



SÜDMO
SEAL TECHNOLOGY
THE P³ DIAPHRAGM

SÜDMO'S ADVANCED ASEPTIC SEAL TECHNOLOGY

THE P³ DIAPHRAGM

Südmö sets the industry standard with its P³ diaphragm seal material for use in a wide range of aseptic valves.

The P³ diaphragm's shape along with the material properties provide outstanding performance in terms of chemical and temperature resistance, as well as pressure and load cycle resilience compared to other options on the market, including metal bellows. The P³ diaphragm provides many advantages in various process areas and aseptic applications.

- **Extremely good chemical resistance**
- **Temperature resistance up to 150 °C (302 °F)**
- **Dynamic working pressure up to 10 bar (145 psi)**
- **High number of cycles > 300,000**



Already standard in the pharmaceutical industry, the use of aseptic production and packaging is growing rapidly in the beverage, food and dairy industries. Consumer trends toward natural chemical-free products, extended shelf life (ESL) options, and unique packaging that requires cold filling challenges production plants to process microbiological sensitive products.

Due to product liability processors must protect consumers from the risk of health-damaging germs and bacteria. This increases the procedural and economic optimization requirements that are imposed by the manufacturers on the suppliers of the respective components.

Challenges include automated Cleaning in Place/Sterilization in Place (CIP/SIP), minimized cleaning times and cost-effective, simple and fast maintenance.

UTILIZATION OF THE P³ DIAPHRAGM

The P³ diaphragm is applied in the Südmö SVP Select Single Seat Valve series and the Aseptic Mix Proof Secure Valves.

In both valve types the advanced seal technology supports all performance areas of the proven Südmö valve technology, including Südmö's minimized maintenance requirements and easy service handling.



SVP Select Single Seat Valve Series

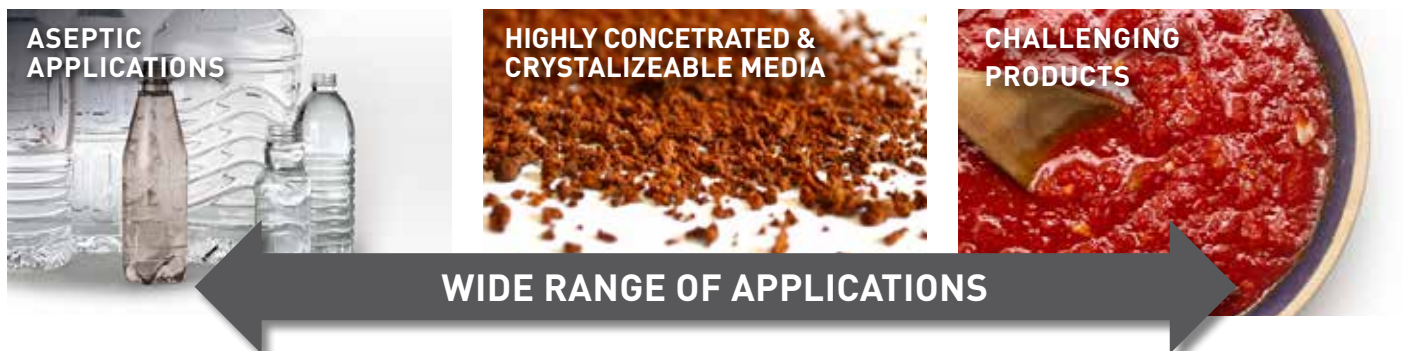
Aseptic Mix Proof Valve Secure



INSTALLATION AND PRINCIPLE OF OPERATION



OPERATING RANGE AND FIELD OF APPLICATION



WIDE RANGE OF APPLICATIONS

- Pasteurized area of dairies
- Cold aseptic filling (CAF)
- Pharmaceutical and biochemical facilities
- Lactose/milk sugar
- Instant coffee
- Abrasive media
- Low-acid products, fruit and vegetable purees and concentrates
- Fruit and confectionery bases, sauces, yogurt, cottage cheese; with / or diced fruit (peach, apricot, strawberry, pear, apple, tropical fruit)
- Diced tomatoes / tomato paste

MARKET REQUIREMENTS - GROWING NEED FOR ASEPTIC VALVES AND PRODUCTION



INCREASE MARKET ACCEPTANCE AND QUALITY

- Increase product life and maximize product shelf-life
- Sterile products
- Microbiological durability
- Increase and stabilize product quality
- Avoid use of chemical preservatives
- Unflavored products
- Enable cold aseptic filling
- No subsequent sterilization of the package required
- Protect against production rejects and product recalls

COMPARISON OF P³ DIAPHRAGM VS. BELLOW TECHNOLOGY



ADVANTAGES OF P³ DIAPHRAGM TECHNOLOGY

Flow from the side is possible and due to the form as a result the diaphragm have a very good flow characteristic. This characteristic creates less turbulence and flow turbulence.

Excellent cleaning ability due to the membrane and body design.

Less sensitive to dynamic pressure shocks as the diaphragm is supported from behind. The unsupported space behind the diaphragm is minimized.

High number of load cycles provide a longer service life in the production area. Suitable for longer strokes to realize a maximized free cross section (gap) for bulky products e.g. pieces of fruit **without leading to a larger dome**.

Cost-effective, because only the diaphragm is replaced. Due to the design, Südmö valves are quick and easy to repair and maintain.

Unimpeded secure and easy leakage detection.

LIMITATIONS OF BELLOWS

Undesirable flow conditions against the side produces a bad CV value and is not suitable for large chunky products. In addition there is a risk for a distortion of the bellows' corrugation resulting in failure of the bellows.

Poor cleaning ability between the bellows corrugations and the dome leads to long cleaning times or uncleanable bellows.

Sensitive to pressure shocks caused by the very large unpressurized space inside the metal bellows. Pressure shocks can cause the bellows to experience premature failure which compromises the valve function.

Low stroke movement and load changes are due to design. With a required enlargement of the stroke the bellows have to be longer. More bellows corrugations lead to a **larger dome** inside and weakens the bellows itself.

High spare parts costs. When replacement is necessary high-quality stainless steel parts, such as the valve seat or the upper socket, are disposed.

Double-walled bellows will not provide secure leakage management. There is a **risk of contamination** between the layers of the metal bellows.

The term aseptic, when applied to valve design, generally means to eliminate atmospheric contact with the product as made possible with a standard hygienic valve. Depending on system design and valve type, processors have become accustomed to performing maintenance at intervals as frequently as once a week to a maximum of about three months. This is in large part due to three variables - temperature, chemicals and pressure shocks. Metal bellows have traditionally been a standard option for aseptic valves. Made from either stainless steel with elastomer seat, or entirely Teflon®, bellows have many limitations.

TECHNICAL ADVANTAGES OF THE P³ DIAPHRAGM

DESIGN

- Very good flow CV's
- Easy cleaning
- Suitable for the use with large particulates (fruits, nuts)
- Dome free housing design
- Leak detection

RESISTANCE

- Extremely good chemical resistance
- Temperature stable material
- High temperature resistance

**EXTREMELY GOOD CHEMICAL RESISTANCE
TEMPERATURE RESISTANCE UP TO 150 °C (302 °F)
DYNAMIC WORKING PRESSURE UP TO 10 BAR (145 PSI)
HIGH NUMBER OF CYCLES > 300,000**

MATERIAL

- Homogeneous material
- No elastomer
- Plastic like PTFE (polytetrafluoroethylene)
- No cold flow
- Elasticity, elastic recovery
- Low adhesive coefficient

DURABILITY

- Good mechanical material properties
- Good dynamic and static pressure stability
- High number of switching cycles and load cycles

COMMERCIAL BENEFITS OF THE P³ DIAPHRAGM

AREA	P ³ DIAPHRAGM ADVANTAGE
Operation and Environment	Improved equipment efficiencies, better protection of downstream equipment, and minimized batch contamination due to the more reliable diaphragm. Shorter and easier cleaning cycles reduce the overall demand for media (water, caustic / acid concentrates).
Maintenance Costs	A longer diaphragm service life increases process run time and reduces labor and documentation costs for membrane replacement.
Spare Parts	Only the P ³ diaphragm is replaced, which reduces spare parts and inventory carrying costs.
Cost Savings	Based on the service life over several years you will see significant cost savings, improved product conditions, and longer process run times.

CHEMICAL RESISTANCE CHART

Lithium, Elemental	C	Mobiltherm 603	A	Norwegian Saltpeter (Calcium Nitrate)	A	Phthalic Anhydride	A
Lubricating Oils, Mineral or Petroleum Types	A	Mobiltherm 605	A	N-Octadecyl Alcohol	A	Picric Acid, Molten	–
Refined	A	Mobiltherm Light	A	Octane	A	Water Solution	A
Sour	A	Molten Alkali Metals	C	Oil, Petroleum	A	Pinene	A
Lye	A ¹¹	Monomethylamine	A	Oils, Animal and Vegetable ¹⁰	A	Piperidine	A
Magnesium Chloride	A	MultiTherm 100	A	Oleic Acid	A	Polyacrylonitrile	A
Magnesium Hydroxide	A	MultiTherm 503	A	Oleum	A	Polychlorinated Biphenyls	A
Magnesium Sulfate	A	MultiTherm IG-2	A	Orthodichlorobenzene	A	Potash, Potassium Carbonate	A
Maleic Acid	A	MultiTherm PG-1	A	Oxalic Acid	A	Potassium Acetate	A
Maleic Anhydride	A	Muriatic Acid	A	Oxygen, Gas	A	Potassium Bichromate	A
Mercuric Chloride	A	Naphtha	A	Ozone	A	Potassium Chromate, Red	A
Mercury	A	Naphthalene	A	Palmitic Acid	A	Potassium Cyanide	A
Methane	A	Naphthols	A	Paraffin	A	Potassium Dichromate	A
Methanol, Methyl Alcohol	A	Natural Gas	A	Paratherm HE	A	Potassium, Elemental	C
Methoxychlor	A	Nickel Chloride	A	Paratherm NF	A	Potassium Hydroxide	A ¹¹
Methylacrylic Acid	A	Nickel Sulfate	A	Parathion	A	Potassium Nitrate	A
Methyl Alcohol	A	Nitric Acid, Less than 30%	A	Paraxylene	A	Potassium Permanganate	A
2-Methylaziridine	A	Above 30%	A	Pentachloronitrobenzene	A	Potassium Sulfate	A
Methyl Bromide	A	Crude	A	Pentachlorophenol	A	Propionaldehyde	A
Methyl Chloride	A	Red Fuming	A	Pentane	A	Propane	A
Methyl Chloroform	A	Nitrobenzene	A	Perchloric Acid	A	1,3-Propane Sultone	A
4,4 Methylene Bis(2-chloroaniline)	A	4-Nitrobiphenyl	A	Perchloroethylene	A	Beta-Propiolactone	A
Methylene Chloride	A	2-Nitro-Butanol	A	Petroleum Oils, Crude	A	Propionaldehyde	A
4,4-Methylene Dianiline	A	Nitrocalcite (Calcium Nitrate)	A	Refined	A	Propoxur (Baygon)	A
Methylene Diphenyldiisocyanate	A	Nitrogen	A	Phenol	A	Propyl Nitrate	A
Methyl Ethyl Ketone	A	Nitrogen Tetroxide	A	p-Phenylenediamine	A	Propylene	A
Methyl Hydrazine	A	Nitrohydrochloric Acid (Aqua Regia)	A	Phosgene	A	Propylene Dichloride	A
Methyl Iodide	A	Nitromethane	A	Phosphate Esters	A	Propylene Oxide	A
Methyl Isobutyl Ketone (MIBK)	A	2-Nitro-2-Methyl Propanol	A	Phosphine	A	1,2-Propylenimine	A
Methyl Isocyanate	A	Nitromuriatic Acid (Aqua Regia)	A	Phosphoric Acid, Crude	A	Prussic Acid, Hydrocyanic Acid	A
Methyl Methacrylate	A	4-Nitrophenol	A	Pure, Less than 45%	A	Pyridine	A
N-Methyl-2-Pyrrolidone	A	2-Nitropropane	A	Pure, Above 45%, 150° F and below	A	Quinoline	A
Methyl Tert. Butyl Ether (MTBE)	A	N-Nitrosodimethylamine	A	Pure, Above 45%, Above 150° F	A	Quinone	A
Milk ¹⁰	A	N-Nitroso-N-Methylurea	A	Phosphorus, Elemental	A	Refrigerants	A
Mineral Oils	A	N-Nitrosomorpholine	A	Phosphorus Pentachloride	A	10	A
Mobiltherm 600	A	Norge Niter (Calcium Nitrate)	A	Phthalic Acid	A	11	A
12	A	Soda Ash, Sodium Carbonate	A	10-75%, 500° F and below	A	1,2,4-Trichlorobenzene	A
13	A	Sodium Bicarbonate, Baking Soda	A	75-98%, 150° F and below	A	1,1,2-Trichloroethane	A
13B1	A	Sodium Bisulfate (Dry)	A	75-98%, 150° F to 500° F	A	Trichloroethylene	A
21	A	Sodium Bisulfite	A	Sulfuric Acid, Fuming	A	2,4,5-Trichlorophenol	A
22	A	Sodium Chlorate	A	Sulfurous Acid	A	2,4,6-Trichlorophenol	A
23	A	Sodium Chloride	A	Syltherm 800	A	Tricresylphosphate	A
31	A	Sodium Cyanide	A	Syltherm XLT	A	Triethanolamine	A
32	A	Sodium, Elemental	C	Tannic Acid	A	Triethyl Aluminum	A
112	A	Sodium Hydroxide	A ¹¹	Tar	A	Triethylamine	A
113	A	Sodium Hypochlorite	A	Tartaric Acid	A	Trifluralin	A
114	A	Sodium Metaborate Peroxyhydrate	A	2,3,7,8-TCDB-p-Dioxin	A	2,2,4-Trimethylpentane	A
114B2	A	Sodium Metaphosphate	A	Tertiary Butyl Amine	A	Tung Oil	A
115	A	Sodium Nitrate	A	Tetrabromoethane	A	Turpentine	A
123	A	Sodium Perborate	A	Tetrachlorethane	A	UCON Heat Transfer Fluid 500	A
124	A	Sodium Peroxide	A	Tetrachloroethylene	A	UCON Process Fluid WS	A
125	A	Sodium Phosphate, Monobasic	A	Tetrahydrofuran, THF	A	Varnish	A
134a	A	Dibasic	A	Therminol 44	A	Vinegar ¹⁰	A
141b	A	Tribasic	A	Therminol 55	A	Vinyl Acetate	A ¹
142b	A	Sodium Silicate	A	Therminol 59	A	Vinyl Bromide	A ¹
143a	A	Sodium Sulfate	A	Therminol 60	A	Vinyl Chloride	A ¹
152a	A	Sodium Sulfide	A	Therminol 66	A	Vinylidene Chloride	A ¹
218	A	Sodium Superoxide	A	Therminol 75	A	Vinyl Methacrylate	A
290	A	Sodium Thiosulfate, "Hypo"	A	Therminol D12	A	Water, Acid Mine, with Oxidizing Salt	A
500	A	Soybean Oil ¹⁰	A	Therminol LT	A	No Oxidizing Salts	A
502	A	Stannic Chloride	A	Therminol VP-1	A	Water, Distilled	A
503	A	Steam, Saturated	A	Therminol XP	A	Return Condensate	A
C316	A	Superheated	–	Thionyl Chloride	A	Seawater	A
C318	A	Stearic Acid	A	Titanium Sulfate	A	Tap	A
HP62	A	Stoddard Solvent	A	Titanium Tetrachloride	A	Whiskey and Wines ¹⁰	A
HP80	A	Styrene	A ¹	Toluene	A	Wood Alcohol	A
HP81	A	Styrene Oxide	A	2,4-Toluenediamine	A	Xceltherm 550	A
Salt Water	A	Sulfur Chloride	A	2,4-Toluenediisocyanate	A	Xceltherm 600	A
Saltpeter, Potassium Nitrate	A	Sulfur Dioxide	A	Toluene Sulfonic Acid	A	Xceltherm MK1	A
2,4-D Salts and Esters	A	Sulfur, Molten	A	o-Toluidine	A	Xceltherm XT	A
Sewage	A	Sulfur Trioxide, Dry	A	Toxaphine	A	Xylene	A
Silver Nitrate	A	Wet	A	Transformer Oil (Mineral Type)	A	Zinc Chloride	A
Skydrols	A	Sulfuric Acid, 10%, 150° F and below	A	Transmission Fluid A	A	Zinc Sulfate	A
Soap Solutions	A	10%, Above 150° F	A	Trichloroacetic Acid	A		

Key: **A** = Suitable
B = Depends on operating conditions
C = Unsuitable
– = No data or insufficient evidence

P³ DIAPHRAGM CHARACTERISTICS

PHYSICAL PROPERTIES

Compression	20 - 25%
Resetting	45 - 50%
Creep Relaxation	35 %
Tension	31 N/mm ² (4500 psi)
Ultimate Elongation	320 %
Specific Gravity	2.14
Gas Permeability	5 x 10 ⁻⁷
Flex Endurance	17.6 mio. cycles

The data referred are determined in accordance with ASTM guidelines ASTM F36, F152, D1708, D792, D2176

MATERIAL PROPERTIES

Color	Clear, translucent
Composition	PTFE
Temperature continuous	up to +150 °C (302 °F) *
Pressure	up to 10 bar (145 psi) *
Flammability	Will not burn
Bacterial Growth	Will not support
Meets Specification	FDA Regulation 21CFR177.1550, 3A Standard, NSF 61 Standard, USP Class VI Chapter 87 & 88, USP Part 31, 281 and 661, TSE free, EG1935/2004

* The data refer to the operating limits of the valve technology and are dependent on the type and size.

HANDLING THE P³ DIAPHRAGM

AREA	NOTE
Storage	Store flat in a cool, dry area. Store away from incidental exposure to all types of radiation. Following extended storage, carefully inspect the material for damage.
Cleaning	If exposed to grease, oil, or solvents in liquid or vapor form, clean before installing.
Handling	Do not fold or bend.



PENTAIR SÜDMO GMBH

INDUSTRIESTRASSE 7, 73469 RIESBÜRG, GERMANY WWW.SUEDMO.DE

All Pentair trademarks and logos are owned by Pentair. All other brand or product names are trademarks or registered marks of their respective owners. Because we are continuously improving our products and services, Pentair reserves the right to change specifications without prior notice.

Pentair is an equal opportunity employer.

ID-No.: 2222491 - P³ E-1/14 © 2014 Pentair, All Rights Reserved.