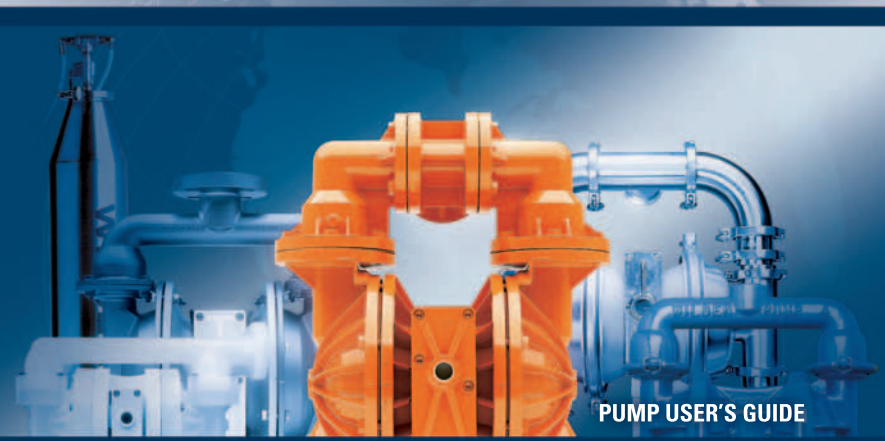

PUMP USER'S GUIDE

WILDEN®

A DOVER COMPANY

Wilden's Pump User's Guide II (PUG II) was designed to familiarize you with the operation and mechanics of Wilden air-operated double diaphragm pumps and accessories. This guide is to be used as a supplement to your pump's Engineering, Operation and Maintenance manual (EOM). The PUG II is a resource for the following: pump operation principles, application alternatives, air distribution systems, elastomers, pump selection, pump designation system, pump performance, pump installation, pump operation, troubleshooting, and pump maintenance. In addition, a list of applicable pump accessories, pump warranty, and safety precautions are discussed.

For best results, this guide should be used in conjunction with the EOM manual specific to your pump model.

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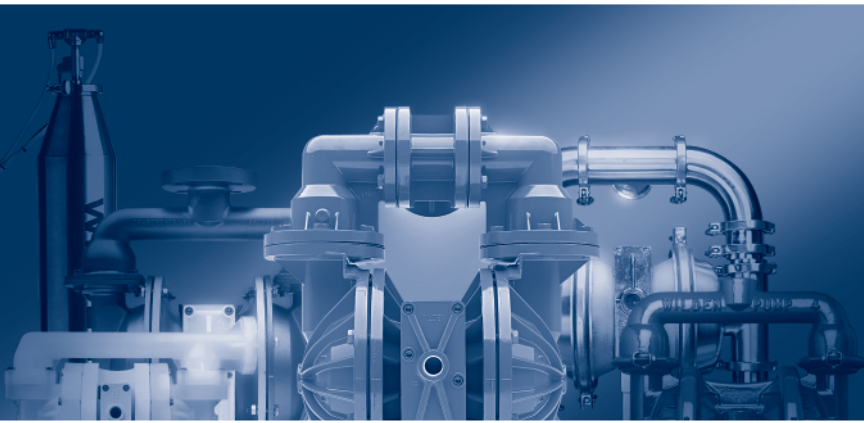


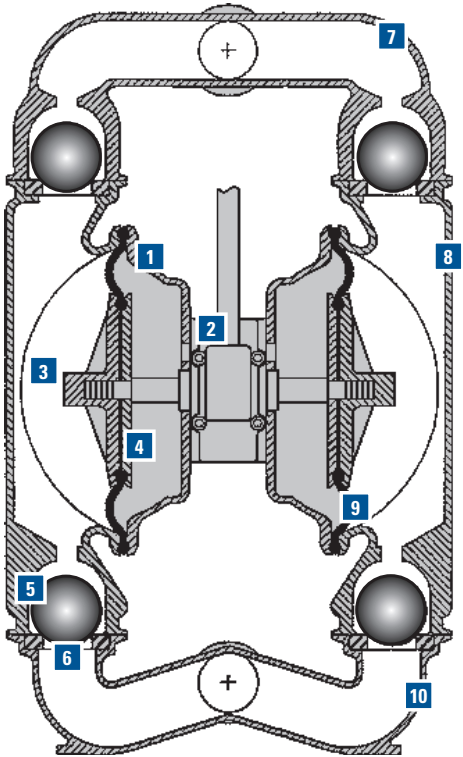
The Wilden Pump

1

Jim Wilden invented the first air-operated double-diaphragm pump in 1955. Wilden pumps are designed for demanding applications that require a robust design. They are extremely reliable, easy to maintain and offered in a variety of configurations and materials to meet your pumping needs.

On the following pages you will learn the basic components that make up a Wilden pump. You will also become familiar with the dynamics of how a pump works. Included at the end of this section are pump availability charts that categorize the Wilden pump offering. These availability charts will assist you in picking the correct Wilden pump for your application. For best results, this guide should be used in conjunction with the EOM manual specific to your pump model.

Air-Operated Double-Diaphragm Pump



1 Air Chamber *(Qty. 2)* The air chamber is the chamber that houses the air which powers the diaphragms.

2 Air Distribution System The air distribution system is the heart of the pump. The air distribution system is the mechanism that shifts the pump in order to create suction and discharge strokes.

Wilden offers Accu-Flo™, Pro-Flo®, Pro-Flo V™, and Turbo-Flo™ air distribution systems for your specific pumping needs. Refer to the Air Distribution Systems section for more details.

3 **Outer Diaphragm Piston** *(Qty. 2)* The outer diaphragm pistons provide a means to connect the diaphragms to the reciprocating common shaft and to seal the liquid side from the air side of the diaphragm.

4 **Inner Diaphragm Piston** *(Qty. 2)* The inner piston is located on the air side of the pump and does not come into contact with the process fluid.

5 **Valve Ball** *(Qty. 4)* Wilden air-operated pumps use suction and discharge check valves to produce directional flow of process fluid in the liquid chamber. The check valve balls seal and release on the check valve seats allowing for discharge and suction of process fluid to occur.

6 **Valve Seat** *(Qty. 4)* The removable seats provide the ball valves a site to check.

7 **Discharge Manifold Process** fluid exits the pump from the discharge port located on the discharge manifold at the top of the pump.

8 **Liquid Chamber** The liquid chamber is filled with the process fluid during the suction stroke and -is emptied during the discharge stroke. It is separated from the compressed air by the diaphragms.

9 **Diaphragm** The diaphragm membrane provides for separation of the process fluid and the compressed air power source. To perform adequately, diaphragms should be of sufficient thickness and of appropriate material to prevent degradation or permeation in specific process fluid applications. Wilden offers a variety of diaphragm materials for your specific application requirements. Turn to the elastomers section for more details.

10 **Inlet Manifold Process** fluid enters the pump from the intake port located on the inlet manifold at the bottom of the pump.

How It Works

The Wilden air-operated pump is a reciprocating double-diaphragm, positive displacement type. The pump displaces fluid from one of its two liquid chambers upon each stroke completion. The following drawings and paragraphs detail the liquid flow pattern through the pump from its initial unprimed position.

There are a few wetted parts (parts that contact the fluid) which are dynamic: The two diaphragms which are connected by a common shaft, the two inlet valve balls and the two discharge valve balls. The diaphragms act as a separation membrane between the compressed air supply and the liquid. Driving the diaphragms with compressed air instead of the shaft balances the load on the diaphragm which removes mechanical stress and therefore extends diaphragm life. The valve balls open and close on the valve seats to direct liquid flow.

FIGURE 1 The air distribution system directs the air supply to the right air chamber and therefore, the back side of diaphragm A. The compressed air moves diaphragm A away from the center block toward the liquid chamber. The opposite diaphragm (diaphragm B) is pulled inward by the shaft connected to the pressurized dia-phragm (diaphragm A). Diaphragm B is now on its suction stroke; air behind the diaphragm has been forced out to atmosphere through the exhaust port of the pump. Diaphragm A is currently working against atmospheric pressure. The movement of diaphragm B toward the center block of the pump creates a vacuum within liquid chamber B. Atmospheric pressure forces fluid into the inlet manifold forcing the inlet valve ball off its seat. Liquid is now free to move past the inlet valve ball (lower left) and fill the liquid chamber.

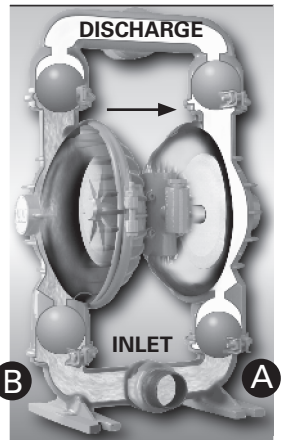


Figure 1 Right Stroke

FIGURES 2 & 3 When the pressurized diaphragm (diaphragm A) reaches the limit of its discharge stroke, the air valve redirects the compressed air supply to the back side of diaphragm B. The pressurized air forces diaphragm B away from the center block while the shaft pulls diaphragm A toward the center block. The air chamber on side A exhausts its air to atmosphere through the exhaust port of the pump. Diaphragm B is now on its discharge stroke while diaphragm A is on its suction stroke. Diaphragm B forces the inlet valve ball (lower left) onto its seat due to the hydraulic forces developed in the liquid chamber and manifold of the pump. These same hydraulic forces lift the discharge valve ball off its seat, while the opposite discharge valve ball is forced onto its seat, forcing fluid to flow through the left side of the pump and out the discharge manifold. The movement of diaphragm A to the center block of the pump creates a vacuum within liquid chamber A. Atmospheric pressure forces fluid into the inlet manifold of the pump. The inlet valve ball (lower right) is forced off its seat allowing the fluid to enter the right liquid chamber.

As the pump reaches its original starting point, each diaphragm has gone through one suction and one discharge stroke. This movement constitutes one pumping cycle. The pump will take several cycles to completely prime depending on the application variables.

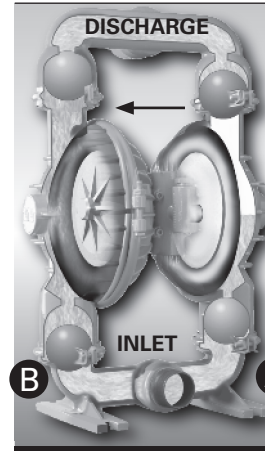


Figure 2 Midstroke

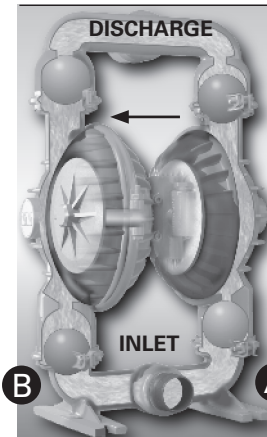


Figure 3 Left Stroke

Pump Availability Charts

Original Series Pumps

Wilden's legendary Original™ Series pumps were designed for demanding utilitarian type of applications that require a robust design. The clamped configuration is a classic design that evolved from 1955 with the invention of Jim Wilden's first air operated double diaphragm pump. The Original™ Series pumps ensure reliability without sacrificing ease of maintenance. Wilden's metal pump line lends itself to various processes and waste applications. Wilden also offers a multitude of elastomer options including PTFE, to meet your abrasion, temperature, and chemical compatibility concerns.

Pump Size	Accu-Flo™		Pro-Flo®		Pro-Flo V™		Turbo-Flo™	
	Plastic	Metal	Plastic	Metal	Plastic	Metal	Plastic	Metal
6 mm (1/4")	•	•	•	•				
13 mm (1/2")	•	•	•	•			•	•
25 mm (1")	•	•	•	•			•	•
38 mm (1-1/2")	•	•	•	•		•	•	•
51 mm (2")	•	•	•	•		•	•	•
76 mm (3")	•	•	•	•		•	•	•
102 mm (4")							•	•

NOTE: Wilden Original™ Series pumps are available with polypropylene, PVDF, aluminum, cast iron and stainless steel wetted components.

Advanced Series Pumps

Wilden's revolutionary Advanced™ Series pumps were specifically designed for maximum performance and efficiency. The bolted configuration of these pumps ensures product containment while the redesigned liquid path reduces internal friction to maximize output and efficiency. A variety of elastomer options, including PTFE, are available to meet abrasion, temperature, and chemical compatibility concerns. The Advanced™ Series metal pumps are offered in die cast aluminum, stainless steel and alloy C. Advanced™ Series plastic pumps are offered in polypropylene, PVDF and PFA. A variety of options such as ANSI and DIN flanges and specialized air distribution systems are available to meet your specific application requirements

Pump Size	Accu-Flo™		Pro-Flo®		Pro-Flo V™	
	Plastic	Metal	Plastic	Metal	Plastic	Metal
6 mm (1/4")	•	•	•	•		
10 mm (3/8")	•		•			
13 mm (1/2")	•	•	•	•		
25 mm (1")	•	•	•	•		•
38 mm (1-1/2")			•	•	•	•
51 mm (2")			•	•	•	•
76 mm (3")			•	•		•

NOTE: Wilden Advanced™ pumps are available with polypropylene, PVDF, PFA, aluminum, stainless steel and alloy C wetted components.

Saniflo™ Series Pump

The Saniflo™ Series pump line is specifically designed to meet the strict guidelines established for sanitary process applications. Saniflo™ pumps incorporate a straight flow-through design, large solids passage and efficiencies to insure process success. Saniflo™ pumps have a shear sensitive operation, Tri-clamp® style fittings and are offered in various surface finishes. The Saniflo™ pump line also offers pumps that are CIP (clean in place) and COP (clean on of plate) for ease of use and maintenance. Wilden is consistently meeting and exceeding industry standards by having the certifications needed (FDA, USDA, 3A) in order to help refine your process.

Pump Size	FDA	USDA	3A	Vacuum Controlled
	Metal			
13 mm (1/2")	•			
25 mm (1")	•		•	
38 mm (1-1/2")	•			
51 mm (2")	•	•		
76 mm (3")	•			
102 mm (4")				•
152 mm (6")				•
203 mm (8")				•

NOTE: Saniflo™ Series vacuum controlled pumps are available with 304 stainless steel and 316 stainless steel wetted components.

Tha BioPharm™ Series Pump

The BioPharm™ Series pump line offers high purity process pumps that improve your process efficiencies to meet the ever-increasing demands put on your systems. CFR 21 certified materials with complete tractability available specific request, so you can feel secure in your decision to rely on Wilden pharmaceutical pumps. With factory staff that is trained and certified in the construction of pharmaceutical and waste processing pumps, you can feel confident your products are safe with us. Our quality programs ensure safe and reliable Wilden pumps that will serve you well for years to come.

Pump Size	Accu-Flo™	Pro-Flo®	Pro-Flo V™	Turbo-Flo™
	Metal			
13 mm (1/2")	•	•		•
25 mm (1")	•	•		•
38 mm (1-1/2")		•	•	•
51 mm (2")		•	•	•
76 mm (3")		•	•	•

NOTE: Wilden BioPharm™ Series pumps are available with stainless steel or alloy C wetted components.

UNITEC™ Series Pump

The UNITEC™ series includes a complete line of versatile pumps made for nearly any process and waste application. With their machined sealing surfaces and superior product containment, the UNITEC™ pumps will exceed your expectations about how an air-operated double-diaphragm pump should perform. Put the latest Wilden technology to the test. By adding new materials to Wilden's already extensive line of products, the PTFE and polyethylene pumps in the UNITEC™ series extend the application limits where an air-operated double-diaphragm pump (AODDP) can be used. The conductive plastic pumps in the UNITEC™ series are designed to safely discharge static electricity when hazardous static build-up is present in a process system. The pump's ability to safely discharge this static electricity also meets the ATEX 100 directive standards for Europe.

Pump Size	UA		UB		UC		UH		UU		XUX	
	Plastic	Metal	Plastic	Metal	Plastic	Metal	Plastic	Metal	Plastic	Metal	Plastic	Metal
6 mm (1/4")	•											
10 mm (3/8")	•								•		•	
13 mm (1/2")	•						•		•	•	•	•
19 mm (3/4")											•	
25 mm (1")	•		•				•		•	•		•
32 mm (1-1/4")									•		•	
38 mm (1-1/2")	•						•		•			
51 mm (2")	•											

NOTE: Wilden Unitec™ Series pumps are available with polyethylene, conductive polyethylene, conductive PTFE, ultra-high molecular weight polyethylene, stainless steel and PTFE.

Wilden Specialty Pumps

Wilden Specialty pumps are designed with unique features and benefits for specialized applications. Wilden has the infrastructure and intellectual capital to solve your application problems with knowledge, service and products. If your application requires a pump or a feature not presented on this site, please contact us at (909) 422-1730 to discuss its feasibility. Wilden has many resources available to solve your application challenges and is ready to meet your toughest pumping needs.

Pump Size	High Pressure				Stallion®
	H25/H38	H400S	H800	UH	Turbo-Flo™
6 mm (1/4")	•				
10 mm (3/8")	•				
13 mm (1/2")				•	
25 mm (1")				•	
38 mm (1-1/2")		•		•	•
51 mm (2")			•		•
76 mm (3")					•

NOTE: The Rhino™ high pressure pump is available with aluminum wetted components and reaches discharge pressures up to 221 bar (3,200 psi). The H400 high pressure pump is available with aluminum and stainless steel wetted components and reaches discharge pressure up to 17.2 bar (250 psi). The H800 high pressure pump is available with stainless steel wetted components and reaches discharge pressure up to 17.2 bar (250 psi).
UH high pressure pumps are available with ultra-high molecular weight polyethylene and reach discharge pressures up to 16 bar (230 psi). Stallion® pumps are available with aluminum wetted components and passes solids up to 25.4 mm (1").

Why Buy a Wilden Pump?

Since 1955 Wilden has been the market leader in AODDPs. Wilden is deeply committed to the pursuit of excellence, research & development, customer satisfaction and market knowledge. As a premiere organization, Wilden has the infrastructure, knowledge base and intellectual capital to exceed customer expectations worldwide. Wilden pumps are self-priming, can handle viscous and abrasive products, can run dry without damage and are capable of passing up to 152 mm (6") solids. Wilden pumps do not employ costly motors, variable speed drives, by-pass plumbing or mechanical trip rods. Please see the matrix below for a comparison of the Wilden AODDP versus Rotary and Centrifugal pumps:

	A = Excellent B = Good C = Fair D = Poor	Feature						
		Solid Passage	Shear Sensitivity	Abrasives Handling	Solids Handling	Dry Priming	Viscous Fluids Handling	Maintenance Costs
Pump Type	Wilden Pumps	A	A	A	A	A	A	A
	Vane Pumps	D	D	D	A	B	C	C
	Internal Gear Pumps	D	D	B	B	C	A	D
	External Gear Pumps	D	D	D	B	C	A	D
	Lobe Pumps	A	C	B	C	C	A	D
	Centrifugal Pumps	D	D	B	B	C	D	B
	Progressive Cavity Pumps	D	C	A	B	A	A	D
	Piston/Plunger Pumps	C	D	B	C	A	A	D

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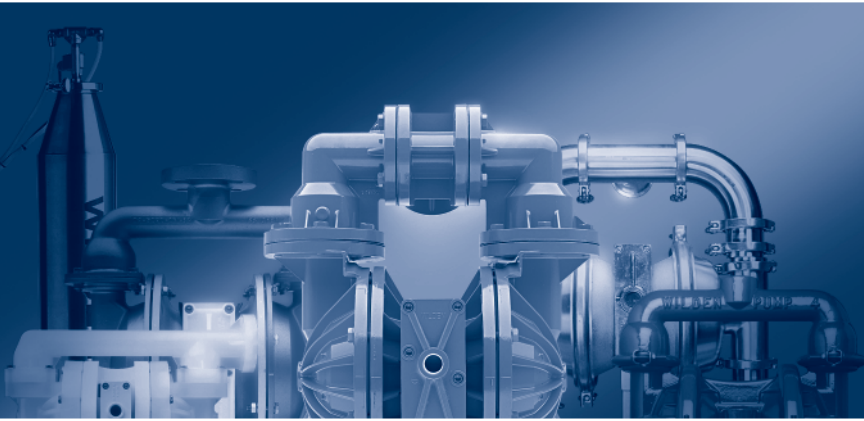
PUMP USER'S GUIDE



Site Selection

2

Self-Priming

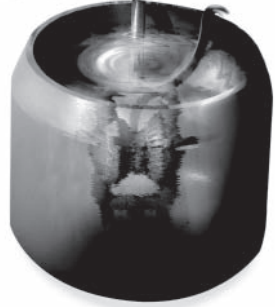
The Wilden pump is capable of pulling high vacuum. Design characteristics enable the pump to run dry without damage to create a pressure differential. This pressure differential creates suction lift up to 9.5 m (31.2') of water. Suction lift capability is dependent on pump size and operating conditions (see the Suction Lift Curves and Data Section of your EOM).

Positive Suction Head

The pumping system can be designed so that a positive suction head condition is created. This condition is experienced when it is necessary to draw off the bottom of holding tanks, mixing tanks, clarifiers, etc. Pumps operate most efficiently and parts life is maximized when inlet pressure is limited to .68 bar (10 psig).

Submerged

Many Wilden pumps can be completely submerged. The pump's materials of construction must be chemically compatible with the process fluid and the air exhaust must be plumbed to atmosphere.



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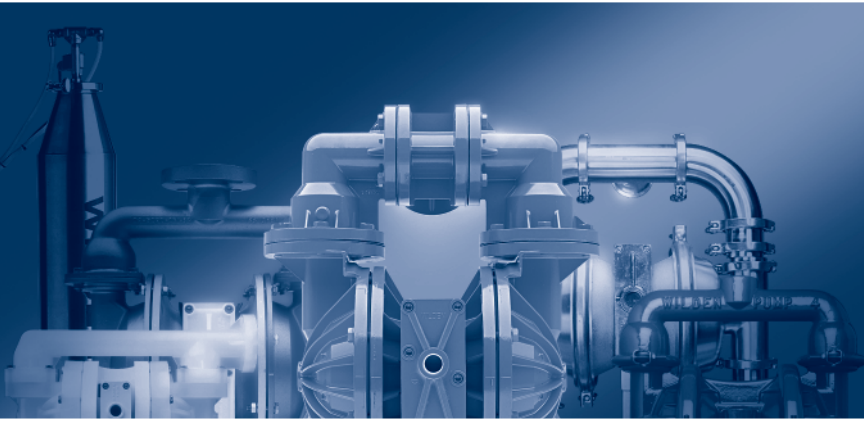
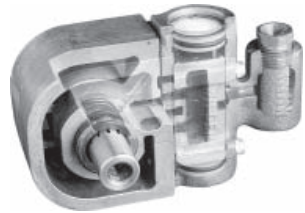


Air Distribution Systems

3

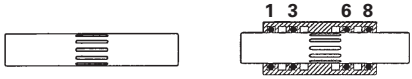
The following section represents a quick overview of the heart of the pump: the air distribution system. The pump's air distribution system alternately routes air supply from one side of the pump to the next, shifting the pump. Wilden Pump offers five different air distribution systems to meet your specific pumping needs: Turbo-Flo™, Pro-Flo®, Accu-Flo™, Uni-Flo™ and Pro-Flo V™.

Turbo-Flo™



The patented Wilden Turbo-Flo™ air distribution system consists of a ported air valve body which houses a piston. This piston is the only moving component of the air distribution system. The system utilizes differential pressure only to shift the pump. There are no mechanical trip rods, bearings, or springs to repair due to wear. The air valve attaches to a center block which has matching ports. As air is supplied to the air valve, differential pressure causes the piston to move vertically. The vertical movement alternately supplies the power ports with pressurized air. The ports then direct the air to the back side of the diaphragms. Air valve tolerances allow for the passage of some moisture and air line particulates allowing free movement of the piston. The Turbo-Flo™ air distribution system utilizes Glyd™ rings. Glyd™ rings are PTFE composite seals that offer long-lasting chemically resistant center block seals. The Turbo-Flo™ straight shaft used in conjunction with the Glyd™ rings enhances sealing characteristics and improves pump life. The anodized hollow aluminum piston provides a clean crisp shift. All air valve components can be inspected without disassembling the pump.

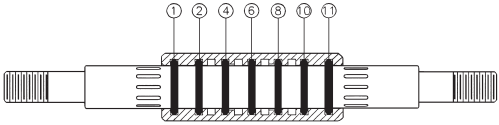
Turbo-Flo™ cont'd



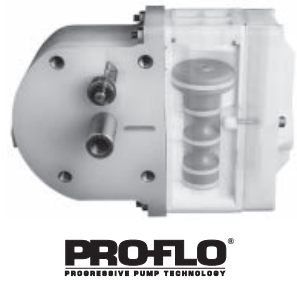
ENHANCED SHAFT ENHANCED CONFIGURATION

Shaft and Glyd™ ring configuration for the T1 and T2 pumps. 1, 3, 6, and 8 are seal grooves while 4 and 5 are air bleed grooves.

Shaft and Glyd™ ring configuration for the T4, T8, T15, and T20 pumps. 1, 2, 4, 6, 8, 10, and 11 are seal grooves while 3, 5, 7, and 9 are air channeling grooves.



Pro-Flo®



The Pro-Flo® patented air distribution system incorporates two moving parts: the air valve spool, the pilot spool and the main shaft/diaphragm assembly. The heart of the system is the air valve spool and air valve. This valve design incorporates an unbalanced spool. The smaller end of the spool is pressurized continuously, while the large end is alternately pressurized then exhausted to move the spool. The spool directs pressurized air to one air chamber while exhausting the other. The air causes the main shaft/diaphragm assembly to shift to one side — discharging liquid on that side and pulling liquid in on the other side. When the shaft reaches the end of its stroke, the inner piston actuates the pilot spool, which pressurizes and exhausts the large end of the air valve spool. The repositioning of the air valve spool routes the air to the other air chamber.

The Pro-Flo® air distribution system provides superior on/off reliability in industrial processing applications where the pump is critical to process integrity. Seal technology and porting tolerance diminish blow-by in dead head conditions. Freezing is diminished due to the Pro-Flo® porting and muffler design. Mating parts and seal configuration have a low coefficient of friction, allowing the pump to operate without in-line lubricants.

NOTE: Pro-Flo® pumps utilize a unique Pro-Flo® straight shaft.
NOTE: Pro-Flo® pumps require a 5 micron air filter.

Accu-Flo™

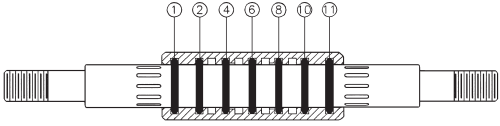
Wilden Accu-Flo™ pumps use electrical impulses to stroke the pump instead of differential pressure. The solenoid air valve is a two position, four-way solenoid valve that has a single operator and spring return. The valve is internally air piloted for long coil and operator life. When the solenoid is unpowered, one air chamber within the pump is pressurized with air, while the opposite chamber is exhausted. When electric power is applied, the solenoid shifts and the pressurized air chamber is exhausted while the opposite chamber is pressurized. By alternately applying and removing power, the Accu-Flo™ pump runs like a standard Wilden Pump. Wilden's Accu-Flo™ pumps interface directly with electronic devices, need no lubrication and offer On/Off reliability. Three coil voltage options are available in both Nema 4 and Nema 7 ratings. One coil allows for 110 V AC operation. The second coil option allows for 24 V DC operation and the third option allows for either 24 V AC or 12 V DC operation at 60 Hz.

NOTE: Accu-Flo™ pumps are not submersible.

Shaft and Glyd™ ring configuration for the A.025, A1 and A2 pumps.

ENHANCED SHAFT ENHANCED CONFIGURATION

1, 3, 6, and 8 are seal grooves.



Shaft and Glyd™ ring configuration for the A4, A8, A15, and A20 pumps. 1, 2, 4, 6, 8, 10, and 11 are seal grooves.

Accu-Flo™ Solenoid Coil Options

Nema 4 UL CSA Approved								
Coil Part Number	Voltage ±10%			Power (W) ±10%	Current (A)			Resistivity (Ω)
		AC			DC	AC		
	DC	60 Hz	50 Hz			Inrush	Holding	
00-2110-99-150	24	48	44	4.8	.20	.20	.20	121
00-2110-99-151	12	24	22	4.8	.40	.40	.40	32
00-2110-99-155	60	120	110	4.8	.08	.08	.06	840

Nema 7 UL CSA Approved								
00-2110-99-153	12	24	22	7	.60	.55	.32	19
00-2110-99-154	24	48	44	7	.30	.30	.18	75
00-2110-99-156	60	120	110	7	.12	.13	.06	475

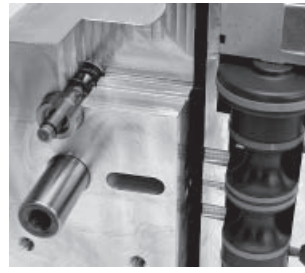
International Explosion Proof / Cenelec / PTB file # EX-91.C.2027					
00-2110-99-157	24 VDC	3.3	.135	.135	177

Uni-Flo™

UNI-FLO™
PROGRESSIVE PUMP TECHNOLOGY

The Uni-Flo™ air distribution system, the driving force behind Unitec™ pumps, is assembled inside the center section of the pump between the reciprocating diaphragms. The Uni-Flo™ system uses a main air valve body and mechanically actuated pilot spool mechanism to direct inlet air pressure alternately behind each diaphragm while at the same time exhausting the air behind the opposite diaphragm to atmosphere. Air inlet pressure has a direct relation to the fluid discharge pressure that the pump can develop (head), while the volume of air has a direct relation to how quickly the pump will reciprocate (flow).

Pro-Flo V™



PRO-FLO V™
PROGRESSIVE PUMP TECHNOLOGY

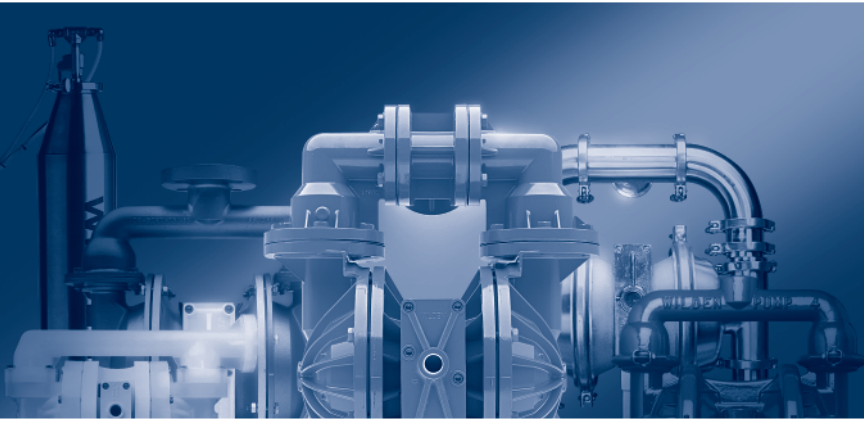
The Pro-Flo V™ patent pending air distribution system incorporates two moving parts: the air valve spool and the pilot spool. The heart of the system is the air valve and air valve spool. The smaller end of the spool is pressurized continuously, while the large end is alternately pressurized then exhausted to move the spool. The spool directs pressurized air to one air chamber while exhausting the other. The air causes the main shaft/diaphragm assembly to shift to one side – discharging liquid on that side and pulling liquid in on the other side. When the shaft reaches the end of its stroke, the inner piston actuates the pilot spool, which pressurizes and exhausts the large end of the air valve spool. The repositioning of the air valve spool routes the air to the other air chamber.

The Pro-Flo V™ air distribution system offers durable aluminum construction and the same reliable operation as the traditional Pro-Flo®. The design features unique parts (center block, air chambers and air valve assembly) that improve performance, provide superior resistance to freezing, excellent flow rates and efficiencies. Pro-Flo V™ operates lube free and has the longest mean time between failures (MTBF). Retrofit kits are available to easily convert your Turbo-Flo™ or Pro-Flo® pump to Pro-Flo V™ pump.

WILDEN

A DOVER COMPANY

PUMP USER'S GUIDE



Elastomers

4

Diaphragms, valve balls, valve seats and o-rings are collectively known as pump elastomers. Wilden diaphragm pumps can be fitted with a wide range of elastomer compounds to meet virtually any application requirement.

Considerations for specifying elastomers include: temperature limitations, chemical compatibility, flex-life, abrasion resistance, initial investment, suction lift capabilities and sanitary standards.

There are 3 types of elastomers: Rubber compounds, Thermoplastics, and PTFE. Please see Elastomer Options for a comprehensive guide of material availability for each pump type and size.

CAUTION: Verify the chemical compatibility of the process and cleaning fluid to the pump's component materials in the Chemical Resistance Guide (Section 12.)

Rubber Compounds

These compounds consist of natural rubber and manmade additives to increase their resistance to specific types of fluids. Diaphragms made of these compounds utilize a nylon fabric mesh. The fabric mesh is centered within the diaphragm during the molding process. The fabric mesh lends dimensional stability and strength to the compound.

Elastomer:	Neoprene
Usage:	An excellent general purpose elastomer for use in non-aggressive applications.
Temperature Limits:	–18°C to +93°C
	0°F to +200°F

Elastomer: Buna-N
Usage: Excellent for applications involving petroleum/oil-based fluids.
Temperature Limits: -12°C to +82°C
+10°F to +180°F

Elastomer: EPDM
Usage: Excellent for use in applications requiring extremely cold temperatures. May also be used as a low cost alternative when pumping dilute acids or caustics. Not oil resistant.
Temperature Limits: -51°C to +138°C
-60°F to +280°F

Elastomer: Viton®
Usage: Excellent for use in applications requiring extremely hot temperatures. May also be used with aggressive fluids such as aromatic or chlorinated hydrocarbons and acids.
Temperature Limits: -40°C to +175.7°C
-40°F to +350°F

Ultra-Flex™ Diaphragms

Wilden developed Ultra-Flex™ technology to make it the longest-lasting rubber compound diaphragms in the industry. Ultra-Flex™ technology incorporates revolutionary design concepts, which reduce internal stress. The reduction of stress is the key to long diaphragm life. The patented Ultra-Flex™ diaphragm technology is guaranteed to deliver longer life than pie-shaped, dome shaped or any other competitive diaphragm technology. The Ultra-Flex™ diaphragm is ideal for applications where the pump runs many hours per day or where greater flex life is needed. Field test results also show the Ultra-Flex™ diaphragm to be an excellent choice for powder transfer applications.

Thermoplastic Compounds

These compounds are made up entirely of manmade elements. Diaphragms made of these compounds require no fabric reinforcement due to the dimensional stability and tensile strength inherent in TPE (Thermoplastic Elastomers) compounds.

Elastomer:	Polyurethane
Usage:	A general purpose diaphragm for use in non-aggressive and/or highly abrasive applications.
Temperature Limits:	–12°C to +66°C +10°F to +150°F

Elastomer:	Saniflex™ (Hytrel®)
Usage:	Excellent abrasion resistance, flex life and durability. This material is FDA approved for food processing applications. An outstanding general purpose diaphragm. Good for oil and coolants.
Temperature Limits:	–29°C to +104°C -20°F to +220°F

Elastomer:	Wil-Flex™ (Santoprene®)
Usage:	A lot cost alternative to PTFE in many acidic and caustic applications. Exhibits excellent abrasion resistance and flex life.
Temperature Limits:	-40°C to 107.2°C -40°F to 225°F

PTFE (Polytetrafluoroethylene)

PTFE is one of the most chemically inert manmade compounds known. Wilden engineers were the first to discover that by reinforcing a molded PTFE diaphragm with concentric ribs they could control the flex pattern of the diaphragm. Wilden's patented ribbed design extends flex life 5 to 10 times longer than that of any other diaphragm. This innovation made the use of PTFE elastomers in diaphragm pumps cost effective, greatly expanding the range of applications for diaphragm pumps. PTFE is not an elastic material, therefore when utilizing PTFE diaphragms, a backup diaphragm is required to provide flexibility and memory in every size except A.025 and P.025. Material options for backup diaphragms are Neoprene, Saniflex™ and high temperature Buna-N. When using PTFE diaphragms, see Section 5 of EOM manual for PTFE flow curve. Typically, PTFE flow rates are different than TPE and rubber. This is due to the inability of PTFE to flex as far as rubber diaphragms, thus decreasing the displacement of process fluid per stroke.

Elastomer: PTFE

Usage: Excellent choice when pumping highly aggressive fluids such as aromatic or chlorinated hydrocarbons, acids, caustics, ketones and acetates.

Temperature Limits: +4°C to +104°C
+40°F to +220°F

For T1, A1, P1
+4°C to +142°C
+40°F to +300°F

Specialty Diaphragms

Wilden offers a variety of specialty diaphragms such as the IPD (Integral Piston Diaphragm) for the 6 mm (1/4"), 10 mm (3/8") and 25 mm (1") pumps.

WILDEN

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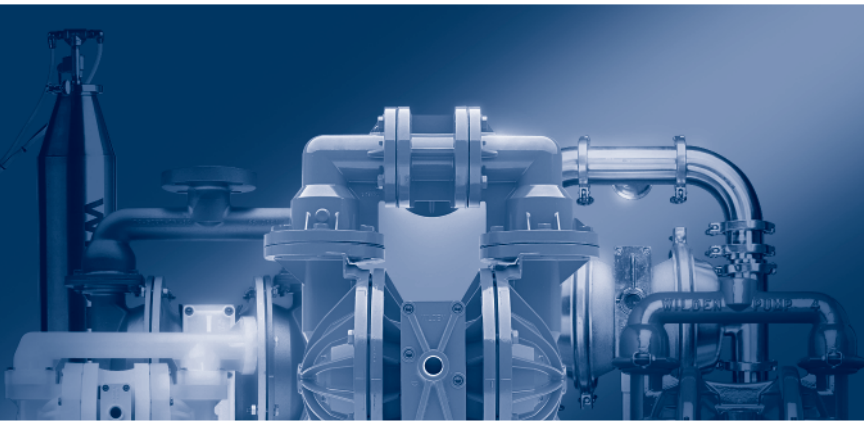
PUMP USER'S GUIDE



Torque/ Shaft Specs

5

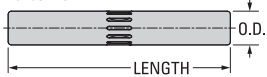
Accu-Flo™

A.025 PLASTIC

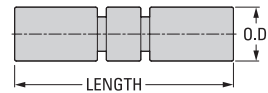
TORQUE	Description of Part	Torque Value
	Air Valve, Turbo-Flo™ Version	2.3 N•m (20 in-lbs)
	Air Valve, Pro-Flo® Version	3.1 N•m (27 in-lbs)
	Outer Piston, Rubber & TPE fitted	5.6 N•m (50 in-lbs)
	Top & Bottom Retainer, Polypropylene	5.6 N•m (50 in-lbs)
	Top & Bottom Retainer, PVDF	6.2 N•m (55 in-lbs)
	Top & Bottom Retainer, Carbon Filled Acetal	6.2 N•m (55 in-lbs)
	Large Clamp Bands	2.3 N•m (20 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Turbo-Flo™ Version, All Diaphragms	00-3800-03	2.013" L x 0.372" O.D.
	Pro-Flo® Version, All Diaphragms	00-3800-99-700	2.015" L x 0.496" O.D.

Turbo-Flo™



Pro-Flo®

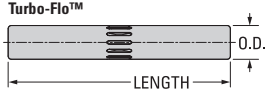


A.025 METAL

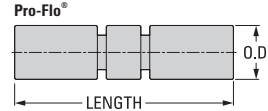
TORQUE	Description of Part	Torque Value
	Air Valve, Turbo-Flo™ Version	2.3 N•m (20 in-lbs)
	Air Valve, Pro-Flo® Version	3.1 N•m (27 in-lbs)
	Outer Piston	5.6 N•m (50 in-lbs)
	Vertical Bolts	5.6 N•m (50 in-lbs)
	Large Clamp Bands	2.3 N•m (20 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Turbo-Flo™ Version, All Diaphragms	00-3800-03	2.013" L x 0.372" O.D.
	Pro-Flo® Version, All Diaphragms	00-3800-99-700	2.015" L x 0.496" O.D.

Turbo-Flo™



Pro-Flo®



Accu-Flo™ cont'd

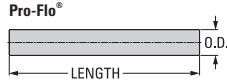
A1 PLASTIC

	Description of Part	Torque Value
TORQUE	Air Valve, Turbo-Flo™ Version	2.3 N·m (20 in-lbs)
	Air Valve, Pro-Flo® Version	3.1 N·m (27 in-lbs)
	Outer Piston, Rubber, All Diaphragms	14.1 N·m (125 in-lbs)
	Vertical Bolts, Rubber-fitted, Polypropylene	9.0 N·m (80 in-lbs)
	Vertical Bolts, Rubber-fitted, PVDF	5.6 N·m (50 in-lbs)
	Vertical Bolts, PTFE-fitted Polypropylene	9.0 N·m (80 in-lbs)
	Vertical Bolts, PTFE-fitted PVDF & PFA	2.8 N·m (25 in-lbs)
	Small Clamp Bands	1.7 N·m (15 in-lbs)
	Large Clamp Bands, Rubber & TPE fitted	7.3 N·m (65 in-lbs)
	Large Clamp Bands, PTFE fitted	9.6 N·m (85 in-lbs)

	Diaphragm Material	Part Number	Dimensions
SHAFTS	Turbo-Flo™ Version, All Diaphragms	01-3800-03-07	3.350" L x 0.622" O.D.
	Pro-Flo® Version, All Diaphragms	01-3810-03	3.350" L x 0.622" O.D.

Turbo-Flo™

Pro-Flo®

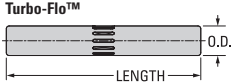


A1 METAL

	Description of Part	Torque Value
TORQUE	Air Valve, Turbo-Flo™ Version	2.3 N·m (20 in-lbs)
	Air Valve, Pro-Flo® Version	3.1 N·m (27 in-lbs)
	Outer Piston, Rubber, TPE & PTFE w/ Neoprene fitted	14.1 N·m (125 in-lbs)
	Outer Piston, PTFE w/EPDM fitted	24.4 N·m (18 ft-lbs)
	Vertical Bolts	14.1 N·m (125 in-lbs)
	Small Clamp Bands	1.7 N·m (15 in-lbs)
	Large Clamp Bands, Rubber & TPE fitted	9.0 N·m (80 in-lbs)
	Large Clamp Bands, PTFE fitted	13.6 N·m (120 in-lbs)

	Diaphragm Material	Part Number	Dimensions
SHAFTS	Turbo-Flo™ Version, All Diaphragms	01-3800-03-07	3.350" L x 0.622" O.D.
	Pro-Flo® Version, All Diaphragms	01-3810-03	3.350" L x 0.622" O.D.

Turbo-Flo™



Pro-Flo®

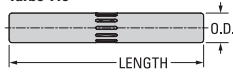
Accu-Flo™ cont'd

A2 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve, Turbo-Flo™ Version	2.3 N·m (20 in-lbs)
	Air Valve, Pro-Flo® Version	3.1 N·m (27 in-lbs)
	Outer Piston, All Diaphragms	27.1 N·m (20 ft-lbs)
	Top & Bottom Retainers	14.1 N·m (125 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	10.7 N·m (95 in-lbs)
	Large Clamp Band, PTFE fitted	14.1 N·m (125 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Turbo-Flo™ Version, All Diaphragms	02-3820-03-07	4.687" L x 0.750" O.D.
	Pro-Flo® Version, All Diaphragms	02-3810-03	5.000" L x 0.750" O.D.

Turbo-Flo™



Pro-Flo®

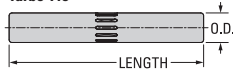
A2 METAL

TORQUE	Description of Part	Torque Value
	Air Valve, Turbo-Flo™ Version	2.3 N·m (20 in-lbs)
	Air Valve, Pro-Flo® Version	3.1 N·m (27 in-lbs)
	Outer Piston, All Diaphragms	40.7 N·m (30 ft-lbs)
	Vertical Bolts	31.2 N·m (23 ft-lbs)
	*Vertical Bolts	13.0 N·m (115 in-lbs)
	*Liquid Chamber to Air Chamber	13.0 N·m (115 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Turbo-Flo™ Version, All Diaphragms	02-3820-03-07	4.687" L x 0.750" O.D.
	Pro-Flo® Version, All Diaphragms	02-3810-03	5.000" L x 0.750" O.D.

*Pro-Flo® Hybrid Bolted Pump only.

Turbo-Flo™



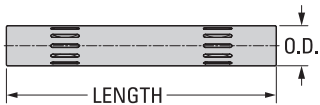
Pro-Flo®

Accu-Flo™ cont'd

A4 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	3.4 N·m (30 in-lbs)
	Outer Piston, All Diaphragms	47.5 N·m (35 ft-lbs)
	Small Clamp Band	9.6 N·m (85 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	18.6 N·m (165 in-lbs)
	Large Clamp Band, PTFE fitted	18.6 N·m (165 in-lbs)

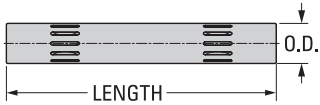
SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	08-3840-09	5.875" L x 0.872" O.D.
	PTFE	04-3820-03-700	4.940" L x 0.872" O.D
	Ultra-Flex™	04-3835-03	5.375" L x 0.872" O.D



A4 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	3.4 N·m (30 in-lbs)
	Outer Piston, Rubber & TPE fitted	34.2 N·m (40 ft-lbs)
	Outer Piston, PTFE fitted	34.2 N·m (40 ft-lbs)
	Outer Piston, Ultra-Flex™ fitted	47.5 N·m (35 ft-lbs)
	Small Clamp Band	3.4 N·m (30 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	10.7 N·m (95 in-lbs)
	Large Clamp Band, PTFE fitted	13.6 N·m (120 in-lbs)
	Air Chamber to Center Block	13.0 N·m (115 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	08-3840-09	5.875" L x 0.872" O.D.
	PTFE	04-3820-03-700	4.940" L x 0.872" O.D
	Ultra-Flex™	04-3835-03	5.375" L x 0.872" O.D

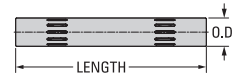


Accu-Flo™ cont'd

A8 PLASTIC

	Description of Part	Torque Value
TORQUE	Air Valve	6.8 N·m (60 in-lbs)
	Outer Piston, Rubber & TPE fitted	81.3 N·m (60 ft-lbs)
	Outer Piston, PTFE fitted	81.3 N·m (60 ft-lbs)
	Outer Piston, Ultra-Flex™ fitted	47.5 N·m (35 ft-lbs)
	Small Clamp Band	9.6 N·m (85 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	18.6 N·m (165 in-lbs)
	Large Clamp Band, PTFE fitted	18.6 N·m (165 in-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

	Diaphragm Material	Part Number	Dimensions
SHAFTS	Rubber/TPE	08-3805-09	10.000" L x 0.872" O.D.
	PTFE	08-3840-09	5.875" L x 0.872" O.D
	Ultra-Flex™	08-3841-03	5.875" L x 0.872" O.D



A8 METAL

	Description of Part	Torque Value
TORQUE	Air Valve	6.8 N·m (60 in-lbs)
	Outer Piston, Rubber & TPE fitted	108.5 N·m (80 ft-lbs)
	Outer Piston, PTFE fitted	108.5 N·m (80 ft-lbs)
	Outer Piston, Ultra-Flex	74.6 N·m (55 ft-lbs)
	Outer Piston, Rubber & TPE fitted w/ stainless steel inner piston	115.2 N·m (85 ft-lbs)
	Small Clamp Band	3.4 N·m (30 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	10.7 N·m (95 in-lbs)
	Large Clamp Band, PTFE fitted	13.6 N·m (120 in-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

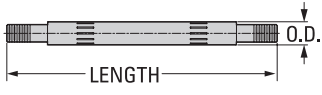
	Diaphragm Material	Part Number	Dimensions
SHAFTS	Rubber/TPE	08-3805-09	10.000" L x 0.872" O.D.
	PTFE	08-3840-09	5.875" L x 0.872" O.D
	Ultra-Flex™	08-3841-03	5.875" L x 0.872" O.D

Accu-Flo™ cont'd

A15 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	9.0 N·m (80 in-lbs)
	Outer Piston, Rubber & TPE fitted	135.6 N·m (100 ft-lbs)
	Outer Piston, PTFE fitted	135.6 N·m (100 ft-lbs)
	Outer Piston, Ultra-Flex™ fitted	135.6 N·m (100 ft-lbs)
	Inner Piston Ring	18.9 N·m (14 ft-lbs)
	Small Clamp Band	15.5 N·m (137 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	61.0 N·m (45 ft-lbs)
	Large Clamp Band, PTFE fitted	61.0 N·m (45 ft-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	All	15-3800-09-07	11.625" L x 0.995" O.D.

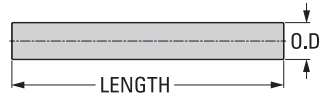


HIGH PRESSURE

H400S METAL

SHAFTS	Diaphragm Material	Part Number	Dimensions
	TPE & Aluminum Wetted Components	04-3845-08	8.400" L x 0.995" O.D.
	TPE & Stainless Steel Wetted Components	04-3846-08	8.210" L x 0.995" O.D.

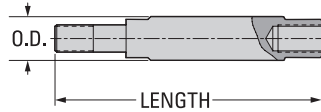
TORQUE	Description of Part	Torque Value
	Air Valve	13.6 N·m (120 in-lbs)
	Outer Piston, TPE	105.8 N·m (78 ft-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)



H800 METAL

SHAFTS	Diaphragm Material	Part Number	Dimensions
	TPE	08-3800-03-60	6.099" L x 1.000" O.D.

TORQUE	Description of Part	Torque Value
	Air Valve	9.5 N·m (84 in-lbs)
	Outer Piston, TPE fitted	139.6 N·m (103 ft-lbs)
	Inner Piston	58.3 N·m (43 ft-lbs)
	Center Section Cover Bolts	88.1 N·m (65 ft-lbs)
	Top & Bottom Manifolds	17.6 N·m (13 ft-lbs)
	Liquid Chamber	58.3 N·m (43 ft-lbs)

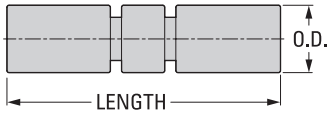


Pro-Flo®

P.025 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	2.3 N·m (20 in-lbs)
	Outer Piston, Rubber & TPE fitted	5.6 N·m (50 in-lbs)
	Top & Bottom Retainer, Polypropylene	5.6 N·m (50 in-lbs)
	Top & Bottom Retainer, PVDF	6.2 N·m (55 in-lbs)
	Top & Bottom Retainer, Carbon Filled Acetal	6.2 N·m (55 in-lbs)
	Large Clamp Bands	2.3 N·m (20 in-lbs)

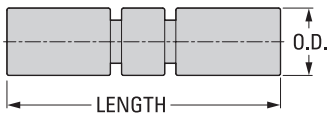
SHAFTS	Diaphragm Material	Part Number	Dimensions
	All	00-3800-99-700	2.015" L x 0.496" O.D.



P.025 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	2.3 N·m (20 in-lbs)
	Outer Piston	5.6 N·m (50 in-lbs)
	Vertical Bolts	5.6 N·m (50 in-lbs)
	Large Clamp Bands	2.3 N·m (20 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	All	00-3800-99-700	2.015" L x 0.496" O.D.

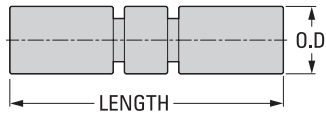


Pro-Flo® Cont'd

P25 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	2.3 N·m (20 in-lbs)
	Outer Piston, Rubber & TPE fitted	5.6 N·m (50 in-lbs)
	Top & Bottom Manifolds	6.2 N·m (55 in-lbs)
	Liquid Chamber to Center Section	6.2 N·m (55 in-lbs)

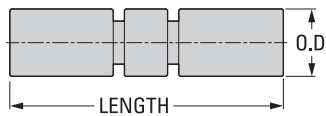
SHAFTS	Diaphragm Material	Part Number	Dimensions
	All	00-3800-99-700	2.015" L x 0.496" O.D.



P38 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	2.3 N·m (20 in-lbs)
	Outer Piston, Rubber & TPE fitted	5.6 N·m (50 in-lbs)
	Top & Bottom Manifolds	6.2 N·m (55 in-lbs)
	Liquid Chamber to Center Section	6.2 N·m (55 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	All	00-3800-99-700	2.015" L x 0.496" O.D.

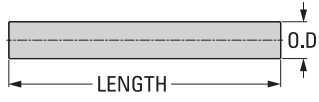


Pro-Flo® Cont'd

P1 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	3.1 N·m (27 in-lbs)
	Outer Piston, Rubber, All Diaphragms	14.1 N·m (125 in-lbs)
	Vertical Bolts, Rubber-fitted, Polypropylene	9.0 N·m (80 in-lbs)
	Vertical Bolts, Rubber-fitted, PVDF	5.6 N·m (50 in-lbs)
	Vertical Bolts, PTFE-fitted Polypropylene	9.0 N·m (80 in-lbs)
	Vertical Bolts, PTFE-fitted PVDF & PFA	2.8 N·m (25 in-lbs)
	Small Clamp Bands	1.7 N·m (15 in-lbs)
	Large Clamp Bands, Rubber & TPE fitted	7.3 N·m (65 in-lbs)
	Large Clamp Bands, PTFE fitted	9.6 N·m (85 in-lbs)

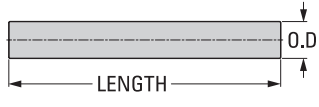
SHAFTS	Diaphragm Material	Part Number	Dimensions
	All	01-3810-03	3.350" L x 0.622" O.D.



P1 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	3.1 N·m (27 in-lbs)
	Outer Piston, Rubber, TPE & PTFE w/ Neoprene fitted	14.1 N·m (125 in-lbs)
	Outer Piston, PTFE w/EPDM fitted	20.3 N·m (15 ft-lbs)
	Vertical Bolts	14.1 N·m (125 in-lbs)
	Small Clamp Bands	1.7 N·m (15 in-lbs)
	Large Clamp Bands, Rubber & TPE fitted	9.0 N·m (80 in-lbs)
	Large Clamp Bands, PTFE fitted	13.6 N·m (120 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	All	01-3810-03	3.350" L x 0.622" O.D.



Pro-Flo® Cont'd

P100 PLASTIC

TORQUE

Description of Part	Torque Value
Air Valve	3.1 N·m (27 in-lbs)
Outer Piston, All Diaphragms	10.2 N·m (90 in-lbs)
Top & Bottom Manifolds	5.6 N·m (50 in-lbs)
Liquid Chamber to Air Chamber	5.6 N·m (50 in-lbs)

SHAFTS

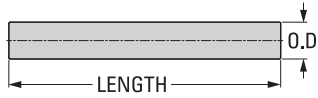
Diaphragm Material	Part Number	Dimensions
All	01-3810-03	3.350" L x 0.622" O.D.

Pro-Flo® Cont'd

P2 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	3.1 N·m (27 in-lbs)
	Outer Piston, All Diaphragms	27.1 N·m (20 ft-lbs)
	Top & Bottom Retainers	14.1 N·m (125 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	10.7 N·m (95 in-lbs)
	Large Clamp Band, PTFE fitted	14.1 N·m (125 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	02-3810-03	5.000" L x 0.750" O.D.
	PTFE	02-3840-03	4.687" L x 0.750" O.D

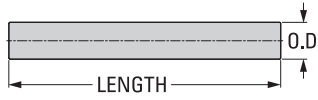


P2 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	3.1 N·m (27 in-lbs)
	Outer Piston, All Diaphragms	40.7 N·m (30 in-lbs)
	Vertical Bolts	31.2 N·m (23 ft-lbs)
	*Vertical Bolts	13.0 N·m (115 in-lbs)
	*Liquid Chamber to Air Chamber	13.0 N·m (115 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	02-3810-03	5.000" L x 0.750" O.D.
	PTFE	02-3840-03	4.687" L x 0.750" O.D

*Hybrid Bolted Pump only.

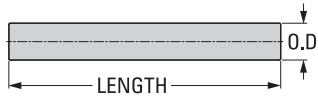


Pro-Flo® Cont'd

P200 PLASTIC

	Description of Part	Torque Value
TORQUE	Air Valve	3.1 N·m (27 in-lbs)
	Outer Piston, All Diaphragms	27.1 N·m (20 in-lbs)
	Top & Bottom Manifolds, Polyporpylene & PVDF	5.6 N·m (50 in-lbs)
	Top & Bottom Manifolds, PFA	3.4 N·m (30 in-lbs)
	Liquid Chamber, Polypropylene & PVDF	8.5 N·m (75 in-lbs)
	Liquid Chamber, PFA	5.6 N·m (50 in-lbs)

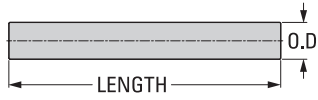
	Diaphragm Material	Part Number	Dimensions
SHAFTS	Rubber/TPE	02-3810-03	5.000" L x 0.750" O.D.
	PTFE	02-3840-03	4.687" L x 0.750" O.D.



P200 METAL

	Description of Part	Torque Value
TORQUE	Air Valve	3.1 N·m (27 in-lbs)
	Outer Piston, All Diaphragms	40.7 N·m (30 in-lbs)
	Top & Bottom Manifolds	8.5 N·m (75 in-lbs)
	Liquid Chamber	8.5 N·m (75 in-lbs)

	Diaphragm Material	Part Number	Dimensions
SHAFTS	Rubber/TPE	02-3810-03	5.000" L x 0.750" O.D.
	PTFE	02-3840-03	4.687" L x 0.750" O.D.

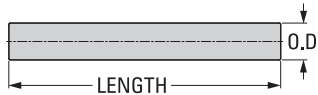


Pro-Flo® Cont'd

P4 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	5.1 N·m (45 in-lbs)
	Outer Piston, All Diaphragms	40.7 N·m (30 ft-lbs)
	Small Clamp Band	9.6 N·m (85 in-lbs)
	Large Clamp Band Rubber, TPE & PTFE fitted	18.6 N·m (165 in-lbs)
	Air Chamber to Center Block	46.6 N·m (35 ft-lbs)

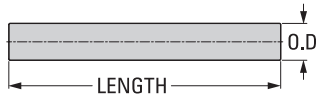
SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	04-3800-03-700	5.531" L x 0.872" O.D.
	PTFE	04-3820-03-700	4.940" L x 0.872" O.D
	Ultra-Flex™	04-3830-03-700	5.170" L x 0.872" O.D



P4 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	5.1 N·m (45 in-lbs)
	Outer Piston, Rubber, TPE & PTFE	54.2 N·m (40 ft-lbs)
	Outer Piston, Rubber, TPE & PTFE w/Stainless Steel Inner Piston	54.2 N·m (40 ft-lbs)
	Outer Piston, Ultra-Flex	54.2 N·m (40 ft-lbs)
	Small Clamp Band	3.4 N·m (30 in-lbs)
	Large Clamp Band Rubber & TPE fitted	10.7 N·m (95 in-lbs)
	Large Clamp Band PTFE fitted	13.6 N·m (120 in-lbs)
	Air Chamber to Center Block	46.6 N·m (38 ft-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	04-3800-03-700	5.531" L x 0.872" O.D.
	PTFE	04-3820-03-700	4.940" L x 0.872" O.D
	Ultra-Flex™	04-3830-03-700	5.170" L x 0.872" O.D

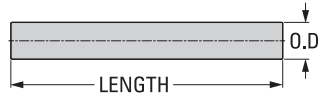


Pro-Flo® Cont'd

P400 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	5.1 N·m (45 in-lbs)
	Outer Piston, All Diaphragms	47.5 N·m (35 ft-lbs)
	Top & Bottom Manifolds	9.6 N·m (85 in-lbs)
	Liquid Chamber	9.6 N·m (85 in-lbs)
	Air Chamber to Center Block	47.5 N·m (35 ft-lbs)

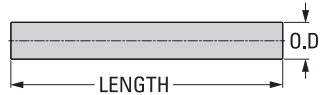
SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	04-3811-03	6.439" L x 0.872" O.D.
	PTFE	04-3842-03	5.848" L x 0.872" O.D.



P400 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	5.1 N·m (45 in-lbs)
	Outer Piston, Rubber, TPE & PTFE fitted	54.2 N·m (40 ft-lbs)
	Outer Piston, Ultra-Flex™ fitted	74.6 N·m (55 ft-lbs)
	Liquid Chamber, Stainless Steel Only	17.6 N·m (13 ft-lbs)
	Air Chamber to Center Block	47.5 N·m (35 ft-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	04-3811-03	6.439" L x 0.872" O.D.
	PTFE	04-3842-03	5.848" L x 0.872" O.D.

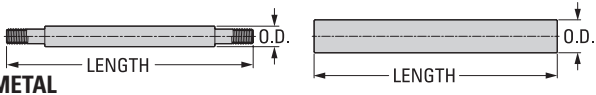


Pro-Flo® Cont'd

P8 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	5.1 N·m (45 in-lbs)
	Outer Piston, Rubber & TPE fitted	81.3 N·m (60 ft-lbs)
	Outer Piston, PTFE fitted	81.3 N·m (60 ft-lbs)
	Outer Piston, Ultra-Flex™ fitted	54.2 N·m (40 ft-lbs)
	Small Clamp Band	9.6 N·m (85 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	18.6 N·m (165 in-lbs)
	Large Clamp Band, PTFE fitted	18.6 N·m (165 in-lbs)
	Air Chamber to Center Block	47.5 N·m (35 ft-lbs)

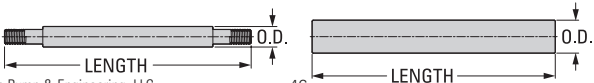
SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	08-3810-09	9.860" L x 0.872" O.D.
	PTFE	08-3840-09	5.875" L x 0.872" O.D
	Ultra-Flex™	08-3841-03	6.875" L x 0.872" O.D



P8 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	5.1 N·m (45 in-lbs)
	Outer Piston, Rubber & TPE fitted Excluding Stainless Steel Inner Piston	108.5 N·m (80 ft-lbs)
	Outer Piston, PTFE fitted	108.5 N·m (80 ft-lbs)
	Outer Piston, Ultra-Flex	74.6 N·m (55 ft-lbs)
	Outer Piston, Rubber & TPE fitted Including Stainless Steel Inner Piston	115.2 N·m (85 ft-lbs)
	Small Clamp Band	6.6 N·m (58 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	47.5 N·m (35 ft-lbs)
	Large Clamp Band, PTFE fitted	47.5 N·m (35 ft-lbs)
	Air Chamber to Center Block	47.5 N·m (38 ft-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	08-3810-09	9.860" L x 0.872" O.D.
	PTFE	08-3840-09	5.875" L x 0.872" O.D
	Ultra-Flex™	08-3841-03	6.875" L x 0.872" O.D



Pro-Flo® Cont'd

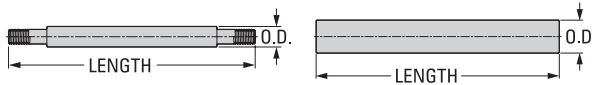
P800 PLASTIC

TORQUE

Description of Part	Torque Value
Air Valve	5.1 N·m (45 in-lbs)
Outer Piston, Rubber, TPE & PTFE fitted	81.3 N·m (60 ft-lbs)
Outer Piston, Ultra-Flex™ fitted	47.5 N·m (35 ft-lbs)
Top & Bottom Manifolds	44.7 N·m (33 ft-lbs)
Liquid Chamber	44.7 N·m (33 ft-lbs)
Air Chamber to Center Block	47.5 N·m (35 ft-lbs)

SHAFTS

Diaphragm Material	Part Number	Dimensions
Rubber/TPE	08-3811-09	10.500" L x 0.872" O.D.
PTFE	08-3842-03	6.750" L x 0.872" O.D.
Ultra-Flex™	08-3843-03	7.500" L x 0.872" O.D.



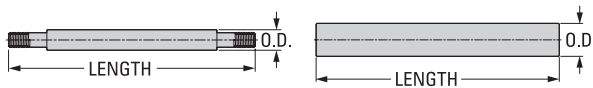
P800 METAL

TORQUE

Description of Part	Torque Value
Air Valve	5.1 N·m (45 in-lbs)
Outer Piston, Rubber, TPE & PTFE fitted, w/Stainless Steel Inner Pistons	108.5 N·m (80 ft-lbs)
Outer Piston, Rubber, TPE & PTFE fitted, Excluding Stainless Steel Inner Pistons	115.2 N·m (85 ft-lbs)
Outer Piston, Ultra-Flex™ fitted	74.6 N·m (55 ft-lbs)
Liquid Chamber, Aluminum Only	27.1 N·m (20 ft-lbs)
Air Chamber to Center Block	47.5 N·m (35 ft-lbs)

SHAFTS

Diaphragm Material	Part Number	Dimensions
Rubber/TPE	08-3811-09	10.500" L x 0.872" O.D.
PTFE	08-3842-03	6.750" L x 0.872" O.D.
Ultra-Flex™	08-3843-03	7.500" L x 0.872" O.D.



Pro-Flo® Cont'd

P15 METAL

TORQUE

Description of Part	Torque Value
Air Valve	8.5 N·m (75 in-lbs)
Outer Piston, All Diaphragms	135.6 N·m (100 ft-lbs)
Inner Piston Ring	18.9 N·m (14 ft-lbs)
Small Clamp Band	15.5 N·m 137 in-lbs)
Large Clamp Band, Rubber & TPE fitted	61.0 N·m 45 ft-lbs)
Large Clamp Band, PTFE fitted	61.0 N·m 45 ft-lbs)
Air Chamber to Center Block	47.5 N·m (35 ft-lbs)

SHAFTS

Diaphragm Material	Part Number	Dimensions
All	15-3805-09	11.625" L x .995" O.D.

Pro-Flo® Cont'd

P1500 PLASTIC

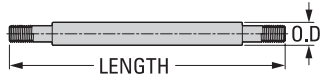
TORQUE	Description of Part	Torque Value
	Air Valve	8.5 N·m (75 in-lbs)
	Outer Piston, PTFE fitted	135.6 N·m (100 ft-lbs)
	Top & Bottom Manifolds	43.4 N·m (32 ft-lbs)
	Liquid Chamber	43.4 N·m (32 ft-lbs)
	Air Chamber to Center Block	47.5 N·m (35 ft-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	PTFE	15-3842-03	15.900" L x 0.995" O.D.

P1500 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	8.5 N·m (75 in-lbs)
	Inner Piston Ring	18.9 N·m (14 ft-lbs)
	Outer Piston, All Diaphragms	135.6 N·m (100 ft-lbs)
	Air Chamber to Center Block	47.5 N·m (35 ft-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	All Diaphragms	15-3805-09	11.625" L x 0.995" O.D.



Pro-Flo V™

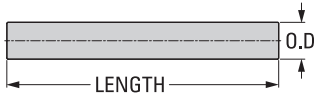
PV4 METAL

TORQUE

Description of Part	Torque Value
Air Valve	13.6 N·m (120 in-lbs)
Outer Piston, Rubber, TPE & PTFE	54.2 N·m (40 ft-lbs)
Outer Piston, Ultra-Flex™	54.2 N·m (40 ft-lbs)
Small Clamp Band	3.4 N·m (30 in-lbs)
Large Clamp Band Rubber & TPE fitted	10.7 N·m (95 in-lbs)
Large Clamp Band PTFE fitted	13.6 N·m (120 in-lbs)
Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

SHAFTS

Diaphragm Material	Part Number	Dimensions
Rubber/TPE	04-3800-03-700	5.531" L x 0.872" O.D.
PTFE	04-3820-03-700	4.940" L x 0.872" O.D
Ultra-Flex™	04-3830-03-700	5.170" L x 0.872" O.D

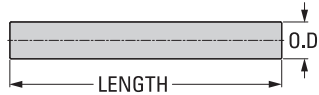


Pro-Flo V™ Cont'd

PV400 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	13.6 N·m (120 in-lbs)
	Outer Piston, All Diaphragms	47.5 N·m (35 ft-lbs)
	Top & Bottom Manifolds	9.6 N·m (85 in-lbs)
	Liquid Chamber	9.6 N·m (85 in-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

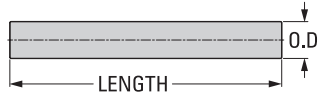
SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	04-3811-03	6.439" L x 0. 0.872" O.D.
	PTFE	04-3842-03	5.848" L x 0. 0.872" O.D.



PV400 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	13.6 N·m (120 in-lbs)
	Outer Piston, Rubber, TPE & PTFE fitted	54.2 N·m (40 ft-lbs)
	Outer Piston, Ultra-Flex™ fitted	54.2 N·m (40 ft-lbs)
	Liquid Chamber, Stainless Steel Only	17.6 N·m (13 ft-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	04-3811-03	6.439" L x 0. 0.872" O.D.
	PTFE	04-3842-03	5.848" L x 0. 0.872" O.D.



Pro-Flo V™ Cont'd

PV8 METAL

TORQUE

Description of Part	Torque Value
Air Valve	13.6 N·m (120 in-lbs)
Outer Piston, Rubber & TPE fitted, Excluding Stainless Steel Inner Piston	105.7 N·m (78 ft-lbs)
Outer Piston, PTFE fitted	108.5 N·m (80 ft-lbs)
Outer Piston, Ultra-Flex™	74.6 N·m (55 ft-lbs)
Outer Piston, Rubber & TPE fitted Including Stainless Steel Inner Piston	115.2 N·m (85 ft-lbs)
Small Clamp Band	6.6 N·m (58 in-lbs)
Large Clamp Band, Rubber & TPE fitted	47.5 N·m (35 ft-lbs)
Large Clamp Band, PTFE fitted	47.5 N·m (35 ft-lbs)
Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

SHAFTS

Diaphragm Material	Part Number	Dimensions
Rubber/TPE	08-3810-09	9.860" L x 0.872" O.D.
PTFE	08-3840-09	5.875" L x 0.872" O.D
Ultra-Flex™	08-3841-03	6.875" L x 0.872" O.D

Pro-Flo V™ Cont'd

PV800 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	13.6 N·m (120 in-lbs)
	Outer Piston, Rubber, TPE & PTFE fitted	81.3 N·m (60 ft-lbs)
	Outer Piston, Ultra-Flex™ fitted	47.5 N·m (35 ft-lbs)
	Top & Bottom Manifolds	44.7 N·m (33 ft-lbs)
	Liquid Chamber	44.7 N·m (33 ft-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	08-3811-09	10.500" L x 0.872" O.D.
	PTFE	08-3842-03	6.750" L x 0.872" O.D.
	Ultra-Flex™	08-3843-03	7.500" L x 0.872" O.D.

PV800 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	13.6 N·m (120 in-lbs)
	Outer Piston, Rubber, TPE & PTFE fitted, w/Stainless Steel Inner Pistons	115.2 N·m (85 ft-lbs)
	Outer Piston, Rubber, TPE & PTFE fitted, Excluding Stainless Steel Inner Pistons	108.5 N·m (80 ft-lbs)
	Outer Piston, Ultra-Flex™ fitted	74.6 N·m (55 ft-lbs)
	Liquid Chamber, Aluminum Only	27.1 N·m (20 ft-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	08-3811-09	10.500" L x 0.872" O.D.
	PTFE	08-3842-03	6.750" L x 0.872" O.D.
	Ultra-Flex™	08-3843-03	7.500" L x 0.872" O.D.

Pro-Flo V™ Cont'd

PV15 METAL

TORQUE

Description of Part	Torque Value
Air Valve	13.6 N·m (120 in-lbs)
Outer Piston, Rubber, TPE & PTFE fitted	135.6 N·m (100 ft-lbs)
Outer Piston, Ultra-Flex™ fitted	135.6 N·m (100 ft-lbs)
Outer Piston Ring	18.9 N·m (14 ft-lbs)
Small Clamp Band	15.5 N·m (137 in-lbs)
Large Clamp Band, Rubber & TPE fitted	61.0 N·m (45 ft-lbs)
Large Clamp Band, PTFE fitted	61.0 N·m (45 ft-lbs)
Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

SHAFTS

Diaphragm Material	Part Number	Dimensions
All	15-3805-09	11.625" L x 0.995" O.D.

Pro-Flo V™ Cont'd

PV1500 ALUMINUM

TORQUE	Description of Part	Torque Value
	Air Valve	13.6 N·m (120 in-lbs)
	Inner Piston Ring	18.9 N·m (14 ft-lbs)
	Outer Piston, All Diaphragms	135.6 N·m (100 ft-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	All Diaphragms	15-3805-09	11.625" L x 0.995" O.D.

PV1500 STAINLESS STEEL

TORQUE	Description of Part	Torque Value
	Air Valve	13.6 N·m (120 in-lbs)
	Inner Piston Ring	18.9 N·m (14 ft-lbs)
	Outer Piston, All Diaphragms	135.6 N·m (100 ft-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)
	Liquid Chamber to Air Chamber	67.8 N·m (50 ft-lbs)
	Top & Bottom Manifolds	54.2 N·m (40 ft-lbs)

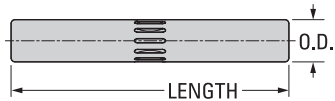
SHAFTS	Diaphragm Material	Part Number	Dimensions
	All Diaphragms	15-3805-09	11.625" L x 0.995" O.D.

Turbo-Flo™

T1 PLASTIC

TORQUE	Description of Part	Torque Value
	Outer Piston, Rubber, TPE & PTFE w/ Neoprene fitted	10.2 N·m (90 in-lbs)
	Vertical Bolts, Rubber-fitted, Polypropylene	9.0 N·m (80 in-lbs)
	Vertical Bolts, Rubber-fitted, PVDF	5.6 N·m (50 in-lbs)
	Vertical Bolts, PTFE-fitted Polypropylene	9.0 N·m (80 in-lbs)
	Vertical Bolts, PTFE-fitted PVDF & PFA	2.8 N·m (25 in-lbs)
	Small Clamp Bands	1.7 N·m (15 in-lbs)
	Large Clamp Bands, Rubber & TPE fitted	7.3 N·m (65 in-lbs)
	Large Clamp Bands, PTFE fitted	9.6 N·m (85 in-lbs)

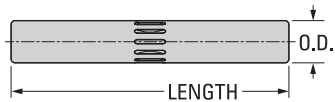
SHAFTS	Diaphragm Material	Part Number	Dimensions
	All	01-3800-03-07	3.350" L x 0.622" O.D.



T1 METAL

TORQUE	Description of Part	Torque Value
	Outer Piston, Rubber, TPE & PTFE w/ Neoprene fitted	14.1 N·m (125 in-lbs)
	Outer Piston, PTFE w/EPDM fitted	20.3 N·m (15 ft-lbs)
	Vertical Bolts	14.1 N·m (125 in-lbs)
	Small Clamp Bands	1.7 N·m (15 in-lbs)
	Large Clamp Bands, Rubber & TPE fitted	9.0 N·m (80 in-lbs)
	Large Clamp Bands, PTFE fitted	13.6 N·m (120 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	All	01-3800-03-07	3.350" L x 0.622" O.D.

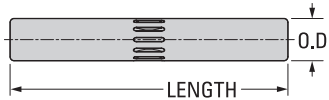


Turbo-Flo™ Cont'd

T2 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	3.4 N·m (30 in-lbs)
	Outer Piston, All Diaphragms	27.1 N·m (20 ft-lbs)
	Top & Bottom Retainers	14.1 N·m (125 in-lbs)

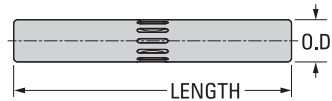
SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	02-3800-03-07	4.937" L x 0.750" O.D.
	PTFE	02-3820-03-07	4.687" L x 0.750" O.D



T2 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	3.4 N·m (30 in-lbs)
	Outer Piston, All Diaphragms	40.7 N·m (30 ft-lbs)
	Vertical Bolts	31.2 N·m (23 ft-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	02-3800-03-07	4.937" L x 0.750" O.D.
	PTFE	02-3820-03-07	4.687" L x 0.750" O.D

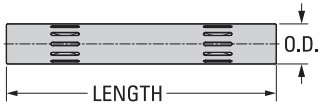


Turbo-Flo™ Cont'd

T4 PLASTIC

TORQUE	Description of Part	Torque Value
	Air Valve	3.4 N·m (30 in-lbs)
	Outer Piston, All Diaphragms	47.5 N·m (35 ft-lbs)
	Small Clamp Band	9.6 N·m (85 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	18.6 N·m (165 in-lbs)
	Large Clamp Band, PTFE fitted	18.6 N·m (165 in-lbs)

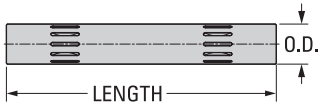
SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	04-3800-03-07	5.875" L x 0.872" O.D.
	PTFE	04-3820-03-07	5.375" L x 0.872" O.D
	Ultra-Flex™	04-3830-03-07	5.375" L x 0.872" O.D



T4 METAL

TORQUE	Description of Part	Torque Value
	Air Valve	3.4 N·m (30 in-lbs)
	Outer Piston, Rubber, TPE & PTFE fitted	54.2 N·m (40 ft-lbs)
	Outer Piston, Ultra-Flex™ fitted	47.5 N·m (35 ft-lbs)
	Small Clamp Band	3.4 N·m (30 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	10.7 N·m (95 in-lbs)
	Large Clamp Band, PTFE fitted	13.6 N·m (120 in-lbs)
	Air Chamber to Center Block	8.5 N·m (75 in-lbs)

SHAFTS	Diaphragm Material	Part Number	Dimensions
	Rubber/TPE	04-3800-03-07	5.875" L x 0.872" O.D.
	PTFE	04-3820-03-07	5.375" L x 0.872" O.D
	Ultra-Flex™	04-3830-03-07	5.375" L x 0.872" O.D

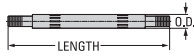


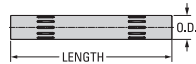
Turbo-Flo™ Cont'd

T8 PLASTIC

	Description of Part	Torque Value
TORQUE	Air Valve	5.1 N·m (45 in-lbs)
	Outer Piston, Rubber & TPE fitted	81.3 N·m (60 ft-lbs)
	Outer Piston, PTFE fitted	81.3 N·m (60 ft-lbs)
	Outer Piston, Ultra-Flex™ fitted	47.5 N·m (35 ft-lbs)
	Small Clamp Band	9.6 N·m (85 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	18.6 N·m (165 in-lbs)
	Large Clamp Band, PTFE fitted	18.6 N·m (165 in-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

	Diaphragm Material	Part Number	Dimensions
SHAFTS	Rubber/TPE	08-3810-09	9.860" L x 0.872" O.D.
	PTFE	08-3820-03-07	5.875" L x 0.872" O.D
	Ultra-Flex™	08-3820-03-07	5.875" L x 0.872" O.D

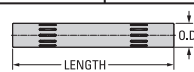




T8 METAL

	Description of Part	Torque Value
TORQUE	Air Valve	9.6 N·m (85 in-lbs)
	Outer Piston, Rubber & TPE fitted, Excluding Stainless Steel Inner Piston	108.5 N·m (80 ft-lbs)
	Outer Piston, PTFE fitted	108.5 N·m (80 ft-lbs)
	Outer Piston, Ultra-Flex™	74.6 N·m (55 ft-lbs)
	Outer Piston, Rubber & TPE fitted, Including Stainless Steel Inner Piston	115.2 N·m (85 ft-lbs)
	Small Clamp Band	6.6 N·m (58 in-lbs)
	Large Clamp Band, Rubber & TPE fitted	47.5 N·m (35 ft-lbs)
	Large Clamp Band, PTFE fitted	47.5 N·m (35 ft-lbs)
	Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

	Diaphragm Material	Part Number	Dimensions
SHAFTS	Rubber/TPE	08-3810-09	9.860" L x 0.872" O.D.
	PTFE	08-3820-03-07	5.875" L x 0.872" O.D
	Ultra-Flex™	08-3820-03-07	5.875" L x 0.872" O.D



Turbo-Flo™ Cont'd

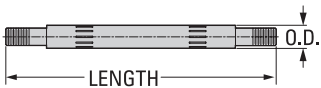
T15 METAL

TORQUE

Description of Part	Torque Value
Air Valve	9.0 N·m (80 in-lbs)
Outer Piston, Rubber, TPE & PTFE fitted	135.6 N·m (100 ft-lbs)
Outer Piston, Ultra-Flex™ fitted	135.6 N·m (100 ft-lbs)
Outer Piston Ring	18.9 N·m (14 ft-lbs)
Small Clamp Band	15.5 N·m (137 in-lbs)
Large Clamp Band, Rubber & TPE fitted	61.0 N·m (45 ft-lbs)
Large Clamp Band, PTFE fitted	61.0 N·m (45 ft-lbs)
Air Chamber to Center Block	27.1 N·m (20 ft-lbs)

SHAFTS

Diaphragm Material	Part Number	Dimensions
All	15-3800-09-07	11.625" L x 0.995" O.D.



Turbo-Flo™ Cont'd

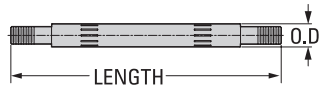
T20 METAL

TORQUE

Description of Part	Torque Value
Air Valve	9.0 N·m (80 in-lbs)
Outer Piston, Rubber & TPE fitted	135.6 N·m (100 ft-lbs)
Outer Piston, PTFE fitted	135.6 N·m (100 ft-lbs)
Outer Piston, Ultra-Flex™ fitted	135.6 N·m (100 ft-lbs)
Outer Piston Ring	18.9 N·m (14 ft-lbs)
Small & Medium Clamp Bands	17.6 N·m (156 in-lbs)
Large Clamp Band, Rubber & TPE fitted	61.0 N·m (45 ft-lbs)
Large Clamp Band, PTFE fitted	61.0 N·m (45 ft-lbs)
Air Chamber to Center Block	27.1 N·m (20 ft-lbs)
U-Bolt	44.7 N·m (33 ft-lbs)
Drain Plug	105.8 N·m (78 ft-lbs)

SHAFTS

Diaphragm Material	Part Number	Dimensions
Rubber, TPE & PTFE	20-3800-09-07	9.875" L x 0.995" O.D.
Ultra-Flex™	20-3830-09-07	10.375" L x 0.995" O.D.



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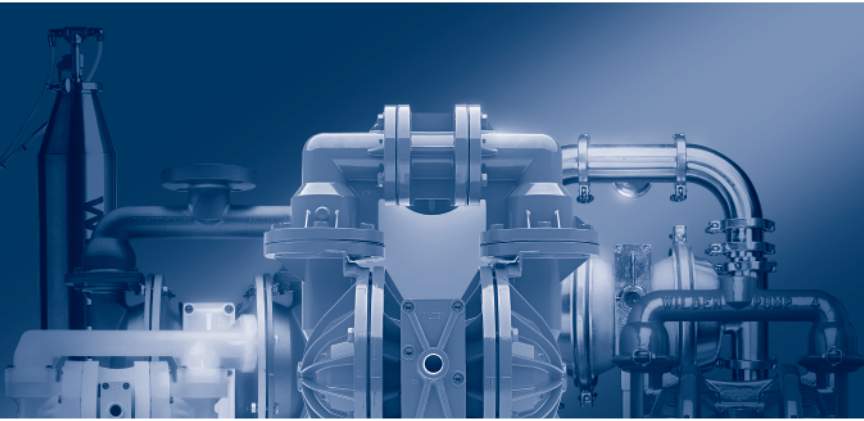


Diaphragm Assembly

6

Wilden has refined diaphragm technology and innovated major technological advancements through modern techniques, destructive testing, and critical analysis.

Rubber Diaphragms

Rubber diaphragms are molded with natural rubber and man-made additives to increase the diaphragms chemical resistance and/or flexing characteristics. A nylon fabric mesh is positioned within the rubber diaphragms during the molding process to strengthen the diaphragm while dispersing stress.

Thermoplastic (TPE) Diaphragms

Thermoplastic (TPE) diaphragms are manufactured by molding man-made compounds into net shaped parts. These TPE diaphragms have inherent tensile strength and do not need fabric reinforcement.

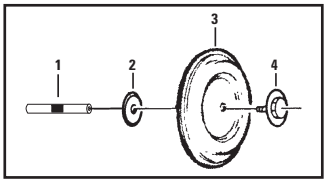
PTFE Diaphragms

PTFE is one of the most inert man-made compounds known. Wilden engineers patented PTFE diaphragms with concentric ribs to control the flex pattern of the diaphragm to extend life. This innovation made the use of PTFE diaphragms cost effective, greatly expanding the range of applications for diaphragm pumps. PTFE is not elastic and has no memory; therefore a back-up diaphragm is used to provide support and lengthen life. Wilden prides itself in having the longest lasting PTFE diaphragm in the industry.

Please verify the chemical resistance capability and temperature limitations of diaphragms and all other pump components prior to pump installation.

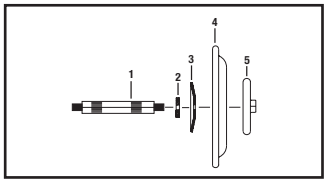
The following drawings represent generic diaphragm assemblies for a Wilden pump. Your specific diaphragm configuration might be different. Please consult your EOM for your pump's specific diaphragm assembly.

Rubber/TPE (Thermoplastic Elastomer) fitted pumps:



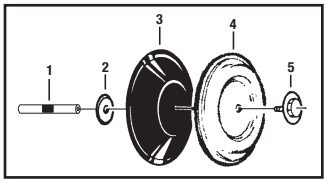
1. Main shaft
2. Inner piston
3. Primary diaphragm in contact with the process fluid
4. Outer piston holds the diaphragm to the shaft (in contact with process fluid)

Ultra-Flex™-fitted pumps:



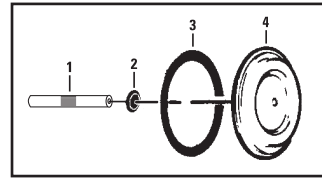
1. Main shaft
2. Spacer
3. Inner piston
4. Primary diaphragm — Ultra-Flex™
5. Outer piston

PTFE-fitted pumps (except A.025 and P.025):



1. Main shaft
2. Inner piston
3. Back-up diaphragm not in contact with process fluid (employed with PTFE primary diaphragms, except 1/4" pumps)
4. Primary PTFE diaphragm in contact with process fluid on the outer piston side
5. Outer piston holds the diaphragm to the shaft (in contact with process fluid)

PTFE-fitted A.025 and P.025 pumps diaphragm assembly:



1. Main shaft
2. Bellville washer
3. Back-up o-ring not in contact with process fluid (employed with PTFE primary diaphragms only)
4. PTFE diaphragm

Note: Pro-Flo® (P4 & P8) models fitted with Ultra-Flex™ diaphragms do not use a spacer.

Note: 6 mm (1/4"), 13 mm (1/2"), and 25 mm (1") pump shaft assemblies utilize Bellville washers, installed between the shaft and inner piston and 242 Loctite.

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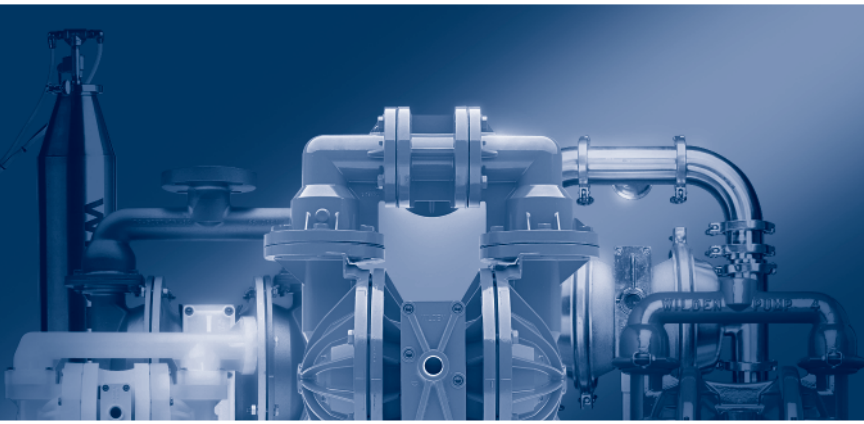


Pump Selection

7

The following pump selection portion of this manual will assist you in choosing the right pump for your specific pumping needs. This section will address pump size, flow rates, solids handling capability, chemical compatibility, temperature limitations and many other key factors. This section also includes pump selection charts that provide a quick reference defining the capabilities of the many different Wilden pump types.

Pump Selection Charts

Advanced™ Series

Model	Material	Inlet	Discharge	Max. Solids	Max. Flow
P25	Plastic	6 mm (1/4")	6 mm (1/4")	1.6 mm (1/16")	16.7 lpm (4.4 gpm)
P38	Plastic	10 mm (3/8")	10 mm (3/8")	2.4 mm (3/32")	25.4 lpm (6.7 gpm)
P100	Plastic	13 mm (1/2")	13 mm (1/2")	1.6 mm (1/16")	58.7 lpm (15.5 gpm)
P200	Plastic	25 mm (1")	25 mm (1")	4.8 mm (3/16")	220 lpm (58 gpm)
	Metal			6.4 mm (1/4")	212 lpm (56 gpm)
P400	Plastic	38 mm (1-1/2")	38 mm (1-1/2")	4.8 mm (3/16")	454 lpm (84 gpm)
	Metal			8.0 mm (5/16")	408 lpm (108 gpm)
P800	Plastic	51 mm (2")	51 mm (2")	6.4 mm (1/4")	625 lpm (165 gpm)
	Metal				591 lpm (156 gpm)
P1500	Plastic	76 mm (3")	76 mm (3")	12.7 mm (1/2")	784 lpm (207 gpm)
	Metal				972 lpm (257 gpm)
PV400	Plastic	38 mm (1-1/2")	38 mm (1-1/2")	6.4 mm (1/4")	474 lpm (125 gpm)
	Metal			8.0 mm (5/16")	443 lpm (117 gpm)
PV800	Plastic	51 mm (2")	51 mm (2")	6.4 mm (1/4")	702 lpm (186 gpm)
	Metal			6.4 mm (1/4")	674 lpm (178 gpm)
PV1500	Metal	76 mm (3")	76 mm (3")	12.7 mm (1/2")	999 lpm (264 gpm)
T810	Metal	51 mm (2")	51 mm (2")	51 mm (2")	628 lpm (166 gpm)

Original™ Series

Model	Material	Inlet	Discharge	Max. Solids	Max. Flow
A.025	Plastic	6 mm (1/4")	6 mm (1/4")	0.4 mm (1/64")	12.4 lpm (3.2 gpm)
	Metal				16.3 lpm (4.3 gpm)
P.025	Plastic	6 mm (1/4")	6 mm (1/4")	0.4 mm (1/64")	18.1 lpm (4.8 gpm)
	Metal				18.9 lpm (5.0 gpm)
A1	Plastic	13 mm (1/2")	13 mm (1/2")	1.6 mm (1/16")	39.0 lpm (10.3 gpm)
	Metal				35.6 lpm (9.4 gpm)
P1	Plastic	13 mm (1/2")	13 mm (1/2")	1.6 mm (1/16")	56.8 lpm (15.0 gpm)
	Metal				58.7 lpm (15.5 gpm)
T1	Plastic	13 mm (1/2")	13 mm (1/2")	1.6 mm (1/16")	53.4 lpm (14.1 gpm)
	Metal				54.9 lpm (14.5 gpm)
A2	Plastic	25 mm (1")	19 mm (3/4")	3.2 mm (1/8")	134.8 lpm (35.6 gpm)
	Metal				130.2 lpm (34.4 gpm)
P2	Plastic	25 mm (1")	19 mm (3/4")	3.2 mm (1/8")	140 lpm (37 gpm)
	Metal				170 lpm (45 gpm)
T2	Plastic	25 mm (1")	19 mm (3/4")	3.2 mm (1/8")	114 lpm (30 gpm)
	Metal	25 mm (1")	19 mm (3/4")	3.2 mm (1/8")	133 lpm (35 gpm)
A4	Plastic	38 mm (1-1/2")	38 mm (1-1/2")	6.4 mm (1/4")	235 lpm (62 gpm)
	Metal		32 mm (1-1/4")	4.8 mm (3/16")	197 lpm (52 gpm)
P4	Plastic	38 mm (1-1/2")	38 mm (1-1/2")	4.8 mm (3/16")	352 lpm (93 gpm)
	Metal		32 mm (1-1/4")		307 lpm (81 gpm)
PV4	Metal	38 mm (1-1/2")	32 mm (1-1/4")	4.8 mm (3/16")	337 lpm (89 gpm)
T4	Plastic	38 mm (1-1/2")	38 mm (1-1/2")	4.8 mm (3/16")	220 lpm (58 gpm)
	Metal		32 mm (1-1/4")		307 lpm (81 gpm)
A8	Plastic	51 mm (2")	51 mm (2")	6.4 mm (1/4")	420 lpm (111 gpm)
	Metal				420 lpm (111 gpm)
P8	Plastic	51 mm (2")	51 mm (2")	6.4 mm (1/4")	587 lpm (155 gpm)
	Metal				675 lpm (178 gpm)
PV8	Metal	51 mm (2")	51 mm (2")	6.4 mm (1/4")	675 lpm (178 gpm)
T8	Plastic	51 mm (2")	51 mm (2")	6.4 mm (1/4")	591 lpm (156 gpm)
	Metal				617 lpm (163 gpm)
A15	Metal	76 mm (3")	76 mm (3")	9.5 mm (3/8")	640 lpm (169 gpm)
P15	Metal	76 mm (3")	76 mm (3")	9.5 mm (3/8")	920 lpm (243 gpm)
PV15	Metal	76 mm (3")	76 mm (3")	9.5 mm (3/8")	909 lpm (232 gpm)
T15	Metal	76 mm (3")	76 mm (3")	9.5 mm (3/8")	878 lpm (232 gpm)
T20	Metal	102 mm (4")	102 mm (4")	34.9 mm (1-3/8")	1,041 lpm (275 gpm)

Saniflo™ Series

Model	Material	Inlet	Discharge	Max. Solids	Max. Flow
P1	Metal	38 mm (1-1/2")	38 mm (1-1/2")	1.6 mm (1/16")	58.7 lpm (15.5 gpm)
T1	Metal	38 mm (1-1/2")	38 mm (1-1/2")	1.6 mm (1/16")	54.9 lpm (14.5 gpm)
P2	Metal	38 mm (1-1/2")	38 mm (1-1/2")	3.2 mm (1/8")	170 lpm (45 gpm)
P2-3A	Metal	38 mm (1-1/2")	38 mm (1-1/2")	6.4 mm (1/4")	133 lpm (35 gpm)
T2	Metal	38 mm (1-1/2")	38 mm (1-1/2")	3.2 mm (1/8")	133 lpm (35 gpm)
P4	Metal	51 mm (2")	51 mm (2")	4.8 mm (3/16")	307 lpm (81 gpm)
PV4	Metal	51 mm (2")	51 mm (2")	4.8 mm (3/16")	337 lpm (89 gpm)
T4	Metal	51 mm (2")	51 mm (2")	4.8 mm (3/16")	307 lpm (81 gpm)
P8	Metal	64 mm (2-1/2")	64 mm (2-1/2")	6.4 mm (1/4")	675 lpm (178 gpm)
PV8	Metal	64 mm (2-1/2")	64 mm (2-1/2")	6.4 mm (1/4")	675 lpm (178 gpm)
PV8 LSH	Metal	51 mm (2")	51 mm (2")	76 mm (3")	848 lpm (224 gpm)
T8	Metal	64 mm (2-1/2")	64 mm (2-1/2")	6.4 mm (1/4")	617 lpm (163 gpm)
T8 USDA	Metal	51 mm (2")	51 mm (2")	19 mm (3/4")	579 lpm (153 gpm)
P15	Metal	76 mm (3")	76 mm (3")	9.5 mm (3/8")	920 lpm (243 gpm)
PV15	Metal	76 mm (3")	76 mm (3")	9.5 mm (3/8")	909 lpm (232 gpm)
PV15 LSH	Metal	76 mm (3")	76 mm (3")	76 mm (3")	931 lpm (246 gpm)
T15	Metal	76 mm (3")	76 mm (3")	9.5 mm (3/8")	878 lpm (232 gpm)
VC4	Metal	76 mm (3")	76 mm (3")	76 mm (3")	155 lpm (41 gpm)
VC6	Metal	102 mm (4")	102 mm (4")	102 mm (4")	170 lpm (45 gpm)
VC8	Metal	152 mm (6")	152 mm (6")	152 mm (6")	238 lpm (63 gpm)

NOTE: All Wilden Saniflo pumps have Tri-Clamp® style inlet and discharge connections.

BioPharm™ Series

Model	Material	Inlet	Discharge	Max. Solids	Max. Flow
A1	Metal	13 mm (1/2")	13 mm (1/2")	1.6 mm (1/16")	35.6 lpm (9.4 gpm)
P1	Metal	13 mm (1/2")	13 mm (1/2")	1.6 mm (1/16")	58.7 lpm (15.5 gpm)
T1	Metal	13 mm (1/2")	13 mm (1/2")	1.6 mm (1/16")	54.9 lpm (14.5 gpm)
A2	Metal	25 mm (1")	25 mm (1")	3.2 mm (1/8")	130.2 lpm (34.4 gpm)
P2	Metal	25 mm (1")	25 mm (1")	3.2 mm (1/8")	170 lpm (45 gpm)
T2	Metal	25 mm (1")	25 mm (1")	3.2 mm (1/8")	133 lpm (35 gpm)
P4	Metal	38 mm (1-1/2")	38 mm (1-1/2")	4.8 mm (3/16")	307 lpm (81 gpm)
PV4	Metal	38 mm (1-1/2")	38 mm (1-1/2")	4.8 mm (3/16")	337 lpm (89 gpm)
T4	Metal	38 mm (1-1/2")	38 mm (1-1/2")	4.8 mm (3/16")	307 lpm (81 gpm)
P8	Metal	51 mm (2")	51 mm (2")	6.4 mm (1/4")	675 lpm (178 gpm)
PV8	Metal	51 mm (2")	51 mm (2")	6.4 mm (1/4")	675 lpm (178 gpm)
T8	Metal	51 mm (2")	51 mm (2")	6.4 mm (1/4")	617 lpm (163 gpm)
P15	Metal	76 mm (3")	76 mm (3")	9.5 mm (3/8")	920 lpm (243 gpm)
PV15	Metal	76 mm (3")	76 mm (3")	9.5 mm (3/8")	909 lpm (232 gpm)
T15	Metal	76 mm (3")	76 mm (3")	9.5 mm (3/8")	878 lpm (232 gpm)

Unitec™ Series

Model	Material	Inlet	Discharge	Max. Solids	Max. Flow
UA.025	Plastic	6 mm (1/4")	6 mm (1/4")	1.9 mm (5/64")	9.8 lpm (2.6 gpm)
UA.038	Plastic	10 mm (3/8")	10 mm (3/8")	3.2 mm (1/8")	20.1 lpm (5.3 gpm)
UA.050	Plastic	13 mm (1/2")	13 mm (1/2")	3.9 mm 5/32")	49.9 lpm (13.2 gpm)
UA2	Plastic	25 mm (1")	25 mm (1")	6.4 mm (1/4")	98 lpm (26 gpm)
UA4	Plastic	38 mm (1-1/2")	38 mm (1-1/2")	8.7 mm (11/32")	299 lpm (79 gpm)
UA8	Plastic	51 mm (2")	51 mm (2")	11.1 mm (7/16")	530 lpm (140 gpm)
UB2	Metal	25 mm (1")	25 mm (1")	3.2 mm (1/8")	58 lpm (15.4 gpm)
UH.050	Plastic	13 mm (1/2")	13 mm (1/2")	3.9 mm (5/32")	70.0 lpm (18.5 gpm)
UH2	Plastic	25 mm (1")	25 mm (1")	4.7 mm (3/16")	182 lpm (48 gpm)
UH4	Plastic	38 mm (1-1/2")	38 mm (1-1/2")	7.9 mm (5/16")	329 lpm (87 gpm)
UU.038	Plastic	10 mm (3/8")	10 mm (3/8")	N/A	9.8 lpm (2.6 gpm)
UU1	Plastic	13 mm (1/2")	13 mm (1/2")	N/A	20.1 lpm (5.3 gpm)
	Metal			N/A	
UU2	Plastic	25 mm (1")	25 mm (1")	N/A	49 lpm (13 gpm)
	Metal			N/A	
UU3	Plastic	32 mm (1-1/4")	32 mm (1-1/4")	N/A	98 lpm (26 gpm)
UU4	Plastic	38 mm (1-1/2")	38 mm (1-1/2")	N/A	197 lpm (52 gpm)

Specialty Pumps

Model	Material	Inlet	Discharge	Max. Solids	Max. Flow
H25 1600S	Metal	6 mm (1/4")	6 mm (1/4")	N/A	4.1 lpm (1.1 gpm)
H38 3200D	Metal	10 mm (3/8")	10 mm (3/8")	N/A	7.6 lpm (2.0 gpm)
H400S	Metal	38 mm (1-1/2")	38 mm (1-1/2")	7.9 mm (5/16")	242 lpm (64 gpm)
H800	Metal	51 mm (2")	51 mm (2")	12.7 mm (1/2")	360 lpm (95 gpm)
T4 Stallion®	Metal	38 mm (1-1/2")	38 mm (1-1/2")	12.7 mm (1/2")	216 lpm (57 gpm)
T8 Stallion®	Metal	51 mm (2")	51 mm (2")	19.1 mm (3/4")	568 lpm (150 gpm)
T15 Stallion®	Metal	76 mm (3")	76 mm (3")	25.4 mm (1")	692 lpm (183 gpm)

Pump Size

A pump's critical dimensions must be checked against existing piping to eliminate the need for costly re-plumbing. Please refer to Section 4 of your EOM manual for details.

Solids Handling Capability

Maximum slurry particle size must not be greater than the pump's solids passage capability. A strainer may be placed on the inlet line to eliminate particles larger than the pump's capability. Please refer to Section 5 of your EOM manual for your pump's specific solids passage capabilities.

Suction Lift

An application's suction lift requirements must not be greater than the pump's suction lift capabilities. Suction lift will vary depending on the number of inlet and discharge elbows, the viscosity of the process fluid, elevation (atmospheric pressure) and pipe friction loss. Wilden suction lift curves are calibrated for pumps operating at 305m (1,000') above sea level pumping water. When reading suction lift curves, locate the curve on the chart that represents your pump (PTFE, TPE, Ultra-Flex™ or Rubber fitted). On the Inlet Air Pressure axis, locate the amount of air pressure you are running to the pump, follow that point straight up until you locate the curve. Once you locate the curve, trace that point to the left until you locate the Dry Vacuum vertical axis. The point you reach corresponds to the dry vacuum or suction lift your pump will achieve at that specific inlet air pressure. Please refer to Section 6 of your EOM for your pump's specific suction lift capabilities.

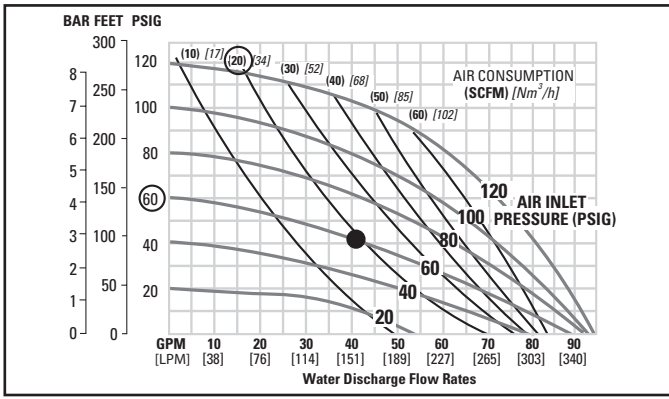
Performance Curves

Pump performance capabilities must be matched with flow rate requirements. Please consult Section 5 of your EOM for your pump's performance curve.

- Discharge head (vertical axis).
- Required flow rate (horizontal axis).

A pump should be selected which will operate between the 25 and 75 percentile range of capacity.

For optimum life and performance, pumps should be specified so that daily operation parameters will fall in the middle of the pump performance curve. Wilden publishes 4 different performance curves for most metal and plastic pump models. These performance curves are unique due to the different stroke lengths of the diaphragm assemblies. The four classifications are: 1) Rubber-fitted pumps; 2) Ultra-Flex™-fitted pumps; 3) Thermoplastic (TPE)-fitted pumps; and 4) PTFE-fitted pumps. When applicable, all four of these curves are included in the Engineering, Operation, and Maintenance manuals (EOM's).



How to read a Wilden performance curve: Determine the flow rate your application requires and calculate the Total Discharge Head (page 15). Plot the intersection of the discharge head on the vertical axis to the flow rate on the horizontal axis. Now the air supply pressure and air supply volume can be extracted from the curve. Simply locate the solid black line closest to this intersection and follow it to the vertical axis to the left. This is the air supply pressure needed to provide the flow rate you require at the given discharge head. Next locate the closest

gray line to the intersection and follow it up to where the numbers are provided. These numbers indicate the air supply volume needed to provide the flow rate you require at the given discharge head.

To pump 151 lpm (40 gpm) against a discharge pressure head of 2.7 Bar (40 psig) requires 4.1 bar (60 psig) and 30.6 Nm3/h (18 scfm) air consumption. Dot on chart represents the plotted intersection and the circled numbers are the air pressure and volume figures.

Total Dynamic Head Calculation

Please refer to the example on page 71 for calculating your TDH (Total Dynamic Head). Wilden publishes a Pump Viscosity and Cavitation Chart (E6) that needs to be used in accordance with the boxed worksheet to obtain the Total Dynamic Head. Process fluid viscosity plays an integral part in calculating TDH. The more viscous a product, the more head a pump has to overcome to move that product. Please contact your authorized Wilden distributor for more information.

Chemical Compatibility

Wilden's Chemical Resistance Guide (E4) should be used in conjunction with personal experience to select wetted pump construction and elastomers for chemical compatibility with the process fluid.

Temperature Limitations

Temperature limitations are based on mechanical stress only. Certain chemicals will significantly reduce the maximum safe operating temperatures. Consult Wilden's Chemical Resistance Guide (E4) for chemical compatibility and temperature limits for specific fluids. Process fluid and environmental temperatures must be considered. Temperature limits for materials of construction and elastomers are listed below. Additionally, temperature limitations are listed in Section 1 of your EOM.

Temperature Limits:

Polypropylene	0°C to 79°C	32°F to 175°F
PVDF	-12°C to 107°C	10°F to 225°F
PFA	7°C to 143°C	20°F to 300°F
Neoprene	-18°C to 93.3°C	0°F to 200°F
Buna-N	-12°C to 82.2°C	10°F to 180°F
EPDM	-51°C to 137.8°C	-60°F to 280°F
Viton®	-40°C to 176.7°C	-40°F to 350°F
Wil-Flex™	-40°C to 107.2°C	-40°F to 225°F
Saniflex™	-29°C to 104.4°C	-20°F to 220°F
Polyurethane	-12°C to 65.6°C	10°F to 150°F
PTFE	4°C to 104.4°C	40°F to 220°F

Abrasion Resistance

When a highly abrasive fluid is pumped, damage can occur to the pump's internals if the given internals do not exhibit the abrasion resistance needed. Certain powders as well as, slurries containing rocks, metal fines, or sand, tend to be highly abrasive, "scratching" the pump's internals as they go through the pump. Pump internals most likely to get damaged are a pump's ball cages and elastomers: diaphragms, balls, and seats. If the given elastomers do not exhibit the abrasion resistance required, they will wear prematurely. This premature wear will affect the pump's performance.

Note: When pumping highly abrasive substances, it is suggested to install an oversize pump in order to reduce the velocity of the process

fluid and hence reduce elastomer abrasion. Ultra-Flex™ diaphragms exhibit exceptional abrasion resistance given special fabric placement that allows for more sacrificial rubber. In addition, Wilden Pump & Engineering, LLC offers a complete line of abrasion resistant materials to revolutionize the way you solve your toughest pumping problems.

Cavitation

Cavitation is a hydraulic condition which can exist in any type of pump. It is primarily a situation in which the pump is discharging less liquid than its rated capacity due to reduction or lack of fluid supply to the pump. Common causes of cavitation are excessive suction lift, insufficient Net Positive Suction Head (NPSH), or operation at too high a speed. Pitting, vibration, and noise are common troubles stemming from cavitation. While severe cavitation is usually accompanied by excessive noise, mild cavitation may produce nothing more than a small reduction in pump efficiency and moderate wear of pump parts. You should:

- Slow pump down
- Reduce suction lift
- Increase positive head pressure
- Use a larger pump if you are not getting the required flow rates
- Consult Wilden's Cavitation and Pump Friction Guide (E6) for more details

Total Dynamic Head Worksheet

Need to Know: G.P.M. Specific Gravity (s.g., γ) Pipe Size (ϕ) Viscosity (μ)

Need to Have: Wilden Cavitation/Pipe Friction Chart and Viscosity Chart (RBG-E6)

TOTAL DYNAMIC HEAD = +/- TOTAL SUCTION LIFT + TOTAL DISCHARGE HEAD

I. Static Suction Head/Lift

Static Lift (head) = vertical distance from liquid surface to center line of pump

___ (Vertical feet) x___ s.g.=___ feet

___ feet x .433 (or Divide by 2.31)=___ PSIG

Static Discharge Head

Discharge Head = vertical distance from center line of pump to point of free discharge

___ (Vertical feet) x ___ s.g. = ___ feet

___ feet x .433 (or Divide by 2.31) = ___ PSIG

II. Dynamic Suction

(A) Pipe Diameter ___ (inches)
(B) Viscosity ___ (ssu)
(C) Pipe ___
+ elbows* ___
= total pipe ___ (feet)

Viscosity Chart Figure ___ (PSIG loss/100 ft)

____ x ____ s.g. x ____ total pipe= ____ PSIG
(PSIG loss 100)

Dynamic Discharge

(A) Pipe Diameter ___ (inches)
(B) Viscosity ___ (ssu)
(C) Pipe ___
+ elbows* ___
= total pipe ___ (feet)

Viscosity Chart Figure _____(PSIG loss/100 ft)

____ x ____ s.g. x ____ total pipe= ____ PSIG
(PSIG loss 100)

II. Total Suction Lift/Head

___ (PSIG figure from calculation I)
+ ___ (PSIG figure from calculation II)
= ___ PSIG

Total Discharge Head

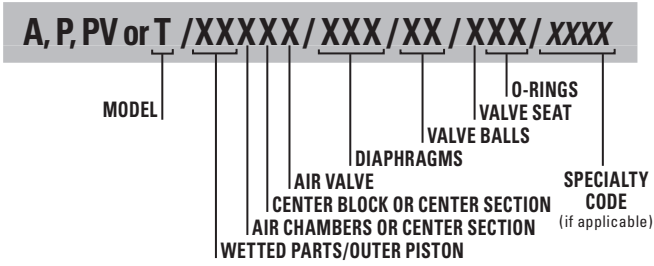
____ (PSIG figure from calculation I)
+ ____ (PSIG figure from calculation II)
= ____ PSIG

+/- ___ Total Suction Lift
___ Total Discharge Head
= ___ PSIG Total Dynamic Head

* Assume 10 ft loss for every 90° elbow.

Pump Designation System

The following is a generic pump designation system to familiarize you with Wilden's nomenclature. Please refer to Section 2 of your Engineering, Operation & Maintenance manual for the Material Code designation system for your pump size and type. Your specific pump model is located on your pump's serial tag. Please note, some model descriptions include a three digit specialty code at the end of the serial number. This specialty code signifies an additional feature for the specific pump. See your authorized Wilden Distributor for additional information.



Pump Model — Inlet

A or P.025	=	1/4"
P25	=	1/4"
P38	=	3/8"
A, T, or P1	=	1/2"
P100	=	1/2"
A, T, P or PV4	=	1 1/2"
P or PV400	=	1 1/2"
A, T, P or PV8	=	2"
P or PV800	=	2"
A, T, P or PV15	=	3"
P or PV1500	=	3"
A, T or PV20	=	4"

Wetted Parts & Outer Piston

AA	=	Aluminum / Aluminum
AM	=	Aluminum / Mild Steel
AS	=	Aluminum / Stainless Steel
AZ	=	Aluminum / No Outer Piston
DZ	=	Conductive Polyethylene / No Outer Piston
EZ	=	Polyethylene / No Outer Piston
FZ	=	Conductive PTFE / No Outer Piston

Wetted Parts & Outer Piston (Cont.)

HH = Alloy C / Alloy C
HZ = Alloy C / No Outer Piston
KK = PVDF / PVDF
KZ = PVDF / No Outer Piston
PP = Polypropylene / Polypropylene
PK = Polypropylene / PVDF
PZ = Polypropylene / No Outer Piston
TT = PTFE / PTFE
TZ = PTFE / No Outer Piston
SS = Stainless Steel / Stainless Steel
SZ = Stainless Steel / No Outer Piston
WW = Ductile Iron / Ductile Iron
WM = Ductile Iron / Mild Steel
WS = Cast Iron / Mild Steel
WZ = Ductile Iron / No Outer Piston

Air Chambers

A = Aluminum
C = PTFE-Coated
L = Virgin Acetal
M = Mild Steel (A4, T4)
N = Nickel-Plated
P = Polypropylene
S = Stainless Steel
V = Halar-Coated
W = Cast Iron
Y = Nylon

Center Block

A = Aluminum
C = PTFE-Coated
K = PVDF
L = Virgin Acetal
N = Nickel-Plated
P = Polypropylene
S = Stainless Steel
Y = Nylon

Air Valve

A = Aluminum
B = Brass
C = PTFE-Coated
D = Brass w/Oil Btl.
L = Virgin Acetal
N = Nickel-Plated
P = Polypropylene
S = Stainless Steel

Diaphragms

AWS = Wil-Flex™, Soft Shore
BNL = Buna-N, IPD (Red Dot)
BNS = Buna-N (Red Dot)
BNU = Buna-N, Ultra-Flex™ (Red Dot)
EPL = EPDM, IPD (Blue Dot)
EPS = EPDM (Blue Dot)
EPU = EPDM, Ultra-Flex™ (Blue Dot)
FBS = Sanitary Buna-N (Two Yellow Dots)
FES = Sanitary EPDM (Two Blue Dots)
FNS = Sanitary Neoprene
FSS = Saniflex™ (Cream)
FVS = Sanitary Viton® (Two White Dots)
FWS = Sanitary Wil-Flex™

Diaphragms (Cont.)

LEL = PTFE EPDM Backed, IPD (White)
LNL = PTFE Neoprene Backed, IPD (White)
NES = Neoprene (Green Dot)
NEU = Neoprene, Ultra-Flex™ (Green Dot)
PEL = Polyethylene, IPD
PUS = Polyurethane (Clear)
TEL = PTFE w/EPDM Back-Up O-Ring, IPD (White)
TEU = PTFE w/EPDM Back-Up (White)
TFL = PTFE, IPD, No Back-Up (White)
THU = PTFE w/High Temp Buna-N BACK-UP (White)
TNL = PTFE w/Neoprene Back-Up O-Ring, IPD (White)
TNU = PTFE w/Neoprene Back-Up (White)
TSU = PTFE w/Saniflex™ Back-Up (White)
TVL = PTFE w/Viton® Back-Up O-Ring, IPD (White)
TVU = PTFE w/Viton® Back-Up (White)
VTS = Viton® (White Dot)
VTU = Viton®, Ultra-Flex™ (White Dot)
WFS = Wil-Flex™ (Orange Dot)
XBS = Conductive Buna-N (Two Red Dots)
XES = Conductive EPDM (Two Blue Dots)
XNS = Conductive Neoprene (Two Green Dots)
XVS = Conductive Viton® (Two White Dots)

Valve Ball

BN = Buna-N
FS = Saniflex™
FV = Food Grade Viton®
EP = EPDM
NE = Neoprene
PU = Polyurethane
SS = Stainless Steel
TF = PTFE
VT = Viton®
WF = Wil-Flex™

Valve Seat

A = Aluminum
BN = Buna-N
FS = Saniflex™
H = Alloy C
K = PVDF
M = Mild Steel
EP = EPDM
NE = Neoprene
P = Polypropylene
PU = Polyurethane
S = Stainless Steel
T = PFA
VT = Viton®
WF = Wil-Flex™

Valve Seat O-ring

BN = Buna-N
CR = Chemraz (UP)
FS = Saniflex™
FS = Fluoro-Seal (Metal)
EP = EPDM
PU = Polyurethane
TF = PTFE (Metal)
TV = Encap. Viton®
WF = Wil-Flex™

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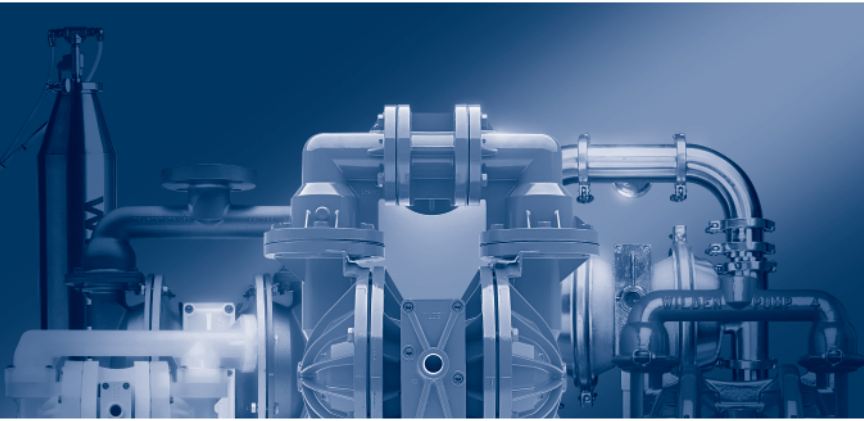
PUMP USER'S GUIDE

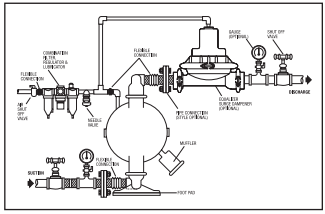


Installation

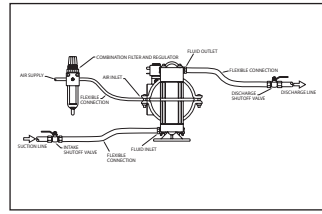
8

Diagrams

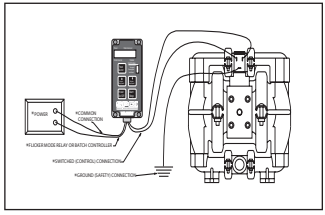
Typical Suggested Installation



Accu-Flo™ Plumbing Connections



Accu-Flo™ Electrical Connections



Pre-Installation Checklist:

Cautions

- **Verify pump model received against purchase order or spec sheet.**
- **Re-torque all bolts to specifications on torque table.**
- **Remove shipping plugs.**
- **Pumps that need to be submersed must have both wetted and non-wetted parts compatible with material being pumped.**
- **Submersed pumps must have a hose attached to pump's air exhaust and to he exhaust air piped above liquid level.**
- **Pumps should be thoroughly flushed with water before installation.**
- **FDA, USDA, and 3A pumps should be sanitized prior to usage.**
- **Do not exceed 8.6 bar (125 psig) air supply pressure 50 psig on UL models).**
- **Blow out air line for 10 to 20 seconds before attaching to pump to make sure all pipe line debris is clear.**

Suggested Installation

The suction pipe should be at least the diameter of the pump's inlet manifold connection or larger if highly viscous material is being pumped. The suction hose must be non-collapsible, reinforced type as Wilden pumps are capable of pulling a high vacuum. Discharge piping should be at least the diameter of the pump's discharge manifold connection; larger piping can be used to reduce friction losses. It is critical that all fittings and connections are airtight or a reduction or loss of pump suction capability will result. The pump should not be used as a support mechanism for the piping system. Wilden suggests the use of flexible connections for inlet/outlet ports and air line (see diagrams).

Due to the reciprocating action of the pump, lateral instabilities can occur during normal operation, thus footed pumps should be bolted to the ground and pads should be used. Ensure the operating surface is level and flat.

Most Wilden pumps can be used in submersible applications only when both wetted and non-wetted portions are compatible with the material being pumped. If the pump is to be used in a submersible application, a hose should be attached to the pump's air exhaust and the exhaust air piped above the liquid level.

NOTE: Pro-Flo® and Accu-Flo™ pumps cannot be submerged.

If the pump is to be used in a self-priming application, be sure that all connections are airtight and that the suction lift is within the pump's ability. Note: Materials of construction and elastomer material have an effect on suction lift parameters. Refer to the performance section of your EOM for your pump's specific suction lift capability.

Pumps in service with a positive suction head are most efficient when inlet pressure is limited to 0.5–0.7 bar (7–10 psig). Premature diaphragm failure may occur if positive suction head is 0.8 bar (11 psig) and higher, particularly when using PTFE and Thermoplastic diaphragms. All positive suction head applications should include a "check valve" at the pump liquid inlet to allow for the pump to be disconnected.

Each Wilden pump has a specific maximum solids capability. Whenever the possibility exists that larger solid objects may be sucked into the pump, a strainer should be used on the suction line. (See page 13 for maximum solids passage.)

CAUTION: Do NOT exceed 8.6 bar (125 psig) air supply pressure. 50 psig (3.4 bar) for UL-listed and 5.9 bar (85 psi) for H800.

CAUTION: Blow out air line for 10 to 20 seconds before attaching to pump to make sure all pipe line debris is clear. Use a 5µ (micron) air filter on all Pro-Flo® and Wil-Flo™ models.

NOTICE: All fasteners should be checked to match the pump's given torque specifications listed in of the EOM.

CAUTION: Ensure proper ventilation of tanks/vessels that house liquid supply. Due to the pump's high vacuum ability, improper ventilation of these supply tanks can lead to implosion of tanks when fluid is completely evacuated.

CAUTION: Thermal expansion: Some liquids present in piping may expand at elevated temperatures, resulting in pipe and/or pump damage and subsequent risk to operator.

Electrical Hazards

Static Spark can cause explosion resulting in severe injury or death. Electrostatic hazard is eliminated by properly grounding the pump and the pumping system. For some applications the A.025, P.025, T1 and A1 Carbon Filled Acetal (CFA) pumps will provide a more adequate dispersal of static electricity. Consult local building codes and electrical codes for specific grounding requirements.

Conductivity: Certain Wilden pumps provide for safe transfer of flammable materials. UL 79, Carbon-filled Acetal pumps (CFA), and Nema 7 coils are available to meet your specific conductivity needs.

Temperature Hazards

Fluid being pumped should be compatible with the pump's material of construction and temperature limits as stated in the Wilden Chemical Resistance Guide (E4).

Hazards Generated By Noise

Pump noise can be excessive under certain operating conditions, e.g. high air pressure supply and little or no discharge head. Extended periods of operation under such conditions can create a hazard to operators working in proximity to the pumps. Ways to avoid this hazard are listed as follows:

- Use proper hearing protection devices.
- Use mufflers on the pump's air exhaust.
- Plumb the pump's exhaust air to an area not in proximity of plant workers.
- Use elastomeric valve balls in lieu of PTFE valve balls since soft balls reduce noise. (Ensure proper chemical resistance of ball elastomer used)

Hazardous Materials

Handler should obtain Material Safety Data Sheet (MSDS) from the chemical supplier for all materials being pumped for appropriate handling instructions.

When pumping hazardous fluids, Wilden pumps should be fitted with the Wil-Gard II™ diaphragm monitoring system, which will detect a diaphragm failure before hazardous material exits the pump. Wil-Gard™ II diaphragm monitoring system is only available with PTFE fitted pumps.

In case of diaphragm failure, material being pumped may exit pump via air exhaust, in which case contact with the hazardous material is possible.

Chemical Compatibility

When selecting a pump for a particular application, pump wetted materials of construction and elastomer materials must be compatible with the material being pumped. Please consult Wilden Chemical Resistance Guide (E4) or your local authorized distributor for more information.

CAUTION: Some materials such as halogenated solvents should not be pumped with an aluminum construction pump due to a possible explosive reaction. Consult your chemical supplier.

Accu-Flo™ Installation

All wiring used to operate the pumps should be placed and connected according to the proper electrical codes. It is important that the wiring is of adequate gauge to carry the current required to operate the pump. In addition, it is necessary that the electrical power supply is large enough to supply the current required to operate the pump. Wiring should be above ground level if possible (in case of fluid spill or leakage), and all wiring and connections which could become wet or damp should be made watertight.

The solenoid valve is rated for continuous duty; however, stopping an even number stroke count insures that the electrical power is off when the pump is stopped. This practice is safer and also eliminates unwanted strokes when the system is shut down and electrical power is off.

Solenoid valve fitted pumps should not be used in an area where explosion proof equipment is required unless an explosion proof coil is utilized. Nema 7 explosion proof coils are available for all Accu-Flo™ pumps.

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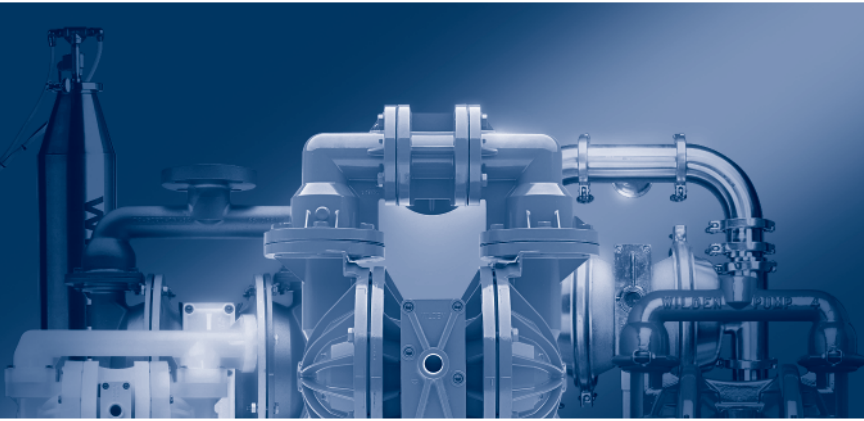

Maintenance

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Directions for Disassembly/Reassembly

The following are generic directions for disassembly/reassembly of the Wilden pump. Please refer to your EOM for detailed disassembly/reassembly instructions and photographs pertaining to your specific pump.

CAUTION: Before any maintenance or repair is attempted, the compressed air line to the pump should be disconnected and all air pressure allowed to bleed from the pump. Disconnect all intake, discharge and air lines. Drain the pump by turning it upside down and allowing any fluid to flow into a suitable container. Wear safety glasses. When diaphragm failure occurs, material being pumped may be forced out the air exhaust.

NOTE: Before starting disassembly, mark a line from each liquid chamber to its corresponding air chamber. This line will assist in proper alignment during reassembly.

Before you disassemble the pump:

- Wear safety glasses
- Shut off main air supply
- Disconnect air hose from air valve to drain air pressure in hose
- Isolate pump using isolation valves to avoid product spillage from pipe
- Turn pump upside down to drain all liquid trapped by valve balls
- Mark a line from each liquid chamber to its corresponding air chamber to assist in proper alignment during reassembly

Inspection

Air Valve Piston/Spool and Casing

- Ensure piston/spool can move freely
- Clean out debris

Diaphragms

- Make sure no swelling, cracking, or other damage is apparent

Balls/Seats/O-rings

- Make sure no swelling, cracking, or other damage is apparent
- Lubricate shaft if needed

Mean Time to Failure

A Preventative Maintenance Schedule (PMS) should be set up for the following parts to ensure pump is serviced prior to part wear

- Diaphragms
- Valve Seats
- Valve Balls
- O-Rings

Seal Replacement

Proper seal installation is critical to pump performance when employing AODDPs in your application. Great care must be taken to ensure that seals are placed in the proper grooves and not damaged during installation. Incorrect seal location will render the pump inoperable. Damaged seals may cause decreased performance and shorter seal life. The Ringer™ seal installation kit, containing an installation tool and locator bushings, simplifies seal installation on Turbo-Flo™ pumps.

Disassembly Overview

The following instructions are to be used as a reference for disassembly/reassembly of your Wilden pump. These instructions are meant solely to give you an idea on how to disassemble/reassemble a Wilden pump. Your pump size and build may vary substantially. Please refer to your EOM for specific detailed instructions on disassembly / reassembly of your Wilden pump.

Before starting disassembly, mark a line from each liquid chamber to its corresponding air chamber. This line will assist in proper alignment during reassembly.

Remove the fasteners that connect the discharge manifold to the liquid chambers. Remove the discharge manifold to expose the valve balls and valve seats. Inspect the ball cage area of the manifold for excessive wear or damage. Remove the discharge valve balls, seats and o-rings from the discharge manifold and inspect for nicks, gouges, chemical attack and/or abrasive wear. Replace worn parts with genuine Wilden parts to ensure reliable performance.

Remove the fasteners that connect the inlet manifold to the liquid chambers. Lift the intake manifold away to expose the valve balls and seats. Inspect intake valve ball cage for excessive wear or damage. Remove the intake valve balls, seats and o-rings from the discharge manifold and inspect for nicks, gouges, chemical attack and/or abrasive wear. Replace worn parts with genuine Wilden parts to ensure reliable performance.

Remove the fasteners that connect the liquid chamber to the center section assembly. Lift liquid chamber away from the center section assembly to expose the diaphragm and outer piston. Using an adjustable wrench, remove the diaphragm assembly. Inspect diaphragm assembly and shaft for signs of wear or chemical attack. Repeat disassembly instructions for opposite liquid chamber.

See your Engineering, Operation & Maintenance manual (EOM) for detailed disassembly/reassembly instructions of your pump's air distribution system.

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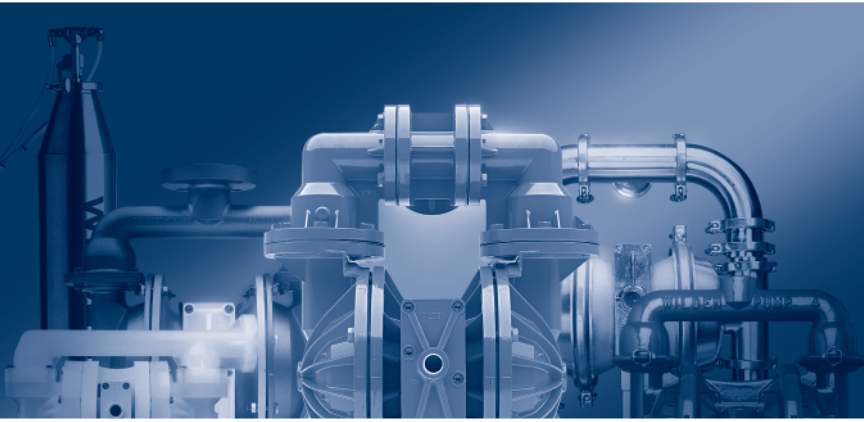

Wilden Accessories

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SD Equalizer® Surge Dampener

An inherent characteristic of reciprocating pumps is the pressure change between each pump stroke. The Equalizer® can be used to provide a supplementary pumping action between pump strokes, thus minimizing pressure fluctuation while offering protection to your pumping system. The Equalizer® reduces water hammer, absorbs acceleration head, lowers system maintenance costs and minimizes pipe strain protecting in-line equipment. Sizes available are SD1⁄2 13 mm (1⁄2") inlet/discharge, SD1 25 mm (1") inlet/discharge, SD2 51 mm (2") inlet/discharge and SD3 76 mm (3") inlet/discharge.

Materials of Construction Available

	SD1/2	SD1	SD2	SD3
Aluminum	•	•	•	
316 Stainless Steel	•	•	•	•
Cast Iron		•	•	
Polypropylene	•	•	•	
PVDF	•	•	•	
Carbon-filled Acetal	•			
PTFE	•	•		

Adjustable

- Self-relieving regulator
- Permanent air supply
- Easy adjustment of internal air pressure
- Inlet & discharge for constant pressure systems

Automatic

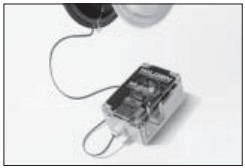
- Automatic valve
- Permanent air supply
- Self-adjusting
- Discharge siding on varying pressure systems

Flow Control System II™

The Flow Control System II™ (FCS-II) counts the strokes of the Wilden pump and controls the pump so that specific repeatable quantities can be batched. The system has manual entry screens which allow the user to customize the data based on specific application calculations. Once the unit is programmed, the data is held in memory even when the unit is off or disconnected. To aid the user, the FCSII provides help screens where additional information concerning every system setup is displayed at the touch of a button. The FCSII can be used with either standard Wilden air-shifted pumps or Wilden Accu-Flo™ pumps. Three separate batch quantities can be programmed.

Solenoid Pump Controller I™

The Solenoid Pump Controller I™ (SPC-I) is designed to provide an intuitive interface between you and your Accu-Flo™ pump. The SPC-I energizes and de-energizes the solenoid coil at a programmed rate to control Wilden Accu-Flo™ pumps. The pump speed can be easily adjusted by simply pushing the appropriate (increase or decrease) buttons on the keypad. To expedite your pump speed selection, three programmable presets are available. The LCD screen and LED's (light emitting diodes) display operational status which allows you to operate the pump from a remote location. The preset number, the stroke interval in seconds (pump speed), the stroke counter and stroke totalizer are indicated on the LCD screen. The leak detection LED informs you of the optional Wil-Gard II™ leak detection device status. The SPC-I will stop pump operation if a leak is detected by the Wil-Gard™ diaphragm monitoring system. An external input can be utilized to remotely start and stop the pump to customize the application. Liquid level controllers, proximity switches, temperature switches, etc. can easily interface with the SPC-I by simply wiring the external component to the terminal strip and selecting the external input mode. The SPC-I can be powered by three different voltages: 110V AC, 220V AC and 12V DC. The output voltage of the SPC-I is 12V DC which must be used with Wilden's Nema 4 or Nema 7 12V DC Accu-Flo™ pumps.



Wil-Gard II™

The Wil-Gard II™ diaphragm monitoring system will sense the presence of fluid between the primary PTFE diaphragm and back-up diaphragm once installed on a PTFE-fitted pump. Upon sensing the fluid, a high brightness LED and an internal relay are activated while the back-up diaphragm offers product containment. The sensor cables are engineered to withstand millions of pump cycles while detecting conductive fluids. The Wil-Gard II™ can be factory installed on Wilden PTFE-fitted pumps and can be purchased as an accessory to an existing pump. The Wil-Gard II™ reduces chemical attack on non-wetted parts, reduces hazardous emissions passing through the air exhaust and detects a leak while the back-up diaphragm offers containment protecting from product contamination. The Wil-Gard II™ can easily be connected to the FCS-I or SPC-I in order to detect diaphragm failure while offering product containment.

Drum Pump Kit

The Wilden Universal Drum Pump Kit is designed as a lightweight, portable means of adapting your Wilden pump to drum pumping applications. The Wilden Drum Pump Kit is used in conjunction with Wilden 6 mm (1/4") and 13 mm (1/2") pump models. The drum base adapter is available in Nylon and Polypropylene, and the pick-up tube is available in Nylon, Polypropylene and PTFE. The drum adapter is available with a 51 mm (2") NPT male connection suitable for installation on most drums. The pick-up tube can be cut to length to accommodate various drum sizes.

Automatic Powder Valve

The Wilden pump can be used to successfully transfer many low density powders. The Automatic Powder Valve (APV) is a spring loaded valve that is installed on the inlet line to the Wilden pump. The APV introduces atmospheric air to the inlet line of the pump and lightens or fluidizes the material being transferred before it reaches the pump. While best results have been achieved transferring powders with a density up to 400 kg/m3 (25 lbs per cubic foot), a test should be performed to determine if desired capacities can be obtained in your specific application.

2 for 1 System

Wilden's split manifold kit allows users of the Wilden plastic pump line to turn one pump into two. This simple kit contains four adapters to allow one of the following unique uses, 1) transfer two different products, 2) pump from one side and return with the other, and 3) blend two products in the discharge manifold. Wilden pumps can be purchased equipped with a 2 for 1 split manifold kit or a retro-fit kit can be obtained to modify an existing pump.

	A-series	P-series	PV-series	T-series
13mm (1/2")	•	•		•
38mm (1-1/2")	•	•	•	•
51mm (2")	•	•	•	•

P400 and PV4 Aluminum bolted pumps are also available in the 2 for 1 configuration.

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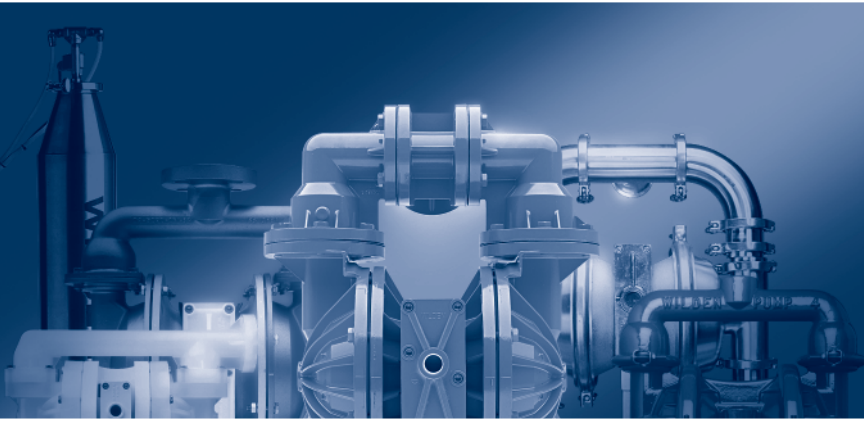

Trouble-shooting

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The following is a concise set of troubleshooting suggestions. Contact your local Wilden distributor for a comprehensive Troubleshooting Guide, or turn to your EOM for your pump's specific troubleshooting techniques.

Pump Will Not Run or Runs Slowly:

1. Check air inlet screen and air filter for debris.
2. Check for sticking air valve, flush air valve with cleaning fluid.
3. Check for worn out air valve. Replace if necessary.
4. Check center block seals. If worn excessively, they will not seal and air will simply flow through the pump and out the air exhaust. Use only Wilden seals as they are of special construction.
5. Check for rotating piston in air valve.
6. Check type of lubricant being used if you are using a pump that needs lubrication. A higher viscosity oil than suggested may cause the piston to stick or run erratically. Wilden suggests the use of a hydraulic oil with arctic characteristics (ISO grade 15/5wt arctic oil).

Pump Runs But Little or No Product Flows:

1. Check for pump cavitation; slow pump speed down to allow material to enter pumping chambers. Increase speed accordingly.
2. Check for sticking ball checks. If material being pumped is not compatible with pump elastomers, swelling may occur. Replace balls with the proper elastomers.
3. Check to make sure all suction connections are air tight, especially manifold connections around intake balls.

Pump Air Valve Freezes:

Check for excessive moisture in compressed air. Install either a dryer or a hot air generator for compressed air.

Air Bubbles In Pump Discharge:

1. Check for ruptured diaphragm.
2. Check tightness of clamp bands, especially at the intake manifold.

Product Comes Out Air Exhaust:

1. Check for ruptured diaphragm.
2. Check tightness of large clamp bands.
3. Check tightness of piston plates to shaft if applicable.

Pump Rattles:

1. Use softer balls.
2. Create false discharge head or suction lift.
3. See Troubleshooting section in EOM.

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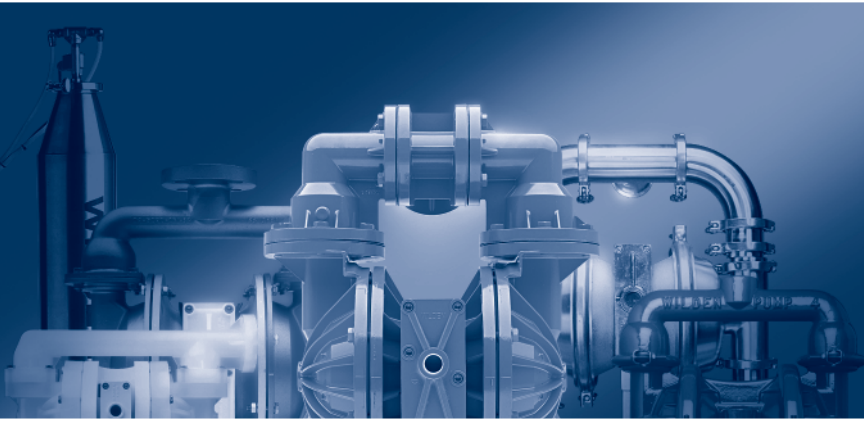

Chemical Resistance Guide

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This information is compiled from numerous sources and believed to be reliable to this date. **It is intended as a guideline to be used with all available information to determine suitability of elastomers and wetted portions of Wilden pumps for various applications.** We suggest thorough research, which should include known applications, when determining pump construction. This chart is to be used at your discretion and risk. The accuracy of these ratings cannot be guaranteed.

SELECTING THE BEST DIAPHRAGM FOR A WILDEN AIR-OPERATED DOUBLE-DIAPHRAGM PUMP

In the absence of previous experience (which is always the best guide) diaphragm material may be selected from available resistance charts. The Wilden Chemical Resistance Guide is compiled from numerous reliable sources and cross-checked, however, it is only intended as an additional source of information.

Diaphragm life not only depends on a diaphragm's chemical compatibility with the process fluid but also on the process conditions. These conditions will vary depending on the abrasiveness of your process fluid, temperature, size of diaphragm, pumping media and lift conditions. Consult your authorized Wilden distributor regarding which diaphragm material will work best for your application requirements.

As A General Rule:

1. Neoprene or Wil-Flex™ diaphragms should generally be used unless the chart shows them to be unsatisfactory. Even though Buna-N, EPDM and Viton® may show "A" ratings, if neoprene or Wil-Flex™ have at least a "B" rating, it will probably be the most economical choice on a "cost of diaphragms per gallon pumped" basis.

2. This is especially true when considering the use of Viton® diaphragms due to their replacement cost being over six times that of neoprene. Viton® should only be considered for aggressive media at extreme temperatures if it shows an "A" rating and neoprene, Buna-N and EPDM show an unsatisfactory rating.

These guides for best diaphragm selection do not hold for the valve ball material. Because the diaphragms are securely gripped by their inner and outer beads, they can stand up to 20% swell without affecting pump performance. If the valve balls swell even a very small amount, they cannot function properly. Therefore, there will be cases where neoprene diaphragms will be the best selection but PTFE, Buna-N, EPDM or polyurethane balls will be required.

CAUTION: Temperature limits are based upon mechanical stress only. Certain chemicals will significantly reduce maximum safe operating temperatures. Consult engineering guides for chemical compatibility and temperature limits.

It must be emphasized that none of these figures are absolute and are only general guidelines.

Selection of Plastic Materials

Many factors can affect the chemical resistance of plastics. These include, but are not limited to, exposure time, extremes of temperature and pressure, frequency of temperature and/or pressure cycling, attrition due to abrasive particles and the type of mechanical stress imposed. The fact that certain combinations of chemicals and mechanical load can induce stress cracking in many otherwise chemically resistant materials, both metallic and non-metallic, is of particular significance.

The chemical/temperature ratings presented are based on well-processed or well fabricated test specimens being essentially resistant to either chemical attack and/or severe swelling which would normally impair their performance under moderate mechanical stresses.

Operating parameters are dependent upon the particular application of polypropylene or PVDF and may differ from those experienced in either laboratory testing or apparently similar field service. Because corrosive fluids or vapors are often mixtures of various individual chemicals, it is strongly recommended that trial installations be evaluated under actual service conditions.

For example, immersion testing in individual chemicals at a specific operating temperature does not predict the performance of polypropylene or PVDF should an exothermic reaction take place when mixtures of chemicals are involved.

The ratings given on the following pages are a guide and do not constitute a warranty of any kind, expressed or implied, with respect to the performance of the materials Wilden offers in any specific application.

Ratings Definition

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information.

Wil-Flex™ is a trademark of Wilden Pump and Engineering, LLC. Saniflex™ is a trademark of Wilden Pump and Engineering, LLC. Viton® is a registered trademark of DuPont Dow Elastomers.

The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
ACETALDEHYDE	B	D	D	D	A	D	A	-
ACETAMIDE	A	D	A	A	A	A	A	-
ACETATE SOLV	B	D	D	D	C	-	A	-
ACETIC ACID, GLACIAL	B	C	D	D	B	D	A	B
ACETIC ACID	B	C	C	C	A	C	A	A
ACETIC ANHYDRIDE	A	D	B	D	B	D	A	D
ACETONE	B	D	D	D	A	D	A	B
ACETONITRILE	-	-	-	-	-	-	-	-
ACETOPHENONE	B	D	D	D	A	D	A	-
ACETYL CHLORIDE	B	D	D	D	C	B	A	-
ACETYLENE	C	-	B	A	A	A	A	A
ACRYLONITRILE	B	-	D	D	D	D	A	-
ADIPIC ACID	B	-	D	B	-	-	A	-
ALCOHOLS								
ALLYL	-	-	-	-	-	-	-	-
AMYL	A	C	B	B	A	B	A	A
BENZYL	A	-	B	D	C	A	A	-
BUTYL	A	D	A	A	A	A	A	-
DIACETONE	C	B	D	D	B	D	A	-
ETHYL	B	D	A	A	A	A	A	A
HEXYL	B	D	B	A	B	A	A	-
ISOBUTYL	A	D	A	C	A	A	A	-
ISOPROPYL	B	D	B	C	B	A	A	A
METHYL	A	D	A	A	B	D	A	A
OCTYL	B	D	B	B	A	A	A	-
PROPYL	A	D	A	A	B	A	A	-

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METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
B	A	A	A	A/100	B/70	A	A/212	C	C	D	D
A	A	A	-	A/200	B/120	A	A/250	A/70	A/70	A/140	D
B	D	A	-	A/100	A	-	A/175	B/72	B/72	A	D
B	D	A	A	A/100	D	D	A/250	A/100	D	A/120	D
B	D	A	A	A/100	D	D	A/250	B/70	A/120	A	D
B	D	A	A	A/200	D	D	A/250	C	D	B/70	D
A	A	A	A	A/200	B/120	A	A/212	D	B/70	D	D
-	-	-	-	-	-	-	A/212	-	-	-	-
B	A	B	-	A/200	A	-	A/250	A/70	-	A/70	-
D	A	B	-	A/100	D	-	A/212	-	D	A/120	C
A	A	A	-	A/200	A	A	-	B/72	D	A	A
B	A	A	B	-	B/70	-	A/140	B	A	A/70	B
B	B	B	-	-	-	-	A/175	B	A	B	A
-	-	-	-	-	-	-	A/212	-	-	-	-
B	B	A	A	A/200	A	A	-	B	B/120	A	A
B	B	A	A	A/200	D	A	-	A/70	D	A	D
B	B	A	A	-	A	A	-	B	A	A	A
A	A	A	A	-	A	A	-	B/72	B/72	A/70	B
B	A	A	A	-	B	A	-	A	B	A	C
A	A	A	A	-	A	A	-	A/70	A	A	A
B	C	A	A	-	B/70	A	-	-	A/120	A	A
B	C	A	A	A/70	B/70	A	A/140	A	A/120	A/150	A
B	A	A	A	A/70	B/70	A	-	A/120	A/70	A	A
A	A	A	A	-	A	A	-	-	A	-	-
A	A	A	A	A/70	B	A	-	A	A/120	A/120	A

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
ALLYL CHLORIDE	-	-	-	-	-	-	-	-
ALKAZENE	D	B	D	D	D	A	A	-
ALUM-NH3-CR-K	A	-	A	A	A	D	A	-
ALUMINUM ACETATE	A	D	B	C	A	D	A	-
ALUMINUM CHLORIDE 100%	-	-	-	-	-	-	-	-
ALUMINUM CHLORIDE 20%	A	B	A	A	A	A	A	D
ALUMINUM FLUORIDE	A	C	A	A	B	-	A	-
ALUMINUM HYDROXIDE	A	-	A	A	A	A	A	-
ALUMINUM NITRATE	A	C	A	A	A	A	A	-
ALUMINUM PHOSPHATE	A	-	A	A	A	A	A	-
ALUMINUM POTASSIUM SULFATE (ALUM)	A	-	A	A	A	A	A	-
ALUMINUM SULFATE	B	D	A	A	A	A	A	D
AMINES	A	D	B	D	-	D	-	-
AMMONIA, ANHYDROUS	A	D	A	B	A	D	A	-
AMMONIA, GAS (COLD)	A	-	A	A	D	A	A	-
AMMONIA, GAS (HOT)	A	-	B	C	C	D	A	-
AMMONIA, LIQUIDS	A	B	A	B	A	D	A	-
AMMONIA, WATER	-	-	-	-	-	-	-	-
AMMONIA NITRATE	A	D	C	A	-	-	-	-
AMMONIUM BIFLUORIDE	A	-	A	A	-	A	A	-
AMMONIUM CARBONATE	A	-	A	D	A	B	A	-
AMMONIUM CASENITE	A	-	A	-	-	-	-	-
AMMONIUM CHLORIDE	A	A	A	A	A	A	A	A
AMMONIUM FLUORIDE	-	-	-	-	-	-	-	-
AMMONIUM HYDROXIDE	A	D	A	B	A	B	A	D
AMMONIUM NITRATE	A	D	B	A	A	A	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	A	-
A	D	B	B	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
B	D	C	A	-	D	C	-	A	B/120	A	A
B	D	C	B	A	B/70	C	A/250	A	A/70	A	A
A	D	A	-	A	B/70	A	A/250	A	A/120	A	A
B	D	A	-	A	B/70	B	A/250	A	A/120	A	B
-	-	A	-	-	-	-	-	-	-	-	-
B	D	A	B	-	D	C	-	A	A/120	A	A
C	D	A	A	A	A/120	B	A/100	A	A/120	A	A
A	D	A	-	D	D	D	-	-	C/70	-	D
B	D	A	A	A/200	B/70	D	-	A/70	B/120	D	A
-	-	-	-	-	-	A	-	B	-	D	-
-	-	-	-	-	-	A	-	-	-	-	-
D	A	A	B	-	B/70	D	A/250	A/70	C/70	A	A
-	-	-	-	-	-	-	A/250	-	-	-	-
C	A	A	-	-	D	C	-	A	A	A	B
D	D	A	B	A	-	D	A/250	A/70	A/120	A	A
C	C	A	B	A	A	D	A/250	A	B/120	A	A
-	-	A	-	-	-	A	-	-	-	-	-
C	D	C	A	A	C	B	A/250	A	A/120	A	A
-	-	-	-	-	-	-	A/250	-	-	-	-
C	A	A	A	A/200	A	C	A/250	A	A/70	A	A
B	B	A	A	A	B	A	A/212	A	A/70	A	A

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
AMMONIUM OXALATE	A	-	A	A	-	-	-	-
AMMONIUM PERSULFATE	A	D	A	D	B	A	A	-
AMMONIUM PHOSPHATE, DIBASIC	A	-	A	A	A	A	A	-
AMMONIUM PHOSPHATE, MONOBASIC	A	-	A	A	A	A	A	-
AMMONIUM PHOSPHATE, TRIBASIC	A	-	A	A	A	A	A	-
AMMONIUM SULFATE	A	A	A	A	A	D	A	B
AMMONIUM THIO-SULFATE	A	-	A	A	A	-	A	-
AMYL-ACETATE	B	D	D	D	B	D	A	B
AMYL-ALCOHOL	B	D	B	B	A	B	A	A
AMYL-BORATE	B	-	B	A	D	A	A	-
AMYL-CHLORIDE	C	-	D	D	D	A	A	-
AMYL-CHLORONAPTHALENE	C	D	D	B	D	A	A	-
AMYL-NAPTHALENE	C	D	D	D	D	A	A	-
ANILINE	B	-	D	D	-	D	A	D
ANILINE DYES	B	D	B	C	A	A	A	-
ANILINE HYDROCHLORIDE	A	D	D	C	B	B	A	-
ANIMAL FATS	B	B	B	A	A	A	A	-
ANTIMONY TRICHLORIDE	-	-	-	-	-	-	-	-
ANSUL ETHER	D	B	D	C	C	D	A	-
ANTI-FREEZE	A	-	C	A	-	A	-	-
AQUA REGIA (80%, HCI, 20% HNO3)	D	D	D	D	C	C	A	-
AROCHLOR(S)1248	D	-	D	D	C	A	A	-
AROMATIC HYDROCARBONS	C	D	D	D	D	A	A	-
ARSENIC ACID	A	C	A	A	A	A	A	-
ARSENIC TRICHLORIDE	B	-	A	C	D	D	A	-
ASKAREL	D	D	C	B	D	A	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	D	A	A	-	-	B	-	-	-	-	A
C	D	A	A	A/150	D	D	-	A	A/120	A	A
B	D	A	A	A/70	D	B	A/250	A	A/120	A	A
B	D	A	A	-	B	B	A/250	A	A	A	A
B	D	A	A	-	B	B	A/250	A	C	A	A
B	C	A	B	A	B/70	B	A/250	A	A/70	A	A
-	D	A	-	-	-	B	-	-	A	-	-
B	C	A	B	A/100	C	B	A/250	C/70	C/70	A/120	D
B	B	A	A	A	B/70	A	A/250	B	B/120	A	A
-	-	-	-	-	-	-	-	-	-	-	-
D	A	A	A	A	D	A	A/250	D	D	A	D
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
C	C	A	B	A/100	C	A	A/250	B	C	C/70	C
B	A	B	-	-	-	-	-	-	-	-	-
D	D	D	-	-	D	-	A/140	-	D	A	B
A	A	A	-	-	-	A	-	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
A	A	A	-	-	D	D	-	A	-	-	A
D	D	D	D	A/100	D	D	A/212	B	B/70	A/70	C
A	B	A	-	-	B/70	-	A/175	-	C/70	-	-
A	A	A	-	-	A	A	-	D	C	-	D
D	D	A	-	A	C	D	A/250	A	B/120	A	A
D	D	D	-	-	-	D	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
ASPHALT	B	B	B	B	D	A	A	D
BARIUM CARBONATE	A	-	-	A	A	A	A	-
BARIUM CHLORIDE	A	A	A	A	A	A	A	-
BARIUM CYANIDE	A	-	A	C	-	A	-	-
BARIUM HYDROXIDE	A	A	A	A	A	A	A	D
BARIUM NITRATE	A	-	A	A	-	A	-	-
BARIUM SULFATE	A	A	-	A	A	A	A	-
BARIUM SULFIDE	A	A	A	A	A	A	A	-
BEER	A	D	A	A	A	A	A	A
BEET SUGAR LIQUIDS	A	D	B	A	A	A	A	-
BEET SUGAR LIQUORS	A	D	A	A	A	A	A	-
BENZALDEHYDE	B	D	D	D	B	D	A	-
BENZENE	C	D	D	D	D	A	A	B
BENZENESULFONIC ACID	A	D	A	C	C	A	A	-
BENZYL BENZOATE	C	-	D	D	B	A	A	-
BENZYL CHLORIDE	C	D	D	D	D	C	A	-
BENZOIC ACID	A	D	D	D	B	A	A	-
BENZOL	B	D	D	D	D	D	A	A
BENZOL, ALCOHOL	-	-	-	-	-	-	-	-
BLAST FURNACE GAS	A	D	A	C	B	A	A	-
BLEACH SOLUTIONS	B	D	D	D	A	A	A	-
BORAX (SODIUM BORATE)	A	A	D	B	A	A	A	A
BORDEAUX MIXTURE	A	D	A	A	A	A	A	-
BORIC ACID	A	A	A	A	A	A	A	A
BRINE	A	A	A	A	A	A	A	-
BREWERY SLOP	A	-	A	A	-	A	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
C	A	A	-	-	A	B	-	A	A/70	A	A
B	A	A	-	A	B/70	A	A/250	A	B/120	A	A
D	C	C	A	A	B/120	A	A/250	A	A/70	A	A
C	C	A	-	-	-	B	-	-	B	-	D
D	D	A	B	A	B/70	D	A/250	A	B/120	A	A
B	A	A	-	A/73	B/70	B	-	-	B/120	-	A
D	B	A	-	A	B/70	B	A/250	A	B/120	A	B
D	D	A	-	A	B/70	A	A/250	A	B/120	A	A
A	D	A	-	A/150	B/70	A	-	B/70	A/120	A/175	A
A	A	A	-	-	A	B	-	A	A/70	A	A
A	B	A	-	A/150	-	A	-	-	-	-	-
B	A	A	-	A/73	C	A	A/212	D	A/70	A/70	D
B	A	A	B	A/200	A	A	A/212	B/72	C/70	A/70	C
D	D	B	-	A/200	D	C	A/250	-	A/70	A/70	A
A	B	B	-	-	-	-	-	-	-	-	-
D	D	B	-	A/100	A	A	A/250	D	-	C	-
B	D	A	A	A/250	D	B	A/250	B	A/70	A	A
B	B	A	A	-	D	A	-	D	C/70	A/70	-
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	D	-	-	-	-	-
D	-	-	-	A	-	D	A/250	B	A/70	-	-
C	A	A	A	A	A	B	A/250	A	A/120	A	A
D	C	A	-	-	-	-	-	-	-	-	-
B	D	A	A	A	B	A	A/250	A	A/120	A	A
C	C	-	A	A	-	A	-	A	-	A	-
-	A	A	-	-	-	-	-	-	-	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
BROMINE	C	D	D	D	C	A	A	-
BROMINE-ANHYDROUS	C	D	D	-	C	A	A	D
BROMINE-TRIFLUORIDE	C	D	D	D	D	D	A	-
BROMINE-VAPOR	-	-	-	-	-	-	-	-
BROMINE-WATER	B	D	B	-	-	A	A	-
BROMOBENZENE	D	D	D	D	D	B	A	-
BUNKER OIL	B	B	B	A	D	A	A	-
BUTADIENE	C	D	B	A	C	A	A	-
BUTANE	C	A	B	A	C	A	A	A
BUTTER	B	A	B	A	A	A	A	-
BUTTERMILK	A	-	A	A	-	A	-	-
BUTYL ACETYL RICINOLEATE	B	D	B	A	D	A	A	-
BUTYL ACETATE	B	C	D	D	B	D	A	B
BUTYL ACRYLATE	C	-	D	D	D	D	A	-
BUTYL ALCOHOL	-	-	-	-	-	-	-	-
BUTYL AMINE	A	D	D	B	D	D	A	-
BUTYL BENZOATE	C	-	D	-	B	A	A	-
BUTYL CARBITOL	B	-	B	A	A	A	A	-
BUTYL CELLOSOLVE	A	D	C	B	A	C	A	-
BUTYL CHLORIDE	-	-	-	-	-	-	-	-
BUTYL ETHER	-	-	-	-	-	-	-	-
BUTYL OLEATE	C	-	D	-	B	A	A	-
BUTYL PHTHALATE	-	-	-	-	-	-	-	-
BUTYL STEARATE	C	-	D	A	B	A	A	-
BUTYLENE	D	D	-	B	D	A	A	-
BUTRALDEHYDE	C	C	C	D	B	D	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
D	-	D	A	A/150	D	D	-	B/72	D	A/150	C
D	D	D	-	-	D	-	-	D	-	A/150	-
D	D	B	-	-	-	D	-	D	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
D	D	B	-	A/250	-	D	A/212	D	-	A	-
D	B	B	-	A/73	-	-	-	D	-	-	-
A	A	A	-	-	-	-	-	-	-	-	-
A	-	A	-	A/200	-	A	A/250	-	D	A	C
A	-	A	-	A/200	B/70	A	A/250	B/72	C/70	A/200	C
A	D	A	-	-	-	A	-	-	-	-	-
A	D	A	-	-	B/70	A	-	-	A/70	-	A
A	A	A	-	-	-	A	-	-	-	-	-
A	A	C	B	A/150	A	A	A/250	D	C/70	A/70	D
-	-	-	-	-	-	A	-	D	-	A/70	-
-	-	-	-	-	-	-	A/250	-	-	-	-
A	-	-	B	-	A	C	B/175	-	-	B/70	D
B	B	B	-	-	-	A	-	-	-	-	-
-	-	-	-	-	-	A	-	-	-	-	-
-	-	-	-	A/73	-	A	-	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	A	-	-	-	-	-
-	-	-	-	-	-	-	A/140	-	-	-	-
B	B	B	-	A/73	-	A	-	-	-	-	-
A	-	A	-	A	B/70	A	-	D	B/70	A	A
-	-	-	-	-	-	-	-	D	-	B	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
BUTYRIC ACID, AQEOUS	A	-	D	D	C	D	A	-
CAFFIENE CITRATE	-	-	-	-	-	-	-	-
CALCIUM BISULFATE	-	-	-	-	-	-	-	-
CALCIUM BISULFIDE	D	A	A	A	-	A	-	-
CALCIUM CARBONATE	A	-	A	A	A	A	A	-
CALCIUM CHLORIDE	A	A	A	A	A	A	A	A
CALCIUM HYDROXIDE	A	A	A	A	A	A	A	B
CALCIUM HYPOCHLORITE	A	D	B	B	B	A	A	B
CALCIUM NITRATE	A	A	A	A	A	A	A	-
CALCIUM SULFATE	A	-	D	A	A	A	A	-
CALCIUM SULFIDE	A	A	B	A	A	A	A	-
CALGON	A	-	A	A	-	A	-	-
CANE JUICE	A	D	A	A		-	-	-
CANE SUGAR LIQUORS	A	D	A	A	A	A	A	-
CARBAMATE	A	D	B	C	B	A	A	-
CARBITOL	B	D	B	B	B	A	A	-
CARBOLIC ACID (SEE PHENOL)	A	C	C	D	C	A	A	D
CARBON BISULFIDE	D	C	D	D	D	A	A	B
CARBON DIOXIDE	A	A	B	A	A	B	A	A
CARBON DISULFIDE	D	C	D	D	D	A	A	-
CARBON MONOXIDE	A	A	B	A	C	A	A	A
CARBON TETRACHLORIDE	D	C	D	C	D	A	A	D
CARBONATE WATER	A	-	A	A	-	A	-	-
CARBONIC ACID	A	A	A	B	A	A	A	-
CATSUP	A	-	C	A	-	A	-	A
CELLOSOLVE	C	D	C	C	A	B	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
B	-	A	A	A	B/70	C	A/250	A	D	A	B
-	-	-	-	-	-	-	A/140	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
C	-	B	A	A	A	A	-	A	B/70	A	A
C	-	A	A	A	A	A	A/212	A	B/70	A	A
C	C	C	A	A	B/70	D	A/250	A	B/70	A	C
C	A	A	A	A	A/120	D	A/250	A	A/120	A	B
C	D	A	A	A	C	D	A/250	A	A/70	A	B
B	C	B	B	A	D	D	A/250	A	A/70	A	A
B	A	A	B	A	D	D	A/250	A	B/70	A	B
A	B	B	-	-	-	-	A/250	A/120	-	A	-
-	D	A	-	-	A	A	-	A	-	-	-
B	A	A	-	-	A	A	-	B/72	-	A	A
A	B	A	-	A/150	-	-	-	A	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
B	B	B	-	-	-	-	-	C	-	A	-
B	D	A	A	A/150	C	D	-	C	D	A/70	D
A	-	A	-	-	A	A	-	B/72	-	A	D
A	D	A	A	A	B/70	A	A/250	A	A/70	A	A
C	A	A	B	A/200	B/70	A	A/250	B/72	C/70	A/70	D
A	A	A	B	A/150	A	A	A/250	A	A/120	B	A
D	C	A	A	A/200	D	A	A/250	B/72	D	A	D
A	D	A	-	-	A	A	-	A	A	A	A
A	D	B	A	A	B/70	B	A/250	A	B/120	A	A
D	D	A	-	-	A	B	-	A	-	-	A
B	B	B	-	A/200	A	A	A/250	A	-	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
CELLOSOLVE ACETATE	C	D	D	C	A	A	A	-
CELLULUBE	D	D	D	D	A	A	A	-
CLORACETIC ACID	D	D	D	D	B	D	A	-
CHLORINATE GLUE	C	-	D	C	-	A	-	-
CHLORINE (DRY)	C	D	D	D	C	A	A	D
CHLORINE (WET)	C	D	D	D	D	A	A	D
CHLORINE, ANHYDROUS LIQUID	D	-	D	D	-	A	A	D
CHLORINE DIOXIDE	D	-	D	D	C	A	A	D
CHLORINE GAS (DRY)	-	-	-	-	-	-	-	-
CHLORINE GAS (WET)	-	-	-	-	-	-	-	-
CHLORINE TRIFLUORIDE	D	D	D	D	D	C	A	D
CHLOROACETIC ACID	-	-	-	-	-	-	-	-
CHLOROACETONE	C	D	C	D	D	B	A	D
CHLOROBENZENE (MONO)	C	D	D	D	D	A	A	D
CHLOROBROMOMETHANE	D	D	D	D	B	A	A	D
CHLOROBUTADIENE	C	D	D	D	D	A	A	D
CHLORODODECANE	D	D	D	D	D	A	A	D
CHLOROFORM	D	C	D	D	D	A	A	D
1-CHLORONAPTHALENE	D	-	D	D	D	A	A	D
1-CHLORO 1-NITRO ETHANE	C	D	D	D	D	C	A	D
CHLOROSULFONIC ACID	A	D	D	D	D	D	A	D
CHLOROTOLUENE	C	D	D	D	D	A	A	D
CLOROX® (BLEACH)	B	D	B	C	-	A	A	D
CHOCOLATE SYRUP	A	-	-	A	-	A	-	-
CHROMIC ACID 5%	A	D	D	D	A	A	A	-
CHROMIC ACID 50%	A	D	D	D	C	A	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	-	-	-	A/73	-	A	-	-	-	A/120	-
-	-	-	-	-	-	A	-	-	-	-	-
D	D	C	A	A	D	D	-	B/72	-	A	-
D	D	A	-	-	-	D	-	-	-	-	-
D	D	-	A	A/150	D	D	-	D	D	A	D
D	B	D	A	A/200	C	D	A/100	D	B/70	A	-
D	D	D	A	-	C	D	-	D	D	A	D
D	D	D	A	A/200	-	-	A/250	-	-	A	-
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
D	D	A	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
D	B	B	-	-	-	B	-	D	D	-	-
D	B	A	A	A/100	B/70	B	A/250	D	D	A/150	D
D	B	B	-	-	-	B	-	D	A	-	D
D	B	A	-	-	-	-	-	D	-	-	-
D	-	-	-	-	-	-	-	D	-	-	-
D	D	A	B	A/200	D	A	A/212	D	C/70	A	D
D	B	B	-	-	-	-	-	D	-	-	-
D	-	-	-	-	-	-	-	D	-	-	-
D	D	D	B	-	D	D	-	D	D	D	D
D	B	B	-	-	-	A	-	D	-	-	-
D	D	A	A	-	A	D	-	B	-	-	A
A	D	A	-	-	A	A	-	A	-	-	-
C	D	A	A	A/200	D	D	B/250	A/70	D	A/120	A
C	D	B	A	A/200	C	D	B/250	A/70	D	A/120	D

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
CHROMIUM ALUM	-	-	-	-	-	-	-	-
CHROME PLATING SOLUTIONS	B	D	D	D	D	A	A	D
CIDER	A	-	A	A	-	A	-	D
CITRIC ACID	A	A	A	A	A	A	A	A
CITRIC OILS	C	-	D	A	B	A	A	-
COBALT CHLORIDE (2N)	A	D	A	A	C	A	A	-
COFFEE	A	D	A	A	-	A	-	-
COKE OVEN GAS	B	D	C	C	D	A	A	-
COPPER ACETATE	A	D	B	B	A	-	A	A
COPPER CHLORIDE	A	A	B	A	A	A	A	A
COPPER CYANIDE	A	A	A	A	A	A	A	A
COPPER FLUOBORATE	A	-	A	B	-	A	-	A
COPPER FLUORIDE	-	-	-	-	-	-	-	-
COPPER NITRATE	A	-	A	A	A	A	A	A
COPPER SULFATE (5% SOLUTION)	A	A	A	A	A	A	A	A
CREAM	A	-	C	A	-	A	-	-
CRESOLS	C	D	D	D	D	A	A	-
CRESYLIC ACID	B	D	D	D	D	A	A	-
CRUDE OIL	-	-	-	-	-	-	-	-
CYCLOHEXANE	C	B	D	A	D	A	A	A
CYCLOHEXANOL	B	-	A	B	C	A	A	-
CYCLOHEXANONE	C	D	D	D	C	D	A	-
CYANIC ACID	B	-	D	C	-	-	-	-
DECALIN (DEKLIN)	C	D	D	D	D	A	A	-
DECANE	C	B	D	B	C	A	A	-
DENATURED ALCOHOL	B	D	B	A	A	B	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	-	-	-	-	-	-	B/250	-	-	-	-
D	D	D	A	-	-	D	-	B	-	A	-
B	D	A	-	-	-	A	-	-	B	-	A
C	D	A	A	A	B/70	C	A/140	A	D	A	B
C	D	A	-	-	-	B	-	A	-	-	-
D	D	-	-	-	-	-	-	A	-	-	-
A	-	A	A	-	A	A	-	A	-	-	-
-	-	-	-	A	-	-	-	-	-	-	-
D	D	C	-	-	-	A	-	-	-	-	-
D	D	D	-	A	A	A	A/250	A	-	A	A
D	D	A	A	A	B/70	A	A/250	A	B/120	A	A
D	D	D	B	-	-	B	-	-	-	-	A
-	-	-	-	-	-	-	A/250	-	-	-	-
D	D	A	A	A	D	A	A/250	A	B/120	A	A
D	D	A	A	A	C	D	A/250	A	A/120	A	A
A	D	A	-	-	A	A	-	A	-	-	-
B	C	A	B	A/150	D	B	A/250	D	C/70	A/150	D
C	A	A	B	-	D	D	-	C	B/70	A/150	D
-	-	-	-	-	-	-	A/250	-	-	-	-
A	B	A	B	A	A	A	A/250	D	B/70	A	D
C	B	B	A	A	B	A	A/250	B	-	A/150	-
B	B	B	-	A/73	A	A	A/250	D	D	B/70	D
-	D	A	-	-	-	D	-	-	-	-	-
-	-	-	-	-	-	-	-	B/120	-	A/175	-
-	-	-	-	-	-	-	A/250	A/70	-	-	-
A	A	A	-	-	-	A	-	A	-	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
DETERGENTS	B	A	B	A	A	A	A	-
DEVELOPING FLUIDS	A	D	A	A	A	A	A	-
DIACETONE	B	B	-	D	A	D	A	-
DIBENZYL ETHER	C	B	D	D	C	C	A	-
DIBENZYL SEBECATE	C	D	D	D	B	B	A	-
DIBUTYL AMINE	B	-	D	C	D	B	A	-
DIBUTYL ETHER	B	B	C	B	C	C	A	-
DIBUTYL PHTHALATE	B	C	D	D	A	B	A	A
DIBUTYL SEBECATE	B	D	D	D	B	B	A	A
DICHLOROBENZYENE	-	-	-	-	-	-	-	-
DICHLOROETHYLENE	-	-	-	-	-	-	-	-
O-DICHLOROBENZENE	D	D	D	D	D	A	A	-
DICHLORO-ISOPROPYL ETHER	D	B	D	D	C	C	A	-
DICYCLOHEXYLAMINE	B	D	D	D	D	B	A	-
DIESEL FUEL	C	B	D	A	D	A	A	-
DIETHYL BENZENE	C	D	D	D	D	A	A	-
DIETHYL ETHER	B	A	C	B	D	D	A	-
DIETHYL SEBECATE	B	D	D	D	B	A	A	-
DIETHYLAMINE	B	C	B	B	-	D	-	-
DIETHYLENE GLYCOL	A	D	A	A	A	A	A	-
DIISOBUTYLENE	C	D	C	B	-	A	A	-
DIISOPROPYL BENZENE	C	-	D	D	D	A	A	-
DIISOPROPYL KETONE	C	D	D	D	A	D	A	-
DIMETHYL ANILINE	B	-	D	D	B	C	A	-
DIMETHYL FORMAMIDE	A	-	D	C	-	A	A	-
DIMETHYL PHTHALATE	A	-	D	D	B	C	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
A	-	A	-	A/200	A	A	A/250	A	D	-	A
-	-	B	-	-	-	A	-	-	-	-	-
A	A	A	-	A/100	A	-	A/212	D	A	A/70	-
B	B	B	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	D	-	-	-
B	B	B	-	-	-	-	A/212	D	-	A/20	-
A	A	A	-	-	A	-	A/140	C	-	D	-
-	A	A	-	A/200	-	-	-	B/72	-	D	-
-	-	-	-	-	-	-	A/140	-	-	-	-
-	-	-	-	-	-	-	A/175	-	-	-	-
D	B	B	-	-	-	-	-	B/70	-	A/150	-
D	-	-	-	-	-	-	-	D	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
A	A	A	B	A/200	A	A	A/250	B/70	C/70	A	A
-	-	-	-	-	-	-	-	-	-	-	-
B	B	B	B	A/200	C	-	A/212	-	-	A/70	D
A	A	A	-	-	-	-	-	A/120	-	A/120	-
A	B	A	A	A/73	B/70	B	A/212	C	D	A/70	D
B	A	A	B	A/70	B/70	D	-	-	B/120	A	C
B	B	B	-	-	-	A	A/250	-	-	A	-
-	-	-	-	-	-	A	-	-	-	-	-
-	-	-	-	A/73	-	A	-	-	-	-	-
A	-	-	B	A/200	A	D	A/250	A	-	A/70	D
A	A	A	-	A/100	A	C	B/250	A/120	A	D	D
-	-	B	-	A/200	C	-	A/250	A/70	-	A/70	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
DINITROTOLUENE	B	D	D	D	D	B	A	-
DIOCTYL PHTHALATE	C	C	D	D	B	A	A	A
DIOCTYL SEBECATE	C	B	D	D	B	B	A	-
DIOXANE	C	D	D	D	A	D	A	-
DIOXOLANE	C	D	D	D	C	B	A	-
DIPENTENE	C	D	D	C	D	A	A	-
DIPHENYL	C	D	D	D	D	A	A	-
DIPHENYL OXIDE	C	D	D	D	D	A	A	-
DISODIUM PHOSPHATE	-	-	-	-	-	-	-	-
DOWTHERM OIL	D	B	D	-	D	A	A	-
DRY CLEANING FLUIDS	D	C	D	C	D	A	A	-
DYES	B	-	C	-	-	A	-	-
EPICHLOROHYDRINE	B	D	D	D	B	D	A	D
EPSOM SALTS (MAGNESIUM SULFATE)	A	-	A	A	A	A	A	-
ETHANE	C	B	B	A	D	A	A	-
ETHANOLAMINE	A	C	B	B	B	D	A	-
ETHER	C	C	D	D	D	C	A	-
ETHYL ACETATE	C	D	D	D	B	D	A	B
ETHYL ACETOACETATE	C	C	D	D	B	D	A	-
ETHYL ACRYLATE	C	D	D	D	B	D	A	-
EHTYL ALCOHOL (ETHANOL)	-	-	-	-	-	-	-	-
ETHYL BENZENE	C	D	D	D	D	A	A	-
ETHYL BENZOATE	C	D	D	D	B	A	A	-
ETHYL CELLOSOLVE	B	D	C	C	A	B	A	-
ETHYL CELLULOSE	A	B	B	B	B	A	A	-
ETHYL CHLORIDE	C	C	A	A	C	A	A	D

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	-	-	-	-	-	-	-	-	-	-	-
A	A	A	-	A/200	A	B	A/250	-	-	-	-
-	-	-	-	-	-	B	-	-	-	-	-
B	A	A	-	A/150	A	B	A/212	C/120	-	C/120	-
-	-	-	-	-	-	B	-	-	-	-	-
A	A	A	-	-	-	-	-	-	-	-	-
A	B	B	B	-	-	-	A/250	-	-	A/120	-
B	A	A	B	-	-	D	A/250	-	-	B	D
-	-	-	-	-	-	-	A/250	-	-	-	-
C	B	A	-	A/200	A	-	-	-	-	-	-
A	A	A	-	-	-	-	-	D	-	-	-
B	-	A	-	-	A	C	-	-	-	-	B
D	A	A	-	A/200	A	B	-	B/70	-	D	-
A	A	A	B	A	B/70	B	A/250	A	A/120	A	A
A	-	A	-	-	D	A	-	-	-	A	A
B	-	A	B	-	A	D	A/212	D	-	C	D
A	C	A	B	A/200	A	A	A/212	C	D	A/70	D
B	A	A	B	A/150	B/120	A	B/175	B/72	A	D	D
A	A	-	-	A/73	-	A	-	-	-	A/70	-
A	A	A	-	A/150	-	A	-	D	-	C	-
-	-	-	-	-	-	-	A/250	-	-	-	-
A	B	B	A	-	-	A	A/140	D	-	C	-
A	A	A	-	-	-	A	-	-	C/120	D	D
-	-	-	-	-	-	A	-	-	-	-	-
B	A	B	-	-	-	A	-	-	-	-	-
D	C	A	B	A	B/70	A	A/250	D	C/70	A	D

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
ETHYL CHLOROCARBONATE	A	D	C	-	-	A	A	D
ETHYL CHLOROFORMATE	C	D	C	-	-	A	A	D
ETHYL ETHER	C	C	D	B	D	D	A	-
ETHYL FORMATE	B	-	B	D	B	C	A	-
ETHYL MERCAPTAN	C	-	D	D	D	B	A	-
ETHYL OXALATE	B	A	D	D	A	B	A	-
ETHYL PENTOCHLOROBENZENE	D	C	D	D	D	A	A	-
ETHYL SILICATE	B	-	A	A	A	A	A	-
ETHYL SULFATE	B	-	-	A	-	A	A	-
ETHYLENE	C	-	-	B	C	A	A	-
ETHYLENE BROMIDE	-	-	-	-	-	-	-	-
ETHYLENE CHLORIDE	D	D	D	D	C	A	A	-
ETHYLENE CHLOROHYDRIN	C	D	B	D	A	B	A	-
ETHYLENE DIAMINE	A	D	A	B	A	D	A	-
ETHYLENE DICHLORIDE	D	D	D	D	B	A	A	D
ETHYLENE GLYCOL	A	B	A	A	A	A	A	A
ETHYLENE OXIDE	A	C	D	D	D	D	A	A
ETHYLENE TRICHOLORIDE	D	D	D	D	D	A	A	-
FATTY ACIDS	B	-	B	C	D	A	A	-
FERRIC CHLORIDE	A	D	B	A	A	A	A	B
FERRIC NITRATE	A	A	A	A	A	A	A	-
FERRIC SULFATE	A	-	A	B	A	A	A	-
FERROUS CHLORIDE	A	D	A	B	A	A	A	-
FERROUS SULFATE	A	-	A	B	A	A	A	-
FISH OIL	B	-	-	A	-	A	A	-
FLUOBORIC ACID	A	-	A	B	A	A	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
D	A	-	-	-	-	A	-	-	-	-	-
D	-	-	-	-	-	A	-	D	-	-	-
C	B	A	B	A/150	B/70	A	A/212	C	D	A	D
C	A	B	-	A/120	-	A	-	-	-	-	-
B	A	B	-	-	-	-	-	-	-	-	-
A	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	D	-	-	-
B	A	A	-	-	-	-	-	-	-	-	-
-	-	D	-	-	-	-	-	-	-	-	-
A	A	A	-	-	-	A	-	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
D	C	A	B	A	B/70	A	A/250	B/72	D	A	D
D	B	B	B	A/73	D	B	A/250	D	D	A/70	D
D	A	A	C	A/73	B/70	A	A/140	A	A	D	D
D	A	A	B	A/73	B/70	A	A/212	D	D	A	D
A	B	A	B	A	B/70	D	A/250	A/120	A/120	A	A
A	D	-	A	A	A/70	A	A/212	D	A	A	D
D	A	A	-	-	-	-	A	D	-	A	-
B	D	A	A	A	B/70	B	A/250	B/70	D	A	A
D	D	D	B	A	C	D	A/250	A	A/70	A	A
D	-	A	A	A	C	D	A/250	A	A/120	A	A
D	D	A	A	A	C	D	A/250	A	A/120	A	A
D	D	D	B	A	D	D	A/250	A	A/120	A	A
D	D	A	B	A	D	D	A/250	A	A/120	A	A
-	-	-	-	-	-	-	-	-	-	-	-
D	D	B	A	A/73	D	A	A/250	A	A/120	A	A

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
FLUORINE (LIQUID)	D	-	D	D	C	B	A	-
FLUOROBENZENE	C	-	D	D	D	A	A	-
FLUOROCARBON OILS	D	-	-	-	A	-	A	-
FLUOROLUBE	D	-	A	C	A	B	A	-
FLUORINATE CYCLIC ETHERS	D	-	-	-	-	-	-	-
FLUOSILICIC ACID	A	B	A	A	B	-	A	B
FORMALDEHYDE	B	D	D	C	A	A	A	B
FORMIC ACID	A	D	D	D	B	B	A	B
FREON 11	D	D	D	C	D	C	A	A
FREON 12 (WET)	D	A	B	A	B	A	A	A
FREON 13	D	-	A	A	A	A	A	A
FREON 21	D	-	D	D	D	D	A	A
FREON 22	D	D	A	D	C	D	A	A
FREON 31	D	-	A	D	A	D	A	A
FREON 32	D	-	A	A	A	C	A	A
FREON 112	D	-	B	B	D	A	A	A
FREON 113	D	B	A	A	D	C	A	A
FREON 114	D	A	A	A	C	A	A	A
FREON 115	D	-	A	A	A	B	A	A
FREON 142B	D	-	A	A	A	D	A	A
FREON 152A	D	-	A	A	A	D	A	A
FREON 218	D	-	A	A	A	A	A	A
FREON C316	D	-	A	A	A	A	A	A
FREON C318	D	-	A	A	A	A	A	A
FREON 13 B1	D	A	A	A	A	A	A	A
FREON 114B2	D	-	A	B	D	B	A	A

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
D	D	A	B	-	D	D	-	D	D	A/70	D
D	-	-	-	-	-	A	-	D	-	-	-
D	-	-	-	-	-	-	-	D	D	-	-
-	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	D	-	-	-
D	D	B	-	A	D	A	-	A	A/120	-	D
A	D	A	B	A/200	D	A	A/212	A	B	A/120	A
D	D	A	A	A/250	D	D	A/250	A	D	A	A
D	C	A	A	A/150	D	A	A/212	D	C	A	A
D	A	A	A	A/150	D	A	A/212	B/72	A/70	A	A
D	-	-	-	-	-	A	-	D	-	A	-
D	-	-	-	A/150	-	A	A/212	D	-	A	-
D	D	A	A	A/150	B	A	A/212	D	-	A	A
D	-	-	-	-	-	A	-	-	-	-	-
D	-	-	-	-	-	A	-	-	-	-	-
D	-	-	-	-	-	A	-	-	-	-	-
D	-	A	A	A/150	-	A	A/212	D	-	A	B
D	-	-	-	A/150	-	A	A/212	D	-	A	-
D	-	-	-	-	-	A	-	-	-	-	-
D	-	-	-	-	-	A	-	-	-	-	-
D	-	-	-	-	-	A	-	-	-	-	-
D	-	-	-	-	-	A	-	-	-	-	-
D	-	-	-	-	-	A	-	-	-	-	-
D	-	-	-	-	-	A	-	-	-	-	-
D	-	-	-	-	-	A	-	-	-	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
FREON 502	D	-	A	B	-	B	A	A
FREON TF	D	A	A	A	D	B	A	A
FREON T-WD602	D	A	B	B	B	A	A	A
FREON TMC	D	B	B	B	B	A	A	A
FREON T-P35	D	A	A	A	A	A	A	A
FREON TA	D	A	A	A	A	C	A	A
FREON TC	D	A	A	A	B	A	A	A
FREON MF	D	C	C	A	-	-	A	A
FREON BF	D	-	B	B	-	-	A	A
FRUIT JUICE	A	-	-	A	-	A	A	-
FUEL OIL	C	B	B	A	D	A	A	-
FUMARIC ACID	A	-	B	C	-	A	A	-
FURAN, FURFURAN	C	-	D	D	D	C	A	-
FURAN RESIN	C	-	D	D	D	A	A	-
FURFURAL	C	D	D	D	A	D	A	-
GALLIC ACID	B	D	C	D	B	A	A	-
GASOLINE - LEADED	C	C	D	A	D	A	A	A
GASOLINE - UNLEADED	C	D	D	D	D	A	A	-
GELATINE	A	A	A	A	A	A	A	-
GLUCOSE	A	A	A	A	A	A	A	-
GLUE P.V.A.	A	A	A	D	B	A	A	A
GLYCERINE	A	A	A	A	A	A	A	A
GLYCOLIC ACID	A	-	A	A	-	A	-	-
GLYCOLS	A	B	A	A	A	A	A	-
GOLD MONOCYANIDE	A	-	A	A	-	A	-	-
GRAPE JUICE	A	-	A	A	-	A	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
D	-	-	-	-	-	A	-	-	-	-	-
D	A	A	A	-	D	A	-	-	-	B	B
D	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-	-	-
B	D	A	A	A/150	A	D	-	A	A	A	A
A	A	A	A	A	B/70	A	A/250	C	B	A	A
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	A/212	C	-	-	-
A	-	A	B	-	-	D	-	C	D	D	A
A	B	A	B	A/200	B	A	A/212	D	D	B/120	D
A	D	B	B	A/150	B/70	-	A/212	A	A	A/70	B
A	A	A	A	A	A	A	A/250	D	-	A	B
A	A	A	A	A	A	A	A/250	D	-	C	C
A	D	A	A	A/250	B/70	B	-	A	A/120	A	B
A	B	A	A	A	B/70	A	-	A	A/120	A	A
B	A	A	A	-	A/70	A	-	B	A/70	A	C
A	B	A	A	A	A/70	A	A/250	A	A/70	A	A
-	-	-	A	A/150	-	A	A/250	A/70	A/120	A/70	B
B	B	B	-	A	B/70	D	A/250	A	-	A	-
-	D	A	-	-	-	A	-	-	-	-	-
B	D	A	-	-	A	B	-	A	B	A	A

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
GREASE	B	-	D	A	D	A	A	-
GREEN SULFATE LIQUOR	A	A	A	A	A	A	A	-
HALOWAX OIL	D	-	D	D	D	A	A	-
HEPTANE	C	B	B	A	-	A	A	-
HEXANE	C	B	B	A	D	A	A	A
N-HEXALDEHYDE	C	B	A	D	B	C	A	-
N-HEXENE-1	C	A	B	A	D	A	A	-
HONEY	A	-	A	A	-	A	-	-
HYDRAULIC OILS (PETROLEUM)	D	A	B	A	C	A	A	-
HYDRAULIC OILS (SYNTHETIC)	D	-	-	C	-	A	-	-
HYDRAZINE	A	D	B	B	A	A	A	D
HYDROBROMIC ACID	B	D	D	D	A	A	A	-
HYDROCHLORIC ACID (20%)	A	B	D	C	A	A	A	B
HYDROCHLORIC ACID (37%) (HOT)	C	C	D	D	C	A	A	D
HYDROCHLORIC ACID (37%) (COLD)	B	C	D	C	B	A	A	D
HYDROCYANIC ACID	B	C	B	C	B	A	A	C
HYDROFLUORIC ACID (20%)*	C	-	C	D	-	A	A	D
HYDROFLUORIC ACID (50%)*	D	D	C	D	A	A	A	D
HYDROFLUORIC ACID (75%)*	D	-	D	D	C	A	A	D
HYDROFLUORIC ACID (CONC-) (HOT)	D	D	D	D	-	B	A	D
HYDROFLUORIC ACID (CONC-) (COLD)	D	D	B	D	-	A	A	D
HYDROFLUOSILICIC ACID (20%)	B	B	B	B	B	A	A	-
HYDROGEN FLUORIDE	-	-	-	-	-	-	-	-
HYDROGEN GAS	A	A	A	A	B	A	A	A
HYDROGEN PEROXIDE	A	C	D	B	C	A	A	-
HYDROGEN PEROXIDE (5%)	-	-	-	-	-	-	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
A	A	A	A	-	-	A	-	-	-	A	A
-	-	-	-	-	-	-	-	A	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
A	A	A	A	A	A	A	A/250	C/170	B/70	A	C
A	A	A	A	A	B/70	A	A/250	C/170	D	A	B
A	A	A	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
A	A	A	A	-	A/70	A	-	A	B	A	A
A	A	A	A	A/100	A/70	A	-	D	C	-	A
A	A	A	A	A/100	A	A	-	D	A	-	A
-	C	A	-	-	-	B	A/100	A/70	-	A/120	-
D	D	D	D	A	D	D	A/250	B	B/70	A	A
D	D	D	D	A/200	D	D	A/250	A	A/120	A	A
D	D	D	D	-	D	D	A/250	-	B/120	A	-
D	D	D	D	-	D	D	A/250	A	B/120	A	-
A	D	A	D	A	-	D	A/250	A	A/120	A	B
D	D	D	D	A/250	D	D	A/250	A*	A/120	A	B
D	D	D	D	A/250	D	D	A/250	B/72*	A/70	A	B
D	D	D	D	-	D	D	A/250	B/72*	C/70	A	C
D	D	D	D	-	D	D	A/212	D	D	A	-
D	D	D	D	-	D	D	A/250	D	D	A	-
D	D	D	B	-	D	-	-	A	B/120	A	A
-	-	-	-	-	-	-	A/250	-	-	-	-
A	A	A	A	A	B/120	-	A/250	A	A/120	A	A
A	D	A	A	A/150	D	D	-	A/70	C/120	A/70	A
-	-	-	-	-	-	-	A/250	-	-	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
HYDROGEN PEROXIDE (50%)	-	-	-	-	-	-	-	-
HYDROGEN PEROXIDE (90%)	-	-	-	-	-	-	-	-
HYDROGEN SULFIDE (WET) (COLD)	A	B	B	C	A	A	A	A
HYDROGEN SULFIDE (WET) (HOT)	A	-	C	D	A	B	A	A
HYDROGEN SULFIDE AQUEOUS SOLUTION	A	-	B	C	A	D	A	-
HYDROQUINONE	A	-	D	C	-	C	A	-
HYDROXYACETIC ACID (70%)	A	-	A	A	-	A	A	-
HYPOCHLOROUS ACID	A	-	D	D	B	A	A	-
INK	A	-	-	A	-	A	-	-
IODINE (IN ALCOHOL)	A	D	D	B	D	A	A	-
IODINE PENTAFLUORIDE	B	D	D	D	D	D	A	-
IODOFORM	B	-	-	D	A	-	A	-
ISOBUTYL ALCOHOL	-	-	-	-	-	-	-	-
ISOOCTANE	C	B	B	A	D	A	A	A
ISOTANE	D	-	-	A	-	A	-	-
ISOPHORONE	B	B	D	D	C	D	A	-
ISOPROPYL ACETATE	B	A	D	D	B	D	A	-
ISOPROPYL CHLORIDE	C	D	D	D	D	B	A	-
ISOPROPYL ETHER	C	B	D	B	D	D	A	-
JET FUEL (JP3, JP4, JP5)	C	C	D	A	D	A	A	A
KEROSENE	C	C	B	A	D	A	A	B
KETONES	C	A	D	D	B	D	A	B
LACQUERS	C	D	D	D	D	D	A	-
LACQUER SOLVENTS	C	D	D	D	D	D	A	B
LACTIC ACID	A	-	C	B	B	A	A	B
LARD	B	A	B	A	C	A	A	A

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	-	-	-	-	-	-	A/140	-	-	-	-
-	-	-	-	-	-	-	A/140	-	-	-	-
D	D	A	A	-	C	D	A/250	A	A	A	-
D	D	A	A	-	D	D	A/250	A	A	A	-
D	D	A	A	A/150	-	C	-	A	A	A	B
A	B	B	B	A/250	-	A	-	A	A	A	B
D	B	-	-	-	-	C	-	-	-	-	D
D	D	D	-	A	-	D	A/250	A	-	A	-
C	D	A	-	-	C	A	-	-	-	A	C
D	D	D	B	A/150	C	A	A/250	A/70	B	A/150	A
-	-	-	-	-	-	-	-	-	-	-	-
B	A	B	D	-	-	-	-	-	-	A	A
-	-	-	-	-	-	-	A/250	-	-	-	-
A	-	-	-	A/73	B/70	-	A/140	A	B	-	A
A	-	-	-	-	D	-	-	B/72	-	A	A
A	B	A	-	-	-	-	-	-	-	-	-
C	-	B	B	-	B/70	A	A/140	-	B/70	-	D
D	A	A	-	-	-	A	-	D	-	-	-
A	-	A	A	A/73	A/70	A	-	B/72	B	-	B
A	A	A	A	A	A/70	A	A/212	D	D	A	C
A	A	A	B	A	A	A	A/250	B/72	C/70	A	A
B	-	A	A	A/200	A/120	A	A/212	D	C/70	A/70	D
A	C	A	A	A/70	A/70	A	-	C	A	D	D
A	B	A	-	A/70	A/70	A	-	C	A	D	D
C	D	A	B	A/300	C	A	A/250	A	A/70	A/70	B
A	A	A	A	A	A/70	A	A/250	A	A	A	A

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
LATEX - WATER BASE	A	-	B	A	-	A	A	-
LAVENDER OIL	B	D	C	B	C	B	A	-
LEAD ACETATE	A	D	B	B	A	D	A	-
LEAD NITRATE	-	-	-	-	-	-	-	-
LEAD SULFAMATE	A	-	A	B	A	A	A	-
LIGROIN	B	B	B	A	D	A	A	-
LIME	A	-	B	A	A	A	A	-
LIME BLEACH	A	-	B	A	A	A	A	-
LIME SULFUR	B	-	A	D	C	A	A	-
LINDOL	A	C	C	D	A	B	A	-
LINOLEIC ACID	B	-	D	B	D	A	A	-
LIQUEFIED PETROLEUM GAS	C	A	B	A	D	A	A	-
LUBRICANTS	B	B	B	A	D	A	A	-
LUBRICATING OILS (PETROLEUM)	D	B	B	A	D	A	A	A
LYE	A	C	B	C	B	B	A	-
MAGNESIUM CARBONATE	A	-	A	A	C	-	A	-
MAGNESIUM CHLORIDE	A	A	A	A	A	A	A	D
MAGNESIUM HYDROXIDE	A	A	B	B	A	A	A	D
MAGNESIUM NITRATE	A	-	A	A	A	-	A	D
MAGNESIUM OXIDE	A	-	A	A	-	-	A	D
MAGNESIUM SULFATE	A	-	A	A	A	A	A	D
MALEIC ACID	A	-	D	D	C	A	A	-
MALEIC ANHYDRIDE	A	-	D	D	C	A	A	-
MALIC ACID	A	-	C	B	D	A	A	-
MASH	A	-	A	A	-	-	-	-
MAYONNAISE	A	-	-	A	-	A	-	A

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
A	-	A	-	-	A/70	A	-	A	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
D	A	B	B	A	B/70	B	A/250	A	A/120	A	B
-	-	-	-	-	-	-	A/140	-	-	-	-
C	-	-	-	-	B/70	A	-	A	A/70	A	B
D	-	A	-	-	D	B	-	B/175	A	A	-
C	A	A	-	-	B/70	B	A/250	-	A	A	B
D	-	A	-	-	-	-	-	B	-	-	-
-	-	A	-	A/150	B/70	-	A/250	A	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
A	D	A	-	-	-	-	A/250	A/70	A	A	A
-	-	-	A	-	-	A	-	D	-	-	-
A	A	A	-	-	A/70	A	-	B	D	A	B
A	A	A	-	A	A/70	A	A/250	B	-	A	-
-	-	A	-	-	A/70	-	-	A	-	A/150	B
D	-	A	B	A	-	A	A/250	A	B	A	B
D	D	D	A	A	A/70	A	A/250	A	A/70	A	B
D	B	A	A	A	B/70	A	A/250	A	A/120	A	A
D	D	A	A	A	A/70	A	A/250	A	A/120	A	A
B	A	A	-	-	-	A	-	-	-	-	-
D	C	A	B	A	A/70	A	A/250	B	A/120	A	A
B	A	A	B	A/250	B/70	A	-	A	B/120	A	A
A	-	-	A	-	-	A	-	-	D	A	-
B	D	A	B	A/250	C/70	A	A/250	B	B/120	A	A
A	-	A	-	-	A	A	-	-	A	-	-
D	D	A	A	-	A	A	-	A	D	A	D

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
MELAMINE	B	-	-	C	-	-	-	-
MERCURIC CHLORIDE (DILUTE SOLUTION)	A	-	A	A	A	A	A	B
MERCURIC CYANIDE	A	-	A	A	A	-	A	-
MERCUROUS NITRATE	-	-	-	-	-	-	-	-
MERCURY	A	A	A	A	A	A	A	A
MESITYL OXIDE	C	D	D	D	B	D	A	-
METHANE	C	B	B	A	D	A	A	-
METHANOL (SEE ALCOHOL METHYL)	A	D	A	A	B	C	A	-
METHYL ACETATE	B	D	B	D	A	D	A	-
METHYL ACRYLATE	B	-	B	D	B	D	A	-
METHYL ACETONE	B	-	D	D	-	-	A	-
METHYL BROMIDE	D	-	D	B	A	A	A	-
METHYL BUTYL KETONE	C	D	D	D	B	D	A	-
METHYL CELLOSOLVE	B	D	D	D	B	D	A	-
METHYL CHLORIDE	D	D	D	D	C	A	A	-
METHYL CYCLOPENTANE	C	D	C	B	D	A	A	-
METHYL DICHLORIDE	D	D	D	D	-	A	-	-
METHYL ETHYL KETONE	B	D	D	D	A	D	A	B
METHYL FORMATE	B	D	B	D	A	D	A	-
METHYL ISOBUTYL KETONE	C	D	D	D	B	D	A	-
METHYL ISOPROPYL KETONE	C	-	D	D	C	D	A	-
METHYL METHACRYLATE	B	-	D	D	C	D	A	-
METHYL OLEATE	C	-	D	D	C	B	A	-
METHYL SALICYLATE	B	-	D	D	C	B	A	-
METHYLACRYLIC ACID	A	-	B	-	B	B	A	-
METHYLAMINE	A	-	-	B	A	-	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	D	D	-	-	A	A	-	-	-	-	D
D	D	D	B	A/250	D	B	A/250	A	A	A	A
D	C	A	A	A/250	A	-	A/250	A	A	A	A
-	-	-	-	-	-	-	A/250	-	-	-	-
C	A	A	A	A	A/120	A	A/250	A	A	A	A
A	A	A	-	-	-	-	-	-	-	-	-
A	-	A	A	A/250	A/120	A	A/250	B	-	A	B
B	A	A	A	A/70	B/70	A	A/250	A/120	A/70	A	A
A	A	A	A	-	A/120	A	-	C	B/70	B	D
-	A	-	-	-	-	A	-	-	-	B	-
A	A	A	-	-	A	A	-	D	-	D	D
D	A	-	-	A	C	A	A/250	D	C/70	A	D
A	-	A	-	-	D	A	-	D	-	D	A
A	C	-	-	A	C	A	A/250	B	-	A	D
D	D	A	B	A	C	A	A/250	D	C/70	A	D
-	-	-	-	-	-	A	-	-	-	-	-
D	-	-	-	-	C	A	-	D	-	D	A
A	A	A	A	A/150	A/70	A	A/250	C	B/120	D	D
A	B	B	-	-	-	A	-	-	-	-	-
B	C	A	A	A/150	A/70	A	-	B/72	C	D	D
A	C	A	-	-	D	A	A/250	C	D	-	D
-	C	-	-	A/73	-	A	-	A	-	B	A
-	-	-	-	-	-	A	-	-	-	-	-
A	A	-	-	-	-	A	-	B	-	B	-
-	-	-	-	-	-	A	-	-	-	-	-
-	A	A	-	-	-	A	-	-	A/70	C	D

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
METHYLENE CHLORIDE	D	D	D	D	C	B	A	D
MILK	A	-	A	A	A	A	A	-
MOLASSES	A	D	A	A	A	A	A	-
MONOBROMOROBENZENE	-	-	-	-	-	-	-	-
MONOCHLOROACETIC ACID	-	-	-	-	-	-	-	-
MONOCHLOROBENZENE	C	D	D	D	D	A	A	-
MONOMETHYL ANILINE	B	-	D	D	D	C	A	-
MONOETHANOLAMINE	A	C	C	B	B	C	A	-
MONOMETHYLETHER	C	-	B	A	A	A	A	-
MONOVINYL ACETYLENE	C	-	B	A	A	A	A	-
MUSTARD	A	-	C	B	-	A	-	-
NAPTHA	C	C	D	B	D	A	A	A
NAPTHALENE	C	B	D	D	D	A	A	B
NAPTHENIC ACID	B	-	-	B	D	A	A	-
NATURAL GAS	C	B	A	A	C	A	A	-
NEATSFOOT OIL	B	-	-	A	B	A	A	-
NEVILLE ACID	A	-	C	C	B	A	A	-
NICKEL ACETATE	A	-	B	B	A	A	A	-
NICKEL CHLORIDE	A	-	A	A	A	A	A	-
NICKEL NITRATE	-	-	-	-	-	-	-	-
NICKEL SULFATE	A	A	A	A	A	A	A	-
NITER CAKE	A	-	A	A	A	A	A	-
NITRIC ACID (5-10% SOLUTION)	A	C	D	D	B	A	A	B
NITRIC ACID (20% SOLUTION)	B	C	D	D	B	A	A	D
NITRIC ACID (50% SOLUTION)	C	C	D	D	D	A	A	D
NITRIC ACID (CONCENTRATED SOLUTION)	C	D	D	D	D	A	A	D

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
D	B	A	A	A/73	-	A	A/212	D	D	D	D
A	D	A	A	A/250	A/120	A	-	A	A	A	A
A	A	A	A	A/150	A/70	A	-	A	A	A	A
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
D	A	A	-	A/100	B/70	A	A/250	D	-	A/150	-
-	-	-	-	-	-	B	-	C	-	-	-
B	A	A	-	-	A	D	A/140	D	C	D	D
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
B	C	A	A	-	A/70	B	-	A	A	A	-
A	B	A	B	A	A/70	A	A/250	C	A/70	A	A
B	B	B	A	A/150	A/70	A	A/250	A/70	C	A	D
B	B	A	A	-	-	A	-	-	-	-	-
A	A	A	-	A/150	-	A	A/250	A	A	-	A
A	A	A	-	-	-	B	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	A/73	-	-	-	-	-	-	-
D	D	A	-	A	C	A	A/250	A	A	A	A
-	-	-	-	-	-	-	A/250	-	-	-	-
D	D	A	B	A	A/70	A	A/250	A	A	A	A
-	-	-	-	-	-	-	-	-	-	-	-
D	D	A	A	A	C	C	B/212	A/120	B	A/120	A
D	D	A	A	-	D	C	B/212	B/70	C	A	A
C	D	A	A	A/150	D	C	B/212	B/70	B/70	A	B
A/120	D	A	B	A/150	D	C	-	D	C/70	A/125	B

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
NITRIC ACID - RED FUMING	D	D	D	D	D	B	A	D
NITROBENZENE	B	-	D	D	C	B	A	D
NITROBENZINE	B	-	D	-	C	A	A	-
NITRO ETHANE	A	-	C	D	B	C	A	-
NITROMETHANE	A	-	C	D	A	C	A	-
NITROUS ACID	-	-	-	-	-	-	-	-
NITROUS OXIDE	-	-	-	-	-	-	-	-
NITROGEN (GAS)	A	A	A	A	A	A	A	-
NITROGEN TETROXIDE	D	-	D	D	C	C	A	-
OCTADECANE	B	A	B	A	D	A	A	-
OCTANE	-	-	-	-	-	-	-	-
N-OCTANE	B	-	-	A	D	A	A	-
OCTACHLOROTOLUENE	D	D	D	D	D	A	A	-
OILS								
ANILINE	B	C	D	D	B	A	A	-
ANISE	C	-	D	-	-	-	A	-
BAY	C	-	D	-	-	A	-	-
BONE	C	-	D	A	-	A	A	-
CASTOR	B	A	A	A	B	A	A	B
CINNAMON	C	-	D	-	-	-	-	-
CITRIC	C	-	D	A	B	A	A	-
CLOVE	C	-	-	A	-	-	-	-
COCONUT	B	A	A	A	A	A	A	-
COD LIVER	C	A	B	A	A	A	A	-
CORN	B	A	D	A	A	A	A	-
COTTON SEED	B	A	D	A	A	A	A	A

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
A/B	D	A	-	-	D	C	-	D	-	D	-
C	C	B	B	A/150	B/70	B	A/250	B/72	C/70	A/70	D
-	-	-	-	-	-	B	-	-	-	A	-
A	A	A	-	-	-	B	-	C	-	-	-
A	A	A	A	A/200	B/70	B	A/212	C	A	A/120	B
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
A	A	A	A	A	-	A	-	A	-	A	-
D	D	-	-	-	-	-	-	D	-	C	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	-	-	D	-	A	-
D	-	-	-	-	-	-	-	D	-	-	-
							-				
C	A	A	B	-	A	D	-	A	-	A/70	D
-	A	A	-	-	-	D	-	-	-	-	-
-	A	A	-	-	-	D	-	-	-	A	-
-	A	A	-	-	-	D	-	-	-	A	-
A	A	A	-	-	A	A	-	-	-	A	A
-	-	A	-	-	-	D	-	-	D	-	D
A	D	A	A	A	-	A	-	A	A	A	B
B	-	A	A	-	-	B	-	B	-	-	-
B	A	A	A	-	-	A	-	A	A	A	A
B	-	A	A	-	-	A	-	A	-	A	A
B	A	A	A	A	-	A	-	A	A	A	B
B	A	A	A	-	A	A	-	A	A	A	B

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
CREOSOTE	B	-	B	A	D	A	A	-
DIESEL FUEL (20, 30, 40, 50)	C	-	D	A	-	A	-	A
FUEL (1, 2, 3, 5A, 5B, 6)	C	-	D	B	D	A	A	-
GINGER	C	-	A	A	-	A	-	-
HYDRAULIC (SEE HYDRAULIC)								
LEMON	C	-	D	-	-	A	-	-
LINSEED	B	B	D	A	B	A	A	D
MINERAL	C	A	B	A	D	A	A	-
OLIVE	B	A	B	A	A	A	A	-
ORANGE	C	-	D	A	-	A	-	-
PALM	B	-	D	A	-	A	A	-
PEANUT	B	B	D	A	C	A	A	-
PEPPERMINT	C	-	D	D	-	A	-	-
PINE	C	-	D	A	D	A	A	-
RAPE SEED	B	B	D	B	A	A	A	-
ROSIN	A	-	-	A	-	A	A	-
SESAME SEED	B	-	D	A	-	A	-	-
SILICONE	C	A	A	A	A	A	A	-
SOYBEAN	B	B	D	A	B	A	A	D
SPERM	B	-	D	A	-	A	-	-
TANNING	B	-	D	A	-	A	-	-
TURBINE	C	-	D	A	D	A	A	-
OLEIC ACID	B	B	D	B	B	B	A	A
OLEUM	D	D	D	C	D	A	A	D
OLEUM SPIRITS	D	C	D	C	C	A	A	D
O-DICHLOROBENZENE	D	D	D	D	A	A	-	D

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
A	-	A	B	-	D	B	-	D	C	-	C
A	A	A	B	-	A	A	-	B/70	A	A	B
A	A	A	A	-	A/70	A	-	B/70	B	A	A
-	-	A	-	-	-	A	-	-	-	A	-
A	-	A	-	-	-	A	-	D	-	A	-
A	A	A	B	-	A/70	A	A/250	A	A	A	A
A	A	A	A	-	A	A	A/250	B	B/70	A	B
A	A	A	A	-	A/70	A	-	A	A/70	-	C
A	-	A	A	-	-	A	-	A	C/70	A	C
A	A	A	-	-	-	A	-	-	A	A	A
A	A	A	-	-	-	A	-	B/175	A	A	A
D	-	A	-	-	-	A	-	B/175	-	A	-
A	C	A	-	-	A	A	-	-	D	A	D
-	A	A	-	-	-	A	-	-	D	A	-
A	-	A	A	-	A/70	A	-	A	B/120	A	C
A	A	A	-	-	-	A	-	-	-	A	A
A	A	A	A	-	A/70	A	-	A	A	A	A
A	A	A	A	-	B/70	A	-	A	A/70	A	A
-	A	A	-	-	-	A	-	-	-	A	-
-	-	A	-	-	-	A	-	-	-	A	-
A	A	A	-	-	-	A	-	B/70	C	A	A
B	C	A	A	A/250	B/120	A	A/250	B	C/120	A	C
D	D	A	D	A/73	D	D	-	D	D	D	D
D	D	B	-	-	-	-	-	D	D	D	-
A	A	-	-	-	-	A	-	D	-	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
OXALIC ACID (COLD)	A	-	B	B	A	A	A	-
OXGEN - COLD	A	A	A	C	B	A	A	-
OXYGEN - 200°-400°F	D	D	D	D	D	B	A	-
OZONE	A	A	B	D	A	A	A	-
PAINT THINNER, DUCO	C	D	C	A	D	B	A	-
PALMITIC ACID	B	A	B	A	B	A	A	A
PARAFFIN	A	-	-	A	D	A	A	-
PENTANE	A	D	B	A	D	A	A	-
PERCHLORIC ACID	C	D	A	D	B	A	A	-
PERCHLORIC ACID-10%	-	-	-	-	-	-	-	-
PERCHLORIC ACID-70%	-	-	-	-	-	-	-	-
PERCHLOROETHYLENE	A	D	D	C	D	A	A	D
PETROLATUM	B	-	B	A	-	A	-	-
PETROLEUM - BELOW 250	B	B	B	A	D	A	A	-
PETROLEUM - ABOVE 250	C	D	D	C	D	B	A	-
PHENOL (CARBOLIC ACID)	A	C	D	D	C	A	A	D
PHENYLBENZENE	C	D	D	D	D	A	A	-
PHENYL ETHYL ETHER	C	D	D	D	D	C	A	-
PHENYL HYDRAZINE	B	D	D	D	C	A	A	-
PHORONE	B	D	D	D	C	A	A	-
PHOSPHORIC ACID - 20%	A	B	B	C	A	A	A	-
PHOSPHORIC ACID (TO 40% SOLUTION)	A	B	D	D	B	A	A	-
PHOSPHORIC ACID - 45%	B	B	B	D	B	A	A	-
PHOSPHORIC ACID (40%-100% SOLUTION)	C	C	D	D	B	A	A	-
PHOSPHORIC ACID CRUDE	C	A	D	D	C	A	A	-
PHOSPHOROUS TRICHLORIDE ACID	B	-	D	D	A	A	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
C	D	A	B	A/150	B/120	B	A/250	A/70	A/120	A/120	B
A	A	A	-	A	B/70	C	A/250	C	-	A	-
A	A	A	-	-	D	D	-	D	-	A	-
B	-	-	-	A	-	D	A/212	D	C/70	A	B
A	A	A	-	-	-	A	-	D	-	-	-
C	C	A	B	A/250	C	A	A/250	A	-	A	B
A	-	A	B	A/150	A/70	A	-	A	B	A	B
A	-	C	B	-	A/70	A	-	-	D	A	A
D	D	D	B	A/200	D	C	-	A	B	A/120	C
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	-	A/140	-	-	-	-
D	B	A	B	A/200	D	A	A/250	B/72	D	A	C
B	-	A	A	-	D	A	-	A	B	A	B
A	A	A	-	A	A	A	A/250	A/70	C/70	A/200	-
A	A	A	-	-	D	A	A/250	-	C/70	-	-
B	D	A	A	A/150	C	A	A/212	C	D	A/70	D
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	A/73	-	-	-	-	-	D	-
-	-	-	-	-	-	-	-	-	-	-	-
D	D	B	A	-	D	D	A/250	A/120	-	A	-
D	D	A	A	-	D	D	A/250	A/120	B/70	A	-
D	D	B	-	-	D	D	A/250	A/120	-	A	-
D	D	B	A	A/250	C	D	A/250	A/120	-	A	B
D	D	C	A	-	C	D	-	A/120	B/70	A	B
D	B	A	A	A/250	-	D	A/250	D	B	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
PHOTOGRAPHIC (DEVELOPER)	A	-	A	A	-	A	-	-
PHTHALIC ACID	-	-	-	-	-	-	-	-
PHTHALIC ANHYDRIDE	-	-	-	-	-	-	-	-
PICKLING SOLUTION	A	C	C	-	C	B	A	D
PICRIC ACID	B	B	B	B	B	A	A	-
PINENE	C	B	D	B	D	A	A	-
PIPERIDINE	B	D	D	D	D	C	A	-
PLATING SOLUTIONS:								
ANTIMONY	A	-	A	A	-	A	A	-
ARSENIC	A	-	A	A	-	A	A	-
BRASS	A	-	-	A	-	A	A	-
BRONZE	A	-	A	A	-	A	-	-
CADMIUM	A	-	A	A	-	A	A	-
CHROME	A	-	D	D	A	A	A	-
COPPER	A	-	-	A	-	A	A	-
GOLD	A	-	A	A	-	A	A	-
INDIUM	A	-	-	A	-	A	-	-
IRON	A	-	A	A	-	A	A	-
LEAD	A	-	A	A	-	A	A	-
NICKEL	A	-	-	A	-	A	A	-
SILVER	A	-	A	A	-	A	A	-
TIN	A	-	A	A	-	A	A	-
ZINC	A	-	A	A	-	A	A	-
POLYVINYL ACETATE EMULSION	A	-	B	-	A	-	A	-
POTASH	A	B	B	A	B	A	A	-
POTASSIUM ACETATE	A	D	B	B	A	B	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
C	D	A	A	A/150	-	A	A/250	A	A	-	A
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	A	-	-	D	-	-	-	-	-
C	D	D	D	A/73	C	D	A/140	B/70	A	A/70	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
D	A	A	A	-	D	A/130	-	A	-	A/70	A
C	A	A	A	-	A	A/110	-	A	-	-	A
C	A	A	A	A/150	A	A/100	A/250	A	B	A	A
C	A	A	A	-	A	B	-	A	-	-	-
C	-	-	D	A/150	A	C	A/250	A	-	A	A
C	-	A	D	A/150	D	-	A/250	A	-	A	A
C	-	-	D	A/150	A	-	A/250	A	-	A	-
C	-	A	-	A/150	A/70	-	A/250	A	-	A	-
C	-	A	A	-	D	-	-	A	-	-	A
C	-	A	A	-	D	-	-	A	-	A	D
C	-	-	-	A/150	D	-	-	A	-	A	A
C	-	-	-	A/150	A	-	-	A	-	A	D
C	-	A	-	A/150	A/120	-	-	A	-	A	A
C	-	A	-	A/150	D	-	-	A	-	A	A
C	-	A	-	A/150	D	-	-	A	-	A	D
-	B	-	-	-	-	A	-	B/70	-	A	-
C	B	A	B	A	A	A	A/250	A	A/70	A	A
D	A	B	-	A/70	-	A	-	A	-	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
POTASSIUM ALUMINUM SULFATE	-	-	-	-	-	-	-	-
POTASSIUM BICARBONATE	A	-	A	A	-	A	A	-
POTASSIUM BICHROMATE	-	-	-	-	-	-	-	-
POTASSIUM BROMIDE	A	-	A	A	A	A	A	-
POTASSIUM CARBONATE	A	-	B	A	A	A	A	-
POTASSIUM CHLORATE	A	-	A	A	A	A	A	-
POTASSIUM CHLORIDE	A	A	A	A	A	A	A	-
POTASSIUM CHROMATE	A	-	A	A	-	A	A	-
POTASSIUM CUPRO CYANIDE	A	A	A	A	A	A	A	-
POTASSIUM CYANIDE SOLUTIONS	A	A	A	A	A	A	A	-
POTASSIUM DICHROMATE	A	A	A	A	A	A	A	D
POTASSIUM HYDROXIDE	A	B	B	B	B	D	A	D
POTASSIUM HYPOCHLORITE	-	-	-	-	-	-	-	-
POTASSIUM IODIDE	-	-	-	-	-	-	-	-
POTASSIUM NITRATE	A	A	A	A	A	A	A	-
POTASSIUM PERMANGANATE	A	-	A	A	A	A	A	-
POTASSIUM SULFATE	A	A	A	A	A	A	A	-
POTASSIUM SULFIDE	-	-	-	-	-	-	-	-
PRODUCER GAS	C	A	B	A	C	A	A	-
PROPANE (LIQUIFIED)	C	B	B	A	D	A	A	-
PROPYL ACETATE	B	D	D	D	C	D	A	-
PROPYL ALCOHOL	-	-	-	-	-	-	-	-
PROPYL NITRATE	B	-	-	-	B	C	A	-
PROPYLENE	B	D	D	D	D	A	A	-
PROPYLENE GLYCOL	A	-	C	A	A	A	A	-
PROPYLENE OXIDE	A	D	D	-	B	-	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	-	-	-	-	-	-	A/250	-	-	-	-
C	A	B	B	-	A/70	A	A/250	A	A	A	A
-	-	-	-	-	-	-	A/250	-	-	-	-
C	D	A	A	A	A/70	A	A/250	A	A	A	A
C	B	A	B	A	A/70	A	A/250	A	-	A	-
B	C	A	B	-	C	A	A/250	A	A/70	A	A
B	B	C	B	A	B/70	A	A/250	A	A/70	A	A
A	A	B	A	A	A	D	A/250	A	A	A	A
-	-	-	-	-	-	C	-	-	-	-	-
D	B	A	B	A	A/70	C	A/250	A	-	A	A
A	B	A	B	A	D	D	A/250	A	A	A	A
D	C	A	B	A/150	C	A	A/250	A	A	A/150	A
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
B	A	A	B	A	B/70	B	A/250	A	A	A	A
B	B	B	A	-	D	C	A/250	B	A	A	A
A	B	B	B	A	A/70	B	A/250	A	A/120	A	A
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	A	-	-	-	-	-
A	A	A	A	A	A/70	A	A/250	B/72	C/70	B/200	A
-	-	-	-	A/120	-	A	-	C	-	A/70	-
-	-	-	-	-	-	-	A/212	-	-	-	-
A	D	-	-	-	-	A	-	-	-	-	-
A	A	A	-	-	-	A	-	-	-	-	B
A	B	A	B	-	-	D	A/100	A	B/70	A	C
B	B	A	-	D	-	A	A/140	C	-	D	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
PYRANOL	D	B	D	A	D	A	A	-
PYDRAULS	D	D	D	D	B	A	A	A
PYRIDINE	C	-	D	D	B	D	A	D
PYROGALLIC ACID	A	-	-	-	-	A	-	-
PYROLIGNEOUS ACID	B	-	C	C	B	A	A	-
PYRROLE	C	B	D	D	C	C	A	-
RADIATION	A	A	B	B	C	B	A	-
RED OIL	B	B	C	A	B	A	A	-
ROSINS	A	-	-	A	-	-	A	-
RUM	A	D	-	A	A	A	A	-
RUST INHIBITORS	B	-	C	A	-	A	-	-
SALAD DRESSING	A	-	-	A	-	A	-	-
SALICYLALDEHYDE	-	-	-	-	-	-	-	-
SALICYLIC ACID	-	-	-	-	-	-	-	-
SAL AMMONIAC	A	A	A	A	A	A	A	-
SEA WATER	A	A	B	A	A	A	A	A
SEWAGE	A	D	A	A	B	A	A	-
SHELLAC (BLEACHED)	B	-	-	A	-	-	-	-
SHELLAC (ORANGE)	B	-	-	A	-	-	-	-
SILICATE ESTERS	B	A	B	A	D	A	A	-
SILICONE	B	-	A	A	-	A	-	-
SILICONE GREASES	B	A	A	A	A	A	A	A
SILVER BROMIDE	A	-	-	-	-	-	-	-
SILVER CHLORIDE	-	-	-	-	-	-	-	-
SILVER CYANIDE	-	-	-	-	-	-	-	-
SILVER NITRATE	A	A	A	C	A	A	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	A/70	A/70	-	-	-	-	-	-
B	A	B	A	D	C	B	A/250	C	B/70	D	D
-	D	A	B	A/150	-	D	A/140	-	-	A	A
D	C	B	-	A/100	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	D	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
A	D	A	-	-	A/70	B	-	A	B/70	-	C
-	-	A	-	-	A	A	-	A	-	-	A
-	C	A	-	-	-	A	-	A	-	-	-
B	D	A	-	-	A	A	-	A	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
D	D	A	-	-	-	-	-	-	-	-	-
D	D	C	-	A/250	A/120	A	-	A	A/120	A	A
B	B	A	-	-	-	A	A/250	A	-	A	-
A	A	A	-	-	A/70	A	-	A	A/70	-	-
A	A	A	-	-	A/70	A	-	A	A/70	-	-
-	-	-	-	-	-	-	-	-	-	-	-
B	A	A	-	-	A/70	A	A/212	A	-	A	A
-	-	-	-	-	-	A	-	-	-	-	-
D	D	B	A	-	-	A	-	-	A	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
D	D	A	A	A	A/70	A	A/250	A	A	A	A

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
SKYDROL 500	B	D	D	D	A	C	A	A
SKYDROL 7000	B	D	D	D	C	B	A	-
SOAP SOLUTIONS	A	A	B	A	A	A	A	A
SODA ASH (SEE SODIUM CARBONATE)								
SODIUM ACETATE	A	D	B	B	A	D	A	-
SODIUM ALUMINATE	A	-	A	A	-	A	A	-
SODIUM BENZOATE	-	-	-	-	-	-	-	-
SODIUM BICARBONATE	A	-	A	A	A	A	A	-
SODIUM BICHROMATE	-	-	-	-	-	-	-	-
SODIUM BISULFATE	A	-	A	A	A	A	A	-
SODIUM BISULFITE	A	-	A	A	A	A	A	-
SODIUM BORATE	A	-	A	A	A	A	A	-
SODIUM BROMIDE	-	-	-	-	-	-	-	-
SODIUM CARBONATE	A	-	A	A	A	A	A	-
SODIUM CHLORATE	A	-	A	A	A	A	A	A
SODIUM CHLORIDE	A	A	A	A	A	A	A	A
SODIUM CHROMATE	A	-	A	A	-	A	A	D
SODIUM CYANIDE	A	-	A	A	A	A	A	-
SODIUM DICHROMATE	-	-	-	-	-	-	-	-
SODIUM FLUORIDE	-	-	-	-	-	-	-	-
SODIUM HYDROXIDE (20%)	A	B	B	A	A	A	A	B
SODIUM HYDROXIDE (50% SOLUTION)	A	B	C	D	A	A	A	B
SODIUM HYDROXIDE (80% SOLUTION)	A	B	C	D	A	B	A	-
SODIUM HYPOCHLORITE (TO 20%)	A	D	D	C	C	A	A	D
SODIUM METAPHOSPHATE	A	-	B	A	A	A	A	-
SODIUM METASILICATE	A	-	A	A	-	A	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	-	-	-	A/70	C	A	-	-	-	-	-
-	-	-	-	A/70	C	A	-	-	-	-	-
C	B	A	A	A/150	A/70	A	-	A	D	A	A
							-				-
B	B	A	A	A	B/70	A	A/250	A	A	A	B
C	A	A	B	A	A/70	A	-	A	-	A	-
-	-	-	-	-	-	-	A/250	-	-	-	-
A	C	A	B	A	A	A	A/250	A	A/120	A	A
-	-	-	-	-	-	-	A/212	-	-	-	-
D	D	A	B	A	A/70	A	A/250	A	A/120	A	A
A	D	A	A	A	C	A	A/250	A	A/120	A	A
C	B	B	A	A	A/70	A	A/250	A/140	A/120	A	A
-	-	-	-	-	-	-	A/250	-	-	-	-
C	B	A	A	A	B/70	A	A/250	A	B/120	A	A
B	-	A	A	A	D	A	A/250	A	B/120	A	A
C	B	C	A	-	A/70	A	-	A	A/120	A	A
D	B	-	A	A	D	D	-	A	-	A	-
D	B	A	A	-	A/70	B	A/250	A	A/120	A	A
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
D	B	A	B	-	A	A	A/250	A	D	A	A
D	C	B	A	A/250	A	A	A/250	A	D	C	A
D	C	D	B	-	C	A	A/140	A	D	C	A
D	D	C	A	A	D	D	A/250	B/72	A	A	A
A	C	A	-	A	A/70	B	-	D	A/70	-	A
B	A	A	A	-	-	D	A/250	-	-	-	A

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
SODIUM NITRATE	A	-	B	C	A	A	A	-
SODIUM NITRITE	-	-	-	-	-	-	-	-
SODIUM PERBORATE	A	-	B	B	A	A	A	-
SODIUM PEROXIDE	B	D	B	C	B	A	A	-
SODIUM PHOSPHATE	A	A	B	B	A	A	A	-
SODIUM POLYPHOSPHATE	-	-	-	-	-	-	-	-
(MONO, DI, TRIBASIC)	A	A	D	A	-	A	-	-
SODIUM SILICATE	A	-	A	A	A	A	A	-
SODIUM SULFATE	A	A	A	A	A	A	A	-
SODIUM SULFIDE	A	A	A	A	A	A	A	-
SODIUM SULFITE	-	-	-	-	-	-	-	-
SODIUM TETRABORATE	A	-	-	A	A	A	A	-
SODIUM THIOSULPHATE ("HYPO")	A	A	A	B	A	A	A	-
SORGHUM	A	-	A	A	-	A	-	-
SOY SAUCE	A	B	A	A	B	A	A	-
STANNIC CHLORIDE	A	B	D	A	B	A	A	C
STANNIC FLUOBORATE	A	-	A	A	-	A	-	-
STANNOUS CHLORIDE	-	-	-	-	-	-	-	-
STARCH	A	A	A	A	A	A	A	-
STEAM TO 200°F	A	C	C	C	A	D	D	B
STEAM 220°F-300°F	B	D	D	D	A	D	D	C
STEARIC ACID	B	A	B	C	B	A	A	C
STODDARD SOLVENT	C	A	B	B	D	A	A	-
STYRENE	C	C	D	D	D	B	A	D
SUCROSE SOLUTION	A	D	A	A	A	A	A	-
SUGAR (LIQUIDS)	A	-	B	A	-	A	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
A	A	A	B	A	A/70	A	A/250	A	A/120	A	A
-	-	-	-	-	-	-	A/250	-	-	-	-
B	C	C	B	-	B/70	B	A/250	A	A/70	A	A
D	D	A	B	A	A/70	C	A/250	B/120	A	A	B
D	B	B	-	A	A/70	-	A/250	A	-	A	-
-	-	-	-	-	-	-	-	-	-	-	-
D	D	A	A	-	A/70	B	-	A	A	A	A
C	B	A	B	A	A/70	C	A/250	A	A/120	A	A
B	A	A	B	A	A	B	A/250	A	A/120	A	A
D	A	A	B	A	A/70	B	A/250	A	A/120	A	A
-	-	-	-	-	-	-	A/250	-	-	-	-
C	-	A	-	A	A	B	-	-	A/120	-	A
B	C	A	A	A	B	C	A/250	A	A/70	A	A
-	A	A	-	-	A	A	-	-	-	-	-
A	D	A	-	-	A	A	-	-	-	-	-
D	D	D	-	A	B	B	A/250	A	A/120	A	A
D	D	-	-	-	-	C	-	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
A	C	A	-	A/150	A/70	A	-	-	B	-	A
A	A	A	-	A	D	B	A/250	-	-	-	-
A	A	A	-	A	D	D	A/250	-	-	-	-
B	-	A	A	A/150	A/120	A	A/250	B/72	B/72	A	B
A	A	A	A	A	A	A	A/250	B/120	C/120	A	C
A	A	A	D	-	A/70	A	A/212	D	-	B	D
-	B	-	A	-	A	A	-	-	-	-	-
A	-	A	A	-	A/70	A	-	A	-	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
SULFATE LIQUORS	A	-	C	-	-	-	-	-
SULFITE LIQUORS	A	-	A	A	B	A	A	-
SULFUR	A	B	B	B	A	A	A	C
SULFUR CHLORIDE	D	-	D	D	D	A	A	C
SULFUR DIOXIDE	A	-	B	D	A	D	A	D
SULFUR HEXAFLUORIDE	B	-	B	B	A	A	A	-
SULFUR TRIOXIDE	C	B	C	C	C	A	A	-
SULFUR TRIOXIDE (DRY)	C	B	D	D	C	A	A	-
SULFURIC ACID (DILUTE)	A	C	C	D	-	A	A	A
SULFURIC ACID (TO 10%)	A	D	D	D	A	A	A	A
SULFURIC ACID (10%-75%)	A	D	D	D	C	A	A	B
SULFURIC ACID (CONCENTRATED TO 98%)	B	D	D	D	C	A	A	C
SULFURIC ACID (20% OLEUM)	D	D	D	D	D	B	A	-
SULFUROUS ACID	A	D	B	C	-	A	A	B
SYRUP	A	-	B	A	-	A	-	A
TALL OIL	-	-	-	-	-	-	-	-
TALLOW	B	A	-	A	A	A	A	A
TANNIC ACID	A	A	B	A	C	A	A	A
TANNING LIQUORS	A	-	-	C	-	A	A	-
TAR, BITUMINOUS	B	-	C	B	D	A	A	-
TARTARIC ACID	A	A	B	A	B	A	A	C
TERPINEOL	B	B	D	C	B	A	A	-
TERTIARY BUTYL ALCOHOL	B	D	A	A	A	B	A	-
TERTIARY BUTYL CATECHOL	B	D	B	D	B	A	A	-
TERTIARY BUTYL MERCAPTAN	B	D	D	D	D	A	A	-
TETRA BROMOMETHANE	D	-	D	D	D	A	A	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
B	C	C	A	A/73	B/70	D	A/250	A	A/120	A	B
D	D	B	-	A/73	-	-	A/250	-	-	-	-
D	B	A	-	A/250	A/70	-	A/250	A	-	A	-
D	D	D	A	A/73	A	D	A/140	C	C/70	A/70	C
D	D	A	B	A/150	C	D	A/250	A/70	B/70	A	A
D	D	-	-	-	-	D	-	-	B	-	B
D	D	B	-	-	-	-	-	-	-	-	A
A	A	C	B	-	A/70	D	-	D	C/70	D	A
D	D	B	-	-	C	D	A/250	A	A/70	A	-
D	D	C	A	A/250	C	D	A/250	A/120	A/70	A	A
D	D	C	B	A/150	D	D	A/250	A/72	B/70	A/150	A
D	D	B	-	A/150	D	D	A/250	C/72	B/70	A/120	D
D	D	-	-	-	D	D	A/250	D	-	-	-
D	D	B	B	A/250	D	D	A/212	A	B/120	A	A
A	-	A	-	-	-	A	-	A	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
A	-	A	-	-	A/70	A	-	B/70	C	-	-
C	C	A	B	A/250	C	B	A/250	A	A	A	A
C	-	A	A	A/250	A/70	B	-	A	A/70	-	A
-	B	B	-	A	B	B	-	-	-	-	-
C	C	A	B	A/250	B/70	B	A/250	A	A/70	A	A
A	A	A	-	-	-	-	-	D	-	B/120	-
-	-	-	-	-	-	A	-	B	-	-	-
C	B	B	-	-	-	A	-	-	-	-	-
-	-	-	-	-	-	B	-	-	-	-	-
D	-	-	-	-	-	-	-	D	-	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
TETRABUTYL TITANATE	B	-	A	B	B	A	A	-
TETRACHLOROETHYLENE	D	B	D	D	D	A	A	-
TETRACHLOROETHANE	D	-	-	D	D	A	A	-
TETRAETHYL LEAD	C	-	D	B	D	A	A	-
TETRAHYDROFURAN	B	C	D	D	C	B	A	B
TETRALIN	C	-	D	D	D	A	A	-
THIONYL CHLORIDE	B	-	D	D	D	A	A	-
TITANIUM TETRACHLORIDE	D	D	D	C	D	A	A	-
TOLUENE	C	C	D	C	D	A	A	B
TOLUENE DIISOCYANATE	B	-	D	-	A	-	A	-
TOLUENE, TOLUOL	C	C	D	D	D	A	A	B
TOMATO JUICE	A	-	A	A	-	-	A	A
TRANSFORMER OIL	D	D	C	B	D	A	A	-
TRANSMISSION FLUID TYPE A	C	A	C	A	D	A	A	-
TRIACETIN	A	D	A	A	A	C	A	-
TRIBUTOXY ETHYL PHOSPHATE	B	D	D	D	A	B	A	-
TRIBUTYL PHOSPHATE	B	D	D	D	C	D	A	-
TRIBUTYL MERCAPTAN	B	-	D	D	D	A	A	-
TRICHLOROACETIC ACID	B	D	B	C	B	B	A	-
TRICHLORETHANE	D	D	D	D	D	A	A	-
TRICHLORETHYLENE	D	D	D	D	D	A	A	D
TRICHLOROPROPANE	D	-	A	A	-	A	A	-
TRICRESYLPHOSPHATE	B	C	D	D	A	B	A	-
TRIETHYLAMINE	B	-	B	A	-	A	A	-
TRIETHANOL AMINE	A	D	B	B	B	B	A	D
TRIETHYL ALUMINUM	B	-	D	D	-	B	A	-

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METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	-	-	-	-	-	-	-	-	-	-	-
D	A	A	-	A/200	A/70	A	A/250	D	B	-	D
D	A	A	-	-	C	A	A/140	D	-	-	C
-	-	-	-	-	-	-	A/250	A/70	-	A	-
-	-	A	A	D	A	C	A/212	C	C/70	B/70	D
A	A	A	-	-	-	-	-	D	-	-	-
D	D	-	-	A/150	C	-	A/212	D	-	D	-
D	A	B	-	-	A/70	-	A/212	D	-	A	-
A	A	A	A	A/200	A/70	A	A/250	D	C/70	A	-
-	-	-	-	-	-	C	-	-	-	-	-
A	A	A	-	A/150	A/70	A	-	B/175	C/70	A	D
A	-	A	-	A/250	A	A	A/212	A	A/70	A	A
A	A	A	-	A/250	A/70	A	-	B/70	-	-	B
A	A	A	-	-	-	A	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	A	-	-	A/73	-	-	A/140	A/70	-	A/70	-
-	-	-	-	-	-	-	-	-	-	-	-
D	D	D	B	A/150	D	D	A/250	B/70	A	A/70	B
D	B	A	A	-	C	A	-	D	-	A/120	C
D	C	A	A	A	A/70	A	A/250	B/72	D	A	D
D	A	A	A	-	-	A	-	D	-	-	-
D	B	A	A	-	A/120	C	-	B/70	B/70	-	D
-	A	-	-	A/150	A/70	A	A/212	C	-	A/120	B
B	A	A	-	A/73	A/70	A	A/140	A/70	-	A/70	-
-	-	-	-	-	-	-	-	-	-	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

CHEMICALS	ELASTOMERS							
	WIL-FLEX™	POLYURETHANE	NEOPRENE	BUNA-N	EPDM	VITON®	PTFE	SANIFLEX™ TPE
TRIETHYL BORANE	B	-	D	D	-	A	A	-
TRINITROTOLUENE	A	-	A	D	D	C	A	-
TRIOCTYL PHOSPHATE	B	-	D	D	A	B	A	-
TRISODIUM PHOSPHATE	-	-	-	-	-	-	-	-
TRIARYL PHOSPHATE	B	B	C	D	A	A	A	-
TUNG OIL	B	B	B	A	C	B	A	C
TURPENTINE	C	D	D	A	D	A	A	-
UNLEADED GASOLINE	C	D	D	D	D	A	A	-
URINE	-	-	-	-	-	-	-	-
VARNISH	-	-	-	-	-	-	-	-
VINEGAR	-	-	-	-	-	-	-	-
VINYL ACETATE	-	-	-	-	-	-	-	-
WATER, ACID, MINE	-	-	-	-	-	-	-	-
WATER, DEMINERALIZED	-	-	-	-	-	-	-	-
WATER, DISTILLED, LAB GRADE 7	-	-	-	-	-	-	-	-
WATER, FRESH	-	-	-	-	-	-	-	-
WATER, SALT	A	A	B	B	A	A	A	A
WHITE LIQUOR (PULP MILL)	-	-	-	-	-	-	-	-
WINES	-	-	-	-	-	-	-	-
XYLENE	-	-	-	-	-	-	-	-
ZINC CHLORIDE	-	-	-	-	-	-	-	-
ZINC NITRATE	-	-	-	-	-	-	-	-
ZINC SULFATE	-	-	-	-	-	-	-	-

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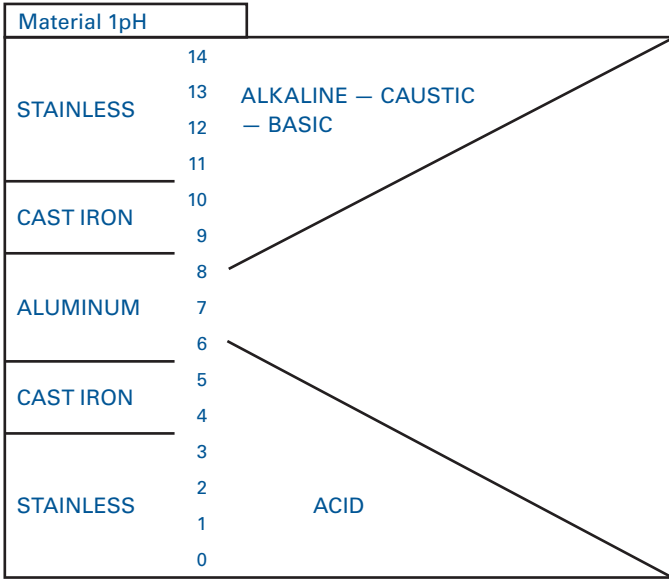
METALS					PLASTICS						
ALUMINUM	CAST IRON	STAINLESS STEEL (316)	ALLOY C	HALAR® ECTFE COATED	NYLON	CARBON-FILLED ACETAL (CFA)	ETFE	POLYPROPYLENE	POLYETHYLENE	PVDF	PVC
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
A	B	B	-	-	-	-	-	-	-	-	-
A	B	A	B	A/200	A/70	A	A/250	B/175	D	A	-
A	A	A	A	-	A	A	-	D	-	C	-
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
D	D	C	-	-	A/120	A	A/250	A	A	A	A
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/212	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-
-	-	-	-	-	-	-	A/250	-	-	-	-

Ratings: A: Minor effect; B: Minor to moderate effect; C: Moderate to severe effect; D: Not recommended; —: Insufficient information. The accuracy of these ratings cannot be guaranteed.

Halogenated Solvents Warning

Halogenated solvents can, under certain circumstances, corrode aluminum or galvanized parts. If the wetted parts or a pressurizable fluid system contain aluminum or galvanized parts, this corrosive action could cause an EXPLOSION. Although manufacturers of these solvents typically add inhibitors, there is no known inhibitor that will prevent the corrosive reaction under ALL circumstances. Special caution should be exercised handling reclaimed or used solvents since the inhibitors are often degraded. ONLY stainless steel or PVDF pumps should be used for these materials. Typical examples of halogenated hydrocarbon solvents (H.H.C.) include, but are not limited to, the following: Trichlorethane, Trichlorethylene, Methylene Chloride, Methyl Chloride, Carbon Tetrachloride, Chloroform and Dichlorethylene.

- **Determine the pH value:**
- pH is a measure of hydrogen-ion concentration. pH of 7 is neutral — below 7, acid — above 7, alkaline.


Material 1pH
STAINLESS
CAST IRON
ALUMINUM
CAST IRON
STAINLESS
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
ALKALINE — CAUSTIC — BASIC
ACID

Elastomer Selection Guide for Solvents

The liquids classified and listed below cannot usually be handled with Neoprene or Buna-N and will probably require Wil-Flex™, Viton®, EPDM and/or PTFE.

a. Ketones and Aldehydes

1. Methyl ethyl ketone
2. Methylacetone
3. Acetone
4. Formaldehyde

→ Wil-Flex™ EPDM/PTFE

b. Acetates

1. Ethyl acetate
2. Isopropyl acetate
3. Amyl acetate
4. Butyl acetate

→ Wil-Flex™ EPDM/PTFE

c. Aromatic Hydrocarbons

1. Benzene
2. Toluol (toluene)
3. Xylene (xyol)
4. Benzol
5. Hexane
6. Cyclohexane
7. Napthalene

→ Viton®/PTFE

d. Chlorinated Hydrocarbons

1. Carbon tetrachloride
2. Trichlorethylene
3. Ethylene dichloride
4. Methyl chloride
5. Propyl chloride
6. Chloroform
7. Dichlorethylene

→ Viton®/PTFE

Temperature Limits for Elastomers

Wil-Flex™	–40° to 107.2° C	(–40° to 225° F)
Neoprene	–18° to 93.3° C	(–0° to 200° F)
Buna-N	–12° to 82.2° C	(+10° to 180° F)
EPDM	–51° to 137.8° C	(–60° to 280° F)
Viton®	–40° to 176.7° C	(–40° to 350° F)
PTFE[1]	4° to 104.4° C	(+40° to 220° F)
Polyurethane	–12° to 65.6° C	(+10° to 150° F)
Saniflex™	–29° to 104.4° C	(–20° to 220° F)

Temperature Limits for Plastics

Polypropylene	0° to 79.4° C	(+32° to 175° F)
Polyethylene	0° to 70.0° C	(+32° to 158° F)
PVDF	–12° to 107.2° C	(+10° to 225° F)
PTFE/PFA[2]	–29° to 107.2° C	(–20° to 225° F)
Acetal	–29° to 82.2° C	(–20° to 180° F)
Nylon	–18° to 93.3° C	(0° to 200° F)

[1] 4.4° to 148.9° C (40° to +300° F) - 13 mm (1/2") and 25 mm (1") models only.
[2] –28.9° to 148.9° C (–20° to +300° F) - Ultrapure II and III models only.

NOTE: These are average temperatures. Chemicals and solvents can have an effect on temperature limits.

Rubber Compounds

Listed below are the various rubber compounds manufactured for use as elastomers in Wilden pumps. These compounds consist of natural rubber and manmade additives to increase the compounds' resistance to specific types of fluids. Diaphragms made of these compounds will utilize a nylon fabric mesh. The mesh is centered within the diaphragm during the molding process. The fabric mesh lends dimensional stability and strength to the compound. The elastomers manufactured of these compounds are fabricated using compression molding process.

Compound Neoprene
Color Green
Temperature Limits –18° to 93° C
0° to +200° F

Suitable Applications An excellent general purpose diaphragm for use in non-aggressive applications such as water-based slurries, well water or sea water. Exhibits excellent flex life and low cost.

Compound Buna-n
Color Red
Temperature Limits –12° to 82° C
+10° to +180° F

Suitable Applications Excellent for applications involving petroleum/oil-based fluids such as leaded gasolines, fuel oils, non-synthetic hydraulic oils, kerosene, turpentines and motor oils.

Compound	EPDM		
Color	Blue		
Temperature Limits	–51°	to	138° C
	–10°	to	+280° F

Suitable Applications Excellent for use in applications requiring extremely cold temperatures. May also be used as a low cost alternative when pumping dilute acids or caustics.

Compound	Viton®		
Color	Silver		
Temperature Limits	–40°	to	177° C
	–40°	to	+350° F

Suitable Applications Excellent for use in applications requiring extremely hot temperatures. May also be used with aggressive fluids such as aromatic or chlorinated hydrocarbons and highly aggressive acids. PTFE would normally be used with these aggressive fluids as its flex life is better than Viton®. However, in applications involving suction lift outside the range of PTFE, Viton® will be the preferred choice for highly aggressive fluids.

Thermoplastic Compounds

Listed below are the various thermoplastic (TPE) compounds manufactured for use as elastomers in Wilden pumps. These compounds are comprised entirely of man-made elements. Thermoplastic elastomers manufactured of these compounds are fabricated using an injection molding process. Diaphragms made of these compounds require no fabric reinforcement due to the dimensional stability and tensile strength inherent in TPE compounds.

Compound Polyurethane
Color Clear
Temperature Limits –12° to 66° C
0° to +150° F

Suitable Applications An excellent general purpose diaphragm for use in non-aggressiv eapplications. This material exhibits exceptional flex life and durability. Wilden's least expensive diaphragm.

Compound Wil-Flex™
Color Cream
Temperature Limits –40° to 107° C
–40° to +225°F

Suitable Applications Excellent choice as a low cost alternative to PTFE in many acidic and caustic applications such as sodium hydroxide, sulfuric or hydrochloric acids. Exhibits excellent abrasion resistance and durability at a cost comparable to neoprene.

Compound	Saniflex™
Color	Cream
Temperature Limits	–29° to 104° C
	–20° to +220° F

Suitable Applications Exhibits excellent abrasion resistance, flex life and durability. This material is FDA approved for food processing applications. An outstanding general purpose diaphragm as well.

PTFE Compounds

PTFE is one of the most chemically inert man-made compounds known. Wilden engineers were the first to discover that by reinforcing a molded PTFE diaphragm with concentric ribs they could control the flex pattern of the diaphragm. The ribbed design extended flex life 5 to 10 times longer than that of any other PTFE diaphragm. This innovation made the use of PTFE elastomers in diaphragm pumps cost effective, greatly expanding the range of applications for diaphragm pumps. PTFE is not an elastic material; therefore, PTFE diaphragms require a rubber back-up diaphragm to provide flexibility and memory. Also, when using a PTFE diaphragm, flow rates will be reduced by up to 20%. This is due to the inability of PTFE to flex as far as a rubber diaphragm which will decrease displacement per stroke.

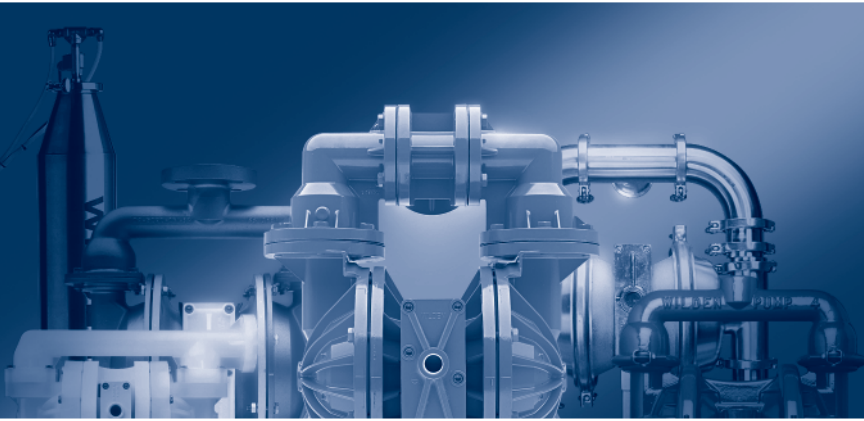
Compound	PTFE
Color	White
Temperature Limits	–4° to 104° C
	+40° to +220° F

Suitable Applications Excellent choice when pumping highly aggressive fluids such as aromatic or chlorinated hydrocarbons, acids, caustics, ketones and acetates. Exhibits good flex life compared to a standard rubber diaphragm.

WILDEN

A DOVER COMPANY

PUMP USER'S GUIDE



Warranty

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Each and every product manufactured by Wilden Pump and Engineering, LLC is built to meet the highest standards of quality. Every pump is functionally tested to insure integrity of operation.

Wilden Pump and Engineering, LLC warrants that pumps, accessories and parts manufactured or supplied by it to be free from defects in material and workmanship for a period of five (5) years from date of installation or six (6) years from date of manufacture, whichever comes first. Failure due to normal wear, misapplication, or abuse is, of course, excluded from this warranty.

Since the use of Wilden pumps and parts is beyond our control, we cannot guarantee the suitability of any pump or part for a particular application and Wilden Pump and Engineering, LLC shall not be liable for any consequential damage or expense arising from the use or misuse of its products on any application. Responsibility is limited solely to replacement or repair of defective Wilden pumps and parts.

All decisions as to the cause of failure are at the sole discretion of Wilden Pump and Engineering, LLC.

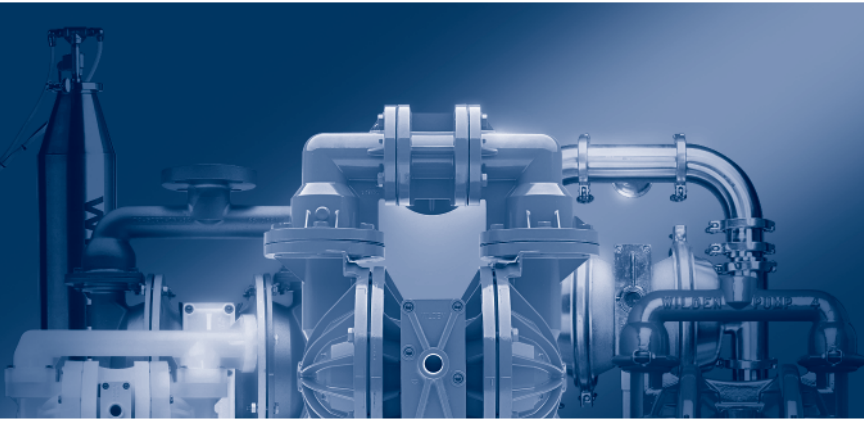
Prior approval must be obtained from Wilden for return of any items for warranty consideration and must be accompanied by the appropriate MSDS for the product(s) involved. A Return Goods Tag, obtained from an authorized Wilden distributor, must be included with the items which must be shipped freight prepaid.

The foregoing warranty is exclusive and in lieu of all other warranties expressed or implied (whether written or oral) including all implied warranties of merchantability and fitness for any particular purpose. No distributor or other person is authorized to assume any liability or obligation for Wilden Pump and Engineering, LLC other than expressly provided herein.

WILDEN

A DOVER COMPANY

PUMP USER'S GUIDE



Safety Supplement

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SAFETY MANUAL

Wilden Pump & Engineering, LLC.
Supplement to Engineering, Operation
and Maintenance Manual

IMPORTANT

READ THIS MANUAL BEFORE PRODUCT INSTALLATION, OPERATION, INSPECTION AND MAINTENANCE

CE This safety manual applies to all Wilden pumps and dampeners and provides instructions for safe installation, operation, inspection, and maintenance. Failing to follow these instructions could result in severe personal injury, including death, and/or substantial product and/or property damage.

This document is a supplement to the Engineering, Operation and Maintenance manual. It is important to refer to the Engineering, Operation, and Maintenance manual for additional information about specific products.

General Safety Considerations

- Verify that the model received matches the purchase order and/or specification sheet.
- Ensure all operators are properly trained and employ safe operating and maintenance practices as outlined in this Safety Manual, the Pump User's Guide, and the Engineering, Operation and Maintenance manual for the specific product.
- Wear appropriate safety equipment during installation, operation, inspection and maintenance. Use caution to avoid contact with process fluids, cleaning fluids, and other chemicals. Gloves, coveralls, face shields and other equipment may be required to adequately protect personnel. All personnel must review the Material Safety Data Sheet (MSDS) for all process and cleaning fluids and follow all handling instructions.

- Wear safety glasses and additional safety equipment during operation. If a diaphragm rupture occurs, the material being pumped may be forced out air exhaust.
- Always use proper hearing protection. Pump noise can exceed 75 dBA under certain operating conditions.

Product Installation

- Always refer to the detailed installation instructions supplied in the Engineering, Operation, and Maintenance manual.
- Retighten all fasteners to the specifications provided in the Engineering, Operation and Maintenance manual.
- Application pressures and temperatures, product maximum pressures, and an acceptable factor of safety should all be considered when selecting suction and discharge piping and hoses. Extra caution must be taken for all high-pressure H-Series and Rhino pumps due to the high discharge pressure that these pumps produce. Consult the product Engineering, Operation, and Maintenance manual or your local distributor for further information.
- During operation, unwanted movement of the pump could occur. All pumps should be bolted to a secure surface that is both level and flat.
- Flush products thoroughly before installation to reduce the possibility of process fluid contamination or chemical reaction.
- FDA, USDA, and 3A products should be cleaned and/or sanitized prior to usage.
- Ensure proper ventilation of any liquid tanks or vessels. The pump can generate high inlet suction and discharge pressure conditions. Improper ventilation can lead to rupture of the container.
- When using gases other than compressed air to power the product, make sure that the environment has adequate ventilation. Product exhaust or system leak can displace air from the environment creating a risk of suffocation.

Product Operation

- Do not exceed the maximum air supply pressure. Refer to the Engineering, Operation, and Maintenance manual for maximum air supply pressure.
- Do not exceed the maximum fluid housing pressure. Refer to the Engineering, Operation, and Maintenance manual or contact factory for details.
- Do not exceed 3.4 bar (50 psig) air supply pressure for UL 79 listed models.
- Do not exceed 0.7 bar (10 psig) pressure to fluid inlet to minimize potential for premature wear and parts failure.

Product Maintenance

- Follow all maintenance instructions in the Engineering, Operation and Maintenance manual.
- Always wear hand and eye protection to prevent injury during installation and maintenance. Example: Removal of a Turbo-Flo® end cap using compressed air could cause the end cap to eject with considerable force.
- Before any maintenance or repair is attempted, the compressed air line to the product should be disconnected and all air pressure allowed to escape. Close system valves to isolate intake and discharge. Carefully drain pressure from intake and discharge piping prior to disconnection. Drain pumps by turning upside down and allowing any fluid to flow into a suitable container. Flush thoroughly prior to performing maintenance.

Regulatory Compliance

- Always ensure that product installation, operation, inspection and maintenance conforms with all applicable laws, regulations and codes.
- Not all products are compliant to all regulatory standards. Consult your local distributor for models that meet your regulatory requirements.

Fire And Explosion Prevention – Use Of Products In Explosion Zones

- There is a risk of fire and/or explosion if certain conditions exist. These conditions include, but are not limited to, the following:
- Pumping flammable fluids (in some cases an additional risk may be created by vapors or gases resulting when the process fluid escapes by leaking, component failure, or improper maintenance.)
- Product used in flammable atmospheres (flammable atmospheres can be caused by the presence of gases, dusts, or vapors)
- Placement of flammable materials near product
- Product powered by flammable gases (Example: Natural gas or air/flammable compressor oil mixture)
- Standard Wilden pump models should not be powered by flammable gases. Consult factory for specific models intended to be powered by flammable gases.
- Be aware of the hazards associated with the specific application and the application environment. Conform with all applicable laws, regulations and codes.
- Do not use the product if there is any doubt about the safety of the application.
- Mechanical operation and flowing fluids can generate static electricity. Groundable products are required for all potentially flammable or explosive applications to prevent static spark. The pump, piping, valves, containers and other equipment must be grounded. Periodic inspection of the ground connection should be performed to ensure the equipment is properly grounded.
- The surface temperature of the equipment must be kept below the ignition temperature of any potential explosive atmosphere. The surface temperature is affected by the temperature of the fluid being pumped and the kinetic energy added by the pump and application

(e.g., recirculation of process media). The end user must ensure process media and equipment maximum temperature is acceptable for the environment.

- Electrical products have special considerations when used in explosive environments. Ensure electrical products possesses the correct rating for the intended application.

ATEX Pump Considerations

- ATEX products have been assessed for use in potentially explosive atmospheres in accordance with the European Directive 94/9/EC (ATEX 100a). Users of ATEX products must be familiar with ATEX requirements and follow all safety guidelines.
- All ATEX product identification tags contain the ATEX rating for the specific model. Verify that the ATEX rating is appropriate for the application.
- It is the responsibility of the end user of ATEX products to ensure that the point of use location has been properly classified in accordance with Directive 1999/92/EC ANNEX I (ATEX 137), and that the equipment placed into service is compatible with that classification.
- For ATEX Equipment Group I, Category M2, the equipment must be de-energized in the presence of an explosive atmosphere. This is achieved by disconnecting the air supply.
- When replacing worn or damaged components for products used in ATEX environments, only use parts approved for use in ATEX environments.

U.L. Pump Considerations

- Do not exceed 3.4 bar (50 psig) air supply pressure or fluid discharge pressure for UL 79 listed models.
- All pipe connections must use U.L. classified gasoline-resistant pipe compound.

- All installations must conform to Flammable and Combustible Liquids Code NFPA 30 or Automotive and Marine Service Station Code NFPA 30A, and all other applicable codes.
- Pump exhaust to be connected to pipe or tubing to be routed outdoors or other location determined to be equivalent.
- Pump should be fitted with a pressure relief valve rated to a maximum of 3.4 bar (50 psig). This valve should be connected to the pump discharge line to vent pressure resulting from thermal expansion. The pressure relief valve should incorporate a return line back to the supply tank.
- Pump must be electrically grounded. The ground connection is marked with a tag having the grounding symbol.

CSA International Pump Considerations

- The pump must be electrically grounded using the grounding conductor provided. Improper grounding can cause improper and dangerous operation.
- The gas outlet of the pump must be vented to a safe location in accordance with local codes or, in the absence of local codes, an industry or nationally recognized code having jurisdiction over the specific installation.

Electrical Product Considerations

- Ensure electrical connections are installed according to Engineering, Operation, and Maintenance manual and local laws, regulations and codes.
- Always disconnect power supply before performing installation or maintenance procedures.
- Protect all electrical connections from exposure to the environment and fluids.

Submersible Applications

- Not all pumps can be used in submersible applications. Refer to the Engineering, Operation, and Maintenance manual.
- When using a submersible pump, both the liquid path and external components must be compatible with material in which the pump will be submersed.
- Submersed pumps must have a hose attached to air exhaust and the exhaust piped above liquid level.

Chemical And Temperature Compatibility

- Check the chemical compatibility of all wetted components, including elastomers, with all process and cleaning fluids to minimize the risk of dangerous chemical reactions. Example: Pumping halogenated hydrocarbon solvents with an aluminum pump creates the potential for an explosion caused by corrosion of the aluminum components.
- Chemical compatibility can change with process fluid concentration and temperature.
- Check the temperature limits for all components, including the elastomers. Example: Viton® has a maximum limit of 176.7°C (350°F) but polypropylene has a maximum limit of only 79°C (175°F), therefore a polypropylene pump fitted with Viton® elastomers is limited to 70°C (175°F).
- Maximum temperature and pressure limits are based upon mechanical stress only. Certain chemicals will significantly reduce the maximum safe operating temperature and/or pressure.
- Always refer to the Wilden Chemical Resistance Guide or contact your local distributor for information regarding specific products.

Temperature Limits

Pump Housing		
Acetal	–28.9°C to 82.2°C	–20°F to 180°F
Carbon-Filled Acetal	–28.9°C to 65.6°C	–20°F to 150°F
Nylon	–17.8°C to 93.3°C	0°F to 200°F
Polypropylene	0°C to 79°C	32°F to 175°F
PVDF	–12°C to 107°C	10°F to 225°F
Teflon® PFA (UPII)	–28.9°C to 148.9°C	–20°F to 300°F
Teflon® PFA (all other models)	–28.9°C to 107.2°C	–20°F to 225°F
Elastomer		
Buna-N	–12.2°C to 82.2°C	10°F to 180°F
Neoprene	–17.8°C to 93.3°C	0°F to 200°F
Nordel®	–51.1°C to 137.8°C	–60°F to 280°F
Polyurethane	-12.2°C to 65.6°C	10°F to 150°F
Saniflex™	–28.9°C to 104.4°C	–20°F to 220°F
Teflon® PTFE (UPII)	4.4°C to 148.9°C	40°F to 300°F
Teflon® PTFE (all other models)	4.4°C to 104.4°C	40°F to 220°F
Viton®	–40°C to 176.7°C	–40°F to 350°F
Wil-Flex™	–40°C to 107.2°C	–40°F to 225°F
Rhino™	-12.2°C to 65.6°C	10°F to 150°F
Unitec™ Temperature Limits		
Conductive Polyethylene	0.0°C to 70.0°C	32°F to 158°F
Teflon® PTFE - UU Series, UA.025, UA.038	0.0°C to 100.0°C	32°F to 212°F
UU High Temperature	0.0°C to 200.0°C	32°F to 392°F
All Others	0.0°C to 120.0°C	32°F to 248°F