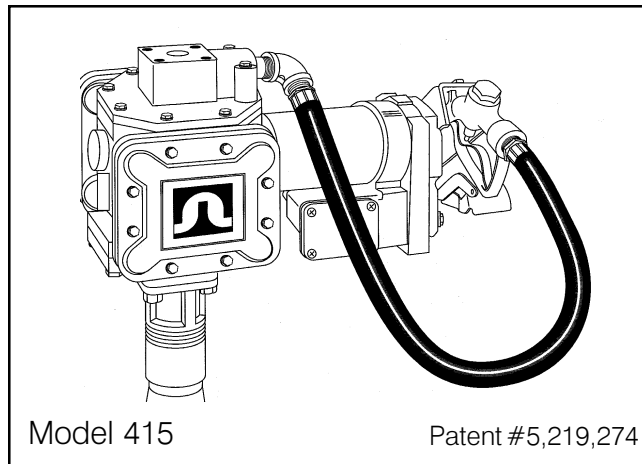




# SERIES 400 DIAPHRAGM PUMP

## FOR AG CHEMICAL FLUID TRANSFER

For Models: 415, 420, 421, 435, 440, 441 (DC)  
460, 460E, 461, 465, 475 (AC)



## OUTSTANDING FEATURES

- Up to 13 GPM / 49 LPM
- Double diaphragm for smooth flow
- Spring driven diaphragm for continuously variable displacement
- Pumps 1 to 3000 CPS fluids without motor overloading



**TUTHILL CORPORATION**

**Sotera Systems**

8825 Aviation Drive  
Fort Wayne, Indiana USA 46809  
Tel 219 747-9060 Fax 219 747-3934

Dear Sotera Customer,

Thank you for buying a Sotera product. Sotera Systems represents a new age in chemical handling products. This service guide contains valuable information about your new equipment and its operating and service requirements. Please take a few minutes to review this material carefully.

Sotera Systems' mission is to provide chemical handling products for ag-chem users that provide the most accurate, safe, convenient and economical way to transfer chemicals.

If, for any reason, any of the products do not meet your performance expectations we want to hear from you. Your comments and suggestions are requested and appreciated. Thank you again for buying a Sotera Systems product. We look forward to serving you in the future.

Sincerely,

Ron C. Bulloch

Vice President & General Manager

## GENERAL DESCRIPTION

The Sotera Series 400 is a double action diaphragm pump, using a patented, spring-driven, positive displacement mechanism. The flow rate with low viscosity material is up to 13 GPM. The ultimate in chemical handling capability is provided with stainless steel, polypropylene and fluorocarbon wetted parts.

## SAFETY

Sotera's 400 Series DC motors' safety is proven by their listing with:



Underwriters Laboratories Inc., a nationally recognized independent organization for product testing to ensure public safety. Also recognized in Canada.

NOTE: 230 VAC models are not UL listed.



Complies with applicable European standards.

## OPTIONS

- 1" polypropylene ball valve/nozzle
- EPDM or Nyal hose
- Telescoping polypropylene suction tube
- 807 mechanical or 825 electronic digital meter
- 2" NPT or 2" buttress inlet bung adapter
- 1" FNPT straight and 90° inlet/outlet fittings available
- Wraparound tubular mounting frame
- Wall/tank mounting bracket
- Tank adapters available for easy installation on most mini-bulk tanks (see price list)
- 12 VDC, 24 VDC, 115 VAC/60 Hz, 230 VAC/50 Hz available

## TECHNICAL INFORMATION

### Design Features

- 1" FNPT straight inlet and 90° outlet standard
- 15 PSIG maximum outlet pressure
- Explosion proof 2600 RPM, 1/4 HP motor:
  - 12 VDC, 20 amps maximum draw (5 amps in full bypass)
  - 24 VDC, 10 amps maximum draw
  - 115 VAC/60 Hz rated at 1.5 amps
  - 230 VAC/50 Hz rated at 1.1 amps
- Thermal overload protection of the motor
- Quality ball bearing and needle bearing construction
- Positive displacement/self-priming design
- Can pass particulate materials up to 0.100" diameter in the pumped fluids
- Flow easily controlled by outlet throttling from maximum to zero
- Pump may run dry without damage
- Handles viscosities from 1.0 CPS to 3000 CPS (SAE 140 gear oil at 68°F (50°C))
- Minimum shear (agitation) of pumped fluids
- Does not include inlet strainer



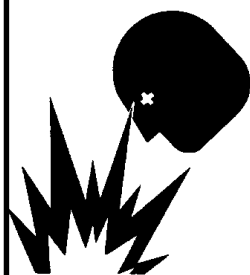
## DANGER



Electrical wiring should be done by a licensed electrician in accordance with approved electrical codes. Pump should be properly grounded and a rigid conduit should be used when installing electrical wiring. Improper use or installation of this product can cause serious bodily injury or death.



## DANGER



Not for use with fluids that have a flash point below 100°F (37.8°C, ie: gasoline, alcohol). Refer to NFPA 325M (Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids) for flash points of common liquids. Static electricity buildup and discharge could result in arc and explosion.



## SAFETY INSTRUCTIONS

1. Use Teflon tape to seal all joints and avoid leakage of fluids being pumped. Leaking of caustic and/or hazardous fluids could result in severe injuries.
2. **Never disassemble YOKE ASSEMBLY (see item 12). This is under extreme pressure and injury could result.**
3. Tank or barrel should be anchored to prevent tipping in both the full and empty conditions.
4. The pump motor is equipped with thermal overload protection. If overheated, it will shut itself off without any damage to the windings. Be sure to turn off the pump power if this occurs. As the motor cools, it will start without warning if power is on.

- Minimum operating ambient temperature: -10°F (-23°C)
- Maximum operating ambient temperature: 130°F (54°C)
- Overall dimensions: 14" (35.6 cm) long x 8.25" (21 cm) high x 8.75" (22.2 cm) deep

Fluorocarbon	Polypropylene
Santoprene™	300 Series Stainless Steel
Buna-N	

## Performance

- 30 minute duty cycle, not for continuous operation
- 9 inches of mercury dry vacuum
- Minimum suction lift: 10' for water & 11' for diesel fuel. The lift in feet is equivalent to the vertical distance from the surface of the fluid in the tank to the inlet of the pump, PLUS the friction losses through the vertical and horizontal runs of pipe, all elbows and other fittings. Systems should be designed to require a minimum amount of suction lift.

## Fluid Compatibility

The 400 Series pump is compatible with the following fluids (all 1997 formulations used in North America):

Aatrex 4L®	Kerosene
Ammonium Sulfate	Laddock S-12®
Antifreeze	Lasso Micro Tech®
Apron®	Marksman®
Assure II®	Maxim®
Atrazine 4L®	Methyl Parathion
Banvel®	Motor Oil
Bicep®	Nufos®
Blazer®	Phosphoric Acid
Broadstrike® + Dual®	Poast®
Broadstrike® + Treflan®	Potash
Caustic Soda (50%)	Princep 4L®
Clarity®	Prowl®
Conclude®	Pursuit®
Dividend®	Reflex®
Doubleplay®	Rezult®
Dual®	Roundup®
Eptam 7E®	Sodium Hydroxide (50%)
Fallowmaster®	Squadron®
Flexstar®	Surpass 100®
Frontier®	Topnotch®
Fultime®	Touchdown®
Furadan®	Transmission Fluid
Fusion®	Zinc + Citric Acid Mix
Galaxy®	Zinc Chloride
Gramoxone Extra®	Zinc Hydrosulfite
Guardsman®	Zinc Sulfate
Harness Xtra®	
Hydraulic Oil	
Karate®	

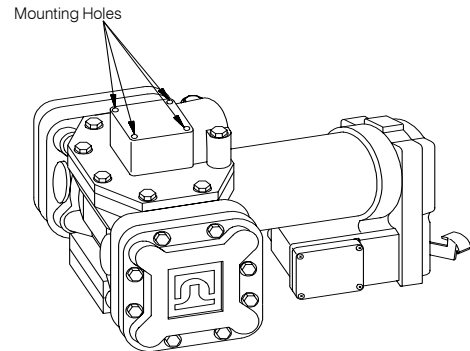
The 400 Series pump is NOT compatible with the following fluids:

Very strong acids, any fluid with a flash point below 100°F

If in doubt about compatibility of a specific fluid, contact the supplier of the fluid to check for any adverse reactions to the following wetted materials.

## INSTALLATION

The basic pump is furnished with 1" NPT threaded openings in the inlet and outlet flanges. Flanges are available as a straight outlet or a 90° angle design, which can be rotated four ways to accommodate different installation needs. Both inlet and outlet flanges include four 1/4-20 threaded holes, spaced apart 1 7/8" between centers, for secure mounting.



Adapters are available to fit the pump to a 2" bung and a selection of standard bung fittings common in the petroleum, chemical and agricultural markets. See price sheet for available fittings.



## Electrical Installation

**DC ONLY:** Connect cable to pump as follows, paying special attention to wire colors:

Pump	Cable
Positive	Red
Negative	Black
Ground	Green

If pump is to be powered from a vehicle power system it is recommended that permanent wiring and connections be made to vehicle power system which includes a 30 amp slow blow fuse.

	<b>DANGER</b>
	<p>Not for use with fluids that have a flash point below 100°F (37.8°C, ie: gasoline, alcohol). Refer to NFPA 325M (Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids) for flash points of common liquids. Static electricity buildup and discharge could result in arc and explosion.</p>

 <b>DANGER</b>	
	Electrical wiring should be done by a licensed electrician in accordance with approved electrical codes. Pump should be properly grounded and a rigid conduit should be used when installing electrical wiring. Improper use or installation of this product can cause serious bodily injury or death.

### Circuit Breakers (AC only)

Power to the unit should be supplied from a dedicated 20 amp circuit breaker. No other equipment should be powered from this breaker. If two pumps are supplied from one breaker, that breaker must be capable of handling the load of both motors. Provision must be made to break both legs of any AC circuit.

### Hose Installation

To prevent thread stripping, remove top and/or bottom flange to install hose. Use Teflon tape to prevent leakage. Thread the flange onto the hose. Reattach the flange to the pump using 50 in.-lb. maximum torque.

## CALIBRATION

If a meter is used, calibrate according to the instructions in the meter's Owner's Operation & Safety Manual.

## ASSEMBLY/DISASSEMBLY

*NOTE:* Pump should be thoroughly flushed prior to disassembly.

### Motor/Gear Assembly Removal (Refer to exploded view of pump)

1. If possible, position pump with sight caps down.
2. Remove four screws (item 19) and lift out motor/gear assembly (items 1 and 24).
3. Drain oil from pump if additional maintenance to pump is required.

### Gear Assembly Replacement

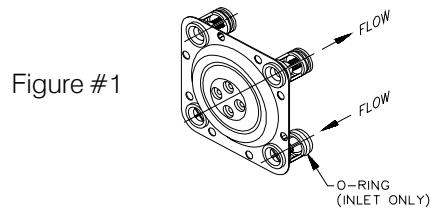
1. Remove six screws (item 25) and pull gear assembly from motor.
2. Pull drive gear (item 27) and key (item 28) from motor shaft.

**DO NOT DISASSEMBLE GEAR ASSEMBLY.** Planet gears and ring gear are marked for proper assembly and must not be altered.

### Diaphragm Assembly/ Check Valve Replacement

*NOTE:* Diaphragm and check valve assemblies can be serviced without removing motor and oil from pump body by removing one at a time with diaphragm facing up. Care must be taken not to contaminate oil.

1. Remove motor and drain oil, if complete disassembly is required.
2. Loosen cover (item 4) screws (item 19) slightly and drain fluid trapped in the chamber. Then remove screws and covers.
3. Remove retainer screws (item 11) and o-rings (item 42).
4. Remove diaphragm assemblies (items 7, 8, 9 and 10) by pulling check valves out of pump body, starting with outlet valves first (item 9 at top of pump).
5. Install new diaphragm/check valve assembly, noting ball location in relation to flow. O-rings are on inlet valves at bottom of pump. Lubricate O-rings before inserting into pump body. See Figure #1.



6. Insert four screws (item 11) and o-rings (item 42) into diaphragm as shown and tighten to 50 in. lbs. of torque.
7. Install pump covers (item 4). Tighten screws to 50 in. lbs.
8. Install motor (item 1) and gear assembly (item 24). Be sure gasket (item 26) is in place. Rotate motor until drive shaft slips in hole in gear assembly. Tighten screws (item 19) to 50 in. lbs. of torque.
9. Fill with approximately 16 ounces of automotive grade SAE 30W oil through one of the holes for sight caps (item 30).

#### To further disassemble pump, after step #4 above:

10. Remove four screws (item 19) and lockwashers (item 21) holding bearing plate (item 17).
11. Remove bearing plate (item 17) and thrust plate (item 16).
12. Remove drive shaft (item 13), bearing (item 14), bearing ring (15) and yoke assembly (item 12).

**Assemble in reverse order.** See step #5 through step #9 above for additional assembly instructions.

## MAINTENANCE

To keep pump running at its best, periodically perform the following procedures. *(Refer to exploded view drawing of pump)*

### Chemical Applications

Do not allow any chemical to remain in the pump for any extended period of time, whereby the chemicals are allowed to

“dry out.” Using the proper cleaning agent, thoroughly clean the diaphragm and check valve assemblies by flushing the pump with:

1. #2 diesel for petroleum based chemicals
2. Water for water based chemicals

### All Applications

1. On an annual basis, check the four #10-24 x 1/2" machine screws (item 11) holding the diaphragm in place. If loose, tighten screws to prevent internal leakage.

**NOTE: NEVER EXCEED 50 IN. LB. TORQUE WHEN REPLACING THE PUMP COVERS OR TIGHTENING THE DIAPHRAGM SCREWS.**

2. Check oil level periodically. The oil level should be level with the bottom edge of the sight caps (item 30) located on the front of the pump body.

**NOTE:** Always check oil level when the pump is *level*.

3. Replace oil with approximately 16 ounces of automotive grade SAE 30W through one of the site cap holes if there are any indications of contamination.

**NOTE:** Contamination may have occurred if the oil appears “milky” or the oil level is above the base of the sight caps.

4. Examine diaphragm/check valve assemblies for excessive wear (items 7, 8, 9, and 10).

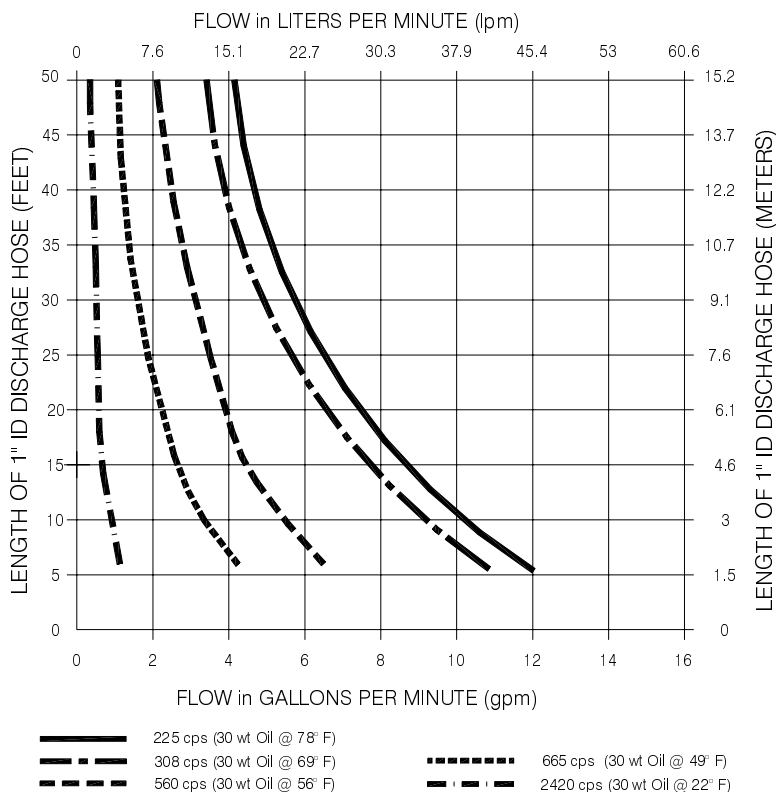
## REPAIR

Motors that need repair should be taken to an authorized repair shop or returned to the factory for service.

**Pumps being returned for service must be triple-rinsed and accompanied by an MSDS sheet indicating the chemicals/fluids which have been pumped. Pumps not adhering to these specifications may be refused service at either the repair shop or the factory.**

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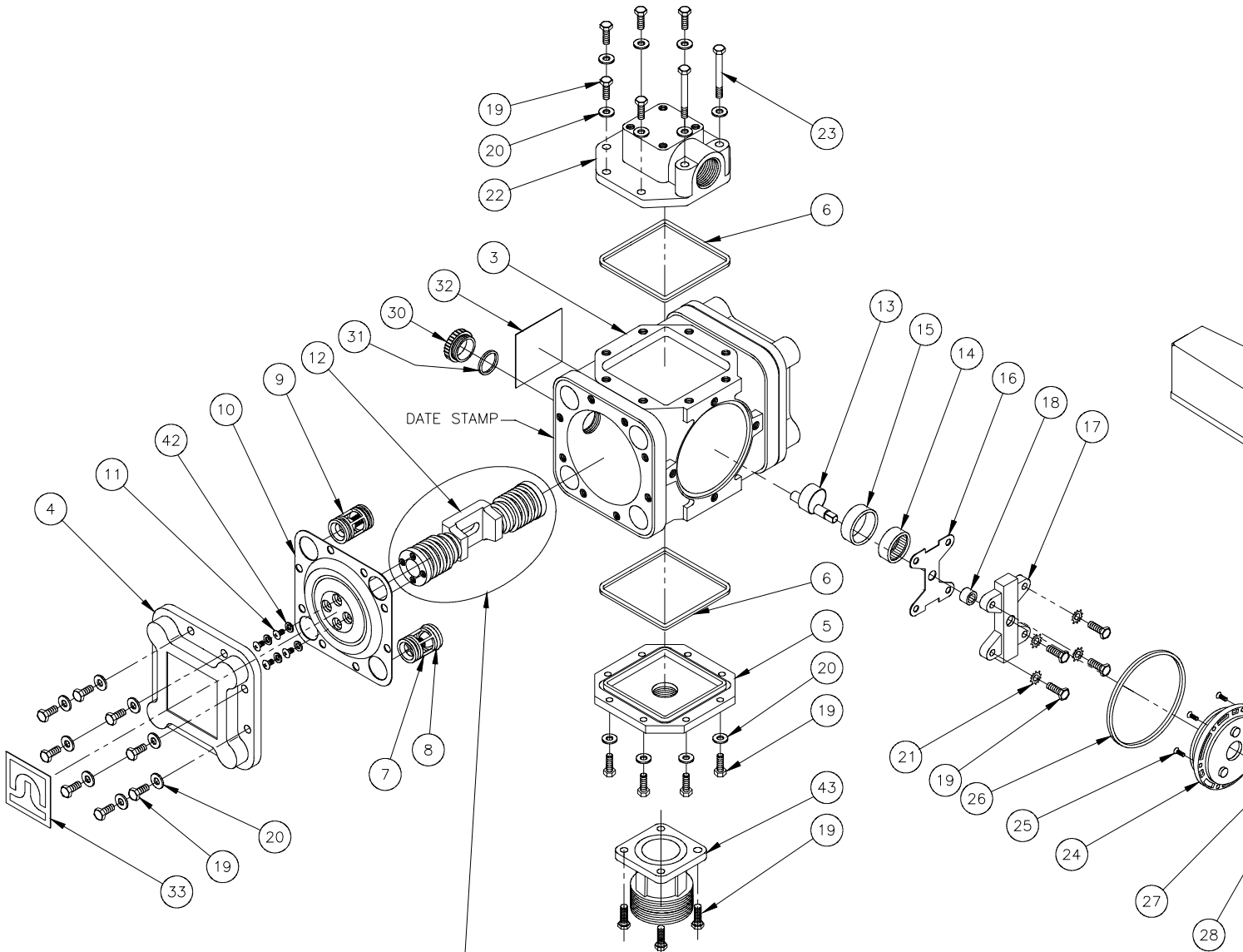
## SERIES 400 DIAPHRAGM PUMP TYPICAL FLOW RATE FOR VARIOUS VISCOSITIES



**NOTES:**

1. **SUCTION LOSSES.**  
Test pump was mounted on a 55 gallon drum of oil, 1/2 full. A SOTERA 1' suction pipe was used.  
A longer or smaller diameter inlet pipe will lower the flow rate.
2. **VERTICAL HEAD LOSSES.**  
Test hose was horizontal with pump. Add 3 feet of hose for each 1 foot of vertical rise.
3. **OTHER LOSSES.**  
Elbows, quick-disconnects, swivels, and check valves in outlet or inlet hoses will restrict the flow.  
Add the estimated length of hose for each component used.  
  - 1' SureStop + 0.5 feet
  - Other 1' disconnects + 13.0 feet
  - 1' Check Valves + 8.7 feet
  - 1' Elbow + 2.6 feet

**WHEN ORDERING REPAIR PARTS, BE SURE TO GIVE REPLACEMENT PART NUMBER, DATE OF MANUFACTURE AND PUMP SERIES NUMBER. THIS WILL ENSURE THAT THE CORRECT REPLACEMENT PART IS SUPPLIED.**



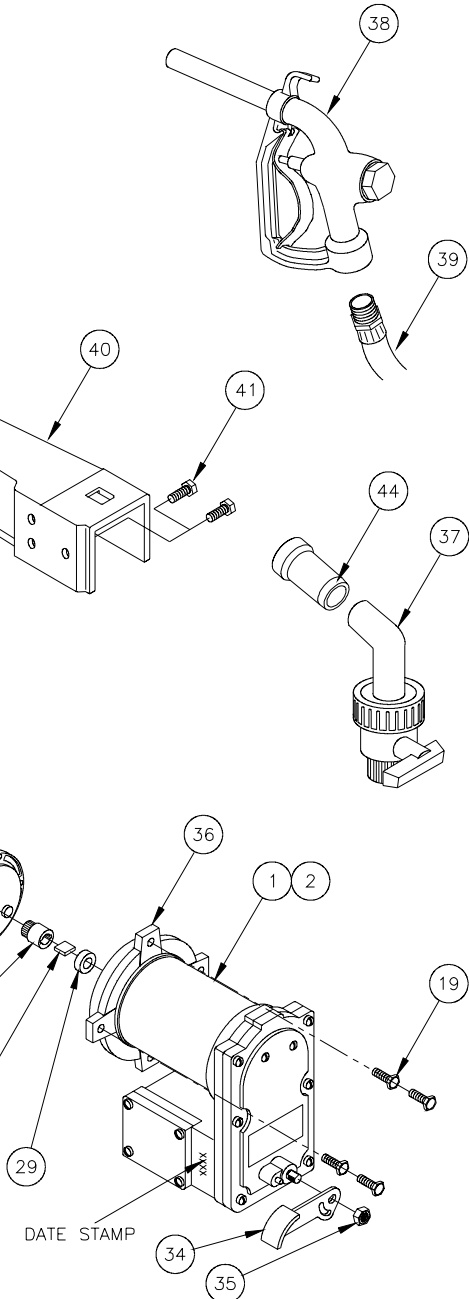
**CAUTION:**  
**NEVER** disassemble Yoke Assembly.  
This is under extreme spring tension  
and injury could result.

## SERIES 400 PUMP PARTS LIST

ITM. NO.	NEW PART NO. †	PART NO.	OLD PART NO. *	DESCRIPTION	QTY.
1	400F6846	F6846	F6846	Motor Assembly - 12 VDC	1
	200F6797	F6797	F6797	Motor Assembly - 24 VDC	Opt.
2	400F7351	400F7351	F7351	Motor Assembly - 115 VAC	1
	400G7186	400G7186	G7186	Motor Assembly - 230 VAC	Opt.
3	400F6567	F6567	F6567	Pump Body	1
4	400F6568	F6568	F6568	Pump Cover	2
5	400F6569	F6569	F6569	Flange	1
6	400F6924	F6924	F6924	L-C Gasket (-247)	2
7	400F6571	F6571	F6571	Check Valve - Inlet	4
8	35F6588	F6588	F6588	O-ring (-117) (Included w/Item 7)	4
9	400F6589	F6589	F6589	Check Valve - Outlet	4
10	400F6917	F6917	F6917	Diaphragm Assembly - Santoprene™ (Includes Items 7, 8, 9)	2
11	400F6795	F6795	F6795	#10-24 x 1/2 THMS	8
12	400F6781	F6781	F6781	Yoke Assembly	1
13	400F6800	F6800	F6800	Drive Shaft	1
14	400F6819	F6819	F6819	Camp Bearing (B-168)	1
15	400F6827	F6827	F6827	Bearing Ring	1
16	400F6880	F6880	F6880	Thrust Plate	1
17	400F6579	F6579	F6579	Bearing Plate	1
18	400F6693	F6693	F6693	Shaft Bearing (B-66)	1
19	400F6792	F6792	F6792	1/4-20 x 3/4 HHMS	38
20	400F6793	F6793	F6793	.281 X .625 x .065 Washer	32
21	702F3300	F3300	702-19	1/4 External Lockwasher	4
22	400F6679	F6679	F6679	90° Flange	1
23	400F6817	F6817	F6817	1/4-20 x 2-1/4 HHMS	2
24	400F6557	F6557	F6557	Gear Assembly (Included w/Item 1 or 2)	1
25	400F6794	F6794	F6794	#6-32 x 1/2 FHMS (Incl. w/Item 1 or 2)	6
26	400F6692	F6692	F6692	L-C Gasket (-241)	1
27	400F6563	F6563	F6563	Drive Gear (Included w/Item 1 or 2)	1
28	1200F6440	F6440	1200-9	Drive Key (Included w/Item 1 or 2)	1
29	400F6707	F6707	F6707	Shaft Seal (Included w/Item 1 or 2)	1
30	400F6818	F6818	F6818	Sight Cap, Polypropylene	2
31	400F6813	F6813	F6813	O-ring Gasket (-022)	2
32	400F8517	F8517	F8517	Nameplate	1
33	400F6758	F6758	F6758	Logo Plate	2
34	1200F6620	F6620	1200-45	Switch Lever	1
35	700F2950	F2950	700-27	5/16-18 Locknut	1
36	400F6566	F6566	F6566	Gear Housing (Included w/Item 1 or 2)	1
37	400KTF6593	F6593	F6593	Ball Valve Nozzle, 1"	Opt.
39	700F3123	F3123	700-64	1" x 12' EPDM Hose	Opt.
	410F3140	F3140	F3140	1" x 12' Nyal Hose	Opt.
40	700F6748	F6748	F6748	Nozzle Cover	Opt.
41	600F2220	F2220	600-109	5/16-18 x 3/4 HHCS	Opt.
	400F1855	F1855	F1855	Suction Pipe	Opt.
42	800F4191	F4191	800-97V	O-Ring, Viton (106)	8
43	400F6483	F6483	400F6483	Bung Adapter	Opt.
44	400F0237	F0237	F0237	Anti-Drip Spout	Opt.
	1200F7207	F7207	F7207	Cable 15 feet (DC Only) (Not Shown)	1
	400F7320	F7320	F7320	Power Cord (115 VAC Only) (Not Shown)	1
	400G7185	G7185	400G7185	Power Cord (230 VAC Only) (Not Shown)	1
	1200F7321	F7321	F7321	Cable Connector (Not Shown)	1

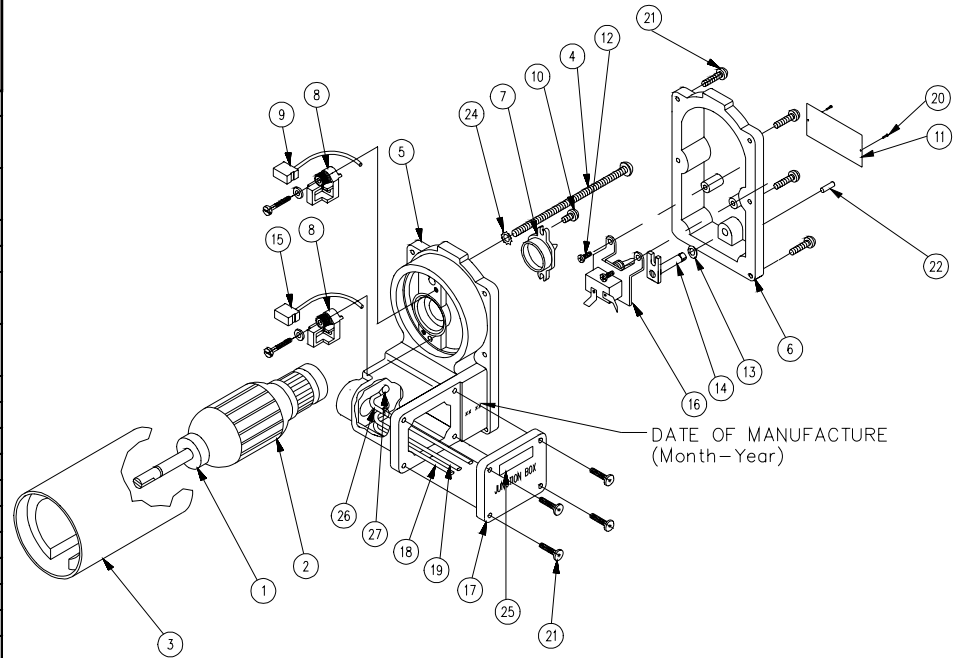
† Effective 2/1/99

\* Prior to 2/1/92

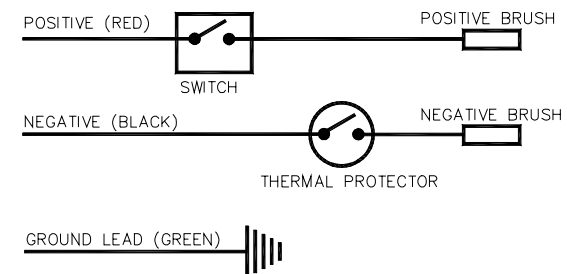


400KTF6863	Diaphragm Repair Kit (Includes Items 6, 10, 24-28, & 42)
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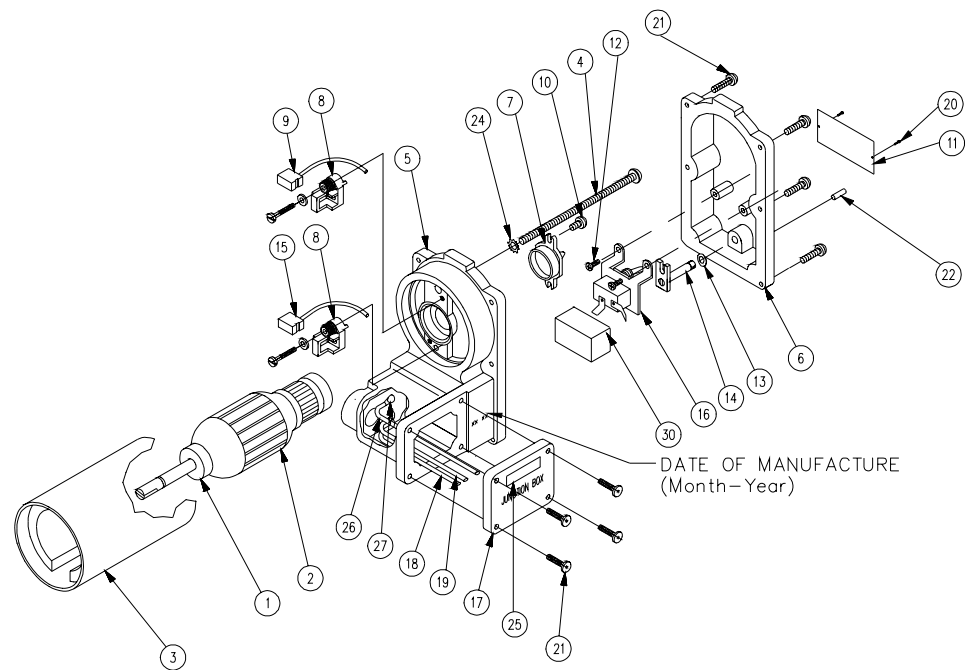
ITM. NO.	NEW PART NO. †	PART NO.	OLD PART NO. *	DESCRIPTION	QTY.
1	1200F6545	F6545	1200-30	Ball Bearing	2
2	400F6552	F6552	F6552	Armature Assembly, 12V (Includes Item 1)	1
	400F6662	F6662	F6662	Armature Assembly, 24V (Includes Item 1)	Opt.
3	1200F6526	F6526	1200-26A	Motor Frame and Magnet Assembly	1
4	1200F6475	F6475	1200-16	1/4-20 x 5 Thru-Bolt	2
5	1200F6444	F6444	1200F6444	Motor Casting (Includes Items 18, 19, 26, 27)	1
6	1200F6413	F6413	1200-4A-X422	Switch Plate with Bushing (Includes Items 22)	1
7	1200F6645	F6645	F6645	Thermal Protector, 12V	1
	2400F6646	F6646	2400F6646	Thermal Protector, 24V	Opt.
8	1200F7329	F7329	1200F7239	Brush Holder Assembly	2
9	1200F6541	F6541	1200-29-1	Brush Assembly, Negative	1
10	35F1396	F1396	35F1396	#8-32 x 1/2 PHTS (Type B)	1
11	-----	-----	-----	Motor Nameplate	1
12	1200F4018	F4018	1200F4018	#8-32 x 3/8 PHMS (Type TT)	2
13	700F3167	F3167	F3167	5/16 Spring Washer	1
14	700F3149	F3149	F3149	Switch Shaft Assembly	1
15	1200F6592	F6592	1200-29-3	Brush Assembly, Positive	1
16	1200F3170	F3170	1200F3170	Line Switch	1
17	1200F6495	F6495	1200-20	Junction Box Cover	1
18	1200F6668	F6668	1200F6668	Wire Lead - Negative/Black (Included with Item 5)	1
19	1200F6661	F6661	1200F6661	Wire Lead - Positive/Red (Included with Item 5)	1
20	700G1906	G1906	G1906	3/32 Blind Rivet	2
21	1200F4015	F4015	F4015	#10-32 x 3/4 PHMS (Type TT)	10
22	1200F6650	F6650	1200-61	5/32 x 1/2 Pin (Included with Item 6)	1
24	1200F8209	F8209	785F8209	1/4 External Lockwasher	2
49	700F3161	F3162	F3162	5/16 Retaining Ring	1
25	-----	-----	-----	Decal, 24V	Opt.
26	1200F6726	F6726	1200-91	Ground Wire, Green (Included with Item 5)	1
27	1200F7342	F7342	1500-33	#8-32 x 3/8 Ground Screw (Type F) (Included with Item 5)	1



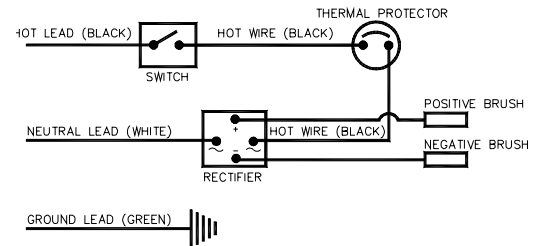
### 12VOLT/24VOLT ELECTRICAL SCHEMATIC



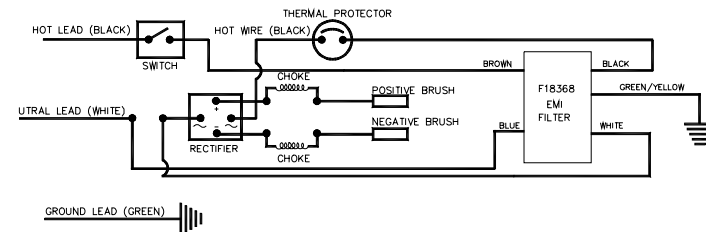
ITM. NO.	NEW PART NO. †	PART NO.	OLD PART NO. *	DESCRIPTION	QTY.
1	1200F6545	F6545	1200-30	Ball Bearing	2
2	400F7350	F7350	400F7350	Armature Assembly, 115V (Includes Item 1)	1
	400G7187	G7187	400G7187	Armature Assembly, 230V (Includes Item 1)	Opt.
3	1200F6526	F6526	1200-26A	Motor Frame and Magnet Assembly	1
4	1200F6475	F6475	1200-16	1/4-20 x 5 Thru-Bolt	2
5	1200F6444	F6444	1200F6444	Motor Casting (Includes Items 18, 19, 26, 27)	1
6	1200F6413	F6413	1200-4A-X422	Switch Plate with Bushing (Includes Items 22)	1
7	600F7287	F7287	F7287	Thermal Protector, 115V	1
	650G7081	G7081	650G7081	Thermal Protector, 230V	Opt.
8	1200F7329	F7329	1200F7329	Brush Holder Assembly	2
9	600F7288	F7288	600F7288	Brush Assembly	2
10	35F1396	F1396	35F1396	#8-32 x 1/2 PHTS (Type B)	1
11	-----	-----	-----	Motor Nameplate	1
12	1200F4018	F4018	1200F4018	#8-32 x 3/8 PHMS (Type TT)	2
13	700F3167	F3167	F3167	5/16 Spring Washer	1
14	700F3149	F3149	F3149	Switch Shaft Assembly	1
16	1200F3170	F3170	1200F3170	Line Switch	1
17	1200F6495	F6495	1200-20	Junction Box Cover	1
18	700F8501	F8501	F8501	Wire Lead - Black (Included with Item 5)	1
19	700F8504	F8504	F8504	Wire Lead - White (Included with Item 5)	1
20	700G1906	G1906	G1906	3/32 Blind Rivet	2
21	1200F4015	F4015	F4015	#10-32 x 3/4 PHMS (Type TT)	10
22	1200F6650	F6650	1200-51	5/32 x 1/2 Pin (Included with Item 6)	1
24	1200F8209	F8209	785F8209	1/4 External Lockwasher	2
49	700F3161	F3162	F3162	5/16 Retaining Ring	1
25	600F7295	F7295	600F7295	Hot Wire	2
26	1200F6726	F6726	1200-91	Ground Wire, Green (Included with Item 5)	1
27	1200F7342	F7342	1500-33	#8-32 x 3/8 Ground Screw (Type F) (Included with Item 5)	1
28	600F7289	F7289	600F7289	Rectifier	1
29	600F7234	F7234	600F7234	Screw, #6-32 x 1/2	1
30	650G7289	G7289	650G7289	EMI Filter	Opt.
	650G7290	G7290	650G7290	Choke Brush (See Schematic)	Opt.



### 115 VOLT ELECTRICAL SCHEMATIC



### 230 VOLT ELECTRICAL SCHEMATIC

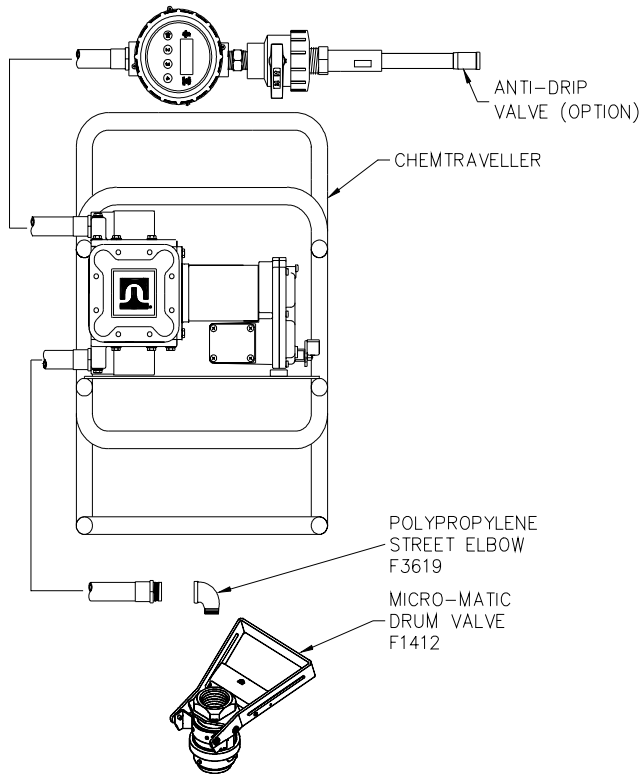


## TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	SOLUTION
Pump won't prime	<ul style="list-style-type: none"> <li>• Suction line problem</li> <li>• Leaky check valves</li> <li>• Check valves improperly installed</li> <li>• Outlet plugged</li> <li>• Motor not operating</li>   <li>• Stripped or damaged gears</li> </ul>	<ul style="list-style-type: none"> <li>• Check for leaks in suction line.</li> <li>• Check for dirt or damaged check valves and replace.</li> <li>• Check for proper installation.</li> <li>• Check for blockage and clear.</li> <li>• Check power source.</li> <li>• Repair or replace motor.</li> <li>• Check gear assembly and drive gear for damage. Replace complete assembly if necessary.</li> </ul>
Pump hums but will not operate	<ul style="list-style-type: none"> <li>• Motor faulty</li> <li>• Gear mechanism jammed</li> </ul>	<ul style="list-style-type: none"> <li>• Replace motor.</li> <li>• Check for free rotation of the gears.</li> </ul>
Low pump capacity	<ul style="list-style-type: none"> <li>• Low voltage</li> <li>• Leaky suction line</li> <li>• Dirt in check valves</li> <li>• Faulty check valves</li> <li>• One or both diaphragms leaking</li> <li>• One piston screw loose</li> <li>• Piston retainer screws loose</li> <li>• Debris ingested</li> </ul>	<ul style="list-style-type: none"> <li>• Check power source.</li> <li>• Repair leaks.</li> <li>• Dismantle and clean.</li> <li>• Install repair kit.</li> <li>• Install repair kit.</li> <li>• Install new yoke assembly.</li> <li>• Install new yoke assembly.</li> <li>• Add inlet screen.</li> </ul>
Motor overheats	<ul style="list-style-type: none"> <li>• Pumping hot fluids</li> <li>• Motor faulty</li> </ul>	<ul style="list-style-type: none"> <li>• Shorten duty cycle.</li> <li>• Replace motor.</li> </ul>
Fluid leakage	<ul style="list-style-type: none"> <li>• Faulty or missing gaskets</li> <li>• Loose bolts</li> <li>• Cracked component</li> <li>• Piston retainer screws loose</li> </ul>	<ul style="list-style-type: none"> <li>• Install all gaskets specified in parts list.</li> <li>• Torque all bolts to 50 in. lbs.</li> <li>• Replace defective component.</li> <li>• Install new yoke assembly.</li> </ul>

# **MICRO-MATIC DRUM VALVE**

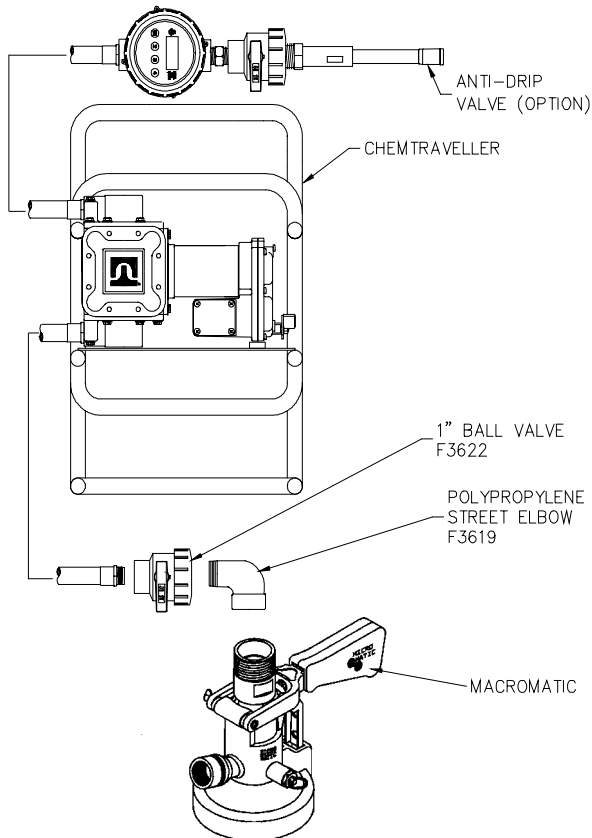
## **Installation Instructions for 435/465 Chemtraveller**



1. Apply thread sealant or Teflon tape to male threads on Chemtraveller suction hose and 90° polypropylene street elbow.
2. Thread elbow onto hose and tighten until snug.
3. Thread drum valve onto elbow. Tighten well.
4. Attach drum valve to container following instructions furnished by Micro-Matic.

# **MICRO-MATIC MACRO VALVE®**

## **Installation Instructions for 435/465 Chemtraveller**



1. Apply thread sealant or Teflon tape to male threads of Macro Valve.
2. Apply thread sealant or Teflon tape to male threads on Chemtraveller suction hose.
3. Thread 1" single union ball valve (F3622) onto suction hose.
4. Apply thread sealant or Teflon tape to male threads of street elbow (F3619) and tighten into ball valve.
5. Thread Macro Valve into street elbow. Tighten until two threads are showing on each connection.
6. Attach Macro Valve to container, following instructions furnished by Micro-Matic.

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PROTECTING THE ENVIRONMENT FOR THE  
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