



**INVENTORS OF THE ORIGINAL DIAPHRAGM VALVE -  
PERFECTED BY POLYMER EXPERTS WITH IN-HOUSE MANUFACTURING**

**SAUNDERS®**  
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 90 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

'Integrated stud compared to earlier stud design results in 50% cost in maintenance reduction'

'All products come with corrosion resistant coatings, displaying excellent scratch resistance also for body and bonnets

- PTFE and modified PTFE diaphragms
- Glass and fluorocarbon linings
- Non-bonded PTFE diaphragm
- Compact pneumatic actuators
- Three layer diaphragm for corrosive-gas applications
- Introduction of the XE high performance diaphragms (resistant to both chemical and abrasive attack)
- 'Integrated stud compared to earlier stud design results in 50% cost in maintenance reduction'
- 'All products come with corrosion resistant coatings, displaying excellent scratch resistance also for body and bonnets

### 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 90 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.



#### Key Diaphragm Valve Features

- 1 The Science Inside®:** Proprietary diaphragm technology provides unique sealing solution and complete emissions control.
- 2 Unmatched Expertise & Innovation:** 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 capability to reduce plant down-time.

## 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 with up to 100% solids content

### 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

### Actuation - Modular or Compact Actuators

- Different actuator types that cover DN008 (1/4") to DN250 (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.

## 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.

## 5 Easy Maintenance

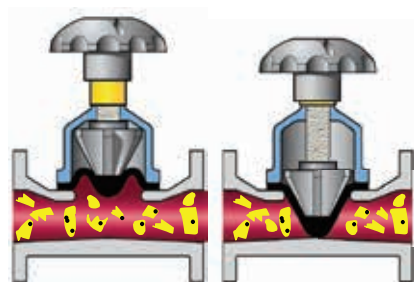
A three-part design allows maintenance and actuator retrofitting without removing the valve body from the pipeline. Overall, this results in lower cost of ownership compared to other valve types.

## 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.

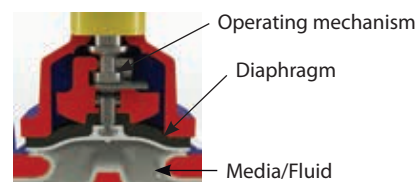
## 2 Abrasion Resistance

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.



## 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.

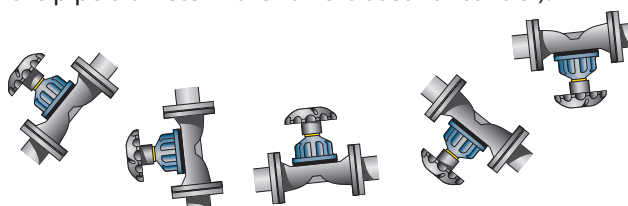


## 6 Suitable for Control

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

## 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).



Links to animations depicting the concepts discussed here are available on the SAUNDERS® section of the Crane ChemPharma & Energy website.

# Valve Comparison

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

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

Corrosion is estimated to cost worldwide industry more than 300 billion dollars every year. SAUNDERS® lined diaphragm valves are the best option to handle these media.

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

## ABRASIVE

SAUNDERS® KB valves are ideally designed for applications requiring a combination of corrosion and abrasion resistance, reliability and long service life.

- Fertilizers
- Titanium Dioxide
- Phosphate
- Copper Mining
- Gold Mining
- Sand
- Coal Slurry
- FGD
- Cement
- Ceramics
- Sewage
- Lithium Mining

## GENERAL INDUSTRY

The best solution for a wide range of water, air and gas applications.

- Water demineralization
- Marine
- Vegetable Oils
- Paints
- Fire Fighting
- Tanning
- Ultra Purified Water Application
- Automotive
- Gaseous effluents
- Fuels
- Food & Beverage
- Wastewater
- HVAC
- Compressed air and gases

Type	Applications	Body/Lining	Diaphragm
<b>C</b>	Strong Acids	ETFE, PVDF, PFA, Glass <sup>1</sup>	PTFE
<b>C</b>	Fine Chemicals and Chlor-alkali	Glass <sup>1</sup> , Wide range of rubbers and plastic linings	Fluoroelastomer, Chlorosulfonated polyethylene, PTFE
<b>C/A</b>	Mineral processing	Butyl, Soft rubber	Butyl, Natural rubber and the Ultimate XE <sup>2</sup>
<b>C/A</b>	Gypsum (FGD)	Butyl	Butyl, Ultimate XE <sup>2</sup>
<b>C/A</b>	Titanium dioxide	Glass, Butyl, Soft rubber	Butyl, Natural rubber
<b>C/A</b>	Fertilizers	Butyl, Polychloroprene	Butyl, Polychloroprene, Ultimate XE <sup>2</sup>
<b>C/A</b>	Pulp & Paper	Glass, Halar, Butyl	Butyl, Polychloroprene, Ultimate XE <sup>3</sup>
<b>A</b>	China clay	Butyl, Soft rubber	Natural rubber, Polychloroprene
<b>G</b>	Water demineralization, desalination, & sewage treatment	Hard rubber, Soft rubber, Butyl	Butyl, Polychloroprene, Butadiene Acrylonitrile
<b>G</b>	Marine, fire fighting <sup>3</sup>	SG Iron, Gunmetal	Chlorosulfonated polyethylene (fabric reinforced)
<b>G</b>	HVAC, utilities (air, water and gas lines) <sup>4</sup> , drinking water	Screwed/Flanged unlined valves in iron, stainless steel or gunmetal	EPDM, Butyl, Polychloroprene

**C** = Corrosive, **A** = Abrasive, **G** = General Industry

<sup>1</sup> 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.

<sup>2</sup> The Ultimate XE Diaphragm was specially developed for highly corrosive and abrasive applications.

<sup>3</sup> Used primarily as water hydrant valves.

<sup>4</sup> Used in copper or stainless steel piping in water, oxygen and other gases.

## 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, rubber diaphragm



PTFE diaphragm with rubber backing



KB Type, rubber diaphragm

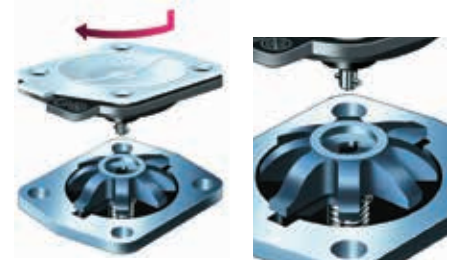


KE High Performance 3-layer diaphragm

### Fitments Features



Rubber diaphragms Screw fitment



PTFE diaphragms Bayonet fitment

**PROPRIETY  
MATERIAL**

**STRINGENT QUALITY  
CONTROLS**

**RELIABILITY, LONG LIFE AND  
SIMPLIFIED MAINTENANCE**

## Diaphragm Construction



- Appropriate choice of the finest raw materials and fabric reinforcements.
- Diaphragms constructed with multi-layers of rubber and reinforcement for maximum performance and durability.
- Studs attached with bonding adhesive and mechanical anchorage.
- Dual sealing ribs (across the weir and around the diaphragm periphery) for enhanced leak tight sealing capabilities and lower closure torque.
- Optimised thickness of diaphragms for superior flexing properties.

### PTFE Diaphragm



Two -piece diaphragm construction - PTFE face, with reinforced rubber backing - to increase pressure rating and durability.

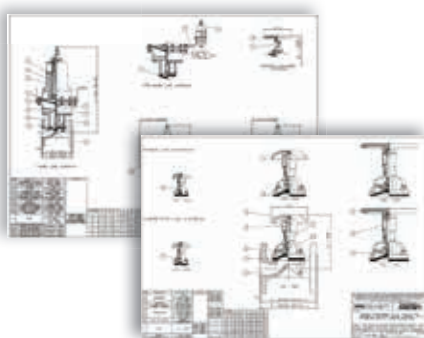
## Supporting Data And Certifications

### 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.



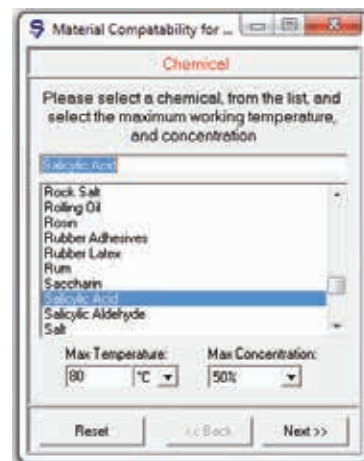
Data sheet index and typical valve information



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](http://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
- Environmental Management System – ISO 14001:2015
- 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 2014/68/EU
- WRAS (Water Regulations Advisory Scheme)
- Lloyd's Register of Shipping
- Lloyd's Register Type Approval System
- ATEX Directive (94/9/EC)
- Food & Drug Administration (FDA)



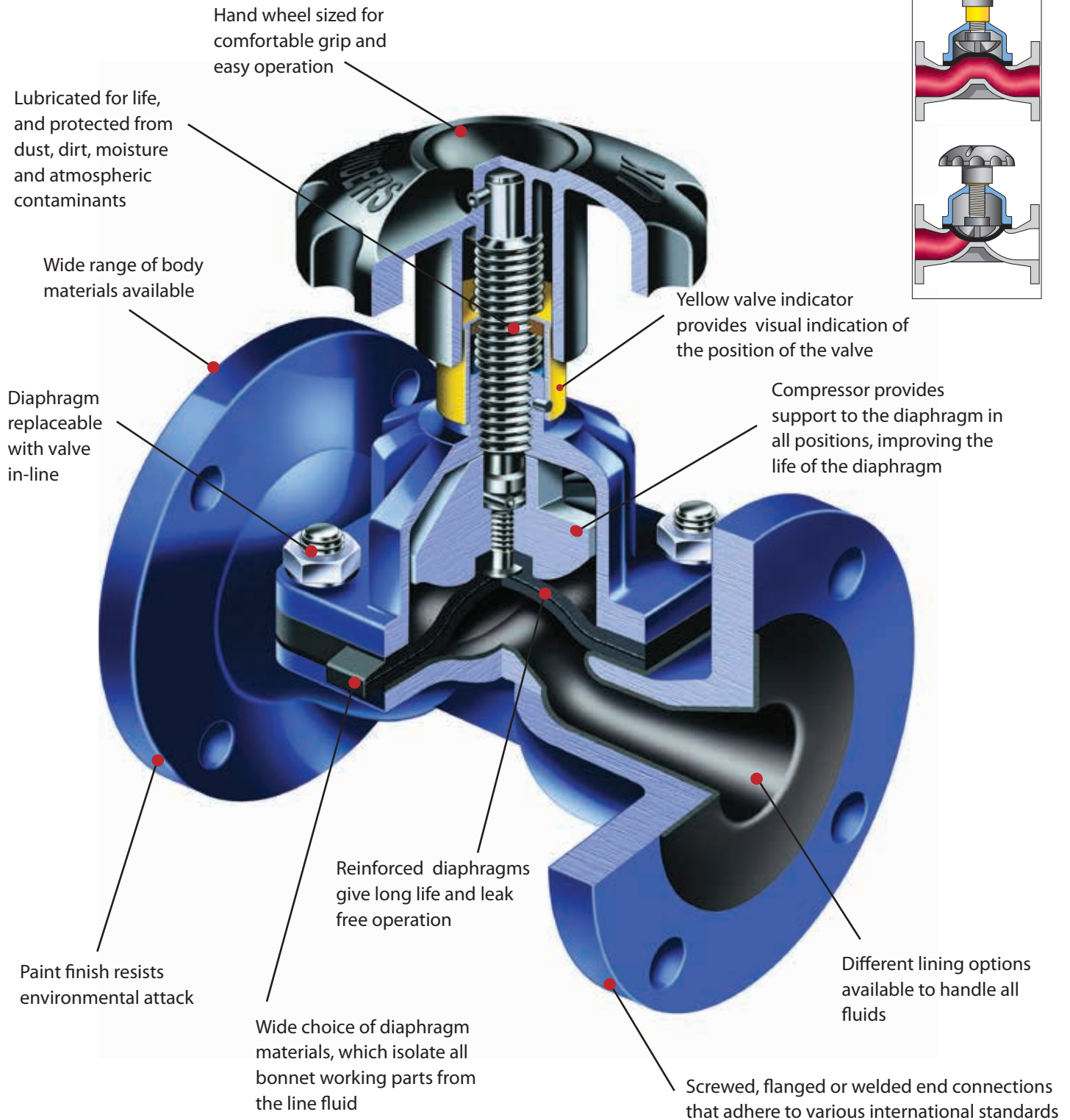
**RWTV**

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 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	1/2"-14" DN15-DN350	14°F to 347°F -10°C to 175°C
SG Iron	Screwed	BS EN1563	GJS-450-10	1/4"-2" DN8-DN50	14°F to 347°F -10°C to 175°C
	Flanged		GJS-400-18 <sup>1</sup>	1/2"-14" DN15-DN350	14°F to 347°F -10°C to 175°C
Cast Steel	Flanged	ASTM A216	WCB	1/2"-10" DN15-DN250	-22°F to 347°F -30°C to 175°C
Gunmetal	Screwed	BS EN1982	CC491K-GS	1/4"-3" DN8-DN80	-22°F to 347°F -30°C to 175°C
	Flanged		CC492K-GS	1/2"-8" DN15-DN200	-22°F to 347°F -30°C to 175°C
Stainless Steel	Screwed	BS EN10283	1.4408 <sup>2</sup>	1/4"-3" DN8-DN80	-22°F to 347°F -30°C to 175°C
	Flanged			1/2"-8" DN15-DN200	-22°F to 347°F -30°C to 175°C

<sup>1</sup> For some sizes GJS-400-18-LT grade is available with a low temperature limit of -20°C (-4°F)

<sup>2</sup> 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	1/2"-8" DN15-DN200	14°F to 347°F -10°C to 175°C
ETFE	SG Iron	1/2"-6" DN15-DN150	14°F to 302°F -10°C to 150°C
PVDF	SG Iron	3/4"-6" DN20-DN150	14°F to 257°F -10°C to 125°C
PP	SG Iron	3/4"-6" DN20-DN150	14°F to 185°F -10°C to 85°C

Glass	Cast Iron	1/2"-8" DN15-DN200	14°F to 347°F -10°C to 175°C
-------	-----------	-----------------------	---------------------------------

Butyl (Isobutylene Isoprene)	Cast Iron	3/4" - 14" DN20-DN350	14°F to 230°F -10°C to 110°C
	SG Iron		-22°F to 230°F -30°C to 110°C
	Cast Steel		14°F to 185°F -10°C to 85°C
HRL (Hard Natural Rubber)	Cast Iron	3/4" - 14" DN20-DN350	14°F to 185°F -10°C to 85°C
	SG Iron		-22°F to 185°F -30°C to 85°C
	Cast Steel		-22°F to 185°F -30°C to 85°C

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)



**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)



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

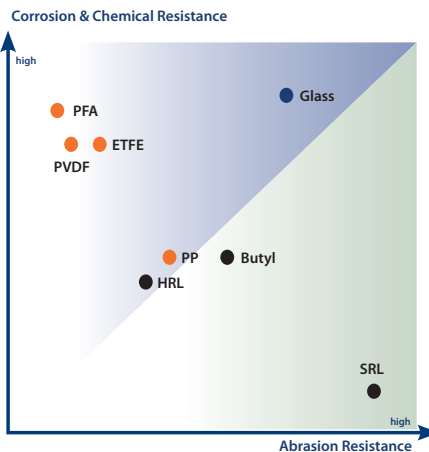


**PVDF** Polyvinylidene Fluoride – Suitable for mineral acids, salts in water, water and effluent treatment, additionally it is the best solution for wet chlorine gas or chlorine in water. (Black)

## 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)



## Rubber Lining



**HRL** Hard Natural Rubber (Ebonite) – 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)

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.

# Diaphragm Valves Type A Diaphragm

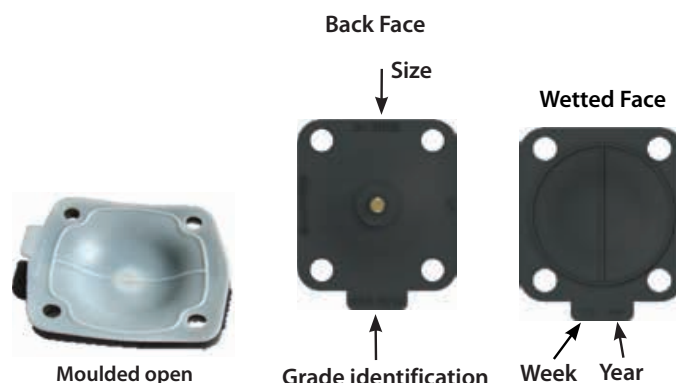
## A Type Diaphragm

Cat Code	Diaphragm	Composition	Size	Temperature
XB	300	Butyl (Isobutylene Isoprene)	All Sizes	-40°F to 226°F -40°C to 130°C
H1	237	CSM (Chlorosulfonated Polyethylene)	All Sizes	14°F to 212°F -10°C to 100°C
XE	XA or 425	EPDM (Ethylene Propylene Diene)	All Sizes	-40°F to 266°F -40°C to 130°C
N1	HT	Neoprene (Polychloroprene)	All Sizes	-22°F to 212°F -30°C to 100°C
XC	226	FKM (Fluoroelastomer)	All Sizes	23°F to 302°F -5°C to 150°C
C1	C	Nitrile (Butadiene Acrylonitrile)	All Sizes	-4°F to 212°F -20°C to 100°C
A2	Q	Natural Rubber	All Sizes	-58°F to 212°F -50°C to 100°C

PB	214/300	PTFE/Butyl	¼"-10" DN8-DN250	-4°F to 302°F -20°C to 150°C
PE	214/425	PTFE/EPM	¼"-10" DN8-DN250	-4°F to 320°F -20°C to 160°C
PC	214/226	PTFE/FKM	¼"-10" DN8-DN250	23°F to 347°F -5°C to 175°C
KE	214K/425	PTFE/PVDF/EPDM	½"-6" DN15-DN150	-4°F to 212°F -20°C to 100°C
KC	214K/226	PTFE/PVDF/FKM	½"-6" DN15-DN150	-5°F to 301°F -15°C to 150°C

## Diaphragm Identification

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.



## PTFE Diaphragm

**PB** - Used in strong acids and alkalis, and salts in water at high temperature. Sulfuric acid is a good example with temperatures up to 110°C (230°F) and concentrations up to 96 %.

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

**PC** - Strong acid, diluted chlorine, bromine solutions at low concentration.

**KC** - Three layer diaphragm with PTFE/PVDF/226, the best option for chlorine, bromine gas and chlorinated solutions. Strong acid, diluted chlorine, bromine solutions at low concentration.

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

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

**H1** - The best solution for sodium hypochlorite. Great with strong acids and low concentration chlorine gas. It is also oil resistant.

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

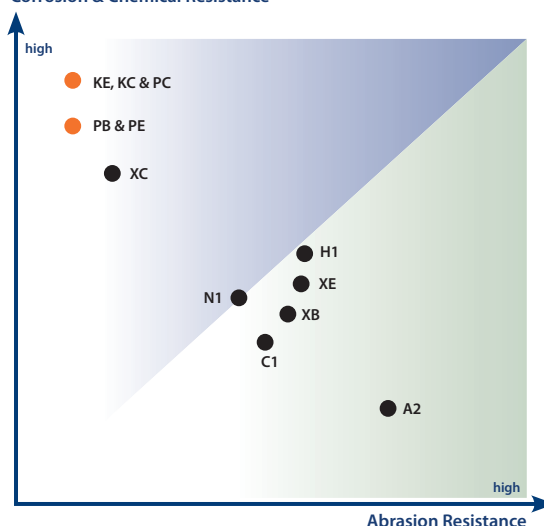
**N1** - Suitable for abrasive slurries containing hydrocarbons.

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

**C1** - Lubricating oil, cutting oils, paraffin, animal and vegetable oils, aviation kerosene at low temperatures. Cv is ideal for vacuum applications, where oils are present, e.g. (compressed air, acetylene gas, LPG).

**A2** - Salts in water, diluted acids and alkalis, and abrasive applications.

Corrosion & Chemical Resistance

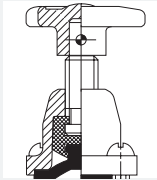


WRAS – Water Regulations Advisory Scheme

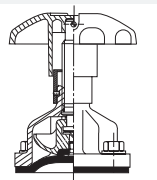
All rubber diaphragms have threaded brass fitments, except vacuum diaphragm (Cv, B1), which have steel fitments. PTFE diaphragms have a stainless steel bayonet fitment. KC Diaphragms use a Titanium stud.

# A Type - Top Works

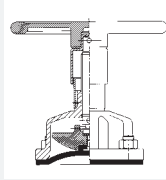
## Standard Range



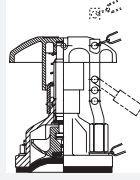
**Rising handwheel (2 bolt)**  
DN8 - DN10  
1/4" - 3/8"



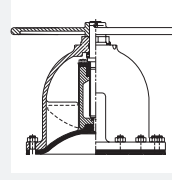
**Cast iron bonnet with rising plastic handwheel**  
DN15 - DN50  
1/2" - 2"



**Cast iron bonnet with rising metal handwheel**  
DN15 - DN150  
1/2" - 6"



**Rising handwheel with indicator (simple padlocking)**  
DN15 - DN150  
1/2" - 6"

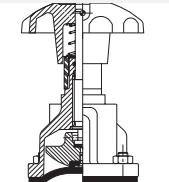


**Standard non-rising handwheel without indicator**  
DN200 - DN350  
8" - 14"

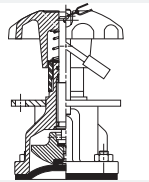


**Non-rising handwheel with indicator**  
DN200 - DN350  
8" - 14"

## High Performance

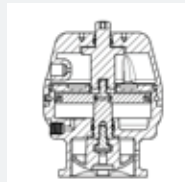


**Fluoroelastomer sealed with padlocking**  
DN15 - DN150  
1/2" - 6"

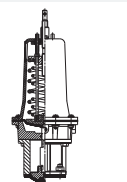


**Fluoroelastomer sealed bonnet**  
DN15 - DN150  
1/2" - 6"

## SAUNDERS® Actuation



**S360 actuators (spring close/spring open/double acting)**  
DN15 - DN50  
1/2" - 2"



**ESM/ES actuators (spring close/spring open/double acting)**  
DN15 - DN250  
1/2" - 10"

Note: Designs may vary across size range

For more details of actuation see pages 17-20

## Manual Valves Working Pressure & Temperature

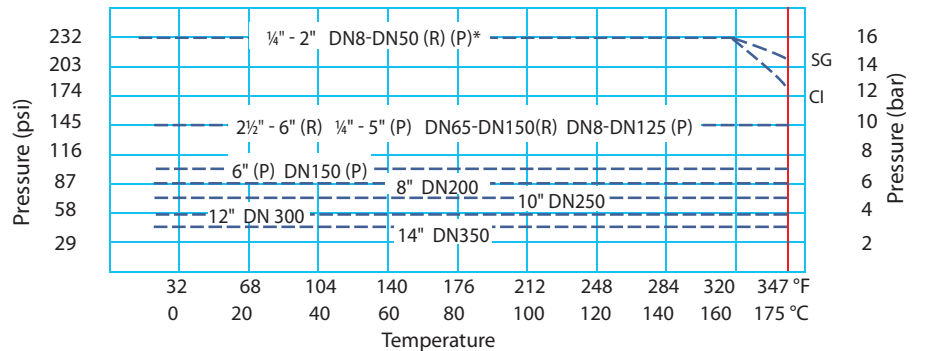
Maximum manual working pressures for SAUNDERS® A Type Diaphragm valves. For actuated valves, please refer to the appropriate datasheets

### Bonnet pressure limits

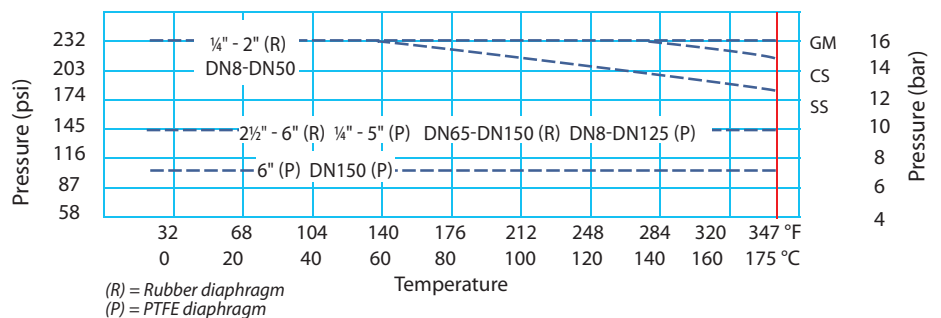
Diaphragm	Pressure (bar/psi)			
	Rubber		PTFE	
Handwheel	Rising	Non-Rising	Rising	Non-Rising
Size (DN/in)				
8	1/4"	16	232	
10	3/8"	16	232	
15	1/2"	16	232	
20	3/4"	16	232	
25	1"	16	232	
32	1 1/4"	16	232	
40	1 1/2"	16	232	
50	2"	16	232	
65	2 1/2"	10	145	
80	3"	10	145	
100	4"	10	145	
125	5"	10	145	
150	6"	10	145	
200	8"		6	87
250	10"		5	73
300	12"		4	58
350	14"		3.5	51

Note: For temperature rating, please refer to adjacent graphs.

### A Type Body Temperature/Pressure Relationship Cast Iron and SG Iron



### Carbon Steel, Stainless Steel & Gunmetal



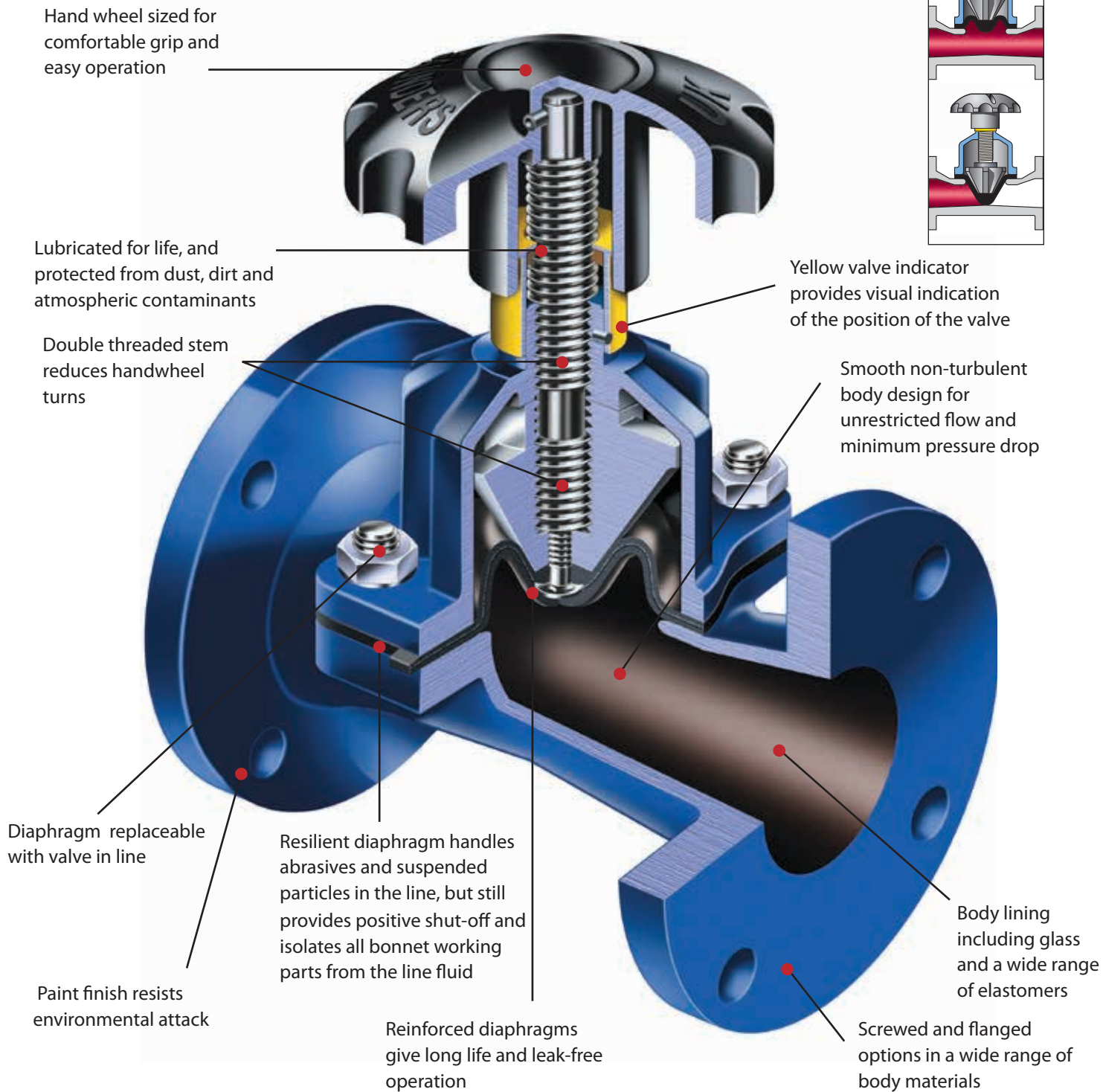
All SAUNDERS® valves are pressure tested in accordance with standard BS EN 12266-1.

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



## KB Type – Features

### SAUNDERS® KB Design



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

# KB 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" DN15-DN50	14 °F to 347 °F -10 °C to 175 °C
	Flanged			½"-14" DN15-DN350	
SG Iron	Screwed	BS EN1563	GJS-450-10	¼"-2" DN8-DN50	14 °F to 347 °F -10 °C to 175 °C
	Flanged		GJS-400-18 <sup>1</sup>	½"-14" DN15-DN350	
Gun Metal	Screwed	BS EN1982	CC491K-GS	½"-2" DN15-DN50	-22 °F to 347 °F -30 °C to 175 °C
	Flanged		CC492K-GS	½"-4" DN15-DN100	
Stainless Steel	Flanged	BS EN10283	1.4408 <sup>2</sup>	½"-10" DN15-DN250	-22 °F to 347 °F -30 °C to 175 °C

<sup>1</sup> For some sizes GJS-400-18-LT grade is available with a low temperature limit of 20 °C (-4 °F)

<sup>2</sup> 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 (145 psi).

### Lined Options - Flanged Bodies Only

Lining	Body Material	Size	Temperature
Butyl (Isobutylene Isoprene)	Cast Iron	1"-14" DN25-DN350	14 °F to 230 °F -10 °C to 110 °C
	SG Iron		
	Cast Steel		-22 °F to 230 °F -30 °C to 110 °C
Hard Natural Rubber (Ebonite)	Cast Iron	1"-14" DN25-DN350	14 °F to 185 °F -10 °C to 85 °C
	SG Iron		
	Cast Steel		-22 °F to 185 °F -30 °C to 85 °C
SRL (Soft Natural Rubber)	Cast Iron	1"-14" DN25-DN350	14 °F to 185 °F -10 °C to 85 °C
	SG Iron		
	Cast Steel		-22 °F to 185 °F -30 °C to 85 °C

Glass	Cast Iron	½" - 6" DN15-DN150	14 °F to 347 °F -10 °C to 175 °C
-------	-----------	-----------------------	-------------------------------------

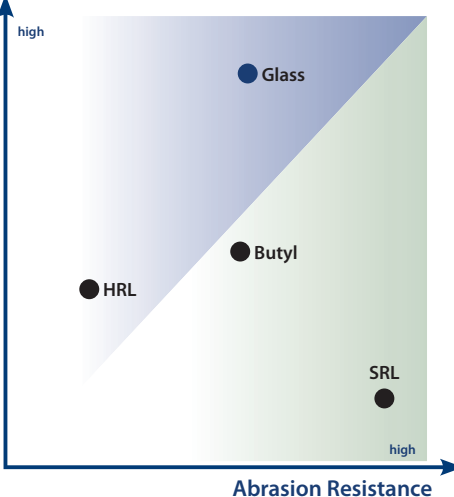
### Glass Lining

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)

### Corrosion & Chemical Resistance



### Rubber Lining

**HRL** Hard Natural Rubber (Ebonite) — 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.

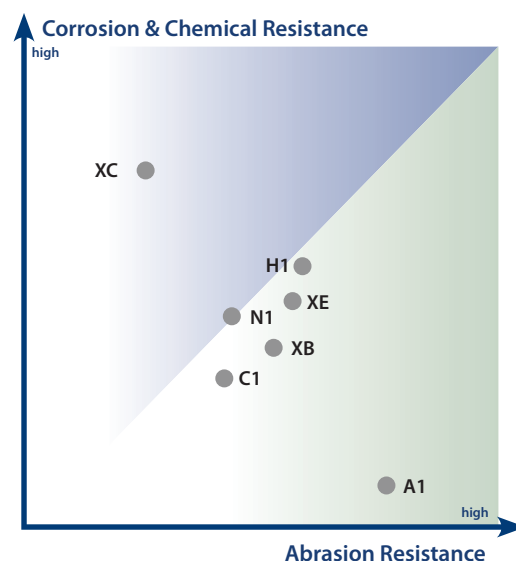
The nominal bore thicknesses of SAUNDERS® linings range from 1 to 5.5 mm, depending on lining material and valve size: glass 1 mm, rubber 2-4.5 mm and plastic 4-5.5 mm.

## KB Type – 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.

### Diaphragm Identification

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



### Rubber Diaphragm

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

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

**N1** - Suitable for abrasive slurries containing hydrocarbons.

**H1** - The best solution for sodium hypochlorite. Great with strong acids and low concentration chlorine gas. It is also oil resistant.

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

**C1** - Lubricating oil, cutting oils, paraffin, animal and vegetable oils and aviation kerosene at low temperatures.

**A1** - Excellent choice on abrasive applications such as slurries. The diaphragm has a light brown colour, and is sulfur cured.

### KB Type Diaphragm

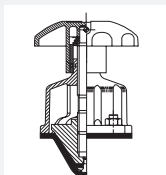
Cat Code	Diaphragm	Composition	Size	Temperature
XC	226	FKM (Fluoroelastomer)	1/2" to 12" DN15-DN300	23 °F to 302 °F -5 °C to 150 °C
A1	AA	Natural Rubber	All Sizes	-40 °F to 194 °F -40 °C to 90 °C
N1	HT	Neoprene (Polychloroprene)	All Sizes	-22 °F to 212 °F -30 °C to 100 °C
H1	237	CSM (Chlorosulfonated Polyethylene)	All Sizes	14 °F to 212 °F -10 °C to 100 °C
XB	300	Butyl (Isobutylene Isoprene)	All Sizes	-40 °F to 266 °F -40 °C to 130 °C
C1	C	Nitrile (Butadiene Acrylonitrile)	All Sizes	-4 °F to 212 °F -20 °C to 100 °C
XE	XA or 425	EPDM (Ethylene Propylene Diene)	All Sizes	-40 °F to 266 °F -40 °C to 130 °C

WRAS – Water Regulations Advisory Scheme

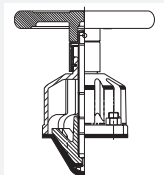
# KB Type – Top Works

## Top Works

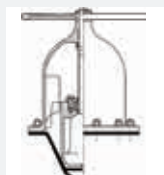
### Standard Range



**Standard plastic rising handwheel with indicator**  
DN15 - DN50  
½" - 2"



**Metal rising handwheel with indicator**  
DN15 - DN150  
2½" - 6"



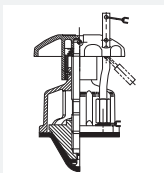
**Standard non-rising handwheel without indicator**  
DN200 - DN350  
8" - 14"



**Non-rising handwheel with indicator**  
DN200 - DN300  
8" - 12"

### High Performance

**Rising handwheel with indicator (simple padlocking)**  
DN15 - DN150  
½" - 6"



### SAUNDERS® Actuation

**ESM/ES actuators (spring close/spring open/double acting)**  
DN15 to DN250  
½" to 10"



For more details of actuation see pages 17-20

## Manual Valves Working Pressure & Temperature

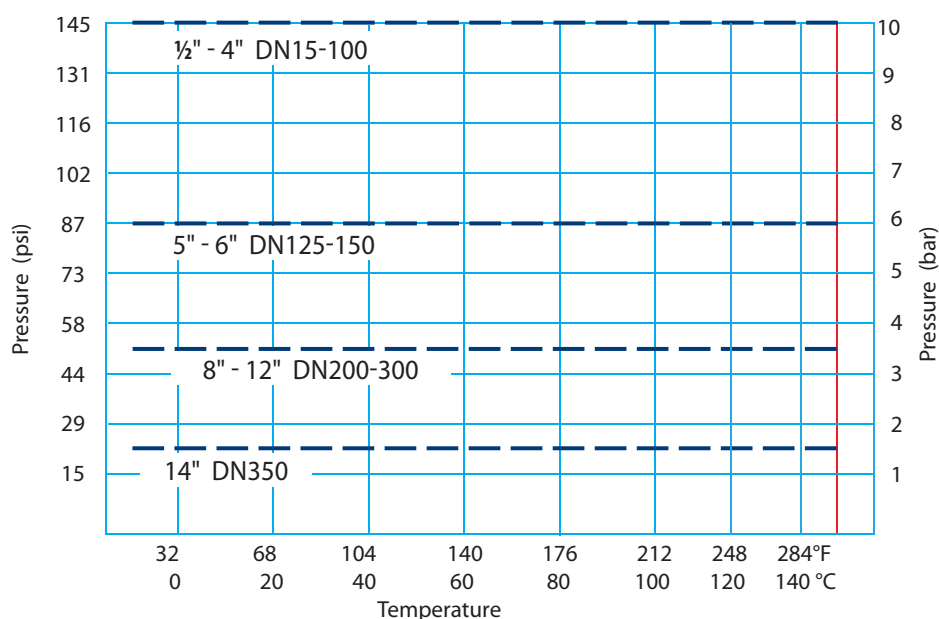
Maximum manual working pressures for SAUNDERS® KB Type Diaphragm valve. For actuated valves, please refer to the appropriate datasheets.

Size (DN)	Pressure (bar)	
	Rising handwheel	Non-Rising handwheel
15	10	145
20	10	145
25	10	145
32	10	145
40	10	145
50	10	145
65	10	145
80	10	145
100	10	145
125	6	87
150	6	87
200	-	3.5
250	-	3.5
300	-	3.5
350	-	1.5

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

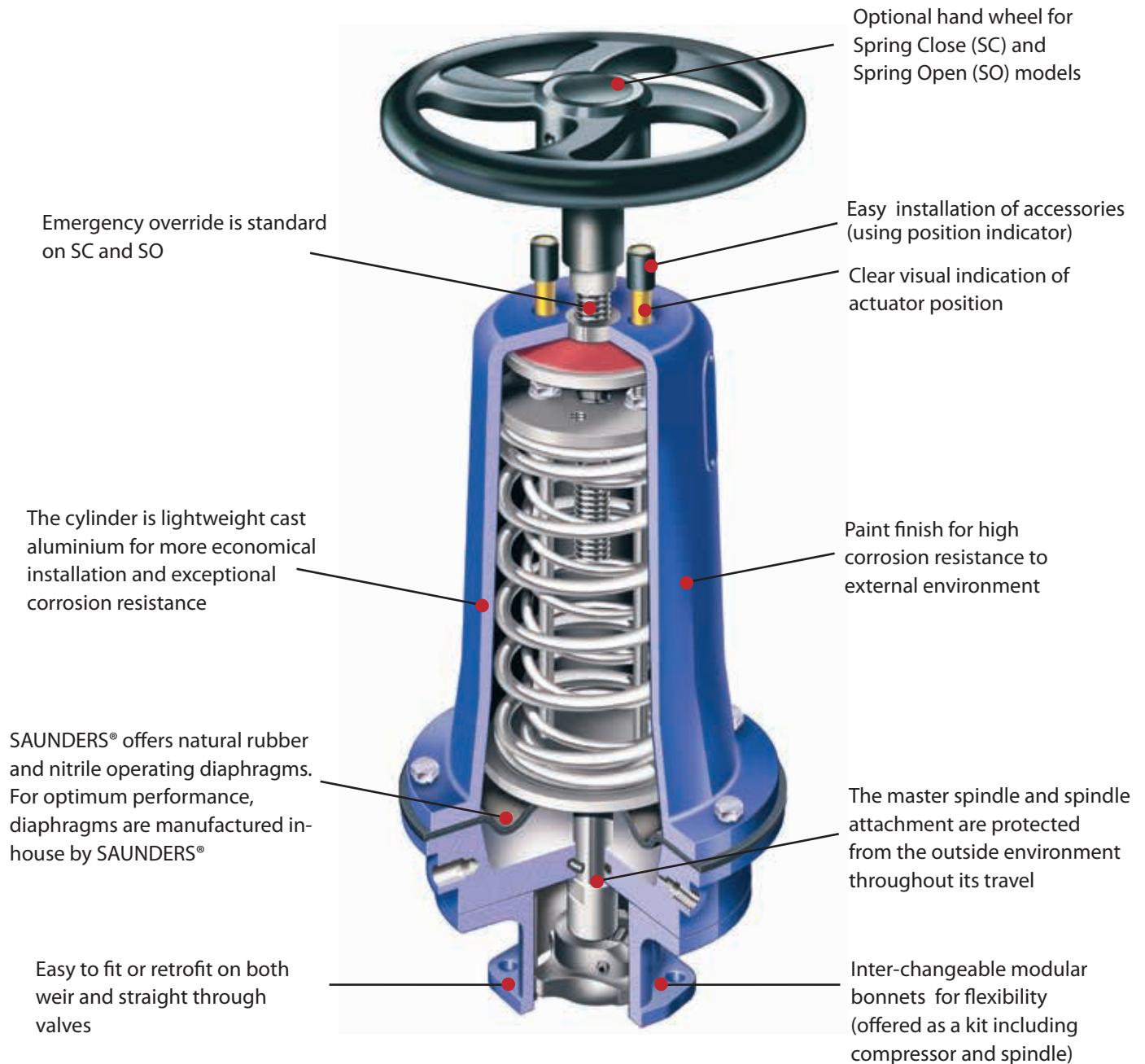
- Shell test: 1.5 times maximum rated working pressure
- Seat test: 1.1 times maximum rated working pressure

### KB Type Valve Temperature/Pressure Relationship\*





## 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.



### ES Modular

- ❶ Diaphragm operated actuator, modular design for flexibility
- ❷ Adjustable spring tension to optimize closure force and maximize diaphragm life
- ❸ Full range of accessories
- ❹ Light weight silicon aluminium housings
- ❺ Durable paint coating for environmental protection

### S360 Power

- ❶ Modular range delivers compact dimensional envelope to reduce dead-leg between associated valves and optimises system design.
- ❷ Maintenance free piston technology provides powerful closure performance.
- ❸ Smooth corrosion resistant profile optimises cleanability.

	Spring Close (SC)	Spring Open (SO)	Double Acting (DA)
<b>Mode of operation</b>	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.
<b>Normal use</b>	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.

## Actuation Accessories

Accessories								
Model	Size Range	Valve type	Material	Solenoid	Switchbox	Positioner	Air Filter	Handwheel
ES/ESM	DN15-DN250 1/2" - 10"	A & KB	Silicon – Aluminium	✓	✓	✓	✓	✓
S360	DN15-DN50 1/2" - 2"	A	Stainless Steel	✓	✓	✓	✓	✗

✓ Available

✗ Unavailable



### Limit Switchboxes

Westlock Controls' AccuTrak series offers integrated sensing options, wiring terminals, enclosures, and local visual indication in a compact unit for valve monitoring.



### Control Monitors

Westlock Controls' Quantum series combines position sensors and low-power solenoid valves for faster commissioning and control of pneumatic actuators.



### Mini Positioner

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



### Positioners

With advanced features, intuitive interfaces and enhanced diagnostics, Westlock Controls' K20 and ICoT smart positioners ensure faster installation, seamless operation and long-term reliability.



### Position Transmitters

Westlock Controls' Digital EPIC transmitters provide continuous valve travel feedback with 4-20mA and HART protocol.



### 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.



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.



### Saunders® I-VUE

The Saunders® I-VUE is a compact intelligent valve sensor that provides accurate and reliable valve position feedback.

- 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.



### Saunders® M-VUE Accurate Operation

- Saunders® M-VUE uses Continuous sensing technology via solid state hall effect sensors, providing accuracy of 0.3 millimeters. Continuous sensing technology eliminates false alarms by detecting the exact status of the valve.

#### Self Calibration

- Saunders® M-VUE uses Continuous sensing technology via solid state hall effect sensors, providing accuracy of 0.3 millimeters. Continuous sensing technology eliminates false alarms by detecting the exact status of the valve.

*\*Other control options available upon request.  
Please, contact SAUNDERS® for more information*

# Catalogue Codes

## A & KB Type Valves

Type	Size	End Specifications	Body Material	Diaphragm	Operating Mechanism
I					
Industrial	A – Weir A Type B – Straight through KB type				Refer to pages 55, 56 and 57
Size	EN558-1 Series 7 Length	Cast Iron	SG Iron	Catalogue Code	Previous Grade
DN8 008	BS10 Table D F1	Rubber Diaphragm CX	Rubber Diaphragm ZX	<b>Rubber</b>	
DN10 010	PN10/16 F3	PTFE Diaphragm CW	PTFE Diaphragm ZW	A2 Q	
DN15 015	ANSI 125/150 F4	Butyl Lined CB	Butyl Lined ZB	A1 AA	
DN20 020	JIS 10K F5	Hard Rubber Lined (HRL) CC	Hard Rubber Lined (HRL) ZC	C1 C	
DN25 025	PN10 4-Bolt F6	HRL for PTFE CD	HRL for PTFE ZD	C2 CV	
DN32 032	<b>Screwed Female</b>	HRL Full Face CJ	HRL Full Face ZJ	N1 HT	
DN40 040	BS21 Rp S1	HRL Full Face for PTFE CK	HRL Full Face for PTFE ZK	B2 300V	
DN50 050	BS21 Rc S2	Soft Rubber Lined CS	Soft Rubber Lined ZS	XB 300	
DN65 065	API/NPT S3	Neoprene Lined CN	Neoprene Lined ZN	XC 226	
DN80 080	<b>DIN Length Flanged</b>	Glass Lined CG	ETFE Lined ZE	XE 425 or XA	
DN100 100	DIN ND10 D1	<b>Cast Steel</b>	PFA Lined ZF	XF 286	
DN125 125	DIN ND10-4 Bolt D2	Rubber Diaphragm QX	PP Lined ZP	H3 (Fire Cert) 286	
DN150 150	<b>US Length Flanged</b>	PTFE Diaphragm QW	PVDF Lined ZV	H1 237	
DN200 200	ANSI 125/150 U1	Hard Rubber Lined (HRL) QC	Galvanised ZZ	<b>PTFE Face</b>	
DN250 250		HRL for PTFE QD	<b>Gunmetal</b>	PE 214/425	
DN300 300		<b>Stainless Steel</b>	Rubber Diaphragm (CC491K-GS) GX	KE 214K/425	
DN350 350		Rubber Diaphragm SX	PTFE Diaphragm (CC491K-GS) GW	PC 214/226	
			Leaded Gunmetal (CC492K-GS) LX	KC 214K/226	
			PTFE Diaphragm (CC492K-GS) LW	PB 214/300	
			Gunmetal (C87800) VX		
			PTFE Diaphragm (C87800) VW		



## WFB Type Valve

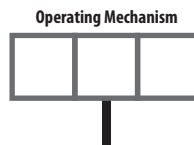
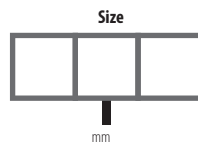
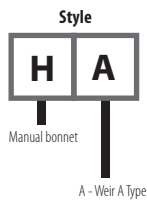
Type	Size	Model	Flange	Body	Diaphragm	Bonnet
I W						
Industrial	DN40 040 DN65 065	Model 9 A Model 4 B Model 11 C	BS Table D F1 BS4504 PN10 F2 ANSI 125/150 F3	Gunmetal G	<b>Fire Diaphragm (formerly Hypalon)</b> 286 fire H3	Gunmetal H01 SG Iron H02



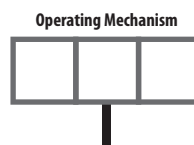
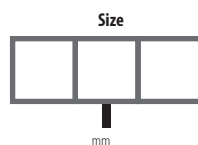
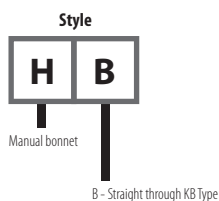


# Catalogue Codes

## Sub Assembly Manual Bonnets Only

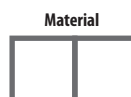
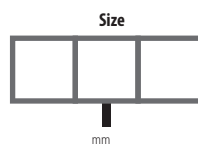
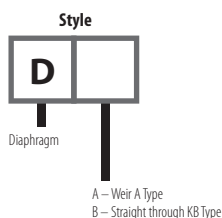


Bonnet Description	Rubber Diaphragm	PTFE Diaphragm
RHI — Standard Plastic Handwheel	H01	H02
RHI — Standard Metal Handwheel	H03	H04
RHI — Sealed, with Plastic Handwheel	H07	H08
RHI — Sealed, with Metal Handwheel	H09	H10
RHI — Viton Seal and Padlock	H13	H14
RHI — Padlock and Plastic Handwheel	H15	—
RHI — Padlock and Metal Handwheel/Compressor	H17	H18
RHI — GGG 40.3 Plastic Handwheel	H25	—
RHI — SS/EP PES Handwheel	H26	H24
RHI — GGG 40.3 Metal Handwheel	H27	H28
CI Indicator Bonnet	H33	H34
RHI — SS Sealed EP	H45	H46
Gunmetal LG2	H55	—
Non-Rising Gunmetal LG4 and Padlock	H56	—
Non-Rising Gunmetal LG4 with limit open	H57	—



Bonnet Description	Code Rubber Diaphragm
RHI — Standard Plastic Handwheel	H01
RHI — Standard Metal Handwheel	H02
CI Indicator Bonnet	H03
RHI — GGG 40.3 Metal Handwheel	H07
Non-Rising Gunmetal LG4 and Padlock	H08

## Diaphragm Spares



Catalogue Code	Previous Grade
PTFE Face	
PE	214/425
KE	214K/425
PC	214/226
KC	214K/226
PB	214/300

Catalogue Code	Previous Grade
Rubber	
A2	Q
A1	AA
C1	C
C2	CV
N1	HT
B2	300V
XB	300
XC	226
XE	425 or XA
XF	286
H3 (Fire Cert)	286
H1	237




# Catalogue Codes

## PURCHASED SEPARATELY AS A SPARE

Style		Size		
A	A	0	5	0

A = Actuator	A	Weir A Type
	B	Staright through KB Type


## As Part of a Full Build ES/ESM Double Acting

Actuator Type		Head Model		Line Diaphragm		Manual Override		Limit Stop	
M		55		R		B		N	
M	ES Modular	54	Double acting ES54	R	Rubber	H	Handwheel	N	None
		55	Double acting ES55	P	PTFE	B	Bareshaft	C	Close
		56	Double acting ES56			N	None	O	Open
		57	Double acting ES57						
		58	Double acting ES58						
S	ES Non-Modular	55	Double acting ES55						




## ES/ESM Spring Closing

Actuator Type		Head Model		Line Diaphragm		Manual Override		Limit Stop	
M		62		R		B		N	
M	ES Modular	61	Spring Closing ES61	R	Rubber	H	Handwheel	N	None
		62	Spring Closing ES62	P	PTFE	B	Bareshaft	C	Close
		63	Spring Closing ES63			N	None	O	Open
		64	Spring Closing ES64						
		65	Spring Closing ES65						
S	ES Non-Modular	66	Spring Closing ES66						





## ES/ESM Spring Opening

Actuator Type		Head Model		Line Diaphragm		Manual Override		Limit Stop	
M		69		R		B		N	
M	ES Modular	68	Spring Opening ES68	R	Rubber	H	Handwheel	N	None
		69	Spring Opening ES69			B	Bareshaft	C	Close
		70	Spring Opening ES70			N	None	O	Open
		71	Spring Opening ES71						
		72	Spring Opening ES72						
		73	Spring Opening ES73						
S	ES Non-Modular	69	Spring Opening ES69		PTFE				
		72	Spring Opening ES72						



## S360 Actuator

Actuator Type	Mode of Operation	Line Diaphragm	Air Connection	Base	Limit Stops	
N	P	R	N	Y	N	
P	Spring Closing Power	R	B	Y	N	None
	Spring Opening	P	N			
	Double Acting	P	N			
					O	Limit Open*
					C	Limit Close*



\*Not available for DN032

# Catalogue Codes

## PURCHASED SEPARATELY AS A SPARE

Type	Size	Spare Part
V S	0 S 0	B

V Accessory	B Switch box	B Switch box
S ES Modular Actuator	P Positioner	P Positioner

## As Part of a Full Build AccuTrack Intrinsically safe Rotary position Monitors (Switchboxes)

W	S	I	M	1
W Westlok	S Switchbox	I Intrinsically Safe (ATEX & IEC Approved)	M Mechanical Switch	1 SPDT gold plated mechanical switches
				4 4x SPDT mechanical switches IP66/67
				1 SPDT gold plated mechanical switches
				2 SPDT Rhodium Magnum switches
				4 4x SPDT mechanical switches IP66/67
			P Proximity Sensor	1 P&F NJ2-V3-N sensors



## AccuTrack Weatherproof safe Rotary Position Monitors (Switchboxes)

W	S	N	M	1
W Westlok	S Switchbox	N Non-Hazardous (WEATHERPROOF IP66/67)	M Mechanical Switch	1 SPDT gold plated mechanical switches
				4 4x SPDT mechanical switches IP66/67
			P Proximity Sensor	2 P&F NJ2-V3-E2 sensors
				3 P&F NBB3-V3-Z4
				4 P&F NJ2-V3-E0 sensors
				5 IFM 5026



## ACCUTRAK™ Rotary Position Monitors - Explosion proof (Switchbox)

W	S	E	M	1
W Westlok	S Switchbox	E Explosion Proof	M Mechanical Switch	1 SPDT gold plated mechanical switches
				2 SPDT Rhodium Magnum switches



## K20 Intrinsically safe Positioner

W	P	I	M	1
W Westlok	P Positioner	I Intrinsically Safe (ATEX & IEC Approved)	M Mechanical Switch	1 SPDT gold plated mechanical switches
			P Proximity Sensor	1 Proximity Sensor P&F Option (NJ2-V3-N)
				6 Hermetically Sealed Proximity Switch (Rhodium)
				7 Hermetically Sealed Proximity Switch (Tungsten)
			N No Sensors	0 No Sensors



**CRANE**®

Alnab Armatur AB  
Ögärdesvägen 4B  
SE-433 30 Partille

Phone +46 (0)31-44 94 50

[www.alnab.se](http://www.alnab.se)  
[alnab@alnab.se](mailto:alnab@alnab.se)

---

Crane Company, and its subsidiaries cannot accept responsibility for possible errors in catalogues, brochures, other printed materials, and website information. Crane Company reserves the right to alter its products without notice, including products already on order provided that such alteration can be made without changes being necessary in specifications already agreed. All trademarks in this material are the property of the Crane Company or its subsidiaries. The Crane and Crane brands logotype (ALOYCO®, BAUM®, CENTER LINE®, CRANE®, CRYOWORKS®, DEPA® & ELRO®, DOPAK®, DUO-CHEK®, FLOWSEAL®, GYROLOK®, GO REGULATOR®, HOKE®, JENKINS®, KROMBACH®, NOZ-CHEK®, PACIFIC®, RESISTOFLEX®, XOMOX®, SAUNDERS®, STOCKHAM®, TECHNIFAB®, TEXAS SAMPLING®, WESTLOCK CONTROLS®, WTA®, and XOMOX®) are registered trademarks of Crane Co. All rights reserved.

---