SUPERPRESSURE

HAND-OPERATED PLUNGER PUMPS

46-12130-1	VERTICAL, SINGLE-END HAND PUMP	10K PSI
46-12130-1WS	VERTICAL, SINGLE-END HAND PUMP, WATER SERVICE	10K PSI
46-12132-1	MULTI-POSITION, SINGLE-END HAND PUMP	10K PSI
46-12134-1	MULTI-POSITION, DOUBLE-END HAND PUMP	10K PSI
46-12155-1	VERTICAL, SINGLE-END HAND PUMP	20K PSI
46-12157-1	MULTI-POSITION, SINGLE END HAND PUMP	20K PSI
46-12159-1	MULTI-POSITION, DOUBLE-END HAND PUMP	20K PSI
46-12180-1	VERTICAL, SINGLE-END HAND PUMP	40K PSI
46-12182-1	MULTI-POSITION, SINGLE-END HAND PUMP	40K PSI
46-12184-1	MULTI-POSITION, DOUBLE-END HAND PUMP	40K PSI

MOTOR-DRIVEN PLUNGER PUMPS

46-12233-1	SINGLE-END, MOTOR DRIVEN PUMP	10K PSI
46-12235-1	DOUBLE-END, MOTOR DRIVEN PUMP	10K PSI
46-12257-1	SINGLE-END, MOTOR DRIVEN PUMP	20K PSI
46-12259-1	DOUBLE-END, MOTOR DRIVEN PUMP	20K PSI
46-12282-1	SINGLE-END, MOTOR DRIVEN PUMP	40K PSI
46-12284-1	DOUBLE-END, MOTOR DRIVEN PUMP	40K PSI

This manual is for:

Pump Part No. :_____
Sales Order No. :_____
Serial No. :_____
Date Manufactured :_____
System Part No. :_____

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CONTENTS

I. INTRODUCTION

The installation procedures, specifications, operating procedures, and maintenance of the Newport Scientific, Inc. hand-operated pumps and motor-driven plunger pumps are described in this manual.

HAND-OPERATED PLUNGER PUMPS

The hand-operated plunger pumps are used when a small amount of high-pressure liquid is required for an application, such as for hydrostatic testing of small objects, and for similar laboratory applications. The single-end and double-end hand pumps, can be mounted in any position including directly on the test apparatus, rig, or machine. The double-ended hand pumps can be used to pump two different liquids at the same time or, if the pump is connected to a common inlet and outlet line, the double-ended pump action causes a discharge flow for each direction of pump handle motion.

The single-ended vertical hand pump includes a ½ gallon reservoir. The reservoir is a gravity-feed type and uses manual shut-off valves to control liquid flow.

MOTOR DRIVEN PLUNGER PUMP

The motor-driven plunger pumps, are single speed, fixed-stroke units (operating at 58rpm) which are driven by a motor with an integral gear reducer. These pumps contain an integral fluid reservoir with a liquid-level sight gauge. These pumps are not suitable for metering purposes.

II. INSTALLATION

The installation requirements and installation procedures are contained in this section.

ELECTRICAL REQUIREMENTS

The hand-operated pumps do NOT require ANY electrical connections. The motors for the motor-driven pumps require 208-220/440V, 3-phase, 60 Hz power. This power must be connected by an electrician in accordance with local and national electrical code regulations. Observe the directions provided on the instruction plate attached to the motor.

SPACE REQUIREMENTS

These pumps require the minimum mounting area indicated in Table 2-1 (refer to the referenced figure for explicit mounting dimensions and overall size):

TABLE 2-1. PUMP SPACE REQUIREMENTS

Hand Operating Pump	Catalog No.	Mounting Area (l x w, inches)
10,000 psi, Single-End, Vertical	46-12130-1	24 x 7
10,000 psi, Single-End, Vertical, Water Service	46-12130-1WS	24 x 7
10,000 psi, Single-End	46-12132-1	13.5 x 6
10,000 psi, Double-End	46-12134-1	19.5 x 6
20,000 psi, Single-End, Vertical	46-12155-1	24 x 7
20,000 psi, Single-End	46-12157-1	13.5 x 6
20,000 psi, Double-End	46-12159-1	19.5 x 6
40,000 psi, Single-End, Vertical	46-12180-1	24 x 7
40,000 psi, Single-End	46-12182-1	13.5 x 6
40,000 psi, Double End	46-12184-1	19.5 x 6
Motor-Driven Pump		
10,000 psi, Single-End	46-12233-1	20 x 21
10,000 psi, Double-End	46-12235-1	24 x 21
20,000 psi, Single-End	46-12257-1	20 x 21
20,000 psi, Double-End	46-12259-1	24 x 21
40,000 psi, Single-End	46-12282-1	20 x 21
40,000 psi, Double-End	46-12284-1	24 x 21

HAND-OPERATED/MOTOR-DRIVEN PLUNGER PUMP INSTALLATION PROCEDURE

Perform the following procedures to install your pump. Note that the hand-operated, vertical, single-end pump **MUST be installed in a vertical position.** The other hand-operated pumps may be installed in any position.

1. Mount pump on floor, wall, bench, or on equipment and secure with bolts through holes in pump base.

2. Connect tubing from the pump outlet check-valve to a pressure gauge (not supplied) and to the equipment to be pressurized. Make all connections with Newport Scientific tubing and fittings.

PRECAUTION

A relief valve or rupture disc must be installed to prevent damage to equipment if an over-pressure condition occurs.

3. For hand-operated pumps without an integral reservoir, connect intake check valves to a reservoir.

4. Fill the reservoir with SAE 20 oil unless otherwise specified for special applications.

5. For hand-operated pumps, install handle and insert locking pin.

6. For motor-driven pumps, check motor voltage and frequency rating and connect power line to motor in accordance with local and national electrical code regulations. A switch or circuit breaker should be connected in the pump power line to enable turning the pump on and off as required. Shaft rotation must agree with the arrow on the motor housing. Check direction of rotation by momentarily energizing the motor; reverse wiring to reverse direction of rotation.

WARNING

IMPROPER WIRING CONNECTIONS COULD PRESENT A SHOCK HAZARD.

7. Check out the operation of the pump and prime pump by performing the procedures in Section V., Operation.

III. PRINCIPLES OF OPERATION

When a small diameter piston and cylinder pump assembly is filled with hydraulic fluid and is operated with a hand lever or motor, high pressures can be generated for conducting hydrostatic tests, for operating pressure intensifiers and for other laboratory applications which require a small volume hydraulic fluid under high pressures. These pumps use the floating plunger principle to reduce friction resistance and wear on packaging materials.

HAND-OPERATED PLUNGER PUMPS

Pressures up to 10,000 psi are generated with a hand-operated lever pump having a 9/16 inch diameter cylinder assembly; up to 20,000 psi with a 3/8 inch diameter cylinder assembly; and up to 40,000 psi with a ¼ inch diameter cylinder assembly.

MOTOR DRIVEN PLUNGER PUMPS

Motor-driven pumps generate 10,000 psi with a 9/16 inch diameter cylinder assembly; 20,000 psi with a 3/8 inch diameter cylinder assembly; 40,000 psi with a ¼ inch diameter cylinder assembly.

IV. PERFORMANCE CHARACTERISTICS AND SPECIFICATIONS

The following tables present the performance characteristics of each type of pumping system with operating specifications.

Note that these plunger pumps are basic units only and require the addition of valves, connectors, tubing, reservoir and gauge to complete a typical pumping system.

SPECIFICATIONS FOR HAND OPERATED UNITS			
VERTICAL, SINGLE END			
Catalog Number	46-12130-1 46-12130-1WS	46-12155-1	46-12180-1
Maximum Working Pressure (psi)	10,000	20,000	40,000
Plunger Diameter (in.)	9/16	3/8	1/4

Stroke, Nominal (in.)	1.0	1.0	1.0
Volume Displaced at Atmos. Pressure (cu. in./stroke	.25	.11	.05
Weight (lb.) Net/Shipping	50/76	50/76	50/76
Overall Dimensions L x W x H (in.)	7x24x16.5	7x24x16.5	7x24x16.5
Mounting Data	2 Holes, 11/16 diameter on 19-1/4 Centers		
Handle Length (in.)	28	28	28
Ports, Working Fluid Inlet; Outlet	¼ NPT.F; ¼ O.D. tubing		

SPECIFICATIONS FOR HAND OPERATED UNITS (cont'd)			
MULTI-POSITION, SINGLE-END			
Catalog Number	46-12132-1 46-12132-1WS	46-12157-1	46-12182-1
Maximum Working Pressure (psi)	10,000	20,000	40,000
Plunger Diameter (in.)	9/16	3/8	¼
Stroke, Nominal (in.)	1.0	1.0	1.0
Volume Displaced at Atmos. Pressure (cu. in./stroke)	.25	.11	.05
Weight (lb.) Net/Shipping	22/35	22/35	22/35
Overall Dimensions L x W x H (in.)	6x7x13.5	6x7x13.5	6x7x13.5
Mounting Data	4 Holes, 13/32 Diameter on 2-1/4 x 5-1/8 centers		
Handle Length (in.)	40	40	40
Ports, Working Fluid Inlet; Outlet	¼ NPT.F; ¼ O.D. tubing		

SPECIFICATIONS FOR HAND OPERATED UNITS (cont'd)			
MULTI-POSITION, DOUBLE-END			
Catalog Number	46-12134-1	46-12159-1	46-12184-1
Maximum Working Pressure (psi)	10,000	20,000	40,000
Plunger Diameter (in.)	9/16	3/8	¼
Stroke, Nominal (in.)	1.0	1.0	1.0
Volume Displaced at Atmos. Pressure (cu. in./stroke)	.50	.22	.10
Weight (lb.) Net/Shipping	34/55	34/55	34/55
Overall Dimensions L x W x H (in.)	6x7x195	6x7x195	6x7x195
Mounting Data	8Holes, 13/32 Diameter on 2-1/4 x 8-1/16 AND 2-1/4 x 2-3/16 centers		
Handle Length (in.)	40	40	40

Ports, Working Fluid Inlet; Outlet	¼ NPT.F; ¼ O.D. tubing		
SPECIFICATIONS FOR MOTOR DRIVEN UNITS			
SINGLE-END			
Catalog Number	46-12233-1	46-12257-1	46-12282-1
Maximum Working Pressure (psi)	10,000	20,000	40,000
Plunger Diameter (in.)	9/16	3/8	¼
Stroke, Nominal (in.)	1.0	1.0	1.0
Strokes per Minute	58	58	58
Volume Displaced at Atmos. Pressure (cu. in./stroke)	.25	.11	.05
Weight (lb.) Net/Shipping	216/267	216/267	216/267
Overall Dimensions L x W x H (in.)	20x21x19	20x21x19	20x21x19
Mounting Data	6 Holes, 9/16 Diameter		
Ports, Working Fluid Inlet; Outlet	¼ NPT.F; ¼ O.D. tubing		
Motor Characteristics	1 HP, 1800 RPM, 230/460 volt, 3 phase, 60 HZ Explosion-proof, with 58 RPM speed reducer		
Reservoir Volume (cu. in.)	250	250	250

SPECIFICATIONS FOR MOTOR DRIVEN UNITS			
DOUBLE-END			
Catalog Number	46-12235-1	46-12259-1	46-12284-1
Maximum Working Pressure (psi)	10,000	20,000	40,000
Plunger Diameter (in.)	9/16	3/8	¼
Stroke, Nominal (in.)	1.0	1.0	1.0
Strokes per Minute	58	58	58
Volume Displaced at Atmos. Pressure (cu. in./stroke)	.50	.22	.10
Weight (lb.) Net/Shipping	225/276	225/276	225/276
Overall Dimensions L x W x H (in.)	24x21x19	24x21x19	24x21x19
Mounting Data	6 Holes, 9/16 Diameter		
Ports, Working Fluid Inlet; Outlet	¼ NPT.F; ¼ O.D. tubing		
Motor Characteristics	1 HP, 1800 RPM, 230/460 volt, 3 phase, 60 HZ Explosion-proof, with 58 RPM speed reducer		
Reservoir Volume (cu. in.)	250	250	250

V. OPERATION

The operating procedures in this section describe how to operate the pump and the priming procedure to be performed if the pump fails to build-up pressure.

PRECAUTION

Ensure that the fluid being compressed is maintained free of solid particulate contaminants. If dirt enters the pump, the piston and check valves may be damaged.

HAND-OPERATED PLUNGER PUMP

Ensure that the oil reservoir is filled before operating the pump. The hand-operated pump is operated by manually moving the handle back and forth. If the pump fails to build-up pressure, discontinue operating and perform the "Plunger Pump Priming Procedure" in this section.

MOTOR-DRIVEN PLUNGER PUMP

Ensure that the oil reservoir is filled before operating the pump. To operate the motor-driven pump, turn on electric power to the pump. Observe the discharge pressure to ensure that the pump is operating properly. If the pump fails to build-up pressure, shut off power and perform the "Plunger Pump Priming Procedure" in the next paragraph.

PLUNGER PUMP PRIMING PROCEDURE

The pump should be primed only if the pump fails to build-up pressure. To prime the pump, perform the following:

1. Stop pumping operation.

2. Disconnect the tubing at the outlet check valve.

3. Operate pump until discharge liquid is free of bubbles. If bubbles persist, remove plug from end of cylinder body, use a squirt can to fill cavity with fluid while plunger is pulled back to suck the fluid into the cylinder. Replace the plug. Resume pumping to expel all air from the system.

4. If the pump fails to pump fluid or air bubbles persist, perform the following alternate procedure. (This procedure is often required for vertically mounted pumps.)

    A. Using low pressure air or gas, pressurize reservoir sufficiently to force fluid past the inlet check valve.

    B. Operate pump to suck fluid into the pump cylinder. Observe condition of fluid during the compression stroke.

    C. If air bubbles persist, loosen the plug during the compression stroke to expel the remaining air. Tighten plug to prevent air from re-entering during the suction stroke. (When the fluid is clear of bubbles, the pump is primed.)

5. Reconnect tubing to the outlet check valve and operate the pump to expel air from the rest of the system.

PRECAUTION

Do not allow fluid to drop out of sight in the fluid level gauge of the reservoir tank while operating the pump or air will enter the system and the pump will require re-priming.

USE OF MOTOR-DRIVEN PUMP WITH REMOTE HEAD GAS COMPRESSOR

If the pump is to be used with a remote head gas compressor, the stroke length must be adjusted to provide the maximum fluid volume required to pulsate the compressor diaphragm. To adjust pump stroke, refer to the Crank Stroke Adjustment Procedure paragraph in Section VII., Maintenance.

INSTRUCTIONS FOR AUTO-LUBE SYSTEM

This system is designed to automatically lube the drive mechanism. It will provide the right amount of grease to meet lubrication requirements for the Slotted Lever.

This unit should be checked every 3-5 hours of run time on the compressor to determine grease level. To refill Lube Site: Remove fasteners and guard from compressor. Simply refill by attaching the grease gun that is supplied with the unit to the grease fitting.
Fill until the seal ring rises to the bottom edge of the "CAUTION" label. **DO NOT OVERFILL.** This should be done before the seal ring is down to the top of the base.

Also, when service is being done on the Lube Site, the pivot pins on the drive unit should be oiled with any 10W 30W or 10W 40W oil.

These instructions will allow the Lube Site to give you many years of trouble-free automatic lubrication.

This section summarizes all warnings, precautions, and limitations contained in this manual. The warnings paragraphs list hazards which, if not observed, could lead to personnel injury. The precautions paragraphs list actions which could result in damage to the equipment.

WARNINGS

The power line ground circuit for the motor-driven pump should be continuous to the main power panel which should be grounded directly to a metal water pipe or other electrical earth ground. Improper grounding could result in a shock hazard.

When performing maintenance on a motor-driven pump, disconnect power from pump and attach a warning label ("Do not turn on switch, maintenance being performed.") to the power switch to ensure against inadvertent start-up of the pump.

When priming the pump by applying pressurized air to the oil reservoir, reservoir opening must be suitably covered to prevent oil from being blown back out of reservoir.

VI. PRECAUTIONS, LIMITATIONS, AND HAZARDS

A relief valve or rupture-disc must be installed in the outlet tubing to prevent damage to equipment if an over pressure condition occurs.

Ensure that the fluid being compressed is maintained free of solid particulate contaminants. If dirt enters the pump, the piston and check valves may be damaged.

Do not allow fluid to drop out of sight in the fluid level gauge of the reservoir tank while operating the pump or air will enter the system and the pump will require re-priming.

VII. MAINTENANCE

Periodic maintenance, adjustment procedures, corrective maintenance information, spare parts list, and illustrated parts lists are contained in this section. Note: Each pump type varies with the drawings to be used, please refer to the table on page iii, when referencing a particular part.

PERIODIC MAINTENANCE

HAND-OPERATED/MOTOR-DRIVEN PUMPS DAILY MAINTENANCE

While referring to your particular pump drawings, daily oil the drive piston, piston guide and drive link pins with a few drops of lubricating oil.

PISTON ASSEMBLY PERIODIC MAINTENANCE, ALL PUMPS (SEE DRAWING)

Daily check packing gland nut on pump plunger for signs of leakage (the plunger should appear moist with oil). If dripping or leakage is evident, tighten gland nut. If leakage persists when pumping is resumed, replace the packing as follows:

To Remove Piston Packing

1. Close all valves except the reservoir valve of hand-operated pumps.

2. Turn **packing gland nut** (item 7) a few turns counterclockwise. Operate pump until a slight increase in pressure pushes the packing against the nut.

3. Turn packing gland nut a few more turns and pump again at low pressure to push packing against the nut. Close reservoir valve on hand-operated pumps.

4. Remove the following while referring to the drawing:

    A. Disconnect tubing from the intake and discharge check valves.
    B. Snap out the retainer ring from the drive piston.
    C. Remove the spacer.
    D. Remove the thrust washer.
    E. Remove the four socket head screws securing the piston assembly to the pump drive assembly.

F. Take off the piston and cylinder assembly.

For a list of the proper drawings, refer to page 15

5. After removing the cylinder and piston assembly:

   A. Remove the packing gland nut and piston.
   B. Pull out the loosened follower, retainer, O-ring, back-up ring, and seal packing.
   C. Clean the cylinder piston, retainer, follower, and gland nut thoroughly.
   D. Discard packing.

To Install Piston Packing

1. While referring to the appropriate drawing, install new packing as follows:

   -For ¼ inch, 3/8 inch, and 9/16 inch diameter cylinder and piston assemblies:

   A. Install the O-ring gasket.
   B. Install the back-up ring.
   C. Install bottom retainer.
   D. Install seal packing and follower.
   E. Install packing gland nut and piston. Do not tighten packing gland nut.

2. Re-install the cylinder and piston assembly onto the drive assembly and secure with the four socket head screws. Ensure that the thrush washer and the spacer are in place. Place the head of the piston against the spacer and lock in place with the retainer ring. Open reservoir valve of hand-operated pumps.

3. Operate pump until no air bubbles appear in the oil that leaks around the packing and piston.

4. Stop pumping and allow pump pressure to bleed off, then tighten gland nut. Fluid should no longer leak around the packing and piston after the gland nut is tightened, but the piston surface should be moist with oil at all times during operation.

MOTOR-DRIVEN PUMPS PERIODIC MAINTENANCE

Perform maintenance listed in "Piston Assembly Periodic Maintenance, All Pumps" paragraph. Periodically, perform the following:

1. Grease crank arm and sliding surfaces when they begin to appear dry.

2. Lubricate electric motor with a few drops of a good grade lubricating oil. Do not oil excessively.

3. Check the oil level in the gearbox section of the gear-head motor and change oil according to the instructions supplied on the attached metal tag. An audible click may be heard in the gearbox during operation. This is a normal result of backlash in the gear train and does not indicate a malfunction.

CRANK STROKE ADJUSTMENT PROCEDURE (MOTOR-DRIVEN PUMPS ONLY)

The pump stroke length is preset by NSI before shipment. The stroke length must be readjusted if the following occur:

-The pump is used to drive a remote-head gas compressor. (Refer to instructions for remote-head compressors.)

-The shoe clamping bolts work loose or are loosened intentionally.

-The cylinder piston assembly is changed.

For maximum efficiency, the volume of oil displaced is critical. This volume is proportional to the length of the piston stroke. For a double-end pump, only the piston at one end must be adjusted; the piston at the other end will then be correctly adjusted. To adjust the crank stroke, perform the following procedure:

1. Stop pump operation. Disconnect power from pump and attach a warning label (**DO NOT TURN ON SWITCH, MAINTENANCE BEING PERFORMED**) to the power switch to ensure against inadvertent start-up of the pump.

2. Remove guard and loosen the two clamp bolts on each side of the sliding shoe until the shoe slides with a little drag.

3. Adjust the pump to get crank stroke to top-dead center by rotating the motor armature with a metal rod inserted through the slots in the cooling fan housing and carefully pushing against the fan blades until the crank stroke is at top-dead center.

4. When crank stroke is at top-dead center, adjust the distance between the bottom of the slot in the crank arm and the end of the slide block to approximately 5/16 inch. Tighten the two clamp bolts to 0 or 60 ft-lb torque.

5. Place a piece of masking tape on the crank arm beside the slide and mark the position of the slide.

6. Operate pump. Check the stroke length by removing the tubing and measuring the volume of oil issuing from the discharge check valve. (See Table 4-1 for volumetric displacement.) Stop pump operation.

7. Loosen slide block clamp bolts. Adjust crank length in increments of 1/32 inch from initial slide setting. Mark the crank slide position after each adjustment as an aid in establishing the optimum setting. Tighten slide block clamp bolts to 50-60 ft-lb torque. Repeat procedure from step 5 until optimum crank length setting is obtained.

8. Replace guard over slide block.

CORRECTIVE MAINTENANCE

Check Valve Assemblies

When a pump fails to pump and inspection indicates that this failure is not due to air leaking, check for inoperative check valves. Remove the check valves from the pump as follows:

1. Stop pump operation.

2. Release pressure from tubing lines.

3. Disconnect tubing connected to check valve.

4. Remove check valve.

5. Examine check valve for foreign particles, wear or damage. Replace with new check valve, if required.

6. Install check valve on pump. Ensure that the lens rings are properly seated. Improper seating of the lens ring may result in a leaking check valve.

VIII. RECOMMENDED SPARE PARTS

	Cat. No. 46-12180-1 46-12182-1 46-12282-1	Qty.	Cat. No. 46-12155-1 46-12157-1 46-12257-1	Qty.
Parts for Pumps				
Soft Good Packing Kit	N/A		85001000500	1
Back Up Ring	59060000800	1		
Packing	P1615050000	1		
Packing Retainer	59060000700	1	65013002700	1
Packing Follower	59060000600	1	65013002800	1
Inlet Check Valve Single Ball	44-14110	1	44-14110	1
Discharge Check Valve Single Ball	44-14115	1	44-14115	1

PARTS FOR CHECK VALVES

Springs	50029003203	2	50029003203	2
Balls	P1500013300	2	P1500013300	2
Lens Rings	63038000400	2	63038000400	2
Tools				
Wrench to Piston Gland Nut	P1869003600	1	P1869003600	1
Open End (5/8-3/4) Wrench for ¼" H.P. Gland Nut	P1869000500	1	P1869000500	1

	Cat. No. 46-12130-1WS 46-12132-1WS 46-12130-1 46-12132-1 46-12233-1	Qty.	Cat. No. 46-12184-1 46-12284-1	Qty.
Parts for Pumps				
Soft Good Packing Kit	85001000900 85001000900WS	1	N/A	
Back Up Ring	N/A	1	59060000800	2
Packing	N/A	1	P1615050000	2
Packing Retainer	64042002500	1	59060000700	1
Packing Follower	64042002200	1	59060000600	1
Inlet Check Valve Single Ball	44-14110	1	44-14110	1
Discharge Check Valve Single Ball	44-14115	1	44-14115	1

PARTS FOR CHECK VALVES

Springs	50029003203	2	50029003203	2
Balls	P1500013300	2	P1500013300	2
Lens Rings	63038000400	2	63038000400	2
Tools				
Wrench to Piston Gland Nut	P1869003600	1	P1869003600	1
Open End (5/8-3/4) Wrench for ¼" H.P. Gland Nut	P1869000500	1	P1869000500	1

	Cat. No. 46-12159-1 46-12259-1	Qty.	Cat. No. 46-12134-1 46-12235-1	Qty.
Parts for Pumps				
Soft Good Packing Kit	85001000500	2	85001000900	2
Packing Retainer	65013002700	2	64042002500	2
Packing Follower	65013002800	2	64042002200	2
Inlet Check Valve Single Ball	44-14110	2	44-14110	2
Discharge Check Valve Single Ball	44-14115	2	44-14115	2

PARTS FOR CHECK VALVES

Springs	50029003203	4	50029003203	4
Balls	P1500013300	4	P1500013300	4
Lens Rings	63038000400	4	63038000400	4
Tools				
Wrench to Piston Gland Nut	P1869003600	1	P1869003600	1
Open End (5/8-3/4) Wrench for ¼" H.P. Gland Nut	P1869000500	1	P1869000500	1

IX. ASSEMBLY DRAWINGS

46-12130-1WS	**PUMP HAND OPERATED, VERTICAL, WATER SERVICE 10,000 PSI**
46-12130-1WS	Pump Hand Operated, Vertical, Water Service 10,000 Psi
44-14110	Check Valve Inlet Single Ball
44-14115	Check Valve Discharge
46-12132-1WS	Sub Assembly Hand Operated 10,000 Psi
63172001500WS	Pump Body Assembly
63167001700	Drive Base Assembly
46-12155-1	**PUMP HAND OPERATED 20,000 PSI**
46-12155-1	Pump Hand Operated 20,000 Psi
44-14110	Check Valve Inlet Single Ball
44-14115	Check Valve Discharge
46-12157-1	Pump Hand Operated 20,000 Psi –Sub Assembly
62051000400	Pump Body Assembly
63167001700	Drive Base Assembly
46-12180-1ALUM	**PUMP HAND OPERATED 40,000 PSI**
46-12180-1	Pump Hand Operated 40,000 Psi
44-14110	Check Valve Inlet Single Ball
44-14115	Check Valve Discharge
46-12182-1	Sub Assembly Hand Operated 40,000 Psi
62052000400	Pump Body Assembly
63167001700	Drive Base Assembly