

WATER PROCESS SOLUTIONS

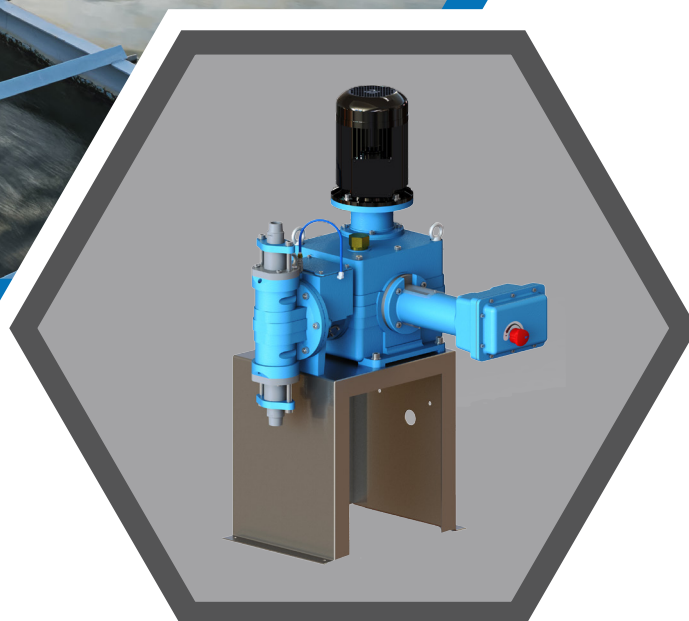
Operation & Maintenance Manual

CHEMTUBE® 2000

TUBULAR DIAPHRAGM

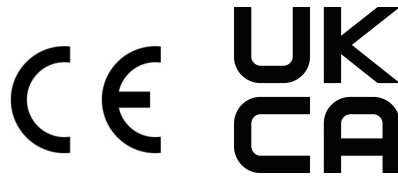
METERING PUMP

Manual No. WPSCH2000MAN



CHEMTUBE® 2000
TUBULAR DIAPHRAGM
METERING PUMP

MANUAL NO. WT.430.500.0AA.UA.IM.0813



EC-DECLARATION OF CONFORMITY

Directives covered by this declaration

89/336/EEC Electromagnetic Compatibility Directive, amended by 92/31/EEC & 93/68/EEC

73/23/EEC Low Voltage Equipment Directive, amended by 93/68/EEC

89/392/EEC Machinery Directive, amended by 91/368/EEC, 93/44/EEC & 93/68/EEC

Products Covered by this declaration

CHEMTUBE® 2000 Tubular Diaphragm Metering Pumps [2", 2.5" & 3"]

The products identified above comply with the requirements of the EMC Directive and with the principle elements of the safety objectives of the Low Voltage and Machinery Directives. The following standards have been applied

EMC Emissions: EN 50 081 Parts 1 & 2

EMC Immunity: EN 50 082 Parts 1 & 2

Electrical Safety: EN 60034

Machinery Safety: BS EN 292
BS EN 294

The CE mark was first applied in 1996

Date of Declaration: 09/02/14

A handwritten signature in black ink, appearing to read 'C.B. Dean', is positioned above a dotted line.

C.B. Dean
Managing Director

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.

Statements and instructions set forth herein are based upon the best information and practices known to WPS, Inc. at the time of publication, but it should not be assumed that every acceptable safety procedure is contained herein. WPS does not guarantee that actions in accordance with such statements and instructions included in this manual will result in the complete elimination of hazards and it assumes no liability for accidents that may occur

This instruction book provides information for the proper installation, operation, and maintenance of the Chemtube® 2000 Tubular Diaphragm Metering Pump. Chemtube 2000 is a hydraulically actuated tubular diaphragm pump.

DESCRIPTION

The Chemtube 2000 provides accurate metering and transfer of a wide variety of chemicals and is available in three piston sizes (52, 68, and 88mm), four stroking speeds (36, 72, 96, and 144 strokes per minute), and a simplex or a double simplex arrangement.

The liquid end uses two diaphragms. A flat disc diaphragm and tubular diaphragm form a sealed intermediate chamber between the process fluid (inside the tubular diaphragm) and the hydraulic fluid (inside the piston displacement cylinder). The liquid surrounding the tubular diaphragm is a water/propylene glycol mixture (50/50) and is compatible with most process fluids. There are no mechanical connections between the two diaphragms and the pump drive. Both diaphragms are hydraulically balanced during pump operation. The disc diaphragm is driven by hydraulic fluid, which is driven by the pump piston. The piston causes the liquid in the intermediate chamber to displace the tubular diaphragm and create pumping action with each stroke of the piston.

The pump features built-in, adjustable pressure relief valve and cartridge type valves for ease of service; an automatic hydraulic fluid make-up valve that is mechanically actuated by sensing the position of the flat intermediate diaphragm; a stroke adjuster (manual or optional electric) that is capable of varying the stroke from zero to 100%; and the electronic leak detection system that monitors the conductivity of the intermediate fluid and will automatically signal a change due to leakage through the tubular diaphragm of the process fluid. Also, when the optional Teflon-lined tubular diaphragm is used, the Chemtube 2000 pump is capable of handling a variety of corrosive fluids.

When an electric stroke length positioner or variable speed drive is used with the pump, a separate instruction manual covering the particular equipment used will be furnished.



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, 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. WHEN DEALING WITH HAZARDOUS MATERIAL IT IS THE RESPONSIBILITY OF THE EQUIPMENT USER TO OBTAIN AND FOLLOW ALL SAFETY PRECAUTIONS RECOMMENDED BY THE HAZARDOUS MATERIAL MANUFACTURER/SUPPLIER. AVOID CONTACTING ELECTRICALLY HOT METER POSTS AND CIRCUIT BOARD COMPONENTS WHILE MAKING METER ADJUSTMENTS.

NOTE: When submitting correspondence or ordering material, always specify model and serial number of apparatus.

TABLE OF CONTENTS

Very Important Safety Precautions	SP-1,-2
Preventive Maintenance General Information	1.010-5
Preventive Maintenance Schedule and Record of Performance	1.010-13
Protective Equipment and Clothing	1.010-6
Regional Offices	1.010-1
Technical Data	Section 1
Installation	Section 2
Operation	Section 3
Service	Section 4
Illustrations	Section 5
Preventive Maintenance Kits	Section 6



WARNING: THIS EQUIPMENT MAY HANDLE HAZARDOUS MATERIALS SUCH AS ACID OR CAUSTIC, WHICH CAN CAUSE SEVERE BURN-TYPE INJURIES. WHEN HANDLING ANY HAZARDOUS MATERIAL, USE EXTREME CARE TO AVOID CONTACT WITH THE HAZARDOUS MATERIAL AND POSSIBLE SEVERE PERSONAL INJURY. USE APPROPRIATE PROTECTIVE CLOTHING AND EYE PROTECTION. REFER TO THE SAFETY PRECAUTIONS OF THE MANUFACTURER OF THE HAZARDOUS MATERIAL AND THIS EQUIPMENT BOOK FOR FURTHER IMPORTANT DETAILS AND PRECAUTIONS.

Very Important Safety Precautions

This page titled “Very Important Safety Precautions” provides, in brief, information of urgent importance relative to SAFETY IN THE INSTALLATION, OPERATION, AND MAINTENANCE of this equipment.

WARNING

TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, 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.

REPLACE GUARD AFTER SERVICING EQUIPMENT.

TURN OFF POWER BEFORE SERVICING.

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

USE APPROPRIATE PROTECTIVE CLOTHING AND EYE PROTECTION WHEN HANDLING HAZARDOUS MATERIAL.

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

USE ONLY WPS LISTED PARTS, EXCEPT FOR THOSE COMMERCIALY AVAILABLE PARTS THAT ARE IDENTIFIED BY COMPLETE DESCRIPTION ON THE PARTS LIST. THE USE OF UNLISTED PARTS CAN RESULT IN EQUIPMENT MALFUNCTIONS HAVING HAZARDOUS CONSEQUENCES.

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

Water Process Solutions
Unit 10 Mill Hall Business Estate
Aylesford, Kent, ME20 7JZ
Phone: +44(0) 1622 719945
Email: enquiries@waterprocesssolutions.com

VERY IMPORTANT SAFETY PRECAUTIONS (CONT'D)

NOTE

Minor part number changes may be incorporated into WPS 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 WPS for information.

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

PROTECT YOUR EQUIPMENT INVESTMENT

MINIMIZE DOWNTIME

ORDER A PREVENTIVE MAINTENANCE KIT NOW ... KEEP ONE ON HAND

Quality Equipment	+	Preventive Maintenance	=	Dependable Operation Minimum Downtime
----------------------	---	---------------------------	---	--

There's no question about it.

Equipment that is properly maintained is dependable equipment.
It will give optimum performance with minimum unscheduled downtime

WPS manufactures quality equipment designed for performance and reliability.

Each product is carefully tested and inspected before shipment to ensure that it meets our high standards.

Our equipment is engineered for easy maintenance. To ensure maximum service life and minimize unscheduled repairs, we recommend a program of regular preventive maintenance, as described in the Service section of this book. To support this program, we developed standard parts kits. These kits can also be used for minor emergency repairs to minimize downtime.

We recommend that these kits be available in your stock at all times. When the complete kit or any of its parts are used, the kit should be replaced immediately.

Preventive maintenance kits may be ordered directly from the company that supplied your equipment, or they may be ordered directly from WPS: For ordering numbers, refer to the parts list at the rear of this book.

PREVENTIVE MAINTENANCE SCHEDULE AND RECORD OF PERFORMANCE

This equipment should receive preventive maintenance on a one (1) year cycle.* It is recommended that the following table be used to plan, schedule, and record this important work.

Preventive Maintenance Log	
Schedule Date	Date Performed

*NOTE: This is the recommended cycle. Your local operating conditions may call for more frequent preventive maintenance.





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.

INSTALLATION, OPERATION, MAINTENANCE, AND SERVICE INFORMATION

Direct any questions concerning this equipment that are not answered in this instruction book to the reseller from whom the equipment was purchased. If the equipment was purchased directly from WPS, contact the office indicated below.

UNITED KINGDOM

Water Process Solutions
Unit 10 Mill Hall Business Estate
Aylesford, Kent, ME20 7JZ
Phone: +44(0) 1622 719945
Email: enquiries@waterprocesssolutions.com

Viton® and Teflon® are registered trademarks of E. I. du Pont de Nemours and Company or its affiliates.

List Of Contents	PARA./DWG. NO.
Technical Data	1.1
Capacity Specifications and Motor Selection	1.2
High Pressure Effects on Capacity	1.3
Illustrations	
Performance	
Compatibility	430.500.190.010A-F
Application Guide for WPS Solution	
Tanks	430.500.190.010A-F

1.1 Technical Data

PARAMETER	SPECIFICATION
Type	Hydraulically actuated tubular diaphragm, simplex, or double simplex.
Service	See Dwg. 430.300.190.010A-F
Capacities	Refer to Power Requirements (paragraph 1.1.1)
Maximum Liquid Temperature	180°F for 316SS valves 150°F for Kynar valves 125°F for PVC valves
Control	Stroke length adjustable -- Manual Optional Electric Positioner Electrical speed -- Optional SCR variable
Ambient Temperature Limits	10° to 120°F
Accuracy	±1% of full scale over a 10:1 range
Operating Range	10 to 1
Suction Condition	Flooded suction recommended, suction lift maximum 5' of water
Connections	52 mm piston suction and discharge 1" male NPT, 1" socket, R1 68 mm piston suction and discharge 1-1/2" male NPT, 1-1/2" socket, R1-1/2 88 mm piston suction and discharge 2" male NPT, 2" socket, R2
Viscosity/Stroke Speed Limits	10,000 centipoise (Brookfield spindle No. 3 @ 12 rpm) under any condition. Higher viscosities (up to 20,000 centipoise) with decreased capacity (10 - 15%)
Standard Intermediate Fluid	50/50 propylene glycol and distilled water

1.2 Capacity Specifications and Motor Selection

Piston Size inches (mm)	60 Hz 1725 RPM			50 Hz 1450 RPM		Pounds per Square Inch						bar						Connection Cartridge Valves					
	Stroke Frequency stroke/ min	Capacity		Stroke Frequency stroke/min	Capacity	Motor Horespower - Induction (Variable) - 1725 RPM			Motor Kilowatts - Induction (Variable) - 1450 RPM														
		gph	lph			Simplex			Double Simplex			Simplex			Double Simplex								
						1/2 (3/4)	3/4 (1)	1 (1-1/2)	1-1/2 (2)	2 (3)	1 (1-1/2)	2 (3)	3 (5)	0.37 (0.55)	0.55 (0.75)	0.75 (1.11)	1.11 (1.49)		1.49 (2.24)	0.75 (1.11)	1.49 (2.24)	2.24 (3.73)	
2 (52)	36	46	175	30	38	144	200				200				13.1				13.3				1" NPT or 1" R1
	72	92	350	60	77	291	120	180	200		150	200			8	12	13.3		10	13.3			
	96	123	467	80	103	390	90	130	180	200		150	200	6	6.7	12	13.3		10	13.3			
	144	185	700	120	154	583	60	90	120	180	200	100	200	4	6	8	8.7	13.3	6.6	13.3			
				144	185	700	60	90	120	180	200	100	200	4	6	8	8.7	13.3	6.6	13.3			
2.5 (68)	36	79	299	30	66	249	125				125				8.3				8.3				1-1/2" NPT or 1-1/2" Soc or R 1-1/2
	72	158	598	60	132	498	70	105	125		75	125			4.7	7	8.3		5	8.3			
	96	211	799	80	176	666	50	75	105	125		125	125	3.3	5	7	8.3		5	8.3			
	144	317	1200	120	164	1000	35	50	70	105	125	125	125	2.3	3.3	4.7	7	8.3	3.3	8.3			
				144	317	1200	35	50	70	105	125		125	2.3	3.3	4.7	7	8.3	3.3	8.3			
3 (88)	36	132	500	30	110	416	75				75				5				5				2" NPT or 2" or R 2
	72	264	1000	60	220	833	40	65	75		50				2.7	4.3	5		3.3	5			
	96	352	1333	80	293	1110	30	45	60	75					2	3	4	5		3.3			
	144	528	2000	120	440	1667	20	30	40	60	75	75	75	1.3	2	3.7	4	5	2	5			
				144	528	2000	20	30	40	60	75		75	75	1.3	2	2.7	4	5	2	5		

NOTE: PVC seat with TFE ball up to 125 psi (8.3 bar). Kynar seat with glass ball or metallic valves are up to 200 psi (13.3bar)

1.3 High Pressure Effects on Capacity

This pump has been designed to provide a high degree of repeatability throughout a wide range of pressures. The capacity that can be expected is nearly that of theoretical displacement. As discharge pressure increases, a small decrease in capacity can be expected, approximately 1.0 to 3% per 100 psi.

LIQUID	REF. NO.	316 S.S	HYPALON	VITON	PVC	TFE	KYNAR 150°F	CERAMIC
ACETALDEHYDE	57	A	C	C	C	A	C	A
ACETATE SOLVENTS	57	A	C	C	C	A	A	A
ACETIC ACID, CRUDE	57	A	C	C	C	A	A	A
ACETIC ACID, PURE	57	A	C	C	C	A	A	A
ACETIC ACID (10%)	3	A	B	C	A	A	A	A
ACETIC ACID (80%)	57	B	C	C	C	A	A	A
ACETIC ANHYDRIDE		B	A	C	C	A	C	A
ACETONE		A	C	C	C	A	C	A
ACETYLENE		A	B	A	A	A	A	N
ACRYLONITRILE	58	A	C	C	A	N	A	N
ALUMINIUM CHLORIDE	5	B	A	A	A	A	A	A
ALUMINIUM HYDROXIDE	6	A	A	A	A	A	A	N
ALUMINIUM NITRATE		A	B	C	A	A	A	A
ALUMINIUM SULFATE	3	A	A	A	A	A	A	A
ALUMS		B	A	C	A	A	A	A
AMINES		A	C	C	A	A	N	N
AMINES (FILMINE) B		A	C	C	A	A	N	N
AMMONIA ANHYDROUS (LIQ.)		A	B	C	A	A	C	A
AMMONIA SOLUTIONS		A	B	B	A	A	A	N
AMMONIUM CARBONATE		A	A	A	A	A	A	A
AMMONIUM CHLORIDE	7	B	A	A	A	A	A	N
AMMONIUM DIPHOSPHATE	9	A	A	A	A	A	A	A
AMMONIUM HYDROXIDE	8	A	A	A	A	A	A	A
AMMONIUM MONOPHOSPHATE	9	A	A	A	A	A	A	A
AMMONIUM NITRATE		A	A	A	A	A	A	A
AMMONIUM SULFATE	10	A	A	A	A	A	A	A
AMMONIUM SULFIDE		A	A	A	A	A	A	A
AMMONIUM TRIPHOPH	9	A	A	A	A	A	A	A
ATEAMYL ACETATE	58	A	C	C	C	A	A	A
AMYL ALCOHOL	11,12	A	A	A	B	A	A	A
AMYL CHLORIDE		A	C	C	C	A	A	A
ANILINE	13	A	C	A	C	A	B	A
ANILINE DYES		A	B	B	C	A	N	A
ARSENIC ACID	14	B	C	A	A	A	A	N
BARIUM CARBONATE	15	B	A	A	A	A	A	A
BARIUM CHLORIDE		A	B	A	A	A	A	A
BARIUM HYDROXIDE	14,15	A	B	A	A	A	A	N
BARIUM SULFATE		A	A	A	A	A	A	A
BARIUM SULFIDE		B	A	A	A	A	A	A
BEER		B	A	A	A	A	A	A
BEET SUGAR LIQUORS		A	C	A	A	A	A	A
BENZALDEHYDE		A	C	C	C	A	B	A
BENZENE OR BENZOL	13,14	A	C	V	C	A	B	A
BENZOIC ACID		A	C	A	A	A	A	A
BLACK SULFATE LIQUOR	57	A	B	A	A	A	A	A
BORAX (SEE SODIUM BORATE)		-	-	-	-	-	-	-
BORIC ACID	16	A	A	A	A	A	A	A
BUTANE		A	A	B	A	A	A	A
BUTADIENE		A	A	B	A	A	A	A
BUTYL ACETATE		A	A	N	B	A	C	N

WARNING: WHEN DEALING WITH HAZARDOUS MATERIALS, IN ALL CASES THE HAZARDOUS MATERIAL SUPPLIERS OR MANUFACTURERS' RECOMMENDATIONS FOR SAFETY PROCEDURES MUST BE OBTAINED AND FOLLOWED.

CHEMICAL COMPATIBILITY OF METERING PUMPS - PERFORMANCE
430.500.190.010A
ISSUE 0 4-98

LIQUID	REF. NO.	316 S.S	HYPALON	VITON	PVC	TFE	KYNAR 150°F	CERAMIC
BUTYL ALCOHOL	17	A	A	A	A	A	A	A
BUTYRIC ACID	14	A	A	B	B	A	A	A
CALCIUM BISULFITE		A	A	A	A	A	A	A
CALCIUM CARBONATE	15	A	A	A	A	A	A	B
CALCIUM CHLORATE		A	A	A	A	A	A	A
CALCIUM CHLORIDE	18	B	A	A	A	A	A	A
CALCIUM HYDROXIDE	15	A	A	A	A	A	A	C
CALCIUM HYPOCHLORITE		C	A	A	A	A	A	B
CALCIUM NITRATE		A	A	A	A	A	A	A
CALCIUM SULFATE		A	A	A	A	A	A	N
CANE SUGAR LIQUORS	14	A	C	B	N	A	A	A
CARBOLIC ACID (PHENOL)	11,14,57	A	C	A	A	A	A	A
CARBON BISULFIDE		A	C	A	A	N	N	N
CARBONIC ACID	14,57	A	A	A	A	A	A	N
CARBON TETRACHLORIDE	13,3	A	C	A	C	A	A	A
CHLORACETIC ACID		C	C	C	A	C	A	A
CHLOROBENZENE (DRY)		A	C	A	C	A	A	A
CHLOROFORM		A	C	A	C	A	A	A
CHORSULPHONIC ACID		B	C	C	A	C	A	A
CHROMIC ACID	19,58	A	A	A	A	A	A	A
CITRIC ACID	20	A	A	A	A	A	A	A
COPPER ACETATE		A	C	C	A	A	A	N
COPPER CHLORIDE	5	C	B	A	A	A	A	A
COPPER CYANIDE	3	A	A	A	A	A	A	N
COPPER NITRATE	3	A	A	A	A	A	A	A
COPPER CULFATE	21	A	A	A	A	A	A	A
CREOSOTE	3	A	C	A	C	A	A	A
CRESYLIC ACID (50%)		A	C	A	A	A	A	N
CYCLOHEXANE		A	C	A	C	A	A	A
DETERGENT		N	A	A	A	A	A	A
DIETHYLAMINE	57	A	C	C	C	N	A	A
DIETHYLENE GLYCOL		A	A	A	A	A	N	A
DOWNTHERMS		A	C	A	C	N	N	N
ETHERS (ETHYL)		A	C	B	C	A	B	A
ETHYL ACETATE		N	C	C	C	A	C	A
ETHYL ACLCOHOL	12	A	A	A	A	A	A	A
ETHYL CHLORIDE		A	C	A	C	A	A	A
ETHYLENE CHLORIDE	22	A	C	B	C	A	A	N
ETHYLENE GLYCOL	12	A	A	A	A	A	A	A
ETHYL MERCAPTAN		A	C	N	N	N	N	N
ETHYLENE OXIDE		A	C	C	C	A	C	A
FATTY ACIDS	14	A	C	A	A	A	A	A
FERRIC CHLORIDE	6	C	A	A	A	A	A	A
FERRIC NITRATE		A	A	A	A	A	A	A
FERRIC SULFATE	24	B	A	A	A	A	A	A
FERROUS CHLORIDE		A	C	C	C	A	C	A
FERROUS SULFATE	14	A	C	A	A	A	A	A
FILTER AID	15	C	A	A	A	A	A	A
FLUOSILICIC ACID	6,25,26	A	A	A	A	A	A	A
FORMALDEHYDE		B	A	A	A	A	A	A
FORMIC ACID	3,58	A	A	B	B	A	A	A
FRUIT JUICES		A	C	A	A	A	A	A
FURFURAL	57	A	C	C	C	A	A	A
GALLIC ACID (5%)		A	C	A	A	A	B	A
GASOLINE		A	C	A	A	A	A	A

CHEMICAL COMPATIBILITY OF METERING PUMPS - PERFORMANCE

430.500.190.010B
ISSUE 0 4-98

LIQUID	REF. NO.	316 S.S	HYPALON	VITON	PVC	TFE	KYNAR 150°F	CERAMIC
GLUCOSE	6,11,27	A	A	A	A	A	A	A
GLYCEROL (GLYCERIN)		A	A	A	A	A	A	A
HEPTANE, HEXANE	28	A	A	A	C	A	A	A
HYDRAZINE (35%)		A	B	C	N	N	A	B
HYDROBROMIC ACID	29	C	A	A	A	A	A	A
HYDROCHLORIC ACID (37%)	5,30	C	A	A	A	A	A	A
HYDROCYANIC ACID	6,26,25	A	A	A	A	A	A	A
HYDROFLUORIC ACID		C	A	A	A	A	A	C
HYDROFLUOSILICIC ACID	6,25,26,57	B	A	A	A	A	A	C
HYDROGEN PEROXIDE	31,59	B	A	A	A	A	A	A
HYDROGEN SULFIDE	11,3	A	A	A	A	A	A	A
INKS	19	A	A	A	A	A	N	N
IODINE SOLUTION	32,57	C	B	A	C	A	A	A
KEROSENE		A	C	A	A	A	A	A
LACTIC ACID		A	A	A	A	A	A	A
LEAD ACETATE	15	A	C	C	A	A	A	A
LIME SLURRIES		A	A	A	A	A	N	N
LINSEED OIL	6,34	A	A	A	A	A	A	A
MAGNESIUM CARBONATE		A	A	A	A	A	A	A
MAGNESIUM CHLORIDE		C	A	A	A	A	A	A
MAGNESIUM HYDROXIDE	6,15	A	A	A	A	A	A	N
MAGNESIUM NITRATE	14,5	A	A	A	A	A	A	A
MAGNESIUM SULFATE		A	A	A	A	A	A	A
MALEIC ACID (DILUTE)	5,14	A	C	A	A	A	A	A
MALIC ACID	14	A	B	A	A	A	A	A
MELAMINE RESINS	5	A	C	N	A	A	N	A
MERCURIC CHLORIDE		C	A	A	A	A	A	A
MERCURIC CYANIDE	57	A	A	A	A	A	A	N
MERCURY		A	A	A	A	A	A	A
METHYL ACETATE		A	C	C	N	A	A	N
METHYL ACETONE	35	A	C	C	C	N	N	N
METHYL ALCOHOL		A	A	B	A	A	A	A
METHYLAMINE		A	C	C	N	N	C	N
METHYL BROMIDE		A	C	A	C	N	A	N
METHYL CELLOSOLVE		A	C	C	N	A	A	A
METHYL CHLORIDE (LIQ.)	36,14	A	C	C	C	A	A	A
METHYLETHYL KETONE		A	C	C	C	A	C	A
METHYLENE CHLORIDE		A	C	B	C	A	C	A
MOLASSES		A	A	A	A	A	A	N
MONOCHLORACETIC ACID		C	N	N	A	A	A	A
MORPHOLINE	57	A	C	C	A	A	A	A
NAPHTHA	13	A	C	A	A	A	A	A
NAPHTHALENE	11	A	C	A	C	A	A	A
NICKEL CHLORIDE	14	A	A	A	A	A	A	A
NICKEL NITRATE		A	A	A	A	A	A	A
NICKEL SULFATE	14	A	A	A	A	A	A	A
NICOTINIC ACID	60	A	C	A	A	N	A	A
NITRIC ACID (10%)		A	A	A	A	A	A	A
NITRIC ACID (70%) TO 100°F	60	B	C	B	A	A	A	A
NITROBENZENE		A	C	C	C	A	B	A
OILS, ANIMAL	11,58	A	C	A	A	A	A	A
OIL, COTTONSEED		A	A	A	A	A	A	A
SOILS, FUEL	37,14	A	A	A	A	A	A	A
OLEIC ACID	3	A	C	C	A	A	A	A
OLEUM (20-25%)		A	C	B	C	A	C	A

CHEMICAL COMPATIBILITY OF METERING PUMPS - PERFORMANCE

430.500.190.010C
ISSUE 0 4-98

LIQUID	REF. NO.	316 S.S	HYPALON	VITON	PVC	TFE	KYNAR 150°F	CERAMIC
OXALIC ACID	3	B	A	A	A	A	A	A
PALMITIC ACID		A	C	A	A	A	A	N
PERCHLORIC ACID (10%)	11	C	B	N	B	N	A	N
PERCHLOROETHYLENE (DRY)	11	A	C	A	C	N	A	N
PHENOL (CARBOLIC ACID)		A	C	A	A	A	A	A
PHOSPHORIC ACID	6,11,39	A	A	A	A	A	A	A
PHOSPHORUS TRICHLORIDE	57	N	C	A	C	A	A	A
PICRIC ACID		A	A	A	C	A	A	N
POTASSIUM BICARBONATE		A	A	A	A	A	A	A
POTASSIUM BROMATE		N	N	N	A	A	A	N
POTASSIUM BROMIDE	40 3 5,41	A	A	A	A	A	A	A
POTASSIUM CARBONATE		A	A	A	A	A	A	A
POTASSIUM CHLORATE		A	A	A	A	A	A	A
POTASSIUM CHLORIDE		B	A	A	A	A	A	A
POTASSIUM CHROMATE		A	A	A	A	A	A	N
POTASSIUM CYANIDE	42	A	A	A	A	A	A	N
POTASSIUM DIPHOSPHATE		A	N	A	A	N	N	N
POTASSIUM HYDROXIDE		A	A	C	A	A	A	C
POTASSIUM MONOPHOSPHATE		A	A	A	A	N	N	N
POTASSIUM NITRATE		A	A	A	A	A	A	A
POTASSIUM PERMANGANATE	5,43 41,5	A	A	A	A	A	A	A
POTASSIUM SULFATE		A	A	A	A	A	A	N
POTASSIUM SULFIDE		A	N	A	A	A	A	A
POTASSIUM SULFITE		A	B	A	A	N	N	N
POTASSIUM TETRABORATE		N	N	N	A	N	N	N
PROPANE (LIQ.)	12,58	A	A	B	A	A	A	A
PROPYL ALCOHOL		A	A	A	B	A	A	N
PROPYLENE GLYCOL		A	A	A	C	A	A	A
RESINS & ROSINS		A	N	A	N	A	N	N
SEA WATER		B	A	A	A	A	A	A
SILVER NITRATE	6,57	A	A	A	A	A	A	A
SOAP SOLUTIONS (STEARATES)		A	A	A	A	A	A	A
SODIUM ACETATE		A	C	A	A	A	A	A
SODIUM ALUMINATE 27Be		A	A	A	B	A	A	A
SODIUM BICARBOATE		A	A	A	A	A	A	A
SODIUM BISULFATE (TO 100°F)	14 44 14	A	A	A	A	A	A	A
SODIUM BISULFITE (TO 100°F)		A	A	A	A	A	A	A
SODIUM BORATE		A	A	A	A	A	A	N
SODIUM CARBONATE		A	A	A	A	A	A	A
SODIUM CHLORATE		A	A	A	A	A	A	A
SODIUM CHLORIDE	3	B	A	A	A	A	A	A
SODIUM CHLORITE (TO 20%)	45	C	N	N	C	N	A	A
SODIUM CHROMATE		A	N	A	A	A	A	N
SODIUM CYANIDE		A	A	A	A	A	A	A
SODIUM DI- OR TRIPHOSPHATE		A	A	A	A	A	A	A
SODIUM FLUORIDE	25,46	B	A	A	A	A	A	C
SODIUM HYDROXIDE 20%	5,3,6 5,3,6 30,13,47	A	A	C	C	A	A	C
SODIUM HYDROXIDE 50%		A	A	C	C	A	A	C
SODIUM HYPOCHLORITE		C	A	B	B	A	A	N
SODIUM MONOPHOSPHATE		A	A	A	A	A	A	A
SODIUM NITRATE	48	A	A	A	A	A	A	A
SODIUM PERBORATE	6	A	B	A	B	A	N	N
SODIUM PEROXIDE		A	A	A	B	A	A	A
SODIUM POLYPHOSPHATE	49	A	B	A	A	A	A	A
SODIUM SILICATE		A	A	A	B	A	A	A

CHEMICAL COMPATIBILITY OF METERING PUMPS - PERFORMANCE

430.500.190.010D
ISSUE 0 4-98

LIQUID	REF. NO.	316 S.S	HYPALON	VITON	PVC	TFE	KYNAR 150°F	CERAMIC
SODIUM SULFATE	50	A	A	A	A	A	A	A
SODIUM SULFIDE	1,48	A	A	A	B	A	A	N
SODIUM SULFITE	44	A	A	A	A	A	A	A
SODIUM THIOSULFATE (HYPO)	51	B	A	A	B	A	A	A
STARCH		A	A	A	A	A	N	A
STEARIC ACID	37	A	B	A	A	A	A	A
SUGAR SOLUTIONS	14	A	B	N	A	A	A	A
SULFUR CHLORIDE	57	C	A	A	N	A	A	A
SULFUR MOLTEN		A	C	A	A	A	A	A
SULFURIC ACID (0-40%)	5	C	A	A	A	A	A	A
SULFURIC ACID (40-95%)	5,58	C	A	A	A	A	A	A
SULFURIC ACID (95-100%)	58	A	B	A	A	A	A	A
SULFUROUS ACID		B	A	A	A	A	A	A
TANNIC ACID	52	A	A	A	A	A	N	A
TARTATIC ACID	6,44	A	A	A	A	A	A	A
TITANIUM DOXIDE		A	A	A	B	A	N	N
TOLUOL & TOLUENE	36	A	C	A	C	A	B	A
TRICHTHORETHYLENE	57	A	C	A	C	A	A	A
TURPENTINE	13	A	C	A	A	A	A	A
UREA FORMALDEHYDE		A	N	N	N	A	A	A
VARNISH & SOLVENTS	14	A	C	A	N	A	N	A
VINEGAR		A	A	N	A	A	N	A
VINYL ACETATE		A	C	C	C	A	A	A
WATER, DEIONIZED		A	A	A	A	A	A	A
WATER, SALT		B	A	A	A	A	N	A
WHISKEY AND WINES	58	A	A	A	A	A	A	A
XYLENE OR XYLOL	13	A	C	A	C	A	A	A
ZINC CHLORIDE	6,53	C	A	A	A	A	A	A
ZINC HYDROSULFITE		B	N	A	A	A	N	N
ZINC SULFATE		A	A	A	A	A	A	A

WARNING:

TO AVOID POSSIBLE SEVERE PERSONAL INJURY AND/OR DAMAGE TO EQUIPMENT WHEN DEALING WITH ANY CHEMICAL, IT IS THE RESPONSIBILITY OF THE EQUIPMENT USER TO OBTAIN AND FOLLOW THE SAFETY PRECAUTIONS OF THE MANUFACTURER OF THE CHEMICAL.

RATING KEY

- A** ACCEPTABLE
- B** SATISFACTORY WHERE MINOR ATTACK IS ACCEPTABLE
- C** SHOULD NOT BE USED
- N** INFORMATION LACKING

UNLESS OTHERWISE NOTED, CONCENTRATION OF AQUEOUS SOLUTIONS ARE SATURATED. ALL RATINGS ARE AT ROOM TEMPERATURE UNLESS SPECIFIED.

CHEMICAL COMPATIBILITY OF METERING PUMPS - PERFORMANCE

430.500.190.010E
ISSUE 0 4-98

NOTES:

- | | |
|---|---|
| 1. WARNING: DRIED RESIDUE OF SPILLED SOLUTIONS IS EXPLOSIVE. | 31. PVC TO 100°F, 50%, SS TO 100°F, 50% |
| 3. SS TO 180°F | 32. PVC TO 70°F, 10%, SS TO 70°F, 10% |
| 5. PVC TO 125°F | 34. SS TO 70°F, 5%, PVC 125°F SAT |
| 6. HYPALON TO 180°F | 35. PVC TO 100°F, SS TO 70°F |
| 7. SS TO 125°F 10%, PVC TO 125°F | 36. VITON TO 100°F |
| 8. PVC TO 125°F, 29%, SS TO 180°F, 29% | 37. HYPALON TO 150°F |
| 9. SS TO 70°F, 5% | 38. SS TO 70°F, 10% |
| 10. PVC TO 105°F, 40%, SS TO 180°F SAT | 39. PVC TO 125°F, 80%, SS TO 70°F, 80% |
| 11. VITON TO 180°F | 40. PVC TO 100°F, SAT, SS TO 180°F, 50% |
| 12. PVC TO 100°F PURE | 41. SS TO 180°F, 5% |
| 12. PVC TO 100°F PURE | 42. PVC TO 70°F, 50% OR TO 125°F, 30%, SS TO 180°F, 50% |
| 14. SS TO 140°F | 43. SS TO 140°F, 10% |
| 15. USE SLURRY VALVES | 44. SS TO 180°F, 50% |
| 16. PVC TO 105°F, SS TO 180°F | 45. PVC TO 105°F |
| 17. PVC TO 100°F, SS TO 100°F | 46. PVC TO 125°F, 4%, SS TO 70°F, 5% |
| 18. SS TO 70°F DILUTE, PVC TO 125°F | 47. PVC TO 125°F, 15%, SS TO 70°F, 5% |
| 19. PVC TO 100°F, 50%, SS TO 70°F, 5% | 48. SS TO 125°F |
| 20. PVC TO 100°F, 25%, SS TO 180°F, 50% | 49. PVC TO 125°F, 41 Be, SS TO 140°F, 41 Be |
| 21. PVC TO 100°F, SS TO 160°F | 50. PVC TO 125°F, 30% |
| 22. VITON TO 120°F | 51. PVC TO 125°F, 50%, SS TO 70°F, 50% |
| 24. PVC TO 125°F, 36%, SS TO 180°F 10% | 52. PVC TO 100°F, 10%, SS TO 150°F |
| 25. FLUORIDATION REQUIRES AN ANTI-SYPHON PUMP INSTALLATION CONSULT LOCAL REGULATIONS FOR DETAILS. | 53. PVC TO 100°F, SS TO 180°F, 70% |
| 26. PVC TO 30% | 57. KYNAR TO 70°F |
| 27. PVC TO 125°F, 50%, SS TO 70°F, 5% | 58. KYNAR TO 120°F |
| 28. MAY CAUSE SURFACE PITTING TO SS | 59. KYNAR TO 120°F, 30% |
| 29. PVC TO 125°F, 48% | 60. KYNAR TO 100°F |
| 30. HYPALON TO 130°F | |

() INDICATES DIMENSIONS IN MILLIMETERS.

CHEMICAL COMPATIBILITY OF METERING PUMPS - PERFORMANCE
430.500.190.010F
ISSUE 0 4-98

Statements and suggestions set forth herein are based upon the best information and practices known to WPS; 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, WPS makes no guarantee of results and assumes no liability in connection with the information contained herein.

When dealing with the installation, operation or maintenance of a specific WPS product, the manuals and data sheets.

CHEMICAL	Concentration	70°	140°	CHEMICAL	Concentration	70°	140°
Acetaldehyde ☐	40%	O	U	Calcium Hypochlorite	Bleach Sol'n	S	S
Acetic Acid ☐	1-60%	S	S	Calcium Nitrate	50%	S	S
Acetic Acid ☐	80-100%	S	O	Calcium Sulfate		S	S
Acetone ☐†		O	U	Camphor Oil		O	U
Acrylic Emulsions ☐		S	S	Carbon Dioxide, wet or dry	100%	S	S
Activated Carbon		S	S	Carbon Disulfide ☐		U	U
Adipic Acid		S	S	Carbon Monoxide		S	S
Allyl Alcohol ☐		S	S	Carbon Tetrachloride		U	U
Aluminium Chloride	Conc.	S	S	Carbonic Acid		S	S
Aluminium Fluoride	Conc.	S	S	Caster Oil ☐		S	O
Aluminium Sulfate	Conc.	S	S	Chloroacetic Acid ☐	100%	O	U
Ammonia, Liquid	100%	O	U	Chlorine Liquid		U	S
Ammonium Carbonate		S	S	Chlorine Water	Sat'd.	S	S
Ammonium Chloride	Sat'd.	S	S	Chlorobenzene ☐		U	O
Ammonium Fluoride	Sat'd.	S	S	Chloroform ☐ †		O	O
Ammonium Hydroxide ☐	Conc.	S	S	Chlorosulfonic Acid ☐		U	U
Ammonium Metaphosphate	Sat'd.	S	S	Chrome Alum	Sat'd.	S	S
Ammonium Nitrate	Sat'd.	S	S	Chrome Acid	20%	S	S
Ammonium Sulfate	Sat'd.	S	S	Chrome Acid	up to 50%	S	O
Ammonium Sulfide	Sat'd.	S	S	Chrome Acid & Sulfuric Acid ☐		S	O
Ammonium Thiocyanate	Sat'd.	S	S	Cider		S	S
Amyl Acetate ☐ †	100%	O	U	Citric Acid ☐	Sat'd.	S	S
Amyl Alcohol ☐	100%	S	S	Coconut Oil Derivatives		S	S
Amyl Chloride	100%	S	S	Cola Concentrates ☐		S	S
Aniline ☐	100%	S	S	Cupric Chloride	Sat'd.	S	S
Antimony Chloride		S	S	Cupric Cyanide	Sat'd.	S	S
Aqua Regia ☐		O	U	Cupric Fluoride	Sat'd.	S	S
Arsenic Acid	80%	S	S	Cupric Nitrate	Sat'd.	S	S
Barium Carbonate	Sat'd.	S	S	Cupric Sulfate	Sat'd.	S	S
Bariu Chloride	Sat'd.	S	S	Cottonseed Oil ☐		S	S
Barium Hydroxide		S	S	Cresol ☐		S	O
Barium Sulfate	Sat'd.	S	S	Cuprous Chloride	Sat'd.	S	S
Barium Sulfide	Sat'd.	S	S	Cyclohexanone ☐		O	U
Beer		S	S	Detergents, Snthetic ☐		S	S
Benzaldehyde ☐		U	U	Developers, Photographic		S	S
Benzene		O	U	Dextrin	Sat'd.	S	S
Benzenesulfonic Acid ☐	10%	S	O	Dextose	Sat'd.	S	S
Benzoic Acid	All Conc.	S	S	Diocetylphthalate ☐		O	U
Bismuth Carbonate	Sat'd.	S	S	Disodium Phosphate		S	S
Bleach Lye	10%	S	S	Diazo Salts		S	S
Black Liquor				Diethylene Glycol ☐		S	S
Boraz	Sat'd.	S	S	Emulsions, Photographic ☐		S	S
Boric Acid	Conc.	S	S	Ethyl Acetate ☐†	100%	O	U
Bromine liquid	100%	U	U	Ethyl Alcohol☐	100%	S	S
Bromine Water †		O	U	Ethyl Bromide		O	U
Butanediol ☐	100%	S	S	Ethyl Butyrate ☐		U	U
Butyl Acetate †	100%	S	O	Etyl Chloride		O	U
Butyl Alcohol ☐	100%	S	S	Ethyl Ether		O	U
Butyric Acid	80%	-	-	Ethylene Dichloride ☐		O	U
Cadmium Salts		S	S	Ethylene Glycol ☐		S	S
Calcium Bisulfide		S	S	Fatty Acids ☐		S	S
Calcium Carbonate	Sat'd.	S	S	Ferric Chloride	Sat'd.	S	O
Calcium Chlorate	Sat'd.	S	S	Ferric Nitrate	Sat'd.	S	S
Calcium Chloride	Sat'd.	S	S	Ferric Sulfate		S	S
Calcium Hydroxide		S	S	Ferrous Chloride	Sat'd.	S	S

NOTE: FOR SYMBOL KEY, SEE DWG. 430.500.191.040C.

CHEMTUBE 2000 METERING PUMP - PERFORMANCE
APPLICATION GUIDE FOR WPS SOLUTION TANKS
- LINEAR POLYETHYLENE
430.500.191.040A
ISSUE 1 8-00

CHEMICAL	Concentration	70°	140°	CHEMICAL	Concentration	70°	140°
Potassium Permanganate	20%	S	S	Stannous Chloride	Sat'd.	S	S
Potassium Sulfate	Conc.	S	S	Stannic Chloride	Sat'd.	S	S
Potassium Sulfide	Conc.	S	S	Starch Solution	Sat'd.	S	S
Potassium Sulfite	Conc.	S	S	Stearic Acid	100%	S	S
Potassium Persulfate	Sat'd.	S	S	Sulfur		S	O
Propargyl Alcohol ▣		S	S	Sulfure Dioxide		S	O
Propyl Alcohol ▣		S	S	Sulfuric Acid	0-50%	S	S
Propylene Dichloride	100%	O	U	Sulfuric Acid	70%	S	O
Propylene Glycol		S	S	Sulfuric Acid	80%	S	O
Pyridine		S	O	Sulfuric Acid	99%	S	U
Rayon Coagulating Bath ▣		S	S	Sulfuric Acid. Fuming ▣		S	U
Sea Water		S	S	Sulfurous Acid	Conc.	S	S
Selenic Acid		S	O	Tallow		S	O
Shortening		S	S	Tannic Acid	Conc.	S	S
Silicic Acid		S	S	Tartaric Acid	Sat'd.	S	S
Silver Nitrate Sol'n.		S	S	Tetrahydrofuran ▣		S	U
Soap Solution ▣	Any Conc.	S	S	Thionyl Chloride		S	U
Sodium Acetate	Sat'd.	S	S	Toluene		S	U
Sodium Benzoate	35%	S	S	Transformer Oil		S	O
Sodium Bicarbonate	Sat'd.	S	S	Trisodium Phosphate	Sat'd.	S	S
Sodium Bisulfate	Sat'd	S	S	Trichlorethylene		S	U
Sodium Bisulfite	Sat'd	S	S	Turpentine ▣		S	U
Sodium Borate		S	S	Urea	Conc.	S	S
Sodium Bromide	Conc.	S	S	Urine		S	S
Sodium Carbonate		S	S	Vinegar		S	S
Sodium Chlorate	Sat'd	S	S	Vanilla Extract ▣		S	S
Sodium Chloride	Sat'd	S	S	Wetting Agents		S	S
Sodium Cyanide		S	S	Whiskey ▣		S	S
Sodium Dichromate	Sat'd	S	S	Wines ▣		S	S
Sodium Ferricyanide	Sat'd	S	S	Xylene ▣ †		S	U
Sodium Ferricyanide	Sat'd	S	S	Yeast		S	S
Sodium Fluoride	Sat'd	S	S	Zinc Chloride	Sat'd.	S	S
Sodium Hydroxide	Conc.	S	S	Zinc Sulfate	Sat'd.	S	S
Sodium Hypochlorite	15%	S	S				
Sodium Nitrate		S	S				
Sodium Silicofluoride		S	S				
Sodium Sulfate		S	S				
Sodium Sulfide	Sat'd. Sol'n.	S	S				
Sodium Sulfite		S	S				
Sour Crude ▣		S	O				

S - Satisfactory

U - Unsatisfactory

O - Borderline

(-) - Data not available

▣ - Under certain conditions, these chemicals cause stress cracking. Polypropylene or cross-linked polyethylene tanks should be used because of their superior resistance to stress cracking.

† - Permeation may result in loss of chemical.

NOTE: This table applies to tanks only. Consult appropriate chemical compatibility chart to choose the proper pump.

Statements and suggestions set forth herein are based upon the best information and practices known to WPS; 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, WPS makes no guarantee of results and assumes no liability in connection with the information contained herein.

When dealing with the installation, operation or maintenance of a specific WPS product, the manuals and data sheets.

CHEMTUBE 2000 METERING PUMP - PERFORMANCE
APPLICATION GUIDE FOR WPS SOLUTION TANKS
- LINEAR POLYETHYLENE
430.500.191.040C
ISSUE 1 8-00

Section 2 - Installation

List Of Contents	PARA./DWG. NO.
Unpacking	2.1
Location	2.2
Mounting	2.3
Electrical Connections	2.4
Motor Rotation	2.5
Piping	2.6
Illustrations	
Space Recommendations	
Simplex Manual Arrangement	430.500.100.020
Double Simplex Manual Arrangement	430.500.100.010
Pump Base - Simplex	430.500.100.030
Typical Installation	
Chemical 2000 Metering Pump	
Recommended For Flood Suction	430.500.110.020
Recommended Suction Lift	430.500.110.010
Installation Wiring - Leak Detector	430.500.130.010

2.1 Unpacking

When unpacking, check all items against the packing list to prevent discarding parts with packing material. Whenever possible, unpack the equipment at the installation site.

2.2 Location

Sufficient space should be provided around the pump to allow for routine maintenance. The pump must be accessible to a suitable power supply and located so that the discharge line may be conveniently run to the point of application. A flooded suction installation is preferred for simplicity of piping and for priming consideration; however, the pump also will operate under limited suction lift conditions (five feet).

2.3 Mounting



WARNING: PUMP IS UNSTABLE AND WILL TIP IF NOT BOLTED TO A SUITABLE BASE. TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE, CARE MUST BE TAKEN DURING HANDLING AND INSTALLATION.

Care should be exercised to ensure that the pump is leveled and that the base is bolted to an adequately substantial foundation. Refer to Dwg. 430.500.100.030 for hole size and spacing.

2.4 Electrical Connection (See Dwg. 430.300.131.010)

Connect a power supply of the characteristics specified on the motor nameplate in conformance with local electrical requirements. Be sure to provide a shut-off switch in the power supply. Overload protection must also be provided. For SCR drive and electric positioner, refer to separate instruction books provided with that equipment.

NOTE: Field wiring must conform to local electrical codes.

2.5 Motor Rotation

The preferred direction of motor rotation is shown on the pump; however, no damage will result if motor runs opposite to the preferred direction.

2.6 Piping

GENERAL



CAUTION: Piping material must be compatible with the fluid being pumped. Piping rating must be selected to withstand the maximum system pressure and temperature.

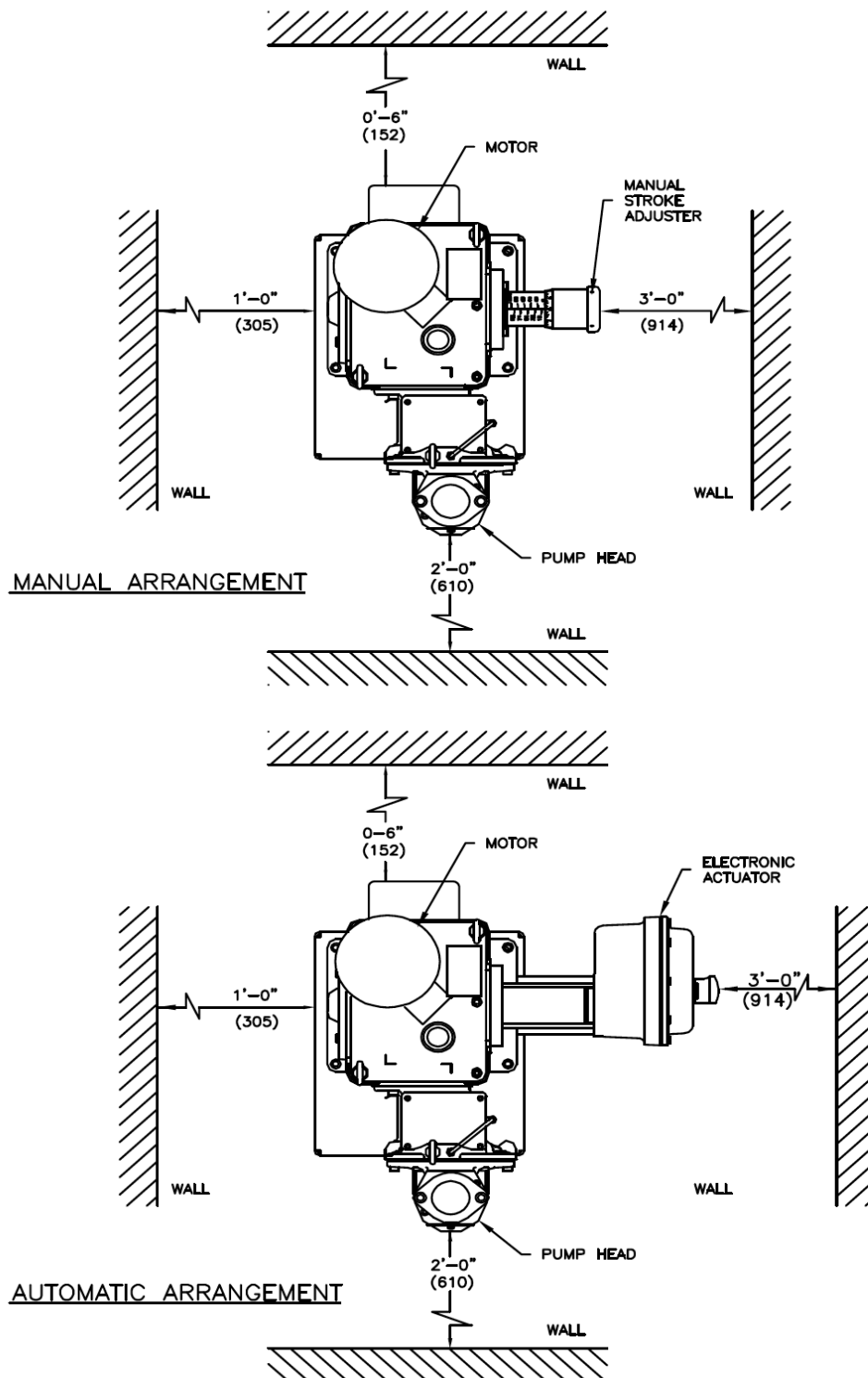
- a. See the Typical Installation drawings for general piping layouts and valve recommendations.
- b. Piping should be supported properly to avoid placing undue strain on the pump.
- c. If hot liquids are to be pumped, provisions for piping expansion must be made.
- d. When using PVC pipe, do not route pipe through cold areas where the liquid can freeze or the pipe can become brittle.
- e. A pulsation dampener, to reduce pressure peaks, will minimize vibration and wear.
- f. Prior to final installation of the pump, lines should be blown or flushed clean.
- g. A shut-off valve should be provided in the discharge and suction lines to permit servicing the liquid ends.

SUCTION PIPING

- a. Suction piping should be short, direct, with a minimum number of fittings, and laid without traps to avoid vapor pockets. A drain valve must be installed at the lowest point.
- b. A strainer should be installed in the suction line to prevent impurities from accumulating on the valve seats.
- c. Suction lines must be thoroughly tightened to prevent leaks and loss of capacity.
- d. For high accuracy applications, the pump must be calibrated after it is installed. See Dwgs. 430.500.110.010 and .020 for the calibration piping. See Section 4 - Service for the calibration procedure.

DISCHARGE PIPING

- a. Discharge piping should be the same size or greater than the discharge fitting.
- b. The pipe pressure rating should be greater than the pressure relief valve setting (which is normally set 20% above system pressure).
- c. Discharge pressure of the pump must exceed the suction pressure by at least 10 psi. An auxiliary backpressure valve may be necessary in the discharge line to maintain this pressure differential.



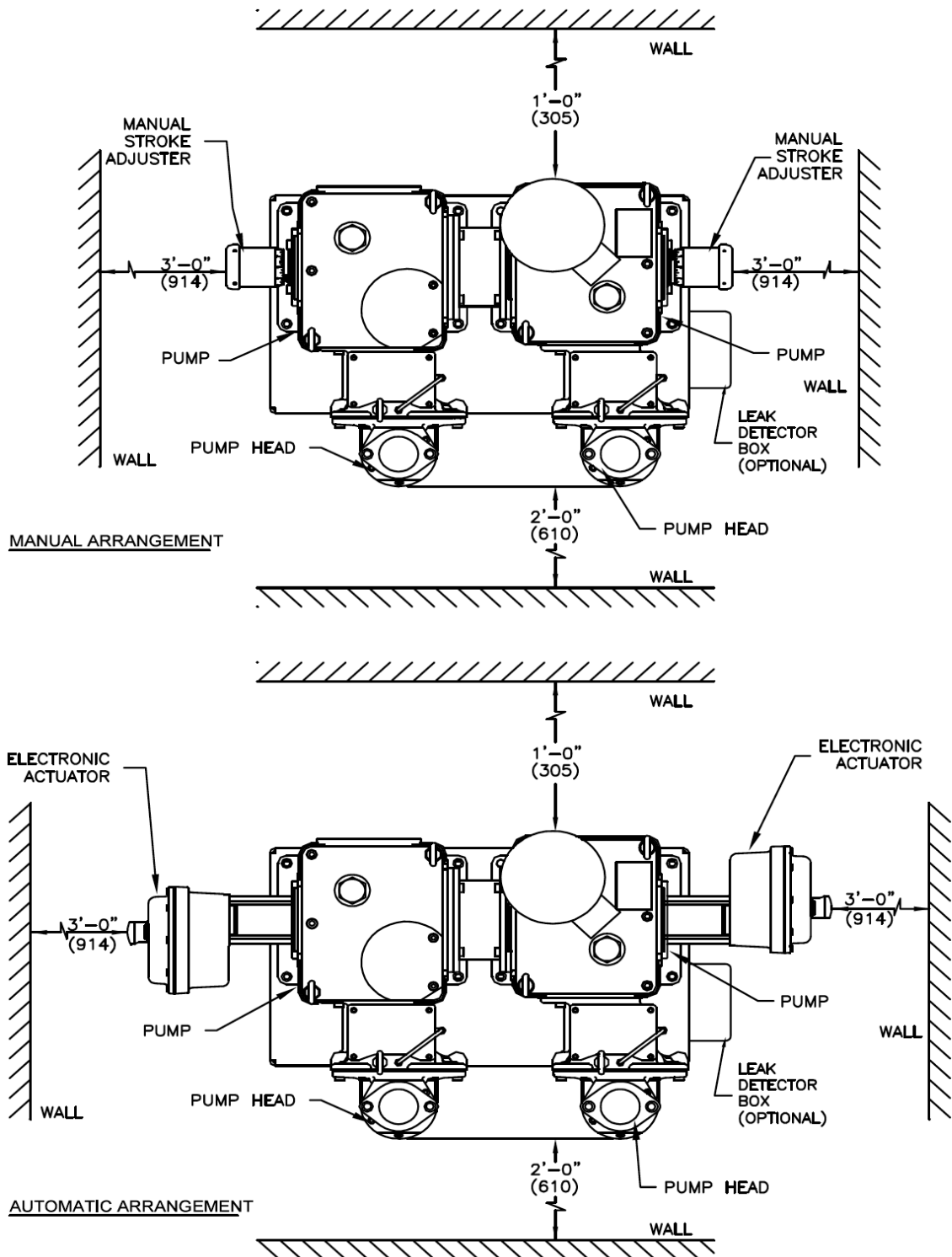
NOTE:

- 1) () INDICATES DIMENSIONS IN MILLIMETER
- 2.) RECOMMENDED MINIMUM HEIGHT FROM FLOOR TO VALVE CONNECTIONS SHOULD BE 12 INCHES.

**CHEMTUBE 2000 METERING PUMP
- SPACE RECOMMENDATION
Simplex Manual Arrangement**

430.500.100.020

ISSUE 1 1-01



NOTE:

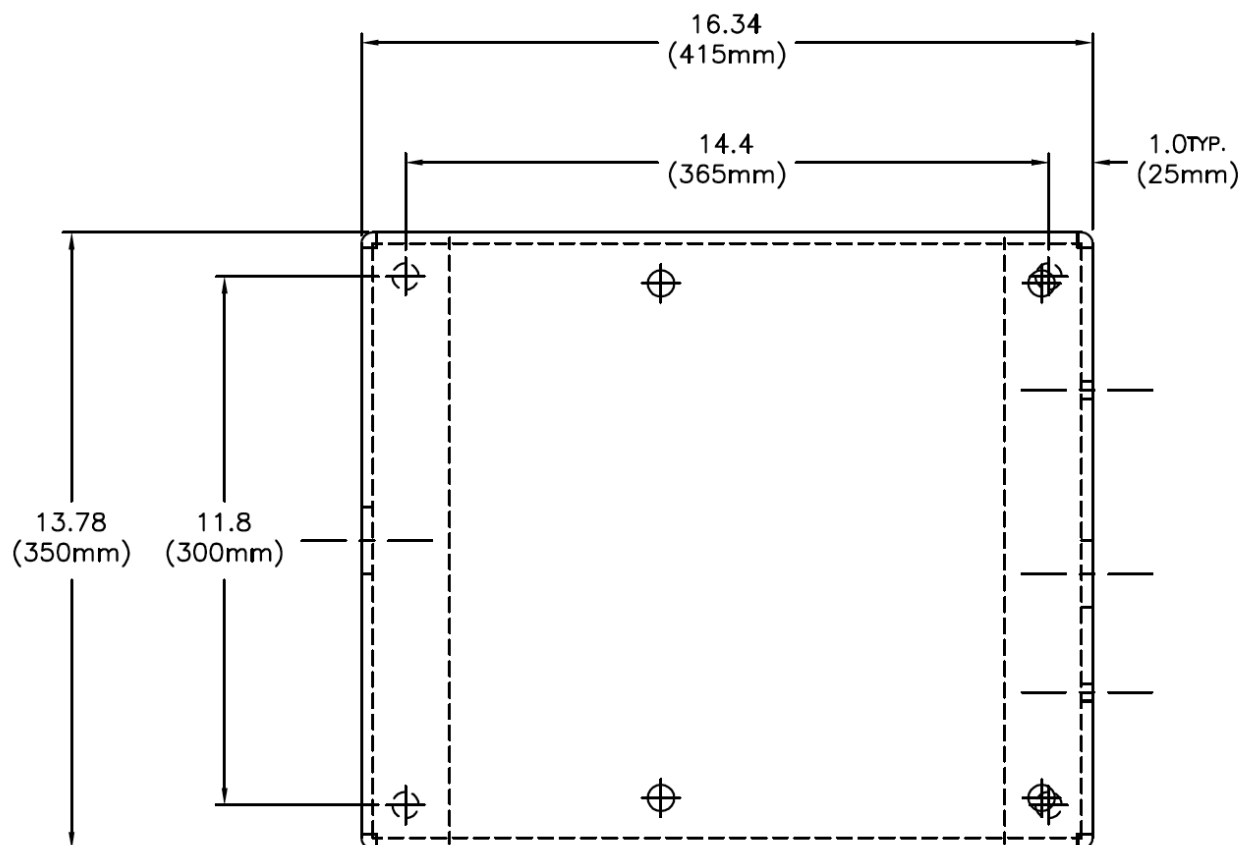
- 1) () INDICATES DIMENSIONS IN MILLIMETERS
- 2) RECOMMENDED MINIMUM HEIGHT FROM FLOOR TO VALVE CONNECTIONS SHOULD BE 12 INCHES.

**CHEMTUBE 2000 METERING PUMP
- SPACE RECOMMENDATION**

Double Simplex Manual Arrangement

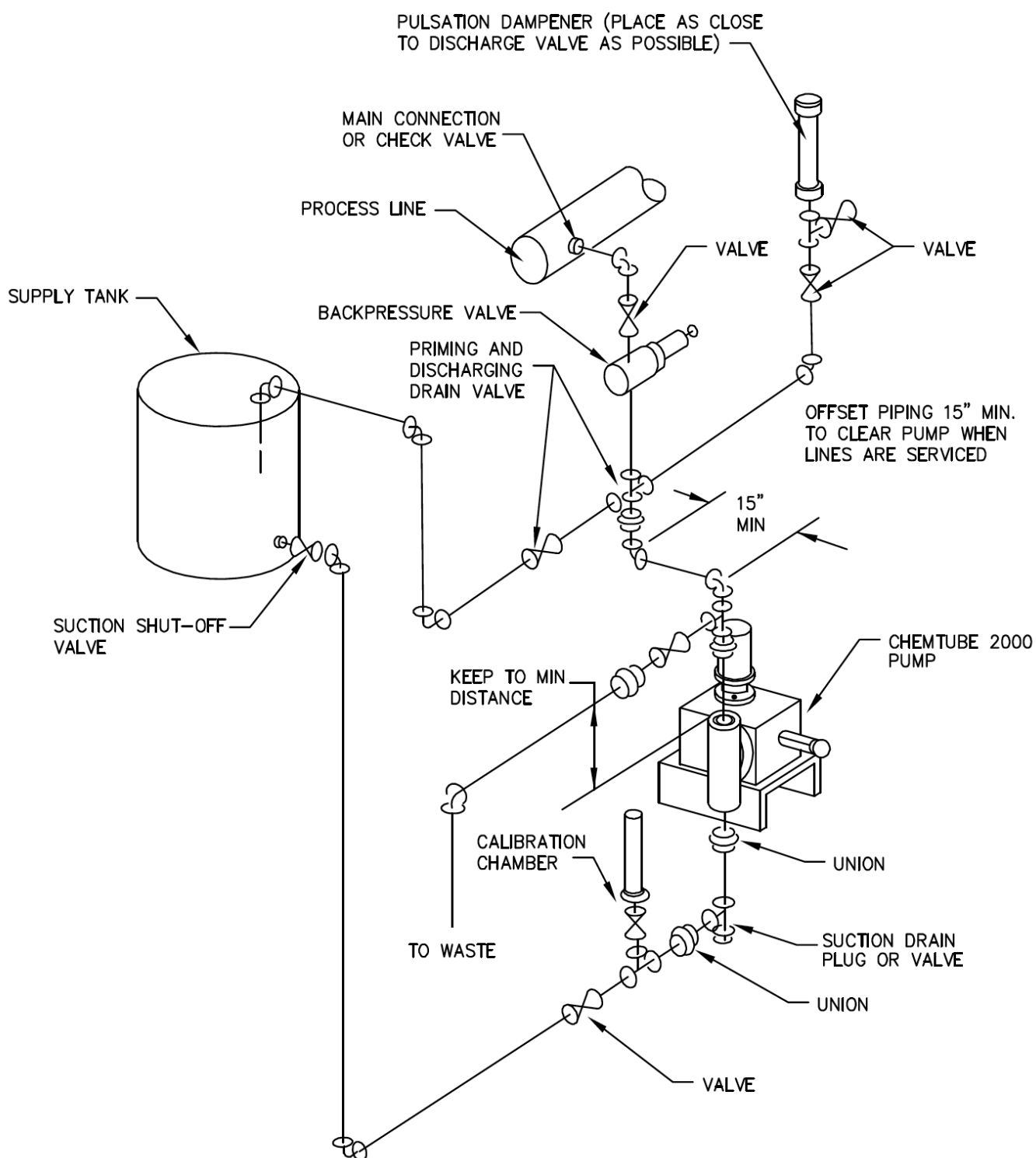
430.500.100.010

ISSUE 1 1-01



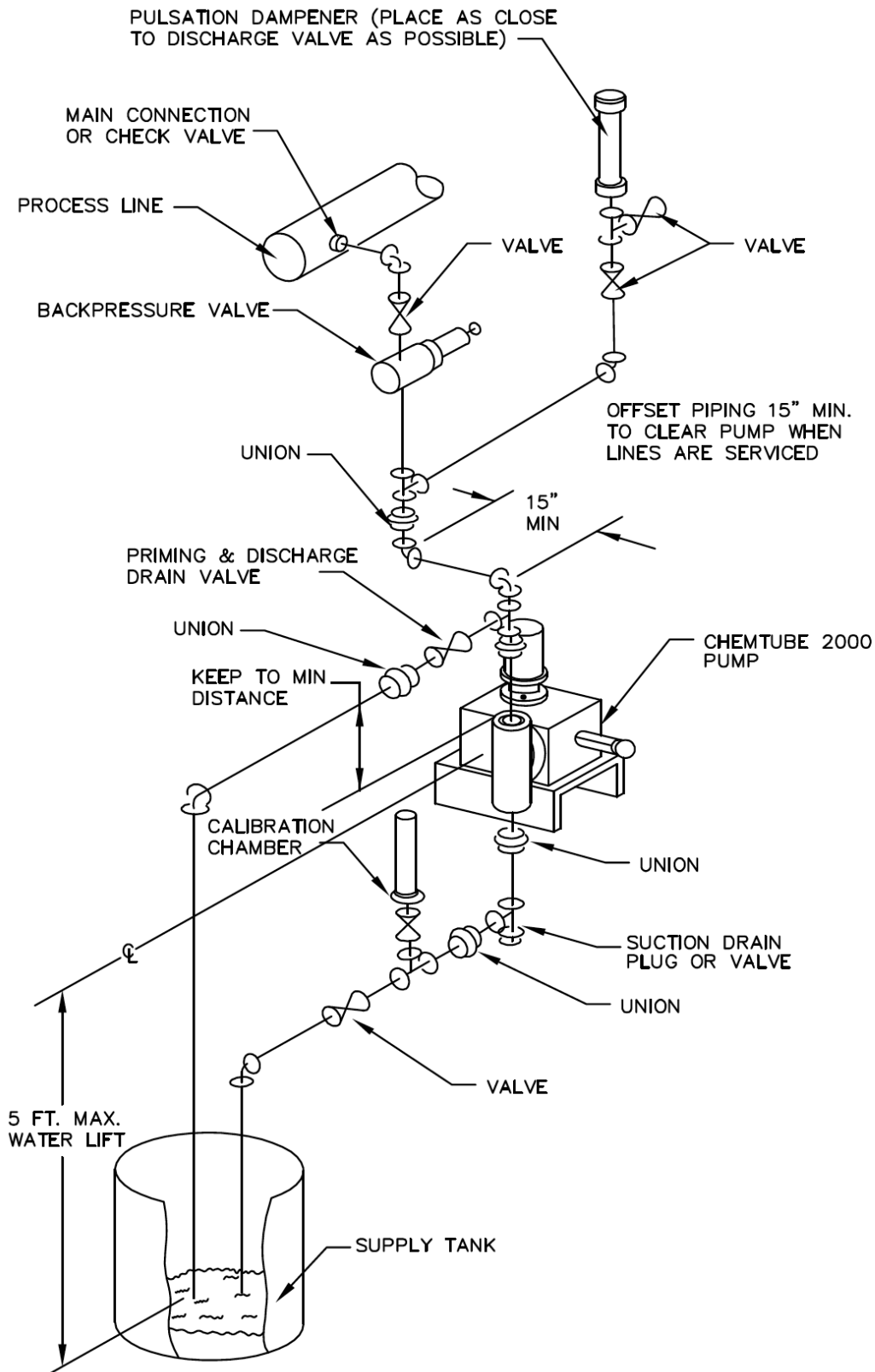
CHEMTUBE 2000 METERING PUMP - DIMENSIONS Base - Simplex

430.500.100.030
ISSUE 0 4-98



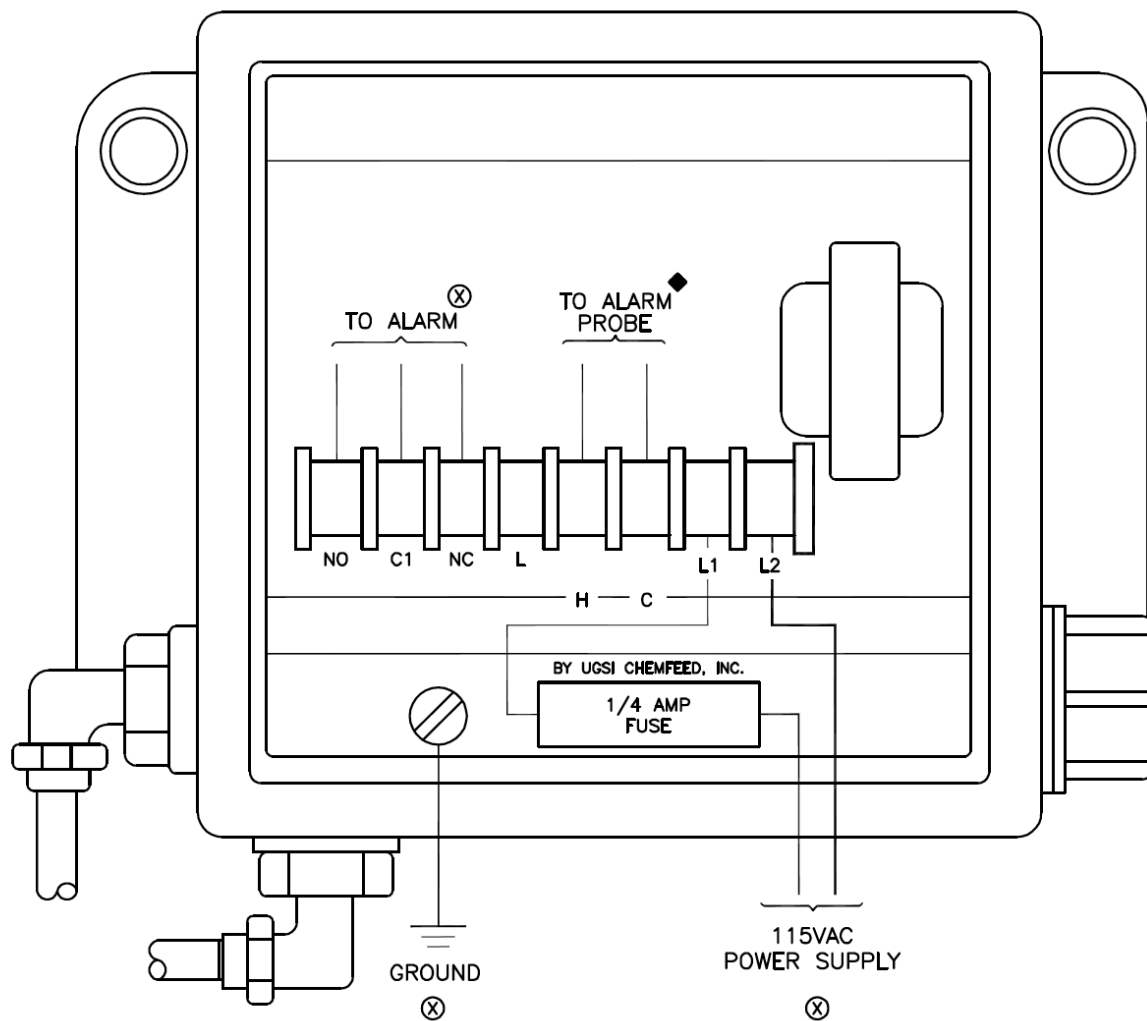
CHEMTUBE 2000 METERING PUMP - TYPICAL INSTALLATION
 Recommendation for Flooded Suction

430.500.110.020
 ISSUE 0 11-97



CHEMTUBE 2000 METERING PUMP
- TYPICAL INSTALLATION
 Recommendation for Suction Lift

430.500.110.010
 ISSUE 0 11-97



NOTE:

⊗ NOT FURNISHED BY UGSI CHEMFEED, INC.

— WIRING BY UGSI CHEMFEED, INC.

— FIELD WIRING (NOT BY UGSI CHEMFEED, INC.) MUST CONFORM TO LOCAL ELECTRICAL CODE.

TO BE WIRED BY CUSTOMER TO INDICATE DIAPHRAGM RUPTURE OR INITIATE PUMP SHUT DOWN.
CONTACT RATING 10AMPS, 115VAC., UNPOWERED.

◆ FOR DOUBLE CONNECT ADDITIONAL PROBES HERE.

CHEMTUBE 2000 METERING PUMP - DIAPHRAGM LEAK DETECTOR - INSTALLATION WIRING

430.500.130.010
ISSUE 0 11-97

List Of Contents	PARA./DWG. NO.
Preparation for Operation	3.1
Gear Box	3.1.1
Hydraulic System	3.1.2
Priming	3.1.3
Adjustment of the Internal Pressure Relief	3.1.4
Calibration	3.1.5
Operation	3.2
Starting	3.2.1.
Stopping	3.2.2
Intermittent Start-Stop Operation	3.2.3
Adjustment of Feed Rate	3.2.4
Strength of Solution	3.2.5
Theory of Operation	3.3
Drive Unit	3.3.1
Liquid End	3.3.2
Hydraulic Coupling	3.3.3
Electronic Leak Detection	3.3.4
Multiple Head Arrangements	3.3.5

3.1 Preparation for Operation

3.1.1 Gear Box



GENERAL

CAUTION: To prevent damage to the gear train, ll gear case before starting with the oil furnished. Remove the over ow plug from the gear case (high), and add oil until the oil level is level with the bottom of the over ow threads or slightly above (slight over ow). You will need approximately 2.5 gallons of SAE 90 synthetic, food-grade oil (WPS part number U10198).

3.1.2 Hydraulic System and Intermediate Section

The intermediate section is shipped filled with the proper fluid. Oil need not be added except for filling gear box as above.

3.1.3 Priming

- a. Connect pump to system piping.
- b. Check that the tank is filled.
- c. Open the suction line shut-off valve.
- d. Open the priming vent valve to ensure that the pump will discharge at atmospheric pressure to speed the priming process. For suction lift, it may be necessary to prime the head by removing the discharge valve and filling the head with a suitable liquid to wet the valves. Reinstall the discharge valve.
- e. Start the pump.
- f. Increase the stroke length to 100% by rotating the triangular knob clockwise and continue to operate at that position until the hydraulic system has primed. The air purge valve should start to discharge oil and air in approximately 20 minutes. If the hydraulic system fails to prime, pull and hold the pressure relief valve stem with a suitable tool for a few minutes. This will normally start the priming action. After priming has begun, release the pressure relief valve stem.
- g. When a constant flow of oil that is virtually free of air bubbles is being discharged from the air purge valve, the system has been properly primed. Continue to operate until the pumping head also has primed. If the pump fails to prime, refer to paragraph 4.7.

h. After both the hydraulic system and the pumping head are primed, adjust the pressure relief valve (PRV) to the system pressure (by either pumping into system or by using a temporary portable manifold containing a pressure gauge and backpressure valve). Set the PRV per instructions in paragraph 3.1.4.

i. The oil refill system valve does not require any adjustment; it is automatically actuated by the position of the flat intermediate diaphragm at the end of every suction stroke.

j. Run the pump for at least one hour to completely purge the hydraulic system of air prior to calibration.

NOTE: The PRV should be set high enough so that it relieves at 10 to 15% above the running pressure. It should never be set to relieve at more than 10 to 15% above the maximum rated pressure of the pump.

3.1.4 Adjustment of Internal Pressure Relief

The internal pressure relief valve has been factory set to approximately 10 to 15% above the maximum rating of the pump head or 10 to 15% above the maximum system pressure specified on the shipping order. If the pressure relief is set too low, the valve will discharge oil with every stroke, decreasing the efficiency of the pump. If the valve is set too high, it will be ineffective and the pump may become overloaded.

a. Apply system backpressure to the pump while running. Adjust the pressure relief setting by removing the cover on the cylinder. If there is a bumping of the stem with each stroke, then the valve is set too low. Tighten the adjuster until the stem stops bumping. Tighten another half turn to achieve the desired setting.

b. If no bumping is present when the pump is run at system backpressure, loosen the adjuster until the stem begins to bump, then repeat step a.



CAUTION: Do not set the pressure relief valve more than 10 to 15% above the maximum system pressure and never more than 10 to 15% above the rated pressure for the pump.

c. Reinstall the cover after the valve has been properly adjusted

3.1.5 Calibration

Since the stroke adjustment is marked in percent of full stroke, it is necessary to calibrate the pump under normal operating conditions to determine the actual delivery at a given setting on the stroke adjustment scale.

To obtain significant data from which the calibration curve can be drawn, the pump operator must duplicate the exact conditions that the pump will encounter when in service. It is desirable to take data for timed intervals at low, middle, and high stroke length settings at several different discharge pressures to obtain a good understanding of the pressure and stroke length relationship. Samples should be taken at the suction side of the pump.

With no backpressure, capacity should be slightly higher than the capacities in Section 1 - Technical Data. As the pressure increases, capacity falls off in the 1.0 to 3% per 100 psi range. A WPS calibration chamber is useful for an accurate, on-site calibration of the pump (see Dwgs. 430.500.110.010 and .020).

NOTE: By plotting the rate data at various stroke settings, a calibration curve can be made or the performance spot-checked.

3.2 Operation

NOTE: Before starting, ensure the suction and discharge shut-off valves are open.

3.2.1 Starting

Turn on the power supply to the pump.

3.2.2 Stopping

Turn off the power supply to the pump.

3.2.3 Intermittent Start-Stop Operation

Intermittent start-stop operation (semi-automatic) is the starting and stopping of the treatment in synchronism with an intermittent flow. The usual example calls for treating the discharge from a pumping system. The controller starts and stops in response to predetermined variations in chemical parameters, elevation, or pressure of the liquid being treated.

3.2.4 Adjustment of Feed Rate

Feed rate is governed by frequency of the pump stroke, the length of the pump stroke, and the strength of the solution to be fed.

Frequency of Pump Stroke

The frequency of stroke is a function of the gear set ratio (see table, below) and of motor speed (ac motor full speed only, optional dc motor with variable speed).

Available Gear Ratios	Number of Strokes at 1725 rpm, 60 Hz
12:1	144 spm
18:1	96 spm
24:1	72 spm
48:1	36 spm

NOTE: Capacities given at 100% motor speed, 1725 rpm.

Length of Stroke

- a. Manual Adjuster - Manual adjustment of the stroke length is accomplished by turning the stroke adjust triangular knob clockwise for increased stroke and counterclockwise for decreased stroke. The vernier scale on the stroke adjust barrel is readable in 1% increments from zero to 100%.



CAUTION: To prevent damage to the pump and stroke adjust mechanism, do not force the control triangular knob above 100% or below 0%.

- b. Electric Control - Refer to the separate instruction book provided with the actuator/controller.

3.2.5 Strength of Solution

In many cases the solution strength may be adjusted by dilution. This will increase the amount to be pumped per unit of time to be compatible with pump capability and permit operation at a length of stroke for best repeatability of metering.



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.

3.3 Theory of Operation

3.3.1 Drive Unit

The motor drives the worm shaft, which in turn drives the worm gear/ sheave guide/eccentric shaft. The different stroking speeds are determined by the pitch and thread of the worm/worm gear combination. The connecting rod rides on the sheave of the eccentric shaft and produces the reciprocating motion of the piston. The gear box is flood-lubricated. The stroke length adjustment is of the non-loss-of-motion type, thus, the piston travel is sinusoidal regardless of the stroke length, and is adjustable from 0% to 100% either manually or with an optional electric positioner.

3.3.2 Liquid End

The flat disc diaphragm is flexed hydraulically in a conventional manner by the reciprocating piston. The tubular diaphragm mounted in the head is surrounded by a liquid. This liquid acts as the hydraulic coupling between the two diaphragms.

On the discharge stroke, the piston forces the flat diaphragm outward, causing the intermediate fluid to be displaced, collapsing the tubular diaphragm and forcing the process fluid out the discharge valve. On the suction stroke, the direction of the flat diaphragm is reversed and the tubular diaphragm, returning to its original position, allows process fluid to enter through the suction valve assembly. When the two diaphragms are synchronized through proper filling of the intermediate chamber, the tubular diaphragm flexes from the relaxed position inward. Volumetric efficiency is achieved by maintaining the volume of hydraulic oil in the displacement cylinder.

3.3.3 Hydraulic Coupling

The piston reciprocates within an accurately sized cylinder, displacing an exact volume of oil. The oil serves as an intermediate fluid between the piston and the diaphragm. As the piston displaces the oil through its stroke, the diaphragm flexes causing the process fluid to enter or leave the pump. This concept is known as “hydraulically balanced” diaphragm, as there is no significant pressure differential across the diaphragm. This ensures that no accuracy or efficiency will be lost due to ballooning of the diaphragm or through the inability of the diaphragm to move through the entire displacement. In order to maintain the balanced hydraulic coupling, a number of different valves are used.

Oil Refill Valve

The loss of a small amount of oil occurs with each stroke through the piston/cylinder interface gap and the air purge valve. If a provision is not made for refilling this oil, the diaphragm will eventually flatten against the rear baffle plate or the oil will vaporize. The oil refill valve performs this refill function.

The oil refill valve will admit hydraulic oil into the space between the top of the piston and the flat intermediate diaphragm under the coexistence of the following two conditions:

- a. The piston is on the suction stroke and thus is creating at least a three psi vacuum.
- b. The intermediate diaphragm is all the way up against the rear baffle plate thus actuating the flat diaphragm position sensing disc, which will allow the oil refill valve to open.

Under the two coexisting conditions the oil refill valve will not over-fill the intermediate volume between the piston and the intermediate diaphragm, even in the case of excessive suction lift or a blocked suction line.

The vacuum setting on the oil refill valve is not adjustable, it is factory-set at three psi of vacuum.

Air Purge Valve

Most oil has some air dissolved in it. In order to provide accurate metering, this air must be purged from the hydraulic system. On each stroke of the pump, the air purge valve opens and allows any trapped air to be vented. When no air is present, a slight amount of oil is vented. The oil refill valve senses the loss of oil volume and refills the oil on each stroke.

Pressure Relief Valve

This valve protects the diaphragm and the thrust-carrying parts of the drive from overpressure by relieving excess oil. This excess pressure may occur when the outlet becomes dead ended (by closing a discharge valve) causing the pump design pressure to be exceeded. This valve is field-set to relieve at 10 to 15% above the nominal process pressure.

In the case of a closed discharge line, the pump will continually try to oppose the static discharge pressure, thus building up excessive pressure. When the setting of the pressure relief valve is reached, the valve will open, relieving oil to the pump reservoir, and thus relieving excessive pressure. If the pump is the only pressure-producing component in the system, the pressure relief valve will serve as protection for the entire system.

3.3.4 Electronic Leak Detection (Optional)

The leak detection system operates on the principle of conductivity (the ability of a liquid to conduct electricity). The system consists of a conductivity probe and an electronic sensing circuit. In operation the conductivity probe passes a minute electrical current through the high resistance intermediate fluid. If there is a tubular diaphragm rupture, low-resistance process fluid is mixed with intermediate fluid, changing its conductivity, completing the circuit, and activating the alarm. This system will measure the resistivity of a fluid up to 100,000 ohms. The resistivity of the fluid can be checked by removing the probe wires from terminals H and C on the relay amplifier and replacing with two wires placed into a container with a small amount of the fluid. The tips of the wires should have a maximum distance between them of 1/8 inch. Energize the leak detecting system and check for the closing and opening of the relay.

TYPICAL RESISTIVITY	
LIQUID	NOMINAL RESISTIVITY RANGE (OHMS)
ACIDS, BASES AND SALTS	0-20
DILUTE ACIDS	20-200
MILK, BEER	200-2,000
NON-DISTILLED WATER	2,000-20,000
NON-DISTILLED WAT	20,000 - 200,000

3.3.5 Multiple Head Arrangement

The Chemtube 2000 hydraulically actuated diaphragm pump is available as a simplex and as a double simplex pump, powered by a common drive unit. The liquid ends can have manifolded or separate suction and discharges, and may be any combination of two capacities, but will be driven at identical speed (SPM).

List Of Contents	PARA./DWG. NO.
General	4.1
Periodic Cleaning	4.2
Cleaning Pumping Head Parts	4.2.1
Clogging of Discharge Piping	4.2.2
Periodic Preventive Maintenance	4.3
Lubrication	4.3.1
Priming Troubles or Loss Of Suction	4.4
Corrective Maintenance	4.5
Removing Pump From Service	4.5.1
Draining System of Hazardous Material	4.5.2
Removing Valves	4.5.3
Removal and Replacement of Tubular Diaphragm	4.5.4
Removal and Replacement of Flat Diaphragm and Differential Valve	4.5.5
Disassembly and Assembly of Cylinder	4.5.6
Removing and Installing Motor	4.5.7
Gearbox Disassembly and Assembly	4.5.8
Replacement of Shaft Seal	4.5.9
Leak Detector Bracket	4.6
Troubleshooting	4.7
Warnings Summary Page	1 Page



WARNING: PRIOR TO DISASSEMBLY OF PIPE CONNECTIONS, REFER TO PARAGRAPH 4.5.2 FOR DETAILED GUIDANCE ON RELIEVING PRESSURE AND DRAINING.

4.1 General

Routine maintenance of the Chemtube 2000 Metering Pump consists of TWO periodically performed operations:

- Periodic Cleaning to remove contaminants and deposits formed on parts in contact with the process fluids.
- Periodic Preventive Maintenance to disassemble, inspect, clean, and accomplish recommended parts replacement. Kits of replacement parts required for this periodic maintenance are available and are listed in this section.

PROTECT YOUR EQUIPMENT INVESTMENT
MINIMIZE DOWNTIME ORDER PREVENTIVE
MAINTENANCE KITS NOW KEEP THEM ON HAND

Corrective maintenance is performed (as required at unscheduled intervals) to correct a discrepant operating or non-operating condition. A troubleshooting table is provided to guide the service personnel.

NOTE: When a unit is disassembled, discard and replace all removed O-rings and gaskets.

4.2 Periodic Cleaning

4.2.1 Cleaning Pumping Head Parts

If difficulty is encountered in pumping the solution where hard water has been used in the preparation of the solution, remove the pumping head parts for cleaning. 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 10% muriatic acid, obtainable in any plumbing supply store. Where the above condition is known to exist, pump the acid solution through the pump head for approximately five minutes as a periodic preventive maintenance procedure.



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.

To clean the air purge valve do not disassemble the valve. Soak the valve in kerosene. Agitate the valve to distribute the solution within the valve passages. Allow the remaining solution to drain out.

4.2.2 Clogging of Discharge Piping

Where the solution joins water being treated, and that water contains considerable hardness, a deposit may form inside the discharge piping at the point of application. In time, this deposit can completely plug the line and must be removed. The best method is by dissolving the deposit as described in paragraph 2.1. Where this condition is known to exist, clean the solution line as a part of routine maintenance.

4.3 Periodic Preventive Maintenance

Periodic preventive maintenance is performed (at specified intervals while equipment is in satisfactory condition) to minimize unscheduled shutdown and ensure maximum service life. The following table lists the intervals, the maintenance operation, and the preventive maintenance kits required. Before starting the work, ensure that the appropriate preventive maintenance kits are on hand. Refer to the table below and to Section 6 for appropriate kit numbers.

RECOMMENDED INTERVAL	MAINTENANCE OPERATION
Annually	Replace tubular diaphragm.
	Replace gearbox oil.
Semi-annually	Replace valve sets, which includes seat, ball, retainer, guide, and O-rings

4.3.1 Lubrication

The gear box should be filled with approximately 2-1/2 gallons of synthetic, food-grade SAE 90 oil (U10198). The drive unit should be drained and refilled with fresh lubricant every year, unless contamination is suspected.

Lubricate the motor as directed by the motor manufacturer. Instructions are furnished on the terminal box cover by some manufacturers.

Check oil level every six months. Stop the pump. Remove the cover of the cylinder oil reservoir and breather cap. Wait for a few seconds. The oil level should be approximately one-inch below the top surface of the cylinder oil reservoir. Add clean oil if necessary, replace the cover and breather cap. Make sure no contamination enters gear box.

4.4 Priming Troubles or Loss of Suction

Difficulty in priming or loss of suction is usually encountered when there is a leak in the suction line. Refer to the troubleshooting guide for corrective action. If the pump is installed as shown on the Typical Installation drawing, the discharge drain valve may be opened to allow the pump to prime against atmospheric pressure.

4.5 Corrective Maintenance

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



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

Routine maintenance procedures include the elimination of solution leaks to avoid corrosion damage. Flush away spilled solution with water and wipe the parts clean and dry.



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.



CAUTION: Solutions 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.

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. Discard used gaskets and O-rings, replacing them with new material each time a joint is broken.

NOTE: Disassembly for parts replacement need only proceed as far as necessary to accomplish the parts replacement. For example, it may be more economical to replace the components parts as a unit (sub-assembly) rather than replacing one of the components, as such parts as press-fitted bearings could be inadvertently damaged in assembly through improper techniques.

4.5.1 Removing Pump From Service



WARNING: USE EXTREME CARE TO AVOID CONTACT WITH THE MATERIAL AND POSSIBLE SEVERE PERSONAL INJURY. WHEN USING HAZARDOUS MATERIAL, OBSERVE ALL SAFETY PRECAUTIONS RECOMMENDED BY THE MATERIAL MANUFACTURER/ SUPPLIER. USE APPROPRIATE PROTECTIVE CLOTHING AND EYE PROTECTION WHEN HANDLING HAZARDOUS MATERIAL.

NOTE: Flush or wash removed parts in suitable diluting fluid. This procedure will minimize normal difficulties associated with removing the head and/or valves when pump head and lines are filled with hazardous material.

4.5.2 Draining System of Hazardous Material

- a. Disconnect power from the pump.
- b. Close discharge shut-off valve.
- c. For flooded suction, close suction shut-off valve to prevent syphoning of liquid when suction lines are opened.
- d. Open suction drain valve (or plug) and drain suction line of liquid.
- e. Open discharge drain valve to relieve pressure and drain discharge line.
- f. If a pulsation dampener is used, close off its valve when pressure has reached zero.



WARNING: TO AVOID THE POSSIBILITY OF BEING SPRAYED WITH HAZARDOUS MATERIAL CAUSING POSSIBLE SEVERE PERSONAL INJURY, ALLOW SYSTEM TO DRAIN FULLY BEFORE ATTEMPTING TO DISASSEMBLE PIPING AND REMOVE VALVES AND/OR HEAD.

4.5.3 Removing Valves

NOTE: See Valve Assembly Drawings 430.500.000.010A-D for 2000 ltr/hr pump, Dwg. 430.500.000.020A-C for 1200 ltr/hr pump, and Dwg. 430.500.000.030A-C for 700 ltr./hr pump.



WARNING: TO AVOID CONTACT WITH MATERIAL AND POSSIBLE SEVERE PERSONAL INJURY, NOTE THAT LIQUID IS PRESENT BETWEEN VALVE AND UNION. FLUSH SPILLED LIQUID IMMEDIATELY.

NOTE: If furnished, the flow indicator must be removed before further disassembly.

Unscrew the two M10 bolts just enough to slip out the valve set. Watch for O-rings on top and bottom of the valve retainer. 4.5.4 Removal and Replacement of Tubular Diaphragm and Filling Intermediate Fluid

NOTE: For drawing references in paragraphs 4.5.4 to 4.5.9 see Dwg. 430.500.000.050A-H

- a. Remove valve as directed in paragraph 4.5.3.
- b. Remove 1/4" NPT drain and fill plugs from head, drain intermediate fluid (50/50 solution of propylene glycol and distilled water).
- c. Remove suction and discharge tubular diaphragm inserts.
- d. Fold flange on one end of tubular diaphragm and pull diaphragm out of head.
- e. To install the new tubular diaphragm, fold in one flange of the diaphragm and secure it with string. Slide the diaphragm through the head. A small amount of silicone grease on the bores at the top and bottom of the head will make it easier to slide the tube through. Take extra care with TFE-lined diaphragm.
- f. Install the suction tube insert and tighten four M8 x 25 screws. Apply teflon pipe sealer to the plug and screw in at the bottom fill hole of the head.

NOTE: If a leak detector is used, install the probe instead of the pipe plug.

g. Install the suction valve and tighten the clamp.

h. Flip the flange to pour the intermediate fluid to the side of the tube until it overflows at the top fill hole.

NOTE: Use straight propylene glycol if a leak detector is used.



i. Plug the oil hole going to the refill valve with appropriate rubber plug. (This hole is located inside the cylinder oil reservoir just below the pressure relief valve).

j. Install a suitable vacuum pump to the air purge valve hole (1/8" NPT hole on top of the cylinder) and, with the tubular diaphragm flange folded, draw the vacuum. Add intermediate fluid as the level goes down, keeping it full up to the fill hole.

k. Apply teflon pipe sealer to the pipe plug and, with the vacuum on hold, install the top pipe plug making sure there is no air trapped.

l. Add more intermediate fluid around the neck of the tubular diaphragm folding the flange to let the air escape, then immediately install the top insert and tighten the four M8 x 25 screws. Remove the vacuum pump and related hardware.

m. Install the discharge valve and tighten the clamping plate.

n. Hook up the pump to the system and calibrate. (See paragraph 3.1.5.)

4.5.5 Removal and Replacement of Flat Diaphragm

a. Remove the tubular diaphragm as directed in paragraph 4.5.4, steps a through d.

b. Place an oil pan (that can hold about 1/2 gallon (two liters)) below the head and cylinder.

c. Remove the six socket head cap screws that secure the head and slowly pull the head out. The front limiter plate might fall off.

d. The teflon flat diaphragm can now be removed and replaced.

e. Clean all the parts and fit the front limiter plate to the recess in the head. Locate it such that one of the outer hole is at the top position.

f. Position a new flat diaphragm into the cylinder and carefully install the head (check the front limiter plate position), holding the head flat against the cylinder, then secure it with six bolts.

g. Torque the bolts in a cross pattern to 15 ft-lbs initially, then tighten completely to 30 ft-lbs.

h. Install the tubular diaphragm and complete the assembly per paragraph 4.5.4, steps e through n.

4.5.6 Disassembly and Assembly of Cylinder

Cleaning Air Purge Valve

- a. Disconnect power from the pump.
- b. Disconnect the plastic tubing from the air purge valve.
- c. Unscrew the air purge valve by the long hexagonal section. Do not disassemble the valve.
- d. To clean the valve, soak it in kerosene or solvent. Shake the valve to remove excess solvent.
- e. Clean old teflon tape from the air purge valve and the cylinder. Avoid dropping pieces of old tape into the cylinder. Apply new teflon tape to air purge valve and screw into cylinder.

Pressure Relief Valve Assembly and Disassembly

NOTE: The pressure relief valve is located inside the cylinder oil reservoir.

- a. Disconnect power from the pump.
- b. Remove the cylinder oil reservoir cover.
- c. Unscrew the pressure relief valve body (do not unscrew the adjuster.) Discard the O-ring.
- d. Mark the initial position of adjuster and housing, loosen the jam nut, and count the number of turns required to remove the adjuster from the body so they can be reassembled with the same setting. Record the number of turns.

- e. Remove the spring, ball, and guide and inspect the seat for any defect. Clean all parts.
- f. Assemble in the reverse order and screw in the adjuster the same number of turns as recorded above.
- g. Use a new O-ring and install the pressure relief valve to the cylinder.
- h. Use new gasket and replace the cylinder cover.

Oil Refill Valve Disassembly and Cylinder Removal

- a. Refer to paragraph 4.5.5, steps a through e, to remove the head.
- b. Drain the hydraulic oil from the gearbox (approximately two gallons (eight liters)).
- c. Remove the cylinder oil reservoir cover.
- d. Place an oil pan under the oil refill valve and, while pushing the sensing disc assembly against the baffle plate, unscrew four M4 screws that hold the cap.
- e. Remove cap, and ball and seat assembly, and pull out sensing disc with spring and plunger together.
- f. Inspect all parts for wear or breakage. Pay particular attention to the ball seat, replace if defective.
- g. Clean all parts in kerosene and set aside.
- h. Remove cylinder from the gearbox by removing four M10 bolts (the bolt inside the oil reservoir is longer than the others). There are three O-rings on the face of the gearbox.
- i. Inspect the internal bore of the cylinder and the outside surface of the piston for any excessive scoring. Replace if defective.
- j. Clean all the oil passages in the cylinder.
- k. Check that the piston is securely fasten to the connecting rod by the wrist pin.
- l. Set aside for assembly.

Oil Refill Valve Assembly and Cylinder Installation

- a. Install the rear baffle plate to the cylinder.
- b. Insert the plunger and sensing disc assembly with spring to the cylinder. Locate the mark on the face of the sensing disc, where the longer slot on the plunger is oriented, and position it toward the top of the cylinder.
- c. Hold the sensing disc against the baffle plate and do not release until the cap is bolted tight.
- d. Apply grease to O-ring and insert the ball and seat assembly into the cylinder.
- e. Apply grease to the cap O-ring and, pushing the cap squarely against the seat, tighten the four screws in a cross pattern.
- f. Release the sensing disc and it will spring back a distance of about 2 to 2.5 mm.
- g. Ensure that the mark on the face of the sensing disc is to the top of the cylinder, and also one of the outer holes of the baffle plate is to the top of the cylinder.
- h. Apply grease to the three O-rings and position them to their respective location on the face of the gearbox.
- i. Apply oil to the piston and cylinder bore. Insert the cylinder carefully to the piston and guide it square against the gearbox. Tighten the four mounting bolts. Check the assembly by turning the worm shaft.
- j. Install the flat diaphragm as directed in paragraph 4.5.5, steps f through h.

4.5.7 Stroke Adjuster Disassembly and Assembly

Replacement of O-ring in the Knob - Manual Stroke Adjuster

- a. Disconnect power from the pump.
- b. Turn the knob counterclockwise all the way until it stops.
- c. Record the location of the "O" position of the knob in relation to the stroke adjust housing in two ways:
 - The distance of the knob front end to the nearest percent line on the stroke adjust housing.
 - The location of the "O" line on the knob from the reference line of the stroke adjust housing. (The long line running along the center of the percent marks.)

- d. Loosen the three set screws and back out flush with the surface of the knob. Do not remove.
- e. Place an oil pan below the knob and slide it off of the stroke adjust housing. The O-ring can now be removed for replacement.
- f. Install new O-ring in the stroke housing groove and apply silicone grease.
- g. Position the knob according to the recorded location in step c, above, and tighten the three set screws equally.
- h. Refill gearbox with oil.

Replacement of Quad-Ring in the Stroke Adjust Housing and Knob-Electric Stroke Positioner

- a. Set the electric positioner to manual mode and position the pump stroke to "0%".
- b. Disconnect power to the pump and the positioner.
- c. Unscrew four M6 screws that secure the positioner housing to the arm.
- d. Pull out the positioner and set aside. Do not disturb the square drive shaft.
- e. With a 1/2-inch square drive, turn the knob counterclockwise as far as it will go.
- f. Unscrew the four bolts that secure the arm to the pump.
- g. Refer to paragraph 4.5.7, Replacement of O-ring in the Knob-Manual Stroke Adjuster, steps c through h, to complete the disassembly and assembly of the knob, only use a quad-ring instead of an O-ring.

- h. Install the arm to the pump and tighten the four bolts.
- i. Set the knob to “0%” pump stroke position and install the electric stroke positioner. Apply “Molykote” grease to the square drive shaft.
- j. Check for positioner calibration.

Removal and Assembly of the Stroke Adjuster

- a. Remove the knob as outlined above.
- b. Bend up the locking tab of the lockwasher and unscrew the locknut with tool (WPS part number AAB4565). Remove the lockwasher and the at washer.
- c. Remove the stroke adjuster by turning counterclockwise. One set of the thrust bearing will come out with it while the other set will remain at the end of the eccentric shaft. With a piece of wire, remove the bearing.
- d. Inspect for any defective parts and replace if necessary.
- e. Grease the thrust bearing so the parts stick together and install one set at the end of the eccentric shaft.
- f. Thread the stroke adjuster all the way against the rst thrust bearing and then install the second set, followed by the at washer, then the lockwasher. The locking tab of the lockwasher is partially bent and must point toward the locknut; the inner tab must engage with the shaft keyway.
- g. With tool (WPS part number AAB4565) screw the locknut with the chamfer side toward the lockwasher. Tighten by hand and hold it while turning the stroke adjuster clockwise and counterclockwise to properly seat the bearings.
- h. Inspect for the closest alignment between the tab of the lockwasher and the slot on the locknut. Unscrew the locknut to align the nearest tab with the slot. Bend that tab, to ensure it is properly seated in the slot.
- i. Install the knob as outlined above.
- j. Fill the gearbox with oil.

4.5.8 Removing and Installing Motor (Driver Gearbox Only on Double Simplex)

NOTE: Metric motor mounting arrangement, see Dwg. 430.500.000.060A&B

- a. Disconnect power to motor. If SCR speed controller is used, disconnect power to the SCR.
- b. If the motor has a tachometer, remove the wiring at the box terminal and record the polarity.
- c. If the conduit pipe is rigid, disconnect at the motor terminal box. Record the wiring connections.
- d. Remove the four bolts that fasten the motor to the motor support.
- e. Lift the motor straight up and set aside.
- f. The motor support can now be removed for complete flexible coupling inspections or replacement.
- g. If the coupling flange on the motor shaft is to be replaced, measure the position on the shaft and install the new flange at the same position.
- h. Install the motor in reverse order of removal. Be sure to tighten all set screws and all keys in place.
- i. The motor will drop into place once the coupling is in proper engagement.
- j. Tighten the mounting bolts and reconnect all the wirings. The motor can rotate in either direction.

4.5.9 Gearbox Disassembly and Assembly

NOTE: Double simplex gearbox arrangement, see Dwg. 430.500.000.020A-H

- a. Drain the oil from the gearbox (approximately 2-1/2 gallons (10 ltrs) for simplex and 5 gallons (20 ltrs) for double simplex).
- b. Remove the motor per paragraph 4.5.8.
- c. Remove the motor support and flexible coupling.
- d. Remove the gearbox cover.

NOTE : The cover is sealed to the gearbox with RTV. There are two screwdriver slots provided for the separation of the cover from the gearbox—a gentle tap with a mallet and screw driver will help to separate the two.

- e. Clean the RTV from both mating surfaces of the cover and the gearbox.
- f. Replace the shaft seal in the bearing adjuster. If the adjuster was loosened, replace the O-ring. When installing the bearing adjuster, go through the adjusting procedures that will be outlined later in the section during the assembly procedures.

NOTE: For double simplex arrangement, the two gearboxes must be separated to get access to the worm gear. The procedures to separate and to assemble the gearboxes are outlined in paragraph 4.4.6.

- g. Remove the worm shaft and its bearings and inspect them for wear. If the worm shaft appears to be worn considerably, replace the worm shaft and worm gear as a set. Do not replace individual components.
- h. Remove bushing end cap and inspect for wear. Replace the O-ring with a new one.
- i. Inspect the end diameter of the eccentric shaft for unusual scoring or wear.
- j. Remove the worm gear and the bushing drive assembly.

NOTE: If only the gear set is to be replaced, in the case of changing the speed ratio, disassembly can be stopped here. Proceed to assemble the gearbox.

- k. To remove the eccentric assembly, the stroke adjuster has to be removed first. Refer to paragraph 4.5.7., Removal and Assembly of the Stroke Adjuster, for the removal and assembly of the stroke adjuster.
- l. Carefully pull out the eccentric assembly and inspect the sheave, tailpiece, and eccentric shaft for wear. Replace if necessary.
- m. If the connecting rod and piston assembly needs to be removed, the cylinder must be moved away from the gearbox about four inches to clear the connecting rod of the gearbox.

- n. Check for excessive radial clearance between the tailpiece and the journal bushing. If it is necessary to replace the bushing, remove the stroke adjust housing. Push out the old bushing and press in the new one.
- o. Clean all the parts and the gearbox and assemble in reverse order of disassembly.
- p. After mounting all the components of the eccentric assembly and the bushing end cap is tightened, check the end play between the nut, tailpiece adjuster, and the tailpiece. The end play should be .001 to .005 inch. The assembly must be free to turn and the eccentric shaft must be able to operate in and out smoothly. If necessary, readjust the adjuster nut by loosening, repositioning, and retightening. Tighten the two set screws.
- q. Install the worm shaft and the bearings in the gearbox. Position the outer race of the top bearing to the cover, and install the cover temporarily by tightening four mounting bolts closest to the bearing.
- r. Adjust the bearing adjuster so that the axial play of the worm shaft is within 0.005 inch. Choose the closest slot, back out if required, and lock with the flat head screw.
- s. Remove the cover and press the shaft seal.

NOTE: On double simplex pump, it is easier to assemble the two gearboxes together at this point without the cover. Proceed to paragraph 4.6.

- t. Apply a 1/8-inch bead of RTV around the top of the gearbox and install the cover.
- u. Install the flexible coupling flange to the worm shaft against the shoulder and tighten the two set screws.
- v. Mount the motor support and install the motor per paragraph 4.5.8.

4.6 Disassembly and Assembly of Double Simplex Gearbox Drive Connection

- a. Disconnect power to the motor. If SCR speed controller is used, disconnect power to the SCR.
- b. Drain the oil from the gearboxes [approximately 5 gallons (20 ltrs)].

NOTE: The driven gearbox has to be moved to perform any work to the drive connection. It is therefore necessary to disconnect the suction and discharge pipings. Refer to paragraph 4.5.3. If an electric actuator is used, disconnect the power to the actuator. Disconnect the wiring and the conduit at the actuator box. Record the wiring connections.

- c. Remove the four bolts that mount the driven gearbox to the base. Record the location of the shims, if any, so that they can be installed at the same location.
- d. Remove the four bolts that secure the duplex bushing cap and housing.
- e. Pull the driven gearbox straight out, secure the cap bushing, and move the pump to a safe place to work on.
- f. All parts involving the duplex drive can now be removed, aside from the bushing duplex drive of the driver gearbox. The worm shaft has to come out to be able to remove the bushing duplex drive. See paragraph 4.5.9.
- g. Inspect all parts for excessive wear and replace if necessary.
- h. Assembly is the reverse of disassembly with the following additional procedures:
- (1) Apply grease to O-rings so not to dislodge from the groove.
 - (2) Check the fits of the tangs on the drive shaft (for new parts).
 - (3) Assemble the driver gearbox first and orient the piston to an either full forward or backward position.
 - (4) Mount the housing duplex coupling to the driver gearbox with the oil hole toward the front.
 - (5) Assemble the driven gearbox and temporarily secure the cap bushing with a short threaded rod and a nut.
 - (6) Orient the piston of the driven gearbox opposite that of the driver. The shaft duplex coupling can be used to turn the eccentric for positioning. The two pumps must be 180 degrees out of phase.
 - (7) Position the driven gearbox close to the driver and check for drive shaft tang alignment. Re-align if necessary. Remove the temporary nut and slide the driven gearbox towards the driver.

(8) Watch for the O-rings and push the driven gearbox against the driver. The drive shaft tangs are properly engaged if the cap bushing made contact with the duplex coupling. Secure with four screws, but do not tighten.

(9) Check that the gearbox is parallel with the base, install the shims to their respective locations, and tighten the four screws.

(10) Tighten the mounting bolts and install the covers per paragraph 4.5.9, steps t, u, and v, if removed.

i. Reconnect all the wirings, install the valves, and fill the gearbox with oil.

j. Hook up the pump to the system and calibrate. (See paragraph 3.1.5.)

4.7 Troubleshooting

The correction of operating difficulties is best accomplished by familiarity with the normal operation of the pump, by close observation, and by an orderly elimination of the possible causes. The following table has been prepared to help the operator find and correct operating difficulties. Before using, the operator should read carefully all the instruction material contained in this section, since the following table is necessarily brief and refers to other sections of the manual for detailed information.

Several general symptoms of improper operation are listed. With each is listed the probable cause and the suggested remedy. An attempt has been made to list the probable cause under each general heading in the most probable order of occurrence and they should be checked and eliminated in the order given.

In order to make the table as complete as possible, many possible operating difficulties have been included. Actually, the pump user can expect long periods of service with few operating difficulties.

Table 4.2 - Troubleshooting

FAULT CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
PUMP FAILS TO PRIME	Suction and discharge valves incorrectly assembled.	Reassemble as necessary.
	Air leaks in suction piping.	Eliminate air leaks.
	Pump discharge below atmospheric pressure.	Increase pump discharge pressure.
	Discharge valve not seating properly.	Replace discharge valves.
	Leak at O-rings.	Replace O-rings.
	Air in hydraulic system.	Bleed hydraulic system.
	Pressure relief valve in suction line.	Reset valve.
	Closed valve in suction line.	Open valve.
	No liquid in supply container.	Replenish supply container.
	Air in intermediate section.	Check for leaks, then refill.
PUMP FAILS TO HOLD PRIME, VALVES RATTLE DURING OPERATION	Vacuum leaks in suction piping.	Check for leaks.
	O-rings leaking.	Replace O-rings.
	Discharge pressure too low.	Adjust discharge pressure to a minimum of 10 psi over suction pressure.
GEAR BOX RUNS HOT	High system pressure.	Adjust system pressure.
	Low oil level.	Check and replenish oil level.
	Misalignment of worm and gear causing excessive wear on bearings and gear.	Check and realign if worn.

Table 4.2 - Troubleshooting (Cont'd)

FAULT CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
PUMP DISCHARGE FLOW IS LOWER THAN RATED	Leaks in suction line.	Correct leaks as necessary.
	O-rings leaking.	Replace O-rings.
	Insufficient net positive inlet pressure.	Increase inlet pressure.
	Dirty or worn valves.	Clean or replace valves as necessary.
	Pressure relief valve improperly set.	Reset pressure relief valve.
	Incorrect motor speed.	Reset motor speed.
	Viscosity of fluid too high.	Heat fluid to lower viscosity.
	Air purge valve dirty.	Clean air purge valve.
	Oil refill valve not sealing.	Repair or replace valve as necessary.
	Air in intermediate section.	Check for leaks, then refill.
PUMP DISCHARGE FLOW SLOWLY DECREASES	Dirty or worn valves.	Clean or replace valves.
	Pressure relief valve setting too low.	Reset valve.
	Leak in suction piping.	Repair leaks.
	Obstruction in suction line or dirty or clogged strainer.	Clear obstruction. Clean or replace strainer.
	Product characteristics change (viscosity)	Reset for current product viscosity.
ERRATIC FLOW FROM PUMP DISCHARGE	Leaks in suction line.	Repair leaks.
	Insufficient net positive inlet pressure.	Increase inlet pressure.
	Motor speed fluctuating.	Check for constant motor speed and correct as necessary.
	Dirty or worn valves.	Clean or replace valves.

Table 4.2 - Troubleshooting (Cont'd)

FAULT CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
HIGHER THAN RATED FLOW FROM DISCHARGE	Suction pressure is higher than discharge.	Add backpressure valve.
	Backpressure valve leaks or is set too low.	Repair or reset backpressure valve.
	Low oil level.	Replenish oil supply.
AIR CONTINUOUSLY COMES OUT OF AIR PURGE VALVE	Pressure relief valve improperly set and relieves at each pump stroke.	Reset valve.
	If setting of pressure relief valve does not stop relieving, foreign matter on seat prevents closing.	Clean valve seat.
	Insufficient net positive inlet pressure.	Increase inlet pressure.
OIL LOSS FROM GEAR CASE	Leaking oil seals and gaskets.	Replace defective parts.
	Diaphragm leak along clamping area.	Replace pump diaphragm. If diaphragm is ruptured with no alarm, check leak detection system for proper operation.
MOTOR OVERHEATS	Backpressure too high.	Reduce backpressure.
	Low voltage.	Increase voltage.
	Low wire.	Tighten connection.
	Improper grade oil (too viscous).	Drain and refill with correct grade oil.
ELECTRONIC LEAK DETECTION NOT FUNCTIONING	Electronic leak detection circuit sensitivity set too high.	Check wiring. Check for power. Check fuse. Replace unit if defective.
LEAKAGE AT CONDUCTIVITY PROBE	Defective seal.	Replace probe.
INTERMEDIATE FLUID DISCOLOURED	Ruptured diaphragm(s).	Replace diaphragm(s).

WARNING LABELS

The following warning labels have been attached to the equipment.

AEK4049: THIS EQUIPMENT MAY HANDLE HAZARDOUS MATERIALS WHICH CAN CAUSE SEVERE PERSONAL INJURY. OBSERVE THE FOLLOWING:

THIS EQUIPMENT MUST BE INSTALLED, OPERATED, SERVICED BY TRAINING QUALIFIED PERSONNEL, WHO ARE THOROUGHLY FAMILIAR WITH THE CONTENTS OF THE INSTRUCTION BOOK.

TURN OFF POWER BEFORE SERVICING TO AVOID ELECTRICAL SHOCK. USE RIGID PIPE WHEN PUMPING HAZARDOUS MATERIAL OR AT HIGH FLUID TEMPERATURES OR AT HIGH DISCHARGE PRESSURES.

REFER TO THE SAFETY PRECAUTIONS OF THE SUPPLIER OF THE HAZARDOUS MATERIAL AND THE EQUIPMENT INSTRUCTION BOOK FOR FURTHER IMPORTANT DETAILS AND PRECAUTIONS.

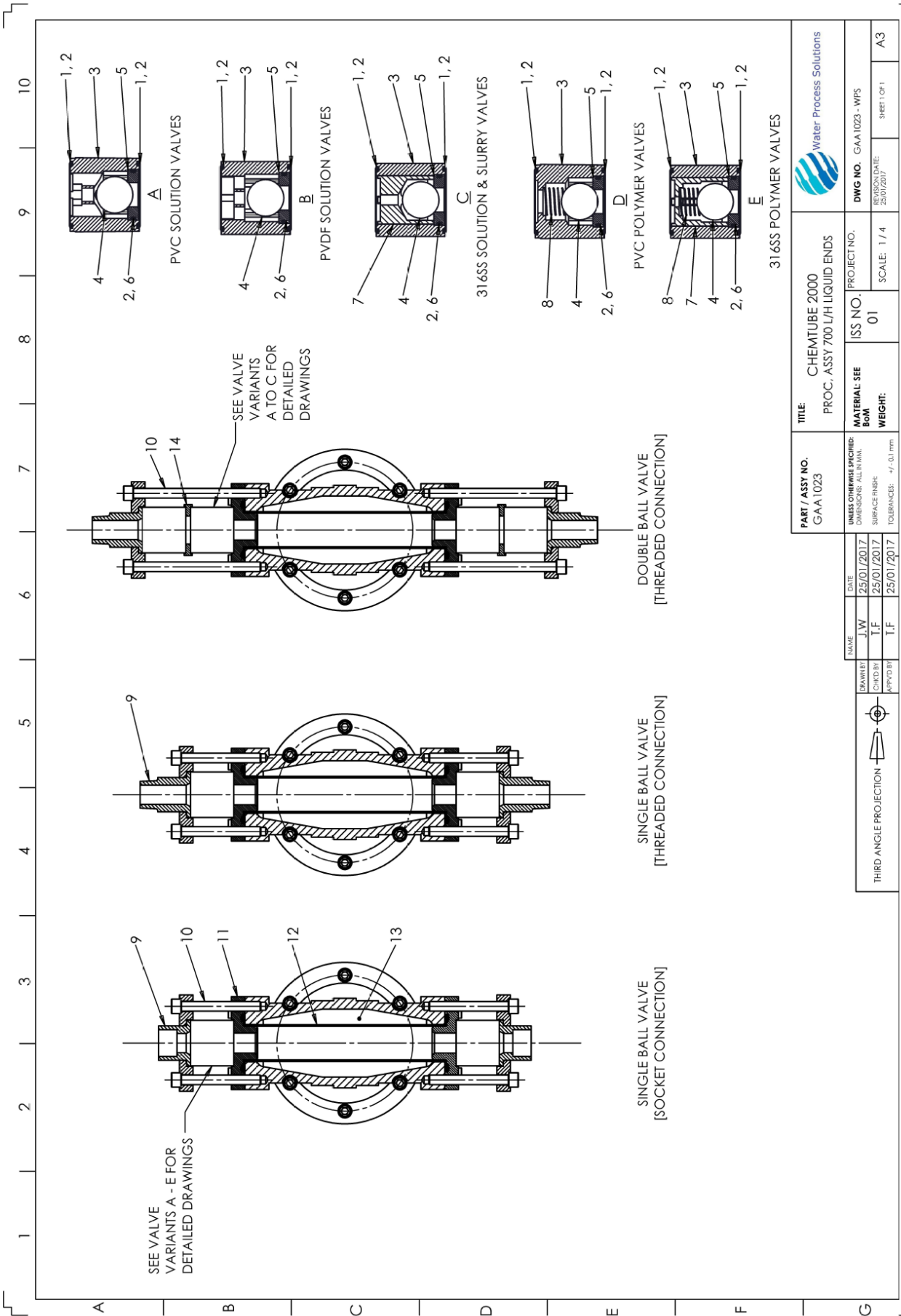
USE APPROPRIATE PROTECTIVE CLOTHING AND EYE PROTECTION, AS RECOMMENDED BY THE CHEMICAL MANUFACTURER.

AAA3759: TO PREVENT POSSIBLE SEVERE PERSONAL INJURY DUE TO BEING SPRAYED WITH HAZARDOUS LIQUID UNDER PRESSURE, DO NOT DISCONNECT DISCHARGE TUBE/PIPE/MAIN CONNECTION WITHOUT FIRST RELIEVING PRESSURE AND DRAINING DISCHARGE LINE. SEE INSTRUCTION BOOK FOR DETAILED GUIDANCE.

List Of Contents

DRAWING NO.

2", 700 LPH Liquid Ends	4 30.500.000.030A-C
2-1/2", 1200 LPH Liquid Ends	430.500.000.040A-C
3", 2000 LPH Liquid Ends	430.500.000.010A-D
Simplex Gearbox Arrangement	430.500.000.050A-H
Metric Motor Mounting Arrangments	430.500.000.060A&B
Double Simplex Gearbox Arrangement	430.500.000.020A-G



430.500.000.030A

KEY NO.	PART NO.	QTY.	DESCRIPTION
□ 1	AMK3876 OR AJE3882	4 4	O-RING, #134, HYP, 47.29 ID x 2.62mm O-RING, #134, VITON, 47.29 ID x 2.62mm
□ 2	AAA 3797	0	GREASE, SILICONE, LIGHT
□ 3	AKG 5002 OR AIA 5008 OR AAA 4661 OR APS 4977 OR AIA 3377 OR AAA 4661	2 2 2 2 2 2 2	GUIDE, RETAINER, 1.125" BALL PVC GUIDE, RETAINER, 1.125" BALL PVDF RETAINER, 1.125" BALL SST RETAINER, 1.125" BALL PVC GUIDE, RETAIN, 1.125" BALL PVC RETAIN, 1.125" BALL SST
□ 4	ABE 3904 OR ABE 3796 OR AEK 3629 OR ABE 3839	2 2 2 2 2	BALL, 1.125" SST BALL, 1.125" PTFE BALL, 1.125" CERAMIC BALL, 1.125" POLYURETHANE
□ 5	AIC 4733 OR AIC 3361 OR ANM 3369 OR AOO 4728	2 2 2 2 2	SEAT, 1.125" BALL, SST SEAT, 1.125" BALL, PVC SEAT, 1.125" BALL, PVDF SEAT, 1.125" BALL, CERAMIC
□ 6	ALI 5643 OR AMK 5934	2 2	O-RING, #126, HYP, 34.59 ID x 2.62mm O-RING, #126, VITON, 34.59 ID x 2.62mm
□ 7	AOO 5311 OR AAA 4610	2 2	GUIDE, 1.125" BALL, SST GUIDE, 1.125" BALL, SST POLYMER
□ 8	ALI 4222	2	SPR. COMP. ELG, .87 O.D. x .031W x 1" LG

- PART OF: AAA 3764, AAA 3767, AAA 3770, AAA3773, AAA 3776, AAA 3779, AAA 3782, AAA 3785, AAA 3788, AAA 3791, AAA 3794, AAA 3797, AAA 3800, AAA 3803, AAA 3806, AAA 3809, AAA 3812
- ◆ PART OF: AAA 3953, AAA 3956, AAA 3962, AAA 3965, AAA 3968, AAA 3971, AAA 3974, AAA 3977, AAA 3980
- PART OF: AJE 4942, APS 4948, ALI 4952, AIC 4968, AOO 4972, AIA 4976, AAA 4037 (SINGLE VALVE); AOO 4956, ALI 4960, AOO 4964, AOO 4981, AAA 4031, AAA 4034, AAA 4043 (DOUBLE VALVE)

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST 2", 700 LPH - Liquid Ends

430.500.000.030B
ISSUE 0 11-97

KEY NO.	PART NO.	QTY.	DESCRIPTION
□ 9	AJE 4298	2	CONNECTION, 1 NPT, PVC
	OR		
	AOO 4311	2	CONNECTION, 1 NPT, PVDF
	OR		
	ALI 4282	2	CONNECTION, 1 NPT, SST
	OR		
	AKG 4304	2	CONNECTION, R1, PVC
	OR		
	ANM 4318	2	CONNECTION, R1, PVC
■ 10	OR		
	ALI 4290	2	CONNECTION, R1, PVC
	OR		
	AM 4997	2	CONNECTION, 1.25, SOCK, PVC
	ASG 3384	4	SCREW, CAP, M12 x 100 SOCK. HD, 316SS
	OR		
	AQC 3417	4	SCREW, CAP, M12 x 160 SOCK. HD, 316SS
	◆ 11		
	AJE 5695	1	DIAPHRAGM, TUBULAR, TFE, 700 1/H
◆ 11	OR		
	AMM 5297	1	DIAPHRAGM, TUBULAR, HYP, 700 1/H
	OR		
	AOO 5283	1	DIAPHRAGM, TUBULAR, VIT, 700 1/H
	◆ 12		
	AOO 4500	2	INSERT, 700 1/H, PVC
	OR		
	AIC 4403	2	INSERT, 700 1/H, PVDF
	OR		
◆ 13	APQ 4399	2	INSERT, 700 1/H, SST
	◆ 14		
	U 28652	0	PROPYLENE GLYCOL, 1 QTE1614
	■ 14		
	APQ 4909	2	ADAPT, DBL, VALVE 1.125" BALL, PVC
	OR		
	ANM 4915	2	ADAPT, DBL, VALVE 1.125" BALL, PVDF
	OR		
	AKG 4922	2	ADAPT, DBL, VALVE 1.125" BALL, SST

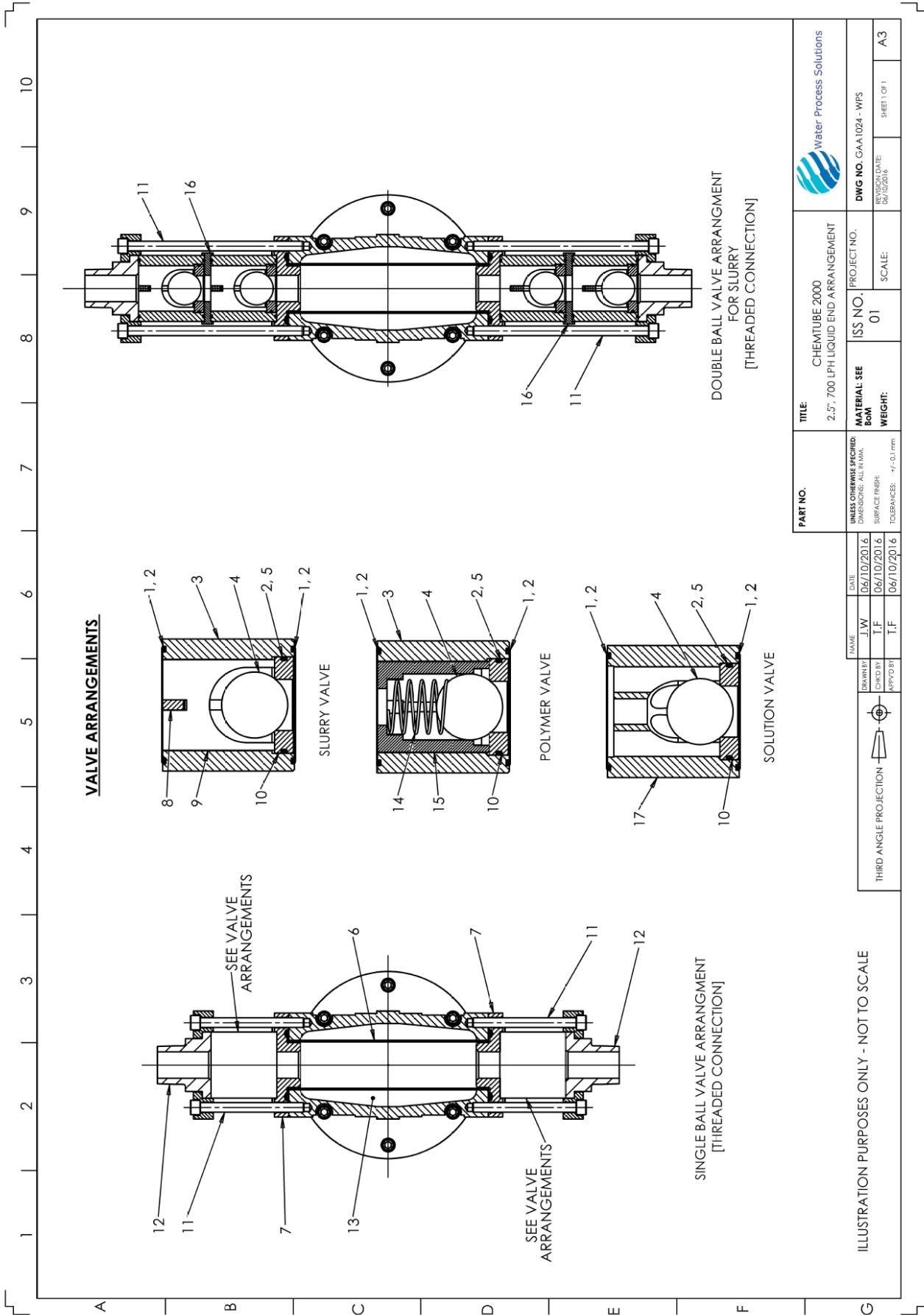
- PART OF: AAA 3764, AAA 3767, AAA 3770, AAA3773, AAA 3776, AAA 3779, AAA 3782, AAA 3785, AAA 3788, AAA 3791, AAA 3794, AAA 3797, AAA 3800, AAA 3803, AAA 3806, AAA 3809, AAA 3812
- ◆ PART OF: AAA 3953, AAA 3956, AAA 3962, AAA 3965, AAA 3968, AAA 3971, AAA 3974, AAA 3977, AAA 3980
- PART OF: AJE 4942, APS 4948, ALI 4952, AIC 4968, AOO 4972, AIA 4976, AAA 4037 (SINGLE VALVE); AOO 4956, ALI 4960, AOO 4964, AOO 4981, AAA 4031, AAA 4034, AAA 4043 (DOUBLE VALVE)

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST

2", 700 LPH - Liquid Ends

430.500.000.030C
ISSUE 0 11-97



430.500.000.040A

KEY NO.	PART NO.	QTY.	DESCRIPTION
□ 1	AIC 5182 OR AKG 5710	4 4	O-RING, #147, HYP 67.95 ID x 2.62MM O-RING, #147, VIT 67.95 ID x 2.62MM
□ 2	AAA 3797	0	GREASE, SILICONE, LIGHT
□ 3	AJE 3930 OR ALI 3938 OR ANM 3922	2 2	RETAINER, 1.625" BALL, PVC RETAINER, 1.625" BALL, PVDF RETAINER, 1.625" BALL, SST
□ 4	ACG 5578 OR AAA 5536 OR AAC 5452 OR ABE 5509	2 2 2	BALL, 1.1625" SST BALL, 1.1625" TEFLON, +/- .002" BALL, 1.1625" CERAMIC, +/- .001" BALL, 1.1625" POLYURETHANE
● 5	ANM 5190 OR ANM 5700	2 2	O-RING, #139, HYP 55.25 I.D. x 2.62 MM O-RING, #139, VIT 55.25 I.D. x 2.62 MM
◆ 6	APS 5702 OR AIC 5293 OR AOO 5278	1 1 1	DIAPHRAGM, TUBULAR, TFE, 1200 1/H DIAPHRAGM, TUBULAR, HYP, 1200 1/H DIAPHRAGM, TUBULAR, VIT, 1200 1/H
◆ 7	AIA 4396 OR APS 4388 OR AIA 4392	2 2 2	INSERT, 1200 1/H, PVC INSERT, 1200 1/H, SST INSERT, 1200 1/H, PVDF
● 8	APS 4334 OR AJE 4330 OR AIC 4326 OR AAB 4715	2 2 2 2	GUIDE, 1.625" BALL, TOP, PVC GUIDE, 1.625" BALL, TOP, PVDF GUIDE, 1.625" BALL, TOP, SST GUIDE, 1.625" BALL, TOP, SST, SLURRY
● 9	AKG 4322 OR AJE 4318 OR AOO 4315 OR AAB 4703	2 2 2 2	GUIDE, 1.625" BALL, BOTTOM, PVC GUIDE, 1.625" BALL, BOTTOM, PVDF GUIDE, 1.625" BALL, BOTTOM, SST GUIDE, 1.625" BALL, BOTTOM, SST, SLURRY

NOTE: FOR SYMBOL KEY, SEE DWG. 430.500.000.040C.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST 2-1/2", 1200 LPH - Liquid Ends

430.500.000.040B
ISSUE 1 8-00

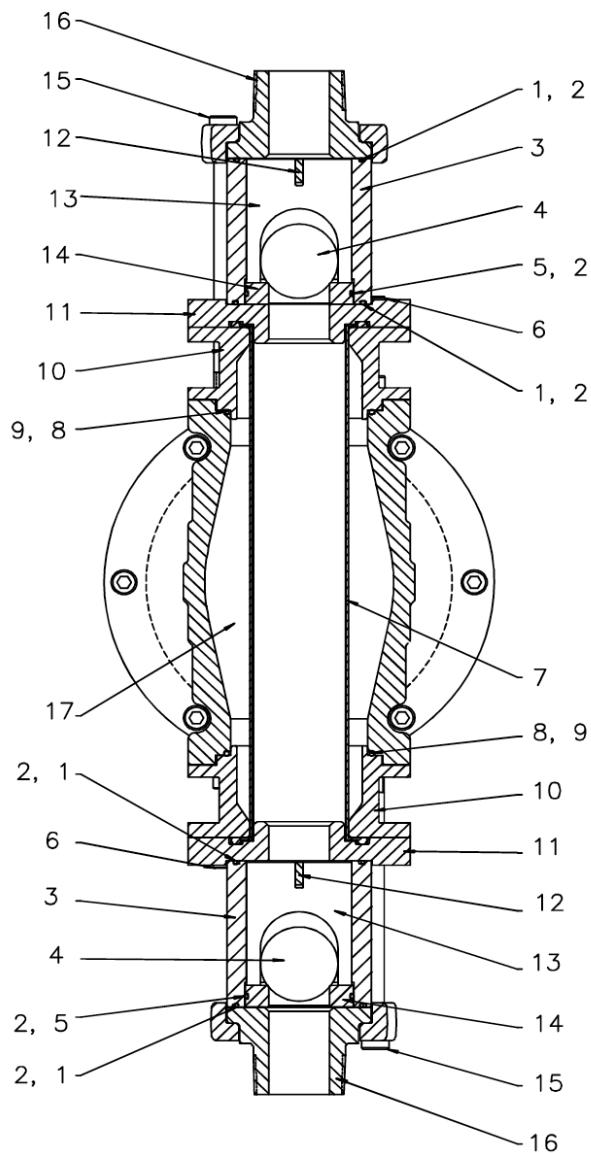
KEY NO.	PART NO.	QTY.	DESCRIPTION
● 10	ALI 4362	2	SEAT, 1.625" BALL, SST
	OR		
	APQ 4371	2	SEAT, 1.625" BALL, PVC
	OR		
	AIC 4366	2	SEAT, 1.625" BALL, PVDF
■ 11	OR		
	AOO 4357	2	SEAT, 1.625" BALL, CERAMIC
	AXQ 3426	4	SCREW, CAP, M12 x 220, SOCK. HD, 316SS
	OR		
	AAA 3447	4	SCREW, CAP, M12 x 130, SOCK. HD, 316SS
■ 12	AIC 3543	2	CONNECTION, 1-1/2 NPT, PVC
	OR		
	ALI 3579	2	CONNECTION, 1-1/2 NPT, PVDF
	OR		
	AJE 3531	2	CONNECTION, 1-1/2 NPT, SST
	OR		
	APQ 3649	2	CONNECTION, R1-1/2 NPT, PVC
	OR		
	APQ 3666	2	CONNECTION, R1-1/2 NPT, PVDF
	OR		
	AJE 3640	2	CONNECTION, R1-1/2, SST
	OR		
	AKG 3698	2	CONNECTION, 1-1/2 SOCKET, PVC
	◆ 13 U 28652	1	PROPYLENE GLYCOL, 1 QT. E1614
	● 14 ALI 4260	2	SPRING, COMP, COB.1.34OD x .06W x 1.68
● 15	AMK 3904	2	GUIDE, 1.1625" BALL, PVC POLYMER
	OR		
	AAA 4613	2	GUIDE, 1.1625" BALL, 316SS POLYMER
	■ 16 APQ 3953	2	ADAPTER, DBL, VAL, 1.625" BALL PVC
	OR		
	ANM 3962	2	ADAPTER, DBL, VAL, 1.625" BALL PVDF
	OR		
	AKG 3946	2	ADAPTER, DBL, VAL, 1.625" BALL SST

● PART OF	AAA 3815	AAA 3818	◆ PART OF	AAA 3983	■ PART OF	AAA 4064
	AAA 3821	AAA 3824		AAA 3986		AAA 4067
	AAA 3827	AAA 3830		AAA 3989		AAA 4070
	AAA 3833	AAA 3836		AAA 3992		AAA 4082
	AAA 3839	AAA 3842		AAA 3995		AAA 4085
	AAA 3845	AAA 3848		AAA 4001		AAA 4088
	AAA 3851	AAA 3854		AAA 4004		AAA 4094
	AAA 3857	AAA 3860		AAA 4007		
	AAA 3863			AAA 4010		

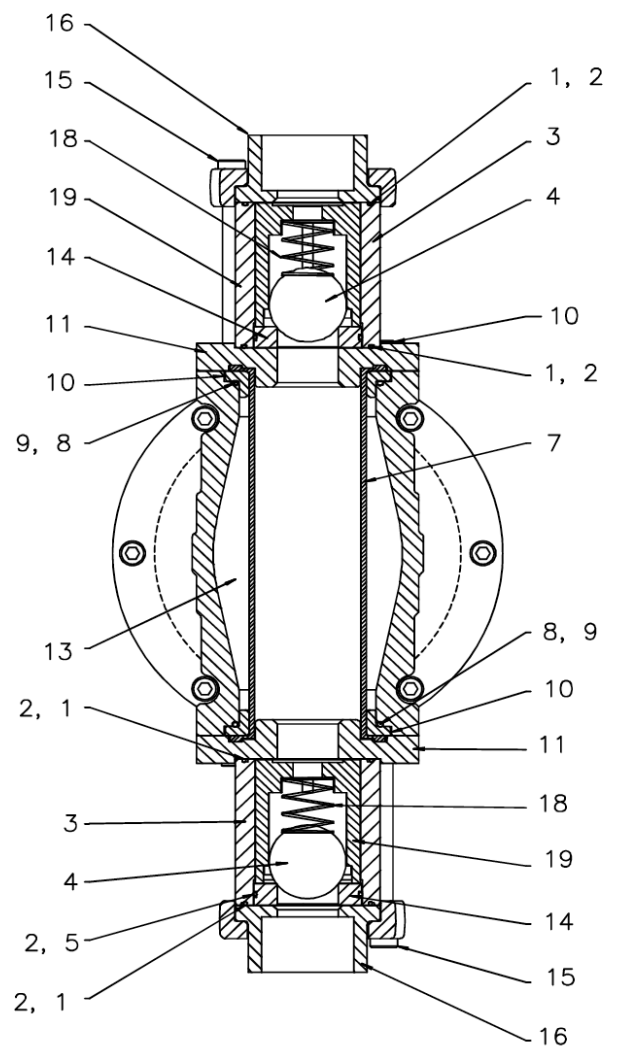
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST 2-1/2", 1200 LPH - Liquid Ends

430.500.000.040C
ISSUE 1 8-00



SINGLE BALL
SOLUTION & SLURRY
VALVES (THREADED CONNECTIONS
& TFE LINED TUBES)

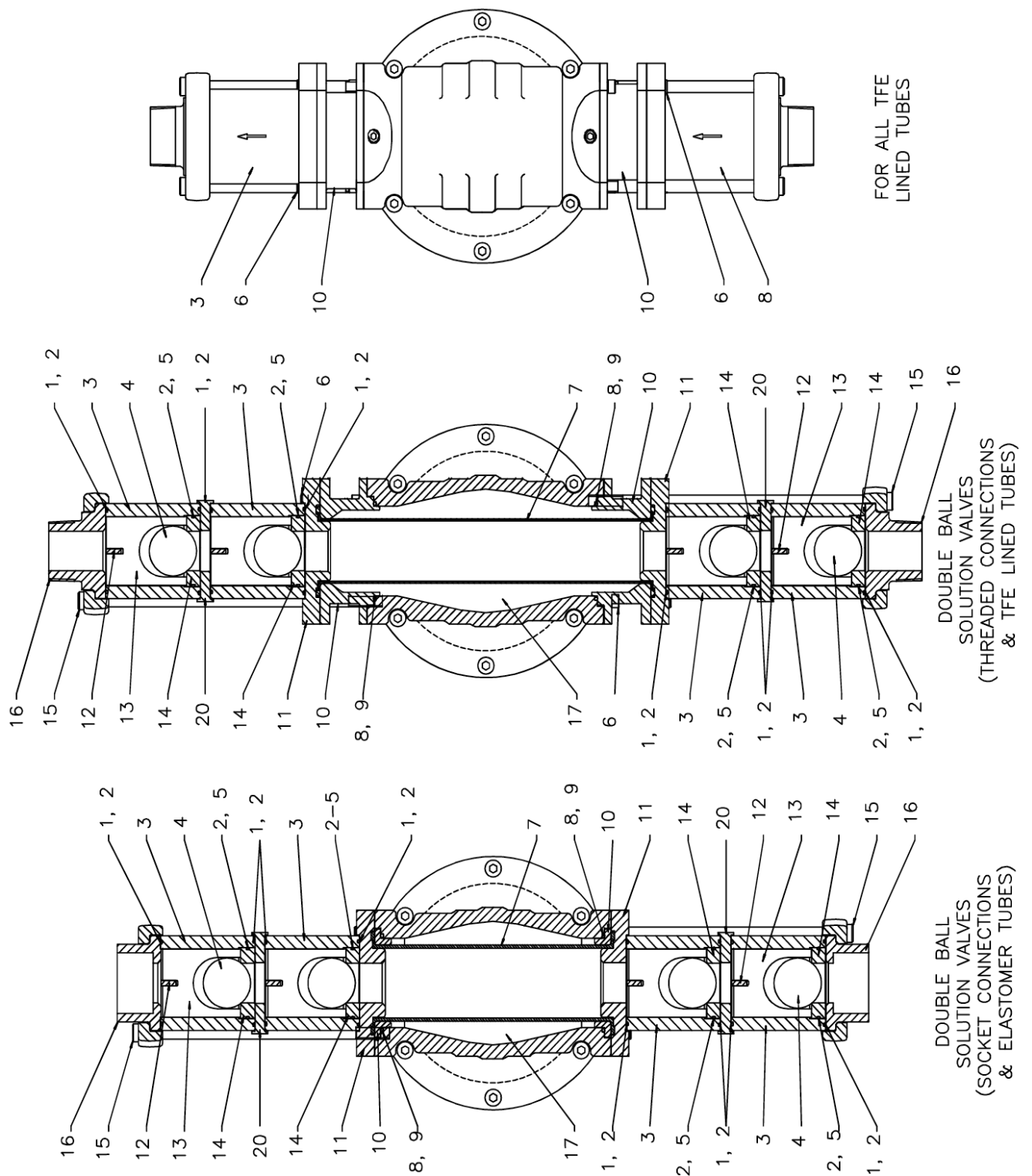


SINGLE BALL
POLYMER VALVES
(SOCKET CONNECTIONS
& ELASTOMER TUBES)

NOTE: FOR PARTS LIST, SEE DWGS. 430.500.000.010C&D.

CHEMTUBE 2000 METERING PUMP - PARTS 3", 2000 LPH - Liquid Ends

430.500.000.010A
ISSUE 0 11-97



NOTE: FOR PARTS LIST, SEE DWGS. 430.500.000.010C&D.

CHEMTUBE 2000 METERING PUMP - PARTS 3", 2000 LPH - Liquid Ends

430.500.000.010B
ISSUE 0 11-97

KEY NO.	PART NO.	QTY.	DESCRIPTION
□ 1	ANM 5175 OR AMK 5714	4 4	O-RING, #152, HYPALON 82.22ID x 2.62MM O-RING, #152, VITON 82.22ID x 2.62MM
□ 2	AAA 3797	0	GREASE, SILICONE, LIGHT
□ 3	AKG 3934 OR AJE 3926 OR ANM 3942	2 2	RETAINER, 2" BALL PVC RETAINER, 2" BALL PVDF RETAINER, 2" BALL SST
□ 4	ACG 5591 OR AAA 5563 OR ACG 5493 OR AAC 5525	2 2 2 2	BALL, 2" SST BALL, 2" PTFE BALL, 2" CERAMIC POLYURETHANE
● 5	AIC 5186 OR AOO 5704	2 2	O-RING, #146, HYPALON 66.34ID x 2.62MM O-RING, #146, VITON 66.34ID x 2.62MM
◆ 6	AXS 3583	4	SCREW, CAP, M8 x 25, SOCK HD, 316SS
◆ 7	ALI 5708 OR ALI 5288 OR APS 5219	1 1	DIAPHRAGM, TUBULAR, TFE 2000 L/H DIAPHRAGM, TUBULAR, 2000 L/H DIAPHRAGM, TUBULAR, VITON 2000 L/H
◆ 8	ALI 5057	2	O-RING, #239, BUNA-N 91.67ID x 3.53MM
◆ 9	AAA 3797	2	GREASE, SILICONE, LIGHT
◆ 10	AAA 3398 OR AAA 3401	2 2	ADAPTER, TFE TDIA, 2000 L/H ADAPTER, ELST TDIA, 2000 L/H
◆ 11	AAA 3938 OR AAA 3944 OR AAA 3941 OR ANM 4383 OR AKG 4379 OR AJE 4374	2 2 2 2 2 2 2	INSERT (PVC), TFE TDIA. 2000 L/H INSERT (PVDF), TFE TDIA. 2000 L/H INSERT (SST), TFE TDIA. 2000 L/H INSERT (PVC), ELST TDIA. 2000 L/H INSERT (PVDF), ELST TDIA. 2000 L/H INSERT (SST), ELST TDIA. 2000 L/H
● 12	AMK 3970 OR AKG 3889 OR AMK 3719 OR AAB 4733	2 2 2 2 2	GUIDE, 2" BALL, TOP, PVC GUIDE, 2" BALL, TOP, PVDF GUIDE, 2" BALL, TOP, SST, SOLUTION GUIDE, 2" BALL, TOP, SST, SLURRY

NOTE: FOR SYMBOL KEY, SEE DWG. 430.500.000.010D.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST 3", 2000 LPH - Liquid Ends

430.500.000.010C
ISSUE 1 8-00

KEY NO.	PART NO.	QTY.	DESCRIPTION
□ 13	APS 3974	2	GUIDE, 2" BALL, BOTTOM, PVC
	OR		
	APQ 3899	2	GUIDE, 2" BALL, BOTTOM, PVDF
	OR		
● 14	AIC 4308	2	GUIDE, 2" BALL, BOTTOM, SST, SOLUTION
	OR		
	AAB 4724	2	GUIDE, 2" BALL, BOTTOM, SST, SLURRY
	AOO 4346	2	SEAT, 2" BALL, SST
■ 15	OR		
	AKG 4354	2	SEAT, 2" BALL, PVC
	OR		
	API 4350	2	SEAT, 2" BALL, PVDF
■ 16	OR		
	AKG 4338	2	SEAT, 2" BALL, CERAMIC
	AXQ 3409	4	SCREW, CAP, M12 x 150 SOCK. HD, 316SS
	OR		
■ 16	AUK 3450	4	SCREW, CAP, M12 x 260 SOCK. HD, 316SS
	OR		
	AAA 2646	4	SCREW, CAP, M12 x 310 SOCK. HD, 316SS
	OR		
■ 16	AAA 2643	4	SCREW, CAP, M12 x 200 SOCK. HD, 316SS
	AIC 3548	2	CONNECTION, 2NPT, PVC
	OR		
	AJE 3635	2	CONNECTION, 2NPT, PVDF
◆ 17	OR		
	APQ 3539	2	CONNECTION, 2NPT, SS
	OR		
	AOO 3663	2	CONNECTION, R2, PVC
● 18	OR		
	APS 3695	2	CONNECTION, R2, PVDF
	OR		
	AJE 3645	2	CONNECTION, R2, SS
● 19	OR		
	APS 3702	2	CONNECTION, 2 SOCK, PVC
	U 28652	2	PROPYLENE, GLYCOL 1 QT, E1614
	ALI 4260	2	SPRING COMP CBN, 1.34 OD x .06W x 1.68"
■ 20	AIC 3908	2	GUIDE, 2" BALL, PVC POLYMER
	OR		
	AAA 4616	2	GUIDE, 2" BALL, SST POLYMER
	AIA 3957	2	ADAPTER, DBL VALVE, 2" BALL, PVC
■ 20	OR		
	AMK 3950	2	ADAPTER, DBL VALVE, 2" BALL, PVDF
	OR		
	ANM 3966	2	ADAPTER, DBL VALVE, 2" BALL

● PART OF	AAA 3869	AAA 3872	AAA 3875	◆	PART OF	AAA 4013	AAA 4016	■
PART OF	AAA 4148	AAA 4151						
	AAA 3878	AAA 3881	AAA 3884	AAA 4019	AAA 4022		AAA 4154	AAA 4166
	AAA 3887	AAA 3890	AAA 3893	AAA 4025	AAA 4028		AAA 4172	AAA 4175
	AAA 3896	AAA 3899	AAA 3902	AAA 4055	AAA 4058		AAA 4181	
	AAA 3905	AAA 3908	AAA 3911	AAA 4061				

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

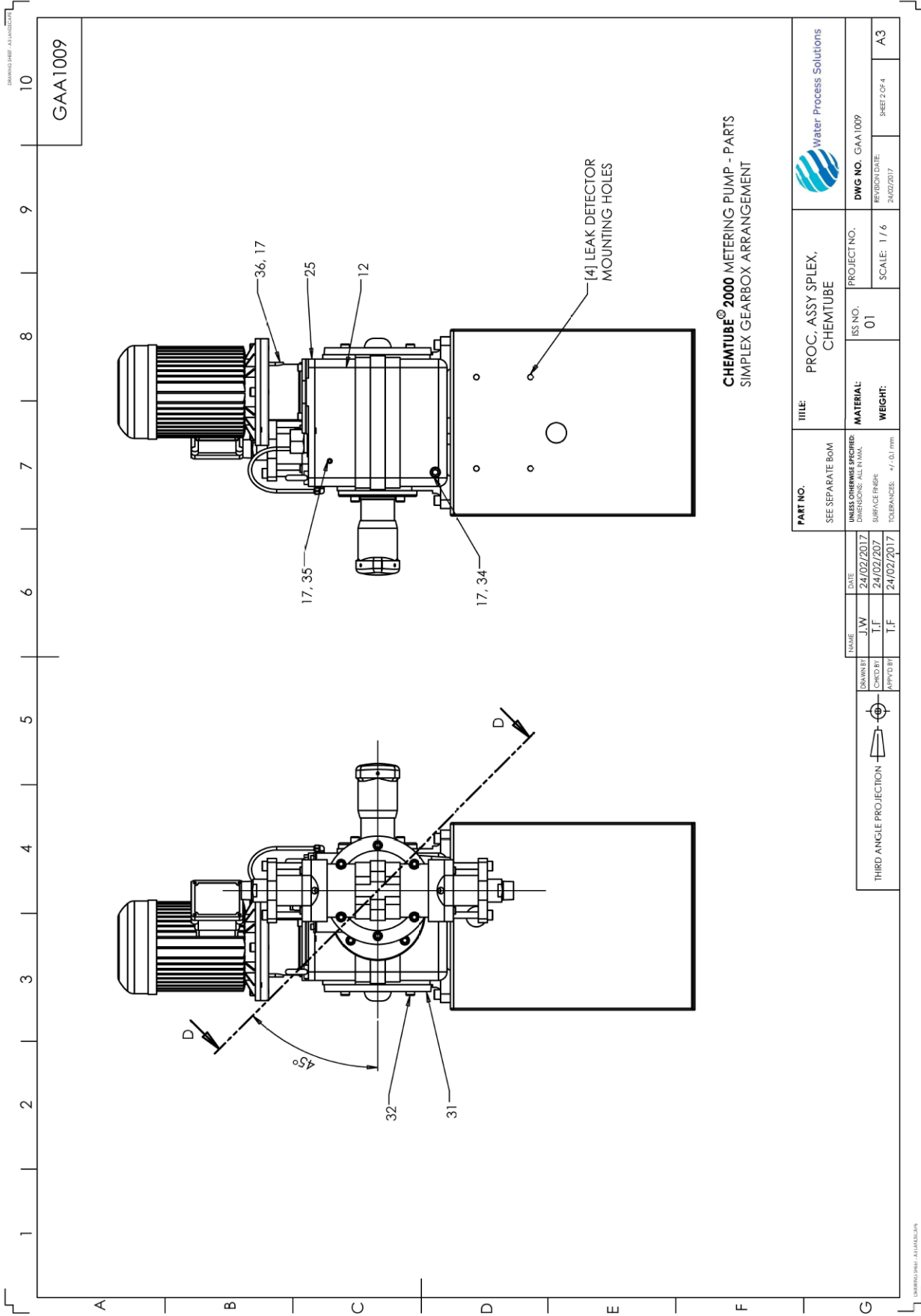
CHEMTUBE 2000 METERING PUMP - PARTS LIST

3", 2000 LPH - Liquid Ends

430.500.000.010D

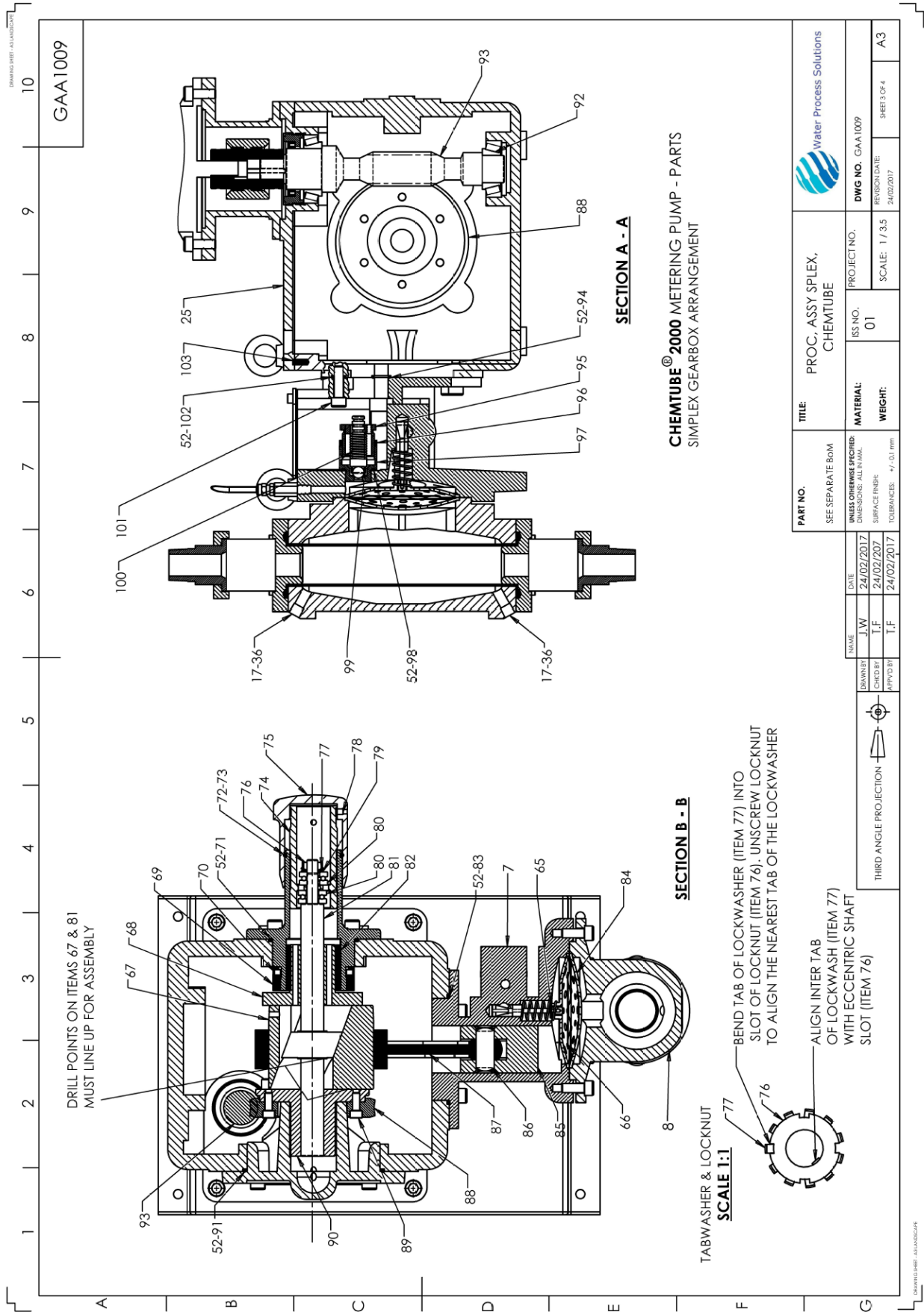
ISSUE 1 8-00





L000001000 - A3 LANDSCAPE

430.500.000.050B



KEY NO.	PART NO.	QTY.	DESCRIPTION
□ 1	AAA 3750	1	LABEL, CHEMTUBE 2000
□ 2	AOK 4334	1	HOUSING, STROKE ADJUST (MACH)
□ 3	AAA 5694	1	LABEL, STROKE ADJ. HOUSING
□ 4	ASG 3667	11	SCR. CAP, M10 x 25, SOCK. HD, 316SS
□ 5	AUK 3561	4	SCR. CAP, M6 x 20, SOCK. HD, 316SS
□ 6	AKG 3975	1	COVER, CYLINDER
□ 7	AMG 5777	1	CYLINDER, 700 L/H (MACH)
	OR		
	ASS 5768	1	CYLINDER, 1200 L/H (MACH)
	OR		
	AQO 5822	1	CYLINDER, 2000 L/H (MACH)
□ 8	AJA 5871	1	HEAD, 700 L/H (MACH)
	OR		
	ALE 5885	1	HEAD, 1200 L/H (MACH)
	OR		
	AQO 5898	1	HEAD, 2000 L/H (MACH)
□ 9	ATI 3670	1	BOLT, M10 x 1.5 LIFTING EYE
□ 10	AWO 3703	2	NUT, M10 x 1.5 LIFTING EYE, ZINC/STL
□ 11	AXS 3712	2	STUD, M10 x 37mm, ZINC/STL
□ 12	AKC 5575	1	GEARBOX, SPLEX (MACH)
□ 13	AHQ 5469	4	SCR. CAP, M4 x 12, SOCK. HD, 316SS
□ 14	AOO 4843	1	PLUG, OIL REFILL VALVE
□ 15	ALE 5833	2	CLAMP, VALVE, 700 L/H (MACH)
	OR		
	AKC 5847	2	CLAMP, VALVE, 1200 L/H (MACH)
	OR		
	AJA 5859	2	CLAMP, VALVE, 2000 L/H (MACH)
□ 16	AXS 3583	4	SCR. CAP, M8 x 25, SOCK. HD, 316SS
□ 17	E 942	0	TAPE, THREAD, SEALANT
□ 18	AAA 6628	1	ELBOW, MALE, 1/8 NPT, .250" O.D. TUBING
□ 19	AQA 3725	1	NUT, SLEEVE, .250" O.D. TUBING
□ 20	U 25970	1	VALVE, AIR PURGE
□ 21	CAA 3780	500mm	TUBING, .250 O.D. x 0.40W POLYETHYLENE
□ 22	AKG 3993	1	GASKET, CYLINDER COVER
□ 23	APQ 3626	1	PLUG, BREATHER, 1-1/4 NPT
● 24	AEK 4049	1	LABEL, WARNING GEARBOX, HAD
● 25	ALE 5595	1	COVER, SPLEX GEARBOX (MACH)
● 26	AXQ 3743	0	ADHESIVE, GE SILICONE RUBBER
◆ 27	ASG 3667	4	SCR. CAP, M10 x 25, SOCK. HD, 316SS
■ 28	AAA 3858	4	NUT, JAM HEX, M12, 316SS
■ 29	AAA 4694	4	SCR. CAP, M12 x 20, SOCK. HD, 316SS
■ 30	AKG 4293	1	BASE, SIMPLEX
■ 31	AJA 5486	1	CAP/BUSHING, SPLEX (MACH)
■ 32	ASG 3667	4	SCR CAP, M10 x 25, SOCK HD, 316SS

NOTE: FOR SYMBOL KEY, SEE DWG. 430.500.000.050H.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST

Simplex Gear Box Arrangement

430.500.000.050E

ISSUE 1 8-00

KEY NO.	PART NO.	QTY.	DESCRIPTION
● 33	AAA 3759	1	LABEL, WARNING, LIQUID END
● 34	AHS 4653	1	PLUG, SOCKET, SCREW, R1/2, 316SS
● 35	AAC 4634	2	PLUG, SOCKET, SCREW, R1/8, 316SS
● 36	AHS 4667	3	PLUG, SOCKET, SCREW, R1/4 NPT, STL
● 37	AAA 4215	1	LABEL, DATAPLATE PUMP
● 38	AAA 2499	1	LABEL, ASSEMBLED IN MEXICO
● 39	ARE3591	2	SCR. CAP, M8 X 40LG, SOCK. HD, 316SS
● 40	AAA6998	1	COUPLING, .875"/.625"
● 41	AAA6995	1	COUPLING, .875"/.875"
● 42	AAA1035	0	ANTI-SEIZE, NI LUB, 771
● 43	AAA6564	4	BOLT, SOCK. HD, 3/8-16 X 1", 316SS
● 44	AAA6974	1	SUPPORT, MOTOR, 56C
● 45	AXS3656	2	SCR. CAP, M8 X 20 LG, SOCK. HD, 316SS
● 46	AKG4945	1	SCR. CAP, M4 X 6, 12 DIA. SLOTTED HD, 303SS
● 47	ALJ4958	1	ADJUSTOR, WORM BEARING
● 48	APS4146	1	BEARING, TPRL, 45 X 75 X 20mm
○ 49	AAA7019	1	SHAFT, 18:1 WORM
● 50	AAA6338	1	OILSEAL, 45 X 60 X 8, BUNA-N
● 51	AJC4952	1	O-RING #041, BUNA-N, 75.92 I.D. X 1.78mm
● 52	AAA3779	0	GREASE, SILICONE LIGHT
● 53	AAA6561	1	KEY, COUPLING, 3/16 X 1"
● 54	AAA4469	1	SPRING, COMP., MSCW., .084 O.D. X .072W X 2"
● 55	AOO4819	1	PLUNGER, OIL REFILL VALVE
● 56	AOO4851	1	BALL, 12.7 W/m 3 X 1
● 57	APQ4998	1	O-RING #16, BUNA-N, 18.17 I.D. X 2.62mm
● 58	ALI4803	1	SEAT, OIL REFILL VALVE
● 59	AOO5003	1	O-RING #121, BUNA-N, 26.64 I.D. X 2.62mm
● 60	AIA4847	1	WASHER, SHOULDER, 11.9 O.D. X 4.3 I.D.
● 61	AXQ3542	1	SCR., SHLD., 4 DIA. / M3 X 10mm SLOTTED
● 62	AQO4265	1	SPRING, COMP, ELG, .43 O.D. X .025W X .38"
● 63	AIA4840	1	PLATE, 700 L/H BAFFLE
	OR		
	AKG4836	1	PLATE, 1200 L/H BAFFLE
	OR		
	AIC4827	1	PLATE, 2000 L/H BAFFLE
● 64	APQ4823	1	DISC, OIL REFILL VALVE
● 65	P19865	1	WASHER
● 66	AJE4815	1	DIAPHRAGM, 700 L/H FLAT TFE
	OR		
	ANM4811	1	DIAPHRAGM, 1200 L/H FLAT TFE
	OR		
	ALI4807	1	DIAPHRAGM, 2000 L/H FLAT TFE
● 67	AMK5806	1	SHEAVE
● 68	AIC5841	1	TAILPIECE
● 69	AJE3157	1	NUT, TAILPIECE ADJUSTOR

NOTE: FOR SYMBOL KEY, SEE DWG. 430.500.000.050H.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST

Simplex Gear Box Arrangement

430.500.000.050F

ISSUE 1 8-00

KEY NO.	PART NO.	QTY.	DESCRIPTION
● 70	AWO3553	2	SCR, SET, M6 X 8, SOCK. HD, FLAT PT. 316SS
● 71	ALI5057	1	O-RING #239, BUNA-N, 91.67 I.D. X 3.53mm
◆ 72	AQO4757	1	QUADRING, #141 BUNA-N (ELECTRIC POSITIONER)
	OR		
	AAA9644	1	O-RING (MANUAL)
◆ 73	AAA3797	0	GREASE, SILICONE, LIGHT
● 74	APS5809	1	ADJUSTOR, STROKE
◆ 75	AIA5788	1	KNOB, STROKE ADJUST (MACH)
● 76	AAB4616	1	LOCKNUT
● 77	AAB4613	1	LOCKWASHER
◆ 78	AAA2382	3	SCR, SET, M6 X 8, FLAT, SKT, NYL, 316SS
● 79	AAA2172	1	WASHER
● 80	AIC5768	2	BEARING THR., 30.96 X 12.78 X 14.30mm
● 81	AJE5785	1	SHAFT, ECCENTRIC
● 82	APO4291	1	BUSHING JOURNAL, 50 I.D. X 60 O.D. X 50mm
● 83	AMK5160	1	O-RING #246, BUNA-N, 113.89 I.D. X 3.53mm
	APS3708	1	PLATE, 700 L/H LIMITER
	OR		
● 84	AIA3712	1	PLATE, 1200 L/H LIMITER
	OR		
	APS3716	1	PLATE, 2000 L/H LIMITER
	AKG5792	1	PISTON, 700 L/HR
	OR		
● 85	AIA5796	1	PISTON, 1200 L/HR
	OR		
	AMK5799	1	PISTON, 2000 L/HR
● 86	AAA5871	1	PIN, DOWEL, 20 X 40M6, HARDENED
● 87	APM5562	1	CONROD, (MACH)
	AMK5899	1	GEAR, 12:1 WORM
	OR		
	AMK5910	1	GEAR, 18:1 WORM
○ 88	OR		
	ANM5902	1	GEAR, 24:1 WORM
	OR		
	AOO5913	1	GEAR, 48:1 WORM
● 89	AXS3656	6	SCR. CAP, M8 X 20, SOCK HD, 316SS
■ 90	AKG5781	1	BUSHING SPLEX DRIVE
91	AOO5170	1	O-RING #257, BUNA-N, 148.82 I.D. X 3.53mm
92	AIC4251	1	BEARING TRPL, 30 X 62 X 21.25mm
	AAA7016	1	SHAFT, 12:1 WORM
	OR		
	AAA7019	1	SHAFT, 18:1 WORM
○ 93	OR		
	AAA7022	1	SHAFT, 24:1 WORM
	OR		
	AAA7025	1	SHAFT, 48:1 WORM

NOTE: FOR SYMBOL KEY, SEE DWG. 430.500.000.050H.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST

Simplex Gear Box Arrangement

430.500.000.050G

ISSUE 1 8-00

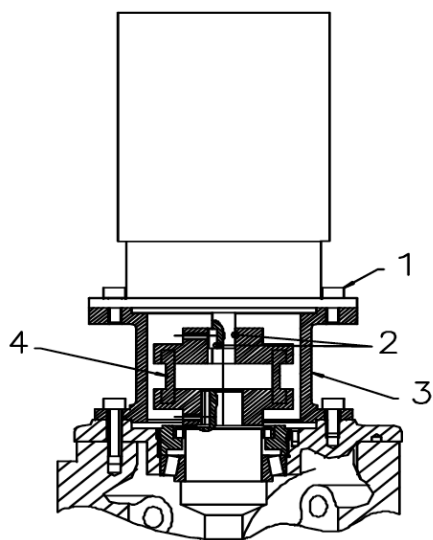
KEY NO.	PART NO.	QTY.	DESCRIPTION
<input type="checkbox"/> 94	AL4994	1	O-RING #114, BUNA-N, 15.54 I.D. X 2.62mm
<input type="checkbox"/> 95	AOO4298	1	NUT, PRESS, RELIEF VALVE ADJUSTMENT
<input type="checkbox"/> 96	AOO4303	1	LOCKNUT, PRESS, RELIEF VALVE
	AA4799	1	BODY, 700 L/H PRESS, RELIEF VALVE
	OR		
<input type="checkbox"/> 97	AL4794	1	BODY, 1200 L/H PRESS, RELIEF VALVE
	OR		
	AOO4788	1	BODY, 2000 L/H PRESS, RELIEF VALVE
<input type="checkbox"/> 98	APS5007	1	O-RING #124, BUNA-N, 31.42 I.D. X 2.62mm
	APS4783	1	STEM, 700 L/H PRESS, RELIEF VALVE
	OR		
<input type="checkbox"/> 99	AL4779	1	STEM, 1200 L/H PRESS, RELIEF VALVE
	OR		
	APS4774	1	STEM, 2000 L/H PRESS, RELIEF VALVE
<input type="checkbox"/> 100	AA4276	1	SPRING, COMP, MSCW, .72 O.D. X .08W X 6.07"
<input type="checkbox"/> 101	AWO3362	1	SCR. CAP, M10 X 35, SOCK. HD, 316SS
<input type="checkbox"/> 102	AKG4988	1	O-RING #111, BUNA-N, 10.77 I.D. X 2.62mm
<input type="checkbox"/> 103	AT3247	2	PIN, DOWEL, 6 X 16mm HARDENED
<hr/>			
● PART OF	AMK 4803	◆ PART OF	AOO 4816
	ALI 4808		
	ANM 4812	■ PART OF	AAA 4694
		○ PART OF	AAA 4808
			AAA 4811
			AAA 4814
			AAA 4817

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST

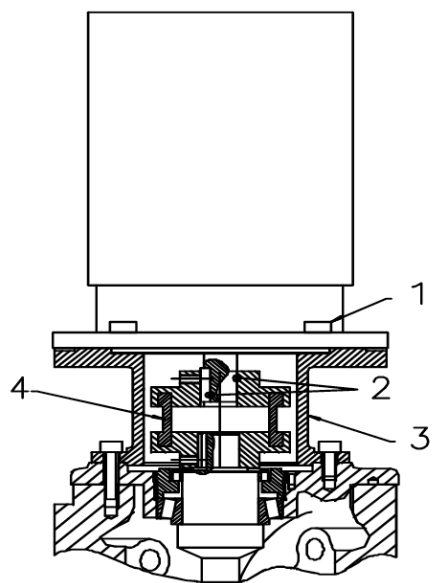
Simplex Gear Box Arrangement

430.500.000.050H
ISSUE 1 8-00



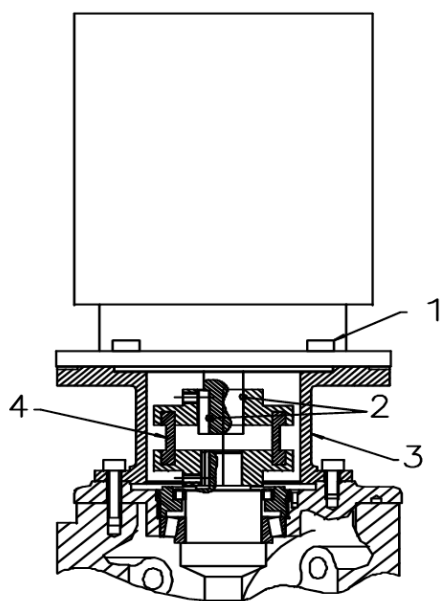
C-C

D71 MOTOR



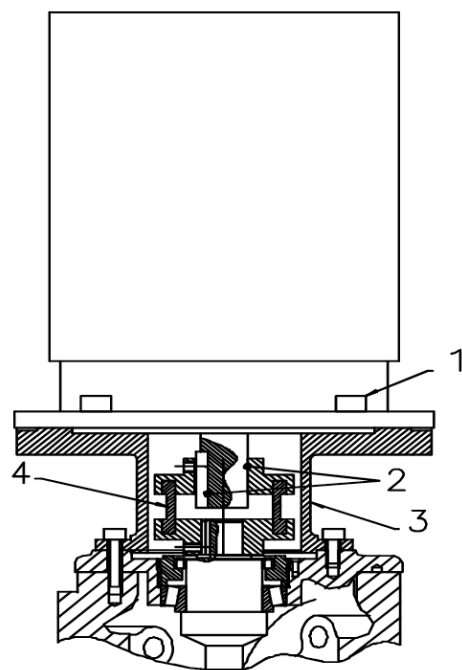
C-C

D80 MOTOR



C-C

D90 MOTOR



C-C

D100 MOTOR

NOTE: FOR PARTS LIST, SEE DWGS. 430.500.000.060B.

CHEMTUBE 2000 METERING PUMP - PARTS Metric Motor Mounting Arrangement

430.500.000.060A
ISSUE 0 11-97

KEY NO.	PART NO.	QTY.	DESCRIPTION
□ 1	AAA 3768 OR ASG 3667 OR AAA 6567	4 4 4	SCR. CAP, M8 x 18LG, SOCK. HD. 316SS SCR. CAP, M8 x 25LG, SOCK. HD. 316SS SCR. CAP, M8 x 30LG, SOCK. HD. 316SS
□ 2	AAA 1035	0	ANTI-SEIZE, NI LUB, 771
□ 3	AAA 6983 OR AAA 6986 OR AAA 6992	1 1 1	SUPPORT, MOTOR, D71 SUPPORT, MOTOR, D80/D90 SUPPORT, MOTOR, D100
□ 4	AAA 7001 OR AAA 7004 OR AAA 7007 OR AAA 7010	1 1 1 1 1	COUPLING, .875" x 14mm COUPLING, .875" x 19mm COUPLING, .875" x 24mm COUPLING, .875" x 28mm

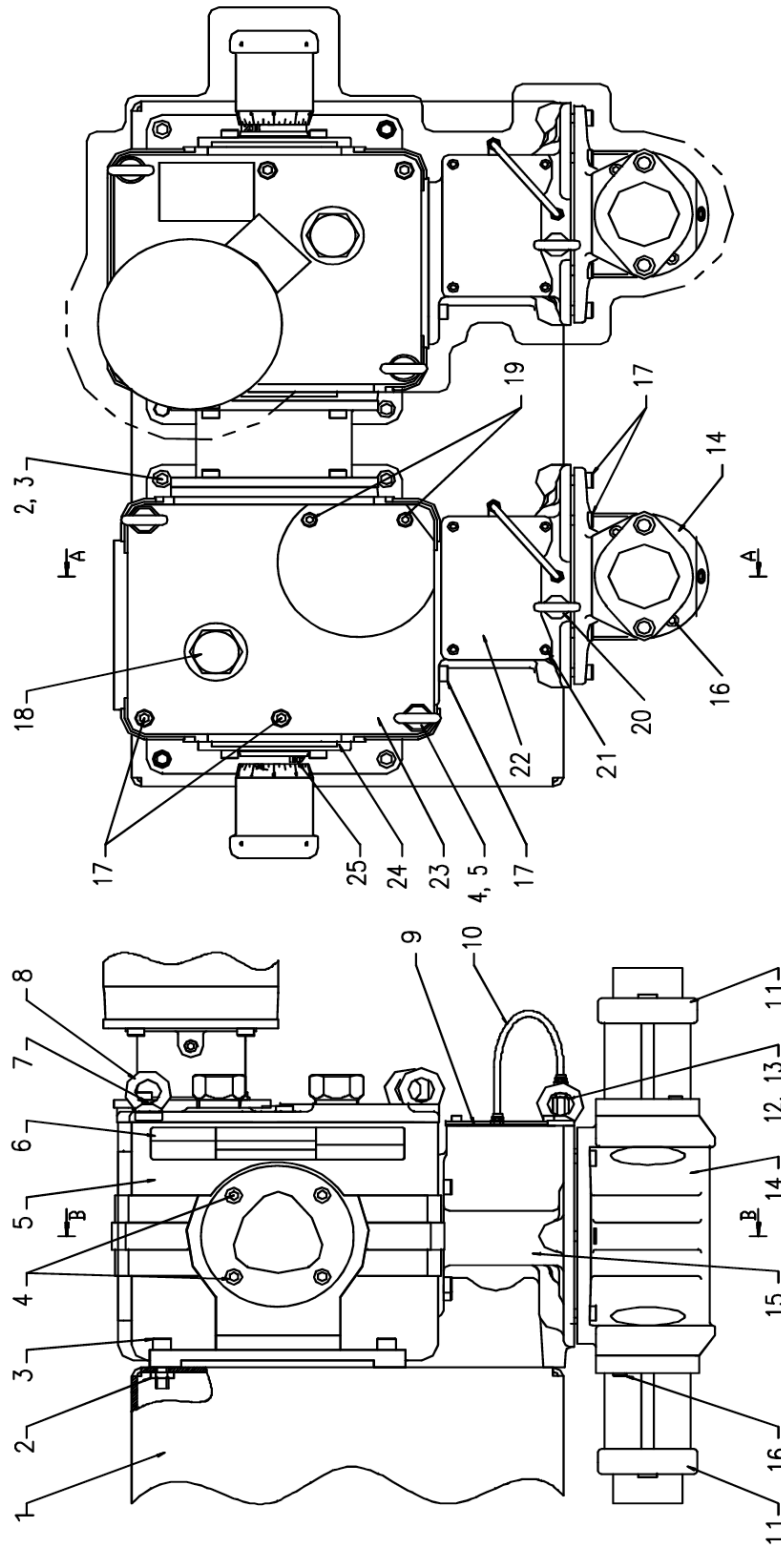
- PART OF AOO 4908
AIA 4921
APQ 4926
ALI 4930

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST

Metric Motor Mounting Arrangement

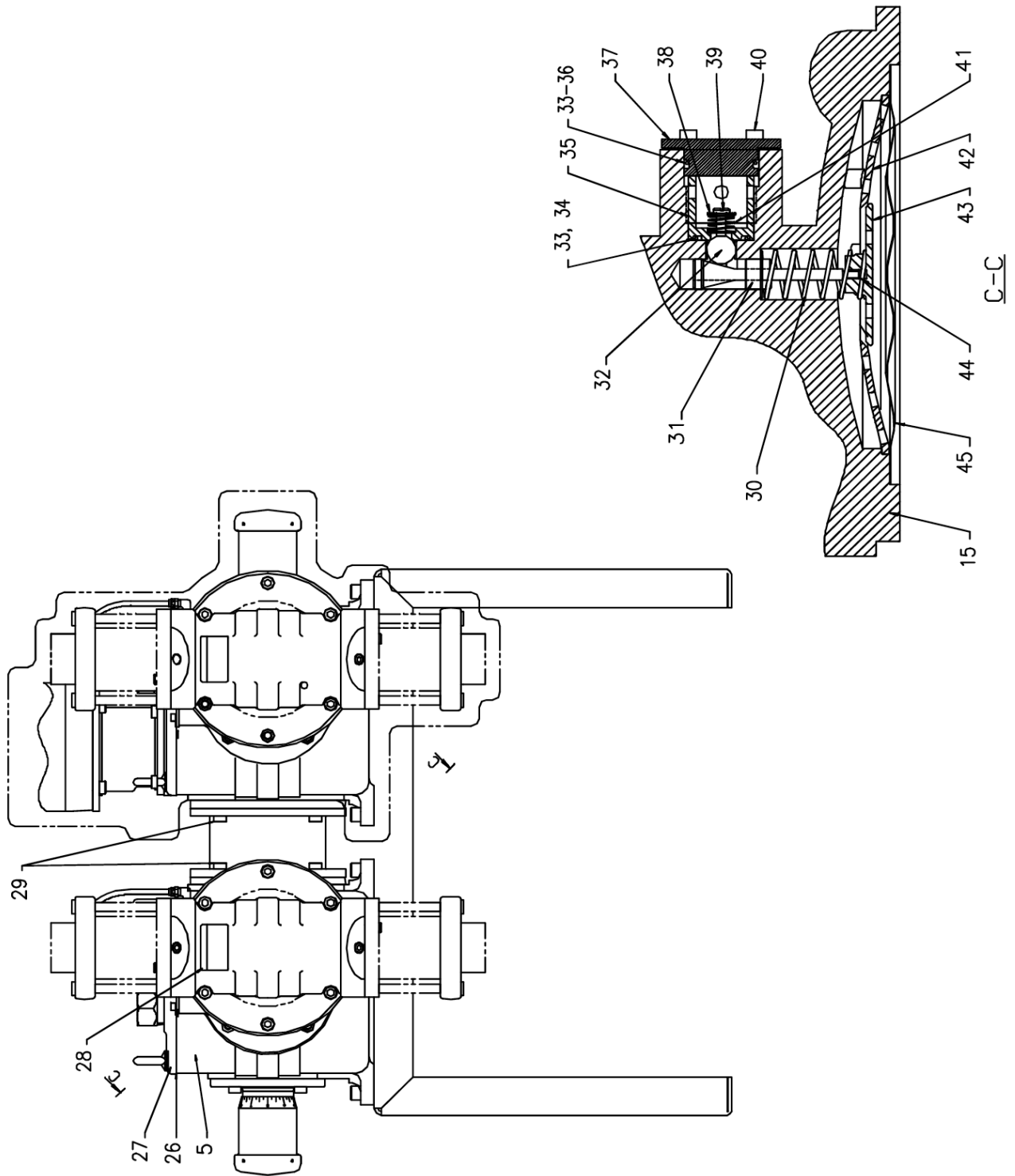
430.500.000.060B
ISSUE 0 11-97



NOTE: FOR PARTS LIST, SEE DWGS. 430.500.000.020E,F&G.

CHEMTUBE 2000 METERING PUMP - PARTS Double Simplex Gearbox Arrangement

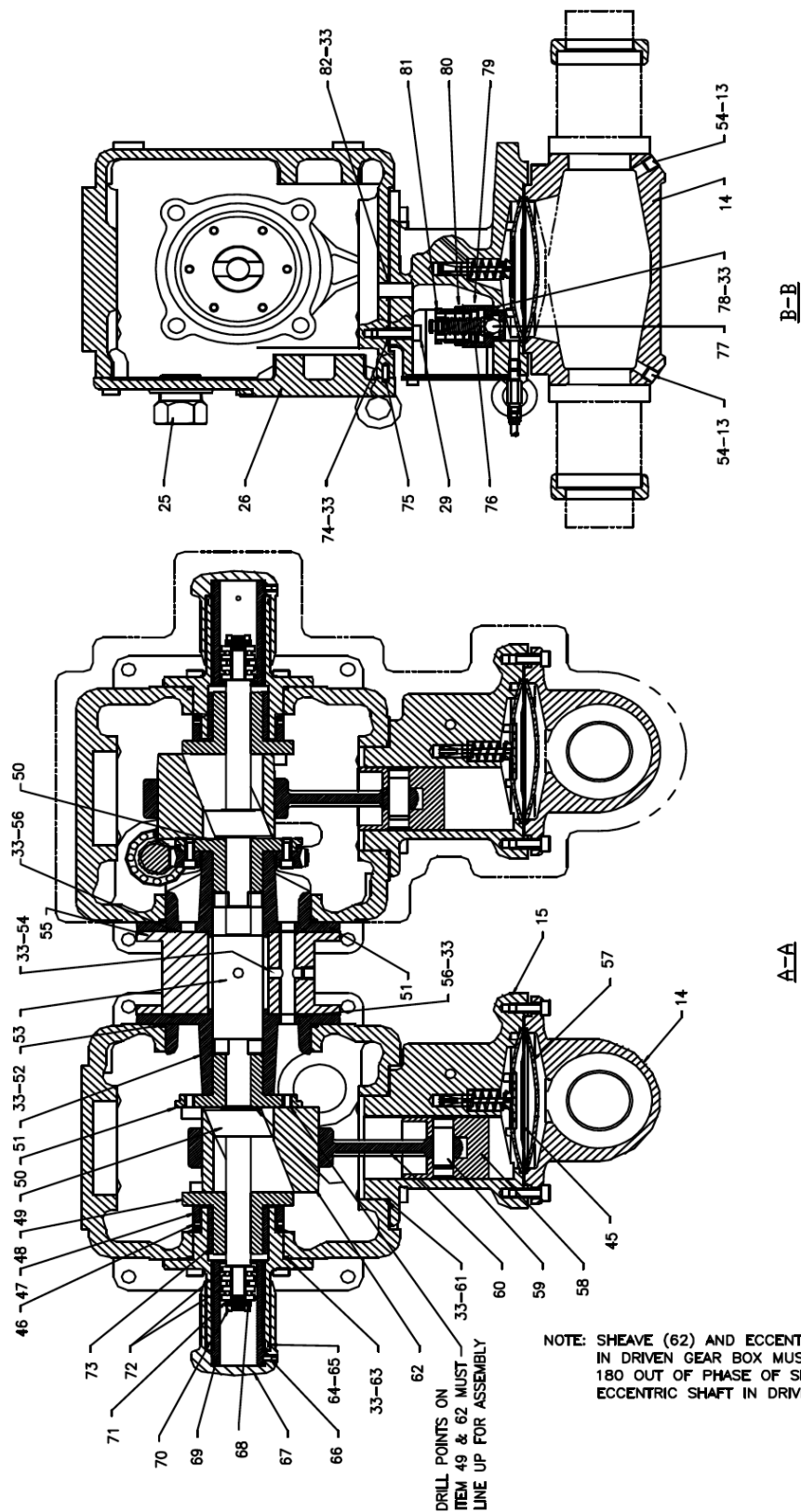
430.500.000.020A
ISSUE 0 11-97



NOTE: FOR PARTS LIST, SEE DWGS. 430.500.000.020E,F&G.

CHEMTUBE 2000 METERING PUMP - PARTS Double Simplex Gearbox Arrangement

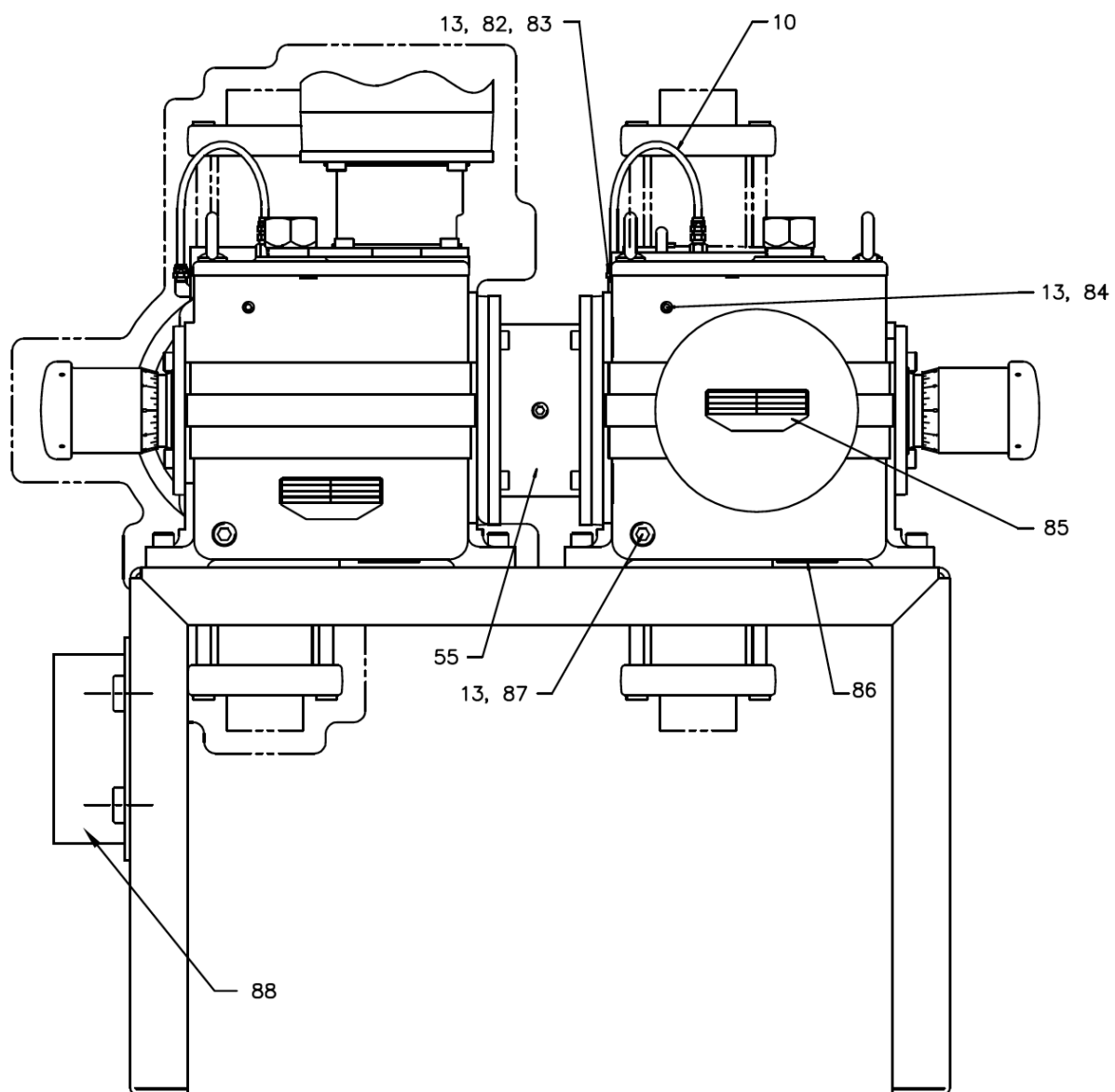
430.500.000.020B
ISSUE 1 1-01



CHEMTUBE 2000 METERING PUMP - PARTS Double Simplex Gearbox Arrangement

NOTE: FOR PARTS LIST, SEE DWGS. 430.500.000.020E,F&G.

430.500.000.020C
ISSUE 0 3-98



NOTE: FOR PARTS LIST, SEE DWGS. 430.500.000.020E,F&G.

CHEMTUBE 2000 METERING PUMP - PARTS Double Simplex Gearbox Arrangement

430.500.000.020D
ISSUE 0 11-97

KEY NO.	PART NO.	QTY.	DESCRIPTION
□ 1	AAA 4691	1	BASE, DSPLEX
□ 2	AAA 3858	8	NUT, JAM HEX M12, 316SS
□ 3	AWO 3376	8	SCR CAP, M12 x 20, SOCK HD, 316SS
4	ASG 3667	4	SCR CAP, M10 x 25, SOCK HD, 316SS
□ 5	AQO 5765	1	GEARBOX, DSPLEX (MASH)
□ 6	AEK 4049	1	LABEL, WARNING, GEARBOX, LHAD
□ 7	AXS 3712	2	STUD, M10 x 37mm, ZINC/STL
□ 8	AWO3703	2	NUT, M10 x 1.5 LIFT EYE, ZINC/STL
□ 9	AKG 3993	1	GASKET, CYLINDER COVER
□ 10	CAA 3780	500mm	TUBING, .245 O.D. x 0.40W POLY
□ 11	ALE 5833	2	CLAMP, VALVE, 700 L/H (MACH)
	OR		OR
	AKC 5847	2	CLAMP, VALVE, 1200 L/H (MACH)
	OR		OR
	AJA 5859	2	CLAMP, VALVE, 2200 L/H (MACH)
□ 12	U 25970	1	VALVE, AIR PURGE
□ 13	E 942	0	TAPE, THREAD, SEALANT
□ 14	AJA 5871	1	HEAD, 700 L/H (MACH)
	OR		OR
	ALE 5885	1	HEAD, 1200 L/H (MACH)
	OR		OR
	AQO 5898	1	HEAD, 2200 L/H (MACH)
□ 15	AMG 5777	1	CYLINDER, 700 LH (MACH)
	OR		OR
	ASS 5788	1	CYLINDER, 1200 LH (MACH)
	OR		OR
	AQO 5822	1	CYLINDER, 2200 LH (MACH)
□ 16	AXS 3583	4	SCR. CAP, M8 x 25 SOCK. HD, 316SS
□ 17	ASG 3667	11	SCR. CA, M8 x 25 SOCK. HD, 316SS
□ 18	APQ 3626	1	PLUG, BREATHER, 1-1/4 NPT
□ 19	ATI 3956	2	SCR, CAP, M8 x 30, SOCK. HD, 316SS
□ 20	ATI 3670	1	BOLT, M10 x 1.5 LIFTING EYE
□ 21	AUK 3561	4	SCR, CAP, M6 x 20 SOCK. HD, 316SS
□ 22	AKG 3975	1	COVER, CYLINDER
□ 23	AAA 3750	1	LABEL, CHEMTUBE 2000
□ 24	AOK 4334	1	HOUSING, STROKE ADJUST (MACH)
□ 25	AAA 5694	1	LABEL, STROKE ADJ. HOUSING
□ 26	AXQ 3743	0	ADHESIVE, GE SILICONE RUBBER
□ 27	ALE 5771	1	COVER, DSPLEX (MACH)
□ 28	AAA 3759	1	LABEL, WARNING, LIQUID END
□ 29	AWO 3362	9	SCR. CAP, M10 x 35, SOCK. HD, 316SS
□ 30	AAA 4469	1	SPRING, COMP, MSCW, .084 O.D. x .072W x 2"

NOTE: FOR SYMBOL KEY, SEE DWG. 430.500.000.020G.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST

Double Simplex Gearbox Arrangement

430.500.000.020E

ISSUE 1 8-00

KEY NO.	PART NO.	QTY.	DESCRIPTION
□ 31	AOO 4819	1	PLUNGER, OIL REFILL VALVE
□ 32	AOO 4851	1	BALL, 12.7W/M3 x 1
□ 33	AAA 3797	1	GREASE, SILICONE LIGHT
□ 34	APQ 4998	1	O-RING #116, BUNA-N, 18.72 ID x 2.62mm
□ 35	ALI 4803	1	SEAT, OIL REFILL VALVE
□ 36	AOO 5003	1	O-RING #121, BUNA-N, 26.64 ID x 2.62mm
□ 37	AOO 4843	1	PLUG, OIL REFILL VALVE
□ 38	AIA 4847	1	WASHER, SHLD, 11.9 O.D. x 4.3 ID
□ 39	AXQ 3542	1	SCR. SHLD, 40/M3 x 10mm SLOTTED
□ 40	AHQ 5469	4	SCREW, CAP, M4 x 12, SOCK. HD, 316SS
□ 41	AOO 4265	1	SPRING, COMP, ELG, .43 O.D. x .25W x .38"
□ 42	AIA 4840	1	PLATE, 700 L/H BAFFLE
	OR		
	AKG 4836	1	PLATE, 1200 L/H BAFFLE
	OR		
	AIC 4827	1	PLATE, 2000 L/H BAFFLE
□ 43	APQ 4823	1	DISC, OIL REFILL VALVE
□ 44	P19865	1	WASHER
□ 45	AJE 4815	1	DIAPHRAGM, 700 L/G FLAT TFE
	OR		
	ANM 4811	1	DIAPHRAGM, 1200 L/G FLAT TFE
	OR		
	ALI 4807	1	DIAPHRAGM, 2000 L/G FLAT TFE
□ 46	AWO 3553	2	SCR, SET, M6 x 8, SOCK. HD, FT PT 316SS
□ 47	AJE 3157	1	NUT, TAILPIECE ADJUSTOR
□ 48	AIC 5841	1	TAILPIECE
□ 49	AJE 5785	1	SHAFT, ECCENTRIC
□ 50	AMK 5160	1	BUSHING, DSPLEX DRIVE
□ 51	AKG 5630	2	CAP/BUSHING, DSPLEX (MACH)
□ 52	APS 5626	2	O-RING #257, BUNA-N, 148.82 ID x 3.53 mm
□ 53	AJE 5618	1	SHAFT, DSPLEX COUPLING
□ 54	AHS 4667	3	PLUG, SOCKET, SCREW, ¼ NPT STL
□ 55	AIC 5622	1	HOUSING, DSPLEX COUPLING
□ 56	AOO 5170	2	O-RING #250 BUNA-N, 126.59 ID x 3.53mm
□ 57	APS 3708	1	PLATE, 700 L/H LIMITER
	OR		
	AIA 3712	1	PLATE, 1200 L/H LIMITER
	OR		
	APS 3716	1	PLATE, 2000 L/H LIMITER
□ 58	AKG 5792	1	PISTON, 700 L/H LIMITER
	OR		
	AIA 5796	1	PISTON, 1200 L/H LIMITER
	OR		
	AMK 5799	1	PISTON, 2000 L/H LIMITER

NOTE: FOR SYMBOL KEY, SEE DWG. 430.500.000.020G.

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST

Double Simplex Gearbox Arrangement

430.500.000.020F

ISSUE 1 8-00

KEY NO.	PART NO.	QTY.	DESCRIPTION
□ 59	ASG 3256	1	PIN, DOWEL 20 x 40 M6 HARDENED
□ 60	APM 5562	1	CONROD (MACH)
● 61	AOO 5165	1	O-RING #246 BUNA-N, 113.89 ID x 3.53mm
● 62	AMK 5806	1	SHEAVE
● 63	ALI 5057	1	O-RING #239 BUNA-N, 91.67 ID x 3.53mm
◆ 64	AAA 3920	2	QUAD RING, #141 BUNA-N (ELECTRIC POSITIONER)
	OR		
	AAA 9644	2	O-RING (MANUAL)
◆ 65	AAA 3797	0	GREASE, SILICONE, LIGHT
◆ 66	AAA 2382	3	SCR,SET,M6x8,FLAT,SKT,NYL,316SS
◆ 67	ALA 5788	1	KNOB, STROKE ADJUST (MACH)
● 68	AAB 4613	2	LOCKWASHER
● 69	APS 5809	1	ADJUSTER, STROKE
● 70	AAB 4616	2	LOCKNUT
● 71	AAA 2172	2	WASHER
● 72	ALC 5768	2	BEARING, THR .30.96 x 12.78 x 14.30mm
● 73	APQ 4291	1	BUSHING, JOURNAL, 50 ID x 60 O.D. x 50mm
● 74	AKG 4988	1	O-RING #111 BUNA-N, 10.77 ID x 2.62mm
● 75	ATI 3247	2	PIN, DOWEL, 6 x 16M6 HARDENED
● 76	ALA 4276	1	SPG, COMP. MSCW, .72 O.D. x .08W x 6.07"
● 77	APS 4779	1	STEM, 700 L/H PRESS. RELIEF VAL.
	OR		
	ALI 4779	1	STEM, 1200 L/H PRESS. RELIEF VAL.
	OR		
	APS 4774	1	STEM, 2000 L/H PRESS. RELIEF VAL.
● 78	APS 5007	1	O-RING #124 BUNA-N, 31.42 ID x 2.62mm
● 79	ALA 4799	1	BODY, 700 L/H PRESS. RELIEF VAL.
	OR		
	ALI 4794	1	BODY, 700 L/H PRESS. RELIEF VAL.
	OR		
	AOO 4788	1	BODY, 700 L/H PRESS. RELIEF VAL.
● 80	AOO 4303	1	LOCKNUT, PRESS. RELIEF VAL.
● 81	ALI 4994	1	O-RING #114 BUNA-N, 15.54 ID x 2.62mm
● 82	AXQ 3845	1	CONN, MALE, 1/8 NPT, .250" O.D. TUBING
	OR		
	AAA 6628	1	ELBOW, MALE, 1/8 NPT, .250" O.D. TUBING
● 83	AQA 3725	1	NUT, SLEEVE, .250" O.D. TUBING
● 84	AAC 4634	1	PLUG, SOCKET, SCREW, R 1/8, 316SS
● 85	AHS 3726	1	LABEL, DATA PLATE PUMP
● 86	AAA 2499	1	LABEL, ASSEMBLED IN MEXICO
● 87	AHS 4653	1	PLUG, SOCKET, SCREW, R1/2, 316SS
● 88	U26475	1	BOX, DETECTOR, LEAK

- PART OF AAA 4697 ◆ PART OF AOO 4816
 PART OF AAA 4700
 PART OF AAA 4703

WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

CHEMTUBE 2000 METERING PUMP - PARTS LIST

Double Simplex Gearbox Arrangement

430.500.000.020G

ISSUE 1 8-00

PREVENTIVE MAINTENANCE KITS AND SPARE PARTS LIST

2"	Retainer / Guide Material	Seat Material	Ball Material	O-Ring Material	Part Number
Solution	PVC	316 SS	316 SS	Hypalon	ANM5211
	PVC	316 SS	316 SS	Viton	APS5215
	PVC	PVC	TFE	Hypalon	ALI5218
	PVC	PVC	TFE	Viton	AKG5223
	PVC	PVC	Ceramic	Hypalon	AKG5228
	PVC	PVC	Ceramic	Viton	APQ5233
	PVDF	316 SS	316 SS	Hypalon	APS5237
	PVDF	316 SS	316 SS	Viton	ALI5242
	PVDF	PVDF	TFE	Hypalon	AIC5272
	PVDF	PVDF	TFE	Viton	AIA5276
	PVDF	PVDF	Ceramic	Hypalon	AJE5280
	PVDF	PVDF	Ceramic	Viton	AKG5283
	316 SS	316 SS	316 SS	Hypalon	AAA4973
	316 SS	316 SS	316 SS	Viton	AAA4976
Slurry	PVC (316 SS Guide)	Ceramic	Polyurethane	Hypalon	AIC5287*
Polymer	PVC	PVC	TFE (spring loaded)	Viton	ALI5292*
	316 SS	316 SS	316 SS (spring loaded)	Viton	AAA4979*

* Not for use with double ball valves.

NOTE: For double ball valves, order a quantity of two kits per head.

NOTE: Always change diaphragms and valves at the same time, annually, for optimum performance.

PREVENTIVE MAINTENANCE KITS AND SPARE PARTS LIST (CONT'D)

2.5"	Retainer / Guide Material	Seat Material	Ball Material	O-Ring Material	Part Number
Solution	PVC	316 SS	316 SS	Hypalon	AAA4982
	PVC	316 SS	316 SS	Viton	AAA4985
	PVC	PVC	TFE	Hypalon	AAA4988
	PVC	PVC	TFE	Viton	AAA4991
	PVC	PVC	Ceramic	Hypalon	AAA4994
	PVC	PVC	Ceramic	Viton	AAA4997
	PVDF	316 SS	316 SS	Hypalon	AAA5000
	PVDF	316 SS	316 SS	Viton	AAA5003
	PVDF	PVDF	TFE	Hypalon	AAA5006
	PVDF	PVDF	TFE	Viton	AAA5009
	PVDF	PVDF	Ceramic	Hypalon	AAA5012
	PVDF	PVDF	Ceramic	Viton	AAA5015
	316 SS	316 SS	316 SS	Hypalon	AAA5018
	316 SS	316 SS	316 SS	Viton	AAA5021

NOTE: For double ball valves, order a quantity of two kits per head.

NOTE: Always change diaphragms and valves at the same time, annually, for optimum performance.

PREVENTIVE MAINTENANCE KITS AND SPARE PARTS LIST (CONT'D)

3"	Retainer / Guide Material	Seat Material	Ball Material	O-Ring Material	Part Number
Solution	PVC	316 SS	316 SS	Hypalon	AAA3869
	PVC	316 SS	316 SS	Viton	AAA3872
	PVC	PVC	TFE	Hypalon	AAA3875
	PVC	PVC	TFE	Viton	AAA3878
	PVC	PVC	Ceramic	Hypalon	AAA3881
	PVC	PVC	Ceramic	Viton	AAA3884
	PVDF	316 SS	316 SS	Hypalon	AAA3887
	PVDF	316 SS	316 SS	Viton	AAA3890
	PVDF	PVDF	TFE	Hypalon	AAA3893
	PVDF	PVDF	TFE	Viton	AAA3896
	PVDF	PVDF	Ceramic	Hypalon	AAA3899
	PVDF	PVDF	Ceramic	Viton	AAA3902
	316 SS	316 SS	316 SS	Hypalon	AAA3905
	316 SS	316 SS	316 SS	Viton	AAA3908
Slurry	PVC (316 SS Guide)	Ceramic	Polyurethane	Hypalon	AAA3911*
Polymer	PVC	PVC	TFE (spring loaded)	Viton	AAA3914*
	316 SS	316 SS	316 SS (spring loaded)	Viton	AAA3917*

* Not for use with double ball valves.

NOTE: For double ball valves, order a quantity of two kits per head.

NOTE: Always change diaphragms and valves at the same time, annually, for optimum performance.

ADDITIONAL SPARE PARTS**QUANTITY****DESCRIPTION****PART NO.**

1

Propylene Glycol (one quart)

U28652

3

Oil (one gallon)

U10198

TUBULAR DIAPHRAGMS

1

Hypalon 700 L/Hr

AMM 5297

1

Hypalon 1200 L/Hr

AIC 5297

1

Hypalon 2000 L/Hr

ALI 5288

1

Viton 700 L/Hr

AOO 5283

1

Viton 1200 L/Hr

AOO 5278

1

Viton 2000 L/Hr

APS 5219

1

TFE Lined 700 L/Hr

AJE 5695

1

TFE Lined 1200 L/Hr

APS 5702

1

TFE Lined 2000 L/Hr

ALI 5708

FLAT DIAPHRAGMS

1

Teflon Flat 700 L/Hr

AJE 4815

1

Teflon Flat 1200 L/Hr

ANM 4811

1

Teflon Flat 2000 L/Hr

ALI 4807

1

Seal, Worm Shaft

AAA 63338


A		H	
Adjustment of Feed Rate	29	High Pressure Effects on Capacity	4
Adjustment of Internal Pressure Relief	27	Hydraulic Coupling	30
C		Hydraulic System and Intermediate Section	26
Calibration	28	I	
Capacity Specifications and Motor Selection	3	INSTALLATION WIRING	
Cleaning Pumping Head Parts	36	Diaphragm Leak Detector	24
Clogging of Discharge Piping	37	Intermittent Start-Stop Operation	28
Corrective Maintenance	38	L	
Disassembly and Assembly of Cylinder	42	Liquid End	30
Draining System of Hazardous Material	39	Location	16
Gearbox Disassembly and Assembly	47	Lubrication	37
Removal and Replacement of Flat Diaphragm	41	M	
Removal and Replacement of Tubular Diaphragm and Filling Intermediate Fluid	40	Maintenance - General Information	36
Removing and Installing Motor	47	Motor Rotation	16
Removing Pump From Service	39	Mounting	16
Removing Valves	40	Multiple Head Arrangement	33
Stroke Adjuster Disassembly and Assembly	44	O	
D		Operation	28
DIMENSIONS		Adjustment of Feed Rate	29
Base - Simplex	21	Intermittent Start-Stop Operation	28
Disassembly and Assembly of Cylinder	42	Starting	28
Disassembly and Assembly of Double Simplex Gearbox	49	Stopping	28
Draining System of Hazardous Material	39	Strength of Solution	29
Drive Unit	30	P	
E		PARTS	
Electrical Connection	16	2", 700 LPH - Liquid Ends	58,59,60
Electronic Leak Detection	32	2-1/2", 1200 LPH - Liquid Ends	61,62,63
G		3", 2000 LPH - Liquid Ends	64,65,66,67
Gear Box	26	Double Simplex Gearbox Arrangement	78,79,80,81,82,83,84
Gearbox Disassembly and Assembly	47		


INDEX (CONT'D)

Metric Motor Mounting Arrangement	76,77	S	
Simplex Gear Box Arrangement	68,69, 70, 71, 72,73, 74,75	SPACE RECOMMENDATION	
		Double Simplex Manual Arrangement	20
		Simplex Manual Arrangement	19
PERFORMANCE		Starting	28
Application Guide for Solution Tanks - Linear Poly	11,12, 13	Stopping	28
Chemical Compatibility of Metering Pumps	5, 6, 7, 8, 9, 10	Strength of Solution	29
		Stroke Adjuster Disassembly and Assembly	44
		T	
Periodic Cleaning	36	Technical Data	2
Cleaning Pumping Head Parts	36	Theory of Operation	30
Clogging of Discharge Piping	37	Drive Unit	30
Periodic Preventive Maintenance	37	Electronic Leak Detection	32
Lubrication	37	Hydraulic Coupling	30
Piping	17	Liquid End	30
Preparation for Operation	26	Multiple Head Arrangement	33
Adjustment of Internal Pressure Relief	27	Troubleshooting	51
Calibration	28	Troubleshooting (Table)	52, 53, 54
Gear Box	26		
Hydraulic System and Intermediate Section	26	TYPICAL INSTALLATION	
Priming	26	Recommendation for Flooded Suction	22
Priming Troubles or Loss of Suction	38	Recommendation for Suction Lift	23
R		U	
Removal and Replacement of Flat Diaphragm	41	Unpacking	16
Removal and Replacement of Tubular Diaphragm and Filling Intermediate Fluid	40	W	
Removing and Installing Motor	47	Warning Labels	55
Removing Pump From Service	39		
Removing Valves	40		



www.waterprocesssolutions.com
enquiries@waterprocesssolutions.com

 Water-Process-Solutions

 @waterwps

Water Process Solutions Ltd
Unit 10,
Mill Hall Business Estate,
Aylesford,
Kent, ME20 7JZ

WATER PROCESS
 **SOLUTIONS**

Literature No. WPS Gen Flyer UK 001.V1