CSM(Chlorosulfonated Polyethylene)	Fire resistant diaphragm specifically designed for fire application valves.
226	FKM (Fluoroelastomer)	This diaphragm (not fire resistant) is a perfect solution for wash decks, with great resistance to lubricating oils and fuel.

Top Works



Standard bonnet - Rising handwheel with indicator
All valve sizes

WFB TYPE - FULLY ASSEMBLED VALVE

Body Material Options and Weights

Body Materials	Size (IN)	Models						
		1	2	4	6	7	9	11
Gunmetal	1½	-	✓	✓	-	✓	✓	-
Gunmetal or SG Iron	2½	✓	✓	✓	✓	✓	✓	✓

Body Materials	Size (IN)	Weight (lbs) / Model		
		4	9	11
Gunmetal	1½	19.4	18.7	21.6
	2½	22.7	22.0	25.4
SG Iron	2½	18.5	17.4	21.6



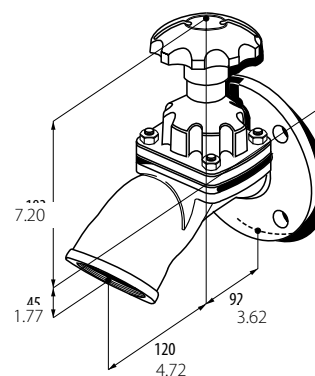
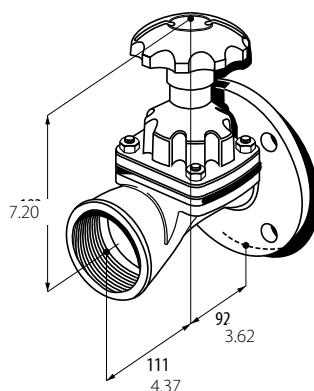
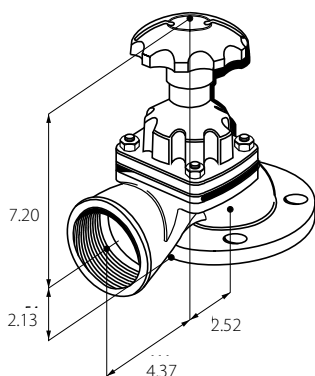
Model 4 with body and bonnet material in SG iron



Model 9 with body and bonnet material in gunmetal



Model 11 with body and bonnet material in gunmetal



All dimensions are specified in inches.

Pressure testing: Saunders® WFB valves tested in accordance with the BS5041 standard i.e. body strength test to 326 psi, seat test to 239 psi (1.1 x maximum working pressure).

SPECIAL VERSIONS

Saunders® environmental protective coating has been developed specifically to provide unrivaled corrosive resistance in the industrial processing industry. The green Tefzel™ coating is applied before the injection moulding of PFA or ETFE lining, using an electrostatic powder coating method. By coating the valve body, bonnet and hand wheel, both internal and external corrosive protection is maximized to provide peace of mind in extreme corrosive material processing applications. Available in ¾"-8" with PFA lining and ¾"-6" with ETFE lining.

High vacuum duty valves are designed for use down to 10⁻⁵ Torr. Vacuum grade diaphragms contain extra nylon reinforcement for sizes (4") and above, as well as a steel stud (not brass) as standard for all sizes. Available for C, 300 & 425 grade diaphragms.

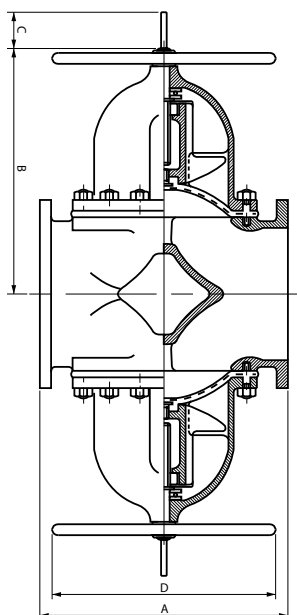
Halar® (ECTFE – ethylene chlorotrifluoroethylene) lining (dark grey) prepared using an electrostatic powder method demonstrates excellent resistance to mineral and oxidising acids, inorganic bases, salts and alcohols, and some resistance to aliphatic and aromatic hydrocarbons. Available in all sizes.

Large "double weir" valves in sizes 16", 18" and 20" are available and consist of two 12" or 14" bodies and bonnets (see table below). Please contact Saunders® for more information. Note: these valves are not suitable for use with Group 1 (dangerous) gases.

Size (IN)	A	B	C (Travel)	D
16"	29.53	29.53	7.48	27.56
18"	29.53	29.53	7.48	27.56
20"	29.53	30.71	9.06	27.56

Note: Dimensions in inches

Valve Sizes	
16"	Fitted with two 12" bonnets
18"	Fitted with two 12" bonnets
20"	Fitted with two 14" bonnets



Schematic of large size double weir valves.



Tefzel® coated ETFE lined A type valve

NX CHECK VALVE - FEATURES

Saunders® NX Check Valve

Drilled to suit BS 10 Table D,
EN 1092-2 PN10/16 and ASME
B16.1 Class 125

Lining is cost effective to allow
the use of these valves in the
most challenging applications,
avoiding exotic alloys

Instructions on casting
indicate the direction of
the flow

Full bore design minimizes
turbulence, preventing
damage of the pipeline

One way disc design ensures
close at 5 psi back pressure

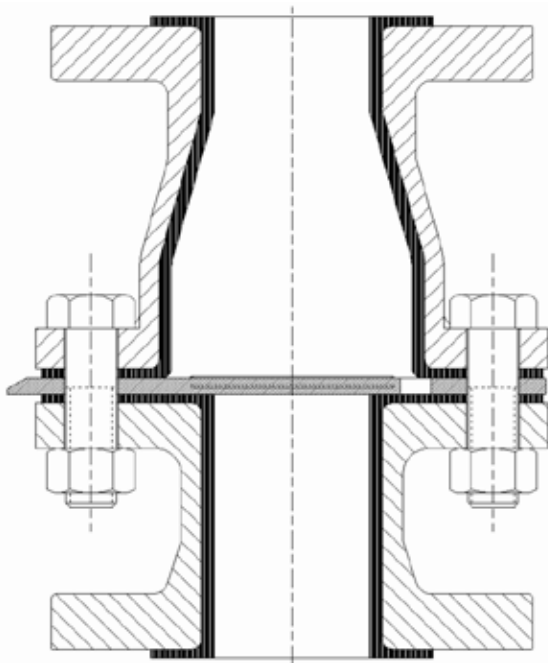
The disc is manufactured as
one piece, ensuring minimal
maintenance costs

Phosphate and alkyd finish is
applied to the valve to reduce
atmospheric corrosion

**NX is the check valve of choice: a full bore, non return
valve capable of handling corrosive media and slurries**

NX CHECK VALVE - ASSEMBLED VALVE DIMENSIONS

A simple one-part disc is the only moving part in the Saunders® NX check valve. This simplicity assists in guaranteeing a long and maintenance-free life in the prevention of reverse flow leakage. The Saunders® NX can be used in vacuum conditions and up to a line pressure of 102 psi. It prevents flow reversal for pressures ≥ 5 psi, ensuring 100 % shut off with repeated reliability.



Body

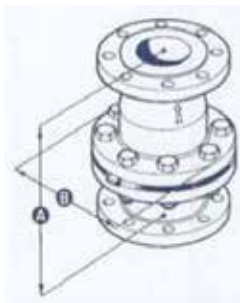
- Cast iron
- SG iron hard rubber lined

Disc

- Rubber coated steel

Seat

- Cast iron
- SG iron hard rubber lined



	A - Overall Length (in)		B - Overall Diameter (in)
Size (IN)	Cast Iron	Rubber	All Specifications
1	5.91	6.18	4.88
1 ½"	7.09	7.32	5.87
2"	7.87	8.03	6.38
3"	10.24	10.43	8.50
4"	13.78	14.02	11.61
6"	15.75	15.98	12.87

Standards

BS EN 12334 — Design standard

BS 10 Table D — Flanged body ends

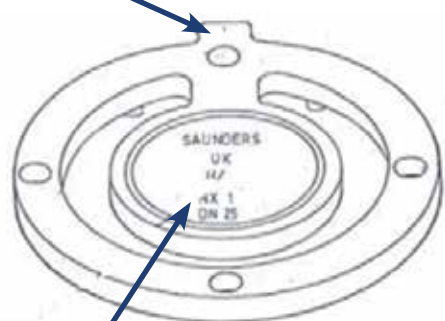
EN 1092-2 PN10/16 — Flanged body ends

ASME B16.1 Class 125 — Flanged body ends

For other rubber lining material options, please contact Saunders®.

NX CHECK VALVE - DISC TYPE & FLOW COEFFICIENTS

Grade



Date

Disc	Composition	Applications	Temperature
226	FKM (Fluoroelastomer)	Sulfur cured. Specially recommended for applications involving gases at high temperature, concentrated acids, aromatic solvents, low concentrated chlorine solutions, ozone and unleaded petroleum.	23°F to 302°F
300	Butyl (Isobutylene isoprene)	Sulphur cured with carbon black reinforcement. It is a great solution for diluted acids and alkalis, drinking water and abrasive applications like phosphoric acid in low concentration.	-22°F to 212°F

Weights with reference to HRL model

Size (IN)	Weight (lbs)
1"	8.8
1 ½"	15.0
2"	19.0
3"	33.1
4"	66.1
6"	110.2

Flow coefficients

Body material/ lining	Cast Iron unlined		SG Iron rubber lining	
Size (IN)	Cv	Kv	Cv	Kv
1"	28	24	25	22
1 ½"	79	68	71	61
2"	135	117	121	105
3"	285	247	256	221
4"	486	420	437	378
6"	811	702	729	631

Cv = flow in US gal/min through a valve at $\Delta P = 1$ psi

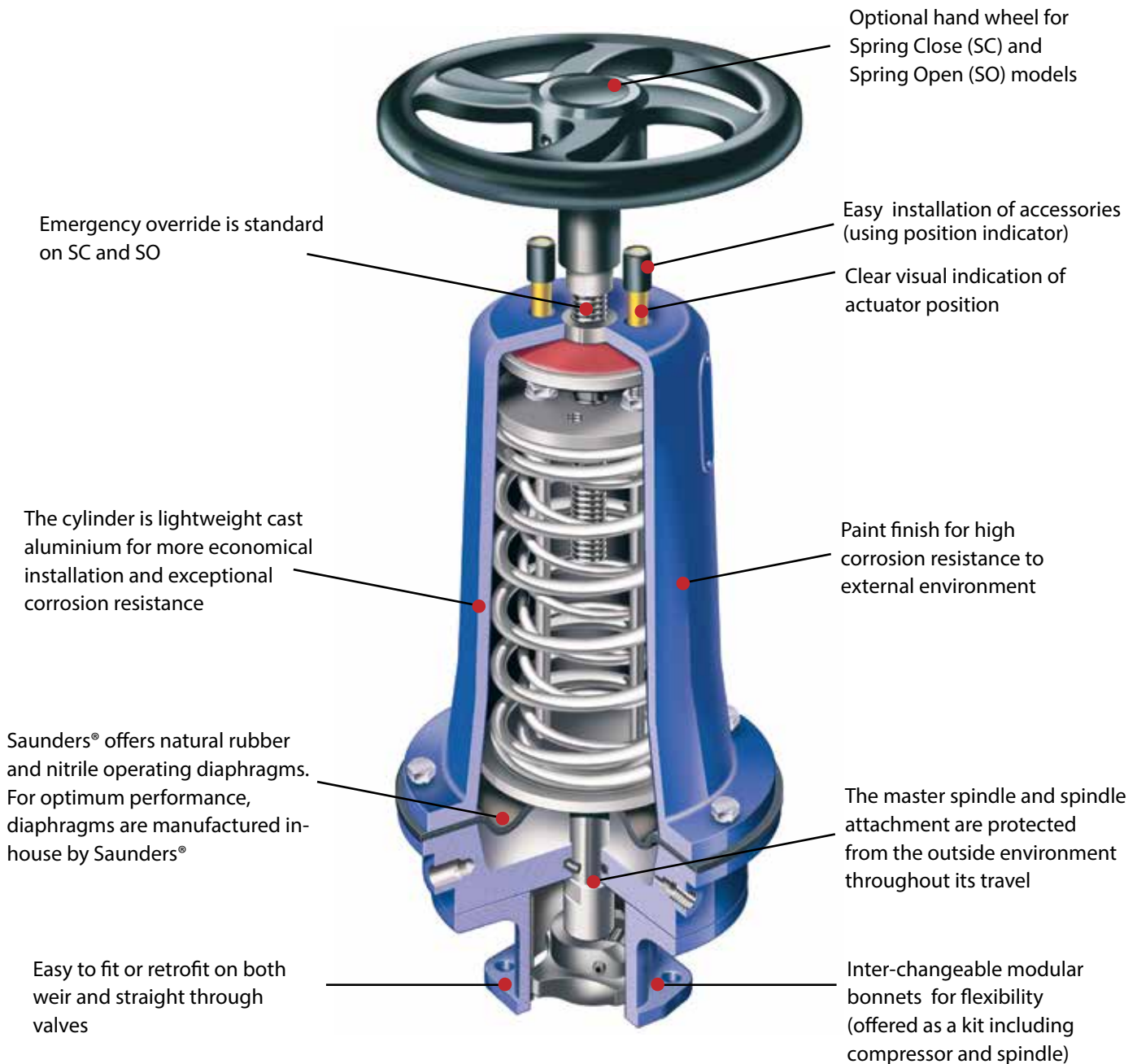
Kv = flow in m³/hr through a valve at $\Delta P = 1$ bar

$$1.156 \text{ Kv} = \text{Cv}$$

Note: The flow coefficient provides a measure of the flow of a valve. It is defined as the volume flow of water at a controlled temperature and a given pressure drop across the valve. This coefficient allows engineers to compare flow capacities of valves of different sizes, types and manufacturers.



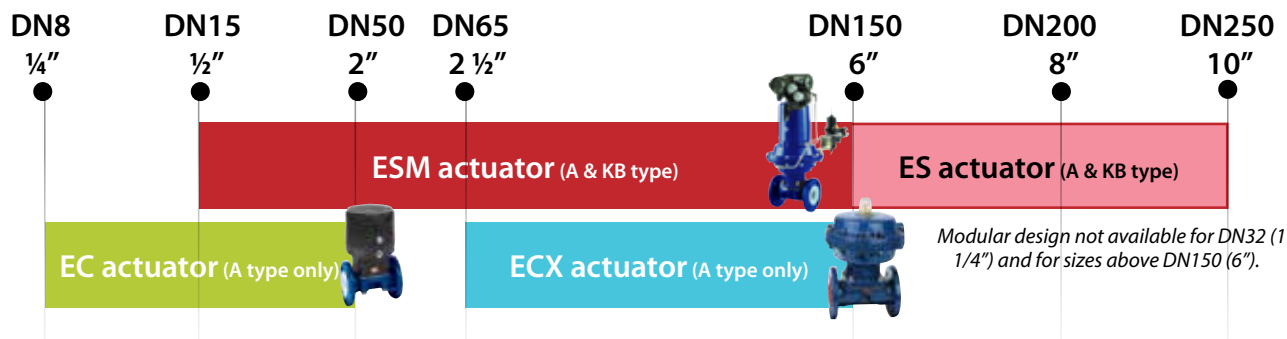
ACTUATION - ES MODULAR DESIGN



Wide range of actuators that provide reliable remote control

ACTUATION - MODEL RANGE AND MODES OF OPERATION

When manual operation is inadequate or inconvenient, Saunders® offer a variety of actuators covering valve sizes up to DN250 (10"), for different line and operating pressure options. We offer three different actuators, designed for various characteristic performances.



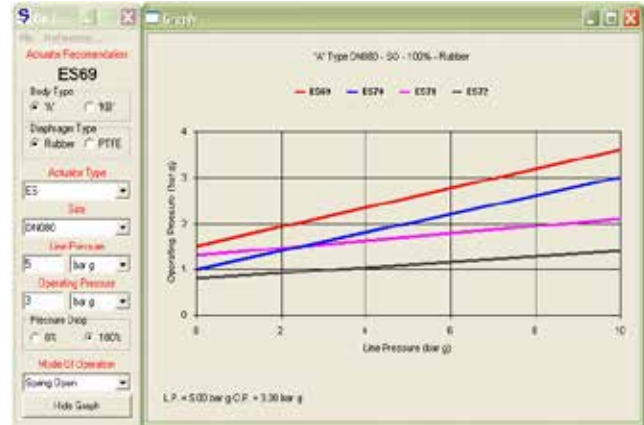
EC	ECX	ES Modular
<ol style="list-style-type: none"> 1 Compact piston style actuator 2 Spring packs to suit pressure requirements 3 Polyethersulfone (PES) bonnet 4 Versatile and robust design 5 Temperature range of -14 °F to 212 °F ambient (autoclave maximum 302 °F) 	<ol style="list-style-type: none"> 1 Diaphragm operated actuator, a compact extension to the EC size range 2 Comprehensive spring packs for a wide range of pressures 3 Full range of accessories 4 Light weight silicon aluminium housings 5 Durable paint coating for environmental protection 	<ol style="list-style-type: none"> 1 Diaphragm operated actuator, modular design for flexibility 2 Adjustable spring tension to optimize closure force and maximize diaphragm life 3 Full range of accessories 4 Light weight silicon aluminium housings 5 Durable paint coating for environmental protection

	Spring Close (SC)	Spring Open (SO)	Double Acting (DA)
Mode of operation	Closes the valve against line pressure in the event of failure (or intended shutoff) of operating pressure to the actuator.	Opens the valve to allow line fluid to flow in the event of failure (or intended shutoff) of operating pressure to the actuator.	Operating pressure opens and closes the valve. Requires a lock up valve to retain the position preceding the failure.
Normal use	When valve is usually in the closed position (to avoid using a constant supply of operating pressure).	When valve is usually in the open position (to avoid using a constant supply of operating pressure).	When a failsafe mode is not required.

-sizing your actuator

To be able to properly size the actuators you will need the following information:

- 1 **Valve Type** A or KB type
- 2 **Diaphragm Type** Rubber or PTFE diaphragm
- 3 **Actuator Type** EC, ECX, or ES
- 4 **Valve Size** Typically the same size as the pipe system
- 5 **Line Pressure** Pressure in the pipeline that the actuator needs to close
- 6 **Operating Pressure** Pressure available in the system to operate the valve
- 7 **Pressure Drop** As represented in figure below, there are two extreme options (0 % or 100 % pressure drop)



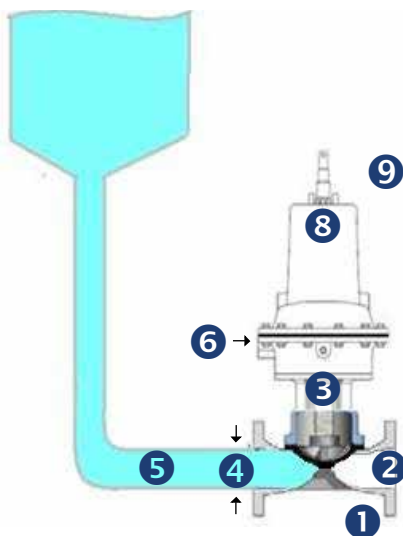
Saunders® On/Off Actuation Selection Software

To use this software, you simply enter your process data into the selection boxes. The program then sizes the actuator to suit your specific requirements.

- 8 **Actuator Mode** Spring Close, Spring Open, Double Acting
- 9 **Accessories** Solenoid valves, switchboxes, positioners, limit stops, etc

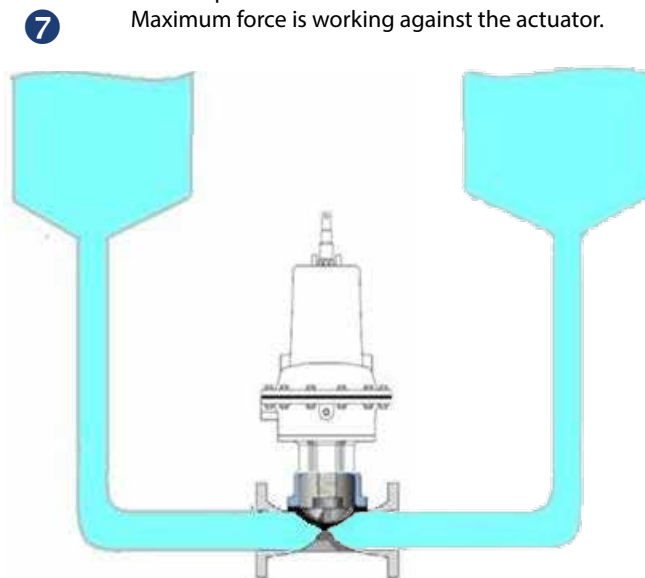
100 % Pressure Drop

The line pressure is on one side of the weir only. This is the most common service condition.

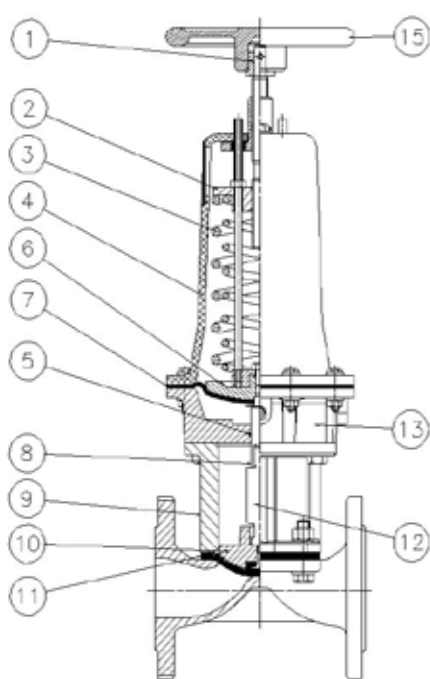


0 % Pressure Drop

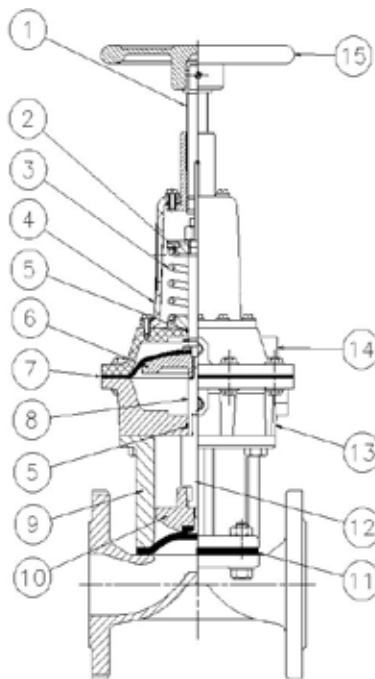
The line pressure is on both sides of the weir. Maximum force is working against the actuator.



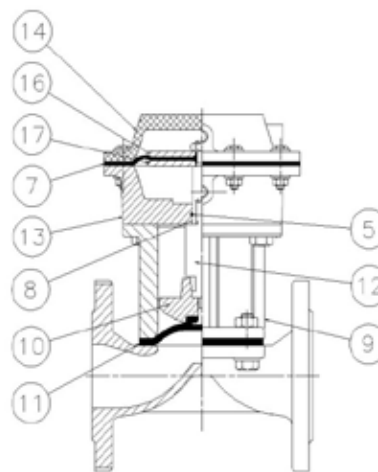
ESM/ES ACTUATORS



Spring Close



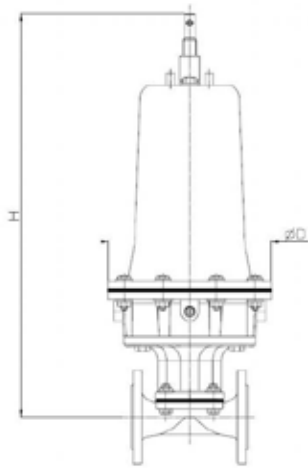
Spring Open



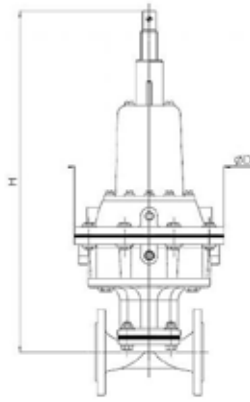
Double Acting

Item	Component	Material		
		Spring Close	Spring Open	Double Acting
1	Handwheel spindle	Mild steel		
2	Upper spring plate	Mild steel		
3	Spring	Steel		
4	Cover	Silicon aluminium		
5	Cylinder "O" ring	Nitrile		
6	Diaphragm plate	SG Iron		
7	Operating diaphragm	Rubber		
8	Master spindle	Stainless steel		
9	Bonnet	Cast Iron		
10	Compressor	Cast Iron		
11	Line diaphragm	Rubber or PTFE		
12	Spindle attachment	Stainless steel		
13	Lower cylinder	Silicon aluminium		
14	Upper cylinder	Silicon aluminium		
15	Handwheel	Cast Iron		
16	Upper diaphragm plate	-	-	Mild steel
17	Lower diaphragm plate	-	-	Mild steel

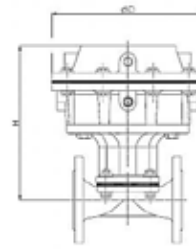
ESM/ES ACTUATORS



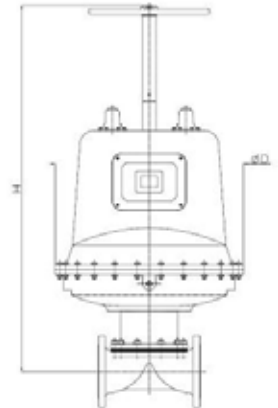
ESM (SC)



ESM (SO)



ESM (DA)



ES66

The table below shows the diameter/width and the maximum height of the actuator from the centre of the valve flange or pipeline.

Note: Dimensions are based on unlined bodies and bare shaft actuators. Add-on handwheel dimensions are displayed in the adjacent table.

Actuator Model	Add-on
68/69/70	+0.55"
61/62/63	+0.55"
71/64	+0.71"

For all ES (non-modular) actuators, dimensions include handwheel add-on as it is provided as standard.



Dimensions

	Actuator Model	D (in)	H (in) – A type valves													H (in) – KB type valves												
			IN ½	IN ¾	IN 1	IN 1¼	IN 1½	IN 2	IN 2½	IN 3	IN 4	IN 5	IN 6	IN 8	IN 10	IN 1	IN 1¼	IN 1½	IN 2	IN 2½	IN 3	IN 4	IN 5	IN 6	IN 8			
Spring Close	ESM61	6.65	16.06	16.26	16.65	15.35	17.13	18.19 ¹	-	-	-	-	-	-	-	18.90	18.90	18.90	-	-	-	-	-	-	-	-		
	ESM62	10.24	-	-	18.23	17.76	18.74	19.80	19.76	19.84 ¹	-	-	-	-	-	20.35	20.35	20.35	20.55	21.50	-	-	-	-	-			
	ESM63	12.44	-	-	-	-	-	28.39	28.82	28.94	29.88 ¹	-	-	-	-	-	-	29.29	30.08	31.14	32.28	-	-	-	-			
	ESM64	16.73	-	-	-	-	-	-	-	31.02	31.85	32.60	35.39	-	-	-	-	-	-	33.23	34.25	34.57	37.28	-	-			
	ESM65	21.61	-	-	-	-	-	-	-	-	39.84	40.94	43.54	-	-	-	-	-	-	-	46.30	42.87	45.47	-	-			
	ES66	29.53	-	-	-	-	-	-	-	-	-	-	-	57.44	60.20	62.56 ¹	-	-	-	-	-	-	-	59.49	60.20			
Spring Open	ESM68	6.65	15.04	14.84	15.31	13.82	15.79	16.85	-	-	-	-	-	-	-	20.55	20.55	20.55	-	-	-	-	-	-	-			
	ESM69	10.24	-	-	19.57	15.79	20.12	21.14	21.10	21.18	-	-	-	-	-	21.85	21.85	21.85	22.05	22.87	-	-	-	-	-			
	ESM70	12.44	-	-	-	-	-	30.43	30.83	30.94	31.89	-	-	-	-	-	-	-	31.30	32.05	33.11	33.82	-	-	-			
	ESM71	16.73	-	-	-	-	-	-	-	-	30.83	32.36	34.57	-	-	-	-	-	-	-	32.83	33.78	32.99	-	-			
	ESM72	21.61	-	-	-	-	-	-	-	-	34.61	35.71	38.35	-	-	-	-	-	-	-	-	37.60	36.81	40.71	-			
	ES73	29.53	-	-	-	-	-	-	-	-	-	-	-	38.50	48.66	49.02 ¹	-	-	-	-	-	-	-	52.64	49.76			
Double Acting	ESM54	10.24	6.14	6.38	6.73	5.12	7.20	8.19	-	-	-	-	-	-	-	8.98	8.98	8.98	-	-	-	-	-	-	-			
	ESM55	12.44	-	-	8.74	7.48	9.25	10.28	10.28	10.31	-	-	-	-	-	10.98	10.98	10.98	11.18	12.01	-	-	-	-	-			
	ESM56	16.73	-	-	-	-	-	12.05	12.32	12.40	13.35	-	-	-	-	-	-	-	13.03	13.78	15.00	15.98	-	-	-			
	ESM57	21.61	-	-	-	-	-	-	-	-	14.06	15.16	17.76	-	-	-	-	-	-	-	15.59	16.57	15.79	19.69	-			
	ESM58	25.59	-	-	-	-	-	-	-	-	15.08	16.18	18.78	-	-	-	-	-	-	-	-	17.60	16.81	20.71	-			

Existing ES actuator only

¹ PTFE diaphragm not available - rubber diaphragm only

D = Actuator diameter/width H = Actuator height

ESM/ES ACTUATORS

Head Volumes

Model	Head Volume (in ³)												
	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"	10"
ESM 54/61/68	9	10	12	14	16	20	-	-	-	-	-	-	-
ESM 55/62/69	-	-	70	83	87	91	96	102	-	-	-	-	-
ESM 56/63/70	-	-	-	-	-	176	186	198	210	-	-	-	-
ESM 57/64/71	-	-	-	-	-	-	-	405	425	454	478	-	-
ESM 58/65/72	-	-	-	-	-	-	-	-	700	700	910	-	-
ES 66/73	-	-	-	-	-	-	-	-	-	-	-	3000	3000

Weights

Assembled weight (lbs) – Head, bonnet, attachment and compressor

		A type valves													KB type valves											
Spring Close	Model	IN ½	IN ¾	IN 1	IN 1¼	IN 1½	IN 2	IN 2½	IN 3	IN 4	IN 5	IN 6	IN 8	IN 10	IN 1	IN 1¼	IN 1½	IN 2	IN 2½	IN 3	IN 4	IN 5	IN 6	IN 8		
	ESM61	15.7	15.7	16.5	17.6	17.6	19.6 ¹	-	-	-	-	-	-	-	19.0	19.0	19.0	-	-	-	-	-	-	-		
	ESM62	-	-	37.5	41.9	39.7	41.9	44.1	46.3 ¹	-	-	-	-	-	41.9	41.9	41.9	44.1	44.1	-	-	-	-	-		
	ESM63	-	-	-	-	-	75.0	75.0	79.4	81.6 ¹	-	-	-	-	-	-	-	75.0	77.2	81.6	88.2	-	-	-		
	ESM64	-	-	-	-	-	-	-	163.1	167.6	176.4	196.2	-	-	-	-	-	-	169.8	172.0	183.0	202.8	-			
	ESM65	-	-	-	-	-	-	-	-	269.0	277.8	297.6	-	-	-	-	-	-	-	-	271.2	282.2	302.0	-		
	ES66	-	-	-	-	-	-	-	-	-	-	760.6	859.8	970.0 ¹	-	-	-	-	-	-	-	-	771.6	870.8		
	Spring Open	ESM68	12.3	12.8	13.0	15.4	14.3	16.1	-	-	-	-	-	-	-	15.7	15.7	15.7	-	-	-	-	-	-	-	
ESM69		-	-	30.9	28.7	30.9	33.1	35.3	37.5	-	-	-	-	-	33.1	33.1	33.1	35.3	37.5	-	-	-	-	-		
ESM70		-	-	-	-	-	59.5	61.7	63.9	68.3	-	-	-	-	-	-	-	61.7	61.7	66.1	72.8	-	-	-		
ESM71		-	-	-	-	-	-	-	-	119.0	127.9	147.7	-	-	-	-	-	-	-	123.5	123.5	134.5	-	-		
ESM72		-	-	-	-	-	-	-	-	163.1	172.0	191.8	-	-	-	-	-	-	-	-	167.6	178.6	198.4	-		
ES73		-	-	-	-	-	-	-	-	-	-	-	760.6	859.8 ¹	-	-	-	-	-	-	-	-	-	771.6		
Double Acting	ESM54	9.3	9.7	9.9	11.7	11.0	13.0	-	-	-	-	-	-	-	19.0	19.0	19.0	-	-	-	-	-	-	-		
	ESM55	-	-	24.3	20.7	26.5	28.7	30.9	33.1	-	-	-	-	-	33.1	33.1	33.1	35.3	37.5	-	-	-	-	-		
	ESM56	-	-	-	-	-	46.3	48.5	50.7	55.1	-	-	-	-	-	-	-	48.5	50.7	55.1	59.5	-	-	-		
	ESM57	-	-	-	-	-	-	-	-	108.0	116.8	136.7	-	-	-	-	-	-	-	110.2	110.2	123.5	143.3	-		
	ESM58	-	-	-	-	-	-	-	-	158.7	167.6	187.4	-	-	-	-	-	-	-	-	160.9	174.2	194.0	-		

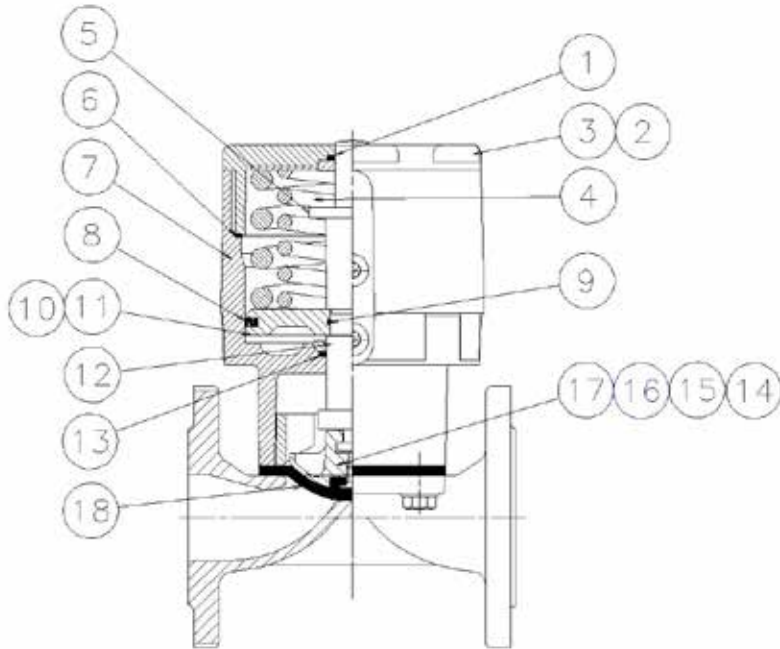
Existing ES actuator only

¹ PTFE diaphragm not available - rubber diaphragm only

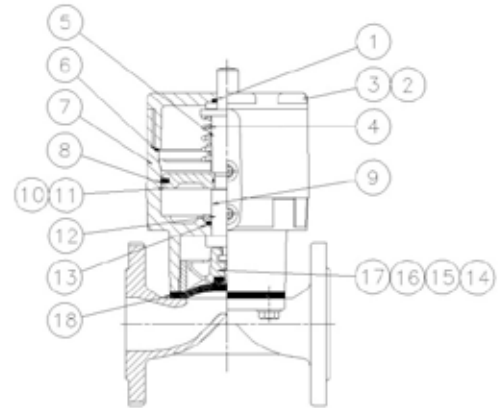
		ES 53/60/67 ²	ESM 54/61/68	ESM 55/62/69	ESM 56/63/70	ESM 57/64/71	ESM 58/65/72	ES 66/73
Operating Diaphragm (catalogue code)	Natural rubber (Q grade)	VS00867RD1	VS01568RD1	VS04069RD1	VS06570RD1	VS08071RD1	VS12572RD1	VS20073RD1
	Nitrile rubber (C grade)	VS00867RD2	VS01568RD2	VS04069RD2	VS06570RD2	VS08071RD2	VS12572RD2	VS20073RD2

² Obsolete models (codes provided for replacement spares purposes only)

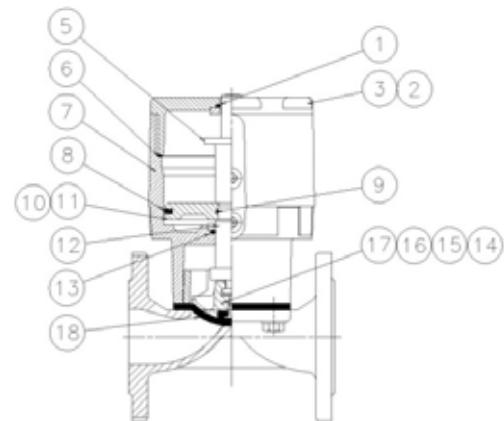
EC ACTUATORS



Spring Close



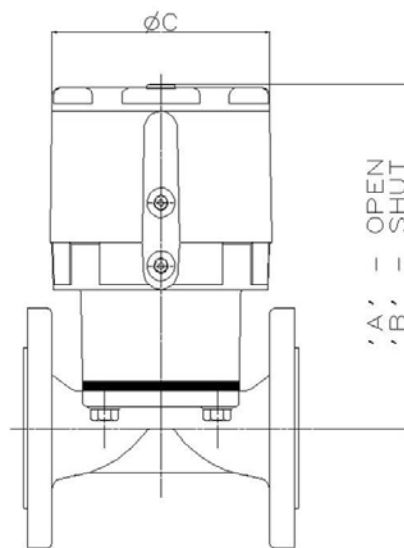
Spring Open



Double Acting

Item	Component	Material			Size Range (IN)
		Spring Close	Spring Open	Double Acting	
1	Indicator seal	Viton			-
2	Cap	IXEF			1½"-2"
3		PES			¼"-1"
4	Spring	Steel			-
5	Indicator	IXEF			-
6	Bonnet/cap o-ring	Nitrile			-
7	Bonnet	PES			-
8	Piston outer seal	Viton			-
9	Piston inner seal	Nitrile			-
10	Piston	IXEF			1½"-2"
11		PES			¼"-1"
12	Spindle	PES			-
13	Spindle seal	Viton			-
14	Compressor	Silicon aluminium			½"-2"
15		Silicon aluminium			1½"-2"
16		Mild steel			½"-1"
17		Mazak			¼"- "
18	Line diaphragm	Rubber or PTFE			-

EC ACTUATORS



- A - Actuator height (open)
- B - Actuator height (closed)
- C - Actuator diameter/Width

All dimensions are based on unlined bodies.

The table below shows the diameter/width and maximum height of the actuator from the centre of the valve flange or pipeline.

Dimensions & Volumes

		Dimensions (in)					
		¼"	½"	¾"	1"	1½"	2"
Spring Open, Spring Close, Double Acting	A	4.41	5.00	6.30	6.34	8.82	9.45
	B	4.33	4.80	5.98	6.06	8.27	8.66
	C	2.28	2.76	4.06	4.06	6.02	6.02
Upper Head Volume (in³)	(to Close)	1.3	3.0	13	13	60	61
Lower Head Volume (in³)	(to Open)	0.5	1.0	3.8	3.8	15	21

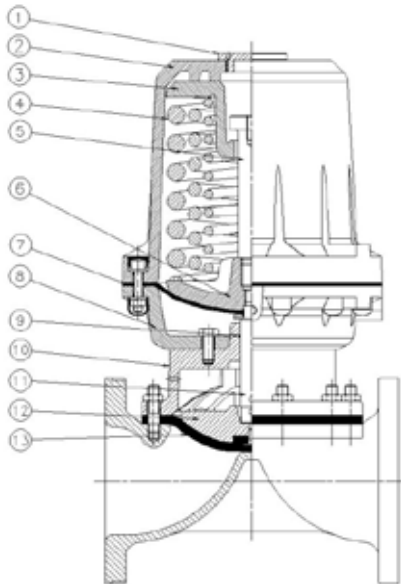
Weights

		Weight (lbs)					
		¼"	½"	¾"	1"	1½"	2"
Spring Close, Spring Open, Double Acting		0.64	1.10	3.09	3.31	8.82	10.80
		0.55	1.01	2.43	2.87	6.39	7.05
		0.53	0.99	2.20	2.65	5.95	6.61

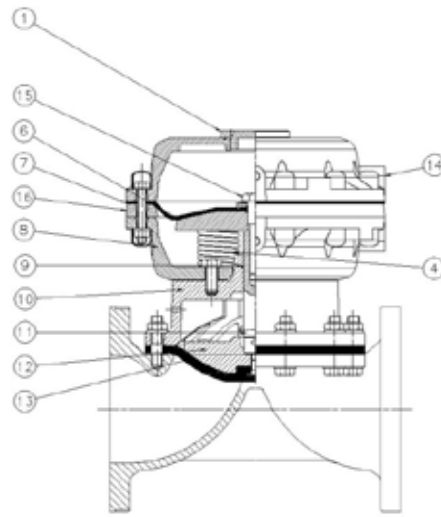
Air Connections

All EC actuator air inlet parts are 1/8" BSP or 1/8" NPT

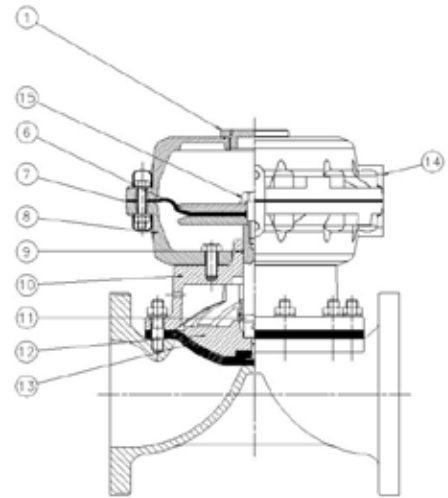
ECX ACTUATORS



Spring Close



Spring Open

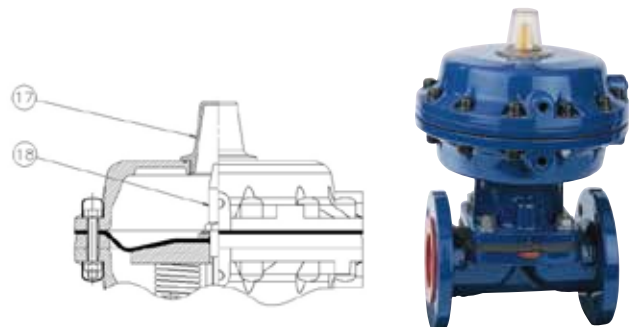


Double Acting

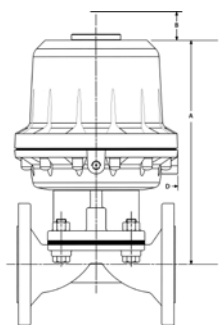
Item	Component	Material		
		Spring Close	Spring Open	Double Acting
1	Cover plug	Mild steel		
2	Cover	Aluminium alloy	—	—
3	Upper spring plate	SG Iron	—	—
4	Spring	Steel		
5	Spring retaining bolt	Mild steel	—	—
6	Diaphragm plate	Forged steel		
7	Operating diaphragm	Rubber		
8	Lower cylinder	Silicon aluminium		
9	Bonnet o-ring	Rubber or PTFE		
10	Bonnet	SG Iron		
11	Spindle	Stainless steel		
12	Compressor	SG Iron		
13	Line diaphragm	Rubber		
14	Upper cylinder	—	Silicon aluminium	
15	Spindle screw	—	Steel	
16	Spacer ring	—	Silicon aluminium	—

Visual Indicator		
Item	Component	Material
17	Indicator cover	Polycarbonate
18	Indicator	Polypropylene

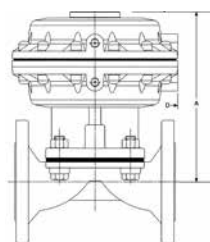
Note: The visual indicator is an optional extra on the ECX



ECX ACTUATORS



ECX (SC)



ECX (SO and DA)

There are seven models in the ECX range, split into three modes of operation: Spring Close (SC), Spring Open (SO) and Double Acting (DA).

For all the SC versions, five different spring packs are available (eg. F1 to F5). The number denotes the strength of the spring pack, 1 being the weakest and 5 the strongest.

H - Actuator Height

D - Actuator Diameter/Width

The following table shows the maximum height and the diameter of the actuator from the centre of the valve flange or pipeline.

Dimensions & Volume

	Model	H - Height (in)					D - Diameter (in)					Head Volume (in ³)
		2 1/2"	3"	4"	5"	6"	2 1/2"	3"	4"	5"	6"	
Spring Close	Models F	14	15	16	-	-	10	10	10	-	-	118
	Models G	16	17	18	-	-	10	10	10	-	-	118
	Models H	-	-	23	23	23	-	-	14	14	14	264
Spring Open	Models S	10	11	12	-	-	10	10	10	-	-	128
	Models H	-	-	14	15	15	-	-	-	14	-	343
Double Acting	Models S	10	11	12	-	-	10	10	10	-	-	130 (Open) 147 (Close)
	Models H	-	-	14	15	15	-	-	14	14	14	326 (Open) 317 (Close)

	Model	Weight (lbs)				
		2 1/2"	3"	4"	5"	6"
Spring Close	Models F1-F3	48.1 - 64.2	60.0 - 70.1	72.5 - 78.3	-	-
	Models G1-G3	51.8 - 77.2	57.8 - 83.1	74.7 - 91.3	-	-
	Models H1-H3	-	-	114.2 - 152.1	120.8 - 158.7	164.7 - 191.8
Spring Open	Models S	28.0	35.9	44.1	-	-
	Models H	-	-	81.1	88.8	107.6
Double Acting	Models S	28.0	34.2	43.0	-	-
	Models H	-	-	75.6	83.3	101.4

Air Connections and Operating Diaphragms

		Models F, G and S	Model H
Operating diaphragm (catalogue code)	Natural rubber (Q grade)	VS04069RD1	VX150HxRD1
	Nitrile rubber (C grade)	VS04069RD2	VX150HxRD2
Air connections (air inlet ports)		1/4" BSP	

All dimensions are based on unlined bodies.



ACTUATION ACCESSORIES

Accessories								
Model	Size Range	Valve type	Material	Solenoid	Switchbox	Positioner	Air Filter	Handwheel
ES	1/2" - 10"	A, KB	SiAl ⁽¹⁾	✓	✓	✓	✓	✓
EC	1/4" - 2"	A	PES ⁽²⁾	✓	✓	✓	✗	✗
ECX	2 1/2" - 6"	A	SiAl ⁽¹⁾	✓	✓	✗	✓	✗

⁽¹⁾ SiAl – Silicon-Aluminium

⁽²⁾ PES – Polyethersulfone

✓ Available

✗ Unavailable



007 Switchbox

Modular switch-boxes are available for the ES Modular actuator range.

Offering a wide range of both mechanical and proximity switches as well as other options, i.e. ASi-interface.



Shown mounted to ESM Actuator

ES Positioner

Provides precise control of the flow through the valve. This long life corrosion resistant range suits a wide variety of applications with reliability and accuracy. Available as pneumatic, electro-pneumatic, intrinsically safe and explosion proof, together with a variety of feedback options. A digital option is also available.



Opti-SET

Economical, compact and lightweight switchbox suitable for the EC actuator. Self setting, which minimizes validation/set-up time, it is available with mechanical or proximity switches including an intrinsically safe option.



Mini Positioner

For control application using an EC actuated valve, Saunders® offers pneumatic, electropneumatic and digital inputs with sensor feedback option and linear mounting design providing a compact control solution.



Saunders® I-VUE

The Saunders® I-VUE is a compact intelligent valve sensor that provides accurate and reliable valve position feedback. It is suitable for EC or ECX actuated valves. Key Features and Benefits:

- Available as Point-to-Point or with network capabilities (ASi and DeviceNet)
- Highly accurate electronic sensing technology to continuously monitor valve position.
- Self Setting (without entry) feature that facilitates setting and programming of switch without opening the enclosure.



MODULE Switchbox

This module switchbox option is available for EC and ECX actuator ranges. The switchbox offers a wide range of mechanical and proximity sensors with space for up to 4 switches, integral solenoid valve and ASi interface (which can be retrofitted).



Solenoid valves

A wide range of locally mounted banjo solenoid valves can be fitted to the Saunders® actuator range with a manual override position and various hazardous area classifications. The solenoid range is designed to cover all requirements.

Other control options available upon request. Please, contact Saunders® for more information

CATALOGUE CODES

A Weir Type Valves

Size	Body Type/Spare Type	Body Material & Lining	Length & Flange
Example: 050	33	06	A
Size	Valves	Body Material & Lining	Length & Flange
1/4 008	Screwed Ends 22	Bronze Gunmetal 03	US Length ANSI 125/150 A
3/8 010	Socket Weld 23	Cast Iron 04	EN 558 Series 7 ANSI 125/150 B
1/2 015	Butt Weld 24	SG - Ductile Iron 05	Socket Weld C
3/4 020	Flanged - Unlined 33	Stainless Steel 06	DIN - ND10 D
1 025	Flanged - Lined 34	Cast Steel 07	DIN - ND10 4 bolt E
1 1/4 032	Spares	Soft Rubber Lined 21	DIN Length ANSI 125/150 F
1 1/2 040	Spare Diaphragm S1	Hard Natural Lined (Ebonite) 22	BS4504 PN10/16 W
2 050	Spare Bonnet H1	Neoprene Lined 23	BS4504 ANSI 125/150 X
2 1/2 065	Spare Actuator T1	Butyl Lined 24	API / NPT S
3 080	Spare Body B1	Glass Lined 32	BS21 Rp T
4 100		Polypropylene Lined 48	
5 125		ETFE Lined 49	
6 150		PVDF Lined 50	
8 200		PFA Lined 52	
10 250		PFA Lined (SS Body) 56	
12 300		ETFE Lined, Fluoropolymer coated 63	
14 350		PFA Lined, Fluoropolymer coated 67	

K & KB Straight Through Type Valves

Size	Body Type/Spare Type	Body Material & Lining	Length & Flange
Example: 080	55	04	A
Size	KB Valves	Body Material & Lining	Length & Flange
1/2 015	Screwed API 44	Bronze Gunmetal 03	US Length ANSI 125/150 A
3/4 020	Flanged - Unlined 55	Cast Iron 04	EN 558 Series 7 ANSI 125/150 B
1 025	Flanged - Lined 56	SG - Ductile Iron 05	DIN - ND10 D
1 1/2 040	KB Spares	Stainless Steel 06	DIN - ND10 4 bolt E
2 050	Spare Diaphragm S2	Cast Steel 07	DIN Length ANSI 125/150 F
2 1/2 065	Spare Bonnet H2	Soft Rubber Lined 21	BS4504 PN10/16 W
3 080	Spare Actuator T2	Hard Natural Lined (Ebonite) 22	BS4504 ANSI 125/150 X
4 100	Spare Body B2	Neoprene Lined 23	API / NPT S
5 125	K Valves	Butyl Lined 24	BS21 Rp T
6 150	Flanged - Unlined 58	Glass Lined 32	
8 200	Flanged - Lined 59		
10 250	K Spares		
12 300	Spare Diaphragm S3		
14 350	Spare Bonnet H3		
	Spare Actuator T3		
	Spare Body B3		

CATALOGUE CODES



Topworks

11R

Manual Bonnets		Actuated	
Rubber Diaphragms		ES Modular	
Handwheel Non-Indicating	10R	DA for Rubber Diaphragm	402-406
Rising Handwheel Indicating	11R	SC for Rubber Diaphragm	502-506
Sealed Bonnet Indicating	13R	SO for Rubber Diaphragm	602-606
Bronze Gunmetal	14R	DA for PTFE Diaphragm	422-426
Locking Bonnet	27R	SC for PTFE Diaphragm	522-526
Sliding Spindle Bonnet	31R	SO for PTFE Diaphragm	622-626
Stainless Steel	36R	EC	
Fluoropolymer Coated	48R	DA for Rubber Diaphragm	EC1
PTFE Diaphragms		SC for Rubber Diaphragm	EC2
Handwheel Non-Indicating	10T	SO for Rubber Diaphragm	EC3
Rising Handwheel Indicating	11T	DA for PTFE Diaphragm	EC4
Sealed Bonnet Indicating	13T	SC for PTFE Diaphragm	EC5
Bronze Gunmetal	14T	SO for PTFE Diaphragm	EC6
Locking Bonnet	27T	SC for Rubber Diaphragm 4 bar	EC7
Sliding Spindle Bonnet	31T	SC for PTFE Diaphragm 4 bar	EC8
Stainless Steel	36T		
Fluoropolymer Coated	48T		

Note:
DA = Double Acting
SC = Spring Close
SO = Spring Open

Diaphragm

HT

PTFE	
PTFE/Butyl (214/300)	P1
PTFE/EPM (214/425)	P2
PTFE/Fluoroelastomer (214/226)	P3
PTFE/PVDF/EPM (214K/425)	P7
TFM/EPM (214S/425)	S5
Fluoroelastomer	
V1	226
Natural Rubber	
Q1	Q
Butyl	
D1	300
DV	300 vac
Nitrile	
C1	C
CV	C vac
EPM	
E2	425
EV	425 vac
CSM (formerly Hypalon)	
U1	237
Neoprene	
HT	HT

Accessories

-

If accessories are required indicate: XX
Accessory detail to be coded separately.

Topworks

11R

Manual Bonnets		Actuated	
		ES Modular	
Handwheel Non-Indicating	10R		
Rising Handwheel Indicating	11R	402-406	DA
Sealed Bonnet Indicating	13R	502-506	SC
Locking Bonnet	27R	602-606	SO
Sliding Spindle Bonnet	31R		

Note:
DA = Double Acting
SC = Spring Close
SO = Spring Open

Diaphragm

AA

Fluoroelastomer	
V1	226
Natural Rubber	
AA	AA
Butyl	
D1	300
Nitrile	
C1	C
EPM	
E2	425
CSM (formerly Hapalon)	
U1	237
Neoprene	
HT	HT

Accessories

-

If accessories are required indicate: XX
Accessory detail to be coded separately.



CATALOGUE CODES

WFB Type Valves

Example: **065** — **17** — **04** — **11R** — **U2**

Size		Valves		Body Material		Manual Bonnets Rubber Diaphragms		Fluoroelastomer CSM (formerly Hypalon)	
1½	040	Model 1	11	Bronze Gunmetal	03	Rising Handwheel Indicating	11R	V1	226
2½	065	Model 2	12	Cast Iron	04	Bronze Gunmetal	14R	U2	286 Fire
		Model 4	13						
		Model 6	14						
		Model 7	15						
		Model 9	16						
		Model 11	17						
		Spares							
		Spare Diaphragm	S4						
		Spare Bonnet	H4						
		Spare Body	B4						

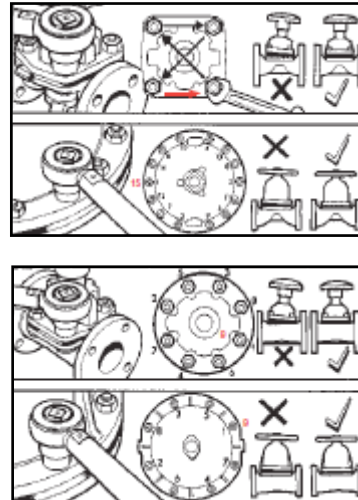
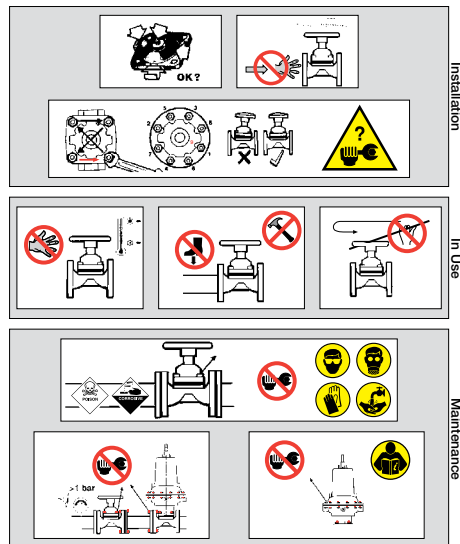


STORAGE, INSTALLATION, OPERATION & MAINTENANCE

Saunders Diaphragm Valves

Key Safety Instructions for Storage, Installation, Operation and Maintenance

Note: For glass lined valves see instruction leaflet 35502



A leaflet detailing key instructions for safe storage, installation, operation and maintenance is supplied with each Saunders diaphragm valve. An excerpt of such a leaflet is shown above.

Storage

Diaphragms

To achieve a long shelf life, we recommend all spare operating and line diaphragms are stored in bags on wooden shelves, away from direct sunlight and ozone (which can be formed by electrical equipment). Leave diaphragms in the provided Saunders® packing until required. To avoid deformation, do not place other articles on top of the diaphragm.

Bodies

Lined bodies supplied as spares will also be fitted with a protective cover across the weir face flange. Keep these protective caps and covers in position until valve/body is installed.

Complete valves

Where possible, store weir type valves (A, and WFB types) in the open position and straight through type valves (K and KB types) in an almost closed position (this retains the line diaphragm in an unstressed position). For power-actuated valves, release spring tension where appropriate. All lined valves are supplied with protective end caps. Special Note: Seal unlined valve ends with paper (especially if stored at ground level on flange face) to reduce the possibility of dirt/moisture ingress.

Check valve and body/lining for:

- correct material
- physical damage
- correct open/closed function
- cleanliness/ freedom from foreign matter
- diaphragm grade for service suitability (or check with Saunders® directly if in doubt)
- body/bonnet fastenings for tightness (see recommended bolting torques)

Installation

Ensure that the valves are properly aligned and the connecting pipework is adequately supported to prevent undue stress. Installing valves near bends, pumps or misaligned pipework should be avoided. According to manufacturing best practices, the valve should be located a minimum of 6 x D the pipe diameter from any bend or pump. Ensure that the intended service conditions are within the pressure/temperature rating of the valve as stated in our catalogue. Where there is an appropriate application standard or code of practice, it is the responsibility of the purchaser to ensure that equipment is compliant.

STORAGE, INSTALLATION, OPERATION & MAINTENANCE

Centralise the diaphragm as follows:

- Fit diaphragm in its natural position i.e. A types – open, KB type – closed
- Mount the bonnet onto the valve body and tighten bolts finger tight.
- Fully close the valve and tighten to 3/4 of final torque value in the correct sequence ensure indent of the first and second lines is the same
- Open valve to allow the diaphragm to regain its natural moulded position i.e. weir types – fully open, straight through types – two turns from fully closed.
- Fasten to recommended torque in the correct sequence.

Before commissioning, the system must be thoroughly flushed through to remove all traces of foreign matter such as rust, pipescale, beads of welding metal etc., which could cause damage to the valve seating faces. Before putting the valve into service, ensure that the bonnet nuts of all valves are correctly adjusted to provide seal to atmosphere (see torque application table).



During the first 24 hours in service, further adjust the bonnet nuts to follow up any relaxation of the diaphragm.

Use

The mechanical efficiency of the handwheel, spindle threads and other bonnet components of Saunders valves is such that normal manual effort is sufficient to give leak-tight closure against the recommended working pressures.

Never use a wrench or pipe lever on the handwheel for closure

Maximum recommended working pressures are based on the assumption that the operator will have reasonable access to the valve. If the valve will not operate in either the open or closed positions, isolate, drain the system and service. Follow the Saunders® guide to speeds of operation, for power actuators. Valve opening load is concentrated on the diaphragm stud which can be loosened by a heavy, instantaneous opening or closing load. For this reason, Saunders® do not recommend the use of self-fitted direct solenoid operators. Do not overclose the valve.

Excessive closure forces can reduce diaphragm life. Valves sizes 8" and above are provided with grease nipples for spindle, spindle nut, and bonnet neck bearing lubrication. Lubricate these valves in the open position. Rising handwheel indicator bonnets have a grease reservoir packed for long life. Lubricate spindle and spindle nut of other non-rising handwheel designs during diaphragm change. Information on recommended lubricants is available from

Saunders®. Using a special bonnet design complying with the appropriate safety design standards, Saunders® can also offer chainwheel operated valves.

Inspection / service / maintenance

Valves should be periodically inspected for corrosion, wear, damage and leakage. This may be performed in line by removal of the bonnet assembly and diaphragm. Cleaning and replacement of the diaphragm, and any damaged part, other than the body, may also be carried out at this time. Full inspection/service/maintenance, including replacement of the body, must be carried out with the valve removed from the line.

Torque Application

This should be carried out at installation or when maintenance is required, using a torque wrench set to the values in the table below. Nuts should be tightened in the correct sequence, as indicated below.



For glass lined products, please refer to the appropriate glass lined figures below.

Size (IN)	Unlined, Plastic & Rubber lined				Glass Lined Product			
	Weir Type 'A'		Straight Through Type 'KB'		Weir Type 'A'		Straight Through Type 'KB'	
	lbf. ft	Nm	lbf. ft	Nm	lbf. ft	Nm	lbf. ft	Nm
1/4"	2.2	3						
3/8"	3	4						
1/2" & 3/4"	5	6.6	5	6.6	3.7	5	3.7	5
1"	6	8	11	15	4.4	6	8.1	11
1 1/4"	8	11	11	15	5.9	8	8.1	11
1 1/2"	13	17	12	16	9.6	13	8.8	12
2"	24	33	24	33	18.4	25	18.4	25
2 1/2"	35	47	30	40	25.8	35	22.1	30
3"	49	67	44	60	36.9	50	33.2	45
4"	39	53	39	53	29.5	40	29.5	40
5"	44	60	39	53	33.2	45	29.5	40
6"	79	107	79	107	59	80	59	80
8"	96	130	96	130	73.7	100	73.7	100
10"	107	145	107	145	81.1	110	81.1	110
12"	122	165	122	165	92.1	125	92.1	125
14"	122	165	122	165	92.1	125	92.1	125
16"	122	165						
18"	122	165						
20"	122	165						

* The specified 3/4 of maximum torque value is a non-critical value used in order to hold the diaphragm in position until the valve is opened and the full torque applied.

A link to an animation depicting the correct diaphragm replacement procedure is available on the Saunders section of the Crane ChemPharma & Energy website.

NOTES



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