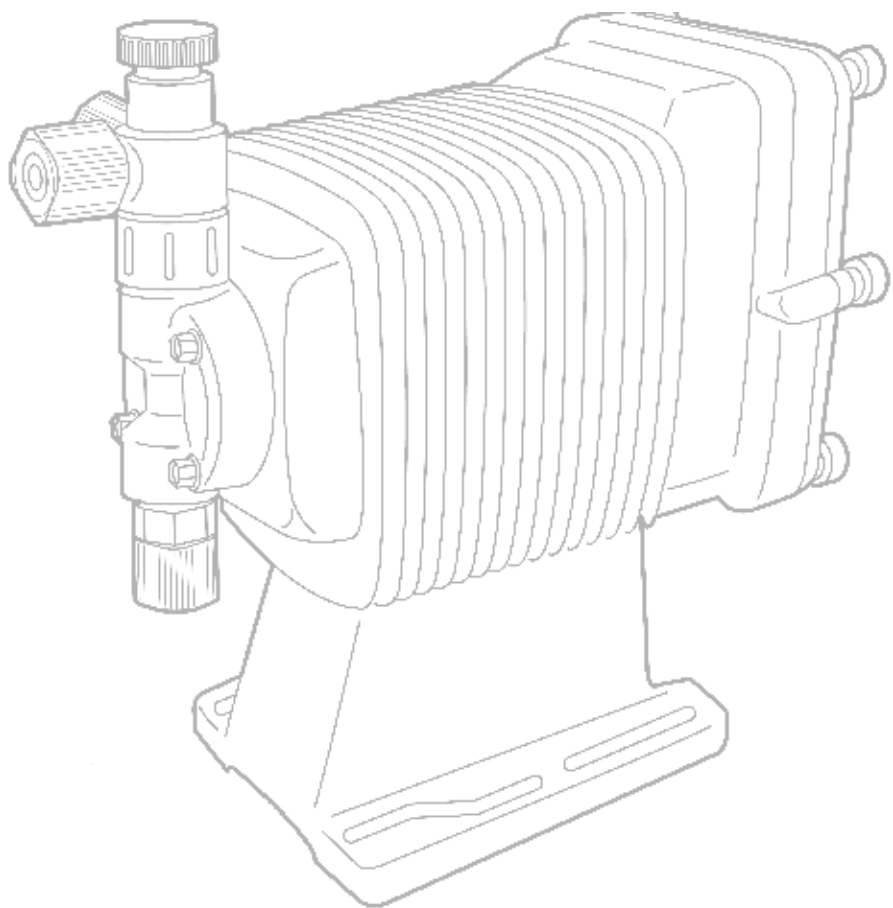




# EK Series Electronic Metering Pump Instruction Manual



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P/N E00269.D  
Jan 2017

Thank you for choosing a Walchem E-Class metering pump. This instruction manual deals with the correct installation, operation, maintenance and troubleshooting procedures for the EK model metering pumps. Please read through it carefully to ensure the optimum performance, safety and service of your pump.

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## 1.0 INTRODUCTION

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### 1.1 Safety and Caution Notes



Always wear protective clothing, eye protection and gloves before working on or near a metering pump. Follow all recommendations of the supplier of the solution being pumped. Refer to the MSDS from the solution supplier for additional precautions.

Walchem E-Class metering pumps should be installed where ambient temperatures do not exceed 122°F (50°C) or do not fall below 32°F (0°C). Pumps should always be shielded from direct exposure to the elements. Black UV resistant tubing should be used if the tubing is exposed to strong UV radiation (sunlight/lamps). The EK Series is specifically designed to withstand the elements and can be mounted directly outdoors within the temperature specifications. To protect and maintain the IP rating of the pump, the clear covers that protect the electronic controls **MUST** be left in a secured/tightened condition at all times other than during adjustment of the pump.



**WARNING Risk of electrical shock!** This pump is supplied with a grounding conductor and grounding-type attachment plug. To reduce the risk of electrical shock, be certain that it is connected only to a properly grounded, grounding type receptacle with ratings conforming to the data on the pump data plate. Prior to performing any maintenance on a pump, disconnect the pump from the electrical power source.

#### **Plumbing Precautions**

All tubing must be securely attached to the fittings prior to starting the pump (see Section 2.3). Only use Walchem tubing with your pump. Tubing should be shielded to prevent possible injury in case of rupture or damage. UV resistant tubing should be used if the tubing is exposed to UV light. Always adhere to local plumbing codes and requirements. Be sure that the installation does not constitute a cross connection. Walchem is not responsible for improper installations. Prior to performing any maintenance on a pump, depressurize the discharge tubing.

If you are pumping downhill or into little or no system pressure, a back pressure/anti-syphon device must be installed to prevent over-pumping. Contact your Walchem distributor for additional information.

#### **Solution Compatibility**



**CAUTION!** This pump has been evaluated for use with water only. The suitability of this pump for use with liquids other than water, such as acid and alkaline, is the responsibility of the user. For liquids other than water, select the best-suited liquid end material combination using a chemical compatibility chart.

### 1.2 Principle of Operation

The E-Class electronic metering pumps consist of a pump unit, a drive unit, and a control unit. The drive unit is an electromagnetic solenoid. When the solenoid coil is energized by the control unit the armature shaft moves forward due to the magnetic force of the solenoid. The shaft is attached to a PTFE faced diaphragm which is part of the pump unit. The diaphragm is forced into the pump head cavity decreasing volume and increasing pressure which forces liquid in the pump head out through the discharge check valves. When the solenoid coil is de-energized, a spring returns the armature to its starting position. This action pulls the diaphragm out of the head cavity increasing volume and decreasing pressure. Atmospheric pressure then pushes liquid from the supply tank through the suction check valves to refill the pump head.

## 1.3 Model Code

<b>EK</b>	<b>B16</b>	<b>R</b>	<b>1</b>	-	<b>VC</b>	<b>A</b>
1	2	3	4		5	6

### 1 Pump Series

EK IP 67 aggressive environment rated electronic metering pump with external pulse control or manual speed control (adjustable to 360 strokes per minute) and manually adjustable stroke length. (Turndown ratio 1800:1.)

### 2 Capacity/Pressure Rating (See Section 1.4 for detailed chart.)

### 3 Control Module

R For use on all EK models, features external pulse input control and stop input.

### 4 Voltage

- 1 115 VAC, 50/60 Hz
- 2 230 VAC, 50/60 Hz

### 5 Liquid End (See Section 1.4 for detailed chart.)

### 6 Options

- A Auto Degassing Valve (ADV) is supplied under the manual air vent valve. Available for B11/16/21 and C16/21 sizes with -VC/-VE liquid ends only.
- M Multifunction Valve is supplied in place of the manual air vent valve. Available on all pumps except for -FC/-SH liquid ends.

## 1.4 Specifications

### 1.4.1 Electrical

#### (50/60 Hz, Single phase)

<b>EKB</b>	115 VAC±10%	0.8 Amp max.	20 watt avg.
	230 VAC±10%	0.4 Amp max.	20 watt avg.
<b>EKC</b>	115 VAC±10%	1.2 Amp max.	22 watt avg.
	230 VAC±10%	0.6 Amp max.	22 watt avg.

### 1.4.2 Operating Conditions

Ambient temperature	32°F to 122°F (0°C to 50°C)
Relative humidity	95% (EK) non-condensing
Liquid temperature	32° to 104°F (0 to 40°C) for PVC based liquid ends 32° to 140°F (0 to 60°C) for PP, PVDF, SS based liquid end Below 32°F (0°C), pump is limited to 70% of max. pressure. Liquid cannot freeze.

### 1.4.3 Capacity/Pressure Rating

Size	Maximum Output Capacity <sup>1</sup>		Output per Stroke (mL)		Maximum Pressure		Connection Size (in) Tubing O.D
	(Gal/hr)	(mL/min)	Min.	Max.	PSI	MPa	
B11	0.6	38	0.03	0.11	150	1.0	3/8
B16	1.0	65	0.04	0.18	105	0.7	3/8
B21	1.8	115	0.07	0.32	60	0.4	3/8
B31	3.3	210	0.12	0.58	30	0.2	1/2
C16	1.3	80	0.05	0.22	150	1.0	3/8
C21	2.3	145	0.08	0.40	105	0.7	3/8
C31	4.3	270	0.15	0.75	50	0.35	1/2
C36 <sup>2</sup>	6.7	420	0.24	1.17	30	0.2	1/2

<sup>1</sup> Auto Degassing valve (ADV) reduces output capacity by approximately 20% of rated.

<sup>2</sup> Output of the EW/EKC36-TC/FC/SH is 6.3 GPH (400 ml/min)

### 1.4.4 Adjustment Range

Stroke length adjustment range                      20% to 100%

Frequency adjustment range                            0 to 360 strokes per minute

### 1.4.5 Materials of Construction

Liquid End Code	Pump Head & Fittings	Diaphragm	Valve Balls	Valve Seat	Valve Seals	Gasket	Tubing
PC	GFRPP	PTFE (bonded to EPDM)	CE	FKM	FKM	PTFE	PE
PE	GFRPP		CE	EPDM	EPDM		
VC	PVC		CE	FKM	FKM		
VE	PVC		CE	EPDM	EPDM		
VF	PVC		PTFE	EPDM	EPDM		
TC	PVDF		CE	FKM	FKM		
FC	PVDF		CE	PCTFE	PTFE		
SH (N)	316 SS		HC	316SS	PTFE		

CE            Alumina ceramic

PE            Polyethylene

EPDM       Ethylene propylene diene monomer

PTFE        Polytetrafluoroethylene

FKM         Fluoroelastomer

PCTFE      Polychlorotrifluoroethylene

PVC         Polyvinylchloride (translucent)

GFRPP      Glass fiber reinforced polypropylene

PVDF        Polyvinylidene fluoride

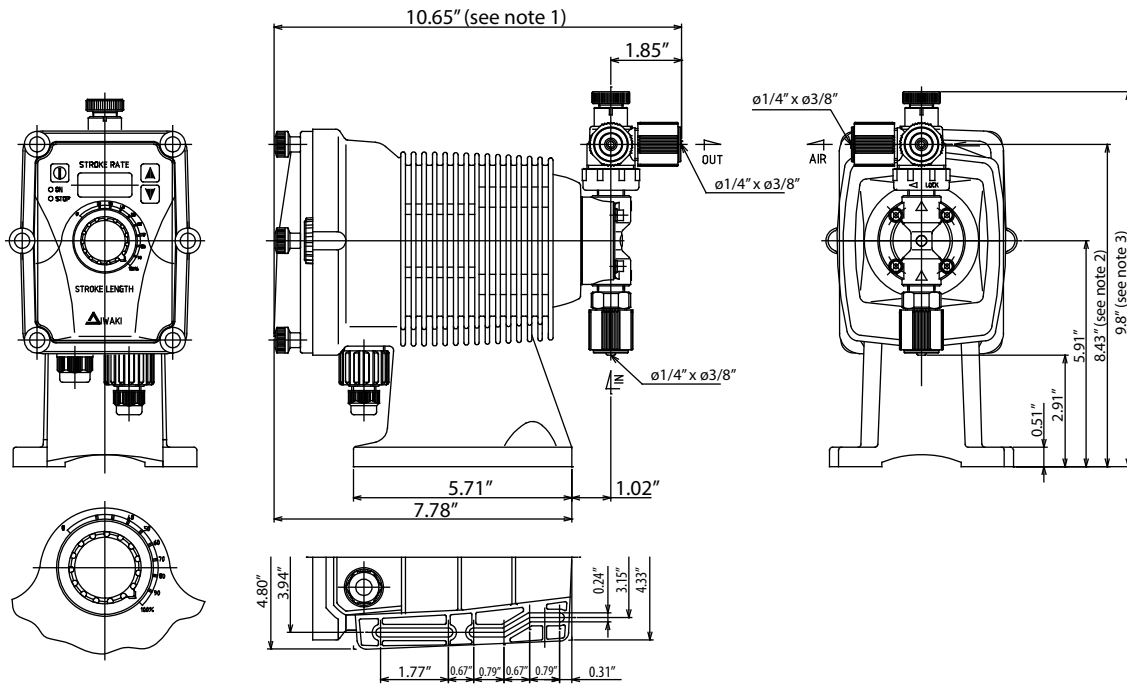
HC          Hastelloy C276

SS          316 stainless steel

# 1.5 Dimensions

(All dimensions in inches)

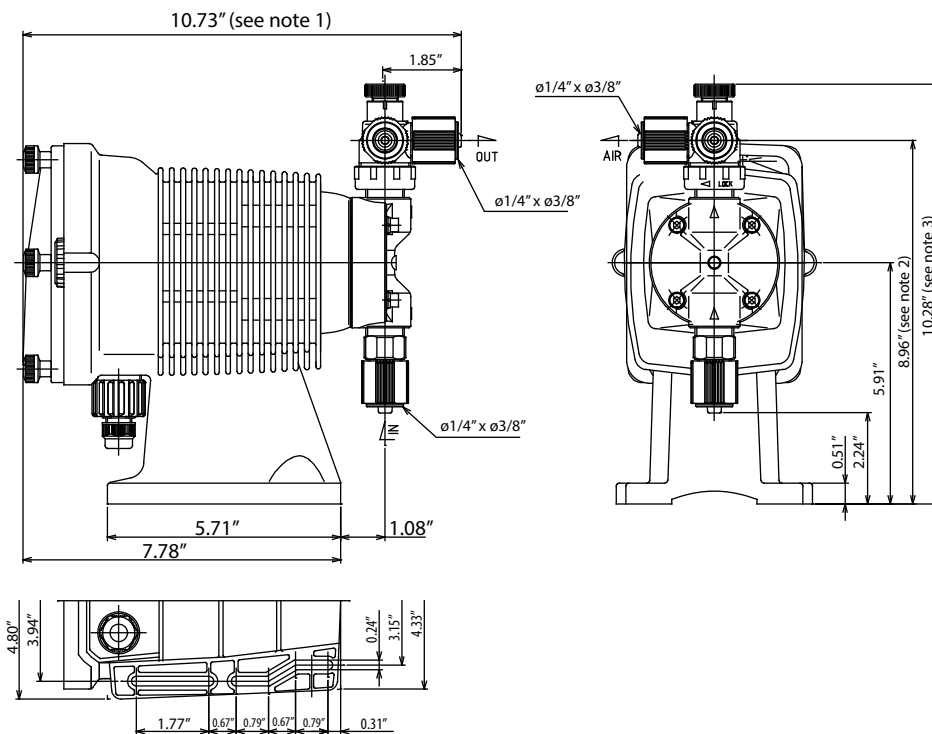
## EK-11,16 and 21 Models with thermoplastic liquid end materials



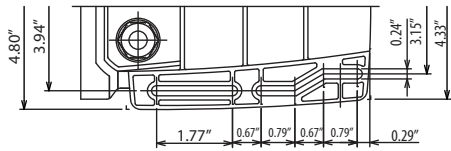
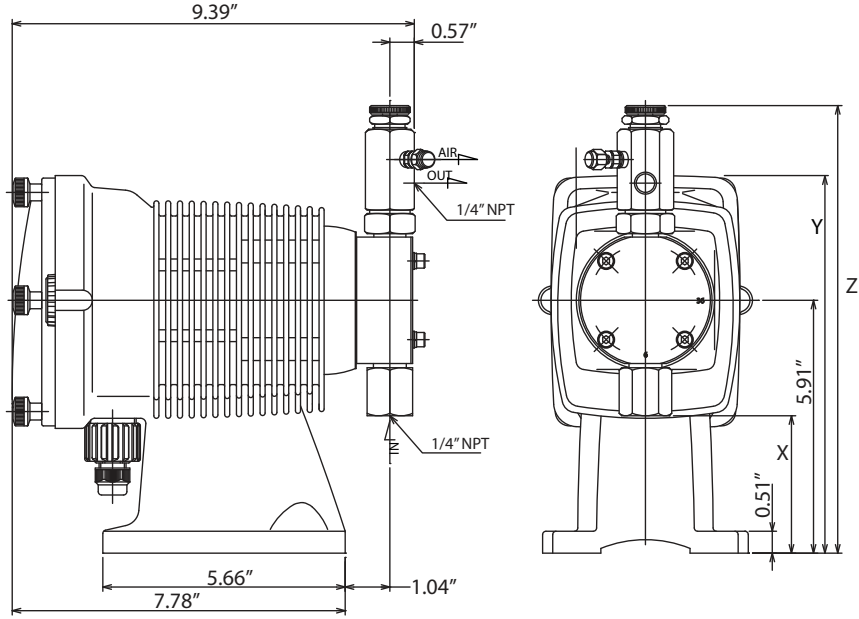
Notes:

1. Addition of a Multifunction valve increases overall length by 0.10".
2. Addition of a Multifunction Valve increases discharge height by 2.62". The Auto Degassing Valve increases discharge height by 1.82".
3. Addition of a Multifunction Valve increases overall liquid end height by 1.25". The Auto Degassing Valve increases height by 1.82"

## EK-31 and 36 Models with thermoplastic liquid ends

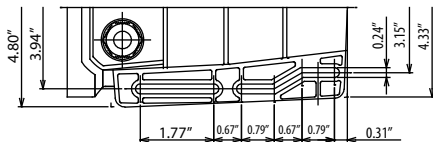
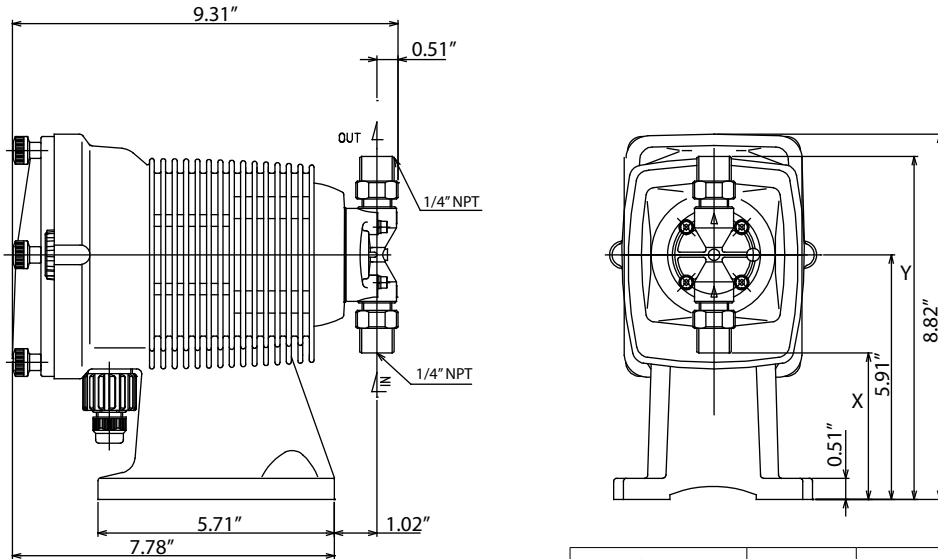


**EK Models with SH liquid end**



Model Size	X	Y	Z
11,16, 21	3.70"	8.07"	9.88"
31, 36	3.31"	8.54"	10.37"

**EK Models with FC liquid end**



Model Size	X	Y
11,16, 21	3.54"	8.28"
31, 36	2.88"	8.88"



## 2.0 INSTALLATION

### 2.1 Unpacking

Open the shipping carton and inspect contents for damage. If any items are missing or damaged contact your local distributor.



Pumps are pre-primed with water at the factory. If the application is not compatible with water, drain and dry before use. Be sure to remove caps from fittings before attaching tubing.

**CAUTION:** Head bolts may have loosened during storage or shipment. Be sure to check and tighten to 19 lb-in torque, if necessary.

### 2.2 Location

Choose a location for the pump which is clean, dry, vibration-free, close to an electrical outlet, and allows convenient access to stroke length control, frequency control, and tubing connections. Avoid areas where ambient temperature exceeds 122°F (50°C) or falls below 32°F (0°C). Pumps should always be shielded from direct exposure to the elements. Black UV resistant tubing should be used if the tubing is exposed to strong UV radiation (sunlight/lamps).

The EK Series is specifically designed to withstand the elements and can be mounted directly outdoors within the temperature specifications.

This pump is cord connected and not intended for permanent mounting to a building structure. However, temporary mounting to stabilize the pump during operation may be necessary as long as tools are not required for the installation or removal of the pump.

Flooded suction (mounting the pump below the level of liquid in the supply tank) is strongly recommended, especially when pumping liquids that readily generate gas bubbles. Sodium hypochlorite and hydrogen peroxide are common examples of such liquids. (See Figure 1.)

If flooded suction mounting is not possible, a shelf adjacent to (but not directly above) the supply tank often works well. (See Figure 2.) The supply tank or cover can also be used if it has provisions for mounting a pump. (See Figure 3.) In any case, the total suction lift should not exceed 5 ft (1.5m).

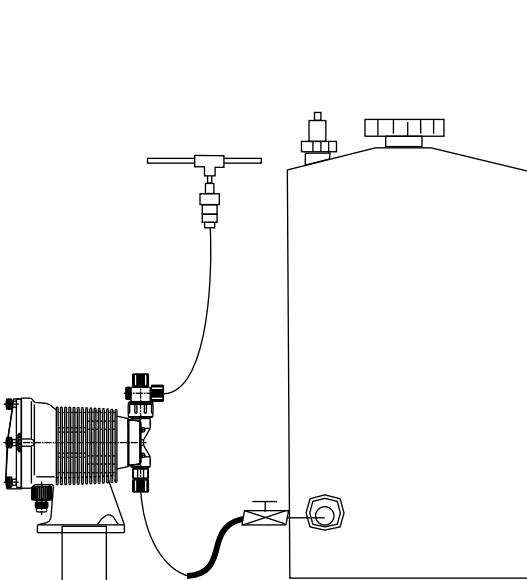


Figure 1 Flooded suction  
Recommended for liquids  
that out-gas

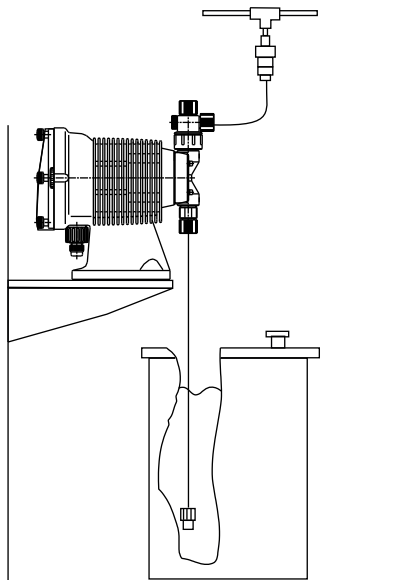


Figure 2 Shelf mount  
6

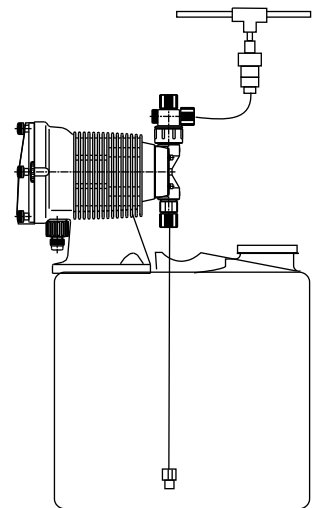
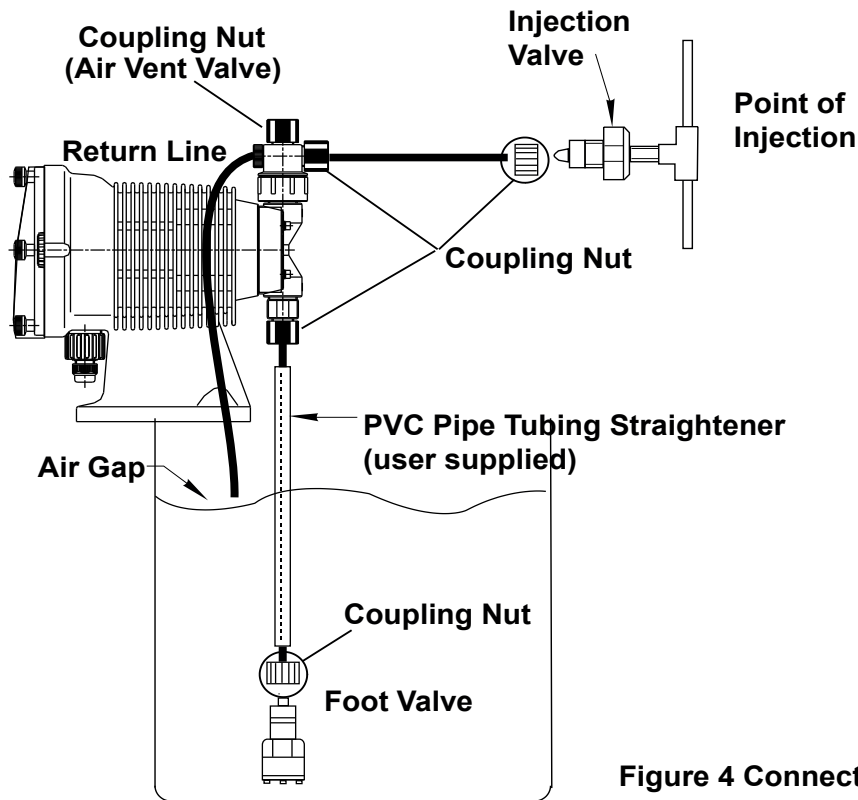


Figure 3 Tank mount



**Figure 4 Connection Tubing**

## 2.3 Supply Tubing

The supply tubing run should be as short as possible. For flooded suction mounting, install a shut-off valve with an appropriate tubing connector at the tank outlet. Cut a length of tubing from the coil supplied and install between the shut-off valve and the pump inlet fitting. For suction lift applications, slide on the ceramic weight, then install a foot valve on one end of suction tubing. Cut the tubing to a length such that the foot valve hangs vertically about 1 in (25mm) above the bottom of the tank. Avoid any loops in the tubing run that could form a vapor trap. Running the tubing through a length of pipe will help to keep tubing straight. Total vertical suction lift should be no more than 5ft. (1.5m). Reference Figure 4.

Attach tubing as shown in Figure 5. First slide the coupling nut, small end first, then the tubing clamp onto the tubing. Push the tubing over the tubing adapter tip all the way to the valve housing shoulder. (Tip: if the tubing is stiff from cold, dip the tubing end in hot tap water for a few minutes so it will slide on and flare out more easily. Push the tubing adapter into the fitting on the pump and coupling nut onto the threads. Apply some pressure on the coupling nut and tubing while tightening the nut, making sure the tubing has not backed off of the shoulder of the valve housing.

**⚠ WARNING:** All fittings and coupling nuts should be tightened by hand only. If necessary, a small tool may be used to make it snug. **DO NOT** use excessive force or large wrenches.

The coupling nut should not bottom out completely against the fitting. If this happens during connection, check the tubing and tubing clamp connection. Remove the coupling nut, re-cut the tubing and re-connect if necessary.

**⚠ WARNING:** If there is any leakage around the coupling nut and it appears to have been installed correctly, **DO NOT TIGHTEN** the coupling further! Release pressure in the line, disconnect tubing, re-cut and re-connect. Tightening of misinstalled tubing may cause the tubing to be cut off under pressure.

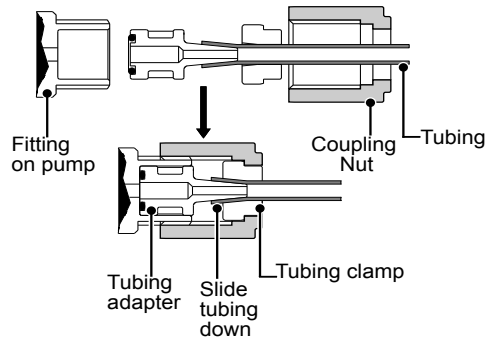


Figure 5

## 2.4 Discharge Tubing

Cut a length of tubing long enough to go from the pump to the application (injection) point. Additional tubing can be ordered from your distributor. Avoid sharp turns or bends and hot surfaces. Routing tubing through rigid pipe such as PVC pipe is recommended for long runs and/or as protective shielding against corrosive chemicals. If applicable, install the injection valve in 1/2" NPT thread at the injection point (see section 2.5) and connect the discharge tubing to the injection valve.

Attach tubing as described in section 2.3 and as shown in Figures 5 and 6. Note: Some models have an air vent valve with two outlet connections. The connection marked 'OUT' is the discharge side to the application point. (Fig 6).

Attach a second length of tubing to the air vent side marked ('AIR') and route back to the chemical solution tank or drum. On the larger pumps (31 & 36 sizes), the air vent valve connections are not marked, however, the discharge side is the vertical (UP) connection and the air vent connection is on the side of the valve.

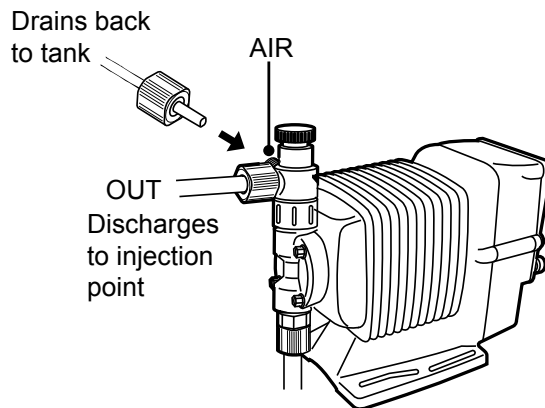


Figure 6 Air Vent Valve Tubing

## 2.5 Installing Injection/BackPressure Valve

A fitting or tee with 3/8" or 1/2" NPTF threads and with sufficient depth will accept the injection valve assembly. If required, trim off an amount of the extension tip until it fits into the fitting or tee. (Fig. 7.)

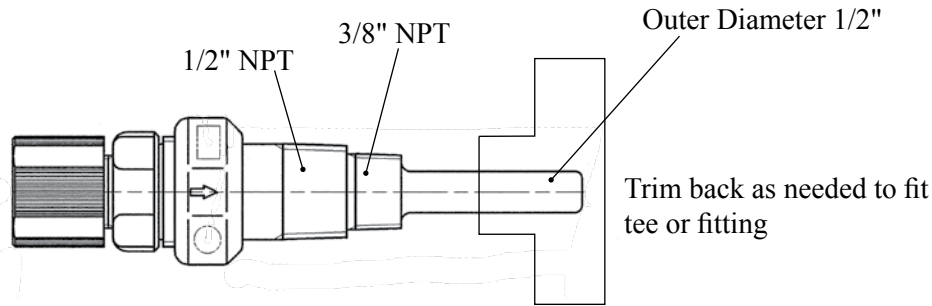
The position of the injection/back pressure valve can be at any orientation as long as the spring is retained in the valve. **DO NOT REMOVE THE SPRING.** Be sure to check and replace the spring as needed. Attach the tubing following the same instructions in section 2.3, connecting the supply tubing.



**CAUTION:** Some chemicals may have reactions as they are injected into the main flow. For example, sulfuric acid may react with water causing excess heat. If the chemical is heavier than water, mount the injection valve as close as possible to vertical coming into the bottom of the pipe. This will keep the injection nozzle facing up and keep the heavier chemistry from draining into the pipe and causing adverse reactions within the injection valve and pipe.

In addition to preventing backflow from pressurized lines, the injection valve acts somewhat as a back pressure valve when pumping into open atmosphere type applications. However, the back pressure by the injection valve is very low and can vary. The output of the metering pumps is rated at maximum back pressure and will increase as back pressure decreases dependent on the specific installation. Additionally, the valve does NOT act as an anti-siphon valve. If siphoning is a possibility, or if pumping downhill into open atmosphere (open tank), a Walchem MultiFunction valve or a separate back pressure/anti-siphon valve must be installed.

Note: Siphoning can also occur at the tip of the injection valve because of the high flow rate in the main pipe flowing past the small injection nozzle (venturi effect). In this case, an anti-siphon device must be installed to avoid over feeding or siphoning of chemistry.



**Figure 7 Injection Valve**

## 2.6 Interlocking Pump

**CAUTION!** Control of pump operation is critical. Operation and chemical addition during no flow situations can create hazardous situations from elevated chemical concentrations and chemical gasses trapped in the line.

Ensure that during no flow conditions such as when the well pump, main line or recirculation pump is off, and for pools/spas, in times of backwash, that the metering pump is not allowed to operate. If using a controller (pH/ORP/pool) for automated control and flow indication is tied into it, pump operation can be interlocked to the controller.

Interlocking the pump operation can also be done directly using a flow switch located in the water, main or pool/spa recirculation lines. The flow switch can be tied directly into the pumps to stop operation during no flow conditions.

## 2.7 Electrical

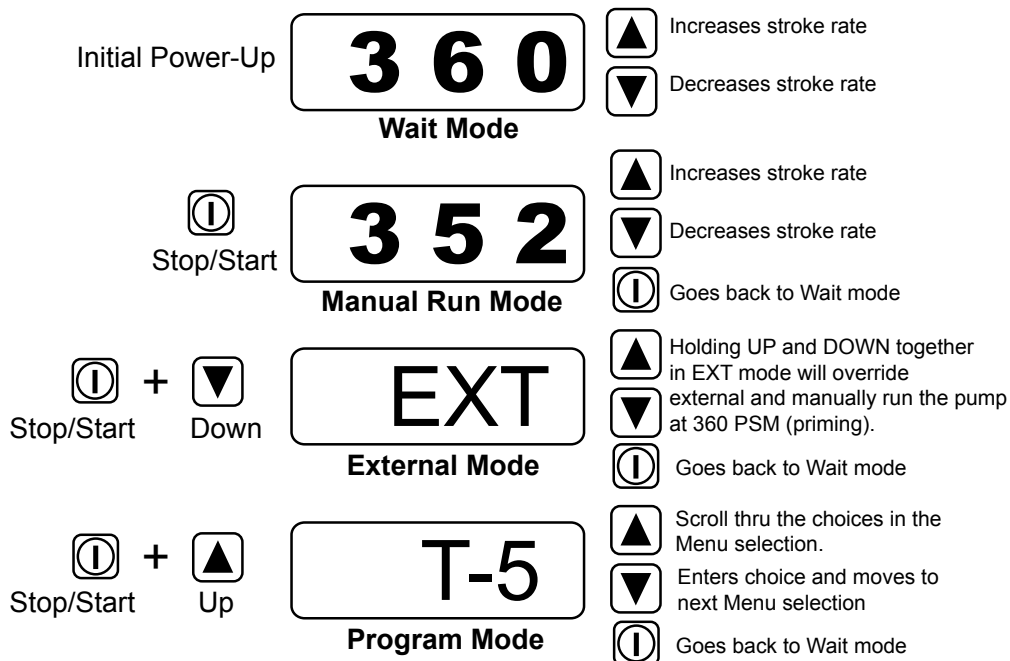
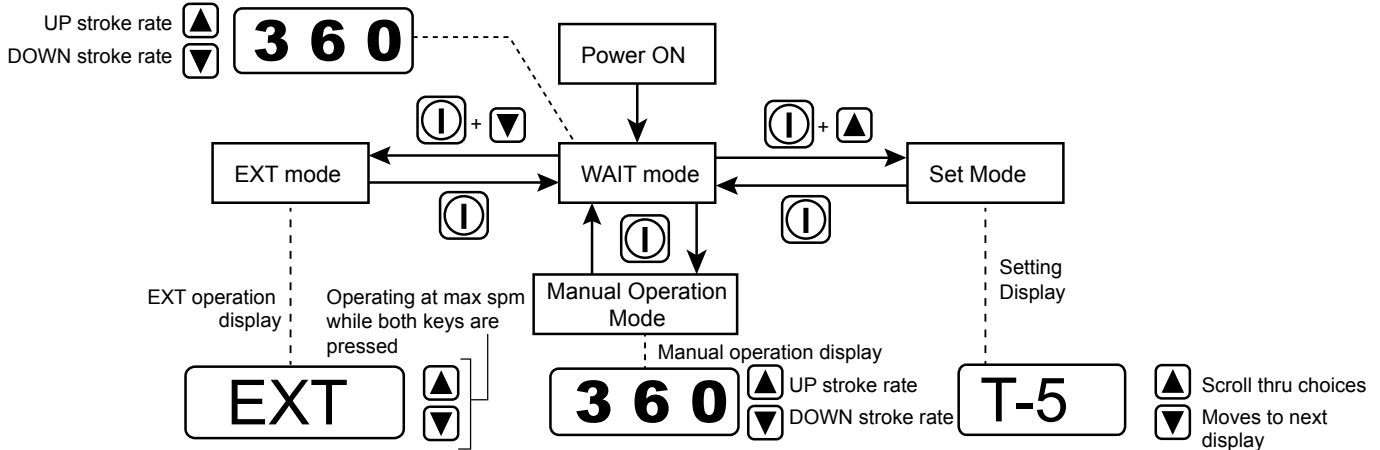
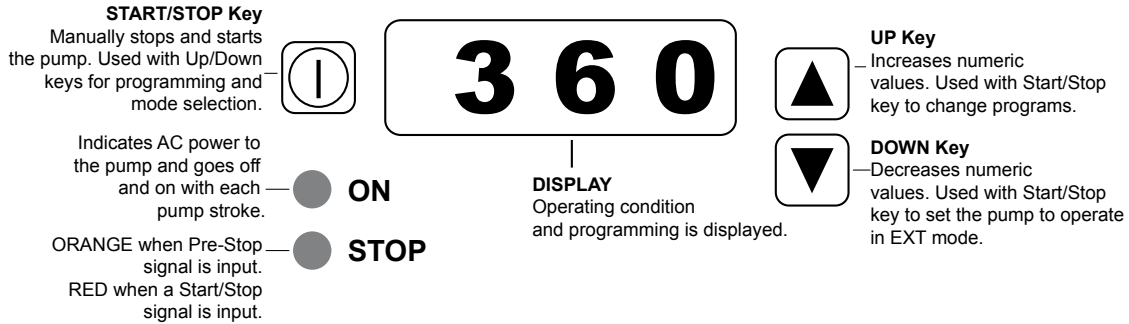
**WARNING Risk of electrical shock!** This pump is supplied with a grounding conductor and grounding-type attachment plug. To reduce the risk of electrical shock, be certain that it is connected only to a properly grounded, grounding type receptacle.

**CAUTION!** The electronics within the pump can be damaged by excessive surges in voltage. Do not install the pump near high-power electrical equipment that generate high surge voltages. Avoid branch circuits that also supply power to heavy or other equipment that could generate electrical interference. If necessary, install a surge suppression device (such as a varistor with a resistance greater than 2000A) or a noise reducing transformer at the pump's power connection.

# 3.0 OPERATION

## 3.1 Pump Operation & Programming

The EK pumps have a digital display, two LED indicators and three pushbutton keys to change the pump speed and programming.



### 3.1.1 Programming

Pressing the stop/start and up keys simultaneously will enter the program mode. The up and down keys scroll through the menus and choices and the stop/start key will exit back to the wait mode.

#### **On-Time Menu**

The first item displayed will be the factory set choice of the External Input On-Time menu (T-5). There are three choices in this menu: T-5, T-20, and T-50 that can be scrolled through by repeatedly pressing the up key. These settings are time in milliseconds and correlate to the required minimum closure time of the external input signal for the pump to recognize it as a true signal. Selecting the smaller T-5 (5 msec) will allow shorter duration pulses to be recognized (typical for Hall Effect input), while the T-50 (50 msec) setting will help to reduce erroneous pulses from noise (as from a reed switch).

#### **Stop Input NO/NC Selection**

Pressing the down key will move from the External Input On-Time menu to the Stop menu and the initial factory setting is M-OFF (input is normally open and contact closure will stop the pump). Pressing the up key will toggle between M-OFF and M-ON. Setting the pump to M-ON means that the pump will be stopped continuously and a contact closure into the stop/start input will now start the pump and the pump will run as long as the contact is made.

Pressing the down key will again move back to the On-Time menu and pressing the stop/start key will go back to the wait mode.

### 3.1.2 Pump Operation

#### **Manual and On/Off Control**

The pumps can be operated manually by pressing the stop/start key from the wait mode. Once pressed, the pump will begin to operate at the stroke rate shown on the display. From here, the up and down keys can be used to change the stroke rate, and the stroke length knob can be adjusted down to further reduce the pump output.

Once adjusted/calibrated to the desired flow rate, the pump can be left in manual mode for on/off control via power (connecting/disconnecting AC power from an external source) or for on/off control via the stop/start input. Pressing the stop/start key will go back to the wait mode.

#### **External Control**

Pressing the stop/start key and the down key simultaneously from the wait mode will set the pump to operate in external mode. In this mode, the pump will operate at a speed correlating to the frequency of digital inputs that it receives (see section 3.2 for wiring inputs). If used, the stop/start input will override the digital input signals.

If at any time in external mode the up and down keys are held down simultaneously, the pump will manually run at 360 SPM as long as the two keys are held down. This feature is useful for priming or the elimination of air trapped in the pump or tubing.

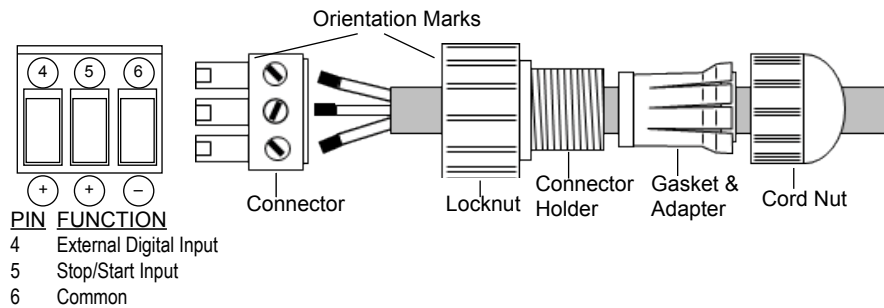
Pressing the stop/start key will disable external control and go back to the wait mode.

## 3.2 External Inputs & Outputs

The EK pumps are capable of being controlled by an external pulse proportional input as well as being controlled by an external stop/start signal. The EK pumps have no outputs

## EK Pumps and the ‘R’ control module

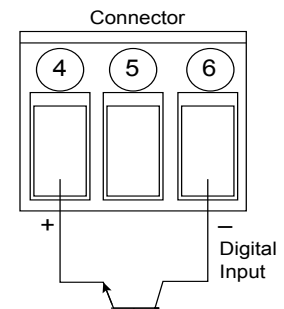
One custom watertight connector is used for the digital input and stop/start connections on the EK pumps. There are no outputs on the EK pumps. The Connector Holder is keyed to fit into the pump only one direction. There is a set of painted alignment marks on the connector and connector holder that identify the correct orientation of the connector. Be sure to double check that the connector is installed properly into the connector assembly before installation onto the pump.



### Digital Control

The external pulse input should not exceed 360 pulses per minute (6Hz) and the pump will output one stroke for every input pulse. The control signal can be a contact closure type switch (reed) with a max load of 1mA or a solid state device. If a solid state device is used, the external circuit should be capable of switching 5VDC at 1.2mA with an active duty cycle pulse width of 5ms to 100ms (actual closure time).

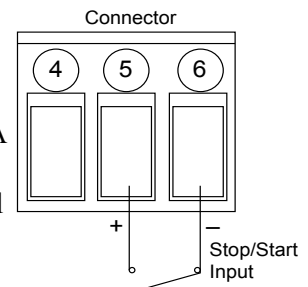
To connect the pulse input from an external device, wire Terminal 4 and Terminal 6 from the contact closure. If using a solid state switching device, wire the connector ensuring that Terminal 4 is positive (+) and Terminal 6 is Common (-).



### Stop/Start Control

An external Stop/Start signal will turn the STOP LED to red and also control the pump. In this mode, AC power is applied continuously, but the pump operation is stopped (or started – see section on programming) by completing the circuit between Terminal 5 and Terminal 6. The Stop/Start signal can be a contact closure type switch (reed) with a max load of 1mA or a solid state device. If a solid state device is used, the external circuit should be capable of switching 5VDC at 1.2mA with an active duty cycle pulse width of 5ms to 100ms (actual closure time).

To connect the Stop/Start input from an external device, wire Terminals 5 and 6 from the contact closure. If using a solid state switching device, wire the connections ensuring that Terminal 5 is positive (+) and Terminal 6 is Common (-).



## 3.3 Adjustment

### EK Pumps using the ‘R’ Control Module

The pump will operate best keeping the stroke length at 100%. If less than full output is required, set the frequency to the approximate percentage of maximum desired.

Example: Model EKC21R1-VC has maximum output of 4.3 GPH.

Desired output is 3.0 GPH.  $3.0 \div 4.3 = 0.7$  or 70%

Using the UP and DOWN arrows, set the frequency of the pump to

$0.7 \times 360 = 252$  SPM.

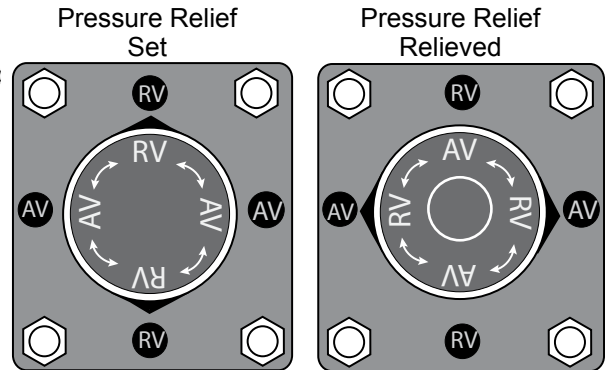
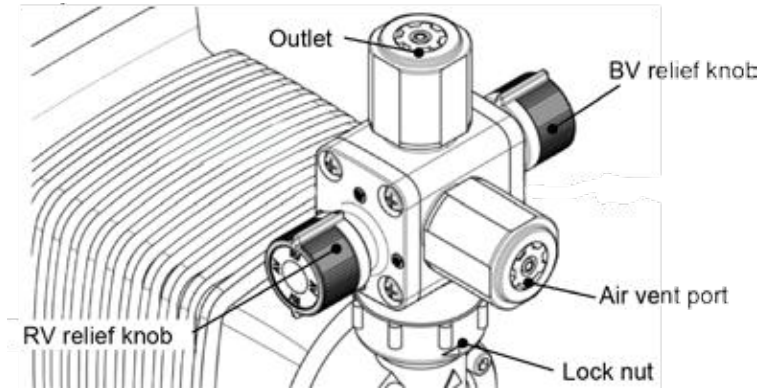
For outputs less than 2% of maximum it will be necessary to also reduce the stroke length. (Minimum recommended stroke length is 20%.) It is good practice to change the frequency first, however, if low flows are required, a balanced turndown of speed and stroke length will yield the best results.

### 3.4 MultiFunction Valve Operation

The MultiFunction Valve is optional on select E-Series pumps and replaces the standard Manual Air Vent Valve when ordered. It integrates the air venting/bleeding functions with a back pressure, anti-siphon, and pressure relief valve.

#### Air Vent / Bleed Function

1. Open the air vent by turning the relief valve knob 90 degrees to the "AV" position.
2. Operate the pump until all of the air is purged and only liquid is discharged from the air vent drain.
3. Turn the relief valve knob back 90 degrees to the "RV" position to set pressure relief.



#### Pressure Relief

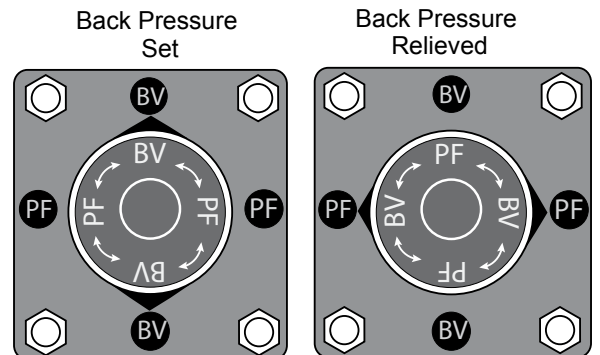
1. In the "RV" position, the diaphragm under the relief valve knob provides a safety relief if the discharge line pressure gets too high.

#### Line Pressure Relief

1. By rotating both the Relief valve knob to "AV" and the back pressure valve knob to "PF", both the discharge line and the pump head pressures are released out the air vent for full line pressure release.

#### Back Pressure / Anti-Siphon Valve

1. A spring-loaded diaphragm under the back pressure knob automatically adds 36PSI (15 PSI for low pressure versions) of back pressure to the discharge side of the pump when the knob is set to the "BP" position.
2. The diaphragm also prevents siphoning of chemical through the pump.



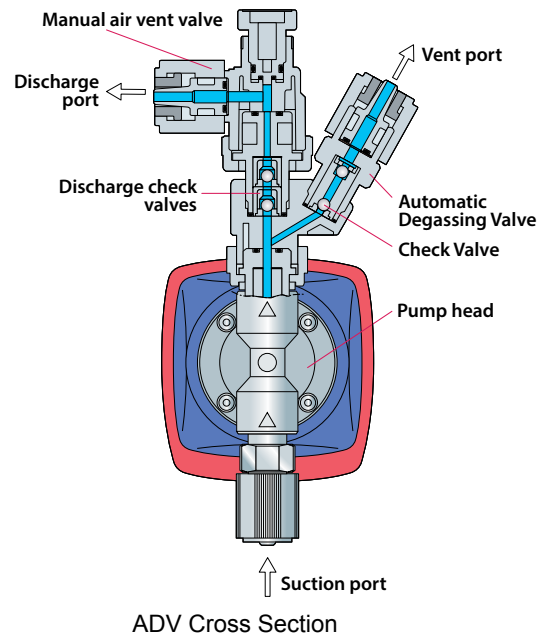
**⚠ CAUTION:** Confirm that liquid is discharged from the air vent drain. If the liquid is not discharged, the pressure may not be released. If this is the case, repeat the Pressure Relief procedure.



### 3.5 Auto Degassing Valve Operation

The Auto Degassing Valve (ADV) is an option on select EK pumps and is added under the standard Manual Air Vent Valve when ordered. It is used primarily in applications where gassing is a problem and pumps can lose prime.

Unlike the Manual Air Vent Valve, the Auto Degassing Valve constantly bleeds a controlled amount of volume out of the “Air” vent. Therefore, the “Air” vent should always be plumbed back to the source tank. During priming, the manual air vent knob does not need to be opened to relieve pressure. The Check Valve assembly in the ADV uses a bottom seat to ensure that air is not introduced into the discharge media and utilizes a second top seat that allows air to be quickly purged but limits the amount of liquid returned to the tank. Moving the pump check valves above the ADV maintains backpressure within the pump head, which helps speed the purging of air.



### 3.6 Priming

Install the pump as described in Section 2.0. With the pump turned on, set stroke length at 100% and frequency to 360 SPM. If the pump is equipped with an air vent valve, open the knob 1/2 turn. Liquid should move up through the suction tubing and into the pump head. When liquid starts running through the vent side tubing, close the air vent knob and continue with output adjustment described below. If the pump has no air vent valve, disconnect the discharge tubing from the injection valve. When liquid enters the discharge tubing at the pump head, stop the pump. Then reconnect the discharge tubing to the injection valve.

If the pump does not self prime, remove the check valve housing on discharge & suction sides to make sure valve cartridges and gaskets are in correct positions (see section 4.2 for correct orientation).

Note: Pumps with FC liquid ends may need assistance if dry priming due to the hard valve seat material.

### 3.7 Calibration

If exact output calibration is required, first prime and adjust the pump as above. Then connect a calibration column to the suction side of the pump. Turn the pump on for one minute and read the amount of liquid pumped from the column. Adjust the frequency up or down as necessary and check the output again. When the desired output is reached, disconnect the calibration column and reconnect the suction tubing. (See Figure 8.) Calibration must be performed with actual application equivalent back pressure for accurate results. Published flow rates are based on maximum pressures. Lower pressures may result in slightly higher flow rates.

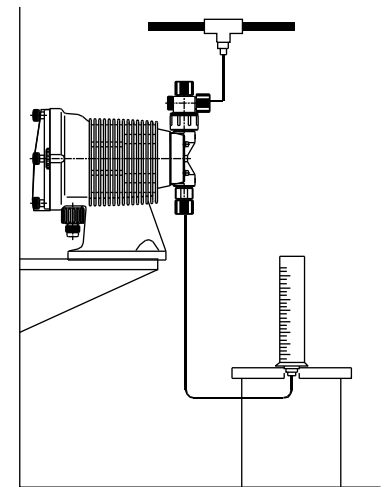


Figure 8 Calibration

### 3.8 AC Power Interruption

If AC power is interrupted, the pump will power up as shown below:

State preceding power OFF	State following power ON
WAIT	WAIT
Run Manual	Run Manual
Run external	Run external

## 4.0 MAINTENANCE



**CAUTION:** Before working on the pump, disconnect the power cord, depressurize the discharge tubing and drain or flush any residual liquid from the pump head and valves. Always wear protective gear when working around chemicals.

### 4.1 Diaphragm Replacement

Disconnect AC power to the pump and disconnect the suction tubing, discharge tubing, and air vent tubing. Remove the four head bolts with a 4mm or 5mm hex wrench. Turn the stroke length knob fully counter-clockwise. Unscrew the diaphragm and remove its retainer (small disk behind the diaphragm).



**CAUTION:** There may be small brass spacers between the retainer and the armature shaft. These spacers need to be reused when replacing the diaphragm.

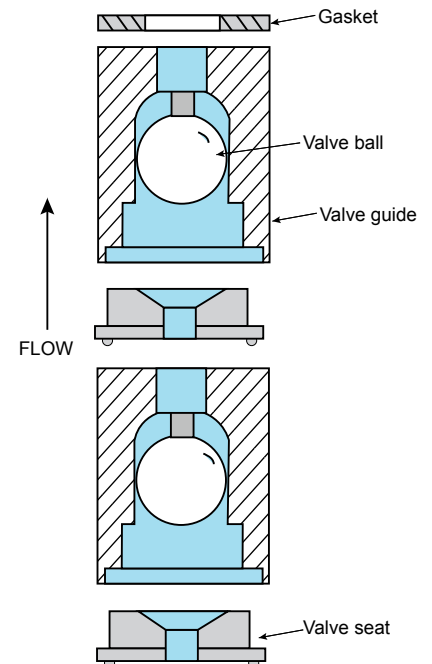
Install the new retainer and diaphragm on the shaft. Turn the diaphragm clockwise until it bottoms on the shaft. Use caution when handling the diaphragm – the PTFE surface can be damaged by tools, nails, or any sharp objects. Replace the pump head and tighten the head bolts to a torque of 19 lb-in (2.16 N-m).

### 4.2 Valve Replacement

Remove the suction and discharge tubing making sure discharge side has been depressurized. Remove the suction fitting, two valve cartridges, o-ring and gasket(s). Install the new o-ring, gasket(s) and valve cartridges. Be sure both valve seats are in the same orientation. Refer to Figure below. Tighten the suction fitting. Similarly remove and replace the discharge valve cartridges, o-ring and gasket(s). For a more detailed drawing, refer to the Section 6.0.



**CAUTION:** There are many small parts in the liquid end. These parts must be installed correctly for proper operation of the pump.



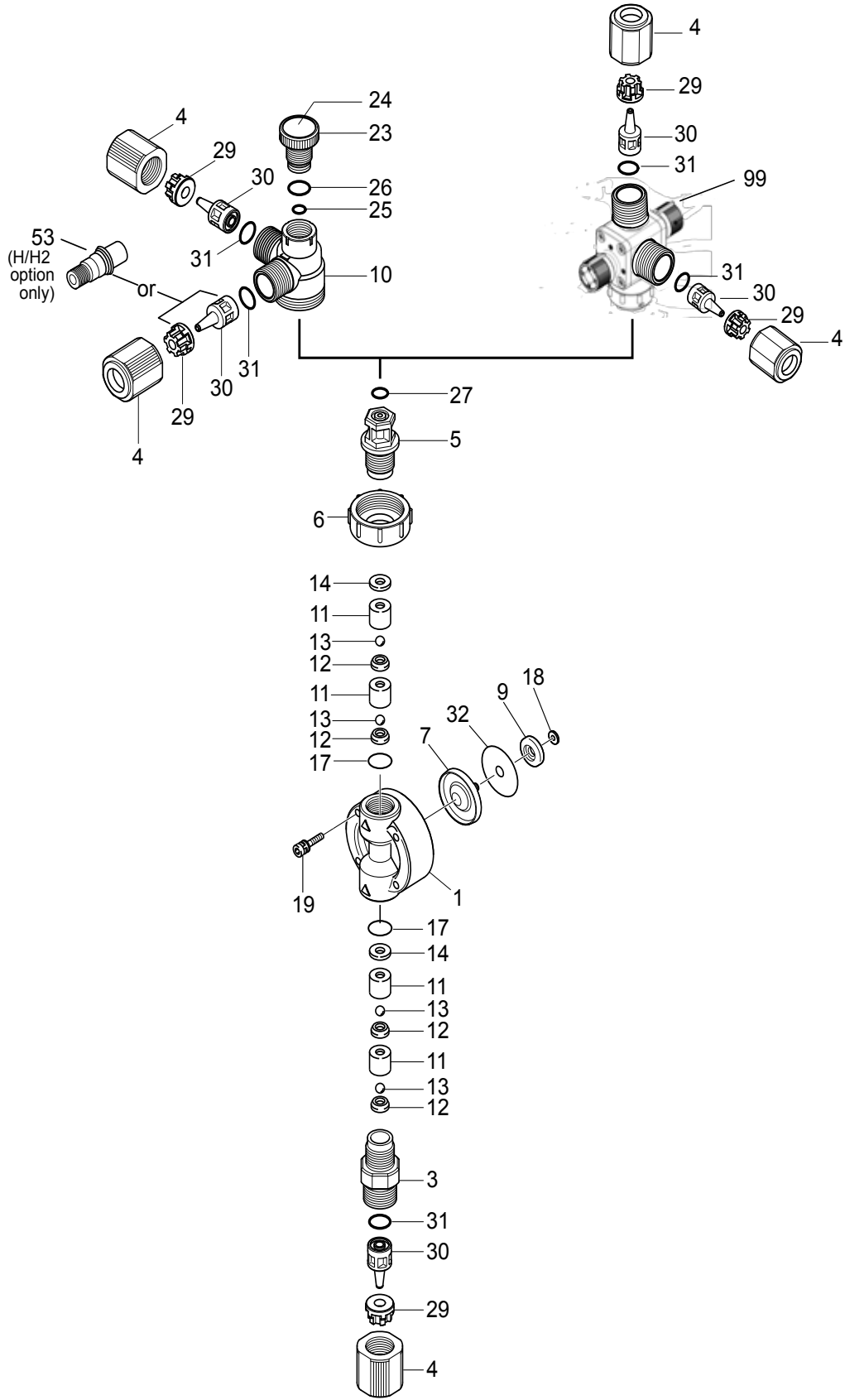
### 4.3 Tubing

Check ends of tubing for splits, cracks, or thin spots. Examine the full length of tubing for damage due to chafing, abrasion, stress cracks, excessive temperature or exposure to ultraviolet light (direct sunlight or mercury vapor lamps). If any signs of deterioration exist, replace the entire length of tubing. It is a good idea to replace discharge tubing on a regular preventive maintenance schedule every 12 months.

# 5.0 EXPLODED VIEW & PARTS GUIDE

## PVC/GFRPP Liquid End Exploded View

For EK pump model sizes 11-36



## EK 11-36 PVC/GFRPP Standard Exploded View & HP/MFV Components

Item	Part#	Description	Qty	Material	Size	Liquid End Material	
<b>1</b>	EH2015	Pump Head	1	PVC	B11	VC, VE, VF	
	EH1950		1	PVC	B16 / C16	VC, VE, VF	
	EH1951		1	PVC	B21 / C21	VC, VE, VF	
	EH1960		1	PVC	B31 / C31	VC, VE, VF	
	EH1953		1	PVC	C36	VC, VE, VF	
	EH2017		1	GFRPP	B11	PC, PA, PE	
	EH1957		1	GFRPP	B16 / C16	PC, PA, PE	
	EH1958		1	GFRPP	B21 / C21	PC, PA, PE	
	EH1961		1	GFRPP	B31 / C31	PC, PA, PE	
	EH1962		1	GFRPP	C36	PC, PA, PE	
	<b>3</b>	EH2328	Housing, Valve (Suction)	1	PVC	B11,16,21 / C16,21	VC, VE, VF
		EH2329		1	PVC	B31 / C31,36	VC, VE, VF
EH2349			1	GFRPP	B11,16,21 / C16,21	PC, PA, PE	
EH2350			1	GFRPP	B31 / C31,36	PC, PA, PE	
<b>4</b>		EH2330	Coupling Nut	3	PVC	B11,16,21,31 / C16,21,31,36	VC, VE, VF
	EH2351		3	GFRPP	B11,16,21,31 / C16,21,31,36	PC, PA, PE	
<b>5</b>	EH2331	Fitting, MAVV	1	PVC	B11,16,21 / C16,21	VC, VE, VF	
	EH2332		1	PVC	B31 / C31,36	VC, VE, VF	
	EH2352		1	GFRPP	B11,16,21 / C16,21	PC, PA, PE	
	EH2353		1	GFRPP	B31 / C31,36	PC, PA, PE	
<b>6</b>	EH2333	Lock Nut, MAVV	1	PVC	B11,16,21,31 / C16,21,31,36	VC, VE, VF	
	EH2354		1	GFRPP	B11,16,21,31 / C16,21,31,36	PC, PA, PE	
<b>*7</b>	EH1971	Diaphragm	1	PTFE+EPDM	B11	ALL	
	EH1972		1	PTFE+EPDM	B16 / C16	ALL	
	EH1973		1	PTFE+EPDM	B21 / C21	ALL	
	EH1974		1	PTFE+EPDM	B31 / C31	ALL	
	EH1975		1	PTFE+EPDM	C36	ALL	
	<b>*9</b>	EH0059	Retainer	1	PPS+GF	B11	ALL
EH0083			1	PPS+GF	B16 / C16	ALL	
EH0067			1	PPS+GF	B21 / C21	ALL	
EH0087			1	PPS+GF	B31 / C31	ALL	
EH0158			1	PPS+GF	C36	ALL	
<b>10</b>		EH2334	Body, MAVV	1	PVC	B11,16,21,31 / C16,21,31,36	VC, VE, VF
	EH2355		1	GFRPP	B11,16,21,31 / C16,21,31,36	PC, PA, PE	
<b>*11</b>	EH0060	Guide, Valve	4	PVC	B11	VC, VE, VF	
	EH0068		4	PVC	B16,21 / C16,21	VC, VE, VF	
	EH0118		4	PVC	B31 / C31,36	VC, VE, VF	
	EH0318		4	GFRPP	B11	PC, PA, PE	
	EH1534		4	GFRPP	B16,21 / C16,21	PC, PA, PE	
	EH0332		4	GFRPP	B31 / C31,36	PC, PA, PE	
	<b>*12</b>	EH0061	Seat, Valve	4	FKMA	B11	VC, PC
EH0069			4	FKMA	B16,21 / C16,21	VC, PC	
EH0119			4	FKMA	B31 / C31,36	VC, PC	
EH0048			4	EPDM	B11	VE, PE, VF	
EH0071			4	EPDM	B16,21 / C16,21	VE, PE, VF	
EH0125			4	EPDM	B31 / C31,36	VE, PE, VF	
EH2415			4	PCTFE	B11	PA	
EH2416			4	PCTFE	B16,21 / C16,21	PA	

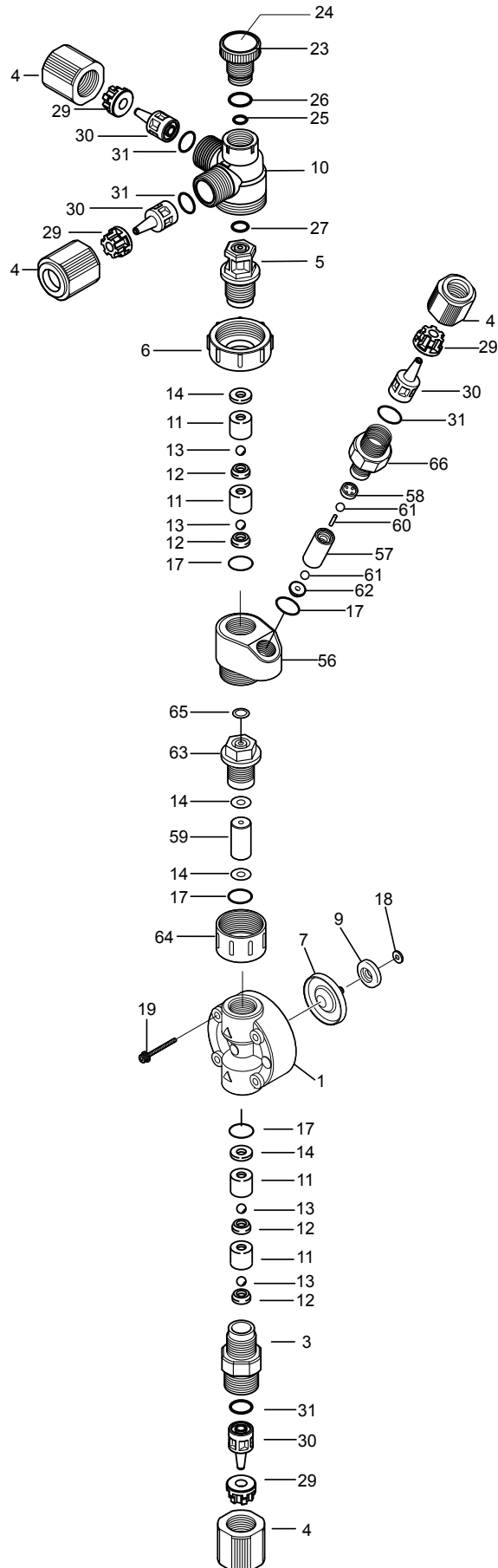
## EK 11-36 PVC/GFRPP Standard Exploded View & HP/MFV Components (continued)

Item	Part#	Description	Qty	Material	Size	Liquid End Material
	EH0593		4	PCTFE	B31 / C31,36	PA
<b>*13</b>	EH0025	Ball, Valve	4	CE	B11	VC, VE, PC, PA, PE
	EH0084		4	CE	B16,21 / C16,21	VC, VE, PC, PA, PE
	EH0120		4	CE	B31 / C31,36	VC, VE, PC, PA, PE
	E00063		4	PTFE	B11	VF
	E00064		4	PTFE	B16, 21 / C16, 21	VF
	E00062		4	PTFE	B31 / C31, 36	VF
<b>*14</b>	EH0026	Gasket, Valve	2	PTFE	B11,16,21 /C16,21	VC, VE, VF
	EH0026		6	PTFE	B11,16,21 /C16,21	PA
	EH0121		2	PTFE	B31 / C31,36	VC, VE, VF, PC, PE
	EH0121		6	PTFE	B31 / C31,36	PA
	EH2178		2	PTFE	B11	PC, PE
	EH0580		2	PTFE	B16,21 / C16,21	PC, PE
<b>*17</b>	EH0027	O-Ring, S14	2	FKMA	B11,16,21 /C16,21	VC, PC
	EH0050		2	EPDM	B11,16,21 /C16,21	VE, VF, PE
	E00179		2	AFLAS	B11,16,21 /C16,21	PA
	EH0122	O-Ring, P16	2	FKMA	B31 / C31,36	VC, PC
	EH0127		2	EPDM	B31 / C31,36	VE, VF, PE
	E00201		2	AFLAS	B31 / C31,36	PA
<b>19</b>	EH1986	Bolt, Hex Soc. w/washers	4	M4X35 316SS	B11,16,21,31 / C16,21,31	ALL
	EH1988		4	M5X35 316SS	C36	ALL
<b>23</b>	EH0299	Knob, MAVV	1	PVC	B11,16,21,31 / C16,21,31,36	VC, VE, VF
	EH0321		1	GFRPP	B11,16,21,31 / C16,21,31,36	PC, PA, PE
<b>24</b>	EH1314	Label, MAVV Knob	1		B11,16,21,31 / C16,21,31,36	ALL
<b>*25</b>	EH0300	O-Ring, P4	1	FKMA	B11,16,21,31 / C16,21,31,36	VC, PC
	EH0301		1	EPDM	B11,16,21,31 / C16,21,31,36	VE, VF, PE
	E00176		1	AFLAS	B11,16,21,31 / C16,21,31,36	PA
<b>*26</b>	EH0302	O-Ring, P10A	1	FKMA	B11,16,21,31 / C16,21,31,36	VC, PC
	EH0303		1	EPDM	B11,16,21,31 / C16,21,31,36	VE, VF, PE
	E00174		1	AFLAS	B11,16,21,31 / C16,21,31,36	PA,
<b>*27</b>	EH2335	O-Ring, P10	1	FKMA	B11,16,21,31 / C16,21,31,36	VC, PC
	EH2336		1	EPDM	B11,16,21,31 / C16,21,31,36	VE, VF, PE
	E00173		1	AFLAS	B11,16,21,31 / C16,21,31,36	PA,
<b>*29</b>	EH2337	Clamp Ring, 3/8" OD	3	PPS+GF	B11,16,21 / C16,21	ALL
	EH2338	Clamp Ring, 1/2" OD	3	PPS+GF	B31 / C31,36	ALL
<b>*30</b>	EH2339	Adapter,Tubing, 3/8"OD	3	PVC	B11,16,21 / C16,21	VC, VE, VF
	EH2356		3	GFRPP	B11,16,21 / C16,21	PC, PA, PE
	EH2340	Adapter, Tubing, 1/2"OD	3	PVC	B31 / C31,36	VC, VE, VF
	EH2357		3	GFRPP	B31 / C31,36	PC, PA, PE
<b>*31</b>	EH2341	O-Ring, P9	3	FKMA	B11,16,21,31 / C16,21,31,36	VC, PC
	EH1585		3	EPDM	B11,16,21,31 / C16,21,31,36	VE, VF, PE
	E00178		3	AFLAS	B11,16,21,31 / C16,21,31,36	PA,
<b>18</b>	-----	Brass Spacers	--	Brass	Drive Specific. Reuse with Dia. change	ALL
<b>99</b>	MFV-HTC-7	Multi-Function Valve	1	PVDF/PTFE/AFLAS	B11,16 / C16,21	xxM
	MFV-MTC-7		1	PVDF/PTFE/AFLAS	B21	xxM
	MFV-MTC-8		1	PVDF/PTFE/AFLAS	C31	xxM
	MFV-LTC-8		1	PVDF/PTFE/AFLAS	B31 / C36	xxM

\* Parts Included in the Spart Parts Kits

# VCA-VEA Liquid End Exploded

For EK pump model sizes 11 thru 21



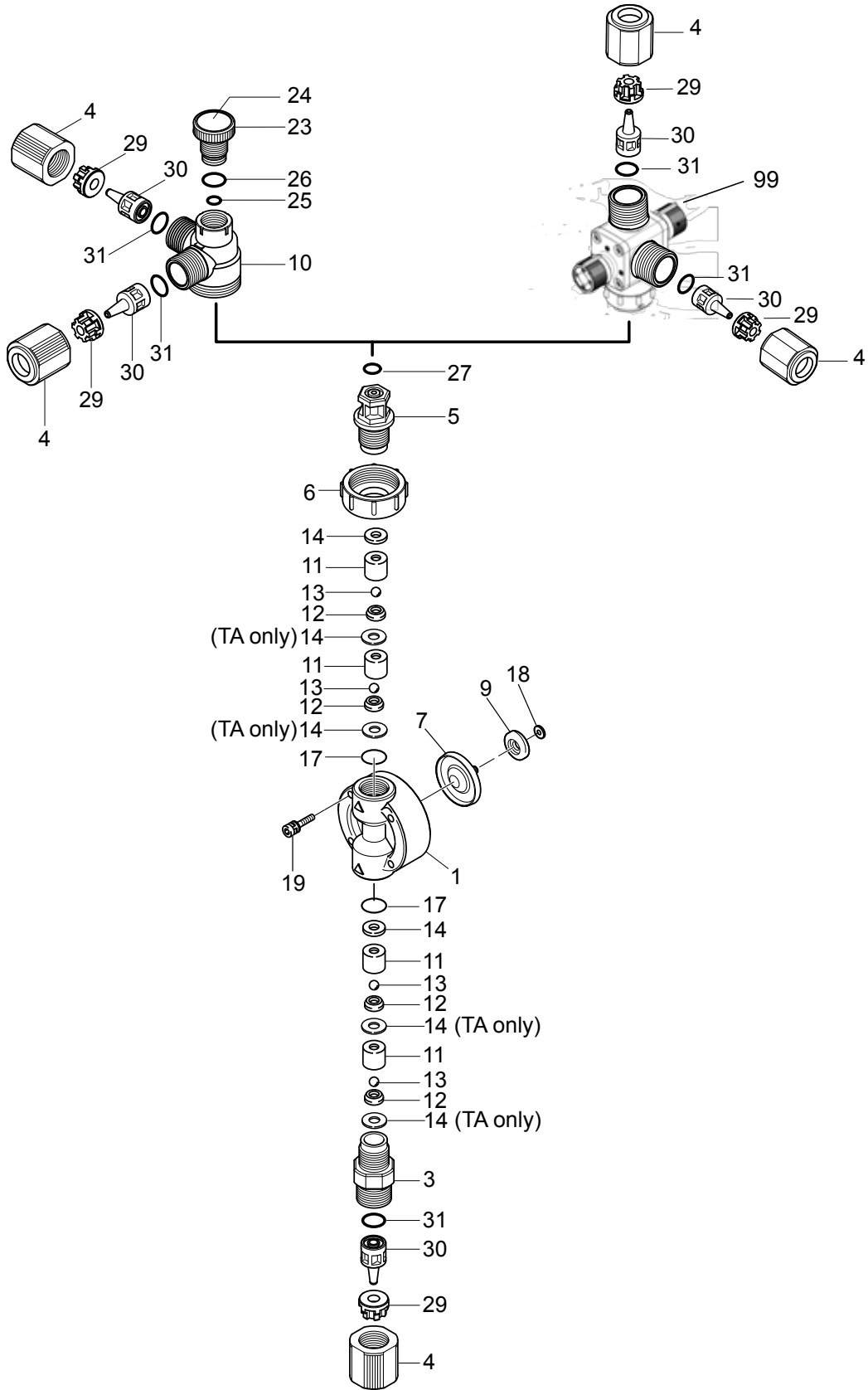
## EK 11-21 VC-A / VE-A/ VC-C / VE-C Components

Item	Part#	Description	Qty	Material	Size	Liquid End Material
<b>1</b>	EH2015	Pump Head	1	PVC	B11	VCA,VEA
	EH1950		1	PVC	B16 / C16	VCA,VEA
	EH1951		1	PVC	B21 / C21	VCA,VEA
<b>3</b>	EH2328	Housing, Valve (Suction)	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>4</b>	EH2330	Coupling Nut	4	PVC	B11,16,21 / C16,21	VCA,VEA
<b>5</b>	EH2331	Fitting, MAVV	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>6</b>	EH2333	Lock Nut, MAVV	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>*7</b>	EH1971	Diaphragm	1	PTFE+EPDM	B11	VCA,VEA
	EH1972		1	PTFE+EPDM	B16 / C16	VCA,VEA
	EH1973		1	PTFE+EPDM	B21 / C21	VCA,VEA
<b>*9</b>	EH0059	Retainer	1	PPS+GF	B11	VCA,VEA
	EH0083		1	PPS+GF	B16 / C16	VCA,VEA
	EH0067		1	PPS+GF	B21 / C21	VCA,VEA
<b>10</b>	EH2334	Body, MAVV	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>*11</b>	EH0060	Guide, Valve	4	PVC	B11	VCA,VEA
	EH0068		4	PVC	B16,21 / C16,21	VCA,VEA
<b>*12</b>	EH0061	Seat, Valve	4	FKMA	B11	VCA
	EH0069		4	FKMA	B16,21 / C16,21	VCA
	EH0048		4	EPDM	B11	VEA
	EH0071		4	EPDM	B16,21 / C16,21	VEA
<b>*13</b>	EH0025	Ball, Valve	4	CE	B11	VCA,VEA
	EH0084		4	CE	B11,16,21 / C16,21	VCA,VEA
<b>*14</b>	EH0026	Gasket, Valve	4	PTFE	B11,16,21 / C16,21	VCA,VEA
<b>*17</b>	EH0027	O-Ring, S14	4	FKMA	B11,16,21 / C16,21	VCA
	EH0050		4	EPDM	B11,16,21 / C16,21	VEA
<b>19</b>	EH1986	Bolt, Hex Soc. w/washers	4	M4X35 316SS	B11,16,21 / C16,21	VCA,VEA
<b>23</b>	EH0299	Knob, MAVV	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>24</b>	EH1314	Label, MAVV Knob	1		B11,16,21 / C16,21	ALL
<b>*25</b>	EH0300	O-Ring, P4	1	FKMA	B11,16,21 / C16,21	VCA
	EH0301		1	EPDM	B11,16,21 / C16,21	VEA
<b>*26</b>	EH0302	O-Ring, P10A	1	FKMA	B11,16,21 / C16,21	VCA
	EH0303		1	EPDM	B11,16,21 / C16,21	VEA
<b>*27</b>	EH2335	O-Ring, P10	1	FKMA	B11,16,21 / C16,21	VCA
	EH2336		1	EPDM	B11,16,21 / C16,21	VEA
<b>*29</b>	EH2337	Clamp Ring, 3/8" OD	4	PPS+GF	B11,16,21 / C16,21	VCA,VEA
<b>*30</b>	EH2339	Adapter,Tubing, 3/8"OD	4	PVC	B11,16,21 / C16,21	VCA,VEA
<b>*31</b>	EH2341	O-Ring, P9	4	FKMA	B11,16,21 / C16,21	VCA
	EH1585		4	EPDM	B11,16,21 / C16,21	VEA
<b>56</b>	EH1682	Body, Auto Degassing Valve	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>*57</b>	EH1684	Guide, Separation Pin, ADV	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>*58</b>	EH1685	Top Disc, Guide, ADV	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>59</b>	EH1683	Spacer, Valve Guides, ADV	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>*60</b>	EH1686	Separation Pin, ADV	1	Titanium	B11,16,21 / C16,21	VCA
	EH1687		1	HC276	B11,16,21 / C16,21	VEA, VCA-H
<b>*61</b>	EH0025	Ball, Valve, ADV	2	CE	B11,16,21 / C16,21	VCA,VEA
<b>*62</b>	EH0061	Seat, Valve, ADV	1	FKMA	B11,16,21 / C16,21	VCA
	EH0048		1	EPDM	B11,16,21 / C16,21	VEA
<b>63</b>	EH0294	Fitting, ADV	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>64</b>	EH0295	Lock Nut, ADV	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>*65</b>	EH0304	O-Ring, P7	1	FKMA	B11,16,21 / C16,21	VCA
	EH0305		1	EPDM	B11,16,21 / C16,21	VEA
<b>66</b>	EWN0157	Housing, Valve, ADV	1	PVC	B11,16,21 / C16,21	VCA,VEA
<b>18</b>	-----	Brass Spacers	--	Brass	Drive Specific. Reuse with Dia. change	ALL

\* Parts Included in the Spart Parts Kits

# TC Liquid End Exploded

For EK pump model sizes 11-36





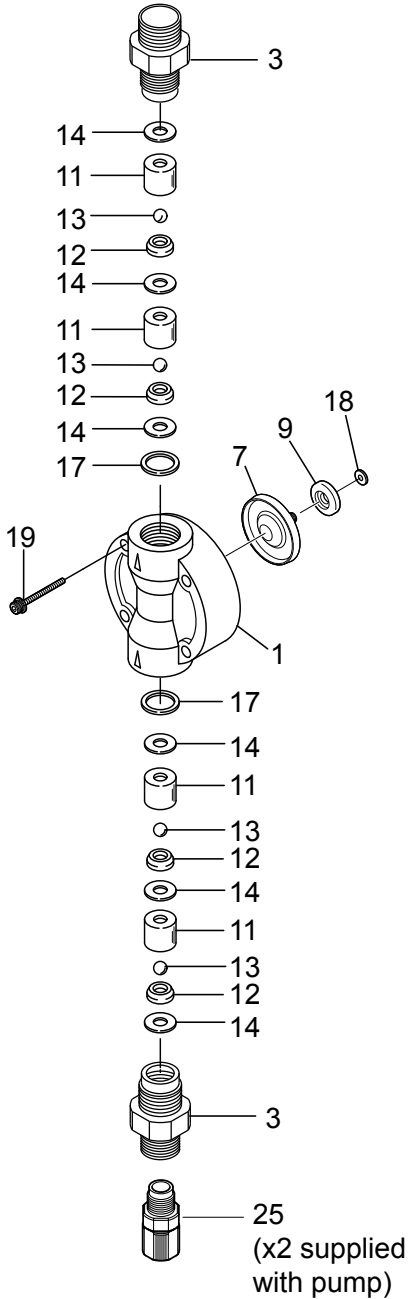
## EK11-36 TC/TA Components

Item	Part#	Description	Qty	Material	Size	Liquid End Material
<b>1</b>	EH2410	Pump Head	1	PVDF	B11	TC, TA
	EH2411		1	PVDF	B16 / C16	TC, TA
	EH2412		1	PVDF	B21 / C21	TC, TA
	EH1966		1	PVDF	B31 / C31	TC, TA
	EH1967		1	PVDF	C36	TC, TA
<b>3</b>	EH2359	Housing, Valve (Suction)	1	PVDF	B11,16,21 / C16,21	TC, TA
	EH2360		1	PVDF	B31 / C31,36	TC, TA
<b>4</b>	EH2363	Coupling Nut	3	PVDF	B11,16,21 /C16,21,31,36	TC,TA
	<b>5</b>	Fitting, MAVV	1	PVDF	B11,16,21 /C16,21	TC,TA
1			PVDF	B31 / C31,36	TC,TA	
<b>6</b>	EH2366	Lock Nut, MAVV	1	PVDF	B11,16,21,31 /C16,21,31,36	TC,TA
<b>*7</b>	EH1971	Diaphragm	1	PTFE+EPDM	B11	ALL
	EH1972		1	PTFE+EPDM	B16 / C16	ALL
	EH1973		1	PTFE+EPDM	B21 / C21	ALL
	EH1974		1	PTFE+EPDM	B31 / C31	ALL
	EH1975		1	PTFE+EPDM	C36	ALL
<b>*9</b>	EH0059	Retainer	1	PPS+GF	B11	TC,TA
	EH0083		1	PPS+GF	B16 / C16	TC,TA
	EH0067		1	PPS+GF	B21 / C21	TC,TA
	EH0087		1	PPS+GF	B31 / C31	TC,TA
	EH0158		1	PPS+GF	C36	TC,TA
<b>10</b>	EH2367	Body, MAVV	1	PVDF	B11,16,21 /C16,21,31,36	TC,TA
<b>*11</b>	EH2413	Guide, Valve	4	PVDF	B11	TC,TA
	EH2414		4	PVDF	B16,21 /C16,21	TC,TA
	EH2368		4	PVDF	B31 / C31,36	TC,TA
<b>*12</b>	EH0061	Seat, Valve	4	FKMA	B11	TC
	EH0069		4	FKMA	B16,21 / C16,21	TC
	EH0119		4	FKMA	B31 / C31,36	TC
	EH2415		4	PCTFE	B11	TA
	EH2416		4	PCTFE	B16,21 / C16,21	TA
	EH0593		4	PCTFE	B31 / C31,36	TA
	<b>*13</b>		EH0025	Ball, Valve	4	CE
EH0084		4	CE		B16,21 / C16,21	TC,TA
EH0120		4	CE		B31 / C31,36	TC,TA
<b>*14</b>	EH1553	Gasket, Valve	2	PTFE	B11,16,21 / C16,21	TC
	EH0354		2	PTFE	B31 / C31,36	TC
	EH0342		6	PTFE	B11,16,21 / C16,21	TA
	EH0354		6	PTFE	B31 / C31	TA
	EH0121		6	PTFE	C36	TA
<b>*17</b>	EH0027	O-Ring, S14	2	FKMA	B11,16,21 /C16,21	TC
	E00179		2	AFLAS	B11,16,21 /C16,21	TA
<b>*17</b>	EH0122	O-Ring, P16	2	FKMA	B31 / C31,36	TC
	E00201		2	AFLAS	B31 / C31,36	TA
<b>19</b>	EH1986	Bolt, Hex Soc. w/washers	4	M4X35 SUS	B11,16,21,31 / C16,21,31	TC,TA
	EH1988		4	M5X35 SUS	C36	TC,TA
<b>23</b>	EH1049	Knob, MAVV	1	PVDF	B11,16,21,31 / C16,21,31,36	TC,TA
<b>24</b>	EH1314	Label, MAVV Knob	1		B11,16,21,31 / C16,21,31,36	ALL
<b>*25</b>	EH0300	O-Ring, P4	1	FKMA	B11,16,21,31 / C16,21,31,36	TC
	E00176		1	AFLAS	B11,16,21,31 / C16,21,31,36	TA
<b>*26</b>	EH0302	O-Ring, P10A	1	FKMA	B11,16,21,31 / C16,21,31,36	TC
	E00174		1	AFLAS	B11,16,21,31 / C16,21,31,36	TA
<b>*27</b>	EH2335	O-Ring, P10	1	FKMA	B11,16,21,31 / C16,21,31,36	TC
	E00173		1	AFLAS	B11,16,21,31 / C16,21,31,36	TA
<b>*29</b>	EH2337	Clamp Ring, 3/8" OD	3	PPS+GF	B11,16,21 / C16,21	TC,TA
	EH2338	Clamp Ring, 1/2" OD	3	PPS+GF	B31 / C31,36	TC,TA
<b>*30</b>	EH2369	Adapter, Tubing, 3/8"OD	3	PVDF	B11,16,21 / C16,21	TC,TA
	EH2370	Adapter, Tubing, 1/2"OD	3	PVDF	B31 / C31,36	TC,TA
<b>*31</b>	EH2341	O-Ring, P9	3	FKMA	B11,16,21,31 / C16,21,31,36	TC
	E00178		3	AFLAS	B11,16,21,31 / C16,21,31,36	TA
<b>18</b>	-----	Brass Spacers	--	Brass	Drive Specific. Reuse with Dia. change	ALL
<b>99</b>	MFV-HTC-7	Multi-Function Valve	1	PVDF/PTFE/AFLAS	B11,16 / C16,21	xxM
	MFV-MTC-7		1	PVDF/PTFE/AFLAS	B21	xxM
	MFV-MTC-8		1	PVDF/PTFE/AFLAS	C31	xxM
	MFV-LTC-8		1	PVDF/PTFE/AFLAS	B31 / C36	xxM

\* Parts Included in the Spart Parts Kits

# EK 11-36 FC Exploded View

## Components

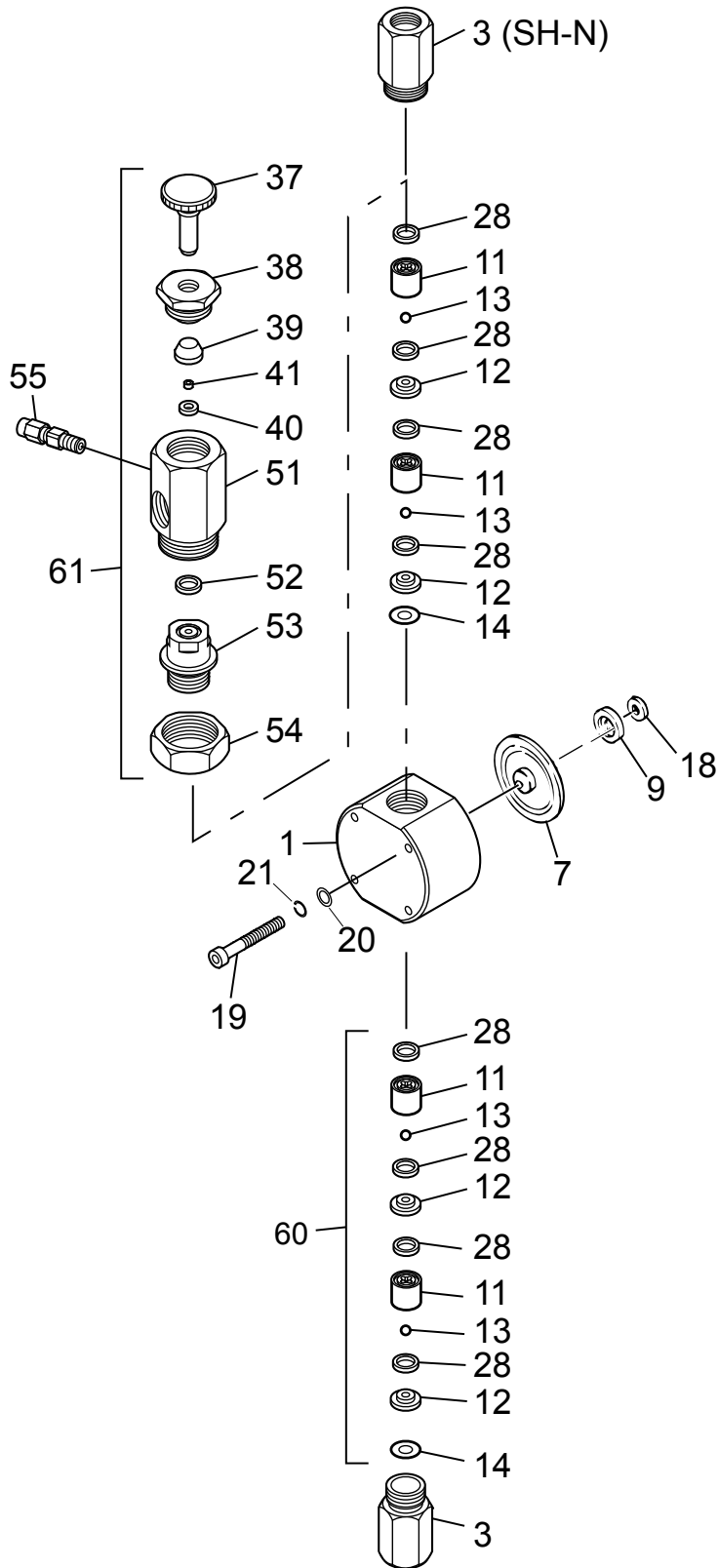


Item	Part#	Description	Qty	Material	Size	Liquid End Material
<b>1</b>	EH2410	Pump Head	1	PVDF	B11	FC
	EH2411		1	PVDF	B16 / C16	FC
	EH2412		1	PVDF	B21 / C21	FC
	EH1966		1	PVDF	B31 / C31	FC
	EH1967		1	PVDF	C36	FC
<b>3</b>	EH2361	Housing, Valve	2	PVDF	B11,16,21 / C16,21	FC
	EH2362		2	PVDF	B31 / C31,36	FC
<b>*7</b>	EH1971	Diaphragm	1	PTFE+EPDM	B11	FC
	EH1972		1	PTFE+EPDM	B16 / C16	FC
	EH1973		1	PTFE+EPDM	B21 / C21	FC
	EH1974		1	PTFE+EPDM	B31 / C31	FC
	EH1975		1	PTFE+EPDM	C36	FC
<b>*9</b>	EH0059	Retainer	1	PPS+GF	B11	FC
	EH0083		1	PPS+GF	B16 / C16	FC
	EH0067		1	PPS+GF	B21 / C21	FC
	EH0087		1	PPS+GF	B31 / C31	FC
	EH0158		1	PPS+GF	C36	FC
<b>*11</b>	EH2413	Guide, Valve	4	PVDF	B11	FC
	EH2414		4	PVDF	B16,21 / C16,21	FC
	EH0352		4	PVDF	B31 / C31,36	FC
<b>*12</b>	EH2415	Seat, Valve	4	PCTFE	B11	FC
	EH2416		4	PCTFE	B16,21 / C16,21	FC
	EH1722		4	PCTFE	B31 / C31,36	FC
<b>*13</b>	EH0025	Ball, Valve	4	CE	B11	FC
	EH0084		4	CE	B16,21 / C16,21	FC
	EH0120		4	CE	B31 / C31,36	FC
<b>*14</b>	EH0354	Gasket, Valve	6	PTFE	B31 / C31,36	FC
	EH0342		6	PTFE	B11,16,21 / C16,21	FC
<b>*17</b>	EH0591	Gasket, Valve Housing	2	PTFE	B11,16,21 / C16,21	FC
	EH0613		2	PTFE	B31 / C31,36	FC
<b>19</b>	EH1986	Bolt, Hex Soc. w/washers	4	M4X35 316SS	B11,16,21,31 / C16,21,31	FC
	EH1988		4	M5X35 316SS	C36	FC
<b>25</b>	E00260	Fitting, 3/8"Tube x 1/4"MPT	2	PVDF	B11,16,21 / C16,21	FC
	E00261	Fitting, 1/2"Tube x 1/4"MPT	2	PVDF	B31 / C31,36	FC
<b>18</b>	-----	Brass Spacers	--	Brass	Drive Specific. Reuse with Dia. change	ALL

\* Parts Included in the Spart Parts Kits

# SH Liquid End Exploded View

For all EK pump models



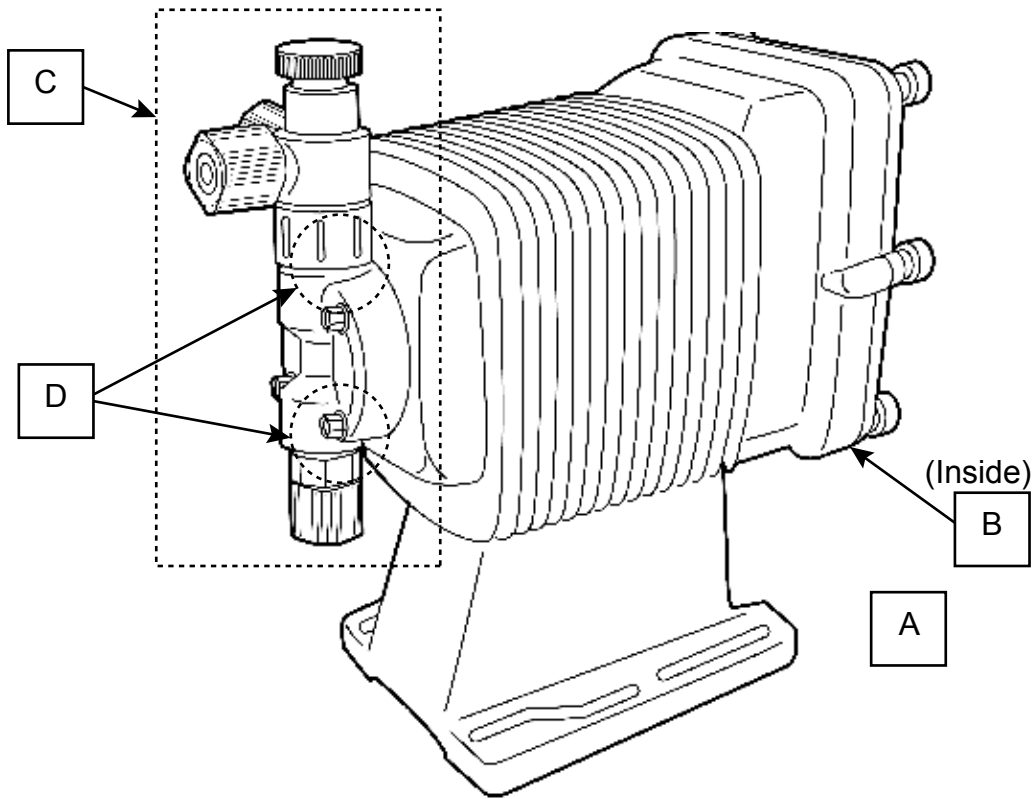
## EK 11-36 SH/SH-N Components

Item	Part#	Description	Qty	Material	Size	Liquid End Material
<b>1</b>	EH2021	Pump Head	1	316SS	B11	SH, SH-N
	EH2176		1	316SS	B16 / C16	SH, SH-N
	EH2022		1	316SS	B21 / C21	SH, SH-N
	EH2023		1	316SS	B31 / C31	SH, SH-N
	EH2024		1	316SS	C36	SH, SH-N
<b>3</b>	EH0429	Housing, Valve	1	316SS	B11,16,21 / C16,21	SH
	EH0429		2	316SS	B11,16,21 / C16,21	SH-N
	EH0433		1	316SS	B31 / C31,36	SH
	EH0433		2	316SS	B31 / C31,36	SH-N
<b>*7</b>	EH1971	Diaphragm	1	PTFE+EPDM	B11	SH, SH-N
	EH1972		1	PTFE+EPDM	B16 / C16	SH, SH-N
	EH1973		1	PTFE+EPDM	B21 / C21	SH, SH-N
	EH1974		1	PTFE+EPDM	B31 / C31	SH, SH-N
	EH1975		1	PTFE+EPDM	C36	SH, SH-N
<b>*9</b>	EH0059	Retainer	1	PPS+GF	B11	SH, SH-N
	EH0083		1	PPS+GF	B16 / C16	SH, SH-N
	EH0067		1	PPS+GF	B21 / C21	SH, SH-N
	EH0087		1	PPS+GF	B31 / C31	SH, SH-N
	EH0158		1	PPS+GF	C36	SH, SH-N
<b>11</b>	EH0360	Guide, Valve	4	316SS	B11	SH, SH-N
	EH1551		4	316SS	B16,21 / C16,21	SH, SH-N
	EH1552		4	316SS	B31 / C31,36	SH, SH-N
<b>12</b>	EH1554	Seat, Valve	4	316SS	B11 /	SH, SH-N
	EH1555		4	316SS	B16,21 / C16,21	SH, SH-N
	EH1556		4	316SS	B31 / C31,36	SH, SH-N
<b>13</b>	EH0049	Ball, Valve	4	HC	B11 /	SH, SH-N
	EH0072		4	HC	B16,21 / C16,21	SH, SH-N
	EH0126		4	HC	B31 / C31,36	SH, SH-N
<b>*14</b>	EH0362	Gasket, Valve Housing	2	PTFE	B11,16,21 / C16,21	SH, SH-N
	EH0380		2	PTFE	B31 / C31,36	SH, SH-N
<b>19</b>	EH2089	Bolt, Hex Socket	4	M4x45	B11,16,21,31 / C16,21	SH, SH-N
	EH2090		4	M5x45	C-31,36	SH, SH-N
<b>20</b>	EH1999	Washer, Plate, M4	4	316SS	B11,16,21,31 / C16,21	SH, SH-N
	EH2011	Washer, Plate, M5	4	316SS	C-31,36	SH, SH-N
<b>21</b>	EH2000	Washer, Split, M4	4	316SS	B11,16,21,31 / C16,21	SH, SH-N
	EH2012	Washer, Split, M5	4	316SS	C-31,36	SH, SH-N
<b>*28</b>	EH0365	Gasket, Valve	8	PTFE	B11,16,21 / C16,21	SH, SH-N
	EH0382		8	PTFE	B31 / C31,36	SH, SH-N
<b>37</b>	EH1014	Knob, MAVV	1	316SS	B11,16,21,31 / C16,21,31,36	SH
<b>38</b>	EH1015	Nut, Knob, MAVV	1	316SS	B11,16,21,31 / C16,21,31,36	SH
<b>*39</b>	EH1016	Seal Ring, MAVV	1	PTFE	B11,16,21,31 / C16,21,31,36	SH
<b>*40</b>	EH1017	Seat, MAVV	1	PTFE	B11,16,21,31 / C16,21,31,36	SH
<b>*41</b>	EH1018	Seat Ring, MAVV	1	316SS	B11,16,21,31 / C16,21,31,36	SH
<b>51</b>	EH1508	Body, MAVV	1	316SS	B11,16,21 / C16,21	SH
	EH1510		1	316SS	B31 / C31,36	SH
<b>*52</b>	EH0365	Valve gasket	1	PTFE	B11,16,21,31 / C16,21,31,36	SH
<b>53</b>	EH1557	Fitting, MAVV	1	316SS	B11,16,21 / C16,21	SH
	EH1558		1	316SS	B31 / C31,36	SH
<b>54</b>	EH1559	Lock Nut, MAVV	1	316SS	B11,16,21,31 / C16,21,31,36	SH
<b>55</b>	EH1517	Connector, 1/4"Tx1/8"RC	1	ECTFE	B11,16,21,31 / C16,21,31,36	SH
<b>18</b>	-----	Brass Spacers	--	Brass	Drive Specific. Reuse with Dia. change	ALL

\* Parts Included in the Spart Parts Kits

## Accessories (Not Shown)

Part#	Description	Size	Liquid End Material
E90665	Connector Assy, EK pump, Input	EK	all
CAN-1VC-7	Valve, Injection 3/8	11, 16, 21	VC
CAN-1VE-7	Valve, Injection 3/8	11, 16, 21	VE, VF
CAN-1PA-7	Valve, Injection 3/8	11, 16, 21	PA
CAN-1PC-7	Valve, Injection, 3/8	11, 16, 21	PC
CAN-1PE-7	Valve, Injection, 3/8	11, 16, 21	PE
CAN-2VCL-8	Valve, Injection, 1/2	31, 36	VC
CAN-2VEL-8	Valve, Injection, 1/2	31, 36	VE, VF
CAN-2PAL-8	Valve, Injection, 1/2	31, 36	PA
CAN-2PCL-8	Valve, Injection, 1/2	31, 36	PC
CAN-2PEL-8	Valve, Injection, 1/2	31, 36	PE
E90238	Valve, Injection, 3/8	11, 16, 21	TC
E90020	Valve, Inj/Back Press, 3/8	11, 16, 21	FC
E90022	Valve, Inj/Back Press, 1/2	31, 36	TC, FC
E90013	Valve, Foot, 3/8	11, 16, 21	VC
E90015	Valve, Foot, 3/8	11, 16, 21	PC
E90016	Valve, Foot, 1/2	31, 36	VC
E90018	Valve, Foot, 1/2	31, 36	PC
E90034	Valve, Foot, 3/8	11, 16, 21	PE
E90035	Valve, Foot, 3/8	11, 16, 21	VE
E90036	Valve, Foot, 1/2	31, 36	PE
E90037	Valve, Foot, 1/2	31, 36	VE
E90193	Valve, Foot, 1/2	31, 36	VF
E90234	Valve, Foot, 3/8	11, 16, 21	VF
E90239	Valve, Foot, 1/2	31, 36	TC
E90240	Valve, Foot, 3/8	11, 16, 21	TC
E90241	Valve, Foot, 3/8	11, 16, 21	FC
E90275	Valve, Foot, 1/2	31, 36	FC
E90919	Valve, Foot, 3/8	11, 16, 21	PA
E90961	Valve, Foot, 1/2	31, 36	PA
E00001	Tubing, 1/2 OD LLDPE, 20 FT	31, 36	all
E00001-50	Tubing, 1/2 OD LLDPE, 50 FT	31, 36	all
E00001-100	Tubing, 1/2 OD LLDPE, 100 FT	31, 36	all
E00001-500	Tubing, 1/2 OD LLDPE, 500 FT	31, 36	all
E00002	Tubing, 3/8 OD LLDPE, 20 FT	11, 16, 21	all
E00002-50	Tubing, 3/8 OD LLDPE, 50 FT	11, 16, 21	all
E00002-100	Tubing, 3/8 OD LLDPE, 100 FT	11, 16, 21	all
E00002-500	Tubing, 3/8 OD LLDPE, 500 FT	11, 16, 21	all
E00074-20	Tubing, 1/2 OD LLDPE, UV Resistant, 20 FT	31, 36	all
E00074-50	Tubing, 1/2 OD LLDPE, UV Resistant, 50 FT	31, 36	all
E00074-100	Tubing, 1/2 OD LLDPE, UV Resistant, 100 FT	31, 36	all
E00074-500	Tubing, 1/2 OD LLDPE, UV Resistant, 500 FT	31, 36	all
E00075-20	Tubing, 3/8 OD LLDPE, UV Resistant, 20 FT	11, 16, 21	all
E00075-50	Tubing, 3/8 OD LLDPE, UV Resistant, 50 FT	11, 16, 21	all
E00075-100	Tubing, 3/8 OD LLDPE, UV Resistant, 100 FT	11, 16, 21	all
E00075-500	Tubing, 3/8 OD LLDPE, UV Resistant, 500 FT	11, 16, 21	all
E00071	Weight, Ceramic	all	all



- A Drive Unit
- B Control Module
- C Head Assembly
- D Valve Cartridge

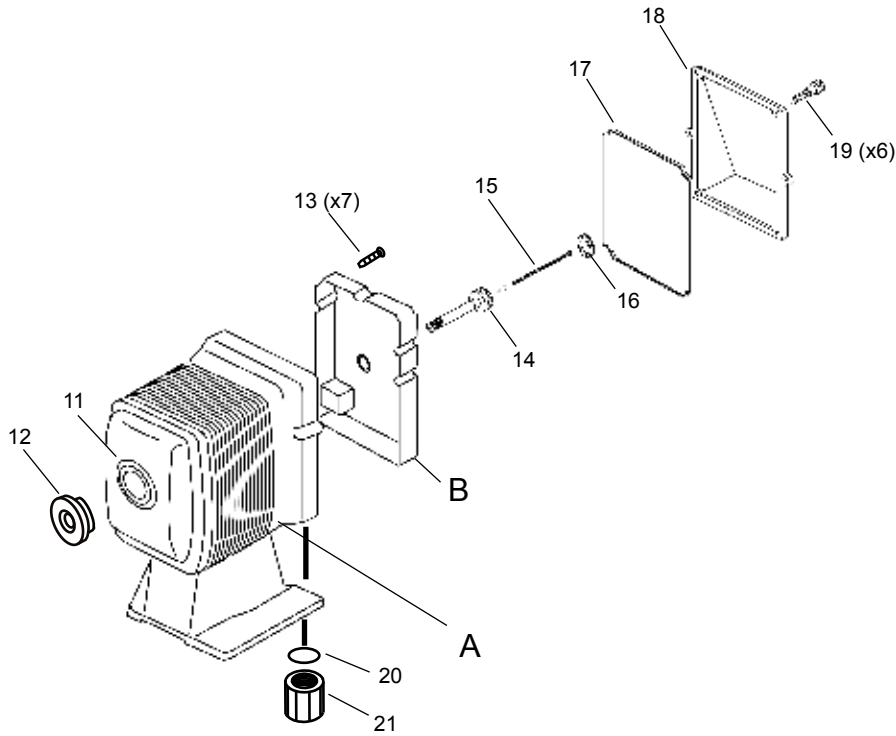
Pump Model	A + B		C Head Assembly * (Spare Parts Kit)								
	Drive Unit	Control Module	PC	PE	PA	VC	VE	VF	TC	TA	FC
EKB11R1-	KB11-R1						N11□				
EKB11R2-	KB11-R2						(N11□-PK)				
EKB16R1-	KB16-R1						N16□				
EKB16R2-	KB16-R2						(N16□-PK)				
EKB21R1-	KB21-R1						N21□				
EKB21R2-	KB21-R2						(N21□-PK)				
EKB31R1-	KB31-R1						N31□				
EKB31R2-	KB31-R2						(N31□-PK)				
EKC16R1-	KC16-R1						N16□				
EKC16R2-	KC16-R2						(N16□-PK)				
EKC21R1-	KC21-R1						N21□				
EKC21R2-	KC21-R2						(N21□-PK)				
EKC31R1-	KC31-R1						N31□				
EKC31R2-	KC31-R2						(N31P□-PK)				
EKC36R1-	KC36-R1						N36□				
EKC36R2-	KC36-R2						(N36□-PK)				
			PC	PE	PA	VC	VE	VF	TC	FC	
<b>D</b> Valve Cartridge	11	E90041	E90042	E91232	E90038	E90039	E90302	E90305	E90044		
	16, 21	E90048	E90049	191231	E90045	E90046	E90303	E90306	E90051		
	31, 36	E90055	E90056	---	E90052	E90053	E90304	---	---		
<b>E</b> Automatic Air Vent Valve	11, 16, 21	---	---	---	ADV-V□-7		---	---	---		
<b>F</b> Multi- Function Valve Assembly	11, 16, 21	MFV-HTC-7 (B11/16, C16/21) / MFV-MTC-7 (B21)									
	31, 36	MFV-MTC-8 (C31) / MFV-LTC-8 (B31/C36)									

Notes: \* The P/N in the block is the head assembly part number and the spare parts kit is shown underneath in parentheses. For head assemblies with a Multifunction Valve, add an "M" to the end of the part number.

Parts kits for pumps with Multifunction valves are the same as pumps without the "M" option. (Parts kits for MFVs available separately)

For head assemblies or parts kits with the Auto Degassing Valve, add "A" after the "VC" or "VE" code in the number.

## Drive and Control Module Exploded View



A Drive Unit  
 B Control Module

Part Numbers for these assemblies are on Page 28

Item	Part No.	Description	Series
11	EH1573	Gasket, Pump Head, EW/EK 11-21	EK
	EH1574	Gasket, Pump Head, EW/EK 31	EK
	EH1575	Gasket, Pump Head, EW/EK 36	EK
12	EH1690	Spacer, Bracket, EW/EK/EZ-11	EK
	EH1431	Spacer, Bracket, EW/EK/EZ-16	EK
	EH1700	Spacer, Bracket, EW/EK/EZ-21	EK
13	EH1410	Screw, M4 N 10, SS PFH, Black	EK
14	EH1375	Knob, Stroke length, EK-B	EK-B
	EH1584	Knob, Stroke length, EK-C	EK-C
15	EH1376	Screw, SL Knob, EK-B, M4 x 95	EK-B
	EH1586	Screw, SL Knob, EK-C, M4 x 75	EK-C
16	EH0141	Cap, Stroke length Adjustment Knob	EK
17	EH1372	Gasket, Cover, EK Controller, EPDM	EK
18	E90633	Cover Asm, EK Control Unit, (no bolts, w/gasket)	EK
	E90634	Cover Asm, EK Control Unit, (w/bolts & gasket)	EK
19	EH1374	Thumb Bolt, Captive, EK Cover	EK
20	EH1567	Gasket, Locknut, EK Input	EK



## 6.0 TROUBLESHOOTING

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**CAUTION:** Before working on the pump, disconnect the power cord, depressurize the discharge tubing and drain or flush any residual liquid from the pump head and valves, using proper chemical handling techniques.

<b>Problem</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
<b>Pump does not start</b>	Faulty wiring	Correct wiring
	Improper voltage	Connect to proper voltage source
	Electronic control unit is damaged	Replace control unit (Contact distributor or factory)
<b>Pump does not prime</b>	Air in suction tubing	Reroute suction tubing to eliminate air trap
	Valve gasket is not installed	Install valve gasket
	Valve set assembly direction is wrong.	Reassemble valve set
	Pump is air locked	Open air vent valve
	Suction or discharge valve is clogged with foreign matter	Disassemble, inspect, clean
	Ball stuck to valve seat	Disassemble, inspect, clean
<b>Output fluctuates</b>	Suction or discharge valve is clogged with foreign matter	Disassemble, inspect, clean
	Air is trapped in pump	Open air vent valve
	Overfeeding	Install injection valve or back pressure valve
	Diaphragm is damaged	Replace diaphragm
<b>Liquid leaks</b>	Fitting or coupling nut is loose	Re-install (see section 2.3/2.4)
	Pump head is loose	Tighten pump head bolts Torque: 19 lb-in (2.16 N-m)
	Diaphragm is damaged	Replace diaphragm
	O-ring or valve gasket missing	Install o-ring or valve gasket

## 7.0 SERVICE POLICY

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The EK Series electronic metering pumps have a 2-year limited warranty. Contact your Walchem distributor for service.