

T4

Original™ Series **METAL** Pumps



Simplify your process

TURBO-FLO™
PROGRESSIVE PUMP TECHNOLOGY

WILDEN®
A **DOVER** COMPANY



WIL-10262-E-01

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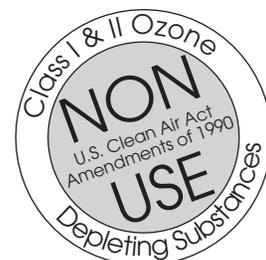
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CAUTIONS—READ FIRST!



TEMPERATURE LIMITS:

Polypropylene	0°C to 79°C	32°F to 175°F
PVDF	-12°C to 107°C	10°F to 225°F
Neoprene	-17.8°C to 93.3°C	0°F to 200°F
Buna-N	-12.2°C to 82.2°C	10°F to 180°F
EPDM	-51.1°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
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
PTFE	4.4°C to 104.4°C	40°F to 220°F



CAUTION: When choosing pump materials, be sure to check the temperature limits for all wetted components. Example: Viton® has a maximum limit of 176.7°C (350°F) but polypropylene has a maximum limit of only 79°C (175°F).



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



CAUTION: Always wear safety glasses when operating pump. If diaphragm rupture occurs, material being pumped may be forced out air exhaust.



WARNING: Prevention of static sparking — If static sparking occurs, fire or explosion could result. Pump, valves, and containers must be properly grounded when handling flammable fluids and whenever discharge of static electricity is a hazard.



CAUTION: Do not exceed 8.6 bar (125 psig) air supply pressure.



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 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.



CAUTION: Blow out air line for 10 to 20 seconds before attaching to pump to make sure all pipe line debris is clear. Use an in-line air filter. A 5µ (micron) air filter is recommended.



NOTE: When installing PTFE diaphragms, it is important to tighten outer pistons simultaneously (turning in opposite directions) to ensure tight fit.



NOTE: Tighten clamp bands and retainers prior to installation. Fittings may loosen during transportation.



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.



CAUTION: Verify the chemical compatibility of the process and cleaning fluid to the pump's component materials in the Chemical Resistance Guide (see E4).



CAUTION: When removing the end cap using compressed air, the air valve end cap may come out with considerable force. Hand protection such as a padded glove or rag should be used to capture the end cap.



CAUTION: Only explosion proof (NEMA 7) solenoid valves should be used in areas where explosion proof equipment is required.



NOTE: All non lube-free air-operated pumps must be lubricated. Wilden suggests an arctic 5 weight oil (ISO grade 15). Do not over-lubricate pump. Over-lubrication will reduce pump performance.



NOTE: On cast iron pumps equipped with PTFE diaphragms, balls and sealing rings, PTFE gasket kits should be utilized.



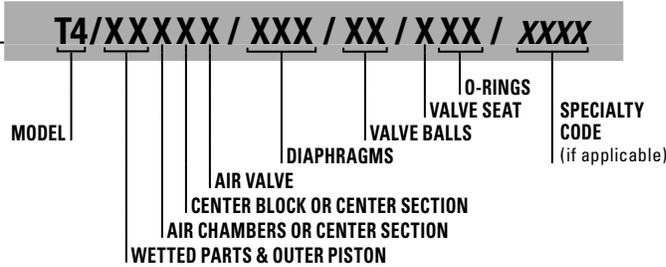
NOTE: UL-listed pumps must not exceed 3.4 bar (50 psig) air supply pressure.

WILDEN PUMP DESIGNATION SYSTEM

**T4 ORIGINAL™
METAL**

38 mm (1-1/2") Pump
Maximum Flow Rate:
307 lpm (81 gpm)

LEGEND



MATERIAL CODES

MODEL

T4 = 38 MM (1-1/2)

WETTED PARTS & OUTER PISTON

AA = ALUMINUM / ALUMINUM
WW = CAST IRON / CAST IRON
WM = CAST IRON / MILD STEEL

AIR CHAMBER / CENTER SECTION

A = ALUMINUM
M = MILD STEEL
P = POLYPROPYLENE

CENTER BLOCK / CENTER SECTION

A = ALUMINUM
P = POLYPROPYLENE

AIR VALVE

B = BRASS

DIAPHRAGMS

BNS = BUNA-N (Red Dot)
BNU = BUNA-N, ULTRA-FLEX™ (Red Dot)
EPS = EPDM (Blue Dot)
EPU = EPDM, ULTRA-FLEX™ (Blue Dot)
FSS = SANIFLEX™ [Hytrel® (Cream)]
NES = NEOPRENE (Green Dot)
NEU = NEOPRENE, ULTRA-FLEX™ (Green Dot)
PUS = POLYURETHANE (Clear)
TEU = PTFE W/EPDM BACK-UP (White)
TNU = PTFE W/NEOPRENE BACK-UP (White)
TSU = PTFE W/SANIFLEX™ BACK-UP (White)
VTS = VITON® (White Dot)
VTU = VITON®, ULTRA-FLEX™ (White Dot)
WFS = WIL-FLEX™ [Santoprene® (Orange Dot)]

VALVE BALL

BN = BUNA-N (Red Dot)
EP = EPDM (Blue Dot)
FS = SANIFLEX™ [Hytrel® (Cream)]
NE = NEOPRENE (Green Dot)
PU = POLYURETHANE (Brown)
TF = PTFE (White)
VT = VITON® (White Dot)
WF = WIL-FLEX™ [Santoprene® (Orange Dot)]

VALVE SEAT

A = ALUMINUM*
BN = BUNA-N (Red Dot)
EP = EPDM (Blue Dot)
FS = SANIFLEX™ [Hytrel® (Cream)]
H = ALLOY C*
M = MILD STEEL*
NE = NEOPRENE (Green Dot)
PU = POLYURETHANE (Brown)
S = STAINLESS STEEL*
VT = VITON® (White Dot)
WF = WIL-FLEX™ [Santoprene® (Orange Dot)]

*No valve seat o-ring required.

VALVE SEAT O-RING

FS = FLUORO-SEAL™
TF = PTFE (White)

SPECIALTY CODES

- 0014 BSPT
- 0030 Screen based
- 0036 Screen based, BSPT
- 0044 Stallion®, balls & seats ONLY
- 0045 Stallion®, shaft & bumpers ONLY
- 0046 Stallion®, internals, BSPT
- 0048 Stallion®, internals
- 0050 Stallion
- 0051 Stallion®, BSPT
- 0113 Stallion®, internals, spark free, BSPT
- 0231 Stallion®, externals (screen)
- 0233 Stallion®, externals (screen), BSPT

NOTE: MOST ELASTOMERIC MATERIALS USE COLORED DOTS FOR IDENTIFICATION.

Viton® is a registered trademarks of DuPont Dow Elastomers.

HOW IT WORKS—PUMP

The Wilden diaphragm pump is an air-operated, positive displacement, self-priming pump. These drawings show the flow pattern through the pump upon its initial stroke. It is assumed the pump has no fluid in it prior to its initial stroke.

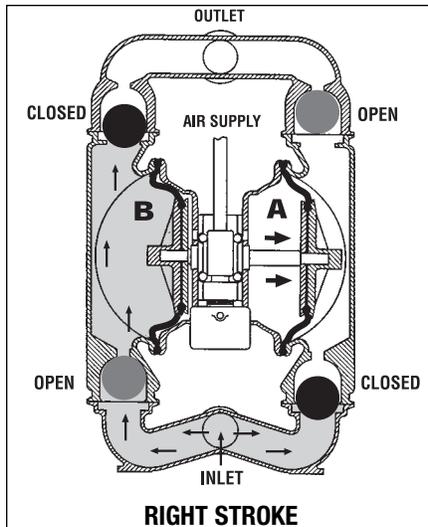


FIGURE 1 The air valve directs pressurized air to the back side of diaphragm A. The compressed air is applied directly to the liquid column separated by elastomeric diaphragms. The diaphragm acts as a separation membrane between the compressed air and liquid, balancing the load and removing mechanical stress from the diaphragm. The compressed air moves the diaphragm away from the center block of the pump. The opposite diaphragm is pulled in by the shaft connected to the pressurized diaphragm. Diaphragm B is on its suction stroke; air behind the diaphragm has been forced out to the atmosphere through the exhaust port of the pump. The movement of diaphragm B toward the center block of the pump creates a vacuum within chamber B. Atmospheric pressure forces fluid into the inlet manifold forcing the inlet valve ball off its seat. Liquid is free to move past the inlet valve ball and fill the liquid chamber (see shaded area).

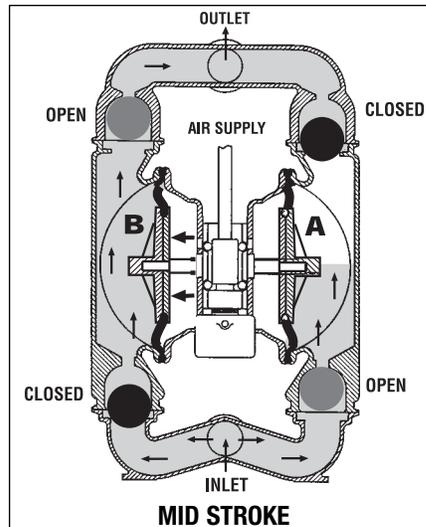


FIGURE 2 When the pressurized diaphragm, diaphragm A, reaches the limit of its discharge stroke, the air valve redirects pressurized air to the back side of diaphragm B. The pressurized air forces diaphragm B away from the center block while pulling diaphragm A to the center block. Diaphragm B is now on its discharge stroke. Diaphragm B forces the inlet valve ball 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 pump discharge. The movement of diaphragm A toward 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 is forced off its seat allowing the fluid being pumped to fill the liquid chamber.

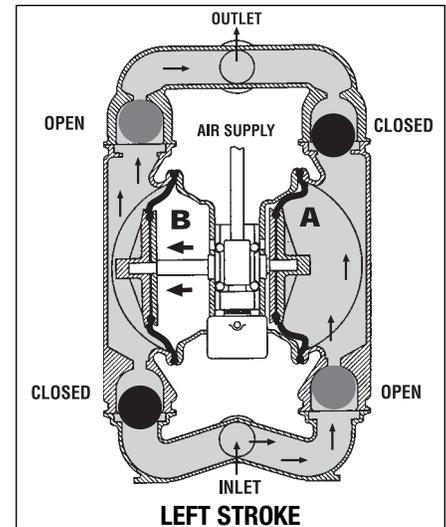
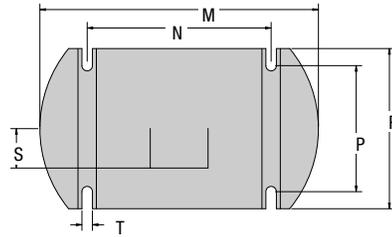
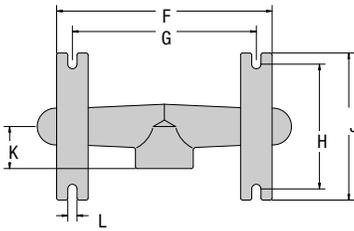
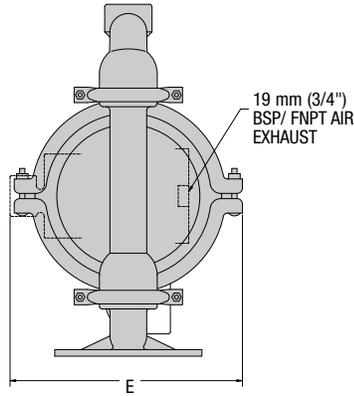
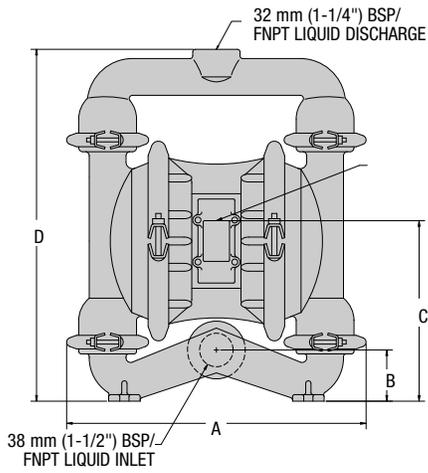


FIGURE 3 At completion of the stroke, the air valve again redirects air to the back side of diaphragm A, which starts diaphragm B on its exhaust stroke. As the pump reaches its original starting point, each diaphragm has gone through one exhaust and one discharge stroke. This constitutes one complete pumping cycle. The pump may take several cycles to completely prime depending on the conditions of the application.

DIMENSIONAL DRAWINGS

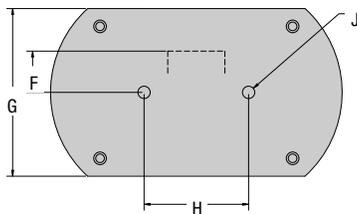
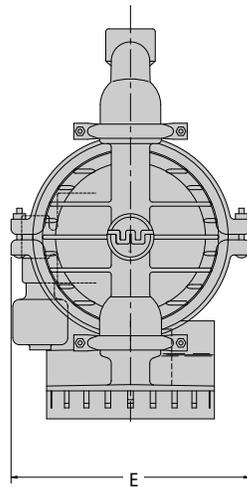
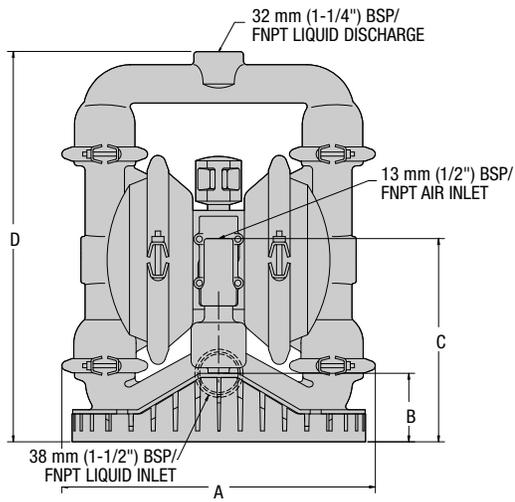


DIMENSIONS

ITEM	METRIC (mm)	STANDARD (inch)
A	391	15.4
B	63	2.5
C	219	8.6
D	442	17.4
E	285	11.2
F	262	10.3
G	224	8.8
H	152	6.0
J	178	7.0
K	67	2.6
L	11	0.4

BSP threads available.

T4 Metal Stallion



DIMENSIONS

ITEM	METRIC (mm)	STANDARD (inch)
A	391	15.4
B	77	3.0
C	232	9.1
D	449	17.7
E	285	11.2
F	48	1.9
G	197	7.8
H	121	4.8
J	Ø14	Ø 0.6

BSP threads available.

**T4 METAL
RUBBER-FITTED**

Height.....442 mm (17.4")
 Width.....391 mm (15.4")
 Depth285 mm (11.2")
 Est. Ship Weight.....Aluminum 17 kg (38 lbs)
 Stainless Steel 26 kg (57 lbs)
 Cast Iron 26 kg (57 lbs)
 Air Inlet.....13 mm (1/2")
 Inlet.....38 mm (1-1/2")
 Outlet32 mm (1-1/4")
 Suction Lift5.49 m (18')
 8.53 m (28')
 Displacement per Stroke . 1.02 l (0.27 gal.)¹
 Max. Flow Rate.....288 lpm (76 gpm)
 Max. Size Solids4.8 mm (3/16")

¹Displacement per stroke was calculated at 4.8 bar (70 psig) air inlet pressure against a 2 bar (30 psig) head pressure.

Example: To pump 113.6 lpm (30 gpm) against a discharge pressure head of 2.7 bar (40 psig) requires 4.1 bar (60 psig) and 25.5 Nm³/h (15 scfm) air consumption. (See dot on chart.)

Caution: Do not exceed 8.6 bar (125 psig) air supply pressure.

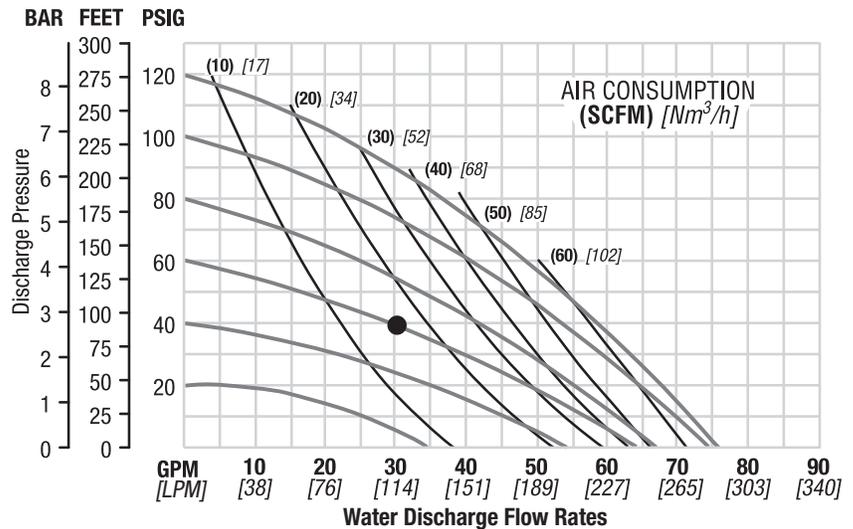
**T4 METAL
TPE-FITTED**

Height.....442 mm (17.4")
 Width.....391 mm (15.4")
 Depth285 mm (11.2")
 Est. Ship Weight.....Aluminum 17 kg (38 lbs)
 Stainless Steel 26 kg (57 lbs)
 Cast Iron 26 kg (57 lbs)
 Air Inlet.....13 mm (1/2")
 Inlet.....38 mm (1-1/2")
 Outlet32 mm (1-1/4")
 Suction Lift4.27 m Dry (14')
 8.23 m Wet (27')
 Displacement per Stroke . 1.17 l (0.31 gal.)¹
 Max. Flow Rate.....307 lpm (81 gpm)
 Max. Size Solids4.8 mm (3/16")

¹Displacement per stroke was calculated at 70 psig (4.8 bar) air inlet pressure against a 2 bar (30 psig) head pressure.

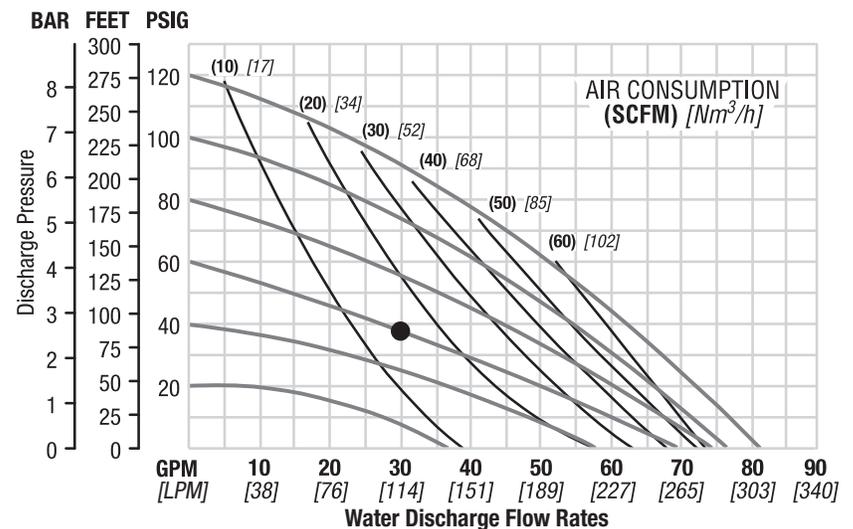
Example: To pump 113.6 lpm (30 gpm) against a discharge pressure head of 2.7 bar (40 psig) requires 4.1 bar (60 psig) and 25.5 Nm³/h (15 scfm) air consumption. (See dot on chart.)

Caution: Do not exceed 8.6 bar (125 psig) air supply pressure.



Flow rates indicated on chart were determined by pumping water.

For optimum life and performance, pumps should be specified so that daily operation parameters will fall in the center of the pump performance curve.



Flow rates indicated on chart were determined by pumping water.

For optimum life and performance, pumps should be specified so that daily operation parameters will fall in the center of the pump performance curve.

**T4 METAL
PTFE-FITTED**

Height..... 442 mm (17.4")
 Width..... 391 mm (15.4")
 Depth 285 mm (11.2")
 Est. Ship Weight.....Aluminum 17 kg (38 lbs)
 Stainless Steel 26 kg (57 lbs)
 Cast Iron 26 kg (57 lbs)
 Air Inlet..... 13 mm (1/2")
 Inlet..... 38 mm (1-1/2")
 Outlet 32 mm (1-1/4")
 Suction Lift 2.74 m Dry (9')
 8.53 m Wet (28')
 Displacement per Stroke ... 0.53 l (0.14 gal.)¹
 Max. Flow Rate..... 235 lpm (62 gpm)
 Max. Size Solids 4.8 mm (3/16")

¹Displacement per stroke was calculated at 4.8 bar (70 psig) air inlet pressure against a 2 bar (30 psig) head pressure.

Example: To pump 94.6 lpm (25 gpm) against a discharge pressure head of 2.7 bar (40 psig) requires 4.1 bar (60 psig) and 51 Nm³/h (30 scfm) air consumption. (See dot on chart.)

Caution: Do not exceed 8.6 bar (125 psig) air supply pressure.

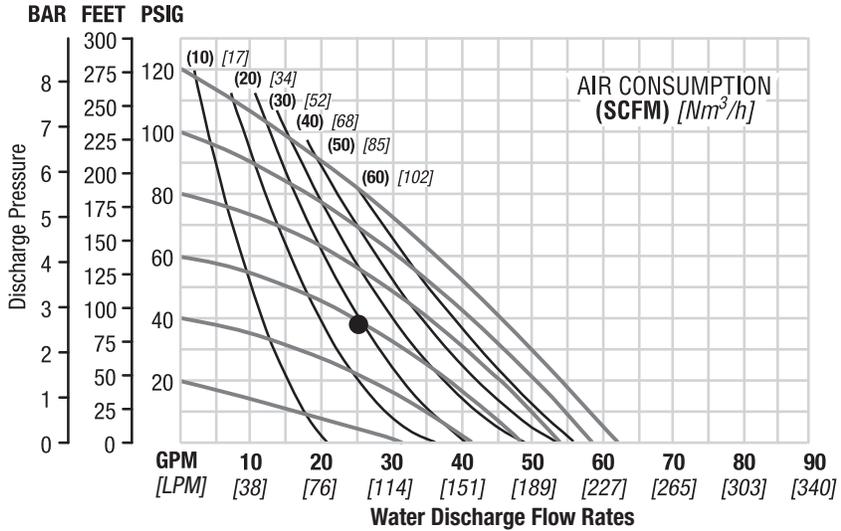
**T4 METAL STALLION
ULTRA-FLEX™-FITTED**

Height..... 449 mm (17.7")
 Width..... 391 mm (15.4")
 Depth 285 mm (11.2")
 Est. Ship Weight.....Aluminum 20 kg (44 lbs)
 Air Inlet..... 13 mm (1/2")
 Inlet..... 38 mm (1-1/2")
 Outlet 32 mm (1-1/4")
 Suction Lift 4.27 m Dry (14')
 8.23 m Wet (27')
 Displacement per Stroke ... 0.64 l (0.17 gal.)¹
 Max. Flow Rate..... 216 lpm (57 gpm)
 Max. Size Solids 13 mm (1/2")

¹Displacement per stroke was calculated at 4.8 bar (70 psig) air inlet pressure against a 2 bar (30 psig) head pressure.

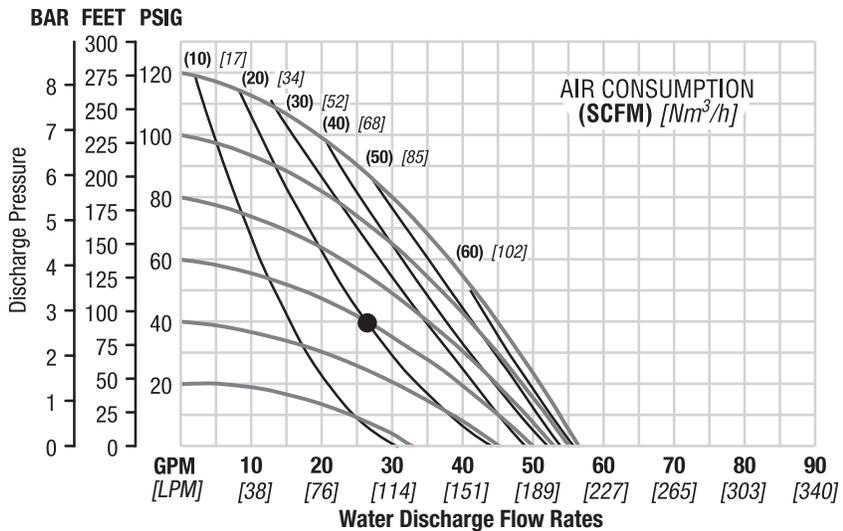
Example: To pump 98.4 lpm (26 gpm) against a discharge pressure head of 2.7 bar (40 psig) requires 4.1 bar (60 psig) and 35.7 Nm³/h (21 scfm) air consumption. (See dot on chart.)

Caution: Do not exceed 8.6 bar (125 psig) air supply pressure.



Flow rates indicated on chart were determined by pumping water.

For optimum life and performance, pumps should be specified so that daily operation parameters will fall in the center of the pump performance curve.



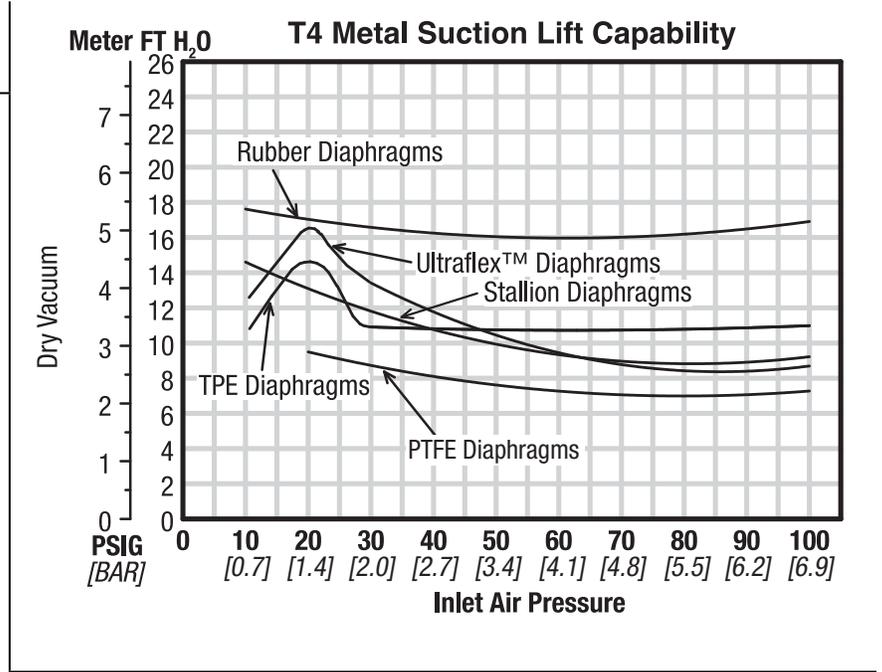
Flow rates indicated on chart were determined by pumping water.

For optimum life and performance, pumps should be specified so that daily operation parameters will fall in the center of the pump performance curve.

SUCTION LIFT CURVE

**T4 METAL
SUCTION LIFT CAPABILITY**

Suction lift curves are calibrated for pumps operating at 1,000' (305 m) above sea level. This chart is meant to be a guide only. There are many variables which can affect your pump's operating characteristics. The number of intake and discharge elbows, viscosity of pumping fluid, elevation (atmospheric pressure) and pipe friction loss all affect the amount of suction lift your pump will attain.



NOTES

SUGGESTED INSTALLATION

The Model T4 Metal pump has a 38 mm (1-1/2") inlet and 32 mm (1-1/4") outlet and is designed for flows to 307 lpm (81 gpm). The T4 Metal pump is manufactured with wetted parts of aluminum, cast iron, or stainless steel. The T4 Metal pump comes with either a center block or center section. The T4 center block is constructed of aluminum or nickel-plated aluminum. The T4 center section comes in polypropylene. The air distribution system consists of a brass air valve body, aluminum piston, Glyd™ rings and a bronze center section bushing. A variety of diaphragms, valve balls, valve seats, and o-rings are available to satisfy temperature, chemical compatibility, abrasion and flex concerns.

The suction pipe size should be at least 38 mm (1-1/2") diameter or larger if highly viscous material is being pumped. The suction hose must be non-collapsible, reinforced type as the T4 is capable of pulling a high vacuum. Discharge piping should be at least 32 mm (1-1/4"); larger diameter 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.

INSTALLATION: Months of careful planning, study, and selection efforts can result in unsatisfactory pump performance if installation details are left to chance.

Premature failure and long term dissatisfaction can be avoided if reasonable care is exercised throughout the installation process.

LOCATION: Noise, safety, and other logistical factors usually dictate that "utility" equipment be situated away from the production floor. Multiple installations with conflicting requirements can result in congestion of utility areas, leaving few choices for siting of additional pumps.

Within the framework of these and other existing conditions, every pump should be located in such a way that four key factors are balanced against each other to maximum advantage.

1. **ACCESS:** First of all, the location should be accessible. If it's easy to reach the pump, maintenance personnel will have an easier time carrying out routine inspections and adjustments. Should major repairs become necessary, ease of access can play a key role in speeding the repair process and reducing total downtime.

2. **AIR SUPPLY:** Every pump location should have an air line large enough to supply the volume of air necessary to achieve the desired pumping rate (see pump performance chart). Use air pressure up to a maximum of 8.6 bar (125 psig) depending upon pumping requirements. The use of an air filter before the pump will ensure that the majority of any pipeline contaminants will be eliminated. For best results, the pumps should use an air filter, regulator, and lubricator system.

3. **SOLENOID OPERATION:** the pumps should use a 5µ micron air filter, needle valve and regulator. The use of an air filter before the pump will ensure that the majority of any pipeline contaminants will be eliminated.

4. **ELEVATION:** Selecting a site that is well within the pump's suction lift capability will assure that loss-of-prime troubles will be eliminated. In addition, pump efficiency can be adversely affected if proper attention is not given to elevation (see pump performance chart).

5. **PIPING:** Final determination of the pump site should not be made until the piping problems of each possible location have been evaluated. The impact of current and future installations should be considered ahead of time to make sure that inadvertent restrictions are not created for any remaining sites.

The best choice possible will be a site involving the shortest and the straightest hook-up of suction and discharge piping. Unnecessary elbows, bends, and fittings should be avoided. Pipe sizes should be selected so as to keep friction losses within practical limits. All piping should be supported independently of the pump. In addition, it should line up without placing stress on the pump fittings.

Expansion joints can be installed to aid in absorbing the forces created by the natural reciprocating action of the pump. If the pump is to be bolted down to a solid foundation, a mounting pad placed between the pump and foundation will assist in minimizing pump vibration. Flexible connections between the pump and rigid piping will also assist in minimizing pump vibration. If quick-closing valves are installed at any point in the discharge system, or if pulsation within a system becomes a problem, a surge suppressor should be installed to protect the pump, piping and gauges from surges and water hammer.

When pumps are installed in applications involving flooded suction or suction head pressures, a gate valve should be installed in the suction line to permit closing of the line for pump service.

The T4 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.

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. Please refer to pump performance data.

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 is 0.8 bar (11 psig) and higher.

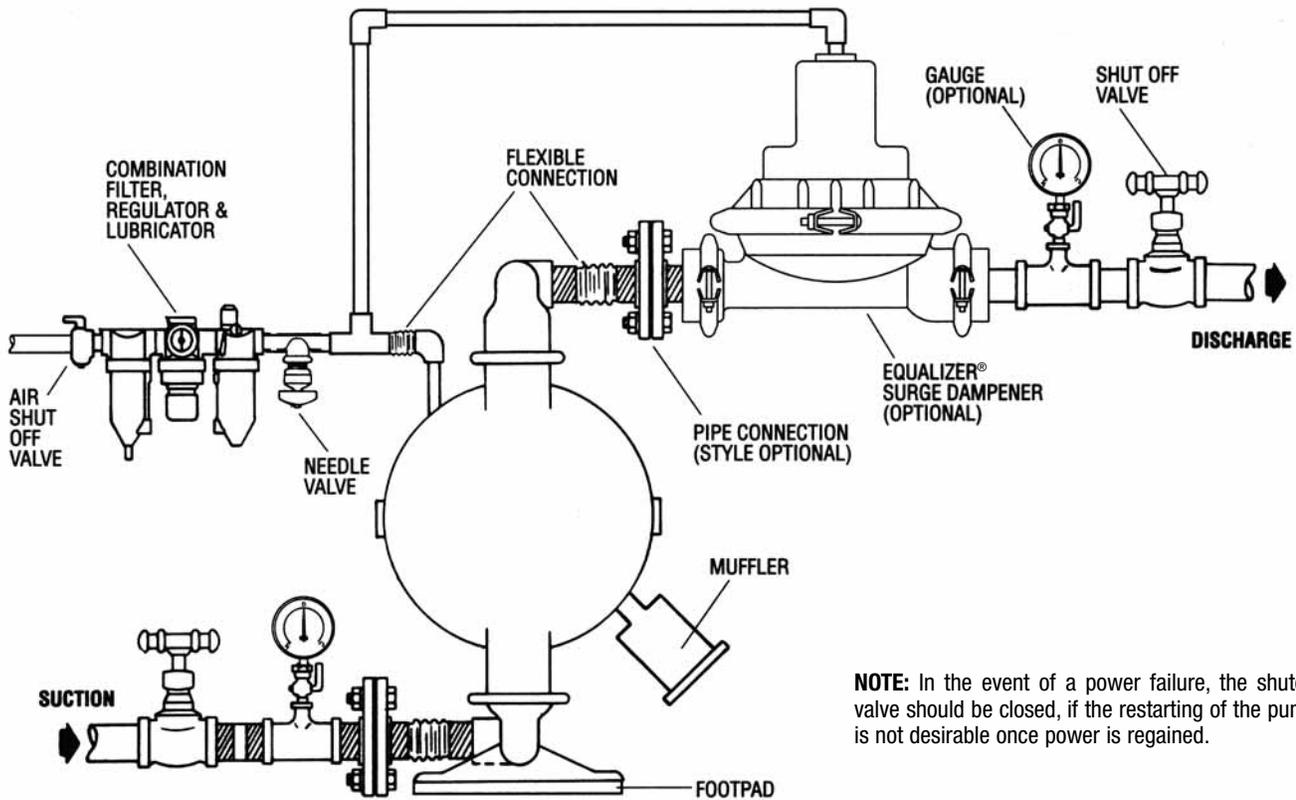
THE MODEL T4 WILL PASS 4.8 mm (3/16") SOLIDS. THE M4 STALLION WILL PASS 13 mm (1/2") SOLIDS. WHENEVER THE POSSIBILITY EXISTS THAT LARGER SOLID OBJECTS MAY BE SUCKED INTO THE PUMP, A STRAINER SHOULD BE USED ON THE SUCTION LINE.

CAUTION: DO NOT EXCEED 8.6 BAR (125 PSIG) AIR SUPPLY PRESSURE. (3.4 BAR [50 PSIG] FOR UL MODELS.)

PUMPS SHOULD BE THOROUGHLY FLUSHED WITH WATER BEFORE INSTALLING INTO PROCESS LINES. FDA AND USDA PUMPS SHOULD BE CLEANED AND/OR SANITIZED BEFORE USE ON EDIBLE PRODUCTS.

BLOW OUT AIR LINE FOR 10 TO 20 SECONDS BEFORE ATTACHING TO PUMP TO MAKE SURE ALL PIPE LINE DEBRIS IS CLEAR. ALWAYS USE AN IN-LINE AIR FILTER.

SUGGESTED INSTALLATION



NOTE: In the event of a power failure, the shutoff valve should be closed, if the restarting of the pump is not desirable once power is regained.

AIR-OPERATED PUMPS: To stop the pump from operating in an emergency situation, simply close the shut-off valve (user supplied) installed in the air supply line. A properly functioning valve will stop the air supply to the pump, therefore stopping output. This shut-off valve should be located far enough away from the pumping equipment such that it can be reached safely in an emergency situation.

SUGGESTED OPERATION & MAINTENANCE

OPERATION: Pump discharge rate can be controlled by limiting the volume and/or pressure of the air supply to the pump (preferred method). An air regulator is used to regulate air pressure. A needle valve is used to regulate volume. Pump discharge rate can also be controlled by throttling the pump discharge by partially closing a valve in the discharge line of the pump. This action increases friction loss which reduces flow rate. This is useful when the need exists to control the pump from a remote location. When the pump discharge pressure equals or exceeds the air supply pressure, the pump will stop; no bypass or pressure relief valve is needed, and pump damage will not occur. The pump has reached a “deadhead” situation and can be restarted by reducing the fluid discharge pressure or increasing the air inlet pressure. The Wilden T4 pump runs solely on compressed air and does not generate heat, therefore your process fluid temperature will not be affected.

RECORDS: When service is required, a record should be made of all necessary repairs and replacements. Over a period of time, such records can become a valuable tool for predicting and preventing future maintenance problems and unscheduled downtime. In addition, accurate records make it possible to identify pumps that are poorly suited to their applications.

MAINTENANCE AND INSPECTIONS: Since each application is unique, maintenance schedules may be different for every pump. Frequency of use, line pressure, viscosity and abrasiveness of process fluid all affect the parts life of a Wilden pump. Periodic inspections have been found to offer the best means for preventing unscheduled pump downtime. Personnel familiar with the pump’s construction and service should be informed of any abnormalities that are detected during operation.