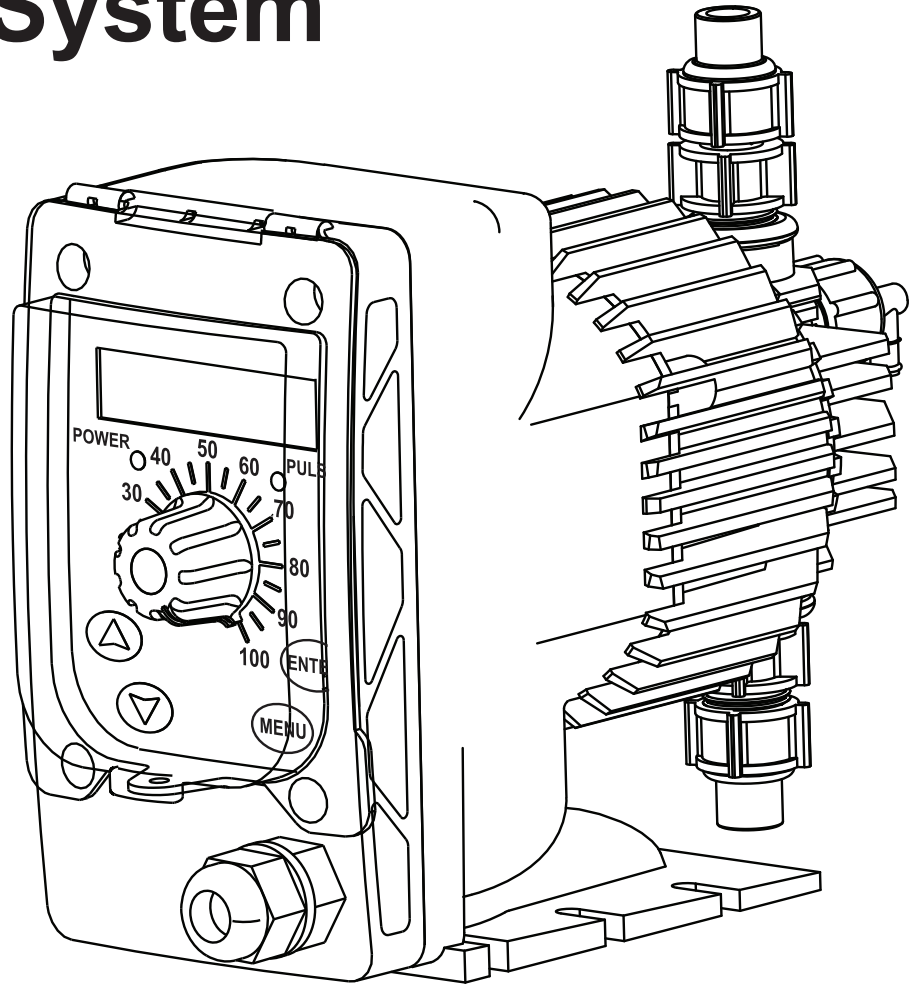


Master Acid Injection System

Model DEMA Ag™
0960-A

*Installation
Maintenance
Repair
Manual*



11/2013

DEMA Ag™ pump Instruction & Maintenance Manual Table of Contents

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I. Introduction

This manual covers all facets of operation of the DEMA Ag™ pump, including unpacking, mounting, electrical and plumbing connection, and start-up. Safety, maintenance and repair, warranty, and factory information is also provided. Please read this manual completely before proceeding. Observe safety protocols and heed all warnings and precautions.

II. Unpacking

DEMA Ag™ series pumps are shipped as a complete package, ready for installation. If the shipping carton shows any signs of damage, notify the shipping company immediately upon receipt. DEMA cannot be held responsible for damage from shipping.

Unpack the carton and insure the following items are present:

- | | | | |
|----|------------------------------------------------------------------------|----|--------------------|
| 1. | Pump/controller | 7. | Injection fitting |
| 2. | Suction, discharge and bleed tubing | 8. | Instruction manual |
| 3. | Foot valve and weight | | |
| 4. | Probe and tee assembly | | |
| 5. | 2 two wire cables for possible connection to flow switch or flow meter | | |
| 6. | A green solution reference wire to connect to the probe | | |

III. Safety Considerations

NOTE: All DEMA Ag™ pumps are primed with water before leaving the factory. If the solution to be pumped is not compatible with water, disassemble the pump fluid end before use. After disassembly, thoroughly dry the pump head, valves, and seals before pump is reassembled and used.

A. Chemical Compatibility

DEMA Ag™ metering pumps are designed to work with most liquid chemicals depending upon your pump's liquid end materials of construction. A chemical resistance chart is available for determining specific compatibility with a wide variety of chemicals.

B. Safety and Preparation

Always wear the proper protective clothing and gear when working around chemicals and chemical metering pumps. Safety glasses, gloves, and aprons are critical in preventing accidental exposure to dangerous chemicals. Liquids under pressure can present a special hazard when a line or seal is punctured resulting in the spraying of chemical many yards away. If a chemical spillage occurs, consult the Material Safety Data Sheet (MSDS) for specific instructions regarding the chemical being used.

IV. Installation

A. Mounting

The standard DEMA Ag™ series pump is prewired for easy installation. Select a secure mounting location convenient to electrical and plumbing connections that is accessible by the operator. Do not install the pump in a location where the ambient temperature exceeds 120°F (50°C). The pump is suitable for most outdoor installations, shielding from direct exposure to the elements is recommended. The properties of solutions to be metered should also be considered concerning temperature changes and effects to poly tubing.

Accessory item R00225 (plastic mounting bracket) is recommended for a secure installation.

B. Electrode Installation

The standard DEMA Ag™ series pump is provided with a TPE-21 quick disconnect probe and tee assembly on an 10' lead. The tee has 3/4 " female slip connections. The probe must be installed vertical to the piping in a sample line having an inlet pressure higher than the outlet and 3-10 gpm flow for proper operation. Isolation valves on both sides of the probe assembly are needed to allow for easy removal of the probe for cleaning. See page 17 for probe and optional flow switch assembly diagrams.

NOTE: Chemical injection is typically upstream from the probe!

C. Electrical

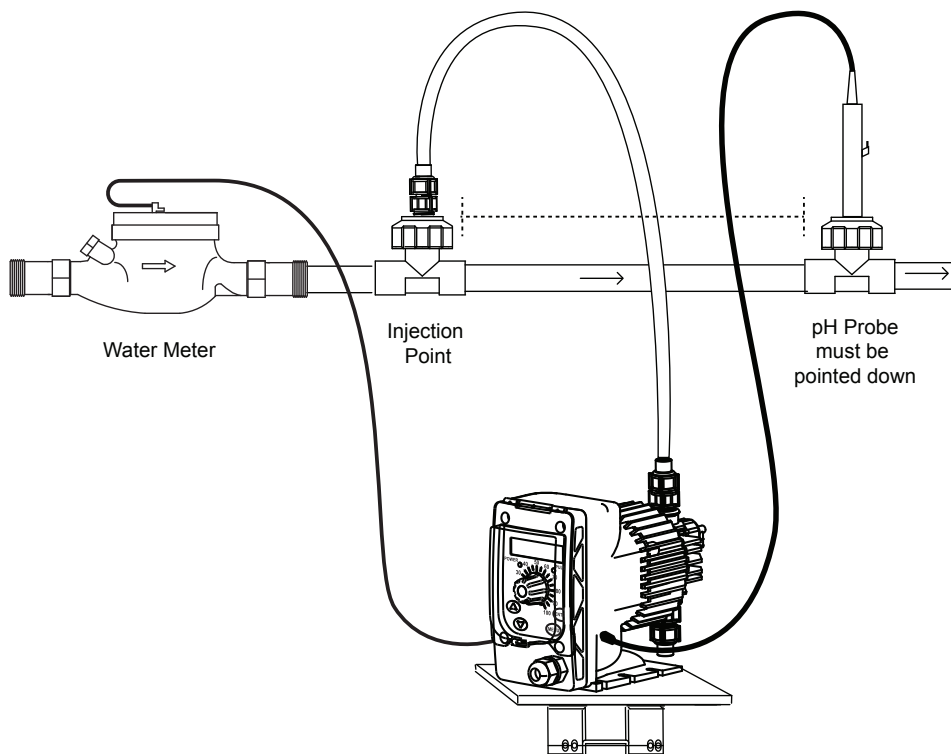
1. The **Standard** DEMA Ag™ pump has a voltage regulated internal power supply capable of operating in the range of approximately 95 to 135 VAC. Use a supply voltage of 100 to 120 VAC for best results. The 3-wire grounded plug must be used in a 3-wire wall plug.
2. With a 240 volt option, the DEMA Ag™ pump has a voltage regulated internal power supply capable of operating in the range of approximately 195 to 260 VAC. Use a supply voltage of 210 to 250 VAC for best results. Pump is supplied without a country specific plug unless otherwise specified.

CAUTION: Never remove ground wire from plug!

3. Control relay output voltage is equal to incoming line voltage with a 5 amp fuse.

Notes: 1. An isolated circuit breaker with a true earth ground is highly recommended to insure uninterrupted operation.

2. Low voltage signal wire (water meter signal or probe wire) should never be run in conduit with high voltage wire above 30 VAC.



* Distance between injection point and pH probe must be a minimum of 10 feet, unless sent through a mixing process.

** Maximum probe wire run without signal booster is 20 feet.

D. Chemical Injection Plumbing

1. Piping Connections

The DEMA Ag™ pump uses carefully matched components to achieve a predictable metering output. This predictability can only be maintained if all fitting sizes remain unaltered. **Do not** attempt to reduce tubing size. All tubing connections should be double checked to insure against leakage. If hazardous chemicals are being pumped, use shielding around discharge tubing.

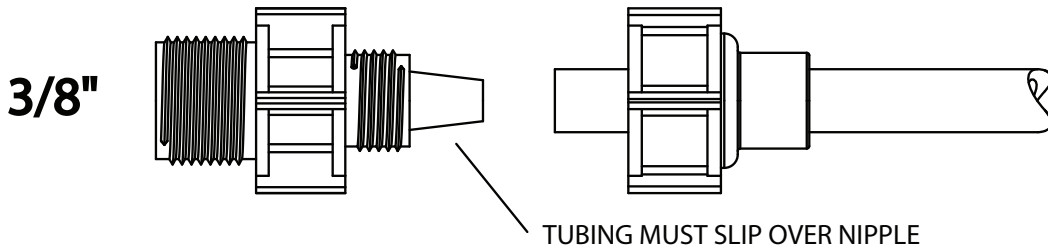
NOTE: When cutting lengths of tubing for your installation, ensure a clean, square cut. Use short lengths of tubing and as few connections as possible.

2. Tubing Nuts

Do not overtighten the tubing connectors. Tighten the fittings no more than 1/4 turn after the fitting contacts the seal. Hand tighten only. **Do not use a wrench or pliers** as they may damage the fittings. Do not use Teflon tape except on NPT fittings. **Be sure to observe applicable local plumbing codes.**

WARNING: Clear flexible tubing is not intended for pressurized use.

3. Tubing Connections



4. Suction Lift vs Flooded Suction Applications

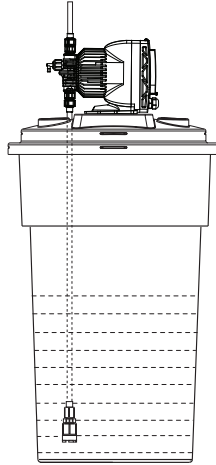
Suction Lift Installation

Mount the DEMA Ag™ pump around the top of the solution tank, not to exceed 5 feet from pump to bottom of tank.

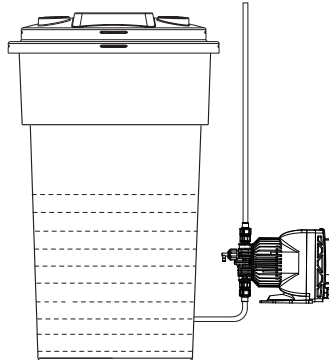
Flooded Suction

This installation is recommended for very low outputs, solutions that gasify and/or high viscosity solutions. Priming is easier and loss of prime is reduced. Failure of the pump diaphragm or rupture of the solution tubing can cause loss of solution in the tank.

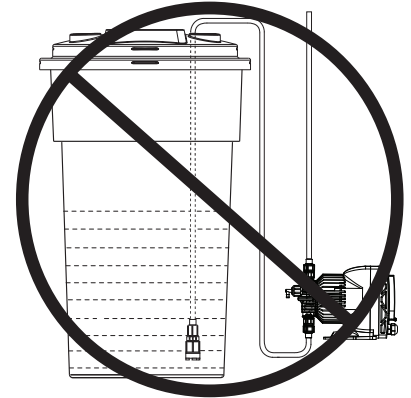
Suction lift



Flooded Suction



Not recommended

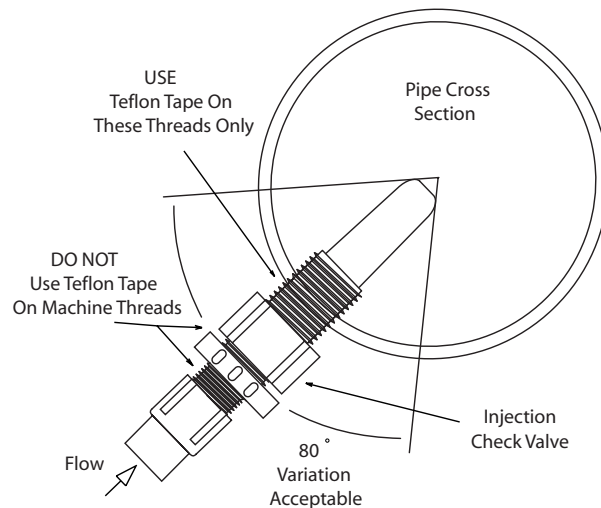


5. Foot valve installation

A weight is provided to hold the tubing and foot valve in a vertical position at the bottom of the tank. **Do not allow the foot valve to lay horizontally in the chemical container.** This defeats the action of the valve and causes the pump to lose prime. Keep suction tubing reasonably short and avoid high spots or bends.

6. Injection valve installation

The injection valve is designed to prevent a back flow and to inject chemical into the line. To work properly, this valve must be mounted within 45 degrees of vertical (see drawing). One end of the injection valve is 1/2" MNPT. Install this end into the piping system. Use Teflon tape on this fitting only. Connect the pump's discharge tubing to the opposite end of the injector. Do not use Teflon tape or joint compound on this fitting. Connect tubing between this fitting and the pump discharge fitting at the pump head.



NOTE: When installation is made into a line with zero pressure or when pumping into an open vessel, use our three-function valve to prevent syphoning.

7. Optional Three Function Valve.

Anti-siphon feature allows metering of liquids “down hill” or into the suction side of a circulating pump. It provides protection against an accidental application of suction pressure at the fluid injection point. Its Teflon coated diaphragm provides a positive anti-siphon action.

Back pressure function permits metering into atmospheric discharge (open container) without overpumping.

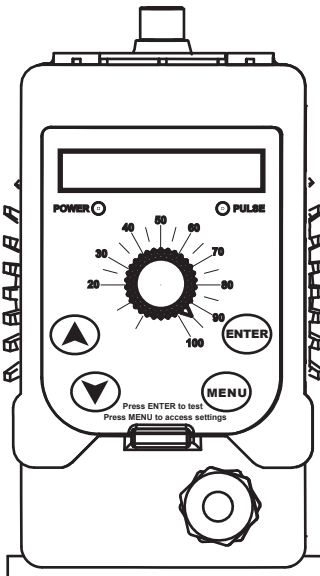
Line check permits removal of discharge tubing without release of system fluid.

8. Priming/bleed valve connection

Connect the clear poly tubing to the outlet of the bleed or priming valve. Position the free end of this tube in the chemical container. Standard head configurations include a priming valve built into the head. Clear poly tubing should be connected to the outlet of this valve, the other end of the tube should be placed in the chemical container above the fluid level.

V. Start-Up

A. Front Panel Description



All DEMA AG™ series pumps come with the following standard panel features:

- 1x16-backlit LCD display
- On/Off power indicator light
- Pulse or Stroke indicator light
- Up and Down arrow keys for setting adjustments
- MENU key to enter and exit pump set-up
- ENTER key to save desired adjustments

B. Run Mode Explanation

The readout will display one of two modes, Run mode and Set-up mode. Run mode is displayed only while the pump is in normal operation. The display will show the pump speed setting.

Manual activation of the relay output and pump stroking can be activated by pressing the ENTER key while the pump is in the run mode. This will manually activate both functions of the unit for 3 minutes. After three minutes the unit goes back to automatic.

If the ENTER key is pressed during the 3 minute test, it will revert to automatic.

C. Set Up Mode Explanation

To enter Set-up mode, press MENU. Notice that a cursor appears on the screen signifying that an adjustment can be made. To change the figure above the cursor press the UP or DOWN keys until the desired setting appears, then press ENTER to advance. Continue pressing ENTER to toggle past the other displays. When all settings are made, press MENU to return to run mode, and save settings.

See Menu Map on Page 12.

D. Priming the Pump

1. Settings

Plug in pump, set stroke knob to 100%.

2. Priming/Bleed valve

If fluid begins moving up suction line while pump is operating, no further priming is required. If fluid is not moving, open bleed valve approximately one turn until fluid begins to move. When suction line fills, close bleed valve. **Do not over tighten bleed valve. Damage may occur.**

3. To prime the DEMAAG™ series pump simply press the ENTER key while the pump is in Run mode. This allows the pump to stroke at the maximum STROKES/MIN setting.

E. Stroking Speed or Frequency

The DEMAAG™ series pump allows for an exact number of strokes to be set and read on the front panel LCD meter. It is adjustable from 0 to 125 strokes per minute (0 to 160 for 55 GPD). In addition, for applications requiring very low outputs the speed can be set in strokes per hour from 1 to 125.

F. Stroke Length

The stroke length can be adjusted on all DEMA Ag™ pumps. This adjustment is a mechanical adjustment made using the large knob on the control panel. To avoid damage to the pump, this adjustment should only be made while the pump is running at a high stroking rate.

Always start adjusting your pump's output down by reducing the pump's stroking speed or frequency. By leaving the stroke length as long as possible you decrease any chance of losing prime.

G. Calculating Output

A pump's output per minute can be determined by dividing the maximum rated gallons per day by 1440 (minutes per day). For example, a 30 gallons per day (gpd) pump at a maximum stroke length and speed setting of 125 strokes per minute (spm) will pump 0.000167 gallons per stroke (gps).

$$30 \div 1440 = 0.0208 \text{ gpm} \div 125 \text{ spm} = 0.000167$$

With this value and the pump's speed setting (strokes per minute) you can calculate your pump's output at it's rated pressure. A 30 gpd pump set at 50 strokes per minute:

$$50 \text{ spm} \times .000167 \text{ gps} \times 1440 \text{ (minutes per day)} = 12.02 \text{ gallons per day}$$

Reducing the stroke length will reduce the pump's output again. If the example pump above had it's stroke length reduced to 50% the 12.02 gallons per day output is reduced to 6.01. (example: 12.02 gpd x 0.50 = 6.01 gpd)

A higher product viscosity will reduce the output. Pressures lower than the pump's rating can increase the output.

H. Calibration

All DEMA Ag™ units are factory calibrated. The reading should be verified for accuracy and adjusted as per the instructions listed below.

One Point Calibration

Units can usually be one point calibrated by leaving the cleaned probe on-line sensing the system water and entering the known system pH or ORP value in the calibration screen.

pH Two Point Calibration

A two-point calibration allows the user to reset the offset and slope of the pH reading. Occasionally a 2-Point calibration will be required for installations where a one-point calibration is not sufficient or as a probe ages. You should calibrate to the side of pH scale the unit will normally be operating in. For example if the unit is going to be operating in a range of 8 to 9 then use a buffer of 10 pH plus the buffer of 7.

1. **Known pH buffer solutions with pH values of 4 or 10 plus a buffer of 7 are required to perform a 2-point calibration.**
2. **The solution ground lead MUST be in the buffer solution with the pH probe for correct calibration.**
3. **Rinse probe with buffer to be tested before placing probe in the buffer to prevent buffer contamination.**
4. **Allow the probe to set in the known buffer for 30 seconds before calibrating.**

Reset Calibration to Factory Default

To return the unit to the original factory calibration defaults cycle power to the unit while pressing in on the "down arrow" key. Once the power has come back on for five seconds release the key and all user defined calibrations will have been removed.

Warnings:

1. **Do not allow probe to become dry! Damage will occur and a new probe may be needed.**
2. **Probes typically last from 6 to 18 months depending upon installation and care.**

VI. Control Options

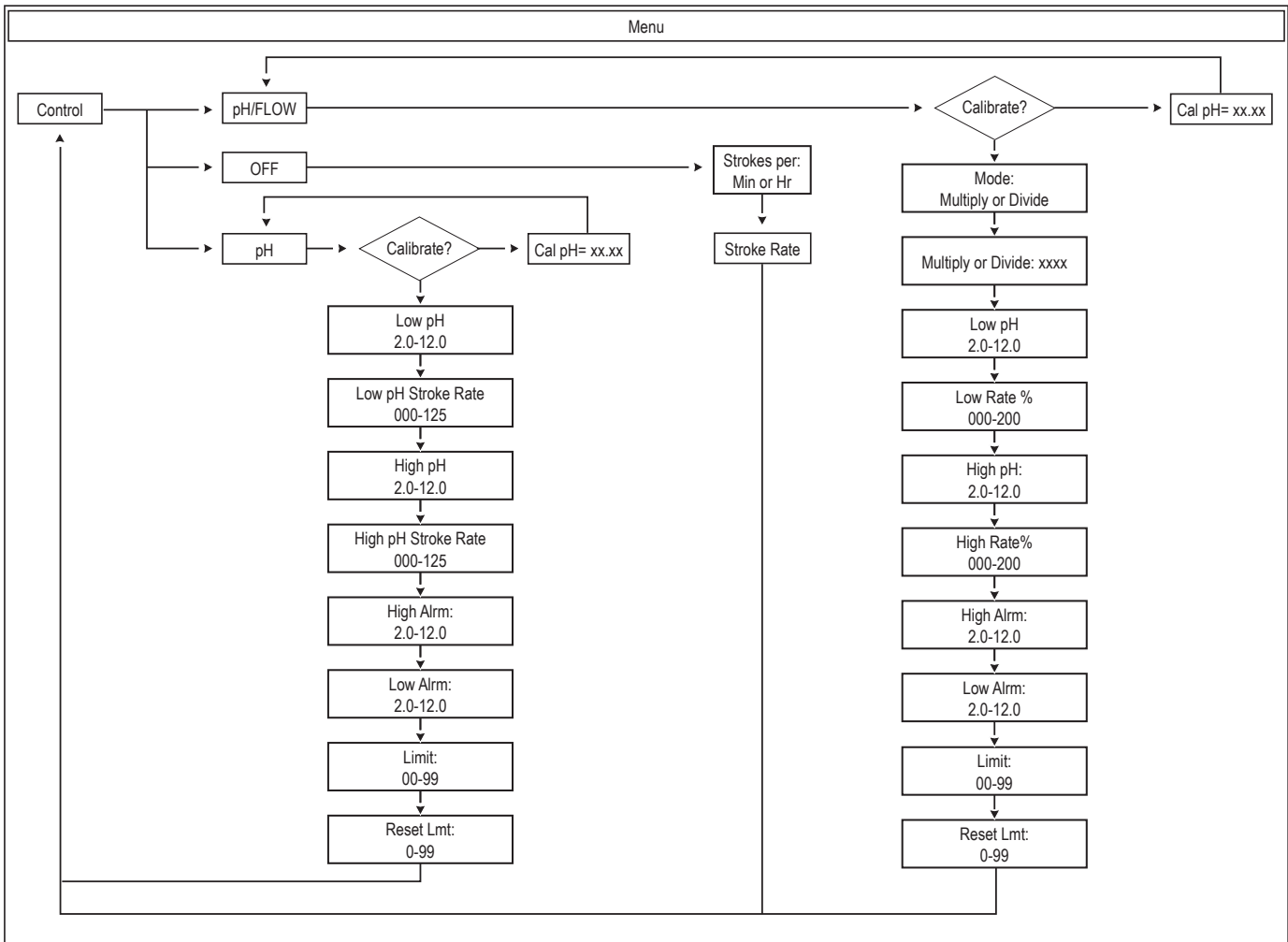
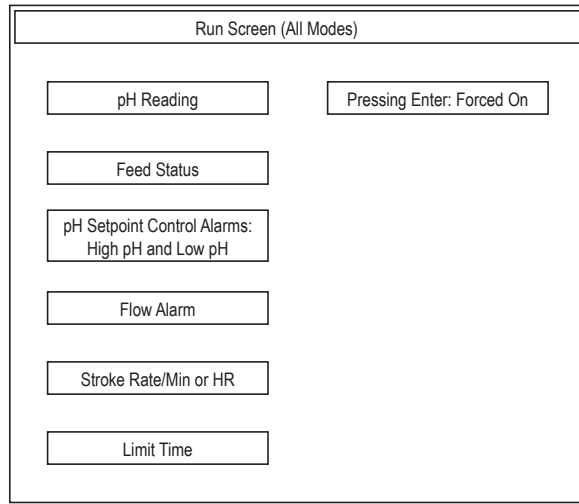
- OFF - The OFF control mode will stroke the pump at a user defined rate. From 0-125 strokes per minute or per hour.
- pH Control - The pH control mode will allow the pump to stroke proportionately based on high and low pH setpoints. This will allow the pump to stroke faster as the pH reading moves away from the desired control level, and slower as it gets closer to it.
- pH/Flow - The pH/Flow control mode uses a multiply/divide feature as part of the programming that allows for an incoming dry contact pulse (such as from a water meter) to dictate how many times the pump will actually stroke. **For example, setting the “Multiply” to 5 means that a single incoming pulse from a water meter can indicate to the pump that it needs to multiply that by 5, which would cause the pump to stroke 5 times per dry contact pulse that it receives. If the pump was set to “Divide” that signal by 5, then it would require receiving 5 dry contact pulses from the water meter before the pump would stroke once.**

When the multiply/divide is set, low and high pH setpoints with percentage settings can be programmed. The high and low setpoints and percentage settings are used to alter the multiply/divide settings based on how far away the pH reading is from the desired control level.

For instance, if the “multiply” is set to 5 and the low pH setting is 6.0 with a 20% setting, then if the pH is at 6.0 or lower and the pump receives a dry contact pulse from a water meter, then the pump will only stroke once, or 20% of the “multiply” setting of 5.

The pulse input should receive no more than 1 pulse/second

VII. Menu Map



VIII. Maintenance

The DEMA AG™ series pump is designed for long service life with minimum maintenance. If for any reason, maintenance is necessary or desirable, the DEMA Ag™ pump is easily maintained.

Before any maintenance or service is performed, observe the following precautions:

1. Disconnect the DEMA Ag™ pump from power source.
2. Drain chemical from discharge tubing.
3. Disconnect discharge tubing from pump.
4. If the DEMA Ag™ pump is used in a flooded suction application, remove foot valve from chemical container.
5. Observe relevant safety protocols when handling parts which have been in contact with hazardous chemicals.

A. Diaphragm Replacement

1. Remove the four screws attaching the fluid end to pump body.
2. Remove the fluid end from the pump body.
3. Unscrew the diaphragm from the pump shaft in a counter-clockwise direction. Be careful that diaphragm support ring does not fall out.
4. Do not allow sharp or abrasive objects to come in contact with pump parts.
5. Inspect end of shaft to assure that threads are in good condition. No further disassembly is recommended.
6. Screw new diaphragm onto pump shaft until it bottoms out on shoulder of shaft. It is not necessary to tighten further.
7. Replace fluid end. Make sure that screws are evenly tightened.
8. Reconnect plumbing and power. Prime the pump.

B. Suction and Discharge Check Valve Replacement

1. Disconnect suction tubing from pump.
2. Unscrew fitting from pump head.
3. Remove check valve from suction fitting and replace.
4. Remove O-ring from cavity in fluid end.
5. Remove check valve from suction side pump and replace.
6. Install new O-ring in cavity of fluid end.
7. Replace valve fitting with check valve in fluid end.
8. Replace fluid end. Make sure that screws are evenly tightened.
9. Reconnect plumbing and power. Prime the pump.

NOTES:

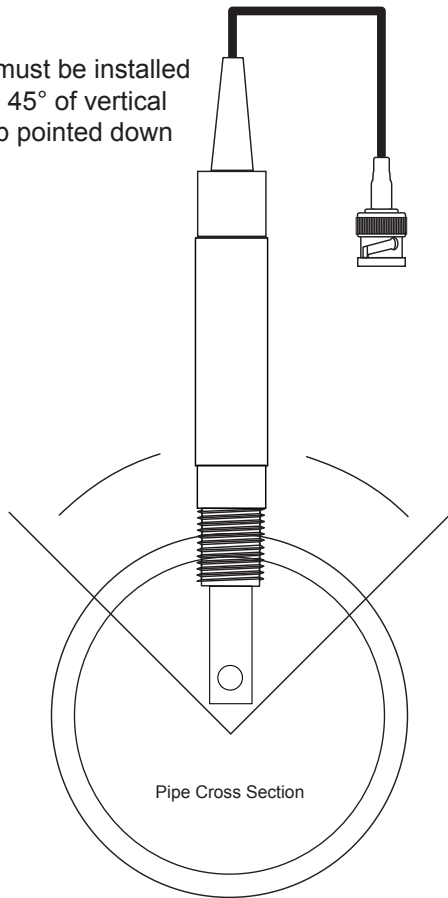
1. **Tighten pump head screws after pump's initial week of operation.**
2. **When installing check valves, remember that the seats are always installed at the bottom.**

C. Cleaning Probe

1. Remove the electrode from the system by turning counter-clockwise until fully released.
2. Spray with water and/or detergent, using a soft brush to dislodge any particulate matter. (Cold water applied to a hot probe may cause damage.)
3. Visually inspect the electrode for signs of damage.
4. Calibrate the electrode.
5. Re-mount into the system, avoid twisting on the cable.

The pH glass is susceptible to coating by many substances. The speed of response, normally 95% of the reading in less than 10 seconds, is dramatically degraded when the pH glass is coated. Slow response or non-reproducible measurements are signs that the electrode has become coated, clogged or dead. pH probes should be replaced annually under good conditions.

Probes must be installed within 45° of vertical with tip pointed down



Coating of an electrode's measuring surface can lead to erroneous readings including shortened span and slow response times. The type of coating determines the type of cleaning technique.

Soft Coatings can be removed by vigorous stirring, by use of a squirt bottle, or very carefully, by gently wiping with a soft cloth, clean non-abrasive paper or cloth. **DO NOT USE ANY BRUSH OR ABRASIVE CLEANER ON pH GLASS!**

Hard Coatings should be chemically removed. The chemical used to remove the coating should be the least harsh chemical that dissolves the coating in 1 or 2 minutes and does not attack the electrode's materials of construction. For example, a calcium carbonate coating might be removed with 5% HCl (muriatic acid). Oily or Organic Coatings are best removed with detergents or an appropriate solvent that does not attack the electrode's materials of construction. For example, isopropyl alcohol might be used but acetone should be avoided if the electrode's body is made of CPVC.

NOTE: WHEN USING CHEMICALS OR SOLVENTS CARE SHOULD BE TAKEN AND APPROPRIATE EYE, FACE, HAND, BODY AND/OR RESPIRATORY PROTECTION SHOULD BE USED.

Abranding or sanding a pH electrode's surface should never be done. However, the measuring surface of an ORP electrode may be gently abraded by use of 600 grade wet silicon carbide paper, jeweler's rouge or very fine steel wool, but try to clean chemically before abrading with 600 paper.

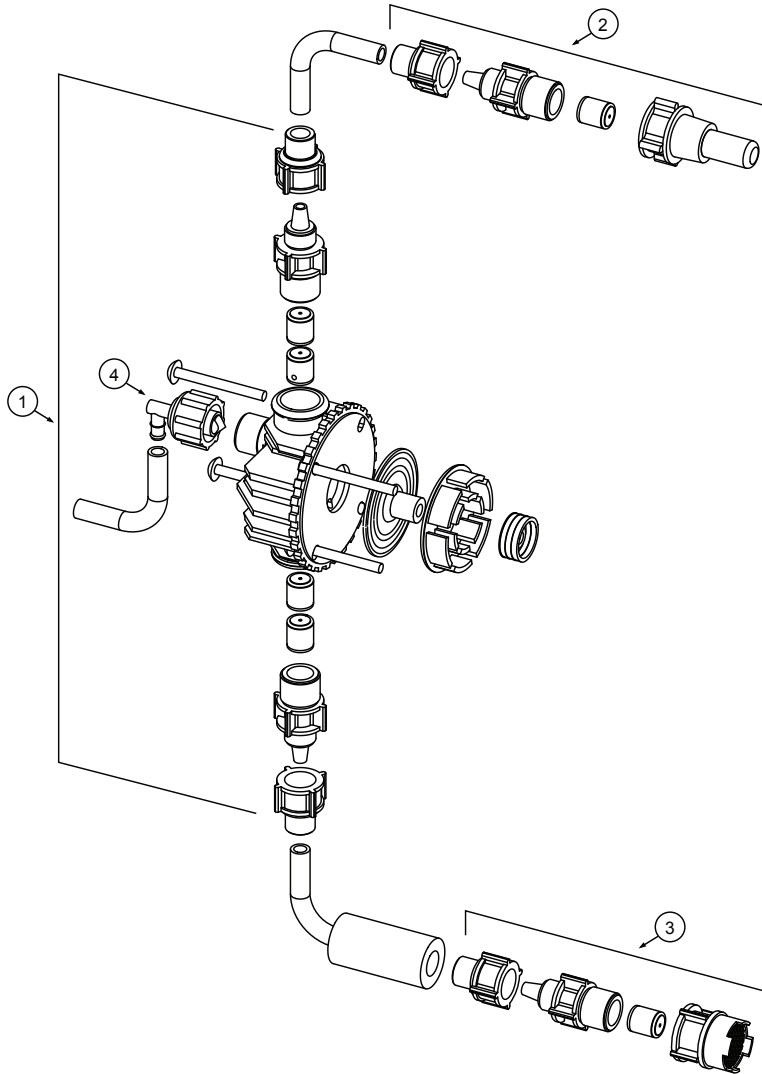
Important considerations for pH/ORP probes

1. The pH Electrode is shipped in a cap containing a solution of pH 4 buffer and potassium chloride. ORP Electrodes are shipped in caps containing a piece of cotton wetted with tap water. The electrode should remain in the cap until it is used. If the electrode is used infrequently the cap and its solution should be saved and the electrode stored in it. Store pH electrodes in pH 4 buffer if soaking solution is discarded. Remove cap and label to use.
2. After exposure to a sample, buffer or rinse solution, carryover can be minimized by blotting-never by wiping-the electrode with a clean, non-abrasive paper or a clean cloth towel. **DO NOT USE A BRUSH ON pH GLASS.**
3. Coatings on an electrode's surface prevent new liquids from contacting an electrode's measuring surface and can mimic the effects of electrode aging. Before concluding that an electrode needs replacing check its surface for coatings.

When to use a remote transmitter

pH and ORP probes require a remote transmitter if the wire run from the probe to the controller is beyond 20 feet (6 meters).

D. Liquid End Diagram



Item	Description
1	Complete Head Kit
2	Injection Valve
3	Foot Valve
4	Bleed Valve Assembly

E. Replacement Parts

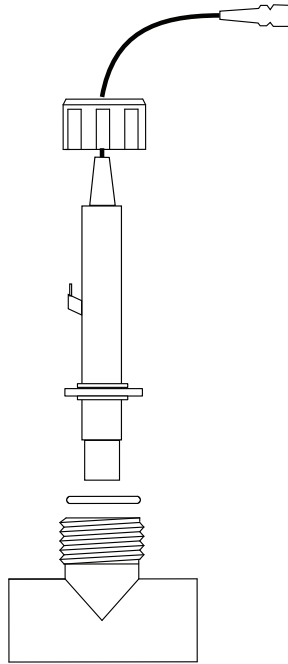
Part Assemblies

Item	Description	Part Number
1.....	Complete Head Assembly 110 psi.....	CKR- <u>K</u> <u>E</u> <u>C</u> <u>U</u>
2.....	Injection Valve Assembly	INJ- <u>K</u> <u>E</u> <u>C</u> <u>U</u>
3.....	Foot Valve Assembly	FTV- <u>K</u> <u>E</u> <u>C</u> <u>U</u>
4.....	Priming Valve Assembly	PRI- <u>K</u> <u>E</u> <u>C</u> <u>U</u>

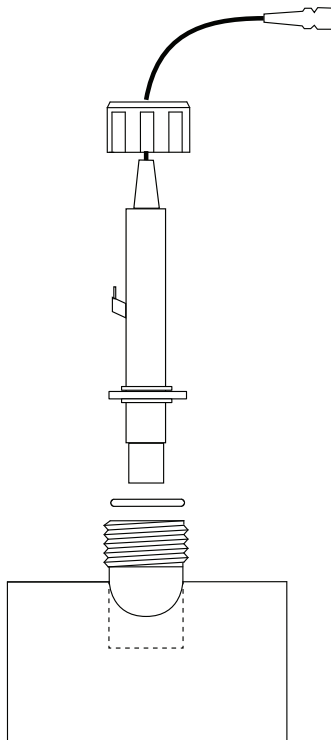
<u>Body</u>	<u>Seat</u>	<u>Ball</u>	<u>Connection</u>
K- Kynar	F- Teflon	C- Ceramic	U- 3/8" Tubing UV Resistant

IX. Diagrams

A. Standard 3/4" Electrode



B. T-ADAPT in large pipe



X. Trouble Shooting

PROBLEM	CAUSE	REMEDY
Pump does not achieve or maintain prime	Air trapped in suction line	Straighten suction line so as to eliminate high spots.
	Foot valve contaminated or improperly installed	Inspect foot valve screen and assure that foot valve is in a vertical position below fluid level.
	Excessive lift	Maximum suction lift is 5 feet with water or fluids of similar specific gravity; less with heavier liquids such as acids. Mount pump in a lower position relative to the chemical container.
	Suction fittings not properly tightened	Check fittings. Overtightening may cause restriction. Conversely, if any leakage occurs, pump will suck air and fail to prime.
	Worn or contaminated check valves	Inspect check valves in fluid end for cleanliness. Clean or replace as necessary.
	Split or pinch in suction tube	Inspect suction tube through its full length to assure that there are no splits at the connections or other restrictions. Move any objects or equipment which impinges upon suction tube or reroute as required to assure a smooth transition from foot valve to pump.
	Low chemical level	Check fluid level in chemical supply tank.
Insufficient fluid	Stroke adjustment set too low	Check operation of stroke limiter knob. If pump delivers too low adjustable rate, check settings. Readjust as required.
	Worn or contaminated check valves	Inspect, clean or replace as necessary.
	Obstruction in suction line	Check suction line for obstructions, clogging, kinks or pinch points.
	Clogged foot valve screen	Clean or replace foot valve screen.
	Output (system) pressure too high	Relocate the injector to a lower pressure part of the the system.
	Diaphragm worn or torn	Replace diaphragm, making sure that it is screwed on fully to shoulder of shaft.
	Electronic failure	Consult dealer or factory.

Excessive fluid	Failure or lack of antisiphon valve	Inspect or add anti-siphon valve. This is caused when system is in a vacuum condition or valve in delivery applications with flooded suction which feeds systems at very low pressures.
	Excessive stroke rate	Lower the stroke rate if adjustable on your pump.
	Improper stroke length	Reduce stroke length.
Pump will not pump	System pressure too high	Check system pressure to assure that it is within system rated parameters of the pressure.
	Diaphragm improperly installed	Make sure that diaphragm is screwed fully onto shaft.
	Check valves worn or clogged	Clean or replace as required.
Pump will not run not plugged in	Pump not turned on or not plugged in	Check outlet with meter to assure that correct or voltage is present and that power supply cord is in good condition and plugged in.
	Electronic failure	Consult dealer or factory.
Excessive noise	Pump not primed	Prime pump.
	No output pressure	Add an anti-siphon valve to provide 25 PSI restriction on pump discharge.
False Reading	Bad or dirty electrode Out of calibration	Clean, as needed Calibrate unit
Will not calibrate	Dirty electrode Faulty electrode Faulty wiring Out of calibration	Clean electrode Replace controller or electrode as needed Calibrate unit

