

WATER PROCESS SOLUTIONS

Operation & Maintenance Manual

ENCORE[®] 700

PLUNGER METERING PUMP



ENCORE® 700
PLUNGER METERING PUMP

IM.ENC.PLUNGER

ISSUE 2 - 10/03/2021



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

ENCORE® 700 Plunger Metering Pumps [6P, 12P, 24P and 32P]

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

EN 50 081 Parts 1 & 2 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 horizontal dotted line.

C.B. Dean
Managing Director

ENCORE 700 PLUNGER PUMP

PLEASE NOTE: THIS EQUIPMENT HAS BEEN DESIGNED TO PROVIDE RELIABLE SERVICE. HOWEVER BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THE EQUIPMENT, THIS INSTRUCTION MANUAL SHOULD BE READ, UNDERSTOOD AND OBSERVED. FAILURE TO DO SO CAN RESULT IN IMPROPER OPERATION WITH POSSIBLY HAZARDOUS RESULTS.

INTRODUCTION

This book provides installation, operating and maintenance instructions for the Encore Plunger Metering Pumps; here-in-after referred to as the pump or metering pump. The pump provides accurate metering and transfer of a wide variety of chemicals. It is available in four head sizes, four gear ratios, direct or pulley drive configurations and a single and double simplex configuration. A non-loss-of motion, stroke adjustment is used to vary the stroke for a more smooth pumping action. Non-loss-of motion is achieved through the use of a variable eccentric mechanism. Stroke adjustment is done either manually or with an optional electric stroke length positioner.

An optional variable speed drive controls drive motor speed variations through signals received from external sources.

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 BECOME FAMILIAR WITH THE SAFETY PRECAUTIONS LISTED IN THE SAFETY SUMMARY ON PAGES X & Y AND FOLLOW ALL SAFETY PRECAUTIONS RECOMMENDED BY THE MATERIAL MANUFACTURER / SUPPLIER. AVOID CONTACTING ELECTRICALLY HOT METER POSTS AND CIRCUIT BOARD COMPONENTS WHILE MAKING METER ADJUSTMENTS.

When submitting correspondence or ordering material, always specify model and serial number of equipment.

GUARANTEE & WARRANTY

Water Process Solutions Ltd (WPS) guarantees that equipment manufactured or represented by the Company is free from defect in workmanship and materials under normal use and service. The Company will make good, by repair, or at its option, by replacement, defects which, under proper use, in the Company's opinion, appear in the equipment within a period of 12 months after shipment by the Company from our works. The Company's responsibility is limited to the replacement of defective parts whether the work is carried out on site or at the Company's works.

Equipment will be repaired under guarantee, free of charge, at our works providing that it is returned to the Company, freight paid. Alternatively, any necessary repairs may be carried out on site providing that any travel and accommodation costs incurred are paid at ruling rates. Should the Company be called to carry out work under guarantee and find that the fault lies outside the Company's responsibility, then any cost involved will be charged to the Purchaser's account.

This guarantee is in lieu of all other guarantees and warranties expressed or implied and does not apply to replacement or repairs which are required as a result of improper installation, misuse, maladjustment, modification or lack of routine maintenance by others. The Company does not guarantee the overall performance of any plant or the result of any process on which the Company's equipment is used.

Equipment included which is not manufactured or represented by the Company is specifically excluded from the obligation given above. Such equipment will be repaired or replaced under guarantee only to the guarantee (if any) which the Company may have received from the supplier or manufacturer of such equipment in respect thereof, but not so as to impose on the Company in respect of such equipment a liability greater than that set out herein.

The guarantee does not extend to, and the Company accepts no liability for, consequential secondary damages or losses of any kind sustained directly or indirectly as a result of a defect in any products, materials or installation.

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 apparently has 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.

Table Of Contents

Reordering of Preventive Maintenances Kits	PM-1
Very Important Safety Precautions	SP-1
Protective Equipment and Clothing	SP-2
Technical Data	Section 1
Installation	Section 2
Operation	Section 3
Service	Section 4
Illustrations	Section5

PM - 1 : Preventive Maintenance

Protect Your Equipment Investment
Minimize Downtime

Reorder a Preventive Maintenance Kit Now. Keep One On Hand

Quality Equipment	+	Preventive Maintenance	=	Dependable Operation Minimum Downtime
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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 service kits. These kits's 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 pads are used, the kit should be replaced immediately.

Preventive maintenance kits may be ordered directly from the company which 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 scheduled preventive maintenance on a one year cycle*. It is recommended that the following table be used to plan, schedule and record this important work.

DATE OF INSTALLATION _____

PREVENTIVE MAINTENANCE LOG	
SCHEDULE DATE	DATE PERFORMED

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

SP-1: Very Important Safety Precautions

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

WARNING

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

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

AVOID CONTACTING ELECTRICALLY HOT METER POSTS AND CIRCUIT BOARD COMPONENTS WHILE MAKING METER ADJUSTMENTS.

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.

CONSULT YOUR WPS REPRESENTATIVE IF THE PUMP IS TO BE USED UNDER CONDITIONS OTHER THAN ORIGINALLY SPECIFIED AND IF THERE IS ANY QUESTION REGARDING THE SIZE OF THE DISCHARGE LINE.

USE RIGID PIPE WHEN HAZARDOUS CHEMICALS ARE PUMPED AND / OR ELEVATED PRESSURE / TEMPERATURES ARE ENCOUNTERED.

USE EXTREME CARE TO AVOID CONTACT WITH THE MATERIAL AND POSSIBLE SEVERE PERSONAL INJURY. CONSULT YOUR CHEMICAL SUPPLIER FOR INSTRUCTIONS IN THE PREPARATION OF SOLUTIONS AND THE HANDLING OF CHEMICALS. OBSERVE ALL RECOMMENDED SAFETY PRECAUTIONS.

DO NOT SPILL SOLUTION. IF ANY SOLUTION IS SPILLED, DILUTE OR WASH AWAY WITH WATER IMMEDIATELY OR FOLLOW SUPPLIER’S INSTRUCTIONS FOR HAZARDOUS MATERIALS.

AVOID BEING SPRAYED WITH LIQUID UNDER PRESSURE. PRIOR TO DISASSEMBLY OF PPPE CONNECTIONS REFER TO DETAILED INSTRUCTIONS ON RELIEVING PRESSURE AND DRAINING. ALLOW SYSTEM TO DRAIN FULLY BEFORE ATTEMPTING TO DISASSEMBLE PIPING AND REMOVING VALVES AND / OR HEAD.

SINCE THE STORAGE AND HANDLING OF SODIUM CHLORITE PRESENTS VERY SPECIFIC HAZARDS, THE USER MUST SEEK THE ADVICE OF HIS SUPPLIER WITH REFERENCE TO STORAGE FACILITIES, HANDLING PRECAUTIONS AND HEALTH HAZARDS.

SODIUM CHLORITE, WHEN FINELY DIVIDED IN THE PRESENCE OF ORGANIC COMPOUNDS, IS A POSSIBLE FIRE HAZARD. FOR THIS REASON, EXTREME CARE MUST BE EXERCISED TO PREVENT SOLUTIONS FROM DRYING OUT IN THE THREADED PORTIONS OF THE PUMP BODY AND RELATED PARTS. OBSERVE CAREFULLY THE MANUFACTURER / SUPPLIERS RECOMMENDED SAFETY PROCEDURES AND THE HANDLING AND STORAGE PROCEDURES IN THIS BOOK.

WHEN SERVICING HEADS FOR DISASSEMBLY AND / OR VALVES, FOLLOW PROCEDURES IN THE SECTION FOR DISASSEMBLY.

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

USE EXTREME CARE TO AVOID CONTACT WITH LIQUID PRESENT IN HEAD. ALLOW SUCTION VALVE TO FALL INTO SUITABLE CONTAINER AND CATCH LIQUID,

USE EXTREME CARE TO AVOID CONTACT BECAUSE LIQUID IS PRESENT BETWEEN DISCHARGE DRAIN VALVE AND UNION ELBOW. FLUSH SPILLED LIQUID IMMEDIATELY.

TURN POWER OFF BEFORE SERVICING.

DO NOT RUN THE PUMP WITH THE BELT GUARD REMOVED,

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

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

DO NOT DISCARD THIS INSTRUCTION BOOK UPON COMPLETION OF INSTALLATION. INFORMATION PROVIDED IS ESSENTIAL TO PROPER & SAFE OPERATION AND MAINTENANCE. ADDITIONAL OR REPLACEMENT COPIES OF THIS INSTRUCTION BOOK ARE AVAILABLE FROM:

Unit 10
Mill Hall Business Estate
Aylesford
Kent
ME20 7JZ
UK

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 our equipment and does not appear to be reflected in your instruction book, contact your local WPS Sales Office for information.

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

SP-2: 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 pump 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 the following types of protective equipment when handling any hazardous liquid.

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

1. Goggles, flexible fitting, hooded ventilation
2. Face Shield
3. Chemical Apron
4. Chemical Gloves

Section 1 - Technical Data

Pump Type	Variable Eccentric, Plunger type metering pump. Simplex, Duplex and double Simplex capabilities
Plunger / Gland	Ceramic Plunger, PTFE / Glass chevron packing. Single or double chevrons
Service	Metering of mild to very corrosive (water like viscosity) chemicals.
Drive Unit	Directly coupled or pulley coupled motor. Four stroking speeds 30,60,120,144SPM
Variable Speed	AC and DC speed control available.
Capacity Range	Up to 145 l/hr with single head.
Pressure Range	Up to 200 BAR. Refer to chart for additional information.
Stroke length	10 turn stroke control. Adjustable over 10:1 range.
Accuracy	+/- 1% full scale over 10:1 range under constant suction and discharge conditions.
Suction Lift	Up to 1M water lift
Motor Voltage	240 VAC, 50 Hz, 1 ph 415 VAC, 50 Hz, 3 ph
Ambient temperature limits	35-125 degF (2 -52 degC)
Lubrication	Gear oil, SAE90 with antifoam agent or shell OMALA
Weight	50 kg (110 lbs) – average.

1.2 Material Identification / Composition

The chemical composition of materials (these include optional variable materials) used in the manufacture of the Metering Pump are listed in Table 1.2 below.

Common Term	Composition
Ceramic	99% Aluminium Oxide
Hypalon	A Chlorosulphonated polyethylene
Kynar (PVDF)	Polyvinylidene fluoride
Stainless 316	AISI 316 – Cr 16 -18% Ni 10 -14 %, C 0.08%, Mn 2% Si 1%, P 0.045%, S 0.03% Mo 2-3%
TFE	Fluorocarbon resin of tetrafluoroethylene polymer
Viton	Copolymer of vinylidene and perfluoropropylene or hexafluoropropylene
PVC	Polyvinyl Chloride

1.3 Pump Compatibility

The compatibility of the Encore Plunger Metering Pump with various liquid materials are listed in Dwg. 440.050.190.010A-F located at the end of this section. The table identifies the various materials that can enter and come in contact with component materials in the wetted end of the pump and its effect on pump performance.

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	A	N
CARBON ACID	14,57	A	A	A	A	A	N	N
CARBON TETRACHLORIDE	13,3	A	C	A	C	A	A	A
CHLORACETIC ACID		C	C	C	A	A	C	A
CHLORIBENZENE (DRY)		A	C	A	C	A	A	A
CHLOROFORM		A	C	A	C	A	A	A
CHLORSULPHONIC ACID		B	C	C	A	A	C	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	N	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		A	C	C	C	A	C	A
ETHYL ALCOHOL	12	A	A	A	A	A	A	A
ETHYL CHLORIDE		A	C	A	A	A	A	A
ETHYLENE CHLORIDE	22	A	C	B	B	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 CHORIDE	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		C	A	A	A	A	A	A
FERROUS SULFATE	14	B	A	A	A	A	A	A
FILTER AID	15	A	A	A	A	A	A	A
FLUOSILICIC ACID	6,25,26	B	A	A	A	A	A	C
FORMALDEHYDE		A	A	C	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

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		A	A	A	C	A	A	A
HYDRAZINE (35%)		28	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 6,25,26,57 31,59	A	A	A	A	A	A	A
HYDROFLUORIC ACID		C	A	A	A	A	A	C
HYDROFLUOSILICIC ACID		B	A	A	A	A	A	C
HYDROGEN PEROXIDE		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	25,57	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		A	C	C	A	A	A	A
LIME SLURRIES	15	A	A	A	A	A	A	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		A	A	A	A	A	A	N
MAGNESIUM NITRATE	14,5 5,14 14	A	A	A	A	A	A	A
MAGNESIUM SULFATE		A	A	A	A	A	A	A
MALEIC ACID (DILUTE)		A	C	A	A	A	A	A
MALIC ACID		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		A	A	A	A	A	A	N
MERCURY		A	A	A	A	A	A	A
METHYL ACETATE	57	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
METHYLENE KETON		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
NAPANTHALENE	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 60	A	C	A	A	N	A	A
NITRIC ACID (10%)		A	A	A	A	A	A	A
NITRIC ACID (70%) TOO 100°F		B	C	B	A	A	A	A
NITROBENZENE		A	C	C	C	A	B	A
OILS, ANIMAL	11,58 37,14 3	A	C	A	A	A	A	A
OIL, COTTONSEED		A	A	A	A	A	A	A
SOILS, FUEL		A	A	A	A	A	A	A
OLEIC ACID		A	C	C	A	A	A	A
OLEUM (20-25%)		A	C	B	C	A	C	A

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
STERARIC 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
TARTARIC ACID	6,44	A	A	A	A	A	A	A
TITANIUM DIOXIDE		A	A	A	B	A	N	N
TOLUOL & TOLUENE	36	A	C	A	C	A	B	A
TRICHLORETHYLENE	57	A	C	A	C	A	A	A
TURPENTINE	13	A	C	A	A	A	A	A
UREA FORMALDEHYDE		A	N	A	N	A	A	A
VARNISH & SOLVENTS	14	A	C	B	N	A	N	A
VINEGAR		A	A	C	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	N	A	A	N	A
WHISKEY AND WINES	58	A	A	N	A	A	A	A
XYLENE OR XYLOL	13	A	C	A	C	A	A	A
ZINC CHLORIDE	6,53	C	A	C	A	A	A	A
ZINC HYDROSULFITE		B	N	A	A	A	N	N
ZINC SULFATE		A	A	A	A	A	A	A

440.050.190.010A-F

1. WARNING: DRIED RESIDUE OF SPILLED SOLUTIONS IS EXPLOSIVE.

3. SS TO 180°F

5. PVC TO 125°F

6. HYPALON TO 180°F

7. SS TO 125°F 10%, PVC TO 125°F

8. PVC TO 125°F, 29%, SS TO 180°F, 29%

9. SS TO 70°F, 5%

10. PVC TO 105°F, 40%, SS TO 180°F SAT

11. VITON TO 180

12. PVC TO 100°F PURE

13. VITON TO 158°F

14. SS TO 140°F

15. USE SLURRY VALVES

16. PVC TO 105°F, SS TO 180°F

17. PVC TO 100°F, SS TO 100°F

18. SS TO 70°F DILUTE, PVC TO 125°F

19. PVC TO 100°F, 50%, SS TO 70°F, 5%

20. PVC TO 100°F, 25%, SS TO 180°F, 50%

21. PVC TO 100°F, SS TO 160°F

22. VITON TO 120°F

24. PVC TO 125°F, 36%, SS TO 180°F 10%

25. FLUORIDATION REQUIRES AN ANTI-SYPHON PUMP INSTALLATION CONSULT LOCAL REGULATIONS FOR DETAILS.

26. PVC TO 30%

27. PVC TO 125°F, 50%, SS TO 70°F, 5%

28. MAY CAUSE SURFACE PITTING TO SS

29. PVC TO 125°F, 48%

30. HYPALON TO 130°F

31. PVC TO 100°F, 50%, SS TO 100°F, 50%

32. PVC TO 70°F, 10%, SS TO 70°F, 10%

34. SS TO 70°F, 5%, PVC 125°F SAT

35. PVC TO 100°F, SS TO 70°F

36. VITON TO 100°F

37. HYPALON TO 150°F

38. SS TO 70°F, 10%

39. PVC TO 125°F, 80%, SS TO 70°F, 80%

40. PVC TO 100°F, SAT, SS TO 180°F, 50%

41. SS TO 180°F, 5%

42. PVC TO 70°F, 50% OR TO 125°F, 30%, SS TO 180°F, 50%

43. SS TO 140°F, 10%

44. SS TO 180°F, 50%

45. PVC TO 105°F

46. PVC TO 125°F, 4%, SS TO 70°F, 5%

47. PVC TO 125°F, 15%, SS TO 70°F, 5%

48. SS TO 125°F

49. PVC TO 125°F, 41 Be, SS TO 140°F, 41 Be

50. PVC TO 125°F, 30%

51. PVC TO 125°F, 50%, SS TO 70°F, 50%

52. PVC TO 100°F, 10%, SS TO 150°F

53. PVC TO 100°F, SS TO 180°F, 70%

57. KYNAR TO 70°F

58. KYNAR TO 120°F

59. KYNAR TO 120°F, 30%

60. KYNAR TO 100°F

Section 2 - Installation

List Of Contents

General Information	2.1
Unpacking	2.2
Mounting the Pump	2.3
Pipe Line Diameter	2.4
Plunger Size Pressure Rating	2.5
Installation	2.6

Illustrations

Typical Installation - Simplex Manual Arrangement	440.400.1-PLUNGER
Typical Installation - Double Simplex Manual Arrangement	440.400.2-PLUNGER
Typical Installation - Duplex Manual Arrangement	440.400.2B-PLUNGER
Typical Installation - Suction Lift	440.400.3-PLUNGER
Typical installation - Flooded Suction	440.400.4-PLUNGER
InstallationWiring	440.400.5-PLUNGER

2.1 General Information

To provide satisfactory service, the Encore metering pump must be installed properly in accordance with the following instructions. These instructions must be followed or operational difficulties, lack of accuracy and possible damage to the pump mechanism may occur.

2.2 Unpacking

When unpacking, check all items against the packing list to be sure no parts are missing or discarded with the packing material. Wherever possible, unpack the pump at the installation site.

2.3 Mounting the Pump

Pump location is important to the operation of the pump. Select a place that is dry and provides a level base for the pump. Allow work space around the pump for inspection, adjustments and servicing. Be sure it is near a power supply and located where the discharge line may be conveniently run to the point of application. It is recommended that the pump be installed with a flooded suction (see Dwg 440.400.4-PLUNGER). A carefully considered and correct installation will help provide satisfactory performance.

When installing the equipment, proceed as follows:

- a. Select the appropriate dimension and / or installation drawing to be sure the location selected will meet all requirements. See the Typical installation drawings.
- b. Mount the pump on the bench or shelf on which it will be located.
- c. Connect to a power supply matching the characteristics specified on the motor nameplate in accordance with local code requirements. Sufficient flexibility must be provided in the connection to permit adjustments. Be sure to provide a shut-off switch in the power supply.

NOTE: Field wiring must conform to local electrical codes.

WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY OR DAMAGE TO THE EQUIPMENT, CONSULT YOUR WPS REPRESENTATIVE IF THE PUMP IS TO BE USED UNDER CONDITIONS OTHER THAN ORIGINALLY SPECIFIED AND IF THERE IS ANY QUESTION REGARDING THE SIZE OF THE DISCHARGE LINE.

- d. If a pulsation dampener is required to reduce pressure peaks, install it in the discharge line. See the Typical Installation drawing. The dampener will minimise vibrations and wear due to long lines and / or high stroking speed.

- e. Connect rigid pipe to the suction connection on the pump and run a line without traps to the bottom of the solution container. Install a strainer.

2.4 Pipe Line Diameter

General Guidelines: To determine the proper diameter of the suction line and discharge lines, the following should be taken into consideration; cavitation and high pressure drop.

To Avoid Cavitation:

- a) For shorter pipe runs (less than 3 metres), use pipe diameter at least equal to the valve connection.
- b) For longer (greater than 3 metres), use pipe diameter at least one size larger than valve connection.

OR

Use this formula to compute fluid velocity in meters / second

$$\text{Velocity} = \frac{\text{Discharge (Q)} \times 0.35}{d^2}$$

Where

Q = feed rate in litres per hour

d = inside diameter of pipe in mm

V = velocity of fluid in meters /second

Select pipe diameter so that the velocity in the suction line does not exceed 0.2 metres / sec.

2.5 Pressure Ratings

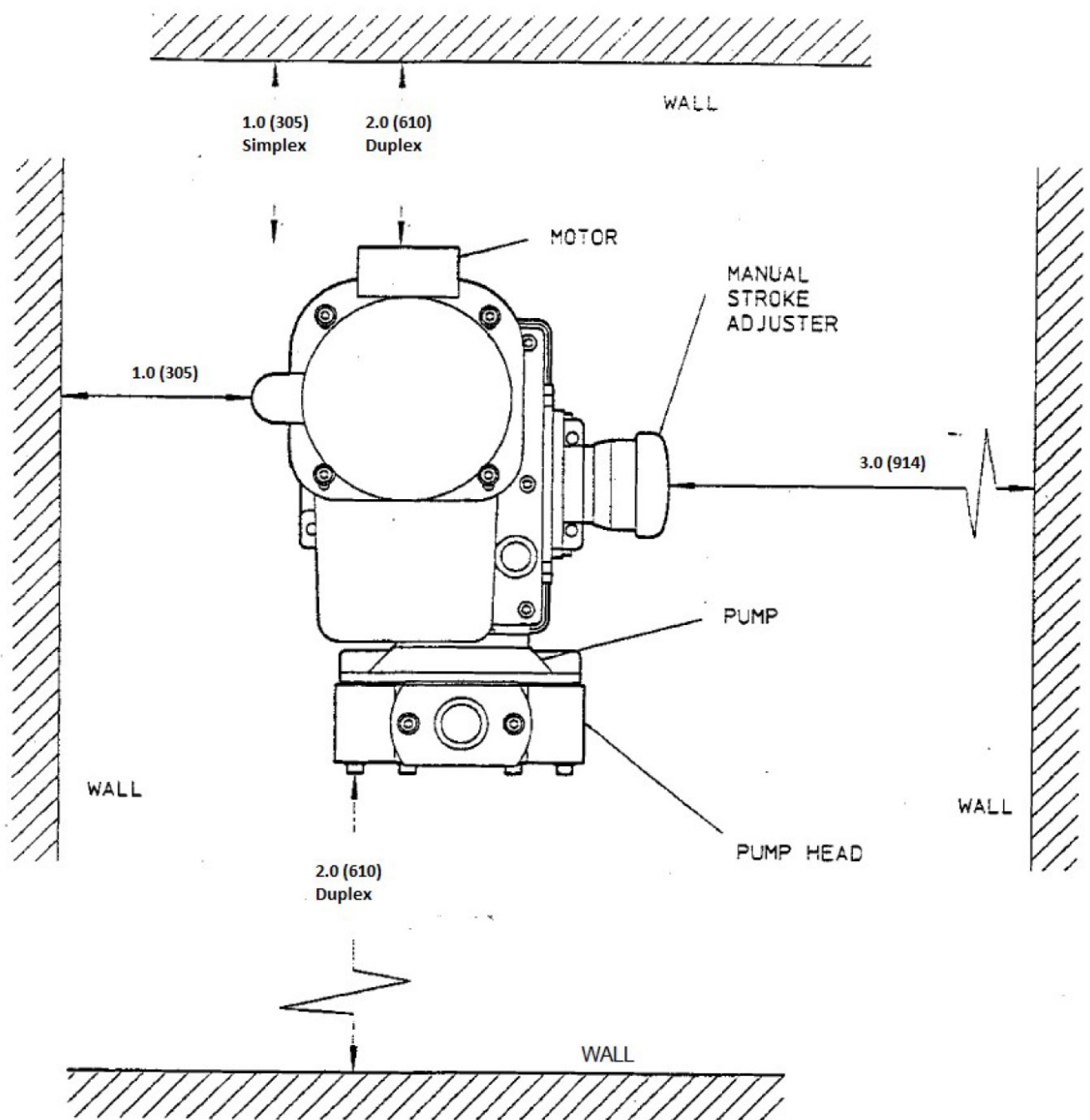
Pressure Ratings	
Plunger Size	Maximum working Pressure (Bar)
6p & 12p (3/8" & 3/4" dia) 10 & 20 mm	200 bar
24p (1 1/2" dia) 38 mm	50 bar
32p (2" dia) 50 mm	30 bar

WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY WHEN HAZARDOUS CHEMICALS ARE PUMPED AND / OR ELEVATED PRESSURE / TEMPERATURES ARE ENCOUNTERED, USE RIGID PIPE.

2.6 Installation

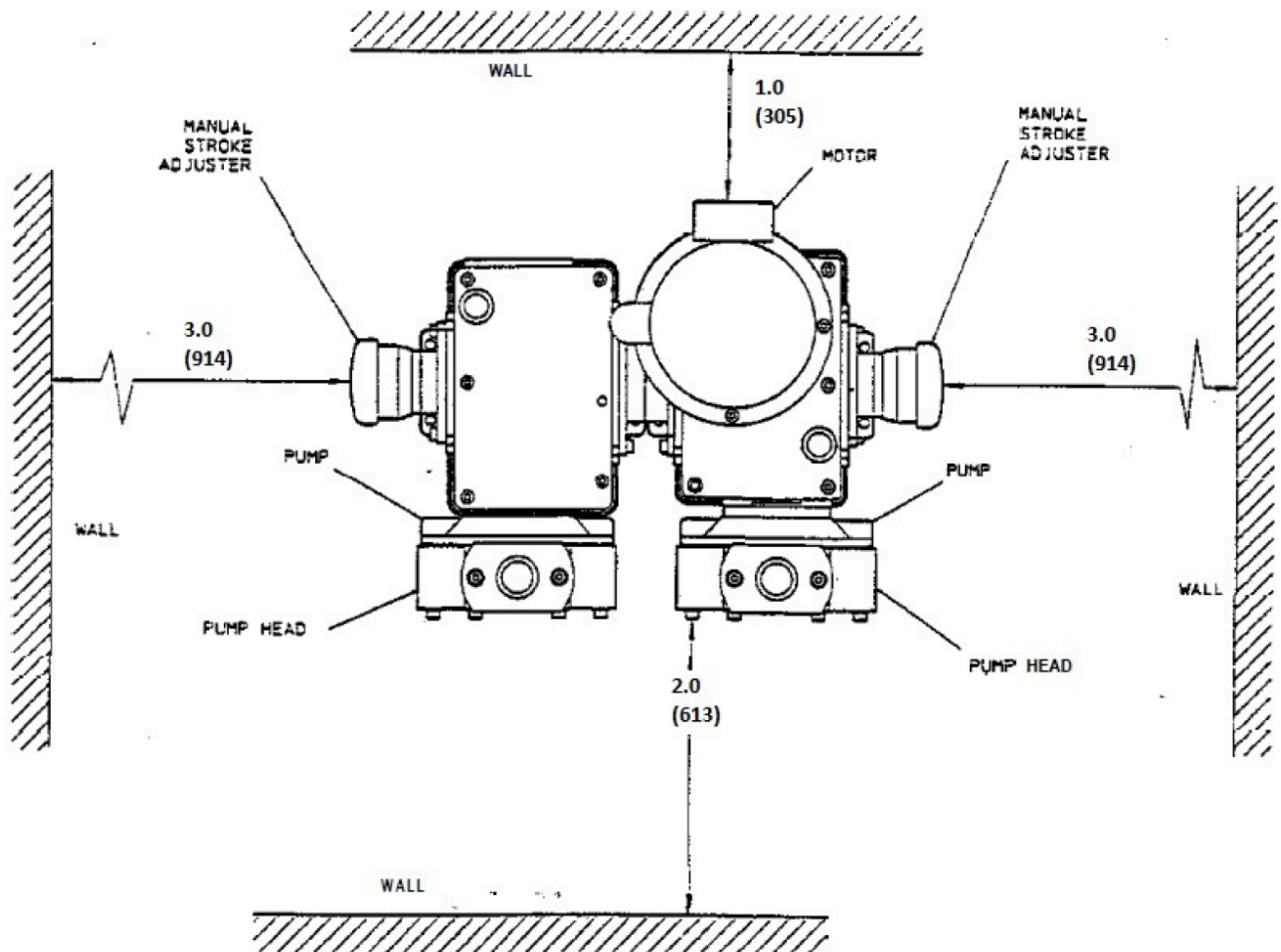
The installation drawings and associated wiring diagram for the various pump configurations are located at the end of this section.

- a. Unnecessary restrictions in piping.
- b. Thin walled hose, which may collapse due to a small cross-sectional area during suction stroke, thereby causing both a high pressure drop and velocity.
- c. Difficult to vent bends in the line, where air may be trapped, impairing the accuracy of feed rate.
- d. If storage container is used, the suction line should be connected above the container's bottom to avoid any deposits on the bottom which can enter the suction line. Such deposits may damage the pump valves and impair the function of the pump.
- e. If the liquid to be pumped contains un-dissolved particles, it is recommended that an adequately dimensioned strainer be installed in the suction line. It is preferred that one size larger than the pipe diameter be used.



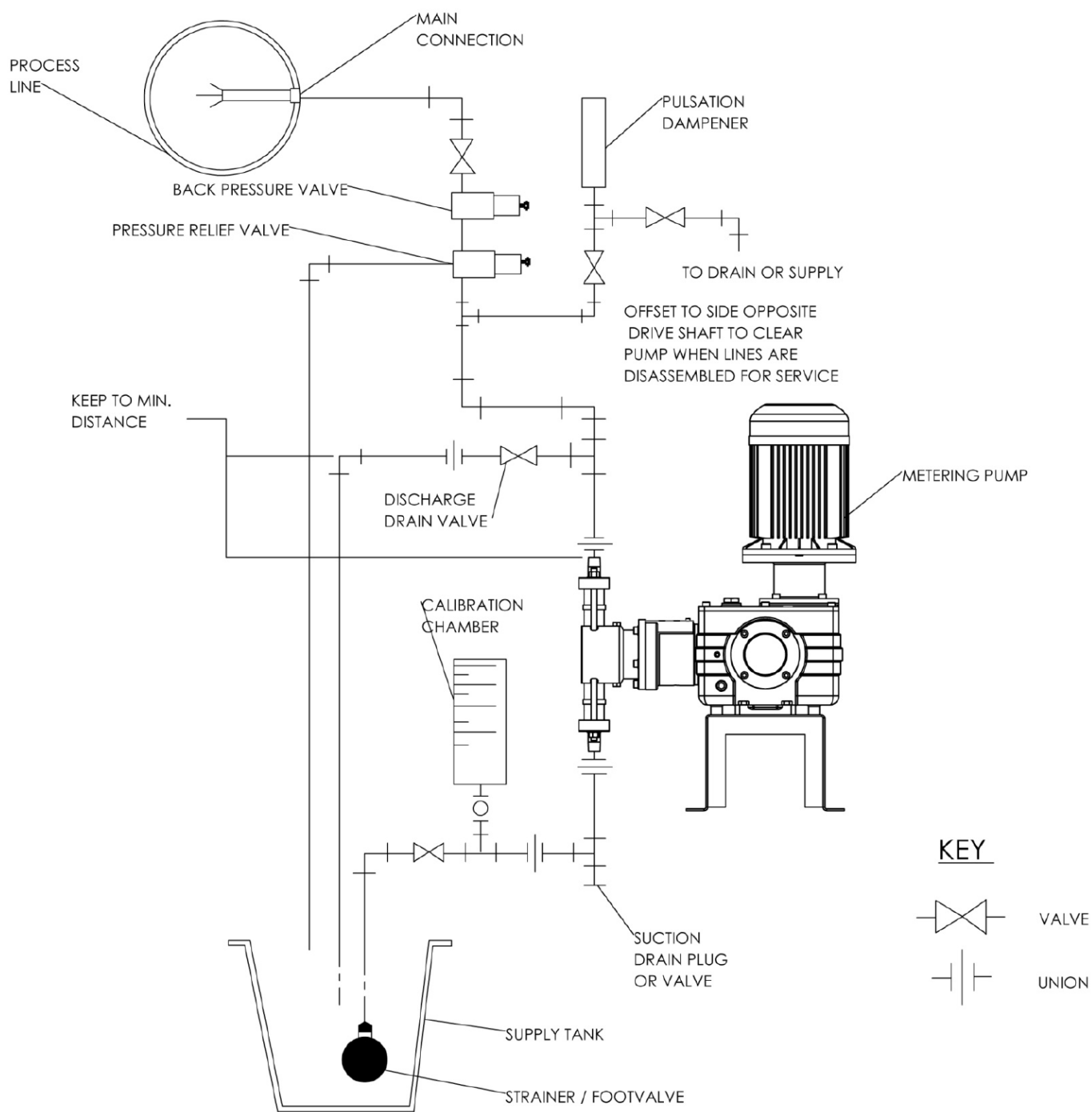
Recommended minimum height from floor to valve connections should be 12 inches (305 mm)

Dimensions are feet and inches (indicates mm)



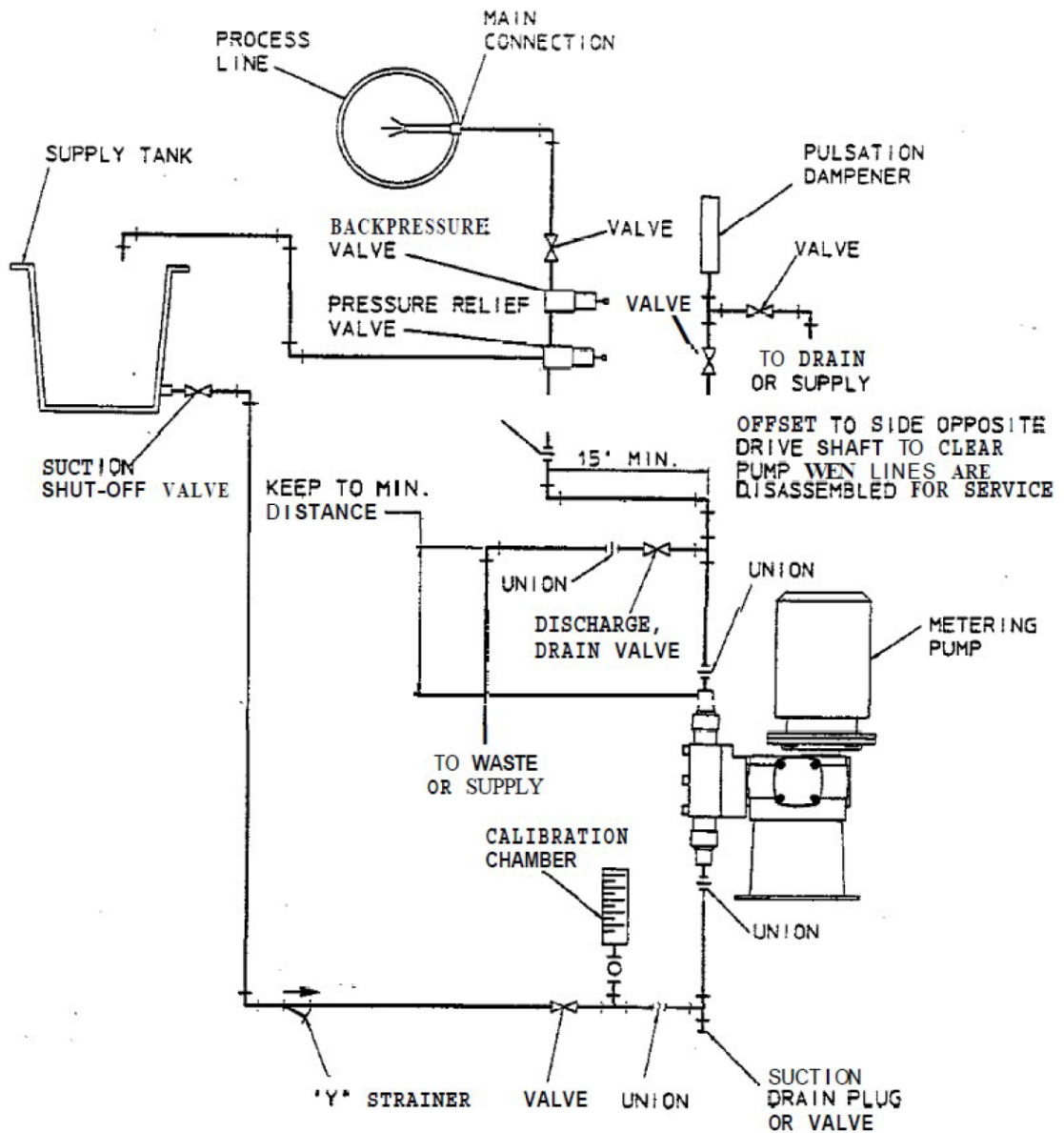
Recommended minimum height from floor to valve connections should be 12 inches (305 mm)

Dimensions are feet and inches (indicates mm)



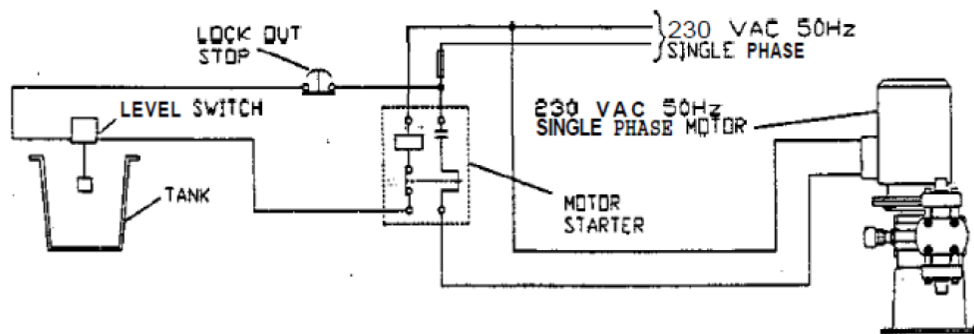
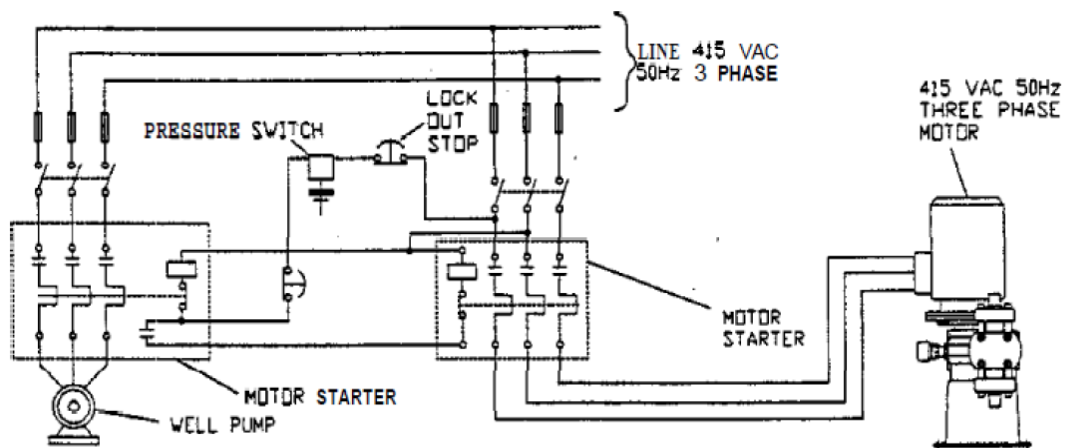
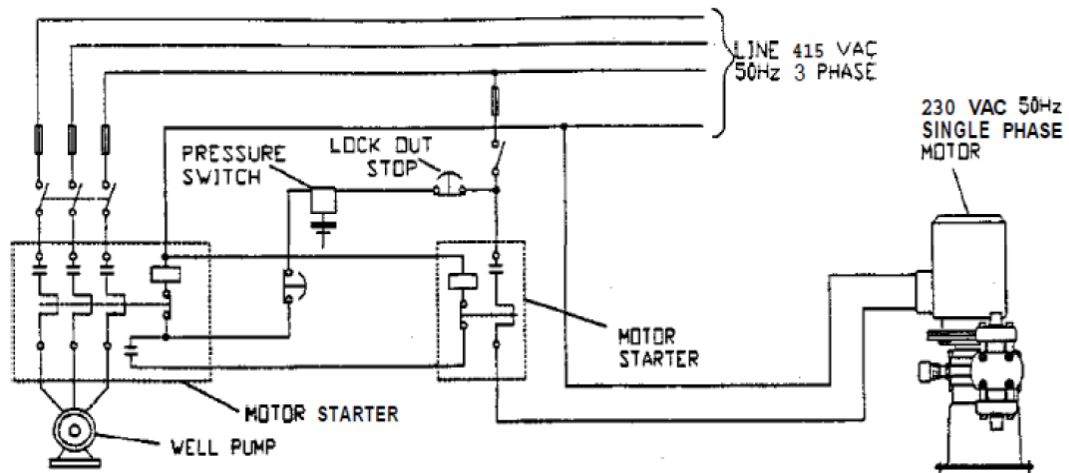
WARNING: TO AVOID POSSIBLE SEVER PERSONAL INJURY WHEN HAZARDOUS CHEMICALS ARE PUMPED AND/OR ELEVATED TEMPERATURE/PRESSURES ARE ENCOUNTERED, USE RIGID PIPE.

METERING PUMPS - TYPICAL INSTALLATION
SUCTION LIFT
DWG NO. 440.400.3 - PLUNGER



WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY WHEN HAZARDOUS CHEMICALS ARE PUMPED AND / OR ELEVATED PRESSURE / TEMPERATURES ARE ENCOUNTERED, USE RIGID PIPE

Metering pumps typical installation – Flooded suction.
Drawing 440.400.4-Plunger



Note: Field wiring (NOT BY WPS) must conform to local codes.

Metering pumps – Installation wiring for intermittent start / stop operation.
Drawing 440.400.5-Plunger

Section 3 - Operation

List Of Contents	Para/Dwg. No
Preparation for Operation	3.1
Starting and Stopping the Pump	3.2
Intermittent Start-Stop Operation	3.3
Adjustment of Feed Rate	3.4
Frequency of the Pump Stroke	3.4.1
Length of the Pump Stroke	3.4.2
Strength of the Solution	3.4.3
Pump Calibration	3.5
Theory of Operation	3.6
Pump Drive Mechanism	3.6.1
Speed Reducer	3.6.2
Stroke Control Mechanism	3.6.3
Liquid Ends	3.6.4

3.1 Preparation for Operation

- a. Fill the solution container with solution.

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

NOTE: Drawings referenced in this section are located in Section 5, Illustrations.

- b. Remove the breather cap (1, Dwg. 40.400.001.020) located on the top of the gearbox. Remove oil level check plug (41, Dwg. 440.400.000.010) located on the right side of gearbox when facing the liquid end. Add two litres of oil, (WPS part number U1 8443 or (equivalent) through the breather cap hole until it flows from the oil level check hole. Replace the oil level check hole plug and breather cap.

CAUTION: To avoid possible severe damage to the pump mechanism, do not run the pump without filling the gearbox with oil as specified above. Oil level must be up to the oil check hole.

- c. If fitted with pulley drive, refer to Table 1-3 to identify the belt location on the pulley to obtain the desired feed rate. Pumps delivered from the factory will have the belt located on the first step (top step of the pulley) which is the maximum speed setting. Install the belt guard before operating this equipment.

WARNING: To avoid possible severe personal injury, do not run the pump with belt guard removed. ENCORE 700 PLUNGER PUMP

- d. Start the motor and run the pump at a stroke setting of 100% on the scale until it is primed and ready for operation. The pump is designed to self-prime under a no back pressure condition; however, if difficulty is encountered in priming, check that the suction valve is not adhering to the suction valve seat. Refer to the Section 4, SERVICE, if the pump does not prime.

3.2 Starting and Stopping the Pump

Apply power to the pump on or off as needed.

3.3 Intermittent Start-Stop Operation

Intermittent start-stop operation, sometimes called semi-automatic operation, is simply the starting and stopping of the treatment (pump) in synchronism with an intermittent flow. This is accomplished by interrupting the electric current to stop the pump. The usual example calls for treating the discharge from a pumping system that starts and stops in response to predetermined variations in elevation or pressure of the liquid being treated.

3.4 Adjustment of Feed Rate

The feed rate of the pump is governed by: frequency of the pump stroke, the length of the pump stroke or strength of the solution to be fed.

3.4.1 Frequency of the Pump Stroke

The frequency of the pump, stroke is determined by the gear ratio of the speed reducer. Available speeds for Encore are listed in Table 3-1.

TABLE 3-1 PUMP GEAR RATIOS AND SPEEDS

Available Gear Ratio	Number of Strokes at 1450 rpm 50 Hz
48:1	30
24:1	60
12:1	120
10:1	144

If the pump is a pulley drive arrangement, each stroking speed can be further turned down. Refer to the Encore Capacity Chart in Table 1-3 of Section I, for further details on stroking speeds.

If the pump is equipped with a variable speed drive, refer to applicable instruction manual.

3.4.2 Length of the Pump Stroke (see Dwg. 440.400.000.010)

CAUTION: To avoid equipment damage, do not force the stroke control above 100% or below 0% position. If it is hard to turn, have the pump operating and then turn the stroke control knob.

a. Manual positioning: Pump stroke length is adjusted by turning the stroke control knob (33). Percent stroke length is shown on the micrometer scale which consists of a linear scale and a circular scale. Ten turns of the knob covers 0 to 100% of the stroke length. Numbers on the scale represent percent stroke. Each full turn of the knob will result in a 10% change of the stroke length. Each graduation on the circular scale on the knob is equal to 0.25%.

b. Automatic positioning: The pump can be equipped with an electric stroke positioner if applicable. If applicable, refer to the separate instruction manual provided with the equipment for stroke positioner operation.

3.4.3 Strength of the Solution

WARNING: Use extreme care to avoid contact with the material and possible severe personal injury. Consult your chemical supplier for instructions in the preparation of solutions and the handling of chemicals. Observe all recommended safety precautions.

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

3.5 Pump Calibration

Perform calibration at the suction side of the pump against actual back pressure so that piping will not have to be disturbed or the pumping process interrupted. Refer to Typical Installation drawings for Suction Lift and Flooded Suction, respectively in Section 2.

Procedures for pump calibration are as follows:

- a. Close the valve of the calibration chamber and fill the chamber to the tap.
- b. With the pump operating, close the in-line valve upstream of the chamber and at the same time open the chamber valve.
- c. Using a stopwatch, note the length of time required to drop the calibration chamber contents from the uppermost graduated line to a suitable graduated line lower on the chamber. Open the in-line valve and close the chamber valve to prevent air from being sucked into the suction line and interrupting the pumping cycle.
- d. Divide the quantity withdrawn from the chamber in cubic centimetres (cc) by the elapsed time in minutes to obtain the pump rate (cc / minute).

$$(\text{cc} / \text{minute}) \times \frac{60}{100} = \text{litres per hour}$$

or

$$(\text{cc} / \text{minute}) \times 1.44 = \text{litres per day}$$

3.6 Pump Calibration

The theory of operation for the Encore Plunger Pump is addressed by discussing the operation and interrelationship of the following assemblies:

- Pump Drive Mechanism
- Speed Reducer
- Stroke Control Mechanism
- Liquid Ends, which includes head, valves and connections

The Encore plunger metering pump, is comprised of a liquid end and a pump drive mechanism. The stroke length can be varied either manually or with an optional electric stroke positioner. The pump is driven by an electric motor which can be coupled either directly to the worm shaft, (see Dwg. 440.400.001.010) or indirectly by a pulley drive arrangement (see Dwg. 440.400.001.020). The pulley drive arrangement provides a wide range of stroking speeds with the same gear ratio, and therefore, a wide range of capacities. A double simplex arrangement is also available. (See Dwg. 440.400.000.020).

3.6.1 Pump Drive Mechanism (see Dwg. 440.400.000.010)

The pump drive mechanism is contained within the gearbox. The motor rotates the worm wheel through the worm shaft. The worm wheel is coupled to the variable eccentric mechanism, which rotates along with it converting the rotational motion into the reciprocating motion of the crosshead (17) through a connecting rod (25). The crosshead provides a link between the connecting rod and the liquid end. The stroke length of the pump can be changed from 0 to 100% by rotating the stroke control knob, (33).

3.6.2 Speed Reducer (see Dwg. 440.400.000.010, 440.400.000.015 and 440.400.000.020)

The pump stroke speed is obtained through gear ratios which provide 30 spm, 60 spm, 120 spm and 144 spm. Each stroking speed is available in pulley drive and direct drive configuration. The four step pulley combination provides additional stroking speed with each gear ratio.

3.6.2 Stroke Control Mechanism (see Dwg. 440.400.000.030)

The stroke control mechanism consists of a triangular knob (33) which is secured to the bearing carrier (34). The carrier, which is bolted to the eccentric shaft, (13) turns on threads through a double row bearing (30), inside the stroke control housing (11). The stroke control housing has a linear scale showing 0 to 100%. This scale indicates the percentage stroke length of the pump. The combination of a linear scale (0 - 100%) on the stroke control housing and a circular scale (0 - 70) provides an accurate micrometer type control of the stroke, with a resolution of 0.25%.

3.6.4 Liquid Ends (Refer to List of Contents in Section 5 to identify applicable Dwgs. For liquid ends)

The Encore metering pump offers four different sizes of liquid ends to provide a wide capacity and pressure range. The Simplex arrangement has a capacity up to 145 l/hr and pressure up to 200 Bar. A variable eccentric mechanism is mechanically connected to the plunger by a self centring nut to crosshead. A secondary seal mounted in the crosshead adapter isolates the gearbox from the liquid end. The chart in Section 2 provides further details on pressure capabilities for each liquid end. Cartridge valves are used on all the liquid ends to provide ease of service and field maintenance.

Section 4 - Service

List Of Contents	Para/Dwg. No
General	4.1
Periodic Cleaning	4.2
Cleaning Pumping Head Parts	4.2.1
Clogging of Solution Tube	4.2.2
Periodic Preventive Maintenance	4.3
Gearbox Lubrication	4.3.1
Priming Troubles or Loss of Suction	4.3.2
Hazardous Properties of Sodium Chlorite	4.3.3
Cleaning the Pump	4.3.4
Inspection	4.3.5
Corrective Maintenance	4.4
Removing Pump from Service & Disassembling Valves, Head and Diaphragms	4.4.1
Draining System of Hazardous Materials	4.4.2
Removing Suction and Discharge Valves	4.4.3
Removing the Plunger	4.4.4
Valve and Plunger Replacement	4.4.5
Disassembly of Complete Pump	4.6
Troubleshooting	4.4.7
Warning Summary Page	Page

NOTE: Referenced drawing numbers beginning with 440.400 are located in Section 5.

WARNING: TO AVOID POSSIBLE SEVERE PERSONAL INJURY BY BEING SPRAYED WITH LIQUID UNDER PRESSURE, PRIOR TO DISASSEMBLY OF PIPE CONNECTIONS REFER TO DETAILED INSTRUCTIONS ON RELIEVING PRESSURE AND DRAINING.

4.1 General

Routine maintenance of the metering pump consists of 2 periodically performed operations.

- a. Periodic Cleaning to remove contaminants and deposits formed on parts in contact with the solution.
- b. Periodic Preventive Maintenance- to disassemble, inspect, clean and replace recommended parts. Corrective Maintenance is performed (as required at unscheduled intervals) to correct a discrepant operating or non-operating condition. A troubleshooting table (see Table 4-3) lists possible fault conditions and corrective action as a guide for service personnel.

4.2 Periodic Cleaning

4.2.1 Cleaning Pumping Head Parts

WARNING: Use extreme care to avoid contact with material and possible severe personal injury. When using hazardous material observe all safety precautions recommended by the material manufacturer / supplier.

If difficulty is encountered in pumping the solution where hard water is known to have been used in the preparation of the solution, remove the pumping head parts for cleaning. The effects of hard water are indicated by a white coating on all parts in contact with the solution. This coating is most easily removed by soaking the parts in 5% hydrochloric acid.. 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.

4.2.2 Clogging Of Solution Tube

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

4.3 PERIODIC PREVENTIVEMAINTENANCE

To minimise unscheduled shutdown and ensure maximum service life, perform periodic maintenance at specified intervals while equipment is in satisfactory condition. Table 4-1 lists the intervals, maintenance operation and preventive maintenance kits required. Prior to performing tasks, ensure that the appropriate preventive maintenance kits are in stock. Refer to Section 6, Preventive Maintenance Kits and Spare Parts List for the appropriate maintenance kit.

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

Table 4-1 Scheduled Maintenance Index

Interval	Maintenance Operation	Preventive Maintenance Kit
Annually	Replace PTFE chevrons and neck rings.	Packing - see liquid end drawing.
Every six months	Valve sets, which include the seat, ball and Retainer / guide O-rings. *For slurry application or other abrasive chemical, replace every six months.	See liquid end drawing.
	Replace gearbox oil.	V18443 (2 litres required)
	Replace belt (if applicable).	APS4875

4.3.1 Gearbox Lubrication (see Dwg. 440.400.000.020)

The gearbox is filled with two litres of SAE 90 grade oil, WPS Part No. U18443. This lubricant must be replaced every year to realise optimum performance of the mechanism. To drain and replace the gearbox oil, perform the following:

- a) Remove the oil drain plug (40) located at the bottom of the side wall of the gearbox (towards the stroke control knob).
- b) Drain the oil completely.
- c) Apply Teflon tape on the oil drain plug and tighten it back.
- d) Remove the breather cap (1,440.400.001 .010) located at the top of the gearbox cover.
- e) Remove oil check plug (41) located at the centre of the gearbox side wall (towards the stroke control knob).
- f) Fill the gearbox with SAE 90 grade oil (WPS Part No. U1 8443) until oil flows out of the oil check hole.
- g) Apply Teflon tape to the oil check plug. Tighten the oil check plug.
- h) Tighten the breather cap.

4.3.2 Priming Troubles or Loss of Suction

- a) Difficulties in priming are usually caused by an air leak in the suction line or when the valves are obstructed. Air leaks in the suction line may be due to a loose valve, O-ring damage, cracked tubing or leaking joints in the pipe thread connections. Obstruction in the valves may be caused by foreign material or by deposits on the pumping head parts.
- b) Where liquid is withdrawn from containers which are replaced when they are empty or if the level in a fixed tank occasionally falls below the suction line inlet, air will be inducted into the pump. If the pump is discharging against atmospheric pressure (or only slightly above), the pump may be expected to reprime itself if the liquid supply is replenished and it is operated briefly at full stroke. If discharging against greater pressures, the pump will not reprime itself due to compression and re-expansion of the air trapped in the pump head.
- c) If the system is installed in accordance with Dwgs. 440.400.3 or 440.400.4, using a backpressure valve and / or pressure relief valve, the discharge drain valve may be opened to allow the pump to prime against atmospheric pressure. Once primed, close the discharge drain valve to resume normal operation.
- d) If no backpressure and / or pressure relief valve are used, repriming is greatly simplified if a three-way valve is installed in the discharge line close to the pump outlet. This valve normally passes the pump output to the downstream tubing or pipe. When repriming is desired the valve is turned to divert the pump output back to the liquid container, the downstream pressure is blocked off and the pump operates at atmospheric discharge pressure. When a flow of liquid is observed returning to the source container, the pump is reprimed. The three-way valve is then turned back to its normal position and pump delivery can continue. If an appropriate three-way valve is unavailable, the same result can be achieved by using two conventional shut-off valves. One is placed in the discharge line and other on the side opening of a tee located immediately upstream of the line valve.

4.3.3 Hazardous Properties of Sodium Chlorite (NaClO_2)

WARNING: To avoid possible severe personal injury, since the storage and handling of sodium chlorite presents very specific hazards, the user must seek the advice of his supplier with reference to storage facilities, handling precautions and health hazards.

- a) Sodium chlorite is a dry flaked salt which, because of its powerful oxidizing nature, is shipped in steel drums bearing a DOT "yellow" label classification. It is stable when sealed or in solution, but is very combustible in the presence of organic material. For this reason do not allow the solution to dry' out on floors. Mop up the solution with technical sulphite solution.

Technical sodium chlorite is a white flaked salt with a density of approximately 897kg/cubic metre. It is a very powerful oxidizing agent.

- b) Sodium chlorite in contact with acid will react with rapid evolution of chlorine dioxide gas. When heated above 347F, sodium chlorite will decompose rapidly, liberating oxygen with the evolution of sufficient heat to make the decomposition self-sustaining. If this decomposition is confined, as in closed containers, the effect is explosive. Therefore, it must be protected at all times from exposure to heat. Sodium chlorite dissolves easily in water at ordinary temperatures to form a cloudywhite solution. This solution is chemically stable under ordinary, conditions of temperature and pressure.
- c) As received in loose flake form in metal containers, sodium chlorite will stand considerable rough handling. In scooping or weighing out the material, avoid contact with ENCORE 700 PLUNGER PUMP eyes, skin, mucous membranes and clothing. Wash contaminated clothing quickly and thoroughly with water to avoid fire.

d) The danger lies in the fact that sodium chlorite in contact with or mixed with organic substances, such as clothing, cloth gloves, cotton waste, sawdust, mops, brooms, etc., become extremely sensitive to any agent, such as heat, friction or impact, and these exposed organic substances will ignite readily when any of these are applied accidentally or otherwise. The finer the sodium chlorite is subdivided, as is the case when sodium chlorite solution is left to evaporate and the more intimately it is mixed with the organic substance, the more sensitive to heat it becomes. Although in practice spontaneous ignition of such mixture is unlikely, it is theoretically possible for such a reaction to occur. Therefore, extreme care must be used to prevent sodium chlorite flakes or sodium solution from coming in contact with combustible material especially fibrous or finely divided material.

4.3.4 Cleaning the Pump - Sodium Chlorite Applications - Special Precautions

WARNING: Sodium chlorite, when finely divided in the presence of organic compounds, is a possible fire hazard. For this reason, extreme care must be exercised to prevent solutions from drying out in the threaded portions of the pump body and related parts. Observe carefully the manufacturer/suppliers recommended safety, procedures and the handling and storage procedures in this book.

Perform pump cleaning procedures in accordance with the following steps. When procedures required pump disassembly, refer to (par. 4.4.1, Removing Pump from Service). Refer to Dwg. 440.400.150.01 0 as a guide during this procedure.

- a) Transfer the suction line to a container of water and pump water until all the sodium chlorite in the pump and discharge line has been replaced by water.
- b) Place a container under the pump head, and remove the suction line.
- c) Shut-off the discharge line valve.
- d) Relieve the pressure and drain the discharge line between the pump and the discharge line shut-off valve.
- e) Remove the pump head. Flush away any spilled solution not caught in the container with ample quantities of water.
- f) Immerse the pump head, valves and lines that were removed in lukewarm water for two minutes.
- g) Unscrew the threaded pans under water.
- h) Rinse all the parts in fresh water before reassembly.
- i) Use water to prime the pump, then transfer the suction line to the sodium chlorite solution container.

4.3.5 Inspection

After the disassembled parts are cleaned and prior to reassembly perform the following:

- a) Check for physical damage of removed parts (chipped, cracked. Damaged threads. etc.). Replace damaged parts.
- b) Discard and replace all removed O-rings, seals, gaskets, packing or neck rings.

4.4 CORRECTIVEMAINTENANCE

WARNING: To avoid contact with the material and possible severe personal injury, when servicing heads and / or valves follow procedures in this section for disassembly.

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.

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

- a) Corrective maintenance is performed as required to correct a discrepant operating or nonoperating condition. Refer to Table 4-3 as a guide for service personnel in diagnosing and correcting most common problems.
- b) Routine maintenance procedures include the elimination of solution leaks when they are found, to avoid corrosion damage. Flush away spilled solution with water and wipe the parts clean and dry.
- c) Ensure that: joints containing gaskets are maintained in good condition. Keep an adequate supply of gaskets and O-rings available so that repair of leaks can be accomplished without delay. It is a good practice to discard used gaskets and O-rings, replacing them with new material each time a joint is broken.

4.4.1 Removing Pump from Service & Disassembling Valves, Head and Plunger

WARNING: Use extreme care to avoid contact with the material and possible severe personal injury, when using hazardous material, observe all safety precautions, appropriate protective clothing and eye protection when handling hazardous material.

Procedure for assembly and disassembly of parts for pump corrective maintenance are referenced in the following paragraphs.

4.4.2 Draining System of Hazardous Material

WARNING: To avoid possible severe personal injury by being sprayed by liquid under pressure, allow system to drain fully before attempting to disassemble piping and removing valves and / or head.

- a) Disconnect power from pump.
- b) Close discharge shutoff valve.
- c) For flooded suction, close suction shutoff valve to prevent backflow of liquid when suction lines are opened,
- d) Open suction drain valve and drain suction line of liquid.
- e) Open discharge drain valve to relieve pressure and drain discharge line.
- f) Open bypass valve in pressure relief valve.
- g) If a pulsation dampener is used, close off its valve when pressure has reached zero.

4.4.3 Removing Suction and Discharge Valves

WARNING: Use extreme care to avoid contact and possible severe personal injury with liquid present in head. Allow suction valve to fall into suitable container and catch liquid.

WARNING: Use extreme care to avoid contact and possible severe personal injury because liquid is present between discharge drain valve and unit below. Flush spilled liquid immediately.

Refer to Cartridge Liquid End parts drawings in Section 5.

- (1) Loosen two screws located on the connection block.
- (2) Spring connection away.
- (3) Pull the valve cartridge out.
- (4) Push seat out of the cartridge to remove ball.

4.4.4 Removing the Plunger

- a. Remove suction and discharge valves as described in paragraph 4.4.3.
- b. Unscrew plunger nut.
- c. Remove head screws, washers.
- d. Carefully remove head with (plunger inside).

4.4.5 Valve & Plunger Replacement

All O-rings must be lightly lubricated with silicone grease before assembly.

- a) Reverse assembly procedures for replacement of cartridge.
- b) Refer to Table 4-2 for head size and corresponding torque values for head screws and cartridge valve clamping.
- c) Install the plunger into the head before assembling head to crosshead guide. Carefully pull plunger out of head and reconnect by tightening plunger nut onto the crosshead.

Table 4-2 Recommended Torque Values

		RECOMMENDED TORQUE			
PLUNGER SIZE		HEAD SCREWS		CARTRIDGE VALVE CLAMPING	
mm	inches	Nm	in-lbs	Nm	in-lbs
10	3/8"	6.8 - 10.2	60 - 90	2.3 - 2.8	20 to 25
20	3/4"				
38	1-1/2"				
50	2"				

NOTE: CARTRIDGE LIQUID ENDS - TIGHTEN ALL HEAD BOLTS BEFORE TIGHTENING VALVE CLAMP SCREWS

4.4.6 Disassembly of Complete Pump

1. A simplex arrangement with manual stroke control is described in the procedures below.

2. All O-rings must be lightly lubricated with Silicone grease before assembly.

3. Under normal operating conditions, disassembly of the gearbox is not required. Should disassembly be necessary, proceed as follows:

a) Gearbox Cover Removal (see Dwg. 440.400.001 .010 or 440.400.001.020)

WARNING: To avoid possible severe personal injury or equipment damage, turn power off before servicing.

WARNING: To avoid possible severe personal injury by being sprayed by liquid under pressure, allow system to drain fully before attempting to disassemble piping and removing valves or heads.

(1) Remove the liquid end, which includes the valves, head and plunger as described in paragraph 4.4.2.

(2) For direct drive, see Dwg. 440.400.001.01 0. Remove the electric motor and motor adapter plate (7), and proceed to step 4.

(3) For pulley drive, see Dwg. 440.400.001.020. Remove the belt guard (8). Loosen the belt (72) and remove the electric motor. The pulley (18) is not required to be removed from the motor shaft unless it is being replaced.

(4) Remove the M8 screw (g), and remove the pulley (13) and stub shaft (16). Do not lose the two stub shaft keys (11).

NOTE: Two slots are provided for this purpose, one in the front and one in the back. Silicone was used as a seal and it needs a gentle tap, to break loose. Note the location of the special washer and all screws.

(5) Unscrew all M8 screws that secure the cover (2), 440.400.001.010 or (25) 440.400.001.020 and pry open with a suitable screwdriver.

(6) The complete mechanism is exposed, with the cover removed.

b. Gearbox Cover Replacement (see Dwg. 440.400.001.01 0 or 440.400.001 -020)

Reverse removal procedures for replacement of gearbox cover.

c. Worm Shaft and Worm Wheel Removal (see Dwg. 440.400.000.010)

(1) Remove the gearbox cover, as described in sub paragraph (a) above.

(2) Drain the gearbox oil.

NOTE: Two bearings (1 and 6), and shim combination (35) come out with the assembly.

(3) Remove the worm shaft (7) assembly, by pulling it up.

(4) Set the knob (33), to zero.

(5) Remove the gear access flange (20), by unscrewing four M8 screws (21).

NOTE: Mark the relative position of the drive bushing (22), and sheave (1 5), so that they can be reassembled at the same position.

(6) Slide out the worm wheel (3), and drive bushing (22) assembly, through the flange opening.

(7) On a bench, remove taper roller bearing (24), from the drive bushing (22).

(8) Unscrew the five M6 screws (4) and remove the worm wheel (3).

d. Worm Shaft and Worm Wheel Replacement (see Dwg. 440.400.000.070)

(1) Apply blue Loctite thread locker, No. 242 to five M6 screws (4). Replace the worm wheel

(3) and secure with screws (4).

(2) Reverse remaining removal procedures for replacement of worm shaft and worm wheel.

e. Eccentric Assembly, Taper Roller Bearings, Connecting Rod, Stroke Control Housing and Knob Removal (see Dwg. 440.400.000.010)

(1) Repeat Steps 1 through 4 of subparagraph (c) above for Worm Shaft and Worm Wheel Removal.

(2) Remove the stroke control knob (33), by loosening the three set screws (9), just enough to slide the knob out. Do not screw all the way out.

NOTE: If the pump is equipped with an electric stroke positioner, see applicable instruction manual.

NOTE: The set screws (9) are coated with Nylok (TM) to seal oil.

(3) With a 6mm Allen wrench, remove one M8 screw (32) from the eccentric shaft (13), which is accessible through carrier bearing (34) end opening. Hold the worm wheel (3), to keep the eccentric assembly from turning.

(4) Turn the carrier bearing (34), counter clockwise to remove.

NOTE: The bearing (3) and flat washer (31) is not required to be removed unless it is being replaced. A special wrench is needed to loosen or tighten the adjuster bearing (8).

(5) Unscrew the four M8 screws (29) and remove the stroke control housing (11).

(6) Unscrew the pre-load nut (27).

(7) Unscrew the four M8 screws (21) and remove the gear access flange (20).

(8) Slide out the worm wheel (3) and drive bussing assembly (22).

(9) Hold the eccentric assembly and connecting rod assembly, and ease it out of the gearbox.

f. Eccentric Assembly, Taper Roller Bearings, Connecting Rod, Stroke Control Housing and Knob Replacement (see Dwg. 440.400.000.010)

(1) Coat set screws (9) with Nylok (TM) before replacing stroke control knob.

(2) Reverse remaining removal procedures for replacement of items. During replacement procedure, also adhere to the following:

a. Tighten the pre-load nut (27) just enough to eliminate axial movement of the eccentric assembly in Step 6 above. The eccentric shaft (13) must slide in and out without any binding.

b. Turn the carrier bearing (34) clockwise until it stops. The bearing (30) must be against the eccentric shaft (31) shoulder before tightening the screw (32) in Step 3, above of the removal procedure.

c. Set the stroke position to approximately zero by turning the carrier bearing (34) counter clockwise until it stops. Then rotate the carrier bearing one turn clockwise.

d. Place a dial indicator with a magnetic base on top of the gearbox. Set the indicator shaft to indicate the eccentricity of the sheave (15) as shown in figure 4-1,

e. Rotate the eccentric shaft assembly (13) and take the indicator reading at two locations, 180° apart, and along the eccentric travel of the sheave.

f. Both readings must be the same. If the readings are different, turn the carrier bearing clockwise or counter clockwise until a point is found, where the readings are the same.

NOTE: Do not disturb this set position until the knob is secured at zero scale indication.

g. Apply silicone grease to O-ring and install the O-ring into the groove in the stroke control housing.

CAUTION: The carrier bearing must not be disturbed while performing the next three steps.

h. Start the three M6 screws, with Nylok patch, in the knob.

i. Position the knob (33) over the stroke control housing with the zero graduation on the knob, lined up with the centre line of the stroke control housing scale (see Figure 4-2).

j. Push the knob past the O-ring/quad-ring until the front edge of the knob is in line with the zero percent line on the stroke control housing scale.

k. Slide the knob, if necessary, to align the scales as shown above. Then tighten the three M6 set screws equally. Make sure the set screws that are used, have a nylon patch on the threads to prevent oil leakage.

NOTE: All O-rings must be lightly lubricated with silicone grease before assembly.

4.4.7 Troubleshooting

a. Troubleshooting of the Encore Plunger Metering Pump consists of procedures and instructions for repair and / or replacement of sub assemblies and components.

b. The troubleshooting procedures are limited to fault isolation to a defective item. Potential problems which could be at fault and recommendations for corrective actions are listed in Table 4-3. Procedures are based on potential fault conditions that may occur under normal pump operation.

Table 4-3 Encore Plunger Metering Pump Troubleshooting Guide

Fault Condition	Possible Cause	Corrective Action
No feed rate or insufficient feed rate	Zero or insufficient stroke length	Adjust to proper stroke length
	Ball valves on suction or discharge do not close tightly	Replace balls in valves. Remove possible deposits in valves or pump head. Replace pump head.
	Gas in suction line or pump	Check for cavitation and, if necessary, use suction line with larger inside diameter. Dilute the liquid (sodium hypochlorite)
	Air in suction line or pump head	Vent suction line and pump head
	Supply tank is empty	Fill supply tank
	Shut-off valves in suction or discharge lines are wclosed	Open valves. Disconnect suction line. Flow should be at least 3 X maximum capacity of pump.
	Strainer clogged	Clean strainer
	Damaged drive mechanism	Check mechanism and replace defective part.
No feed to point of application, although pump is pumping.	Pressure relief valve defective or wrongly adjusted so that liquid flows back into supply tank	Adjust pressure relief valve to proper relief pressure. Set to 10-20% above maximum working pressure.
Liquid is emerging from pump head gland nut / drip from guide	Leaking / worn packing or, crosshead oil seal	Replace chevron or, replace oil seal
Pump is pumping erratically or feed rate is inaccurate	No backpressure	Install backpressure valve into discharge line
Install backpressure valve into discharge line	Insufficient lubrication or defective bearings	Check oil level through oil check hole, if required, replace beatings
Motor will not run	Power off or fuse blown	Turn on power; replace fuse after correcting the cause
Motor is hot but starts when cool	Overload protector has opened	Check supply voltage; check excessive pressure at point of application. Check binding pump mechanism.
Belt is noisy (if applicable)	Worn belt.	Replace belt, Adjust tension by the tensioning screw
	Pulley misaligned.	Align pulley.

Warning Labels and Tags

The following warning labels and tags have been attached listed below:

AAA3769: THIS EQUIPMENT MAY HANDLE HAZARDOUS MATERIALS WHICH CAN CAUSE SEVERE PERSONAL INJURY, OBSERVE THE FOLLOWING:

THIS EQUIPMENT MUST BE INSTALLED, OPERATED, SERVICED BY TRAINED 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 THE HAZARDOUS MATERIALS OR AT HIGH FLUID TEMPERATURE OR AT HIGH DISCHARGE PRESSURE.

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.

AEK3676 (IF PULLEY DRIVE): TO AVOID POSSIBLE SEVERE PERSONAL INJURY FROM CONTACT WITH MOVING PARTS, REPLACE GUARD AFTER SERVICING EQUIPMENT.

Section 5 - Illustrations

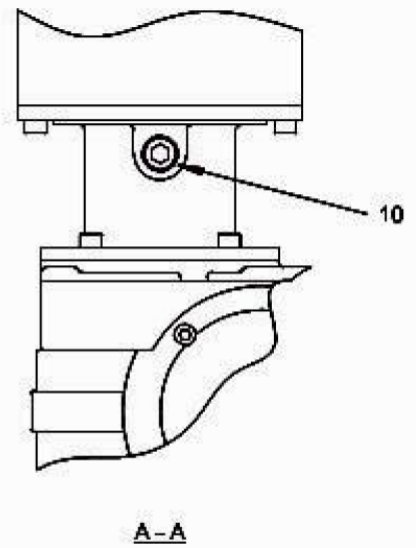
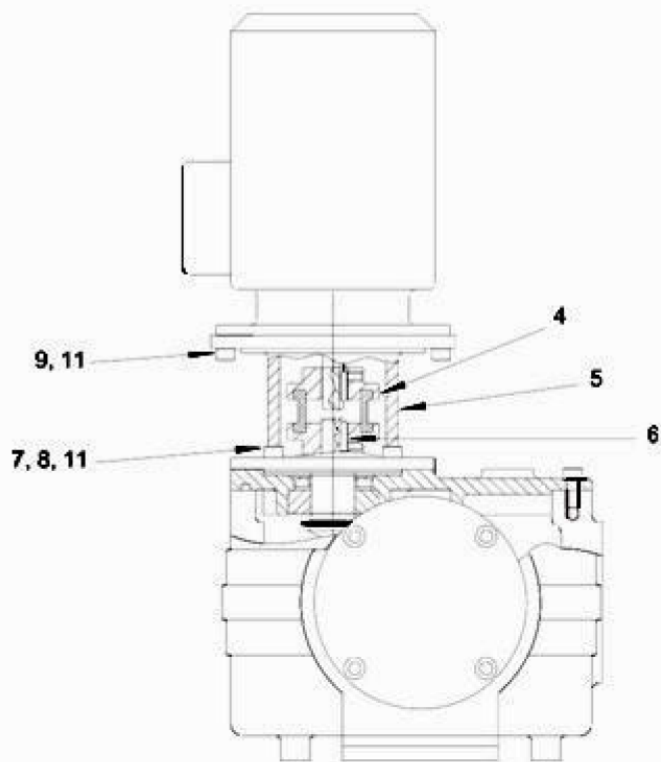
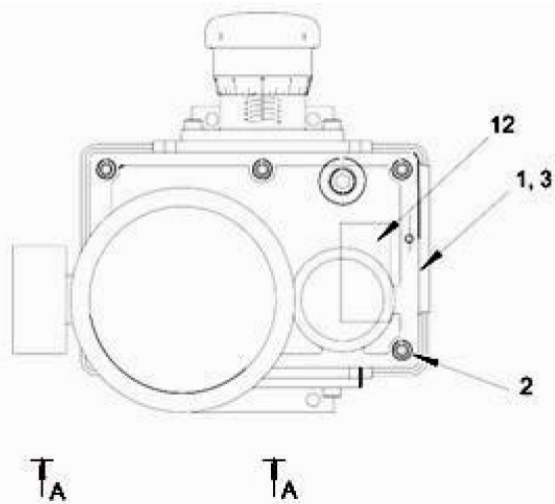
List Of Contents

Direct Drive Assembly, Simplex	440.400.00 1.01 O A&B
Pulley Drive Assembly, Simplex	440.400.00 1.020 A&B
Gearbox Assembly, Simplex	440.400.000.010 A, B, & C
Gearbox Assembly, Double Simplex	40.400.000.020 A-D
Gearbox Assembly, Duplex	40.400.000.015A-F
6p (3/8) 10mm Plunger Liquid End	RD91-6PAS
12p (3/4") 20mm Plunger Liquid End	RD91-12PAS
24p (1-1/2") 38mm Plunger Liquid End	RD91-24PAS
32p (2") 50mm Plunger Liquid End	RD91-32PAS

Dwg. No

IMPORTANT NOTE

THIS EQUIPMENT INSTRUCTION BOOK COVERS ALL MANUAL PUMP MODEL CONFIGURATIONS. THE EQUIPMENT SUPPLIED INCLUDES PARTS SPECIFIC TO MEET DUTY REQUIREMENTS. THEREFORE, IT IS ESSENTIAL THAT THE MODEL AND SERIAL NUMBER BE PROVIDED WHEN ORDERING SPARE PARTS.



KEY NO.	LEGACY PART NO.	ALT. PART NO.	QTY.	DESCRIPTION
• 1	ARQ5712	W2T367161	1	Cover, Simplex, Direct Drive
• 2	AXS3656	W2T11182	4	Scr., Cap, M8 x 20, Sock. Hd., 316SS
• 3	AXQ3743	W2T417691	A/R	Adhesive, GE Silicone RTV
• 4	AAA9542	W2T365047	1	Coupling, Sure-Flex, .625"/.625", 56C
	OR			
	U19946	W2T19457	1	Coupling, Sure-Flex, .625"/.875", 143TC
• 5	AAA9554	W2T416695	1	Support, Motor, 56C/143TC
• 6	AQC3464	W2T367147	1	Key, 3/16 Sq. x 3/4" Lg.
• 7	ARE3591	W2T367156	2	Scr. Cap, M8 x 40 Lg., Sock. Hd., 316SS
• 8	AXS3656	W2T11182	2	Scr. Cap, M8 x 20 Lg., Sock. Hd., 316SS
• 9	AAA6564	W2T10422	4	Bolt, Sock. Hd., 3/8"-16 x 1" Lg.
• 10	AHS4653	W2T11192	1	Plug, Socket, Screw, R1/2, 316SS
• 11	AAA1035	W2T11128	A/R	Anti-Seize NI Lube 771
... 12	AAA1902	W2T11026	1	Label, Nameplate, Encore 700

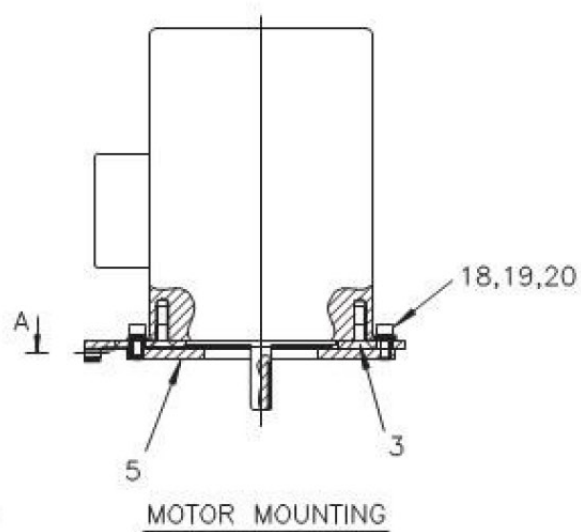
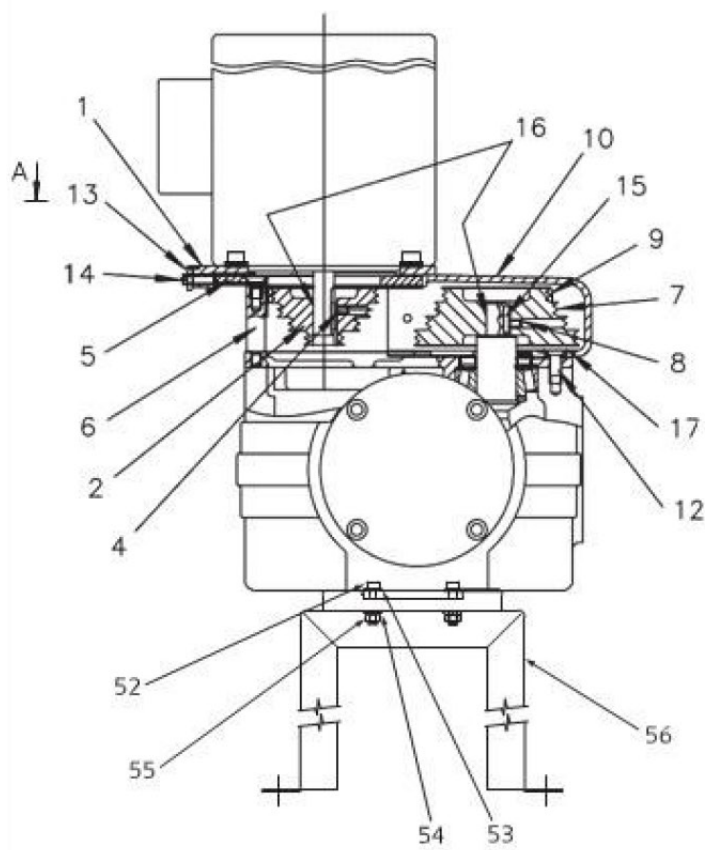
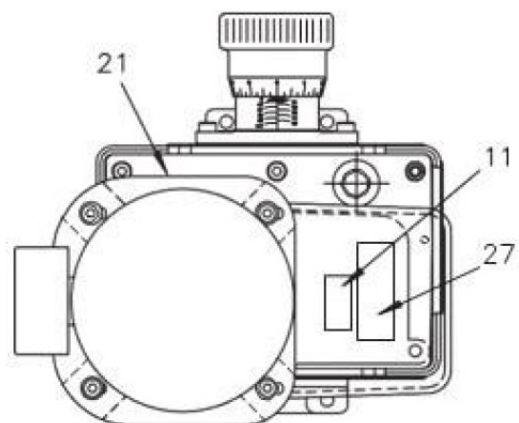
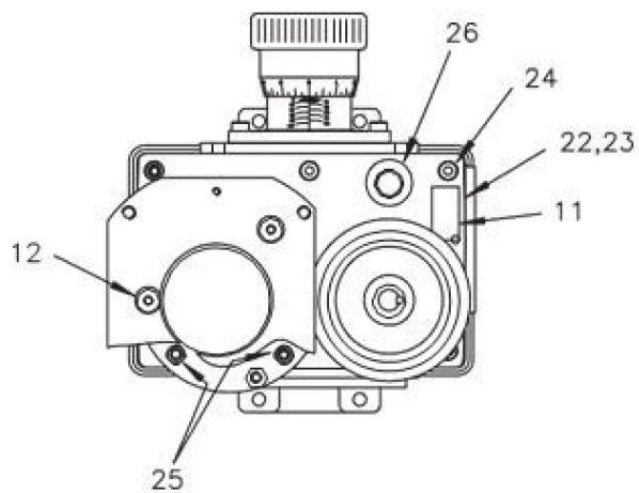
NOTE: • Part of AAA9602 (W3T99430).
• Part of API3492 (W2T417670).
... Part of AOO4751.

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

AIC3021 DIRECT DRIVE - PARTS LIST

440.400.001.010B

ISSUE 4 1-10



KEY NO.	LEGACY PART NO.	ALT. PARTNO.	QTY.	DESCRIPTION
• 1	AJA5596	W2T367023	1	Slide Plate, Motor 56C
• 2	APS3182	W2T367122	1	Pulley, Motor 56C, Double Groove
• 3	AXS3532	W2T367184	4	Screw, 3/8-16 x 3/4", Flat Head Cap
• 4	AAB2979	W2T9572	2	Screw, Set M6 x 12, Sock. Hd.
• 5	ALI3168	W2T367048	1	Stand Off Plate
• 6	AIC5131	W2T11439	3	Stand Off, Pulley Drive
• 7	AIC4746	W2T11438	1	Worm Pulley, DoubleGroove
• 8	AAB2979	W2T9572	1	Screw, Set M6 x 12 Lg.
• 9	APS4857	W2T11316	1	Joint Belt, Polyflex
• 10	AIC4085	W2T11369	1	Belt Guard
• 11	AEK3676	W2T366980	2	Label, Warning Guard
• 12	AQA3480	W2T11171	4	Scr., Flat Hd., M8 x 20, Sock., 316SS
• 13	AUK3630	W2T11170	1	Jam Nut, Hex., M8, 316SS
• 14	AAA3708	W2T10635	1	Screw, Set M8 x 25, Slotted, 316SS
• 15	AQC3464	W2T367147	1	Key, 3/16 Sq. x 3/4" Lg.
• 16	AAA1035	W2T11128	A/R	Anti-Seize NI Lubricant
• 17	AMK5576	W2T417658	1	Washer, Shoulder, Guard
• 18	AXS3577	W2T367185	4	Cap Scr., M8 x 16, Sock. Hd., 316SS
• 19	AWO5392	W2T11160	4	Washer, Flat, M8, 316SS
• 20	AXQ3226	W2T11183	4	Lock Washer, Helical, M8, 316SS
• 21	ATI3486	W2T11179	2	Cap Scr., M6 x 12, Sock. Hd., 316SS
• 22	ANI5724	W2T367083	1	Cover, Simplex Pulley Drive
• 23	AXQ3743	W2T417691	A/R	Adhesive, GE Silicone, RTV
• 24	AXS3656	W2T11182	3	Cap Scr., M8 x 20, Sock. Hd., 316SS
• 25	AXS3583	W2T11181	2	Cap Scr., M8 x 25, Sock. Hd., 316SS
• 26	APP5655	W2T11093	1	Breather Cap
... 27	AAA1902	W2T11026	1	Nameplate, Encore 700

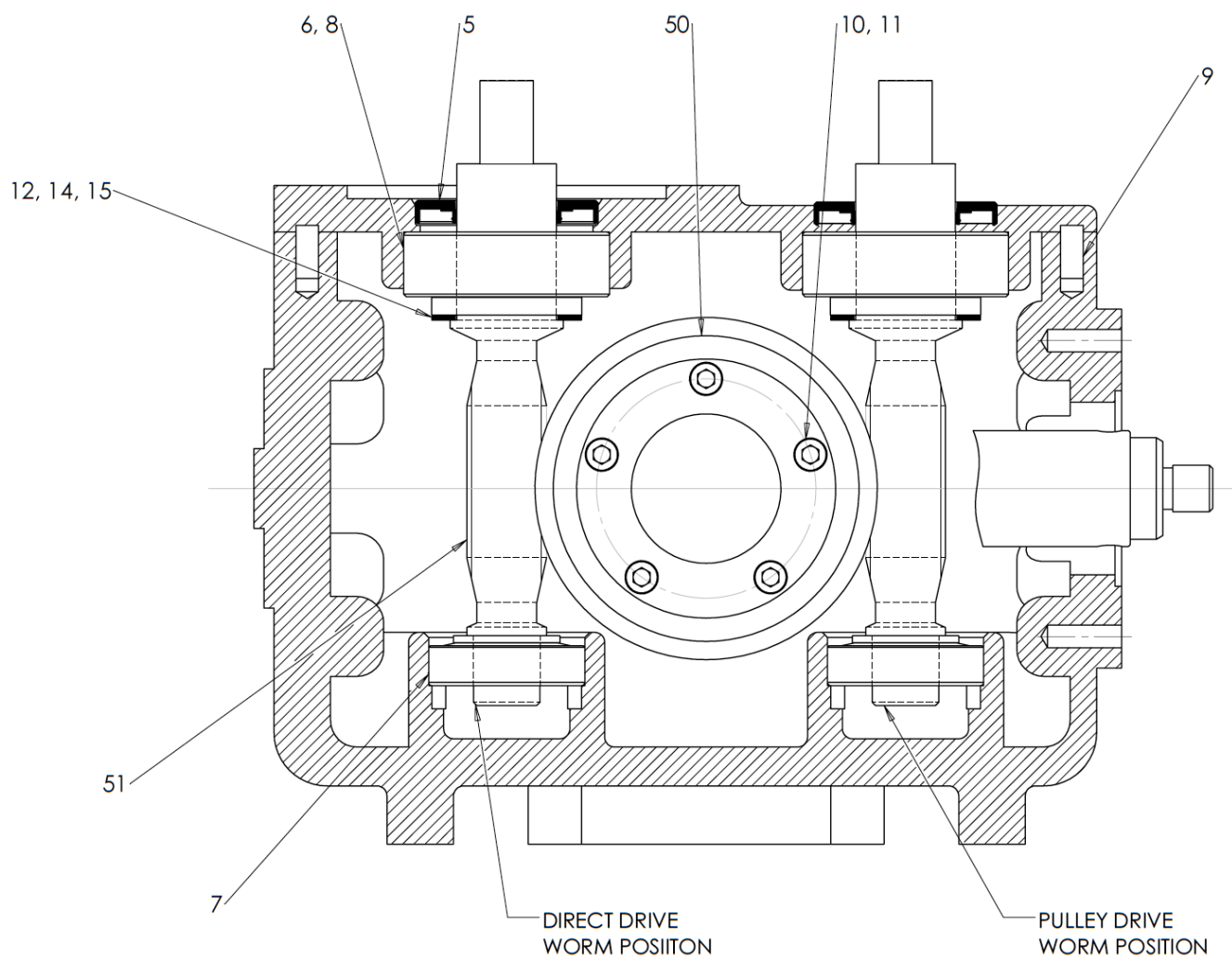
NOTE: • Part of APQ4791.
• Part of AOO4859.
... Part of AOO4751.

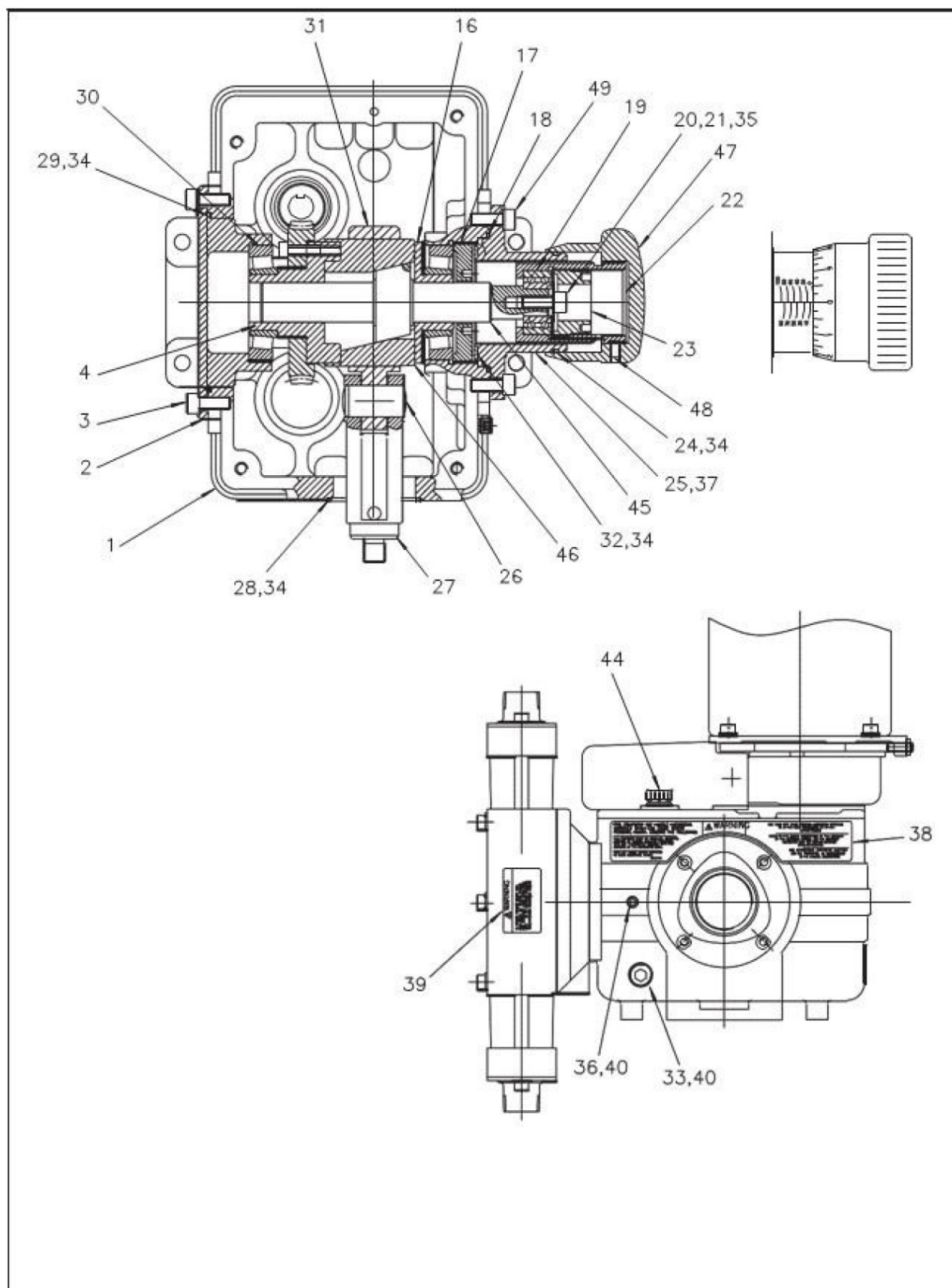
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

AKG3009 (W2T417632) PULLEY DRIVE - PARTS LIST

440.400.001.020B

ISSUE 3 2-10





SimplexGearbox Assembly
440.400.000.010C

KEY NO.	LEGACY PART NO.	ALT. PART NO.	QTY.	DESCRIPTION
• 1	APQ5142	W2T417678	1	Gearbox, Simplex
• 2	AKC5702	W2T417631	1	Flange, Gear Access, Simplex
• 3	AXS3656	W2T11182	4	Cap Scr., M8 x 20, Sock. Hd., 316SS
• 4	ANM4788	W2T417655	1	Bushing Drive, Simplex, LMAD (5" and 6-1/2" Liquid End Only)
• 5	ALI3193	W2T367049	1	Oil Seal, 30 x 55 x 7, BUNA-N
• 6	AIC4251		1	Bearing, TPRL, 30 x 62 x 21.25mm
• 7	AMG3448	W2T367066	1	Bearing, TPRL, 20 x 47 x 15.25mm
• 8	AHS4651	W2T417611	0	Grease, Sunaplex, #992EP
• 9	ATI3247	W2T417689	2	Pin, Dowel, 6 x 16, M6, Hardened
• 10	AUK3561	W2T11169	5	Cap Scr., M6 x 20, Sock. Hd., 316SS (5" and 6-1/2" Liquid End Only)
• 11	AQC3041	W2T417685	0	"Locktite" Sealant, TL-242
• 12	AAA1373	W2T11031	1	Shim (.79mm Thk.) Wormshaft
• 15	AAA1388	W2T11029	2	Shim (.13mm Thk.) Wormshaft
• 16	AIC4878	W2T417621	1	Bushing, Tail, LMAD
• 17	AKG5547	W2T417641	1	Nut, Preload
• 18	ALE4774	W2T11422	1	O-Ring, #152, BUNA-N
• 19	ARQ3426	W2T11452	5	Bearing, ANG, 17 x 40 x 17.5mm
• 20	AVM3239	W2T11162	1	Washer, Oversized OD, M8
• 21	AXS3656	W2T11182	1	Cap Scr., M8 x 20, Sock. Hd., 316SS
• 22	AIC4016	W2T11368	1	Carrier, Bearing, Str. Adj.
• 23	AJE5116	W2T11441	1	Adjuster, Bearing
• 24	AAA3920	W2T16994	1	Quad-Ring #4141, Auto
	OR			
	AQO4757	W2T11391	1	O-Ring #141 (BUNA-N) Manual
• 25	AKG4860	W2T417639	1	Housing, Stroke Adj., LMAD
• 26	ASG3256	W2T11176	1	Dowel Pin, 20 x 40mm, M8, Hardened
• 27	AJE4035	W2T367030	1	Crosshead, Diaphragm
• 28	ARQ4767	W2T11453	1	O-Ring, #138, BUNA-N
• 29	AJA4780	W2T11333	1	O-Ring, #156, BUNA-N
• 30	AMG3442	W2T11378	2	Bearing, TPRL, 35 x 72 x 18.25mm
• 31	ARQ5679	W2T417686	1	Conrod, Splex, Dplex (Mach.)
• 32	AKG4976	W2T11401	1	O-Ring, #332, BUNA-N
• 33	AHS4653	W2T11192	1	Plug, R1/2, Socket Head
• 34	AAA3791	W2T11137	0	Silicone Grease, Light
• 35	AQC3041	W2T417685	0	"Locktite" Sealant, TL-242
• 36	AAC4634	W2T416779	1	Plug, Socket, Screw R1/8, 316SS
• 37	AOO4043	W2T11392	1	Label, Str. Adj., LMAD
• 38	AAA3769	W2T11314	1	Warning Label, Gearbox
• 39	AAA3759	W2T11313	1	Warning Label, Liquid End
• 40	E942	W2T409235	0	Tape, Thread Sealant
• 41	AAA3726		1	Label, Data plate, LMAD
• 43	AAA1902	W2T11026	1	Label, Nameplate, Encore 700

NOTE: e PART OF AOO4751 • PART OF AJE4758 • PART OF ANM4767
0 PART OF AAA9593 D PART OF AAA9596 PART OF APQ4775
(W3T108130) (W3T110122)
PART OF AAA9599 PART OF AIC3164 PART OF AAA9590
(W3T108131) (W3T108129)

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

ANM4784 ENCORE® 700 METERING PUMP - PARTS LIST

Simplex Gearbox Assembly

440.400.000.010C

ISSUE 4 1-10

KEY NO.	LEGACY PART NO.	ALT. PART NO.	QTY.	DESCRIPTION
• 44	APP5655	W2T11093	1	Breather Cap
45	☐ APS4845	W2T417684	1	Shaft, Eccentric, 4.8mm Stroke (1-3/8" & 2" Liquid End Only)
	OR			
	• ALI4852	W2T11404	1	Shaft, Eccentric, 9.6mm Stroke
46	☐ AIA4800	W2T417615	1	Sheave, 4.8mm Stroke (1-3/8" & 2" Liquid End Only)
	OR			
	• AIA4795	W2T11341	1	Sheave, 9.6mm Stroke
... 47	ANI4750	W2T10695	1	Knob, Str., Adj., LMAD (Mach.), Manual
	OR			
	AJA3455	W2T367021	1	Knob, Str., Adj., Auto
... 48	AAA2382	W2T11020	3	Scr., Set, M6 x 10, Flat, Skt., Nyl., 316
... 49	AXS3656	W2T11182	4	Cap., Scr., M8 x 20, Sock. Hd., 316SS
50	• ASS3183	W2T417687	1	Drive Gear, Worm, Ratio 10 (144 SPM @ 50Hz) (5" & 6-1/2" Liquid End Only)
	OR			
	☐ AOK3192	W2T11323	1	Drive Gear, Worm, Ratio 12 (144 SPM) (5" & 6-1/2" Liquid End Only)
	OR			
	☐ ARQ3199	W2T11264	1	Drive Gear, Worm, Ratio 24 (72 SPM) (5" & 6-1/2" Liquid End Only)
	OR			
	• AKC3205	W2T11269	1	Drive Gear, Worm, Ratio 48 (36 SPM) (5" & 6-1/2" Liquid End Only)
	OR			
	AAC5597	W2T416795	1	Drive Gear, Worm, Ratio 10 (144 SPM @ 50Hz) (1-3/8", 2", 3" & 4" Liquid End Only)
	OR			
	AAC5831	W2T8583	1	Drive Gear, Worm, Ratio 12 (144 SPM @ 60Hz) (1-3/8", 2", 3" & 4" Liquid End Only)
	OR			
	AAC5834	W2T8581	1	Drive Gear, Worm, Ratio 24 (72 SPM) (1-3/8", 2", 3" & 4" Liquid End Only)
	OR			
	AAC5837	W2T8582	1	Drive Gear, Worm, Ratio 48 (36 SPM) (1-3/8", 2", 3" & 4" Liquid End Only)
51	• AAA9530	W2T416692	1	Worm Shaft, Ratio 10 (144 SPM @ 50Hz)
	OR			
	☐ AAA9533	W2T10250	1	Worm Shaft, Ratio 12 (144 SPM @ 60Hz)
	OR			
	☐ AAA9536	W2T10251	1	Worm Shaft, Ratio 24 (72 SPM)
	OR			
	• AAA9539	W2T10252	1	Worm Shaft, Ratio 48 (36 SPM)
52	ARE3591	W2T367156	4	Scr. Cap, M8 x 40, Soc. Hd., 316SS
53	AWO5392	W2T11160	4	Washer, Flat, M8, 316SS
54	AXQ3226	W2T11183	4	Lockwasher, M8, 316SS
55	AAA1698	W2T8462	4	Nut, M8, 316SS
56	AAC7619	W2T8262	1	Metal Base, 1-3/8", 2", 3", 4" & 5" Head (Includes Key No.'s 52, 53, 54 & 55)
	OR			
	AAC7622	W2T365189	1	Metal Base, 6-1/2" Head (Includes Key No.'s 52, 53, 54 & 55)

NOTE: e PART OF AOO4751
0 PART OF AAA9593 (W3T108130)
PART OF AAA9599 (W3T108131)

• PART OF AJE4758
D PART OF AAA9596 (W3T110122)
PART OF AIC3164

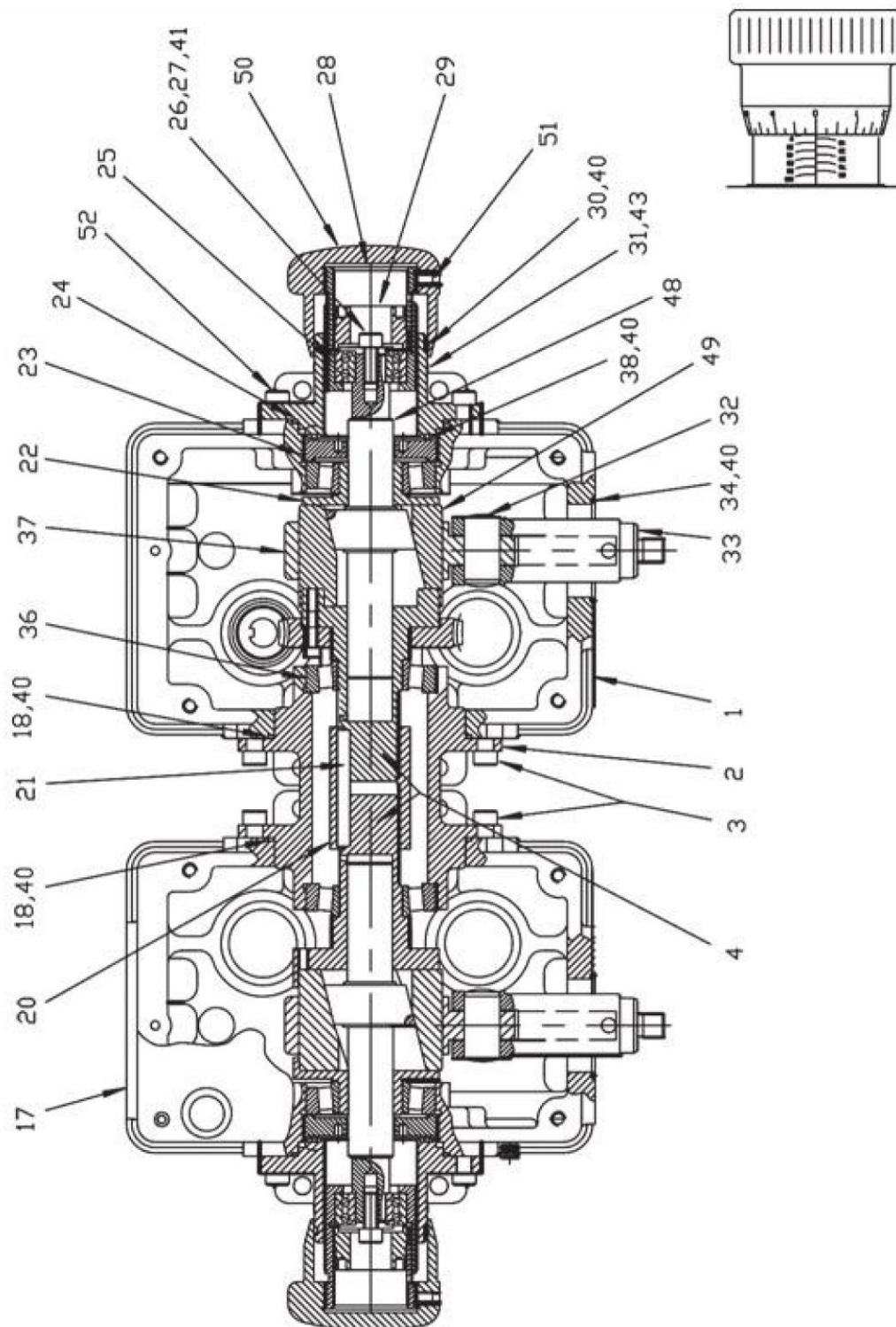
• PART OF ANM4767
PART OF APQ4775
PART OF AAA9590 (W3T108129)

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

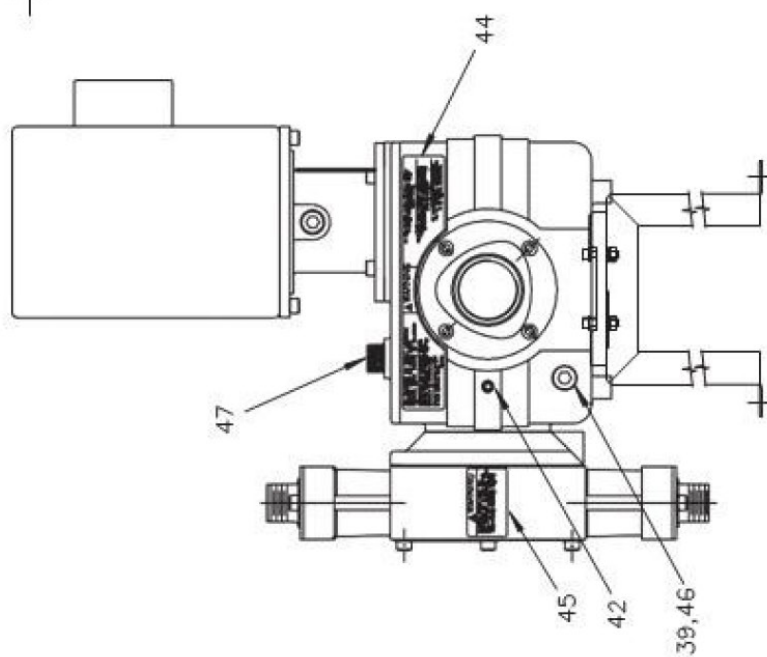
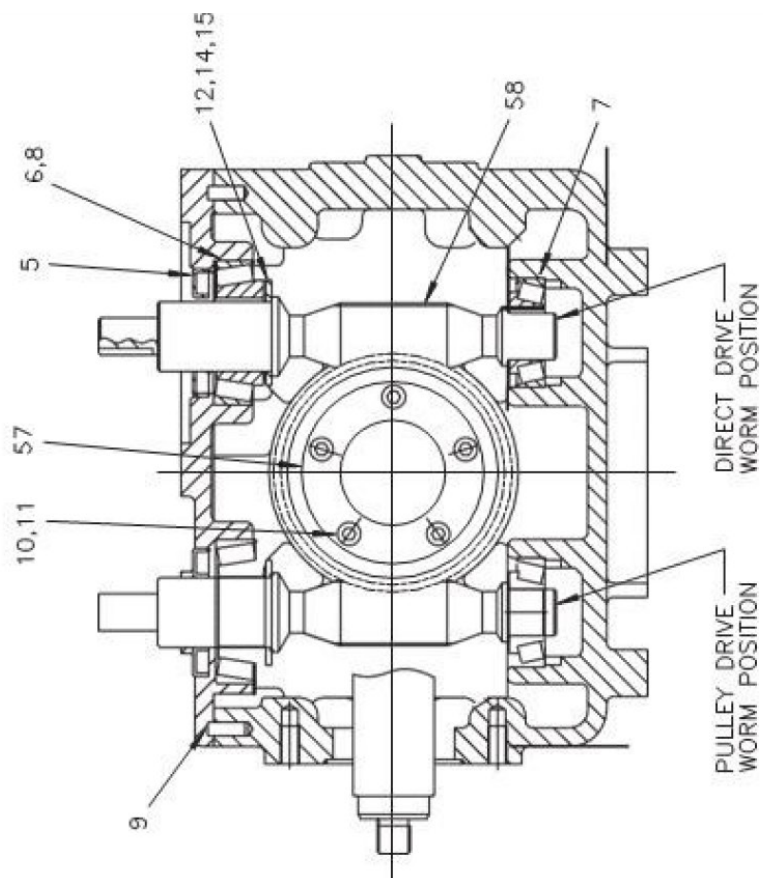
ANM4784 ENCORE® 700 METERING PUMP - PARTS LIST Simplex Gearbox Assembly

440.400.000.010D

ISSUE 5 1-10



Double SimplexGearbox Assembly
440.400.000.020A



Double Simplex Gearbox Assembly
440.400.000.020B

KEY NO.	LEGACY PART NO.	ALT. PART NO.	QTY.	DESCRIPTION
• 1	APQ5142	W2T417678	1	Gearbox, Simplex
• 2	AJA5697	W2T417624	1	Connection, DSplex,
• 3	AXS3656	W2T11182	8	Cap Scr., M8 x 20, Sock. Hd., 316SS
• 4	AKG4783		2	Bushing Drive, DSplex (5" and 6-1/2" Liquid End Only)
• 5	ALI3193	W2T367049	1	Oil Seal, 30 x 55 x 7, BUNA
• 6	AIC4251	W2T367014	1	Bearing, TPRL, 30 x 62 x 21.25mm
• 7	AMG3448	W2T367066	1	Bearing, TPRL, 20 x 47 x 15.25mm
8	AHS4651	W2T417611	0	Grease, Sunaplex, #992 EP
• 9	ATI3247	W2T417689	2	Dowel Pin, 6 x 16, M6
10	AQC3041	W2T417685	0	"Locktite" Sealant, TL-242
• 11	AUK3561	W2T11169	5	Scr. Cap, M6 x 20, Sock. Hd., 316SS
• 12	AAA1373	W2T11031	1	Shim (.79mm Thick)
• 15	AAA1388	W2T11029	2	Shim (.13mm Thick)
• 17	ALI5148	W2T417649	1	Gearbox, Double Simplex
• 18	AJA4780	W2T11333	2	O-Ring (156) BUNA-N
• 20	AMK4076	W2T417656	1	Coupling, Rigid, DSplex
• 21	ATI3361		1	Key, 8 x 7/63
• 22	AIC4878	W2T417621	2	Tail Bushing
• 23	AKG5547	W2T417641	2	Preload Nut
• 24	ALE4774	W2T11422	2	O-Ring (152) BUNA-N
• 25	ARQ3426	W2T11452	2	Bearing, Angc, 17 x 40 x 17.5
• 26	AVM3239	W2T11162	2	Washer, Oversized OD, M8
• 27	AXS3656	W2T11182	2	Cap Scr., M8 x 20, Sock. Hd., 316SS
• 28	AIC4016	W2T11368	2	Carrier, Bearing
• 29	AJE5116	W2T11441	2	Adjuster, Bearing
• 30	AAA3920	W2T10994	2	Quad-Ring #4141, Auto
	OR			
	AQO4757	W2T11391	2	O-Ring (141) BUNA-N, Manual
• 31	AKG4860	W2T417639	2	Housing
• 32	ASG3256	W2T11176	2	Dowel Pin, 20 x 40mm, M6
• 33	AJE4035	W2T367030	2	Crosshead, Diaphragm
• 34	ARQ4767	W2T11453	2	O-Ring (138) BUNA-N
• 36	AMG3442	W2T11378	4	Bearing, TPRL, 35 x 72 x 18.25
• 37	ARQ5679	W2T417686	2	Conrod
• 38	AKG4976	W2T11401	2	O-Ring (332) BUNA-N
• 39	AHS4653	W2T11192	2	Plug, R1/2 Socket Head
40	AAA3797	W2T11137	0	Silicone Grease, Light
• 42	AAC4634	W2T416779	2	Plug, Socket, Screw R1/8, 316SS
• 43	AOO4043	W2T11392	2	Label, Str. Adj.
• 44	AAA3769	W2T11314	2	Warning Label
• 45	AAA3759	W2T11313	2	Warning Label
t 47	APP5655	W2T11093	2	Breather Cap







NOTES: • PART OF AAA4385 e PART OF AOO4751
PART OF AAA4394

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

AAA1445 ENCORE® 700 METERING PUMP - PARTS LIST
Double Simplex Gearbox Assembly

440.400.000.020C

ISSUE 5 1-10

KEY NO.	LEGACY PART NO.	ALT. PART NO.	QTY.	DESCRIPTION
48	 APS4845 OR	W2T417684	2*	Shaft, Eccentric, 4.8mm Stroke
	• ALI4852	W2T11404	2*	Shaft, Eccentric, 9.6mm Stroke
49	 AIA4800 OR	W2T417615	2*	Sheave, 4.8mm Stroke
	• AIA4795	W2T11341	2*	Sheave, 9.6mm Stroke
... 50	ANI4750 OR	W2T10695	2	Knob, Str., Manual
	AJA3455	W2T367021	2	Knob, Str., Adj., Auto
... 51	AAA2382	W2T11020	6	Scr., Set, M6 x 10, Flat, Skt., Nyl., 316
... 52	AXS3656	W2T11182	8	Cap., Scr., M8 x 20, Sock. Hd., 316SS
57	ASS3183 OR	W2T417687	1	Drive Gear, Worm, Ratio 10 (144 SPM @ 50Hz) (5" & 6" Liquid End Only)
	 AOK3192 OR	W2T11323	1	Drive Gear, Worm, Ratio 12 (144 SPM) (5" & 6" Liquid End Only)
	 ARQ3199 OR	W2T11264	1	Drive Gear, Worm, Ratio 24 (72 SPM) (5" & 6" Liquid End Only)
	T AKC3205 OR	W2T11269	1	Drive Gear, Worm, Ratio 48 (36 SPM) (5" & 6" Liquid End Only)
	AAC5591 OR	W2T416795	1	Drive Gear, Worm, Ratio 10 (144 SPM @ 50Hz) (1-3/8", 2", 3" & 4" Liquid End Only)
	AAC5840 OR	W2T8583	1	Drive Gear, Worm, Ratio 12 (144 SPM @ 60Hz) (1-3/8", 2", 3" & 4" Liquid End Only)
	AAC5843 OR	W2T8581	1	Drive Gear, Worm, Ratio 24 (72 SPM @ 60Hz) (1-3/8", 2", 3" & 4" Liquid End Only)
	AAC5846	W2T8582	1	Drive Gear, Worm, Ratio 48 (36 SPM @ 60Hz) (1-3/8", 2", 3" & 4" Liquid End Only)
58	AAA9530 OR	W2T416692	1	Worm Shaft, Ratio 10 (144 SPM @ 50Hz)
	 AAA9533 OR	W2T10250	1	Worm Shaft, Ratio 12 (144 SPM @ 60Hz)
	 AAA9536 OR	W2T10251	1	Worm Shaft, Ratio 24 (72 SPM)
	T AAA9539	W2T10252	1	Worm Shaft, Ratio 48 (36 SPM)

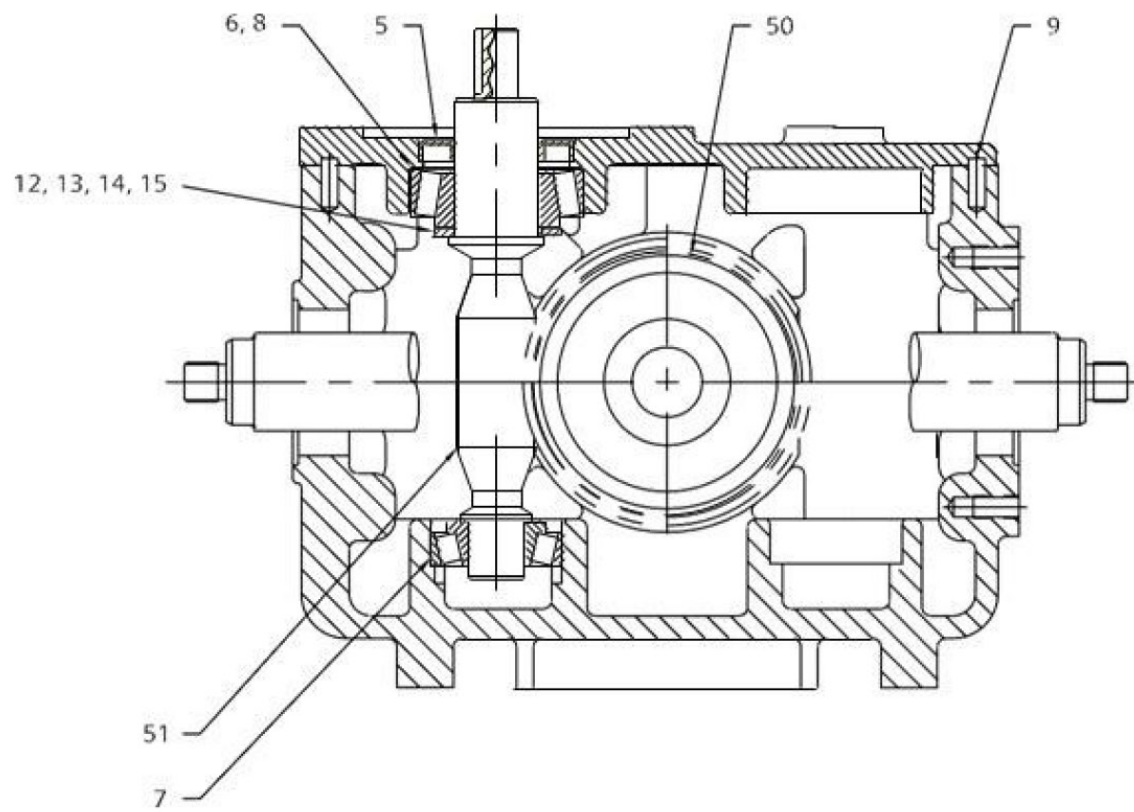
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e PART OF AOO4751 • PART OF ANM4767 D PART OF AJE4411
PART OF AAA4394 PART OF APQ4775 PART OF APS4684

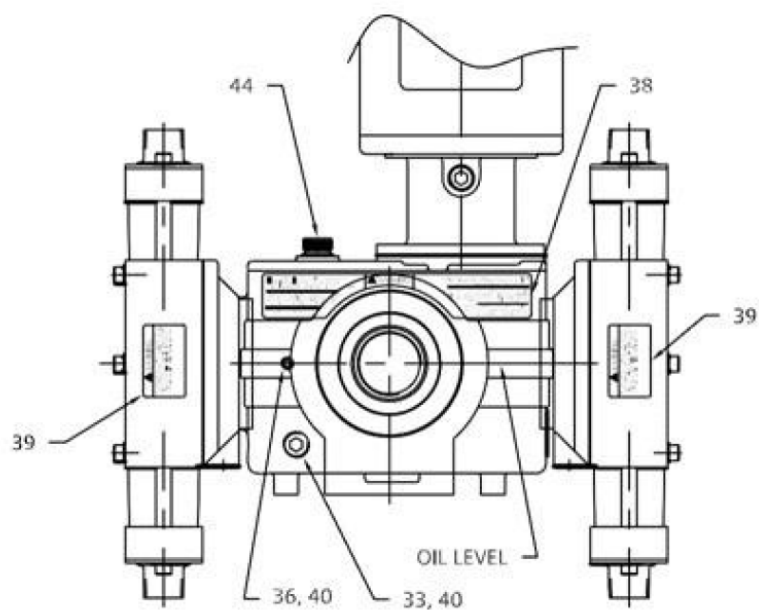
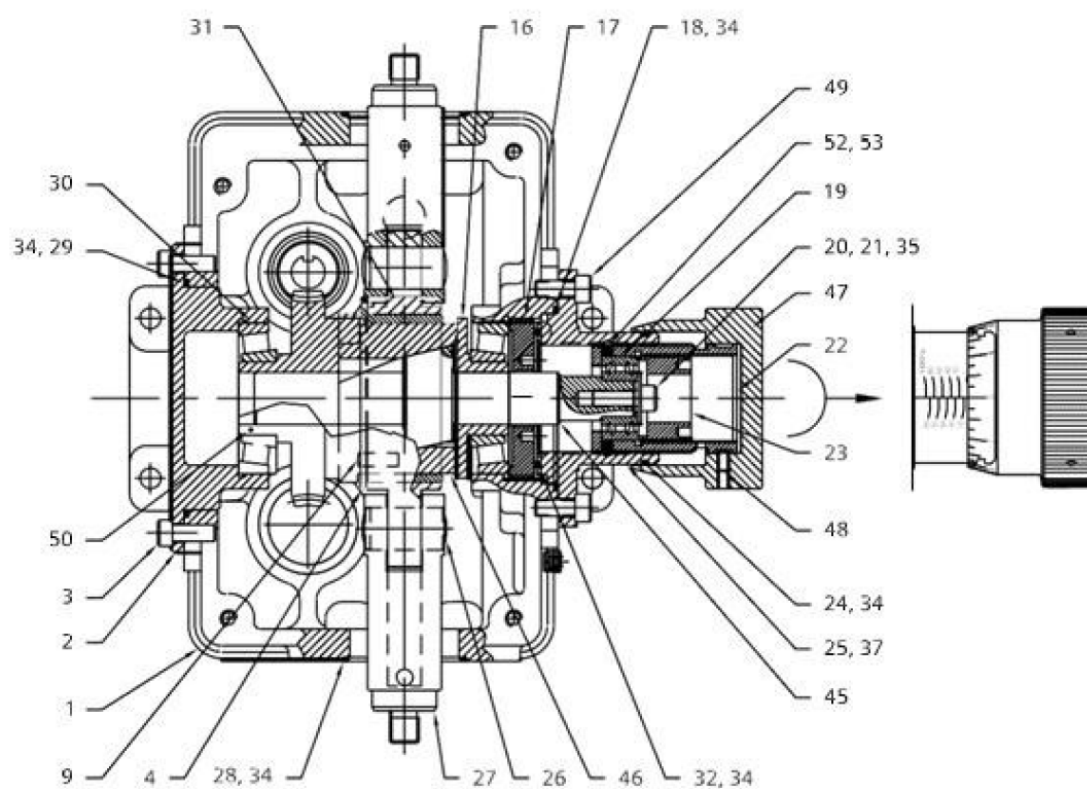
* TWO REQUIRED; MAY BE A COMBINATION OF ONE 4.8 MM STROKE AND ONE 9.6 MM STROKE. 1-3/8" AND 2" HEADS REQUIRE A 4.8 MM STROKE. 3", 4", 5", AND 6-1/2" HEADS REQUIRE A 9.6 MM STROKE. ECCENTRIC SHAFT AND SHEAVE MUST HAVE THE SAME STROKE.

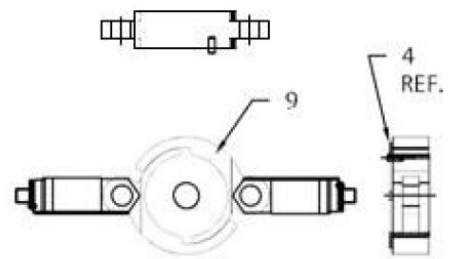
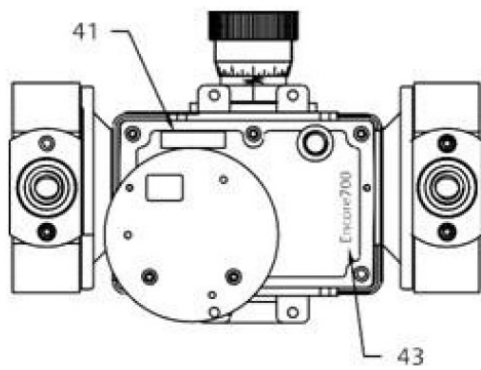
WHEN ORDERING MATERIAL, ALWAYS SPECIFY MODEL AND SERIAL NUMBER OF APPARATUS.

AAA1445 ENCORE® 700 METERING PUMP - PARTS LIST
Double Simplex Gearbox Assembly

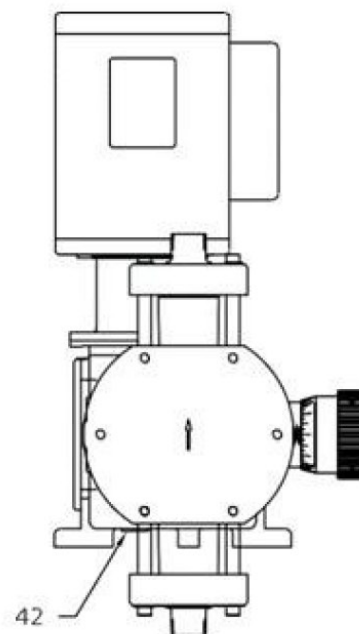
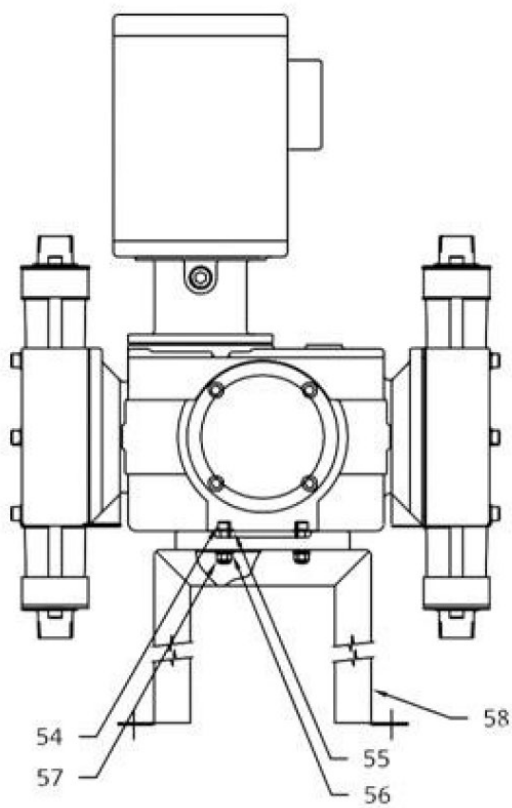
440.400.000.020D
ISSUE 5 1-10







CONNECTION RODS
& PIN LOCATION ASSY



KEY NO.	PART NO.	QTY.	DESCRIPTION
■ 1	AMK5154	1	GEARBOX, DUPLEX
■ 2	AKC5702	1	FLANGE, GEAR ACCESS, SIMPLEX
■ 3	AXS3656	4	CAP SCR., M8 x 20, SOCK. HD., 316SS
● 4	AAC8243	1	BUSHING, DUPLEX, CONN. ROD
■ 5	ALI3193	1	OILSEAL, 30x55x7, BUNA-N
■ 6	AIC4251	1	BEARING, TPRL, 30x62x21.25MM
■ 7	AMG3448	1	BEARING, TPRL, 20x47x15.25MM
■ 8	AHS4651	0	GREASE, SUNAPLEX, #992EP
■ 9	ATI3247	3	PIN, DOWEL, 6x16, M6, HARDENED
■ 12	AAA1373	1	SHIM (.79MM THK.) WORMSHAFT
■ 13	AAA1370	1	SHIM (2.3MM THK.) WORMSHAFT
■ 14	AAA1376	1	SHIM (3.18MM THK.) WORMSHAFT
■ 15	AAA1388	2	SHIM (.13MM THK.) WORMSHAFT
● 16	AIC4878	1	BUSHING, TAIL
● 17	AKG5547	1	NUT, PRELOAD
● 18	ALE4774	1	O-RING, #152, BUNA-N
● 19	ARQ3426	1	BEARING, ANG, 17 x 40 x 17.5MM
● 20	AVM3239	1	WASHER, OVERSIZED OD, M8
● 21	AXS3656	1	CAP SCR., M8 x 20, SOCK. HD., 316SS
● 22	AIC4016	1	CARRIER, BEARING STR. ADJ.
● 23	AJE5116	1	ADJUSTER, BEARING
● 24	AAA9644	1	O-RING, 58MM x 3MM, BUNA-N
	OR		
	AQO4757	1	O-RING #141 (BUNA-N) WITH DETENT STROKE MECHANISM
● 25	AKG4860	1	HOUSING, STROKE ADJ., LMAD
● 26	ASG3256	2	DOWEL PIN, 20x40MM, M8, HARDENED
● 27	AJE4035	2	CROSSHEAD, DIAPHRAGM
● 28	ARQ4767	1	O-RING, #138, BUNA-N
● 29	AJA4780	1	O-RING, #156, BUNA-N
● 30	AMG3442	2	BEARING, TPRL., 35x72x18.25MM
● 31	AAC8240	2	CONROD, DUPLEX (MACH.)
● 32	AKG4976	1	O-RING, #332, BUNA-N
● 33	AHS4653	1	PLUG, R1/2, SOCKET HEAD
● 34	AAA3797	0	SILICONE GREASE, LIGHT

NOTE: ● PART OF AAC8231 ■ PART OF AAC8228 ◆ PART OF AAC8234
○ PART OF AAA9593 □ PART OF AAA9596 ❖ PART OF AAC8237
▼ PART OF AAA9599 ▲ PART OF AIC3164 ◐ PART OF AAA9590

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

Encore® 700 METERING PUMP - PARTS LIST
Duplex Gearbox Assembly

440.400.000.015D
ISSUE 0 02-06

KEY NO.	PART NO.	QTY.	DESCRIPTION
● 35	AQC3041	0	"LOCKTITE" SEALANT, TL-242
● 36	AAC4634	1	PLUG, SOCKET, SCREWR 1/8, 316SS
● 37	AOO4043	1	LABEL, STR. ADJ., LMAD
● 38	AAA3769	1	WARNING LABEL, GEARBOX
● 39	AAA3759	2	WARNING LABEL, LIQUID END
● 40	E942	0	TAPE, THREAD SEALANT
● 41	AAA3726	1	LABEL, DATA PLATE
● 42	AAA2499	1	LABEL, ASSEMBLED IN MEXICO
● 43	AAA1902	1	LABEL, NAMEPLATE, Encore® 700
● 44	APP5655	1	BREATHING CAP
45	◆ APS4845	1	SHAFT, ECCENTRIC, 4.8MM STROKE (1-3/8" & 2" SIZES ONLY)
	OR		
	❖ ALI4582	1	SHAFT, ECCENTRIC, 9.6MM STROKE
46	◆ AAC8249	1	SHEAVE, 4.8MM STROKE, (1-3/8" & 2" SIZES ONLY)
	OR		
	❖ AAC8246	1	SHEAVE, 9.6MM STROKE
▲ 47	ANI4750	1	KNOB, STR. ADJ., (MACH.)
▲ 48	AAA2382	3	SCR., SET, M6x10, FLAT, SKT., NYL., 316
▲ 49	AXS3656	4	CAP SCR., M8 x 20, SOCK. HD., 316SS
50	▶ AAC5597	1	DRIVE BUSHING, RATIO 10 (144 SPM @ 50Hz)
	OR		
	○ AAC5831	1	DRIVE BUSHING, RATIO 12 (144 SPM)
	OR		
	□ AAC5834	1	DRIVE BUSHING, RATIO 24 (72 SPM)
	OR		
	▼ AAC5837	1	DRIVE BUSHING, RATIO 48 (36 SPM)
51	▶ AAA9530	1	WORM, SHAFT, RATIO 10 (142 SPM @ 50Hz)
	OR		
	○ AAA9533	1	WORM, SHAFT, RATIO 12
	OR		
	□ AAA9536	1	WORM, SHAFT, RATIO 24
	OR		
	▼ AAA9539	1	WORM, SHAFT, RATIO 48

NOTE: ● PART OF AAC8231 ■ PART OF AAC8228 ◆ PART OF AAC8234
○ PART OF AAA9593 □ PART OF AAA9596 ❖ PART OF AAC8237
▼ PART OF AAA9599 ▲ PART OF AIC3164 ▶ PART OF AAA9590

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

Encore® 700 METERING PUMP - PARTS LIST
Duplex Gearbox Assembly

440.400.000.015E
ISSUE 0 2-06

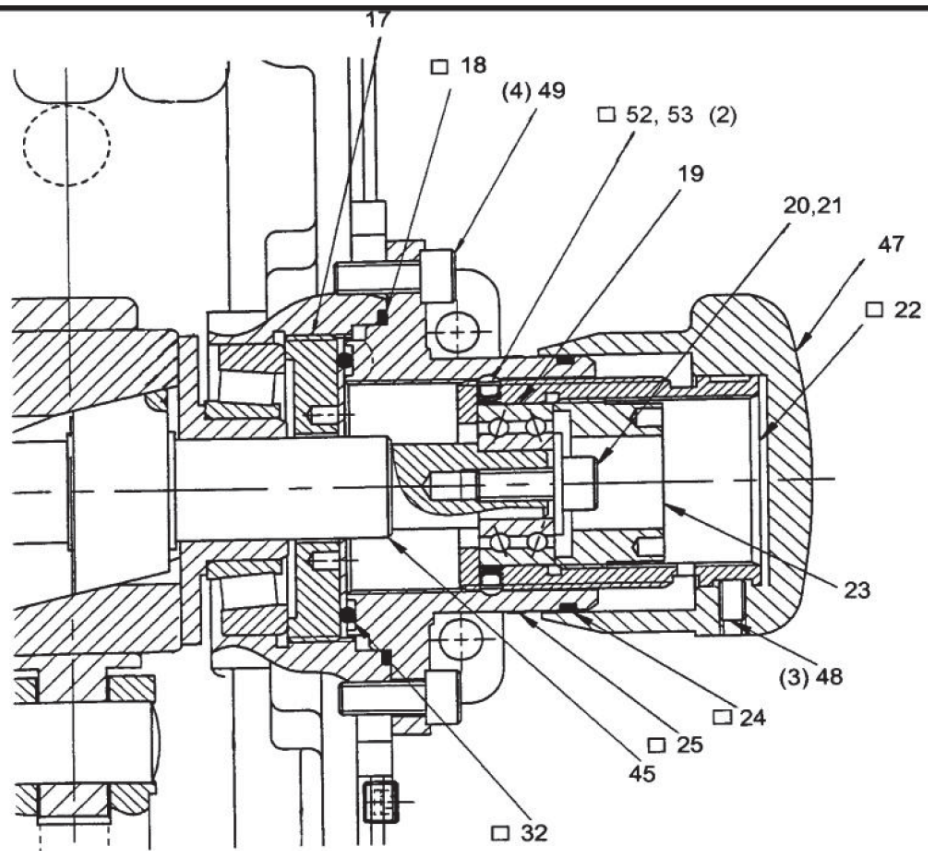
KEYNO.	PART NO.	QTY.	DESCRIPTION
52	AAB5789	2	PAWL, DETENT
53	AAB5786	2	SPRING, DETENT
54	ARE3591	4	SCR. CAP, M8x40 SOC., HD., 316SS
55	AWO5392	4	WASHER, FLAT, M8, 316SS
56	AXQ3226	4	LOCKWASHER, M8, 316SS
57	AAA1698	4	NUT, M8, 316SS
58	AAC7625	1	METALBASE, Encore®700, 1-3/8", 2", 3", 4", & 5" HEAD
	OR		
	AAC8231	1	METALBASE, Encore®700, 6-1/2" HEAD

NOTE: ● PART OF AAC8231 ■ PART OF AAC8228 ◆ PART OF AAC8234
○ PART OF AAA9593 □ PART OF AAA9596 ❖ PART OF AAC8237
▼ PART OF AAA9599 ▲ PART OF AIC3164 ◐ PART OF AAA9590

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

Encore® 700 METERING PUMP - PARTS LIST
Duplex Gearbox Assembly

440.400.000.015F
ISSUE 0_02-06



KEY NO.	LEGACY PART NO.	ALT PART NO.	QTY.	DESCRIPTION
17	AKG5547	W2T417641	1	NUT, PRELOAD
D 18	ALE4774	W2T11422	1	O-RING (#152) BUNA-N
19	ARQ3426	W2T11452	1	BEARING, 17 x 40 x 17.5MM
20	AVM3239	W2T11162	1	WASHER, OVERSIZED OD, M8
21	AXS3656	W2T11182	1	CAP SCR. M8 x 20, SOC. HD.
D 22	AIC4016	W2T11368	1	CARRIER BEARING, STR. ADJ.
23	AJE5116	W2T11441	1	ADJUSTER, BEARING
D 24	AQO4757	W2T11391	1	O-RING (#141) BUNA-N
D 25	AAB5783	W2T416736	1	HOUSING, STR. ADJ., LABELED
D 32	AKG4976	W2T11401	1	O-RING (#332) BUNA-N
45	ALI4852	W2T11404	1	ECCENTRIC SHAFT, 9.6MM STROKE
	OR			
	APS4845	W2T417684	1	ECCENTRIC SHAFT, 4.8MM STROKE
47	ANI4750	W2T10695	1	KNOB
48	AAA2382	W2T11020	3	SET SCR. M6 x 10, "NYLOK"
49	AXS3656	W2T11182	4	CAP SCR. M8 x 20, SOC. HD.
D 52	AAB5789	W2T9614	2	PAWL, DETENT
D 53	AAB5786	W2T9613	2	SPRING, DETENT

NOTE: ☞ INDICATES PARTS FURNISHED IN KIT.

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

AAB5792 (W2T9612) DETENT STROKE ADJUSTMENT KIT - PARTS

Common to Simplex and Double Simplex

440.400.000.030

ISSUE 1 1-10

Plunger Liquid End Supplement

Plunger-Type Liquid End

The plunger-type liquid end is shown as a sectioned view at Fig.1, 2, 3, or 4. As full details of construction are shown, a written procedure for dismantling and assembling is not necessary.

1 Servicing Notes

The following notes should be studied before dismantling or servicing the liquid end.

CAUTION:

- (a)) removing after pumping a hazardous liquid, exercise care to avoid contact with the liquid.
- (b) If removing the crosshead guide from the pump movement, the crankcase oil must first be drained.
- (c) The liquid end is disconnected from the pump movement by unscrewing the locknut securing the plunger to the crosshead and then removing the pump head from the crosshead guide by unscrewing the cap screws.
- (d) On a duplex pump, one crosshead guide must be removed from the crankcase to permit withdrawal of the con-rods after removal of the stroke adjustment mechanism.
- (e) If the crosshead guide is separated from the pump movement, examine the bellow seal for damage or sign of oil leakage.
- (f) If the valves have been removed for inspection or replacement, it is essential that they are refitted as shown in Fig. 1, 2, 3 or 4.
- (g) If a faulty valve seat is causing loss of pumping efficiency, it can be reversed so that the ball will be in contact with the seat on the opposite side.
- (h) If the plunger is found to be worn or damaged, fit a replacement and also replace gland packing and neck rings. O-ring joint seal in valves is achieved by metal to-metal contact. Ensure the assembly is tightened adequately

1.2 Gland Packing

Three gland packing arrangements are available for the plunger. The material of the gland packing is P.T.F.E. glass. Common to all gland packing is a 'neck ring' which is fitted at the closed end of the stuffing box to prevent extrusion of the packing and support the weight of the plunger. In some instances, a second neck ring is fitted at the open end of the stuffing box.

Some applications require the use of a lantern ring to facilitate greasing, or cleansing fluid flush wash.

It should be noted that a small degree of gland leakage is permissible and often necessary to prolong the working life of the packing. The amount of permissible leakage should be controlled to a level that will not affect the metering accuracy of the pump, But provision should be made to drain away the drips. When fitting new gland packing, apply silicone grease, or that recommended in Table 2. It is suggested that at least one spare set of gland packing be held in stock.

- (1) 'Chevron' self-sealing Chevron packing reacts to the liquid pressure by expanding against the stuffing box bore and plunger on each pressure stroke. When fitting new seals the gland nut should only require a small degree of tightening, otherwise the packing should be replaced.
- (2) Lantern rings. If grease is being used, take care only to use a type which is compatible with the liquid being pumped; a fraction of a turn of the greaser every month should be sufficient. For fluid flush, connect inlet supply to bottom connection and outlet to top connection (1/8" BSP taper). Flow should be sufficient to provide approximately 1 millilitre per minute at outlet to drain (one drop / minute).

2 Fault Finding

2.1 Failure to Deliver

Cause	Remedy
Supply tank empty or flow is too low.	Check level in supply tank. Disconnect suction line from pump and check rate of flow – should be at least 3 X the maximum capacity of pump.
Pump stroke too short or set to zero. Closed valves in suction or discharge pipelines	Reset stroke. Open valves,
Dirty strainer (if fitted).	Clean strainer.
Pipelines and / or strainer too small.	Refer to selection chart.
Ingress of air in suction pipeline.	Check all connections.
Damaged drive mechanism.	Remove crankcase cover and check that pump con-rod is reciprocating.
Pump insufficiently primed.	Refer to InstructionManual.
Suction and discharge valves blocked, worn, or incorrectly seated	Refer to InstructionManual.
Discharge pressure too high for relief valve.	Reset relief valve to 25% above maximum working pressure.
Diaphragm damaged.	Inspect diaphragm.
Insufficient net positive suction head.	Increase NPSH.

2.2 Inaccurate Metering

Proceed as Section 2.1 paying particular attention to the condition of the valves.

2.3 Stroke Control Mechanism Locked

Cause	Remedy
Insufficient lubrication	Check oil level in crankcase. If dry, it may be necessary to dismantle the pump movement - Refer to text.

2.4 Crankcase Noisy and / or Hot Whilst Running

Cause	Remedy
Insufficient lubrication. Worm / Worm wheel worn.	Check oil level in crankcase. Replace the worm / worm wheel. Refer to text.

2.5 Knocking or Hammering in Pipeline

This is known as 'hydraulic hammer' and it is essential that it be eliminated as soon as possible, or damage to both the pipeline and the pump may follow.

Cause	Remedy
Shock waves being set up by long column of liquid being alternatively accelerated and halted by action of pump. Occurs especially when pump is delivering against considerable pressure.	Fit an air vessel or hydro pneumatic accumulator in discharge pipe line. Refer to text.

2.6 Overfeeding

The pump delivers more than 100% volumetric capacity and is therefore not capable of metering.

Cause	Remedy
Velocity of liquid in suction and discharge lines too high.	Increase bore of pipelines and / or shorten in length - or fit air vessel or hydro-pneumatic accumulator
Differential head too small.	Fit a back pressure valve to increase differential head.

8 7 6 5 4 3 2 1

F

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C

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A

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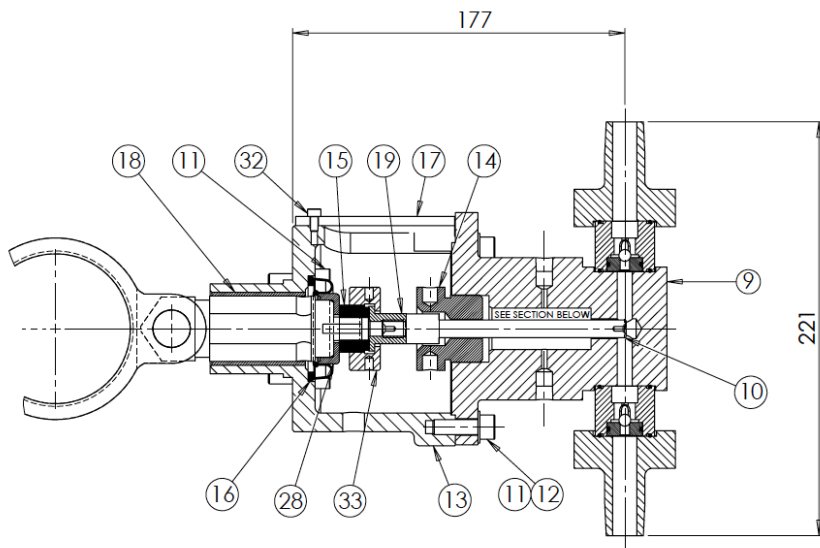
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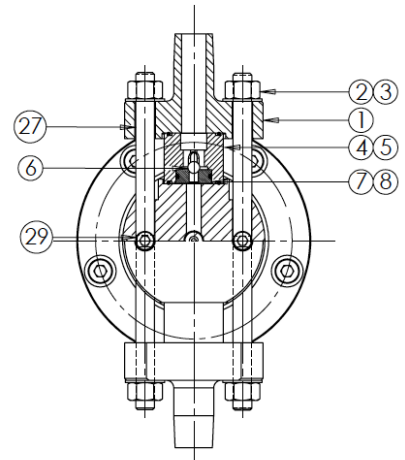
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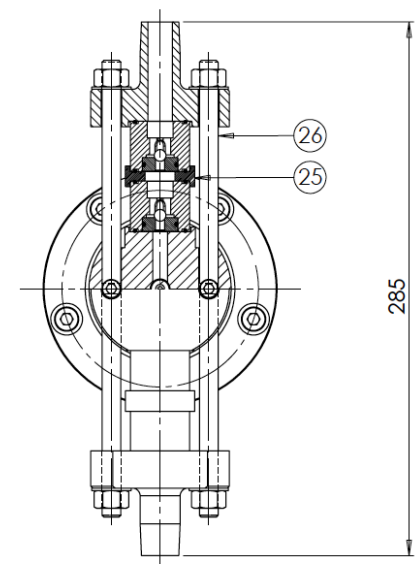
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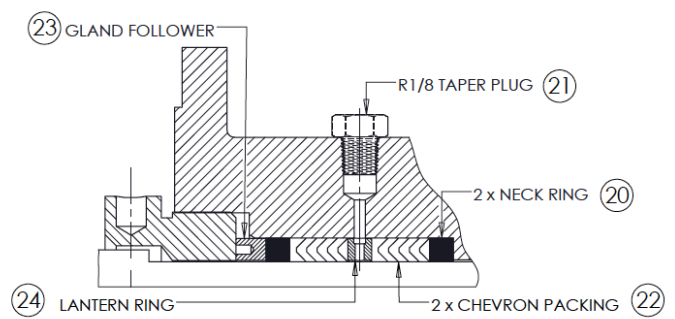
GLAND ARRANGEMENT



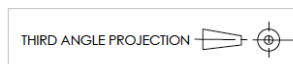
[STANDARD] SINGLE VALVE



[OPTIONAL] DOUBLE VALVE ARRANGEMENT




DOUBLE CHEVRON WITH LANTERN RING FOR FLUID FLUSH [NEW STANDARD ARRANGEMENT]



THIRD ANGLE PROJECTION

NAME	DATE
DRAWN BY J.W	08/06/2016
CHK'D BY T.F	08/06/2016
APPV'D BY T.F	08/06/2016

PART NO. RD91- 6PAS		TITLE: 6P PLUNGER HEAD ASSY		 Water Process Solutions	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS: ALL IN MM. SURFACE FINISH: TOLERANCES: +/- 0.1 mm		MATERIAL:	ISS NO. 04	PROJECT NO. SCALE: 1 / 2.5	DWG NO. RD91 - 6PAS REVISION DATE: 08/06/2016
		WEIGHT:			SHEET 1 OF 1 A3

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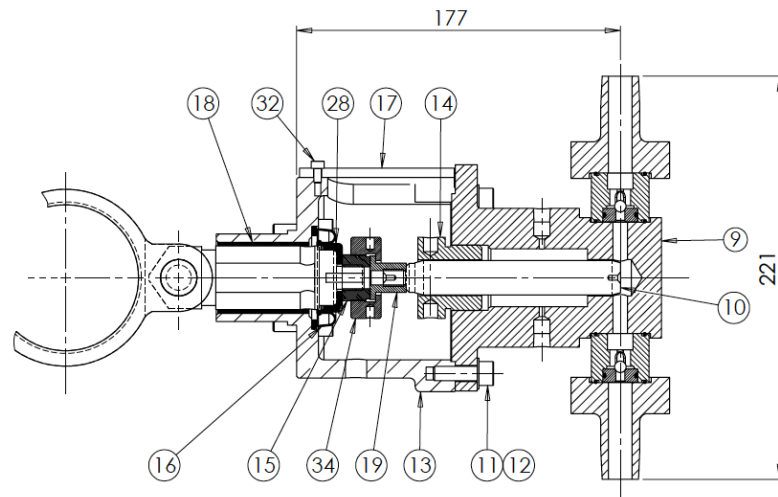
KEY NO.	PART NO.	QTY.	DESCRIPTION
1	RD91-11	2	CLAMP, R1/2 MALE CONN. 316SS
2	PXE99093	4	NUT, M10, 304SS
3	PXE99096	4	WASHER, FLAT M10, 316SS
4	AAA5357	2	GUIDE RETAINER, 0.25" BALL, 316SS
x 5	AMK5913	4	O'RING /022/ VITON, 25.121 x 1.78
x 5	AIA5772	4	O'RING /022/ HYPALON [OPTIONAL]
x 5	JP98556	4	O'RING /022/ TEFLON COATED [OPTIONAL]
6	AFM5842	2	BALL, 0.25", 316SS
7	APQ5049	2	SEAT, 0.25" BALL, 316SS
8	AMK5919	2	O'RING /016/ VITON, 15.06 x 1.78
x 8	AMK5705	2	O'RING /016/ HYPALON [OPTIONAL]
x 8	JP98557	2	O'RING /016/ TEFLON COATED [OPTIONAL]
9	RD91-6P	1	HEAD, 6P PLUNGER, 316SS
10	RD91-6R	1	6P PLUNGER ROD, CERAMIC, Ø3/8"
11	AXS3583	9	SCREW, M8 x 25, SOCKET CAP HD, 316SS
12	AWO5392	5	WASHER, FLAT M8, 316SS
13	RD91-2	1	ADAPTER, 6, 12, 24 & 32P HEAD, 316SS
14	RD91-6G	1	GLAND NUT, 6P, 316SS
15	RD91-1	1	NUT, BELLOW CLAMP, PLUNGER
16	AAB7205	1	SEAL, BELLOW, CROSS HEAD
17	RD91-2G	1	GUARD, ADAPTER HEAD, PERSPEX
18	P99214	1	BEARING, PLAIN, Ø35 x 50
19	RD91-3	1	PLUNGER FOOT, 316SS
20	JP82289	2	NECK RING, 6P
21	JPXB80537	2	PLUG TAPERED, R1/8
22	JUXB98069	2	CHEVRON PACKING, 6P
23	RD91-6FL	1	GLAND FOLLOWER, 6P
24	RD91-6L	1	LANTERN RING, 6P
25	AAA5801	2	ADAPTER SS, VALVE 0.25" BALL
26	RD91-10	2	M10 x 244 STUD SS - DOUBLE VALVES
27	RD91-9	2	M10 x 180 STUD SS - SINGLE VALVES
28	AJA5915	1	CLAMP, DIAPHRAGM, BELLOW
29	ATI3486	2	SCREW, M6 x 12, SOCKET CAP HD, 316SS
30	JP82026	2	RED CAP [THREAD COVER]
31	NOT USED		
32	AHQ5469	1	SCREW, M4 x 12, SOCKET CAP HD, 316SS
33	JPXB80788	1	G.50 CROSSHEAD NUT, 316SS

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

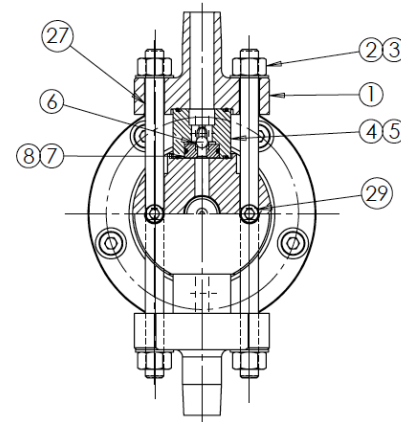
Encore® 700 METERING PUMP - PARTS LIST
6P Plunger Head Assembly

DWG NO. RD91-6PAS

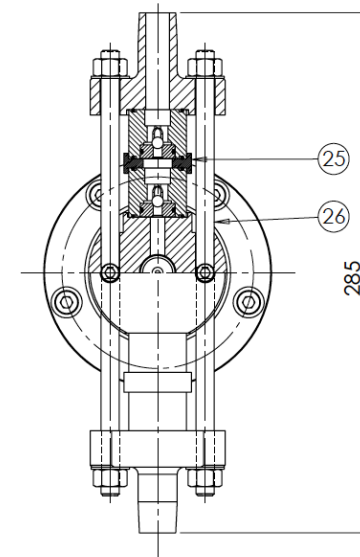
ISSUE 05 10/03/21



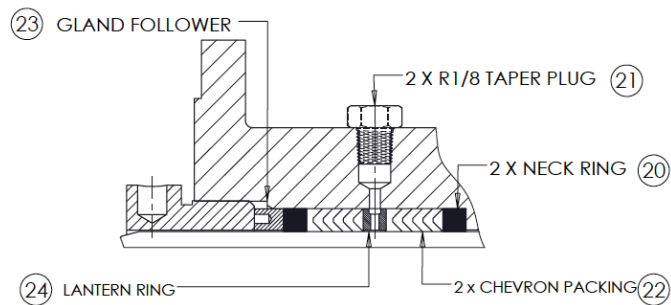
GLAND ARRANGEMENT



[STANDARD] SINGLE VALVE




[OPTIONAL] DOUBLE VALVE
ARRANGEMENT



DOUBLE CHEVRON WITH LANTERN RING
FOR FLUID FLUSH [NEW STANDARD ARRANGEMENT]

THIRD ANGLE PROJECTION

NAME	J.W	DATE	08/06/2016
DRAWN BY	J.W	CHK'D BY	T.F
APP'D BY	T.F	DATE	08/06/2016

PART NO. RD91-12PAS		TITLE: 12P PLUNGER HEAD ASSY		 Water Process Solutions	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS: ALL IN MM. SURFACE FINISH: TOLERANCES: +/- 0.1 mm	MATERIAL:	ISS NO. 04	PROJECT NO.	DWG NO. RD91 - 12PAS	
	WEIGHT:		SCALE: 1 / 2.5	REVISION DATE:	
					SHEET 1 OF 1 A3

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	RD91-11	2	CLAMP, R1/2 MALE CONN. 316SS
2	PXE99093	4	NUT, M10, 304SS
3	PXE99096	4	WASHER, FLAT M10, 316SS
4	AAA5357	2	GUIDE RETAINER, 0.25" BALL, 316SS
x 5	AMK5913	4	O'RING /022/ VITON, 25.121 x 1.78
x 5	AIA5772	4	O'RING /022/ HYPALON [OPTIONAL]
x 5	JP98556	4	O'RING /022/ TEFLON COATED [OPTIONAL]
6	AFM5842	2	BALL, 0.25", 316SS
7	APQ5049	2	SEAT, 0.25" BALL, 316SS
8	AMK5919	2	O'RING /016/ VITON, 15.06 x 1.78
x 8	AMK5705	2	O'RING /016/ HYPALON [OPTIONAL]
x 8	JP98557	2	O'RING /016/ TEFLON COATED [OPTIONAL]
9	RD91-12P	1	HEAD, 12P PLUNGER, 316SS
10	RD91-12R	1	12P PLUNGER ROD, CERAMIC, Ø3/4"
11	AXS3583	9	SCREW, M8 x 25, SOCKET CAP HD, 316SS
12	AWO5392	5	WASHER, FLAT M8, 316SS
13	RD91-2	1	ADAPTER, 6, 12, 24 & 32P HEAD, 316SS
14	RD91-12G	1	GLAND NUT, 12P, 316SS
15	RD91-1	1	NUT, BELLOW CLAMP, PLUNGER
16	AAB7205	1	SEAL, BELLOW, CROSS HEAD
17	RD91-2G	1	GUARD, ADAPTER HEAD, PERSPEX
18	P99214	1	BEARING, PLAIN, Ø35 x 50
19	RD91-3	1	PLUNGER FOOT, 316SS
20	JP82291	2	NECK RING, 12P
21	JPXB80537	2	PLUG TAPERED, R1/8
22	JUXE98069	2	CHEVRON PACKING, 12P
23	RD91-12FL	1	GLAND FOLLOWER, 12P
24	RD91-12L	1	LANTERN RING, 12P
25	AAA5801	2	ADAPTER SS, VALVE 0.25" BALL
26	RD91-10	2	M10 x 244 STUD SS - DOUBLE VALVES
27	RD91-9	2	M10 x 180 STUD SS - SINGLE VALVES
28	AJA5915	1	CLAMP, DIAPHRAGM, BELLOW
29	ATI3486	2	SCREW, M6 x 12, SOCKET CAP HD, 316SS
30	JP82026	2	RED CAP [THREAD COVER]
31	NOT USED		
32	AHQ5469	1	SCREW, M4 x 12, SOCKET CAP HD, 316SS
33	JPXB80788	1	G.50 CROSSHEAD NUT, 316SS

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

Encore® 700 METERING PUMP - PARTS LIST
12P Plunger Head Assembly

DWG NO. RD91-12PAS

ISSUE 05 10/03/21

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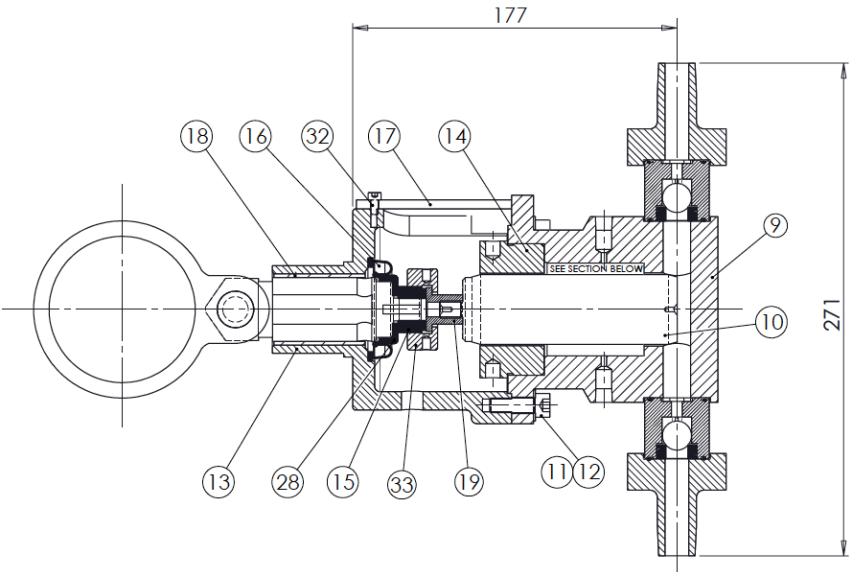
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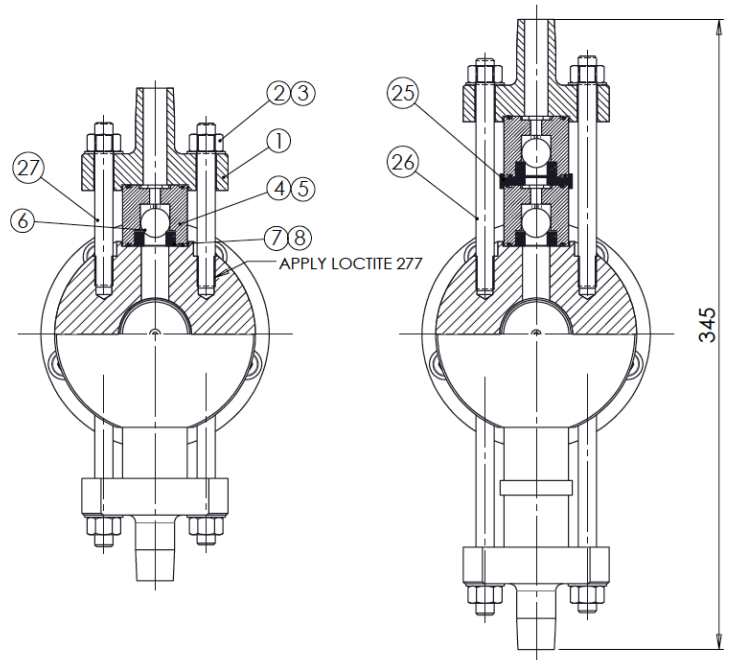
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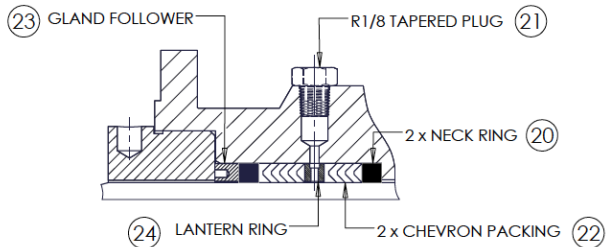


GLAND ARRANGEMENT



[STANDARD] SINGLE VALVE ARRANGEMENT


[OPTIONAL] DOUBLE VALVE ARRANGEMENT



DOUBLE CHEVRON WITH LANTERN RING
FOR FLUID FLUSH [NEW STANDARD ARRANGEMENT]

THIRD ANGLE PROJECTION

NAME	DATE
DRAWN BY J.W	08/06/2016
CHK'D BY T.F	08/06/2016
APPV'D BY T.F	08/06/2016

PART NO. RD91-24PAS		TITLE: 24P PLUNGER HEAD ASSY		 Water Process Solutions	
MATERIAL:	ISS NO. 04	PROJECT NO.		DWG NO. RD91 - 24PAS	
		SCALE: 1 / 2.5		REVISION DATE: 08/06/2016	SHEET 1 OF 1 A3

8 7 6 5 4 3 2 1

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	RD91-13	2	CLAMP, R1/2 MALE CONN. 316SS
2	PXE99093	4	NUT, M10, 304SS
3	PXE99096	4	WASHER, FLAT M10, 316SS
4	AAA5360	2	GUIDE RETAINER, 0.625" BALL, 316SS
x 5	AOO5871	4	O'RING /024/ VITON, 28.3 x 1.78
x 5	AJE5881	4	O'RING /024/ HYPALON [OPTIONAL]
x 5	JP98558	4	O'RING /024/ TEFLON COATED [OPTIONAL]
6	AFM5802	2	BALL, 0.625", 316SS
7	ANM4397	2	SEAT, 0.625" BALL, 316SS
8	APQ5924	2	O'RING /115/ VITON, 17.12 x 1.78
x 8	AOO5683	2	O'RING /115/ HYPALON [OPTIONAL]
x 8	JP98559	2	O'RING /115/ TEFLON COATED [OPTIONAL]
9	RD91-24P	1	HEAD, 24P PLUNGER, 316SS
10	RD91-24R	1	24P PLUNGER ROD, CERAMIC, Ø1-1/2"
11	AXS3583	9	SCREW, M8 x 25, SOCKET CAP HD, 316SS
12	AWO5392	5	WASHER, FLAT M8, 316SS
13	RD91-2	1	ADAPTER, 6, 12, 24 & 32P HEAD, 316SS
14	RD91-24G	1	GLAND NUT, 24P, 316SS
15	RD91-1	1	NUT, BELLOW CLAMP, PLUNGER
16	AAB7205	1	SEAL, BELLOW, CROSS HEAD
17	RD91-2G	1	GUARD, ADAPTER HEAD, PERSPEX
18	P99214	1	BEARING, PLAIN, Ø35 x 50
19	RD91-3	1	PLUNGER FOOT, 316SS
20	JP82294	2	NECK RING, 24P
21	JPXB80537	2	PLUG TAPERED, R1/8
22	JUXJ98069	2	CHEVRON PACKING, 24P
23	RD91-24FL	1	GLAND FOLLOWER, 24P
24	RD91-24L	1	LANTERN RING, 24P
25	AAA5798	2	ADAPTER SS, VALVE 0.625" BALL
26	RD91-8	2	M10 x 127 STUD SS - DOUBLE VALVES
27	RD91-5	2	M10 x 90 STUD SS - SINGLE VALVES
28	AJA5915	1	CLAMP, DIAPHRAGM, BELLOW
30	JP82026	2	RED CAP [THREAD COVER]
31	NOT USED		
32	AHQ5469	1	SCREW, M4 x 12, SOCKET CAP HD, 316SS
33	JPXB80788	1	G.50 CROSSHEAD NUT, 316SS

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

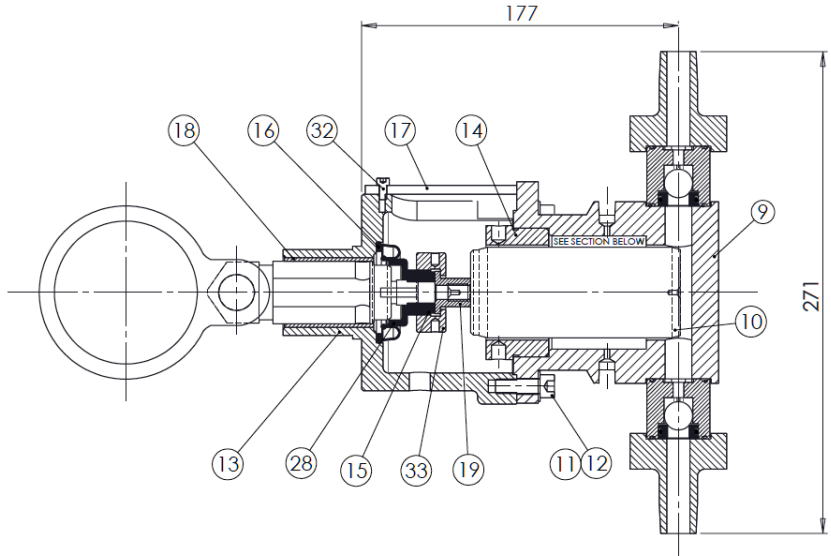
Encore® 700 METERING PUMP - PARTS LIST
24P Plunger Head Assembly

DWG NO. RD91-24PAS

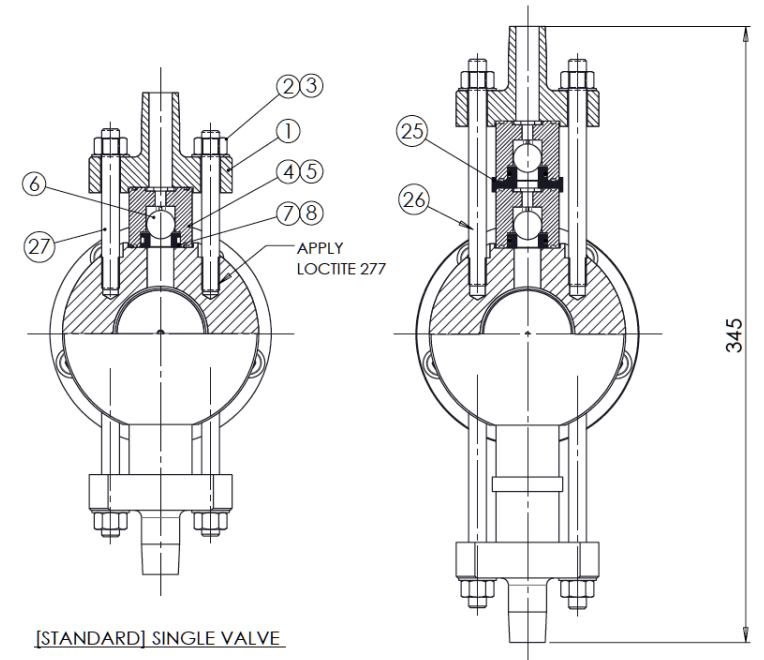
ISSUE 05 10/03/21

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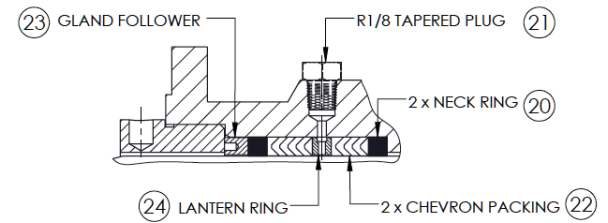


GLAND ARRANGEMENT



[STANDARD] SINGLE VALVE

[OPTIONAL] DOUBLE VALVE ARRANGEMENT



DOUBLE CHEVRON WITH LANTERN RING
FOR FLUID FLUSH [NEW STANDARD ARRANGEMENT]

THIRD ANGLE PROJECTION

NAME	DATE
DRAWN BY J.W	08/06/2016
CHKD BY T.F	08/06/2016
APPVD BY T.F	08/06/2016

PART NO. RD91-32PAS	TITLE: 32P PLUNGER HEAD ASSY		PROJECT NO.	DWG NO. RD91 - 32PAS
	MATERIAL:	ISS NO. 04		
UNLESS OTHERWISE SPECIFIED: DIMENSIONS: ALL IN MM. SURFACE FINISH: TOLERANCES: +/- 0.1 mm		SCALE: 1 / 2	REVISION DATE: 08/06/2016	SHEET 1 OF 1 A3



8 7 6 5 4 3 2 1

KEY NO.	PART NO.	QTY.	DESCRIPTION
1	RD91-13	2	CLAMP, R1/2 MALE CONN. 316SS
2	PXE99093	4	NUT, M10, 304SS
3	PXE99096	4	WASHER, FLAT M10, 316SS
4	AAA5360	2	GUIDE RETAINER, 0.625" BALL, 316SS
x 5	AOO5871	4	O'RING /024/ VITON, 28.3 x 1.78
x 5	AJE5881	4	O'RING /024/ HYPALON [OPTIONAL]
x 5	JP98558	4	O'RING /024/ TEFLON COATED [OPTIONAL]
6	AFM5802	2	BALL, 0.625", 316SS
7	ANM4397	2	SEAT, 0.625" BALL, 316SS
8	APQ5924	2	O'RING /115/ VITON, 17.12 x 1.78
x 8	AOO5683	2	O'RING /115/ HYPALON [OPTIONAL]
x 8	JP98559	2	O'RING /115/ TEFLON COATED [OPTIONAL]
9	RD91-32P	1	HEAD, 32P PLUNGER, 316SS
10	RD91-32R	1	32P PLUNGER ROD, CERAMIC, Ø2"
11	AXS3583	9	SCREW, M8 x 25, SOCKET CAP HD, 316SS
12	AWO5392	5	WASHER, FLAT M8, 316SS
13	RD91-2	1	ADAPTER, 6, 12, 24 & 32P HEAD, 316SS
14	RD91-32G	1	GLAND NUT, 32P, 316SS
15	RD91-1	1	NUT, BELLOW CLAMP, PLUNGER
16	AAB7205	1	SEAL, BELLOW, CROSS HEAD
17	RD91-2G	1	GUARD, ADAPTER HEAD, PERSPEX
18	P99214	1	BEARING, PLAIN, Ø35 x 50
19	RD91-3	1	PLUNGER FOOT, 316SS
20	JP82296	2	NECK RING, 32P
21	JPXB80537	2	PLUG TAPERED, R1/8
22	JUXL98069	2	CHEVRON PACKING, 32P
23	RD91-32FL	1	GLAND FOLLOWER, 32P
24	RD91-32L	1	LANTERN RING, 32P
25	AAA5798	2	ADAPTER SS, VALVE 0.625" BALL
26	RD91-8	2	M10 x 127 STUD SS - DOUBLE VALVES
27	RD91-5	2	M10 x 90 STUD SS - SINGLE VALVES
28	AJA5915	1	CLAMP, DIAPHRAGM, BELLOW
30	JP82026	2	RED CAP [THREAD COVER]
31	NOT USED		
32	AHQ5469	1	SCREW, M4 x 12, SOCKET CAP HD, 316SS
33	JPXB80788	1	G.50 CROSSHEAD NUT, 316SS

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


Encore® 700 METERING PUMP - PARTS LIST
32P Plunger Head Assembly


DWG NO. RD91-32PAS

ISSUE 05 10/03/21



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 Water-Process-Solutions

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WATER PROCESS
 **SOLUTIONS**

Literature No. WPS Gen Flyer UK 001.V2