

**CHEM-AD™ SERIES A  
DIAPHRAGM  
METERING PUMP**

BOOK NO. IM 440.600AA UA ISSUE A

# CHEM-AD™ SERIES A

EQUIPMENT SERIAL NO. \_\_\_\_\_

DATE OF START-UP \_\_\_\_\_

START-UP BY \_\_\_\_\_

Prompt service available from nationwide authorized service contractors.

## ORDERING INFORMATION

In order for us to fill your order immediately and correctly, please order material by description and part number, as shown in this book. Also, please specify the serial number of the equipment on which the parts will be installed.

## WARRANTY

Seller warrants for a period of one year after shipment that the equipment or material of its manufacture is free from defects in workmanship and materials. Corrosion or other decomposition by chemical action is specifically excluded as a defect covered hereunder, except this exclusion shall not apply to chlorination equipment. Seller does not warrant (a) damage caused by use of the items for purposes other than those for which they were designed, (b) damage caused by unauthorized attachments or modifications, (c) products subject to any abuse, misuse, negligence or accident, (d) products where parts not made, supplied, or approved by Seller are used and in the sole judgement of the Seller such use affects the products' performance, stability or reliability, and (e) products that have been altered or repaired in a manner in which, in the sole judgement of Seller, affects the products' performance, stability or reliability. **SELLER MAKES NO OTHER WARRANTY OF ANY KIND, AND THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS OF THE MATERIAL OR EQUIPMENT FOR ANY PARTICULAR PURPOSE EVEN IF THAT PURPOSE IS KNOWN TO SELLER.** If Buyer discovers a defect in material or workmanship, it must promptly notify Seller in writing; Seller reserves the right to require the return of such defective parts to Seller, transportation charges prepaid, to verify such defect before this warranty is applicable. In no event shall such notification be received by Seller later than 13 months after the date of shipment. No action for breach of warranty shall be brought more than 15 months after the date of shipment of the equipment or material.

**LIMITATION OF BUYER'S REMEDIES.** The **EXCLUSIVE REMEDY** for any breach of warranty is the replacement f.o.b. shipping point of the defective part or parts of the material or equipment. Any equipment or material repaired or replaced under warranty shall carry the balance of the original warranty period, or a minimum of three months. Seller shall not be liable for any liquidated, special, incidental or consequential damages, including without limitation, loss of profits, loss of savings or revenue, loss of use of the material or equipment or any associated material or equipment, the cost of substitute material or equipment, claims of third parties, damage to property, or goodwill, whether based upon breach of warranty, breach of contract, negligence, strict tort, or any other legal theory; provided, however, that such limitation shall not apply to claims for personal injury.

Statements and instructions set forth herein are based upon the best information and practices known to U.S. Filter/Wallace & Tiernan, Inc., but it should not be assumed that every acceptable safety procedure is contained herein. Of necessity this company cannot guarantee that actions in accordance with such statements and instructions will result in the complete elimination of hazards and it assumes no liability for accidents that may occur.

The logo for US Filter, featuring the letters "US" in a bold, italicized font, followed by the word "Filter" in a stylized font with horizontal lines through it.

WALLACE & TIERNAN PRODUCTS  
1901 West Garden Road, Vineland, NJ 08360

**INTRODUCTION**

This technical manual contains all the necessary instructions for the installation, start-up, maintenance, and repair of the USFilter’s Wallace & Tiernan Products (USF/W&T) Chem-Ad™ Series A Diaphragm Metering Pumps.



**WARNING: HAZARDOUS GAS MAY BE PRESENT IN THIS EQUIPMENT DURING NORMAL OPERATION. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, READ THIS INSTRUCTION BOOK BEFORE CONNECTING THIS EQUIPMENT TO A SUPPLY OF GAS. OPERATION AND MAINTENANCE OF THIS EQUIPMENT MUST BE RESTRICTED TO TRAINED, QUALIFIED PERSONNEL WHO ARE COMPLETELY FAMILIAR WITH THESE INSTRUCTIONS. CONSULT FACTORY FOR APPLICATIONS AGAINST A NEGATIVE HEAD (PARTIAL VACUUM) OR A POSITIVE BACKPRESSURE OF LESS THAN 1.0 PSI (28 INCHES OF WATER) IN THE SOLUTION DISCHARGE LINE.**

**NOTE: When ordering material, always specify model and serial number of apparatus.**

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**VERY IMPORTANT SAFETY PRECAUTIONS**

This page provides very important safety information related to safety in the installation, operation, and maintenance of this equipment.

**WARNING**

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TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, OBSERVE THE FOLLOWING:

THIS EQUIPMENT SHOULD BE INSTALLED, OPERATED, AND SERVICED ONLY BY TRAINED, QUALIFIED PERSONNEL WHO ARE THOROUGHLY FAMILIAR WITH THE ENTIRE CONTENTS OF THIS INSTRUCTION BOOK.

REPAIRS MAY ONLY BE CARRIED OUT WHEN THE PLUG IS DISCONNECTED FROM THE MAINS, OR WHEN THERE IS NO VOLTAGE.

ONLY ORIGINAL SPARE PARTS MUST BE USED FOR REPAIRS.

DO NOT DISCARD THIS INSTRUCTION BOOK UPON COMPLETION OF INSTALLATION. INFORMATION PROVIDED IS ESSENTIAL TO PROPER AND SAFE OPERATION AND MAINTENANCE.

ADDITIONAL OR REPLACEMENT COPIES OF THIS INSTRUCTION BOOK ARE AVAILABLE FROM:

USFILTER'S WALLACE & TIERNAN PRODUCTS  
1901 WEST GARDEN ROAD  
VINELAND, NEW JERSEY 08360  
PHONE: (856) 507-9000  
FAX: (856) 507-4125

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**NOTE**

Minor part number changes may be incorporated into USF/W&T products from time to time that are not immediately reflected in the instruction book. If such a change has apparently been made in your equipment and does not appear to be reflected in your instruction book, contact your local USF/W&T sales office for information.

Please include the equipment serial number in all correspondence. It is essential for effective communication and proper equipment identification.





**NOTES ON PROTECTIVE EQUIPMENT AND CLOTHING**

The following Warning appears in several locations in this book. It is general in nature due to the variety of hazardous liquids this equipment is capable of handling.

**WARNING: WHEN DEALING WITH HAZARDOUS MATERIAL, IT IS THE RESPONSIBILITY OF THE EQUIPMENT USER TO OBTAIN AND FOLLOW ALL SAFETY PRECAUTIONS RECOMMENDED BY THE MATERIAL MANUFACTURER/SUPPLIER.**

*It is good general practice to make use of protective equipment when handling any hazardous material.*

***IT IS RECOMMENDED THAT SUCH PROTECTIVE EQUIPMENT BE USED BY ALL PERSONS SERVICING THIS PUMP, ASSOCIATED PIPING, TUBING, VALVES, AND ACCESSORIES, WHEN THE EQUIPMENT IS HANDLING ANY HAZARDOUS MATERIAL.***

1. Goggles, flexible fitting, hooded ventilation (per ANSI Z87.1)	
2. Face Shield (per ANSI Z87.1)	
3. Chemical Apron	
4. Chemical Gloves	

**NOTE:** (1) ANSI Z87.1 “practice for occupational.....eye and face protection” recommends goggles (#1 above) as the “preferred protection” when handling chemicals that present a hazard from splash, acid burns or fumes; for severe exposure, a face shield (#2 above) over the goggles is recommended.

(2) An eye flushing fountain and a deluge-type shower may be recommended or required by insurance carriers or governmental safety agencies, which should be consulted for specific requirements.

**REGIONAL OFFICES****INSTALLATION, OPERATION, MAINTENANCE, AND SERVICE INFORMATION**

Direct any questions concerning this equipment that are not answered in the instruction book to the Reseller from whom the equipment was purchased. If the equipment was purchased directly from USFilter's Wallace & Tiernan Products (USF/W&T), contact the office indicated below.

**UNITED STATES**

1901 West Garden Road  
Vineland, NJ 08360  
TEL: (856) 507-9000  
FAX: (856) 507-4125

**CANADA**

If the equipment was purchased directly from USF/W&T Canada, contact the nearest office indicated below.

**ONTARIO**

250 Royal Crest Court  
Markham, Ontario  
L3R3S1  
(905) 944-2800

**QUEBEC**

243 Blvd. Brien  
Bureau 210  
Repentigny, Quebec  
(514) 582-4266

**MEXICO**

If the equipment was purchased directly from USF/W&T de Mexico, contact the office indicated below.

Via Jose López Portillo No. 321  
Col. Sta. Ma. Cuauhtepac, Tultitlan  
Edo. México 54900  
TEL: +52 55 2159 2976 / +52 55 2159 2989  
FAX: +52 55 2159 2985

**SECTION 1 - TECHNICAL DATA**

**List of Contents**

	PARA./DWG. NO.
Technical Data .....	1.1
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**1.1 Technical Data**

<b>Type</b>	Mechanically Actuated Diaphragm-Piston Metering Pump
<b>Model</b>	Chem-Ad, Series A
<b>Service</b>	Metering of mild to very corrosive chemicals
<b>Capacity range</b>	Refer to Capacity Chart
<b>Ambient Temperature</b>	104° F (40° C)
<b>Maximum Liquid Temperature</b>	125° F (52° C)
<b>Maximum Back Pressure</b>	120 PSI (8 BAR) at 60 Hz 150 PSI (10 BAR) at 50 Hz
<b>Suction Lift</b>	6 ft of water
<b>Accuracy</b>	± 2% of full scale over 5:1 range
<b>Valves</b>	Double ball, threaded valves
<b>Diaphragm</b>	PTFE - EPDM composite Diaphragm
<b>Drive unit</b>	Synchronous Motor
<b>Stroke Adjustment</b> <b>E11/M11 and E30/M30 control modes:</b>	Two turns mechanical stroke adjustment, 5% increments
<b>Stroke Frequency Control</b> <b>E30/M30 control mode only:</b>	Manual Rotary Knob, 10% increments, on local mode 0/4 - 20 mA input or pulse input on remote mode
<b>Connection sizes</b> <b>USA Version:</b>	1/4" OD polyethylene tubing for metering 3/8" OD polyethylene tubing for re-circulation or duo hose
<b>EURO Version:</b>	4mm ID x 6mm OD polyethylene tubing for metering 6mm ID x 8mm OD polyethylene tubing for re-circulation or duo hose



# CHEM-AD™ SERIES A

## Alarm Output Signal

**E30/M30 control mode only:**

Empty Signal Output - Max. Load, 24V AC/DC, 3 Amps

Stroke Signal Output - Max. Load, 24V DC, 300 mA

## Power Requirement

USA Version - 115 VAC, 60 Hz, Single Phase, 20 Watts

EURO Version - 230 VAC, 50 Hz, Single Phase, 20 Watts

## 1.2 Capacity Chart

Series A Pumps	Capacity			Pressure	
	GPH @ 60 Hz, 144 spm	LPH @ 60 HZ, 144 spm	LPH @ 50 Hz, 122 spm	PSI @ 60 Hz	BAR @ 50 Hz
1	0.06	0.24	0.2	120	10
2	0.16	0.6	0.5	120	10
3	0.29	1.08	0.9	120	10
4	0.44	1.68	1.4	120	10

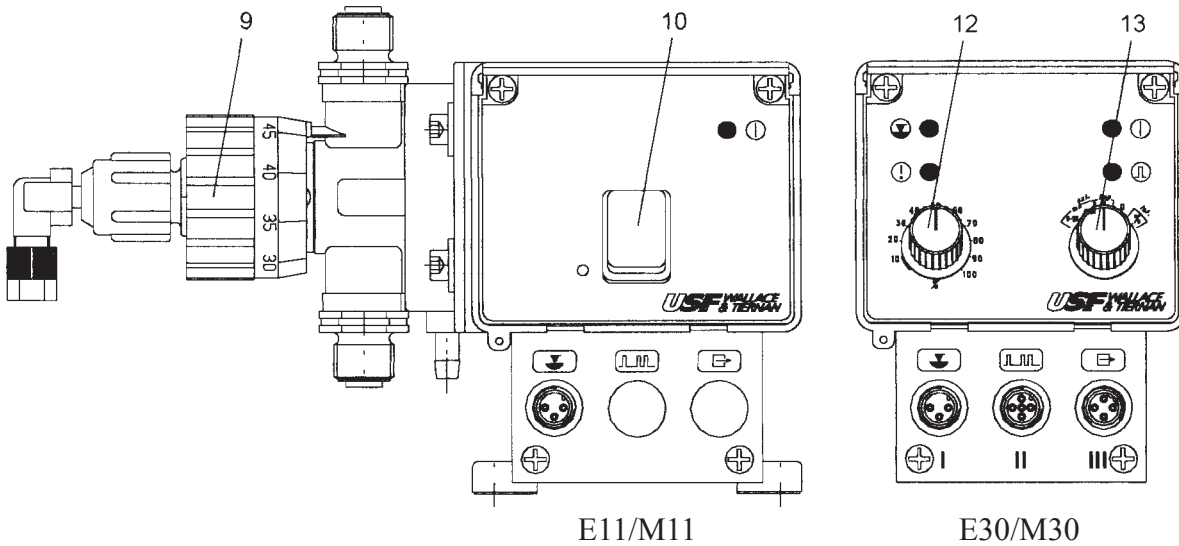
**NOTE:** All data refer to a water temperature of 68° F (20° C).

## 1.3 Materials of Construction

Pump Component	Material of Construction
Pump Head	PVDF
Connection	PVDF
Metering Piston/cylinder	Ceramic
Diaphragm	PTFE-EPDM Composite Diaphragm
Valves	PVDF
Valve Balls	Glass, Ceramic for metering valve
O-ring	Viton, EPDM, Kalrez
Valve Spring	Hastelloy C, PTFE coated
Housing and Finish	Thermoplastic, Blue per RAL 5007

## 1.4 Control Modes - See Figure 1.1

Standard USA Version (E11)	Optional USA Version (E30)
USA 3-prong plug On - Off Button (10) Mechanical Stroke Adjustment (9) Level Switch Connection (I)	USA 3-prong plug Mode Switch (Remote-Off-Local) (13) Mechanical Stroke Adjustment (9) Stroke Frequency Control (12) Level Switch Connection (I) Alarm & Stroke Signal Output (III) Analog Input 0/4 - 20 mA or Pulse Input (II)
Standard EURO Version (M11)	Optional EURO Version (M30)
EURO plug On - Off Button (10) Mechanical Stroke Adjustment (9) Level Switch Connection (I)	EURO plug Mode Switch (Remote-Off-Local) (13) Mechanical Stroke Adjustment (9) Stroke Frequency Control (12) Level Switch Connection (I) Alarm & Stroke Signal Output (III) Analog Input 0/4 - 20 mA or Pulse Input (II)










9	Mechanical Stroke Adjustment	Socket Connector	
10	On/Off Switch	I	Level Switch Connection, empty w/ pre-warning
12	Stroke Frequency Rotary Switch %	II	Pulse/Current Signal Input, Remote On/Off Control
13	Mode Switch, Local/Off/Remote Position	III	Pulse Output/Empty Signal Output

Figure 1.1 - Pumps Front Configuration

**NOTE:**

1. The socket connectors, I and II, must always be occupied, either by the protective cap with the corresponding symbol or by the appropriate equipment.
2. Keep the protective cap secure, in a place where it will not be lost.

## 1.5 Description of Symbols

SYMBOL	DESCRIPTIONS	CONTROL OPTION	INDICATOR LIGHT	MEANING
	Level pre-warning and empty	E11/M11 E30/M30	Blinking Red Light  Steady Red Light	Warning that the storage tank is almost empty. Pump is still in operation.  Storage is empty. Pump stopped.
	Fault Indicator	E30/M30	Steady Red Light	No signal is coming either from the level switch or 4 - 20 mA signal. Pump stopped.
	Operating Indicator	E11/M11 E30/M30	Steady Green Light	Pump is powered. Pump is either running or stopped
	Metering Indicator	E30/M30	Blinking Yellow Light according to frequency setting	Pump is electrically operating normally.
	Level Switch Connection	E11/M11 E30/M30	No Light Indication	See PIN Assignment on Section 2
	Pulse Input Current Signal Input Remote On/Off Switch	E30/M30	No Light Indication	See PIN Assignment on Section 2
	Empty Signal Output Stroke Signal Output	E30/M30	No Light Indication	See PIN Assignment on Section 2

## **INTRODUCTION**

The following pages are offered as a general guide and indication of the suitability of various elastomers and plastics in use today with a wide range of industrial chemicals. The ratings are based, for the most part, on published literature of various plastic suppliers and elastomer manufacturers but, in some cases, they are considered the opinion of experienced compounders.

We cannot guarantee their accuracy nor assume responsibility for use thereof. Several factors must always be considered in using an elastomer or plastic part in service. The most important as we see them are:

## **TEMPERATURE OF SERVICE**

Higher temperatures increase the effect of chemicals on plastic. The increase varies with the plastic and the chemical. The compound quite stable at room temperature might fail at elevated temperature.

## **CONDITIONS OF SERVICE**

A compound that swells badly might still function well as a static seal yet fail in any dynamic application.

## **GRADE OF PLASTIC**

Many types of plastic are available in different grades that vary greatly in chemical resistance.

## **THE COMPOUND ITSELF**

Compounds designed with certain outstanding properties may be poorer in performance with a chemical than one designed especially for fluid resistance.

**CAUTION: It is NOT recommended that USFilter/Wallace & Tiernan Chem-Ad Metering Pumps be used to handle FLAMMABLE LIQUIDS.**

**In light of the above factors, it is always best to TEST.**

Statements and suggestions set forth herein are based upon the best information and practices known to USF/W&T. However, it should not be assumed either that information is complete on the subjects covered or that all possible circumstances, safety measures, precautions, etc., have been included. These statements and suggestions are not intended to reflect state, municipal, or insurance requirements or national safety codes; where applicable, those sources should be consulted directly. Moreover, since the conditions of use are beyond its control, USF/W&T makes no guarantee of results and assumed no liability in connection with the information contained herein.

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**MATERIAL ANALYSIS OR DESCRIPTIONS**

The following is typical analysis and description of the pump components named in Materials of Construction.

MATERIAL	ANALYSIS or DESCRIPTION
Ceramic	99% aluminum oxide
EPDM	Ethylene Propylene
GFPPL	Glass-filled polypropylene
Duran*** Glass	Borosilicate Glass, 81% SiO <sub>2</sub> , 13% B <sub>2</sub> O <sub>3</sub> , 4% Na <sub>2</sub> O/K <sub>2</sub> O, 2% Al <sub>2</sub> O <sub>3</sub>
Hastelloy C	High nickel-chrome alloy of the following analysis: Ni, 54%, Cr 15.5%, Co 2.5%, Mo 16%, W 4%, Fe 5.5%, C 0.08%, others 3%
Hypalon*	Chlorosulphonated polyethylene, CSM
Kalrez*	Perfluoroelastomer, FFPM
Kynar**	Polyvinylidene fluoride, PVDF
PVC	Polyvinyl chloride
PE	Polyethylene
PP	Polypropylene
Stainless Steel, 316	AISI 316 Cr 16 - 18%, Ni 10-14%, C 0.08%, Mn 2%, Si 1%, P 0.045%, S 0.03%, Mo 2-3%
SAN	Styrene-Acrylonitrile
Teflon*	Fluorocarbon resin of tetrafluoroethylene polymer, TFE, PTFE
Viton*	Copolymer of vinylidene fluoride and perfluoropropylene or hexafluoropropylene, FKM, FEPM

\* Teflon, Hypalon, Kalrez, and Viton are registered trademarks of E.I. DuPont Co.

\*\* Kynar is a registered trademark of Atochem North America, Inc.

\*\*\* Duran is a registered trademark of Schott.

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# CHEM-AD™ SERIES A

CHEMICAL	PLASTIC						ELASTOMER						METAL		
	PVC	PVDF	GFPPL	Polyethylene	Polypropylene	SAN	Kalrez	Teflon	Hypalon	EPDM	Viton	Glass	Ceramic	Hastelloy C	316 SS
Acetic Acid, 5%	B	D	A	A	H	A	N	A	C	A	C	A	A	H	H
Acetic Acid, 80%	C	D	C	B	F	F	G	A	F	C	C	A	A	H	B
Acetic Acid, Glacial	C	D	C	B	G	E	X	A	E	B	C	A	A	H	B
Acetic Anhydride	C	C	A	X	G	E	A	A	A	C	C	A	A	H	B
Aluminum Chloride	F	A	A	A	H	A	A	A	A	A	A	A	A	B	B
Aluminum Flouride	F	A	A	X	H	A	X	A	A	A	A	C	X	G	E
Aluminum Sulfate	A	A	A	A	H	A	A	A	A	A	A	A	A	A	B
Ammonia, 10%	A	A	A	B	X	A	A	A	A	B	A	A	A	N	A
Ammonium Chloride	A	A	A	A	H	A	A	A	A	A	A	A	N	H	B
Ammonium Nitrate	A	A	A	X	H	A	A	A	A	A	A	A	A	B	A
Ammonium Persulfate	A	A	A	X	H	A	X	A	A	A	A	A	A	X	E
Ammonium Phosphate	A	A	A	X	H	A	X	A	A	A	A	A	A	A	A
Ammonium Sulfate	A	A	A	A	H	A	A	A	B	A	B	A	A	A	B
Amyl Alcohol	C	A	X	X	H	C	A	A	B	B	B	A	A	A	A
Aniline	C	B	C	B	H	C	A	A	B	B	A	A	A	A	A
Aqua Ammonia	A	A	A	B	X	B	A	A	B	A	B	A	A	C	A
Aqua Regia	C	A	X	B	X	C	X	A	B	B	A	A	A	C	C
Arsenic Acid	A	A	A	X	H	A	A	A	C	X	A	A	N	A	B
Barium Chloride	A	A	A	X	H	A	A	A	B	X	A	A	A	A	E
Barium Sulfate	A	A	A	X	H	A	A	A	A	X	A	N	A	N	B
Beer	A	A	A	B	H	A	A	A	A	A	A	A	A	A	A
Benzaldehyde	C	B	C	X	X	C	A	A	C	B	C	A	A	A	A
Benzoic Acid	A	A	A	A	H	E	A	A	C	C	A	A	A	A	B
Borax (Sodium Borate)	A	H	A	B	H	X	A	A	B	A	A	A	N	A	A
Boric Acid	A	A	A	A	H	A	A	A	B	A	A	A	A	A	A
Bromine Water	C	A	C	X	C	X	X	A	C	B	A	A	A	A	C
Butyric Acid	D	A	A	X	H	B	B	A	C	C	B	A	A	A	B
Calcium Bisulfite	A	A	A	A	H	X	A	A	A	C	A	N	A	A	B
Calcium Chloride	A	A	A	A	H	A	A	A	A	A	A	A	A	A	C
Calcium Hypochlorite	A	A	C	A	G	A	A	A	A	B	B	A	B	H	C
Calcium Sulfate	A	A	A	X	H	A	A	A	A	B	A	N	N	A	B
Carbon Tetrachloride	E	A	C	C	C	X	A	A	C	C	A	A	A	A	B
Chlorine Dioxide	B	A	E	X	C	X	X	A	C	C	A	A	X	X	C
Carbonic Acid	A	A	A	X	H	A	A	A	B	C	B	A	N	A	B
Chloroacetic Acid	A	C	D	X	C	C	A	A	C	C	C	N	A	A	C
Chlorofoam	C	A	E	X	C	C	A	A	C	C	B	A	A	A	A
Chlorosulfonic Acid	E	C	E	C	C	C	A	A	C	C	C	A	A	A	B

**RATING KEY**

- |                                                   |                              |
|---------------------------------------------------|------------------------------|
| A – Acceptable                                    | D – Good to 70° F (20° C)    |
| B – Satisfactory where minor attack is acceptable | E – Good to 80° F (27° C)    |
| C – Not recommended                               | F – Good to 125° F (52° C)   |
| N – Information Lacking                           | G – Good to 150° F (65.5° C) |
| X – Unknown                                       | H – Good to 185° F (85° C)   |

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# CHEM-AD™ SERIES A

CHEMICAL	PLASTIC						ELASTOMER						METAL		
	PVC	PVDF	GFPPL	Polyethylene	Polypropylene	SAN	Kalrez	Teflon	Hypalon	EPDM	Viton	Glass	Ceramic	Hastelloy C	316 SS
Chromic Acid, 10%	A	A	A	A	H	A	A	A	A	C	A	A	A	B	B
Chromic Acid, 30%	A	A	A	A	H	A	A	A	A	C	A	A	A	B	B
Chromic Acid, 50%	C	A	A	B	G	B	A	A	A	C	A	A	A	B	E
Citric Acid	A	A	A	A	H	A	A	A	A	A	A	A	A	A	B
Copper Chloride	A	A	A	B	H	A	A	A	B	B	B	A	A	A	C
Copper Cyanide	A	A	A	X	H	A	A	A	A	N	B	N	A	A	A
Copper Nitrate	A	A	A	X	H	A	A	A	B	B	B	A	A	B	A
Copper Sulfate	A	A	A	A	H	A	A	A	B	B	B	A	A	A	B
Cresylic Acid (50%)	B	A	X	X	X	X	A	A	C	C	A	A	A	A	A
Ethyl Chloride	C	A	E	X	X	C	A	A	C	A	A	A	A	A	A
Ethylene Glycol	A	A	A	X	G	A	A	A	B	A	B	A	A	A	B
Fatty Acids	A	A	A	C	X	G	A	A	C	C	B	A	A	A	A
Ferric Chloride	A	A	A	A	H	A	A	A	B	A	B	A	A	B	C
Ferric Nitrate	A	A	A	C	H	A	A	A	B	A	B	A	A	B	B
Ferric Sulfate	A	A	A	C	H	A	A	A	B	A	B	A	A	A	B
Ferrous Chloride	A	A	A	A	H	A	A	A	B	B	B	A	A	C	C
Ferrous Sulfate	A	A	A	B	H	A	A	A	B	B	B	A	A	B	B
Fluoboric Acid	F	A	A	C	H	B	X	A	B	B	H	N	C	H	B
Flouosilicic Acid	F	A	A	A	H	B	A	A	H	X	B	C	C	H	B
Formaldehyde, 40%	D	G	H	B	H	A	B	A	B	A	C	A	A	H	A
Formic Acid	C	A	H	B	H	C	B	A	B	B	C	A	A	H	B
Freon 12 (Wet)	N	B	C	X	N	X	N	A	E	B	A	A	A	H	C
Furfural	C	X	N	X	N	X	A	A	N	B	C	A	A	H	B
Glycerine (Glycerol)	D	A	A	X	H	A	A	A	B	A	B	A	A	H	A
Hydrobromic Acid, 20%	D	A	A	B	H	X	A	A	A	B	D	A	D	D	C
Hydrochloric Acid, 0-25%	D	A	A	B	H	A	A	A	B	E	A	A	D	D	C
Hydrochloric Acid, 25-37%	D	A	A	B	D	B	A	A	B	E	N	A	N	D	C
Hydrofluoric Acid, 10%	G	A	A	A	H	B	A	A	A	B	H	C	C	H	C
Hydrofluoric Acid, 30%	G	A	B	B	F	C	A	A	A	E	F	C	C	F	C
Hydrofluoric Acid, 60%	X	A	B	C	N	C	A	A	B	B	D	C	C	N	C
Hydrofluosilicic, 20%	A	A	A	A	X	B	A	A	X	A	B	C	C	N	B
Hydrogen Peroxide, 30%	F	A	A	B	H	B	A	A	A	B	A	A	N	N	C
Hydrogen Peroxide, 50%	E	A	X	B	N	X	A	A	A	C	A	A	N	N	C
Hydrogen Peroxide, 90%	N	A	X	B	N	C	A	A	B	C	A	A	N	N	C
Hydrogen Sulfide,AQ.SOL.	A	A	A	X	X	B	A	A	B	A	B	F	N	N	B

**RATING KEY**

- |                                                   |                              |
|---------------------------------------------------|------------------------------|
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| C – Not recommended                               | F – Good to 125° F (52° C)   |
| N – Information Lacking                           | G – Good to 150° F (65.5° C) |
| X – Unknown                                       | H – Good to 185° F (85° C)   |

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# CHEM-AD™ SERIES A

CHEMICAL	PLASTIC						ELASTOMER						METAL		
	PVC	PVDF	GFPPL	Polyethylene	Polypropylene	SAN	Kalrez	Teflon	Hypalon	EPDM	Viton	Glass	Ceramic	Hastelloy C	316 SS
Ketones	C	C	C	X	C	C	X	A	C	X	C	A	A	A	A
Lactic Acid	C	N	A	A	D	C	A	A	B	A	F	A	A	A	N
Lead Acetate	F	A	A	X	H	A	A	A	C	A	C	A	A	A	A
Lubricating Oil	F	A	E	B	H	A	A	A	B	C	A	A	A	A	A
Magnesium Chloride	F	A	A	A	H	A	A	A	A	A	A	A	A	A	N
Magnesium Nitrate	F	A	A	X	H	A	N	A	A	B	A	A	A	A	A
Magnesium Sulfate	F	A	A	A	H	A	A	A	A	A	A	A	A	A	A
Maleic Acid	F	A	A	X	X	C	A	A	A	C	A	A	A	A	B
Methylene Chloride	C	B	C	X	C	C	A	A	C	C	N	A	A	A	A
Napthalene	D	A	E	X	D	C	A	A	C	C	F	F	A	A	A
Nickel Chloride	F	A	A	A	H	A	A	A	H	A	H	A	A	A	N
Nickel Sulfate	F	A	A	A	H	A	A	A	A	A	H	A	A	A	A
Nitric Acid, 10%	F	A	A	A	D	F	A	A	A	B	A	A	N	H	A
Nitric Acid, 20%	F	H	A	B	D	C	A	A	F	C	A	A	N	F	H
Nitric Acid, 50%	N	F	E	E	D	C	A	A	N	C	C	A	N	D	F
Nitric Acid, Anhydrous	C	C	C	C	C	C	A	A	C	X	C	A	N	D	F
Nitro Benzene	C	F	E	X	D	C	A	A	C	C	N	A	A	A	A
Oils and Fats	F	A	A	X	F	X	N	A	X	C	A	A	A	A	A
Oleic Acid	D	A	E	C	D	C	A	A	N	B	D	A	A	F	A
Oleum	C	C	X	C	X	C	A	A	C	X	A	A	A	X	X
Oxalic Acid	D	F	A	B	F	B	A	A	H	B	A	A	A	F	C
Phenol	C	F	B	E	C	A	A	A	C	B	A	A	A	A	H
Phosphoric Acid, 0-50%	D	A	A	A	H	B	A	A	A	B	H	A	A	A	F
Phosphoric Acid, 50-100%	D	A	B	B	H	B	A	A	A	C	H	A	A	F	N
Polymer	B	A	A	A	X	A	A	A	A	A	A	A	A	X	B
Polyphosphate	A	A	A	A	X	X	X	A	A	A	A	X	A	X	A
Potassium Bicarbonate	F	A	A	B	X	A	A	A	B	A	X	N	A	X	B
Potassium Bromide	F	A	A	B	H	A	A	A	H	A	B	N	A	H	F
Potassium Carbonate	F	A	A	B	H	A	A	A	H	A	B	H	N	F	F
Potassium Chlorate	F	A	A	B	H	A	A	A	H	B	B	A	A	F	F
Potassium Chloride	F	A	A	A	H	A	A	A	H	A	B	N	A	H	N
Potassium Cyanide	F	A	A	X	H	A	A	A	H	B	B	F	A	F	A
Potassium Dichromate	F	A	A	B	H	A	A	A	H	B	B	H	A	F	A
Potassium Hydroxide	H	F	A	A	H	C	A	A	H	B	C	C	C	H	H
Potassium Nitrate	F	A	A	A	H	A	A	A	H	B	H	H	A	F	F
Potassium Permanganate	F	A	A	A	F	A	A	A	F	B	F	F	A	A	H
Potassium Sulfate	F	A	A	A	H	A	A	A	H	A	A	F	A	F	H

**RATING KEY**

- |                                                   |                              |
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**CHEMICAL RESISTANCE GUIDE**

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# CHEM-AD™ SERIES A

CHEMICAL	PLASTIC						ELASTOMER						METAL		
	PVC	PVDF	GFPPL	Polyethylene	Polypropylene	SAN	Kalrez	Teflon	Hypalon	EPDM	Viton	Glass	Ceramic	Hastelloy C	316 SS
Soaps	F	A	A	E	H	A	A	A	A	D	A	A	A	A	A
Sodium Acetate	F	A	A	A	H	A	A	A	A	A	N	A	A	F	A
Sodium Aluminate	B	A	A	A	X	A	A	A	A	A	X	A	X	A	A
Sodium Bicarbonate	F	A	A	A	H	A	A	A	A	A	A	G	A	F	A
Sodium Bisulfate	F	A	A	A	H	A	F	A	A	A	A	G	A	F	A
Sodium Bisulfite	F	A	A	A	X	A	F	A	A	A	A	C	A	X	A
Sodium Carbonate	F	A	A	A	H	A	A	A	A	A	A	F	N	F	A
Sodium Chlorate	F	A	A	A	H	A	A	A	A	A	A	N	A	F	F
Sodium Chloride	F	A	A	A	H	A	A	A	A	A	A	F	A	F	N
Sodium Cyanide	F	A	A	X	H	A	X	A	A	A	A	A	A	A	A
Sodium Hexametaphosphate	F	A	C	A	X	X	A	A	A	A	A	X	A	X	X
Sodium Hydroxide, 20%	D	H	A	A	H	B	A	A	A	A	A	C	C	A	A
Sodium Hydroxide, 50%	N	F	A	B	H	B	A	A	A	N	D	C	C	A	A
Sodium Hypochlorite	F	A	E	A	H	A	A	A	A	A	H	G	A	F	C
Sodium Nitrate	F	A	A	A	H	A	A	A	A	A	D	A	A	F	A
Sodium Silicate	F	A	A	A	H	A	A	A	A	A	A	N	A	F	H
Sodium Sulfate	F	A	A	A	H	A	A	A	A	A	A	A	A	A	A
Sodium Sulfide	F	A	A	A	H	A	A	A	A	A	A	X	A	A	B
Stannic Chloride	F	A	A	A	H	A	X	A	N	N	A	A	A	H	C
Stearic Acid	F	A	E	C	X	C	A	A	X	B	A	A	A	X	A
Stoddards Solvents	C	X	X	X	X	X	X	A	X	C	A	A	X	X	A
Sulfuric Acid, 0-10%	D	A	A	A	H	C	A	A	A	A	A	A	A	A	N
Sulfuric Acid, 10-75%	N	A	A	E	F	C	G	A	C	C	A	A	H	F	C
Sulfuric Acid, 75-95%	N	A	E	E	N	C	E	A	C	C	A	A	F	F	C
Sulfuric Acid, 95-100%	C	N	E	E	N	C	E	A	C	C	H	A	F	F	C
Tannic Acid	F	A	A	B	H	X	A	A	A	B	A	A	A	H	F
Tanning Liquors	F	A	A	A	X	X	X	A	X	C	A	A	A	X	A
Tartaric Acid	F	A	A	X	H	C	A	A	D	D	A	H	A	A	A
Trichloroethylene	C	A	E	C	C	X	D	A	C	C	A	A	A	A	N
Tricresylphosphate	C	A	X	X	X	X	X	A	C	B	A	X	A	X	X
Urea	A	A	A	X	H	X	N	A	N	X	C	A	A	A	B
Vinegar	A	A	A	A	H	A	A	A	A	A	B	A	A	A	A
White Liquor (Acid)	A	A	X	X	X	C	X	A	X	X	A	A	A	X	A
Zinc Chloride	A	A	A	A	H	A	A	A	B	A	B	A	A	A	B
Zinc Sulfate	A	A	A	A	H	A	A	A	A	A	A	A	A	D	A
Zinc Orthophosphate	A	A	A	A	X	X	X	A	A	X	A	N	X	X	A

**RATING KEY**

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# CHEM-AD™ SERIES A



**SECTION 2 - INSTALLATIONS****List of Contents**

	PARA. NO.
General Information .....	2.1
Unpacking .....	2.2
Mounting the Pump .....	2.3
Dimensions .....	2.4
Connection of Suction and Return Line with Duo Hose .....	2.5
Connection of Metering Line .....	2.6
Connection to Optional Suction Pipe Assembly .....	2.7
Electrical Connection .....	2.8
Socket Connector, PIN Assignment .....	2.9

## 2.1 General Information

To provide satisfactory service, the metering pump must be installed in accordance with the instructions that follow. Operational difficulties, lack of accuracy, and possible damage to the pump mechanism may occur if these instructions are not followed properly.



**CAUTION: Do not run Chem-Ad Series A pump dry.**

## 2.2 Unpacking

When the pump is unpacked, check all items inside the box. There are bags of various connection parts, including the Duo tubing supplied with the pump. Make sure that no parts are discarded with the packaging material. Whenever possible, unpack the equipment at the installation site.

## 2.3 Mounting the Pump

Pump location is important to the operation of the pump. Select a place that is dry and that provides a level base for the pump. Allow work space around the pump for inspections, adjustment, and servicing. Be sure it is near a power supply and located where the discharge line may be conveniently run to the point of application. The pump must be bolted down to a mounting base or to a wall bracket.

- If the discharge line can be blocked off, a pressure relief valve must be installed immediately after the pump discharge valve. The relief line returns to the storage tank.

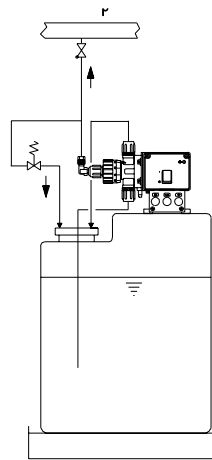


Figure 2.1 - Relief Valve Installations

- If discharging into a negative head, an anti-siphon valve must be installed at the discharge line to prevent siphoning of the process fluids into the point of application. The installation of a solenoid valve may be required to prevent process fluids from siphoning when the pump is not operating.

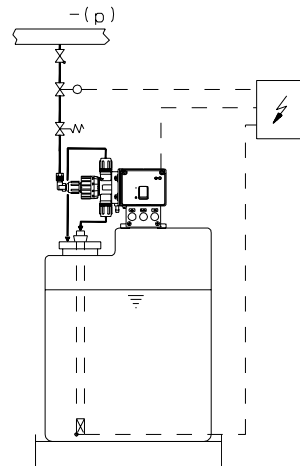


Figure 2.2 - Installation With Anti-Siphon and Solenoid Valve

- If the storage tank is higher than the pump, such that the process fluid may run freely through the pump, a back pressure valve must be installed at the discharge of the pump. The discharge pressure must be at least 15 psi (1 bar) higher than the suction pressure.

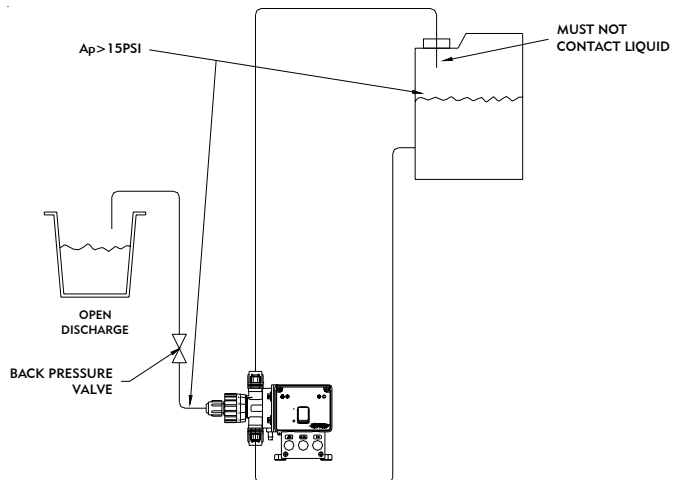


Figure 2.3 - Flooded Suction Installations

- Avoid long and twisted suction lines, particularly loops that may create air pockets. Keep the line as short as possible.

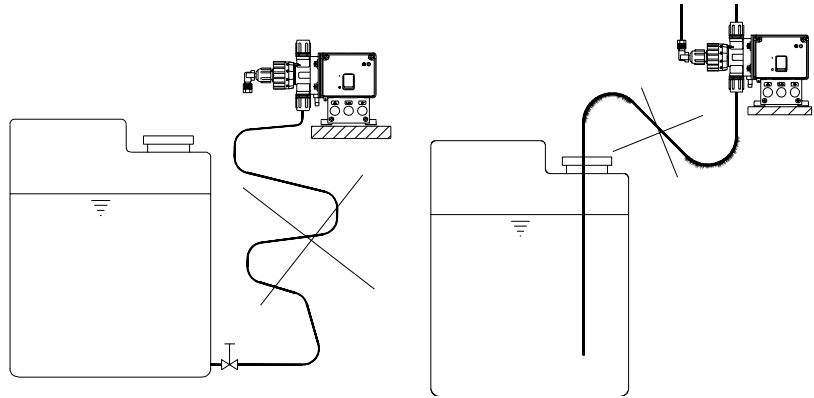


Figure 2.4 - Suction Lines to Avoid

## 2.4 Dimensions

Wall bracket (AJE4896) is a convenient way to mount the pump on the wall. Four #10 x 24 x 3/4" long screws (P41044) are needed to secure the pump. Position the pump for easy access to the liquid end for service and the front face for the control. Figure 2.5 shows the pump dimensions.

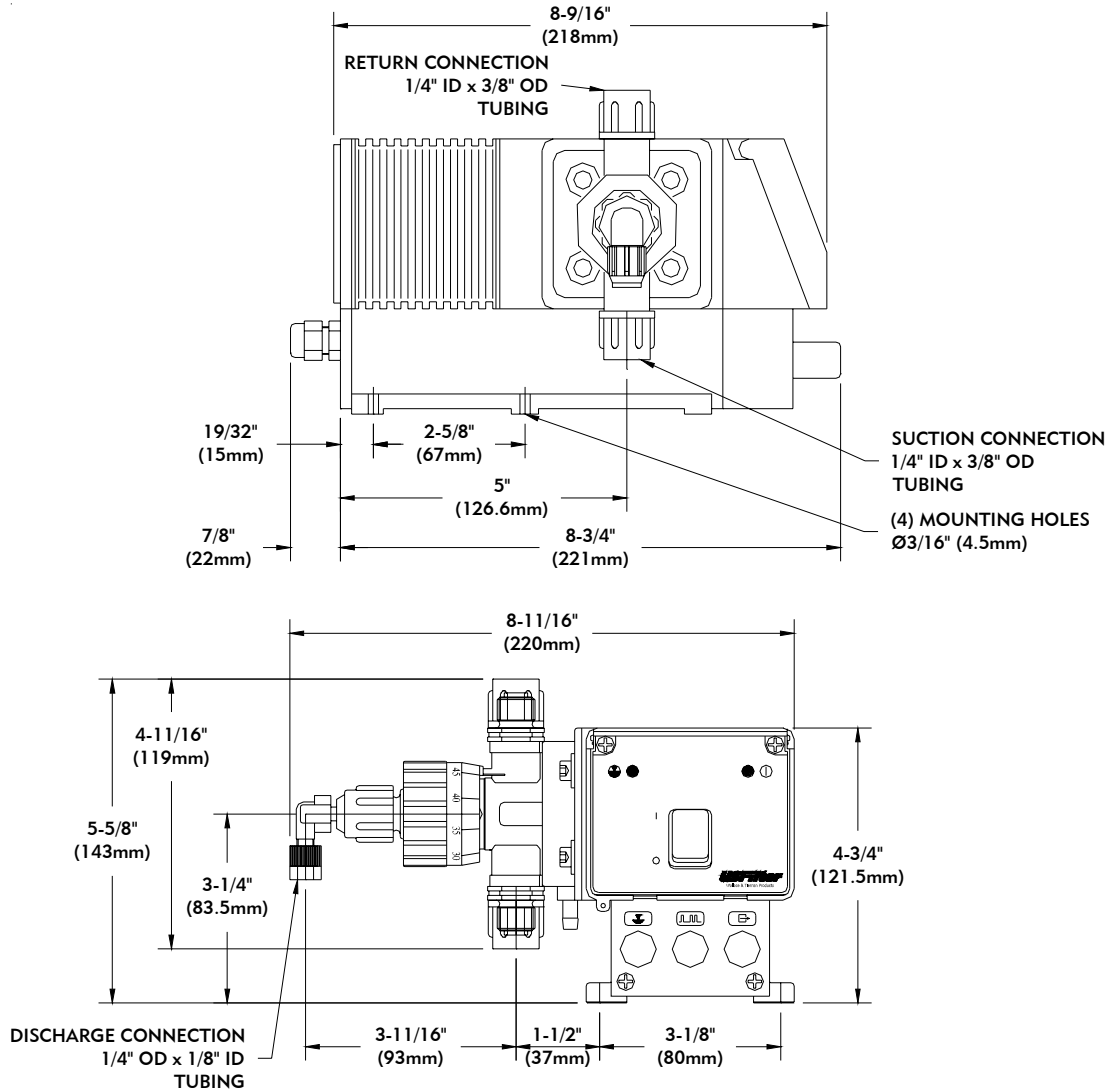


Figure 2.5 - Dimensions, Series A

## 2.5 Connection of Suction and Return Line with Duo Hose

Separate the Duo hose according to Figure 2.6. Cut it off straight and remove the connecting bridge. Push the union nut (16) and the thrust piece (17) over the suction hose and insert the connection piece (18) into the hose all the way against the shoulder. Put the O-ring (19) in the valve groove and tighten union nut by hand. Pull the return hose through the fixing bore (20) at the side of the head. Install the connection pieces the same way as the suction line and connect it to the discharge valve.



**CAUTION:** When using 3/8" O.D. polyethylene tubing (RP684818), adjust the curved radius correspondingly. The return hose must not be kinked. When carrying out the installation, make sure that no pull can occur on the return line.

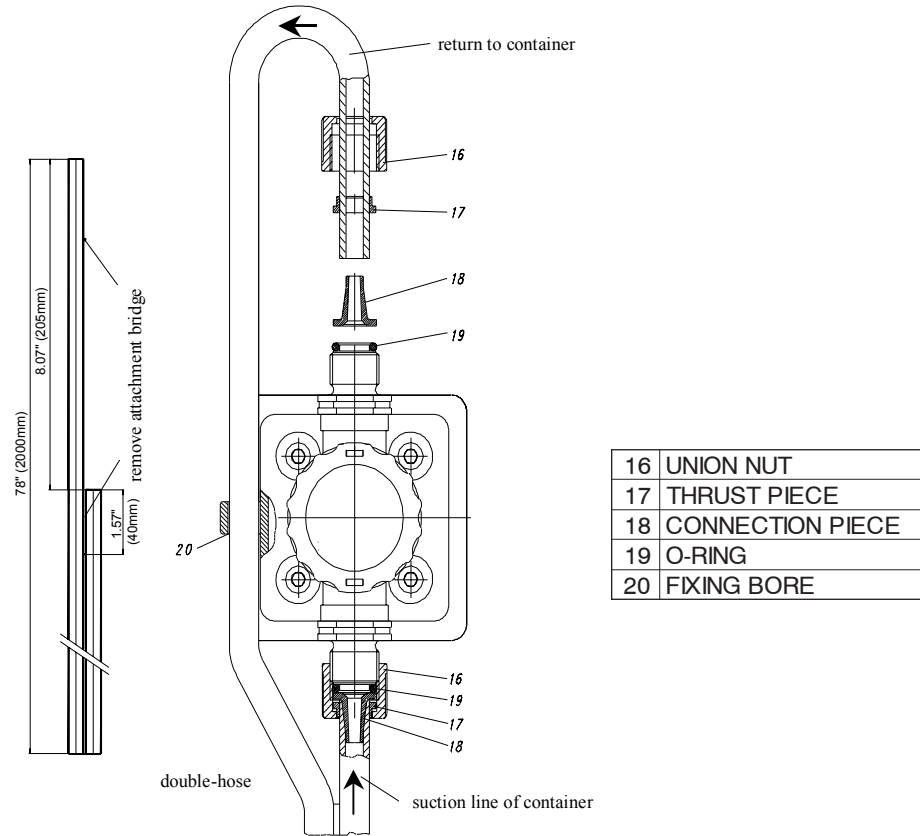


Figure 2.6 - Duo Hose Installations



## 2.6 Connection of Metering Line

Cut off the tubing straight, push union nut (16), and plastic ferrule (21) over the tubing. Attach the tubing into the connection piece (22) all the way in and screw in the union nut tightly by hand. Adjust the angle to a convenient position by loosening and tightening the nut (23). See Figure 2.7.

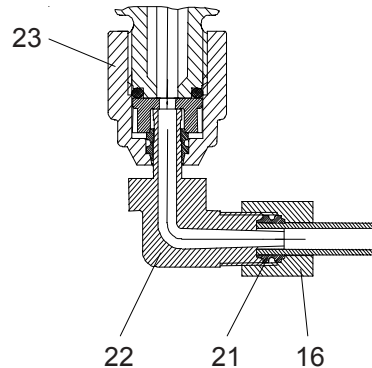


Figure 2.7 - Metering Line Installation

## 2.7 Connection to the Optional Suction Pipe Assembly

Suction pipe assemblies with level switch, pre-warning, and empty signals are available for use with this pump. They are completely wired and ready to connect to the pump socket connector. A foot valve and strainer are built into the pipe. All the necessary connections for the Duo hose come with the suction pipe. Depending on the storage tank height, the suction pipes are available in different lengths. Select the length that is higher than the storage tank by approximately six inches. These pumps must not run dry, therefore the use of the suction pipe with a connection to stop the pump when the storage tank is empty is highly recommended. Refer to Section 6 - Preventive Maintenance Kits and Accessories for more information on these parts..

## 2.8 Electrical Connection

A six-foot cable with a three-prong grounded plug, US standard, is provided with the USA version of the Chem-Ad Series A pumps. It can be plugged into a US standard outlet with 115 VAC, single phase, 30 amps. For the metric version, a cable with a EURO plug is provided.

**NOTE: The electrical connections should comply with local electrical codes.**

## 2.9 Socket Connector, PIN Assignment

Included in the bag of loose parts are the socket terminals for the socket connections. They are keyed to connect properly to the correct PIN in the socket connector. Look at the socket terminal and check for the available PIN connections. Connector I has 3-PIN connections, Connector II has 5-PIN connections and Connector III has 4-PIN connections. Wire accordingly.

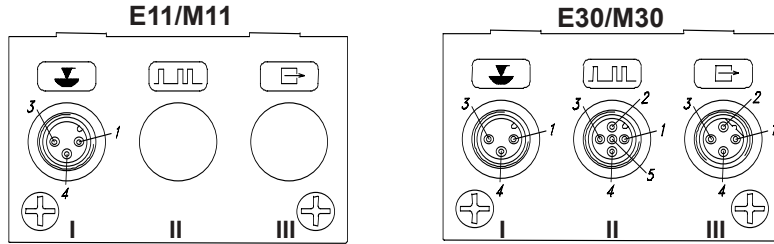
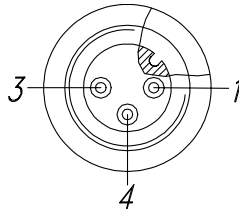


Figure 2.8 - Socket Connector

### 2.9.1 Connector I

- Tank empty signal input, PIN #3 and PIN #4 (Dry contact). Contact is open; the pump is stopped.
- Pre-warning signal input, PIN #1 and PIN #4 (Dry contact). Contact is open pre-warning, but the pump continues to operate.



1	Reserve signal input, brown
3	Empty signal input, blue
4	Ground (common), black

Figure 2.9 - Connector I

## 2.9.2 Connector II

- Remote On/Off, PIN #3 and PIN #4 (Dry contact). Contact is closed; the pump is running.

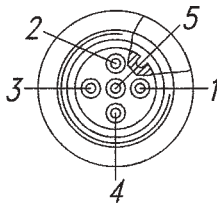
**NOTE:** If the remote On/Off is not used, PIN # 3 and PIN # 4 must be bridged.

- Pulse Input, PIN #2 and PIN #4 (Dry contact). Contact is closed; a pulse is processed.

Minimum pulse length is 15 milli-seconds = 1 stroke

Maximum pulse is 122 pulses per min. = Continuous running for 50 or 60 Hz

- 5V output, PIN #1 and PIN #4. Connect to sensor requiring 5VDC power with maximum load of 80mA.
- 0/4-20mA input, PIN #5 and PIN #4. Connect to equipment with 0/4-20mA output.



1	Output 5 V, brown
2	Pulse Input, white
3	Remote On/Off
4	Ground (common), black
5	Input 0/4 - 20 mA

Figure 2.10 - Connector II

## 2.9.3 Connector III

- Empty signal output, PIN #1 and PIN #2 (Floating relay contact). Contact is closed when pump is in fault mode or tank is empty. When storage tank is almost empty (pre-warning), relay output contact is on and off with every stroke with local flashing red LED.

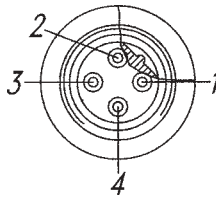
**NOTE: Maximum load is 24V AC/DC, 3 amps External 24V AC/DC, power supply required.**

**120/240V AC/DC, 3 amps power supply can be used, however, PIN #3 and PIN #4 (stroke signal output) must not be used for safety reasons. Use only 2-wire cable.**

- Stroke signal output, PIN #3 and PIN #4.  
1 pulse = 1 stroke

**NOTE: Maximum load is 24VDC, 300mA. External 24VDC power supply required.**

**This output, PIN #3 and PIN #4, can be directly connected to Connector II, PIN #2 and PIN #4, of another Chem-Ad pump.**



1	Empty Signal Output, brown
2	Empty Signal Output, white
3	Stroke Signal Output, blue (+)
4	Stroke Signal Output, black (-)

Figure 2.11 - Connector III

**NOTE: The color code allocation applies only to the standard cable supplied from the factory.**

**SECTION 3 - OPERATION**

**List of Contents**

	PARA. NO.
Preparation for Operation .....	3.1
Theory of Operation .....	3.2
Effect of Back Pressure on Capacity .....	3.3
Capacity in Relation to Stroke Length .....	3.4

### 3.1 Preparation for Operation

- a. Fill the container with solution.



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, USE EXTREME CARE TO AVOID CONTACT WITH THE MATERIAL. CONSULT CHEMICAL SUPPLIER FOR INSTRUCTIONS ON THE PREPARATION OF SOLUTIONS AND HANDLING OF CHEMICALS.**

- b. Start the pump, turn the mechanical stroke adjustment to “0”% and wait until the re-circulating line is primed completely as seen through the tubing. Then turn the stroke to 100% until the discharge line is full. Keep the speed (stroke frequency) high and adjust the required dosage by the mechanical stroke adjustment. If the installation is flow proportional and the pump is controlled by a 4 - 20 mA signal, do the adjustment of dosage in local mode.
- c. Read the stroke scale setting of the knob. Two turns of the knob is from 0% to 100%. Between 0% to 50% setting is direct reading on the knob graduations. Between 50% to 100% setting, add 50% to the knob graduation reading.

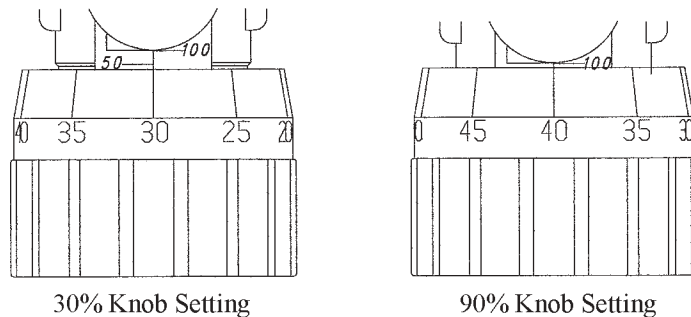


Figure 3.1 - Stroke Length Adjustment Scale

#### 3.1.1 Metering Capability

The reproducible metering accuracy is  $\pm 2\%$  of full scale over 5:1 range with the manually adjustable stroke length knob. Stroke length setting from 20% and below is not recommended. It is preferable to make the stroke length adjustment from low setting to high setting, that is, with clockwise rotation of the knob.

With the E30/M30 control option the frequency of the stroke can be adjusted infinitely from 0 to 144 spm (60 Hz) or 0 to 122 spm (50 Hz) in percent reading by a rotary knob (with the control switch in local posi-

tion). When the control switch is in remote position, the stroke frequency is controlled by 4 - 20 mA signal or pulse, disabling the rotary knob.

### 3.1.2 Strength of Solution

Appropriate dilution of the solution will modify the concentration and therefore the feed rate. This will increase or decrease the amount of solution to be pumped per unit time. Adjusting the solution concentration can match the feed rate with the pump's capabilities and enhance the metering repeatability.

### 3.1.3 Calibrating the Pump

Perform the calibration on the suction side of the pump against actual back pressure. The re-circulating line requires a different set-up than an ordinary pump using a calibration column. The discharge from the re-circulating line must be directed to the calibration column for the duration of the test. In addition, direct the liquid flow so that it will not create disturbances to the liquid level in the column. If a back pressure valve is in-line, connect the discharge line after the valve or rig up a temporary discharge line with back pressure valve in-line. Proceed as follows when using any of the following calibration columns:

100 ML	AAC2543
250 ML	AAC2546
500 ML	AAC2549

- a. Fill up the calibration column over the "0" line.
- b. Close the suction valve and open the valve to the calibration column.
- c. Re-set the stopwatch to zero, start the pump, and watch the liquid level as it goes down.
- d. As soon as the liquid level hits the "0" line, start the stopwatch.
- e. Keep an eye on the liquid level and the stopwatch.
- f. Time for exactly **one minute** and then check the liquid level.
- g. The number corresponding to the graduation is the flow in GPH or ML/MIN.

If the flow rate for one minute is too small and does not show very well in the column graduation, do the test for a longer time period. Use the ML

graduation to get the volume in milliliters and divide it by the run time in minutes to get milliliters per minute (ML/MIN). Multiply ML/MIN by 0.01585 to get GPH.

### 3.2 Theory of Operation

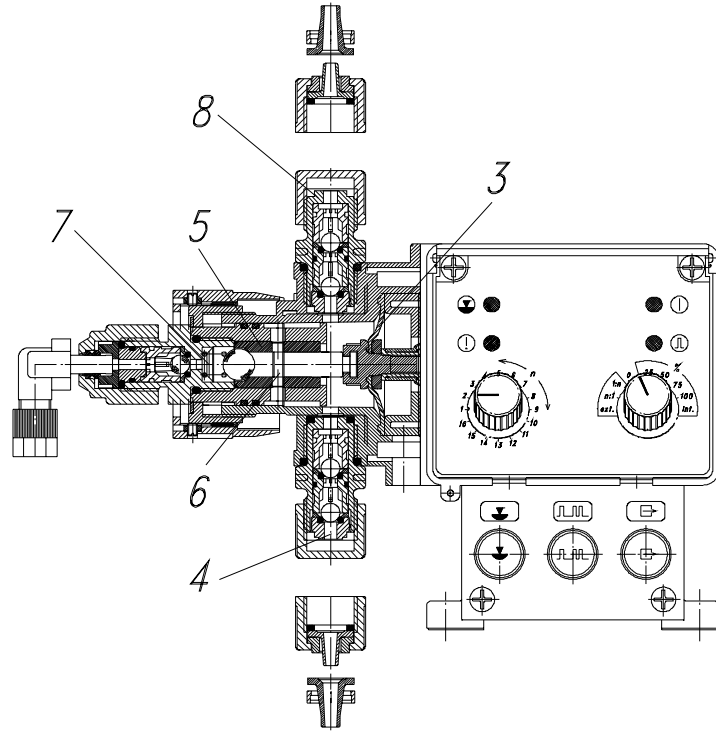
Chem-Ad Series A is a mechanically actuated diaphragm metering pump driven by a synchronous motor. A flat diaphragm between the pump head and the pump housing moves backward and forward to produce a pumping action through two ball checks inside the pumping chamber. A plunger, connecting rod, and a fix eccentric combination produce the reciprocating motion that moves the diaphragm. In as much as the eccentric is fixed, the diaphragm moves the same distance/stroke all the time.

Attached at the front of the diaphragm (3) is a ceramic piston (see Figure 3.2). The piston/cylinder unit (5) is where the metering takes place. When the diaphragm is at the suction stroke (moving back), the suction valve (4) opens to admit the liquid into the pump chamber. Simultaneously vacuum develops in the compression chamber of the metering piston/cylinder unit (5) until the piston uncovers the hole (6) and at that time the liquid enters the compression chamber. On the return stroke of the piston, the liquid in the compression chamber is pushed back out through the hole (6) until the piston covers the hole. All the liquid trapped is then discharged through discharge valve (7) while the excess liquid returns to the storage tank through discharge valve (8). The location of hole (6) determines how much liquid is trapped and hence metered. By turning the knob (9) the hole can be positioned in relation to the piston and is calibrated to meter from 0 flow (no liquid trapped) to 100% (all liquid trapped).

This system provides for the elimination “air binding” in pumping liquid that emits gas, such as sodium hypochlorite and hydrogen peroxide, by continuously purging air through the re-circulating line.



# CHEM-AD™ SERIES A



1	SYNCHRONOUS MOTOR
2	ROD-ECCENTRIC GEAR
3	DIAPHRAGM
4	VALVE
5	METERING PISTON CYLINDER UNIT
6	INSPECTION HOLE
7	VALVE
8	RETURN VALVE
9	STROKE ADJUSTMENT

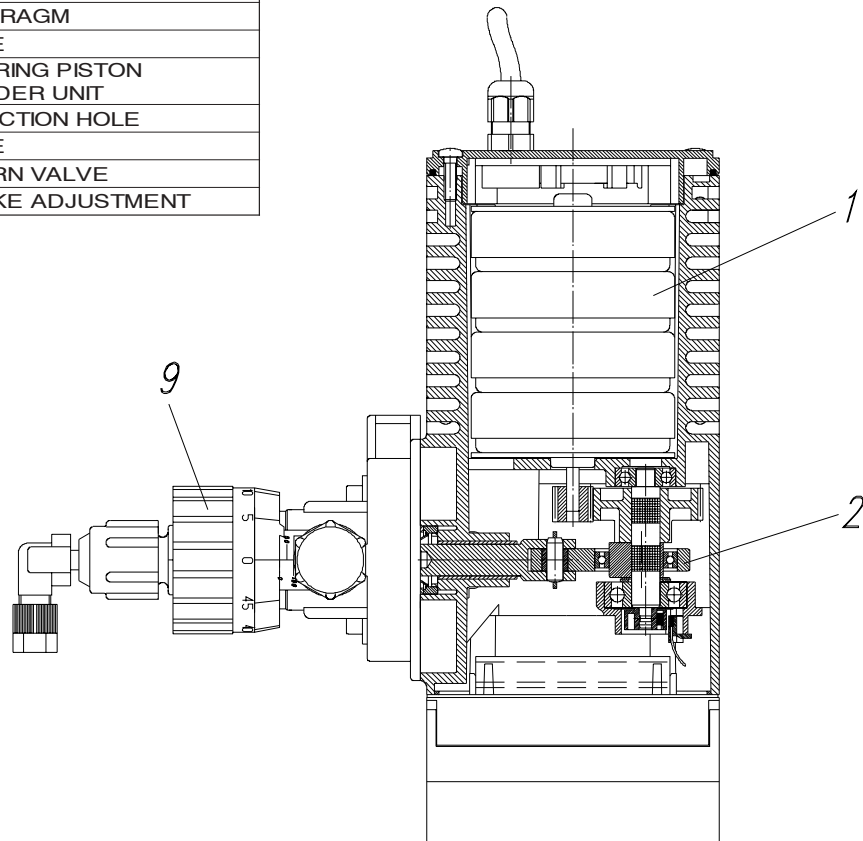
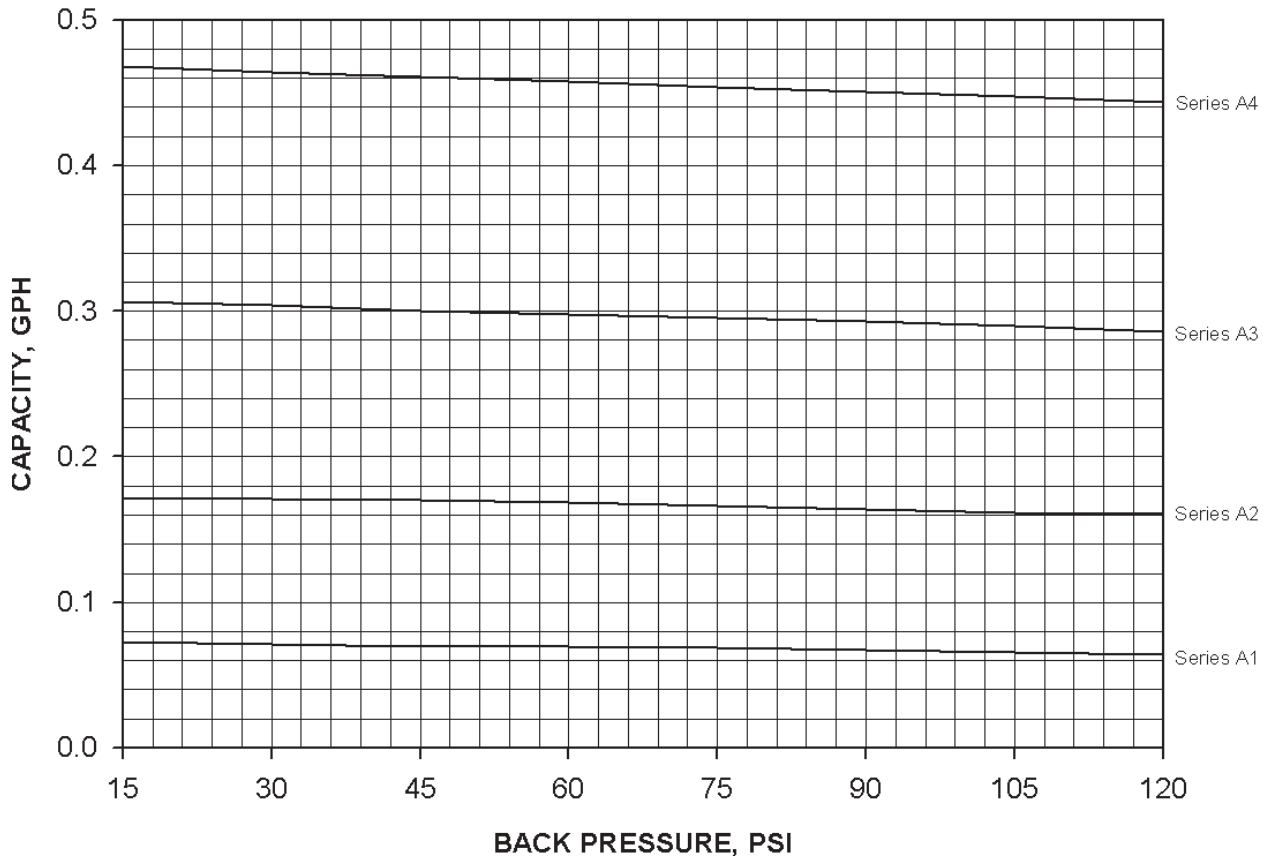


Figure 3.2 - Pump Structure with De-gassing Head

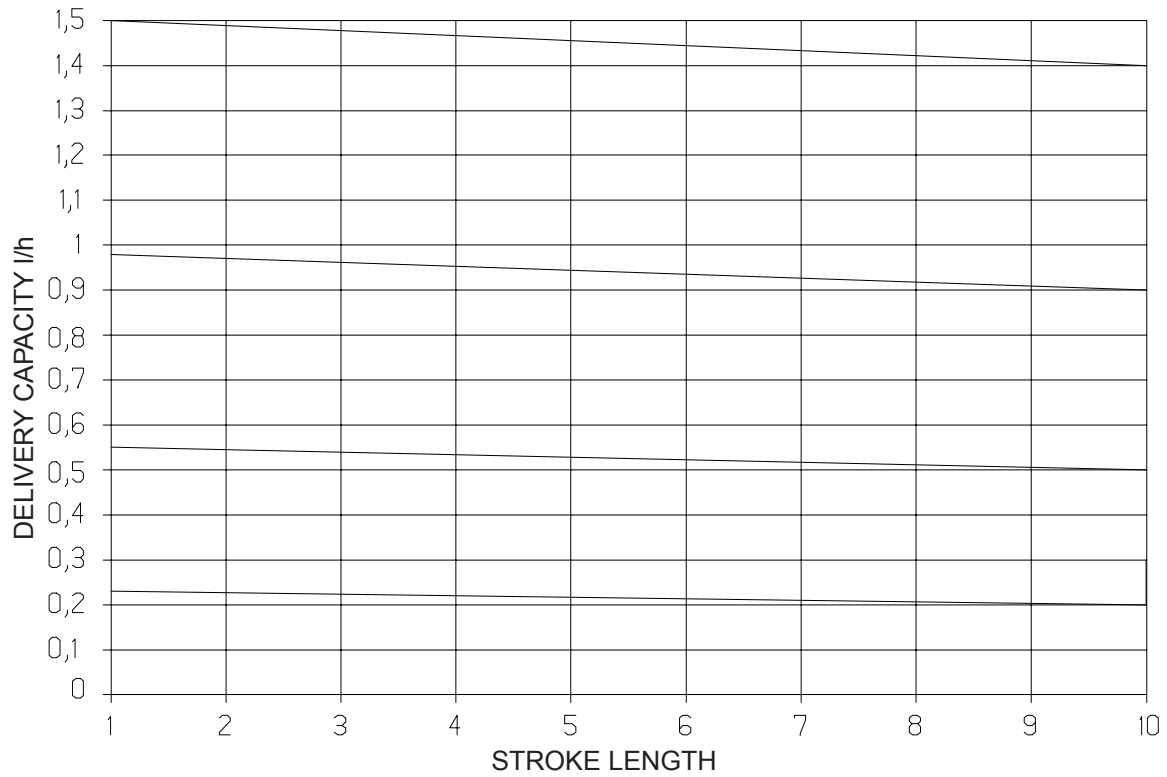
## 3.3 Effect of Back Pressure on Capacity

### 3.3.1 USA Version - Capacity vs. Back Pressure

144 spm, water at 68°F (20°C)



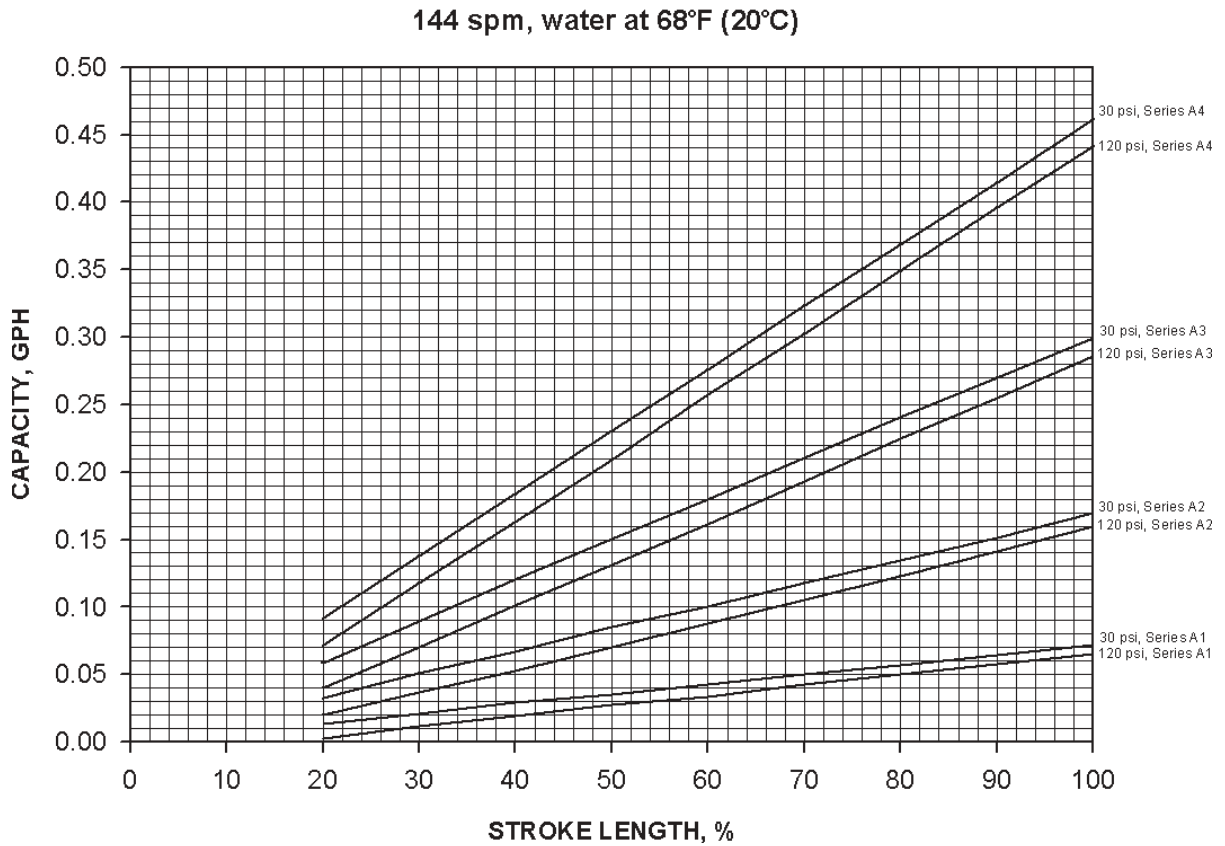
## 3.3.2 EURO Version - Capacity vs. Back Pressure



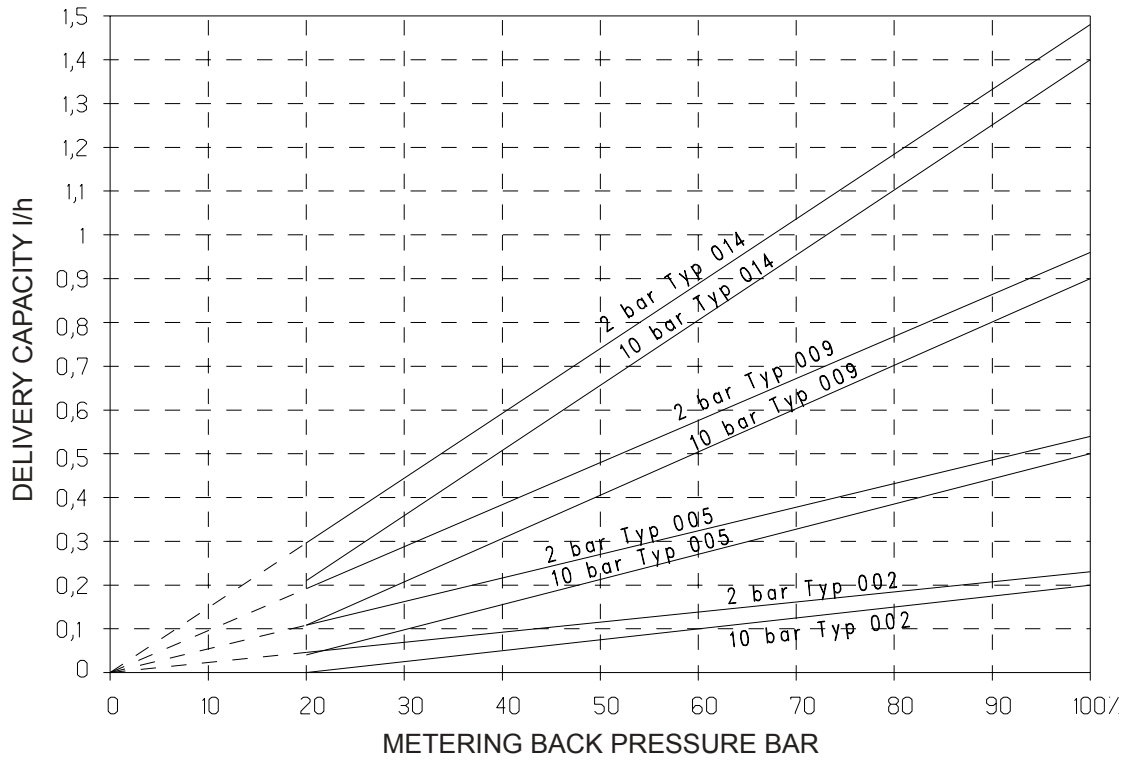
## 3.4 Capacity in Relation to Stroke Length

All metering capacity information relates to measurements using water at 68° F (20° C) with a constant power supply and warmed-up pump. For metering accuracy, it is recommended that the lowest stroke length setting be 20%.

### 3.4.1 USA Version - Capacity vs. Stroke Length



## 3.4.2 EURO Version - Capacity vs. Stroke Length





**CHEM-AD™ SERIES A**

**SECTION 4 - SERVICE**

**List of Contents**

	PARA. NO.
General Information .....	4.1
Periodic Cleaning .....	4.2
Periodic Preventive Maintenance .....	4.3
Corrective Maintenance .....	4.4
Troubleshooting .....	4.5
Warning Summary .....	1 Page

**NOTE:** This Instruction Book assumes that the customer has the right tools that are necessary to service the pump safely and efficiently. The customer must also know how to use them properly. There are certain notes, cautions, and warnings included in the book; each one is there for a specific purpose. **NOTES** provide added information that will help complete a particular procedure. **CAUTIONS** are given to prevent an error that could damage the pump. **WARNINGS** remind the user to be especially careful in those areas where carelessness can cause personal injury.



**WARNING:** TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE FROM BEING SPRAYED WITH LIQUID UNDER PRESSURE, REFER TO DETAILED INSTRUCTION ON RELIEVING PRESSURE AND DRAINING PRIOR TO DISASSEMBLY OF PIPE CONNECTIONS.

## 4.1 General Information

### 4.1.1 Routine Maintenance

Routine maintenance of the metering pump consists of two operations:

- Periodic cleaning: To remove contaminants and deposits formed on parts in contact with the solutions.
- Periodic preventive maintenance: To disassemble, inspect, clean, and replace parts as recommended.

### 4.1.2 Corrective Maintenance

Corrective maintenance is performed (as required, at unscheduled intervals) to correct a discrepant operating or non-operating condition. A troubleshooting table (refer to Table 4.2) lists possible fault conditions and corrective actions as a guide for service personnel.

## 4.2 Periodic Cleaning

### 4.2.1 Cleaning Pumping Head Parts

If difficulty is encountered in pumping the solution where hard water is known to have been used in the preparation of the solution, remove the pumping head parts for cleaning (refer to paragraph 4.4.1, Removing Pump from Service and Replacement of Valves, Pump Head, Diaphragm, and Casing Bellows, for head removal). The effects of hard water are indicated by a white coating on all parts in contact with the solution. This



coating is most easily removed by soaking the parts in 5% hydrochloric acid, commonly obtainable in drug store. The commercial grade of hydrochloric acid—known as muriatic acid—is also suitable for this purpose. Where the above condition is known to exist, pump the acid solution to the pump head for approximately five minutes.



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, USE EXTREME CARE TO AVOID CONTACT WITH THE MATERIAL. CONSULT CHEMICAL SUPPLIER FOR INSTRUCTIONS ON THE PREPARATION OF SOLUTIONS AND HANDLING OF CHEMICALS.**

#### **4.2.2 Cleaning Clogged Solution Tube**

Where the solution joins water being treated and that water contains considerable hardness, there may be a deposit formed inside the solution tube at the point of application. In time, this can completely plug tube and the deposit must be removed. The best method is by dissolving the deposit as described in paragraph 4.2.1, Cleaning Pumping Head Parts. Where this condition is known to exist, clean the solution tube as a part of routine maintenance.

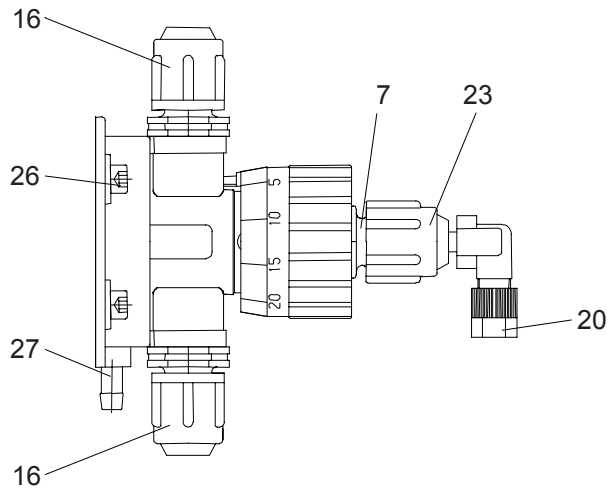
#### **4.3 Periodic Preventive Maintenance**

To minimize unscheduled shut-down and ensure maximum service life, perform periodic maintenance at specified intervals while the equipment is in satisfactory condition. Table 4.1 lists the interval, maintenance operation, and preventive maintenance kits required. Before starting the work, ensure that the appropriate preventive maintenance kits are in stock. Refer to Section 6 - Preventive Maintenance Kits and Spare Parts List for the appropriate maintenance kit.

**NOTE: Although all parts are designed for long service life, it is recommended that routine maintenance be performed to safeguard against unexpected downtime.**

**Table 4.1 - Scheduled Maintenance Index**

INTERVAL	MAINTENANCE OPERATION	PREVENTIVE MAINTENANCE KIT
Quarterly, shorter intervals if running 24 hours a day	Inspect Suction and discharge connections for leaks: Refer to Figure 4.1 Union Nuts (16, 20, 23) Drain Hole (27) on pump head (if there is leak the diaphragm is cracked) Head Screws (26), torque to 26-36 inch-lbs (3-4 Nm)	If parts are needed: Refer to Section 6 for PM Kits. Order the Connection Kit (USA or EURO Version)
Every 4000 hours of operation	Change the diaphragm	A1 and A4 - AAB4207 A2 - AAB4213 A3 - AAB4210
Annually	Change all valve sets and cylinder/piston assembly	Refer to Section 6 for PM Kits Order the Head Kit



**Figure 4.1 - Parts to Check for Leaks**

**4.4 Corrective Maintenance**



**WARNING: TO AVOID CONTACT WITH THE MATERIAL AND POSSIBLE SEVERE PERSONAL INJURY WHEN SERVICING HEADS AND/OR VALVES, FOLLOW THE PROCEDURES IN THIS SECTION FOR DISASSEMBLY.**



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, USE EXTREME CARE TO AVOID CONTACT WITH THE MATERIAL. WHEN HANDLING HAZARDOUS MATERIAL, OBSERVE ALL SAFETY PRECAUTIONS RECOMMENDED BY THE MATERIAL MANUFACTURER/SUPPLIER.**



**CAUTION: To prevent possible equipment damage, the solution must never be allowed to freeze in the pump. If freezing conditions are present when the pump is shut-off, drain the pump head and all solution lines prior to shut-off.**

Corrective maintenance is performed as required to correct a discrepant operating or non-operating condition. A troubleshooting table (refer to Table 4.2) is provided to guide service personnel in diagnosing and correcting most common troubles.

Routine maintenance procedures includes the elimination of solution leaks when they are found, to avoid corrosion damage. Flush away spilled solution with water and wipe the parts clean and dry.

Maintain gasketed joints in good condition. Keep an adequate supply of gaskets and O-rings available so that repair of leaks can be accomplished without delay. It is a good practice to discard used gaskets and O-rings, replacing them with new material each time a joint is broken.

**4.4.1 Removing Pump from Service and Replacement of Valves, Pump Head, Diaphragm, and Casing Bellows**



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, USE EXTREME CARE TO AVOID CONTACT WITH THE MATERIAL. OBSERVE ALL SAFETY PRECAUTIONS, AND UTILIZE APPROPRIATE PROTECTIVE CLOTHING AND EYE PROTECTION WHEN HANDLING HAZARDOUS MATERIAL.**

Procedures for the assembly and disassembly of parts for pump maintenance are referenced in the following paragraph.

#### 4.4.2 Draining System of Hazardous Material



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM BEING SPRAYED BY LIQUID UNDER PRESSURE, ALLOW THE SYSTEM TO DRAIN FULLY BEFORE ATTEMPTING TO DISASSEMBLE PIPING AND REMOVE VALVES AND/OR HEAD.**

- a. Disconnect power from the pump or unplug the pump.
- b. Close the discharge shutoff valves of the metering line and the re-circulating line.
- c. For flooded suction, close the suction shutoff valve to prevent the backflow of liquid when suction lines are disconnected.
- d. Open the suction drain valve and drain the suction line of liquid.
- e. Open the discharge drain valve of both the metering line and the re-circulating line to relieve pressure and drain the line.
- f. The tubing connections can now be disconnected.

#### 4.4.3 Replacement of the Re-circulating Valves



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, USE EXTREME CARE TO AVOID CONTACT WITH LIQUID PRESENT IN THE PUMP HEAD. ALLOW THE SUCTION VALVE TO FALL INTO A SUITABLE CONTAINER AND CATCH THE LIQUID.**



**WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY, USE EXTREME CARE TO AVOID CONTACT WITH THE LIQUID PRESENT BETWEEN THE DISCHARGE DRAIN VALVE AND THE UNIT BELOW. FLUSH ANY SPILLED LIQUID IMMEDIATELY.**

- a. Disconnect the discharge and suction connections per paragraph 4.4.2.
- b. Unscrew the suction and discharge valves.
- c. Wash the valves thoroughly with water to remove any chemical.
- d. The valve can be disassembled to check for any dirt trapped inside by removing the bottom seat. They can be re-used after cleaning and

if there is no evidence of defect. Refer to Figure 4.2 for the valve assembly drawing.



**CAUTION:** Use a small pair of pliers to carefully twist the seat out. Be careful not to mar the seat's outside diameter. Position the valve vertically to prevent the parts from falling.

- e. Inspect all the parts for any defects. Replace the whole valve if any part is defective. The parts are available as a complete assembly in the PM Kit.
- f. For re-assembly look for the direction of the arrow. The arrow must point upward.
- g. To install the discharge valve, position the O-ring (22) at the bottom of the pump head discharge opening.
- h. Position the O-ring (21) at the valve shoulder and screw it in hand-tight; watch for the direction of the arrow.
- i. To install the suction valve, position two O-rings onto the valve, one at the valve shoulder (21) and the other at the valve seat (20). Watch for the direction of the arrow.

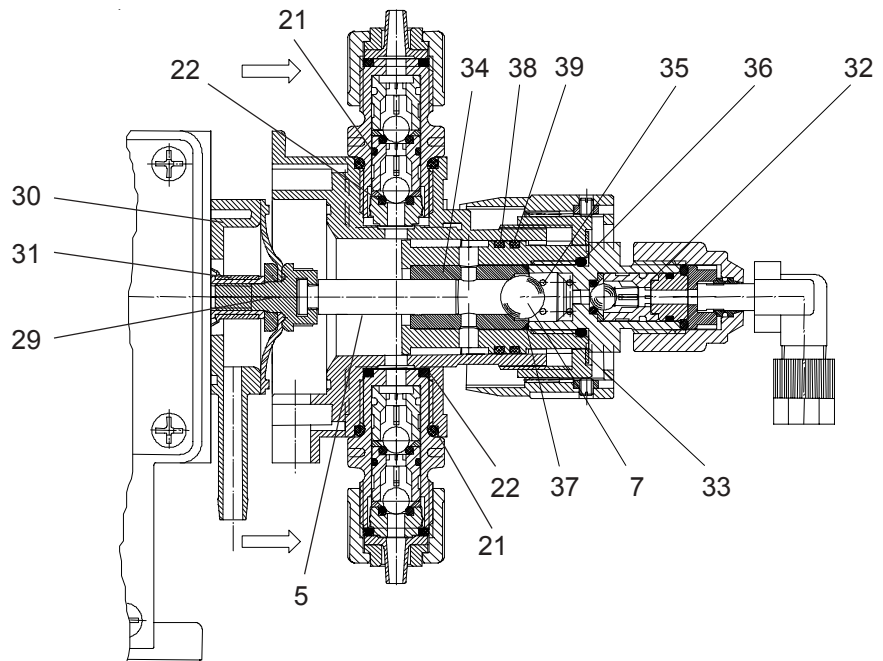


Figure 4.2 - Valves and Diaphragm Assembly

#### 4.4.4 Replacement of Re-circulating Diaphragm and Casing Bellows

- a. Drain the pump head of chemical and disconnect all the tubing lines per paragraph 4.4.2
- b. Remove the suction and discharge valves of the re-circulating line per paragraph 4.4.3
- c. Loosen the metering head screws and pull out the pump head absolutely straight. Refer to Figure 4.2.



**CAUTION:** The head must be pulled straight out until the piston (5) clears the cylinder (34). The piston (5) remains connected to the diaphragm (29), but may fall while pulling the head.

- d. Remove the ceramic piston (5) sideways out of the coupling of the diaphragm unit (29).
- e. Unscrew the diaphragm unit (29) and remove the intermediate plate (30).
- f. Remove the bellow (31) and exchange for the new one.
- g. Gently screw in the diaphragm unit (29) until it stops.

**NOTE:** The leakage drain connection of the intermediate plate must be pointing downward.

- h. Re-insert the piston (5) into the cylinder unit (34) and carefully push the pump head absolutely straight.
- i. Secure with four metering head screws and tighten to 26-36 inch-lbs (3-4 Nm) evenly and diagonally.
- j. The metering head screws must be re-torqued to 26-36 inch-lbs (3-4 Nm) after running the pump for 24 hours.

#### 4.4.5 Replacement of Ceramic Piston/Cylinder Unit

- a. Remove the head assembly per paragraph 4.4.4, procedures “a” to “d”.
- b. Unscrew valve nipple (32). Refer to Figure 4.2.



**CAUTION:** Watch for the spring (35) and valve ball (7) as they might fall out.

- c. Remove washer (33), valve ball (7), and spring (35).
- d. Push the ceramic cylinder unit (34) at the diaphragm end.
- e. Insert a new unit.

**NOTE:** Cylinder and piston are one unit and are replaced as an assembly only.

- f. Replaced O-rings (36, 37, 38, and 39).
- g. Re-install the valve nipple (32) with the valve ball (7) and spring (35) in proper position.

#### 4.4.6 Replacement of Metering Valve

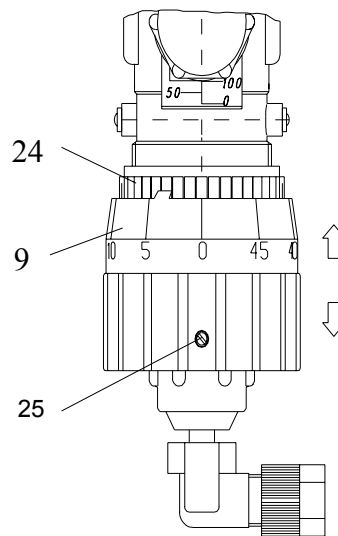
- a. Drain the pump head of chemical and disconnect the metering line per paragraph 4.4.2
- b. Unscrew the union nut (40) that holds the connection assembly. Refer to Figure 4.2.
- c. Unscrew the valve nipple (32) and remove valve ball (7) and spring (35).
- d. Replace O-rings (36 and 37), valve ball (7), and spring (35).
- e. Install the new metering valve assembly with new valve ball (7) and new spring (35) in proper position.

#### 4.4.7 Setting the Mechanical Stroke Adjustment Calibration

The pump is calibrated at the factory in accordance with the characteristic curves shown in Section 3, paragraph 3.4 and at maximum back pressure. The stroke adjustment basic setting can be determined as follows:

- a. Turn the pump on and make sure that the flow of liquid in the metering line (tubing) can be seen clearly.
- b. Turn the stroke adjustment knob (9) counter-clockwise until there is no liquid flow in the metering line. Refer to Figure 4.3.

- c. Loosen headless screw (25, two locations) and pull out the stroke adjustment knob (9).
- d. Re-attach with the “0” line in the knob in line with the “0” scale of the barrel (24).
- e. Turn the adjustment knob clockwise two times, and push in the adjustment knob until the edge of the knob is in line with the “100” scale of the barrel and at the “stop-knob” location.
- f. Tighten the two headless screws (25).



**Figure 4.3 - Mechanical Stroke Adjustment Calibration**

## 4.4.8 Gearbox

The mechanical components in the drive mechanism are not serviceable. It is grease-lubricated and does not require any maintenance. However, it can be opened and inspected by removing the motor through the back end and the electrical face at the front.

## 4.5 Troubleshooting

The troubleshooting procedures are limited to fault isolation on a defective item. Potential problems that could be at fault and recommendations for corrective actions are listed in Table 4.2. There are faults that can be fixed by the customer and faults that can only be fixed by a person with electronic knowledge. In such a case, the whole electronic board must be replaced.



**Table 4.2 - Troubleshooting**

FAULT CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
<b>METERING PUMP DOES NOT WORK, GREEN LED OFF.</b>	Incorrect voltage, no power or fuse blown.	Check power supply and cable.
	Main cable damage or plug defective.	
<b>PUMP DOES NOT PRIME (RE-CIRCULATING LINE) EVEN WITHOUT BACK PRESSURE, MAX STROKE AND SPEED.</b>	Suction and discharge valves leaks, stuck due to dirt or dry.	Remove and rinse the valves.
	Gas accumulates at the pump head and suction line.	Check for cavitation. Install a vented riser if flooded suction. Dilute the liquid, especially Sodium Hypochlorite.
	Suction and discharge shut-off valves closed.	Open valves.
	Strainer is clogged.	Clean strainer.
	There is leakage in suction line.	Check and repair leaks.
<b>NO CHEMICAL AT POINT OF APPLICATION, THOUGH PUMP IS PUMPING (RE-CIRCULATING LINE).</b>	Pressure is too high.	Check the pressure at the main line.
	Cylinder/piston assembly is worn.	Replace cylinder/piston assembly.
	Piston disengage from diaphragm coupling.	Remove head and check for broken coupling or piston.
	Pressure relief valve is relieving (if equipped) or defective.	Adjust pressure relief valve to proper relief pressure. Change or repair the pressure relief valve if defective.
<b>METERING HEAD IS LEAKING AND LIQUID IS EMERGING BETWEEN THE HEAD AND INTERMEDIATE PLATE.</b>	Metering head is loose.	Tighten the head screws diagonally to 26-36 inch-lbs (3-4 Nm).
	Diaphragm rupture.	Replace diaphragm.
<b>LIQUID IS LEAKING THROUGH THE INTERMEDIATE PLATE DRAIN LINE.</b>	Diaphragm rupture.	Replace diaphragm.

**Table 4.2 - Troubleshooting (Cont'd)**

FAULT CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
<b>LEVEL LED FLASHES.</b>	Storage tank is near empty.	Re-fill storage tank.
<b>LEVEL LED IS CONSTANTLY ON.</b>	Storage tank is empty.	Re-fill storage tank.
	Loose jumper plug or missing on connector I.	Check that the plug is properly plugged in.
<b>LEVEL LED FLASHES DESPITE FULL STORAGE TANK.</b>	Float is blocked.	Release float.
	Loose jumper plug or suction pipe assembly connector is loose or dirty.	Check the connector and clean the contacts.
	Suction pipe assembly cable is defective.	Replace or repair the cable.
<b>PUMP NOT WORKING (RED LED NOT INDICATING FAULT).</b>	Metering lock in operation (PIN #3 and #4 of connector II must be bridged).	Attach jumper plug to connector II. Clean contacts of plug.
<b>METERING PUMP DOES NOT WORK, EVEN THOUGH ON SWITCH OR YELLOW LED FLASHES (E30/M30 ONLY).</b>	Cylinder/piston assembly is worn.	Replace cylinder/piston assembly.
	Dirt in the metering discharge valve.	Remove and clean the valve.
	Metering volume too low.	Increase the stroke length setting.
<b>ERROR SIGNAL LED LIGHTS UP.</b>	Metering valve clogged.	Remove and clean the valve.
	Back pressure is too high.	Check return lines for restrictions.
	On E30/M30 operating with 4-20 mA signal the current is interrupted.	Establish the signal current.
	Metering system blocked.	Internal fault, replace electronic board.
	Metering without request being made.	Internal fault, replace electronic board.

**WARNING LABEL**

The following warning label is attached to the equipment.

-----  
**AAA2520:** This equipment may handle HAZARDOUS materials, which can cause severe personal injury.

Use appropriate protective clothing and eye protection.

To prevent spraying of liquid DO NOT disconnect discharge tube/main connection without first relieving pressure and draining line.

Tighten couplings nuts by hand—DO NOT use wrench.

For safety precautions refer to the MSDS for the material being handled and the equipment instruction book for further important details and precautions.

To avoid possible severe personal injury from electrical shock, disconnect power source before servicing.

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**CHEM-AD™ SERIES A**



**SECTION 5 - ILLUSTRATIONS**

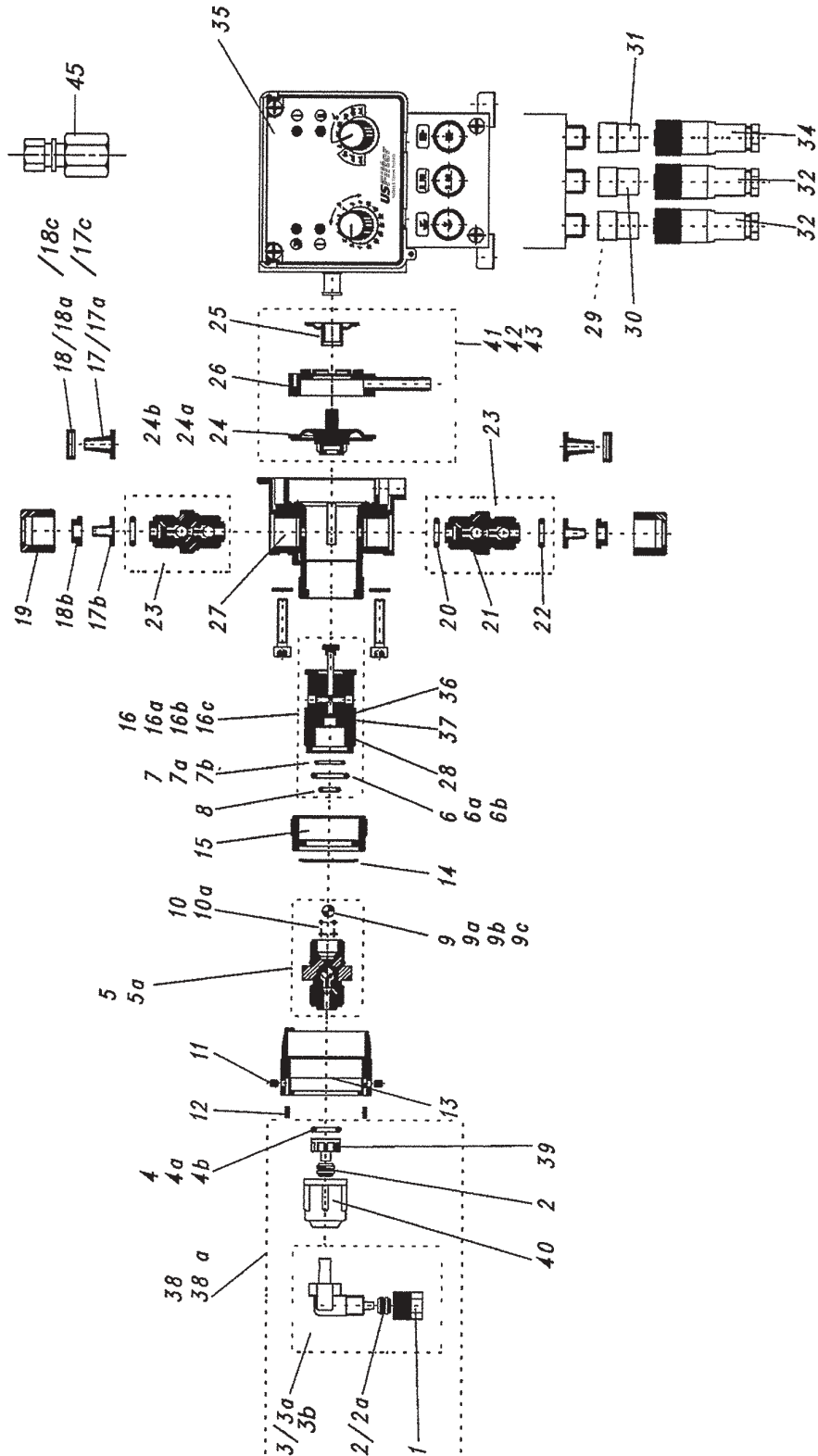
**List of Contents**

DWG. NO.

Parts

Chem-Ad Series A ..... 440.600.000.010A-C

# CHEM-AD™ SERIES A



NOTE: FOR PARTS LIST, SEE DWGS. 440.600.000.010B&C.

## CHEM-AD METERING PUMP SERIES A - PARTS

440.600.000.010A

ISSUE 0 12-02

# CHEM-AD™ SERIES A

KEY NO.	DESCRIPTION	PART NO.
1	UNION NUT 4/6 TYPE 014-005	AAB4099
2	CRIMPING RING 4/6 TYPE 014-005	AAB4102
2a	CRIMPING RING	AAB4105
3	ANGULAR CONNECTION COMPLETE 4/6	AAB4108
3a	ANGULAR CONNECTION COMPLETE 2/4	AAB4111
▲ 3b	ANGULAR CONNECTION COMPLETE (1/4" O.D. TUBE)	AAC2522
4	O-RING FPM 10.0 x 2.5	AAB2869
4a	O-RING EPDM 10.00 x 2.5	AAB4114
4b	O-RING KALREZ 10.0 x 2.5	AAB4117
5	PRESSURE VALVE TYPE 014-005	AAB4120
5a	PRESSURE VALVE TYPE 002	AAB4123
6	O-RING FPM 14.0 x 2.5	AAB4126
6a	O-RING EPDM 14.5 x 2.5	AAB4129
6b	O-RING KALREZ 14.0 x 2.5	AAB4132
7	O-RING FPM 12.0 x 1.5	AAB4135
7a	O-RING EPDM 12.0 x 1.5	AAB4138
7b	O-RING KALREZ 12.42 x 1.78	AAB4141
8	O-RING, TYPE 002, 7.0 x 2.0	AAB4144
9	BALL, TYPE 014, 010	AAB4147
9a	BALL, TYPE 009, 08	AAB4150
9b	BALL, TYPE 005, 08	AAB4153
9c	BALL, TYPE 002, 06	AAB4156
10	SPRING, TYPE 014-005	AAB9481
10a	SPRING, TYPE 002	AAB4162
11	HEADLESS SCREW	AAB4165
12	SQUARE NUT	AAB4168
13	STROKE ADJUSTMENT BUTTON	AAB4171
14	PLATE	AAB4174
15	ADJUSTMENT NUT	AAB4177
16	CYL. PISTON UNIT, COMPLETE, TYPE 01 4 (POS. 43, 44)	AAB4180
16a	CYL. PISTON UNIT, COMPLETE, TYPE 009 (POS. 43, 44)	AAB4183
16b	CYLINDER PISTON UNIT COMPLETE, TYPE 005 (POS. 43, 44)	AAB4186
16c	CYLINDER PISTON UNIT COMPLETE, TYPE 002 (POS. 43, 44)	AAB4189
17	CONNECTION NIPPLE FOR DOUBLE-HOSE PVC 6/10	AAB2884
17a	CONNECTION NIPPLE FOR PVC TEXTILE REINFORCED HOSE 6/12	AAB4195
17b	CONNECTION NIPPLE FOR PE/PTFE PIPE 6/8	AAB2884
▲ 17c	TAPER PART (DUO-HOSE) PVDF	AAC2408
18	THRUST PIECE DOUBLE-HOSE PVC 6/10	AAB4201
18a	THRUST PIECE FOR PVC-TEXTILE REINFORCED HOSE 6/12	AAB2878
18b	THRUST PIECE FOR PE/PTFE PIPE 6/8	AAB2875
▲ 18c	CLAMPING PIECE (DUO-HOSE) PVDF	AAC2411
19	UNION NUT	AAB2872
20	O-RING 10 x 2.5	AAB2869

**NOTE:** ▲ USA CONNECTORS.

WHEN ORDERING MATERIAL ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS

CHEM-AD METERING PUMP SERIES A - PARTS LIST

440.600.000.010B

ISSUE 0 12-02

# CHEM-AD™ SERIES A

KEY NO.	DESCRIPTION	PART NO.
21	O-RING 14 x 2.5	AAB4126
22	O-RING 10 x 2.5	AAB2869
23	SUCTION/RETURN VALVE, COMPLETE	AAB2863
24	COUPLING/ DIAPHRAGM UNIT, COMPLETE TYPE 014 / 002	AAB4207
24a	COUPLING/ DIAPHRAGM UNIT, COMPLETE TYPE 009	AAB4210
24b	COUPLING/ DIAPHRAGM UNIT, COMPLETE TYPE 005	AAB4213
25	BELLOWS	AAB2908
26	INTERMEDIATE PLATE	AAB4219
27	PUMP HEAD	AAB4222
28	CYLINDER	AAB4225
29	BRIDGE CONNECTOR FOR EMPTY SIGNAL PRE-REPORT	AAB2890
30	BRIDGE CONNECTOR PULSE INPUT	AAB2896
31	COVER CAP	AAB2893
32	PLUG 4-POLE (3-POLE) EMPTY SIGNAL-/PULSE INPUT	AAB2899
33	PLUG 5-POLE E 30/32 CURRENT-/PULSE INPUT	AAB2905
34	PLUG 4-POLE EMPTY SIGNAL-/PULSE OUTPUT	AAB2902
35	COVER	AAB2887
36	O-RING FPM 22.0 x 2.0	AAB4228
36	O-RING EPDM 22.0 x2.0	AAB4231
36b	O-RING KALREZ 22.0 x 2.0	AAB4234
37	O-RING EPDM 22.0 x2.0	AAB4231
37a	O-RING FPM 22.0 x 2.0	AAB4228
37b	O-RING KALREZ 22.0 x 2.0	AAB4234
38	CONNECTOR ANGLED G 3/8" - 2/4 TYPE 002	AAB4675
38a	CONNECTOR ANGLED G 3/8" - 4/6 TYPE 005-014	AAB4678
39	SUPPORTING ELEMENT PVDF	AAB4681
40	UNION NUT KKS	AAB4684
▲ 45	CONNECTOR, STRAIGHT, 3/8" O.D. x 1/4" I.D. PVDF	AAC2423

**NOTE:** ▲ USA CONNECTORS.

WHEN ORDERING MATERIAL ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS

CHEM-AD METERING PUMP SERIES A - PARTS LIST

440.600.000.010C

ISSUE 0 12-02



**SECTION 6 - PREVENTIVE MAINTENANCE KITS AND ACCESSORIES**

**List of Contents**

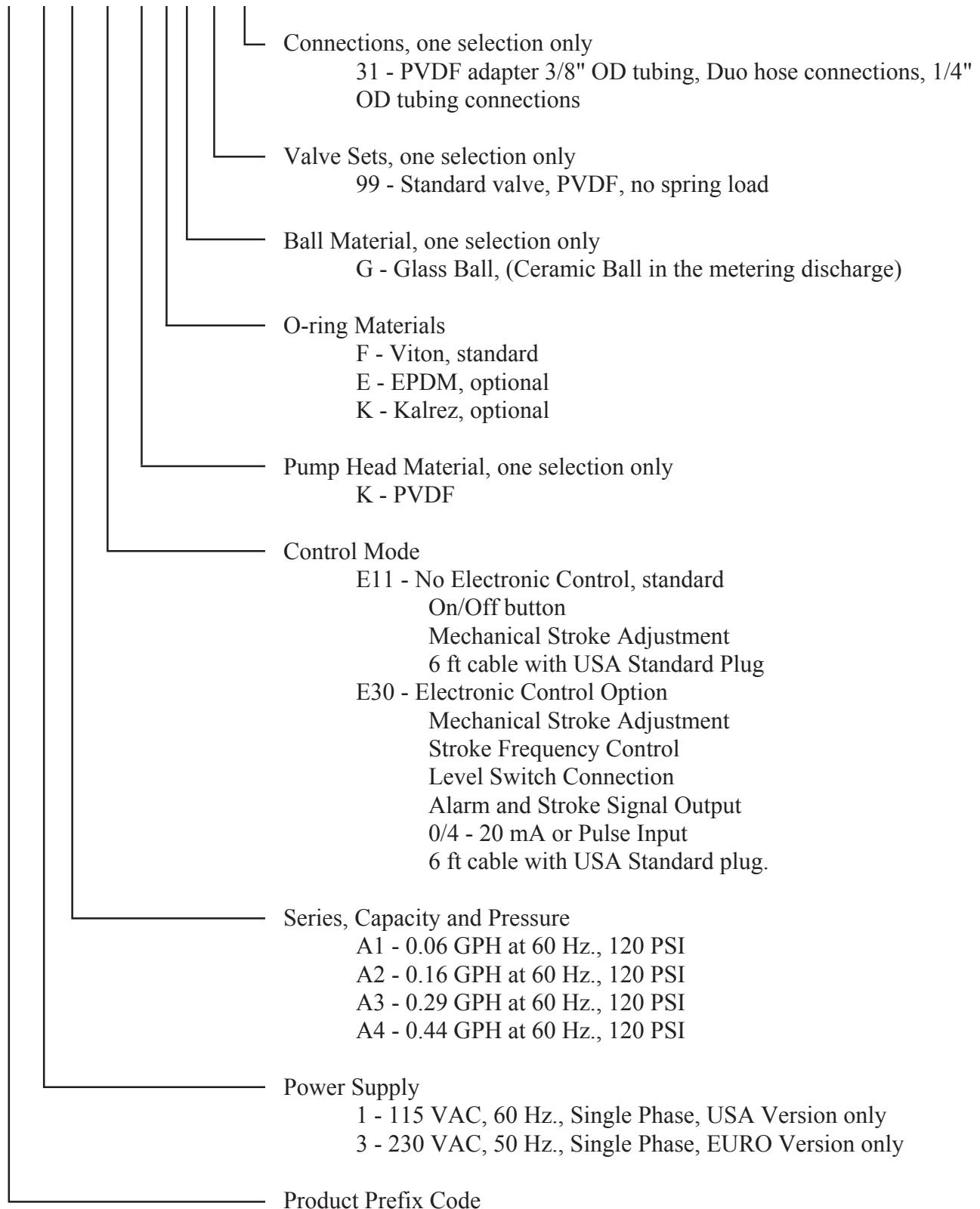
	PARA. NO.
Configuration Code .....	6.1
Preventive Maintenance Kit .....	6.2
Accessories .....	6.3

## 6.1 Configuration Code

To order the correct maintenance kit or spare parts the configuration of the pump must be known. The configuration number is also the ordering code of that particular pump. Every pump has a data plate attached to it that specifies a configured alphanumeric code starting with “CM” and followed by thirteen (13) numbers or letters.

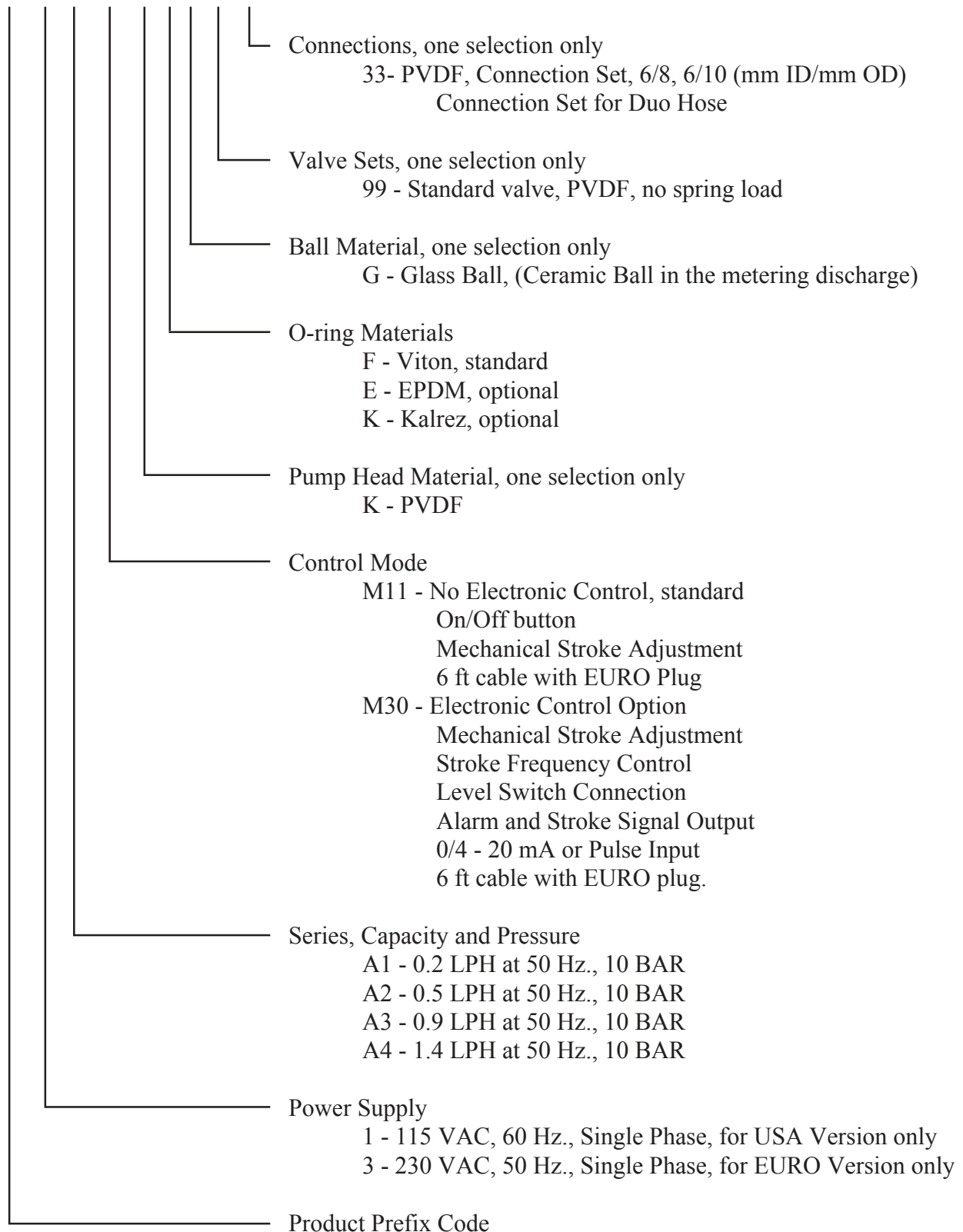
## 6.1.1 USA Version

CM 1 A4 E30 K F G 99 31



## 6.1.2 EURO Version

CM 3 A4 M30 K F G 99 33



## 6.2 Maintenance Kit

For convenient ordering, the Maintenance Kit consists of all the parts necessary to perform regular required maintenance for the pump. Refer to Figure 6.1 for a diagram of the parts that comprise each particular kit.

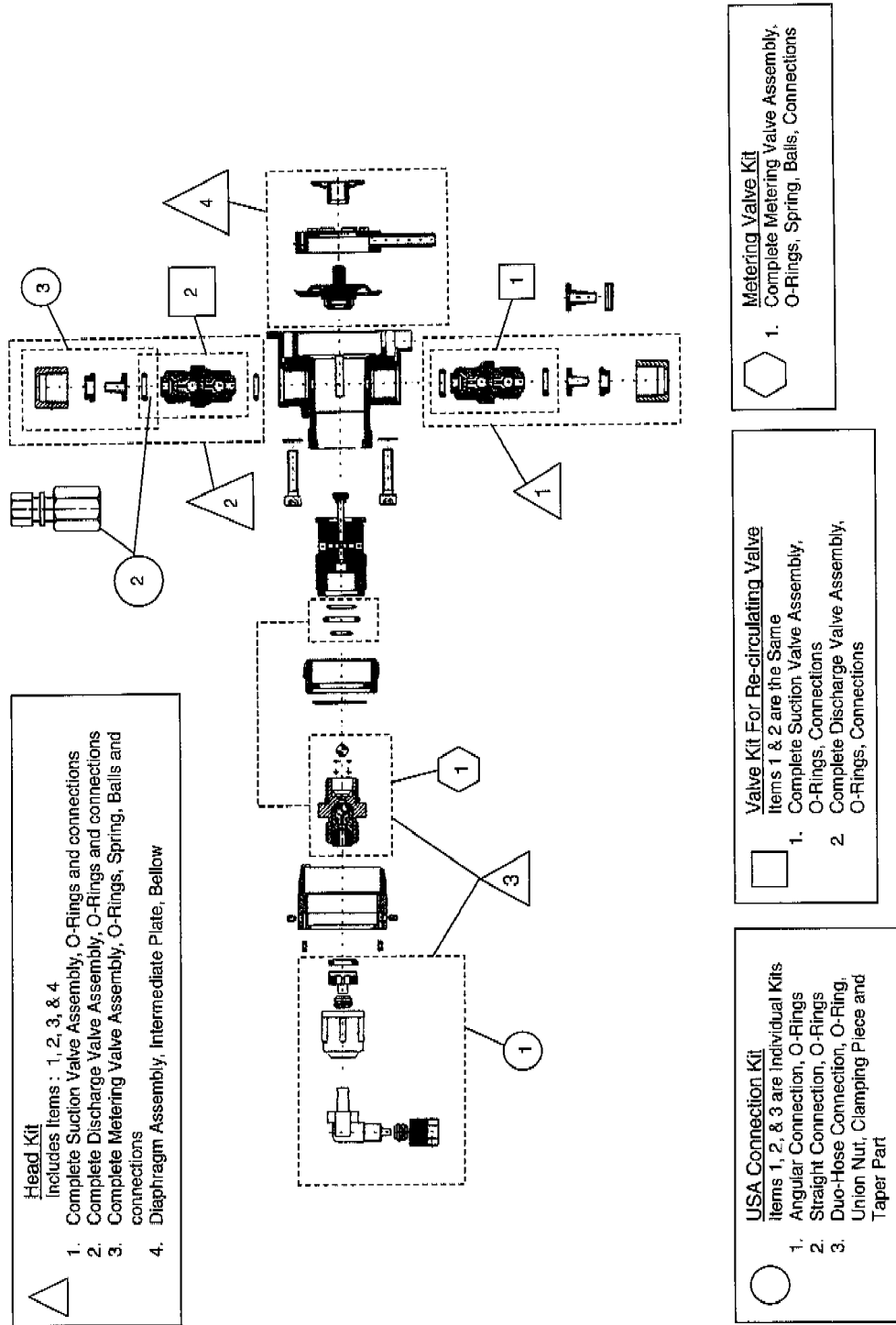


Figure 6.1 - Maintenance Kit Parts Reference

**6.2.1 Head Kit**

Order one (1) kit per pump

Descriptions - See Figure 6.1	USA Version Pump	Metric Version Pump
Head Kit for 0.06 GPH (0.24 l/h), Series A VITON O-ring and GLASS ball, includes connections	AAC2873	AAB5506
Head Kit for 0.06 GPH ( 0.24 l/h), Series A EPDM O-ring and GLASS ball, includes connections	AAC2876	AAB5524
Head Kit for 0.06 GPH (0.24 l/h), Series A VITON O-ring and CERAMIC ball, includes connections	AAC2879	AAB5536
Head Kit for 0.06 GPH (0.24 l/h), Series A EPDM O-ring and CERAMIC ball, includes connections	AAC2882	AAB5548
Head Kit for 0.06 GPH (0.24 l/h), Series A KALREZ O-ring and PTFE ball , includes connections	AAC2744	AAC3008
Head Kit for 0.16 GPH (0.6 l/h), Series A VITON O-ring and GLASS ball, includes connections	AAC2885	AAB5512
Head Kit for 0.16 GPH ( 0.6 l/h), Series A EPDM O-ring and GLASS ball, includes connections	AAC2888	AAB5527
Head Kit for 0.16 GPH (0.6 l/h), Series A VITON O-ring and CERAMIC ball, includes connections	AAC2891	AAB5539
Head Kit for 0.16 GPH (0.6 l/h), Series A EPDM O-ring and CERAMIC ball, includes connections	AAC2894	AAB5551
Head Kit for 0,16 GPH (0.6 l/h), Series A KALREZ O-ring and PTFE ball, includes connections	AAC2747	AAC3011

**6.2.1 Head Kit (Cont'd)**

Descriptions - See Figure 6.1	USA Version Pump	Metric Version Pump
Head Kit for 0.29 GPH (1.08 l/h), Series A VITON O-ring and GLASS ball, includes connections	AAC2897	AAB5515
Head Kit for 0.29 GPH ( 1.08 l/h), Series A EPDM O-ring and GLASS ball, includes connections	AAC2900	AAB5530
Head Kit for 0.29 GPH (1.08 l/h), Series A VITON O-ring and CERAMIC ball, includes connections	AAC3014	AAB5542
Head Kit for 0.29 GPH (1.08 l/h), Series A EPDM O-ring and CERAMIC ball, includes connections	AAC3017	AAB5554
Head Kit for 0.29 GPH (1.08 l/h), Series A KALREZ O-ring and PTFE ball, includes connections	AAC2750	AAC3020
Head Kit for 0.44 GPH (1.68 l/h), Series A VITON O-ring and GLASS ball, includes connections	AAC3023	AAB5518
Head Kit for 0.44 GPH ( 1.68 l/h), Series A EPDM O-ring and GLASS ball, includes connections	AAC3026	AAB5533
Head Kit for 0.44 GPH (1.68 l/h), Series A VITON O-ring and CERAMIC ball, includes connections	AAC3029	AAB5545
Head Kit for 0.44 GPH (1.68 l/h), Series A EPDM O-ring and CERAMIC ball, includes connections	AAC3032	AAB5557
Head Kit for 0.44 GPH (1.68 l/h), Series A KALREZ O-ring and PTFE ball, includes connections	AAC2753	AAC3035

**6.2.2 USA Connection Kit**

Connection for:	Descriptions	Order Quantity	Part Number
Metering Discharge with 1/8" ID x 1/4" OD polyethylene tubing	Angular connection, G3/8 to 1/4" OD tubing, PVDF	One (1)	AAC2522
Re-circulation with 1/4" ID x 3/8" OD polyethylene tubing	Connector, straight, G3/8 to 3/8" OD tubing, PVDF	Two (2)	AAC2423
Re-circulation with Duo hose, Kit consists of: Union Nut, G3/8, PVDF Clamping piece, PVDF Tapered Part, PVDF O-ring, VITON, EPDM, or KALREZ	Duo Hose Connection Kit with VITON O-ring	Two (2)	AAC2756
	Duo Hose Connection Kit with EPDM O-ring	Two (2)	AAC2759
	Duo Hose Connection Kit with KALREZ O-ring	Two (2)	AAC2762

**6.2.3 Metric Connection Kit**

Connection for:	Descriptions	Order Quantity	Part Number
Connection set for metering, straight Connection set for re-circulation, straight	2 mm ID x 4 mm OD	One (1)	AAC3038
	4 mm ID x 6 mm OD	Two (2)	AAC3041
Connection set for metering, angled Connection set for re-circulation, angled	2 mm ID x 4 mm OD	One (1)	AAC3044
	4 mm ID x 6 mm OD	Two (2)	AAC3047
Re-circulation with Duo hose, Kit consists of: Union Nut, G3/8, PVDF Clamping piece, PVDF Tapered Part, PVDF O-ring, VITON, EPDM or KALREZ	Duo Hose Connection Kit with VITON O-ring	Two (2)	AAC3050
	Duo Hose Connection Kit with EPDM O-ring	Two (2)	AAC3053
	Duo Hose Connection Kit with KALREZ O-ring	Two (2)	AAC3056



**6.2.4 Valve Kits for Re-circulation Valve**

Descriptions - See Figure 4.1	USA Version Pump	Metric Version Pump
Complete Re-circulation Valve assembly, Series A, includes connections PVDF housing with GLASS BALL and VITON O-ring	AAC3059	AAB2863
Complete Re-circulation Valve assembly, Series A, includes connections PVDF housing with GLASS BALL and EPDM O-ring	AAC3062	AAC2765
Complete Re-circulation Valve assembly, Series A PVDF housing with CERAMIC BALL and VITON O-ring	AAC3065	AAC2768
Complete Re-circulation Valve assembly, Series A, includes connections PVDF housing with CERAMIC BALL and EPDM O-ring	AAC3068	AAC2771
Complete Re-circulation Valve assembly, Series A, includes connections PVDF housing with PTFE BALL and KALREZ O-ring	AAC3071	AAC2774

**6.2.5 Electronic Board Assembly and Motor**

PUMP VERSION	CONTROL OPTIONS	ELECTRONIC BOARD	MOTOR	VOLTAGE
USA VERSION	E11	AAC5171	AAC5138	115 VAC, 60 Hz
	E30	AAC5174		
EURO VERSION	M11	AAC5204	AAC5153	230 VAC, 50 Hz
	M30	AAC5207		

## 6.3 Accessories

### 6.3.1 Suction Pipe Assembly With Double Empty Signal Report Without Return Connection

**NOTE:** Check the height of the container to be used and order the suction pipe assembly that is more or less six inches higher than the container.

Length	Tube, O-ring and ball material	Part Number
21.25 inches/ 540 mm	PVC, Viton, Glass Ball	AAB5194
29.5 inches/ 750 mm		AAB5197
38 inches/ 970 mm		AAB5203
44.3 inches/1125 mm		AAB5206
21.25 inches/ 540 mm	PVC, EPDM, Glass Ball	AAB5245
29.5 inches/ 750 mm		AAB5668
38 inches/ 970 mm		AAB5671
44.3 inches/1125 mm		AAB5674
21.25 inches/ 540 mm	PVC, Viton, PTFE	AAB5233
29.5 inches/ 750 mm		AAB5236
38 inches/ 970 mm		AAB5239
44.3 inches/1125 mm		AAB5242
21.25 inches/ 540 mm	PVC, EPDM, PTFE	AAB5677
29.5 inches/ 750 mm		AAB5680
38 inches/ 970 mm		AAB5683
44.3 inches/1125 mm		AAB5686

Includes the following features:

- a. Check valve
- b. Suction Strainer
- c. Level pre-warning Contact
- d. Empty Signal Contact, normally close
- e. Hose Connection (4/6mm, 6/8mm)

Material and Specifications:

- a. Tube Diameter, 16 mm
- b. Connection Cable, 3-pin plug with 1 ½ ft cable
- c. Turn-on voltage, 48V AC/DC maximum
- d. Current, 0.5 amps.
- e. Rupturing Capacity, 8 W/ 8VA

**6.3.2 Suction and Discharge Lines and Fittings**

<b>Tubing Size and Material</b>	<b>Maximum Pressure @ 20 C Psi/bar</b>	<b>Part Number</b>	<b>Used on these Pump Connections</b>
PVC duo hose, 6/10mm x 2m	120/8	AAB5632	USA and Metric Connections
3/8" OD x 1/4" ID, polyethylene	165psi at 70° F	RP684818	USA Connection
1/4" OD x 1/8" ID, polyethylene	125/8	RP684447	USA Connection
1/4" OD tubing to 1/4" NPT male straight fitting, polypropylene		U28045	USA Connection
1/4" OD tubing to 1/4" NPT male elbow fitting, polypropylene		U28046	USA Connection
3/8" OD tubing to 1/4" NPT male Adapter, straight, PVC 90 degree elbow, PVC Coupling Nut (Order coupling nut for the adapter and elbow above)		P39233 P39235 PXA39234	USA Connection
1/4" tube to 1/4" NPT female PVDF PVC		U23492 U22615	USA Connections
PVC-fabric 4/10mm	360/24	RP9184471	Metric Connection
PVC-fabric 6/12mm	345/23	RP9184477	
Polyethelene, 4/6mm	150/10	RP9114435	
Polyethelene, 6/8mm	120/8	RP9114451	

**6.3.3 Wall Mounting Bracket**

Description	Part Number
Wall Bracket with mounting hardware, PP	AAB7879
Wall Bracket, PVC	AJE4896
Wall Bracket, Stainless	AAA3308

**6.3.4 Foot Valve Strainer**

**NOTE:** Position the foot valve strainer vertically and at the lowest point of the container.

If agitation is used, use rigid pipe to prevent tubing from becoming entangled with the propeller.

Order rigid pipe adapter U22615 (1/4" NPT) PVC or U23492 (1/4" NPT) PVDF.

Material	Connection	Poppet	O-rings	Part Number
Valve holder, PVC and Polypropylene screen	1/4" ID x 3/8" OD	Kynar	Viton	U23044
Valve holder, PVDF and Polypropylene screen	1/4" ID x 3/8" OD	Kynar	Kalrez	U28746

**6.3.5 Back Pressure Valve**

Housing Material	Connections	Maximum Flow	Pressure Range & Temperature Limits	Diaphragm & O-ring	Part Number
PVC	1/4" NPT inlet and outlet	5.5 gph	25 to 170 psi 35 - 120° F	TFE-faced Hypalon O-ring	U25775
Kynar			25 to 170 psi 35 - 180° F	TFE-faced Viton O-ring	U25778
Kynar			25 to 170 psi 35 - 180° F	TFE-faced Kalrez O-ring	U27400

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## 6.3.6 Pressure Relief Valve

Housing Material	Connections	Maximum Flow	Pressure Range & Temperature Limits	Diaphragm & O-ring	Part Number
PVC	1/4" NPT inlet and outlet	5.5 gph	25 to 170 psi 35 - 120° F	TFE-faced Hypalon O-ring	U25776
Kynar			25 to 170 psi 35 - 180° F	TFE-faced Viton O-ring	U25777
Kynar			25 to 170 psi 35 - 180° F	TFE-faced Kalrez O-ring	U27401

## 6.3.7 Main Connections

Connections	Material	Flow Capacity GPH	Part Number
3/8" OD tubing	PVC	5.5	U21846
3/8" OD tubing	Kynar	5.5	U24769

## 6.3.8 Calibration Column

Flow Rate	Capacity	End Connections	Part Number
0-1.5 GPH	100 mL	1/2" FNPT	AAC2543
0-4 GPH	250 mL	1/2" FNPT	AAC2546
0-8 GPH	500 mL	3/4" FNPT	AAC2549

## 6.3.9 Electrical Cable Assemblies

Description	Part Number
Connection cable assembly, 16.4 ft/ 5 M length	
For empty signal input with straight 4-pin plug	AAB6112
For pulse input with straight 4-pin plug	AAB6115
For pulse or current input, E30, with straight 5-pin plug	AAB6118
For empty signal or stroke signal output with straight 4-pin plug	AAB6121