

DIAPHRAGM PUMP SERIES

OPERATING INSTRUCTIONS
& SERVICE MANUAL



Model No :DP-5



Model No :DP-3

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2015S100DP SERIES



Important Safety Instructions

Read all warnings and instructions in this manual.
Save these instructions.

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WARNING



INSTRUCTIONS

- For your own safety, be sure to read procedures carefully before performing maintenance on this product. After reading this document, be sure to keep it handy for future reference.

This maintenance manual covers what you should know about maintenance of the Storm Machinery DP-Pump series Diaphragm Pumps.

This edition is based on the standards for the March 2010 production run. Remember, the specifications are always subject to change; therefore, some of the information in this edition may not apply to new specifications.

Warnings and Cautions

For safe use of this product, be sure to note the following: In this document, warnings and cautions are indicated by symbols. These symbols are for those who will operate this product and for those who will be nearby, for safe operation and for prevention of personal injury and property damage. The following warning and caution symbols have the meanings described below. Be sure to remember their meanings.



WARNING : If you ignore the warning described and operate the product in an improper manner, there is danger of serious bodily injury or death.



CAUTION : If you ignore the caution described and operate the product in an improper manner, there is danger of personal injury or property damage.

Furthermore, to indicate the type of danger and damage, the following symbols are also used along with those mentioned above:



This symbol indicates a DON'T, and will be accompanied by an explanation on something you must not do.



This symbol indicates a DO, and will be accompanied by instructions on something you must do in a certain situation.



WARNING



- Before starting maintenance work, flush, clean and de-pressurise the pump. Any residue remaining in the pump, can increase the danger of explosion, or possible poisoning resulting in serious injury or death if chemicals adhere to the skin or are accidentally swallowed. (For details on cleaning the pump, refer to the Cleaning & Maintenance section of the operating manual.)
- When replacing parts, be sure to use the recommended genuine parts or Equivalents. Use of other parts may cause a malfunction of the product. (Refer to Exploded View and Reminder to order correct item on the separate sheets.)



CAUTION



- When it is instructed that special tools must be used, be sure to use the specified tools. Otherwise, the pump may be damaged.
- Refer to "Technical Specifications" in the Operating Manual. Also, remember that the pump is heavy, and extreme care must be taken when lifting it.



WARNING



INSTRUCTIONS

EQUIPMENT MISUSE HAZARD

Equipment misuse can cause the equipment to rupture or malfunction and result in serious injury. This equipment is for professional use only. Read all instruction manuals, tags, and labels before operating the equipment.

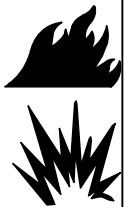
Use the equipment only for its intended purpose. If you are uncertain about usage, call Storm Machinery or your nearest distributor.

Do not alter or modify this equipment. Use only genuine Storm Machinery parts and accessories.

Check equipment daily. Repair or replace worn or damaged parts immediately. While using this diaphragm pump do not exceed maximum permissible operating pressure 5 bar.

Use fluids and solvents which are compatible with the equipment wetted parts. Refer to the **Technical Data** section of all equipment manuals. Read the fluid and solvent manufacturer's warnings.

FIRE AND EXPLOSION HAZARD



Improper grounding, poor ventilation, open flames or sparks can cause a hazardous condition and result in a fire or explosion and serious injury.

Ground the equipment and the object being sprayed. Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being sprayed.

Keep the spray area free of debris, including solvent, rags, and gasoline. Electrically disconnect all equipment in the spray area. Extinguish all open flames or pilot lights in the spray area.

Do not smoke in the spray area.

Do not turn on or off any light switch in the spray area while operating or if fumes are present.

Do not operate a gasoline engine in the spray area.



TOXIC FLUID HAZARD

Hazardous fluid or toxic fumes can cause serious injury or death if splashed in the eyes or on the skin, inhaled, or swallowed.

Know the specific hazards of the fluid you are using.

Store hazardous fluid in an approved container. Dispose of hazardous fluid according to all local, state and national guidelines.



PERSONAL PROTECTIVE EQUIPMENT

You must wear appropriate protective equipment when operating, servicing, or when in the operating area of the equipment to help protect you from serious injury, including eye injury, inhalation of toxic fumes, burns, and hearing loss. This equipment includes but is not limited to:

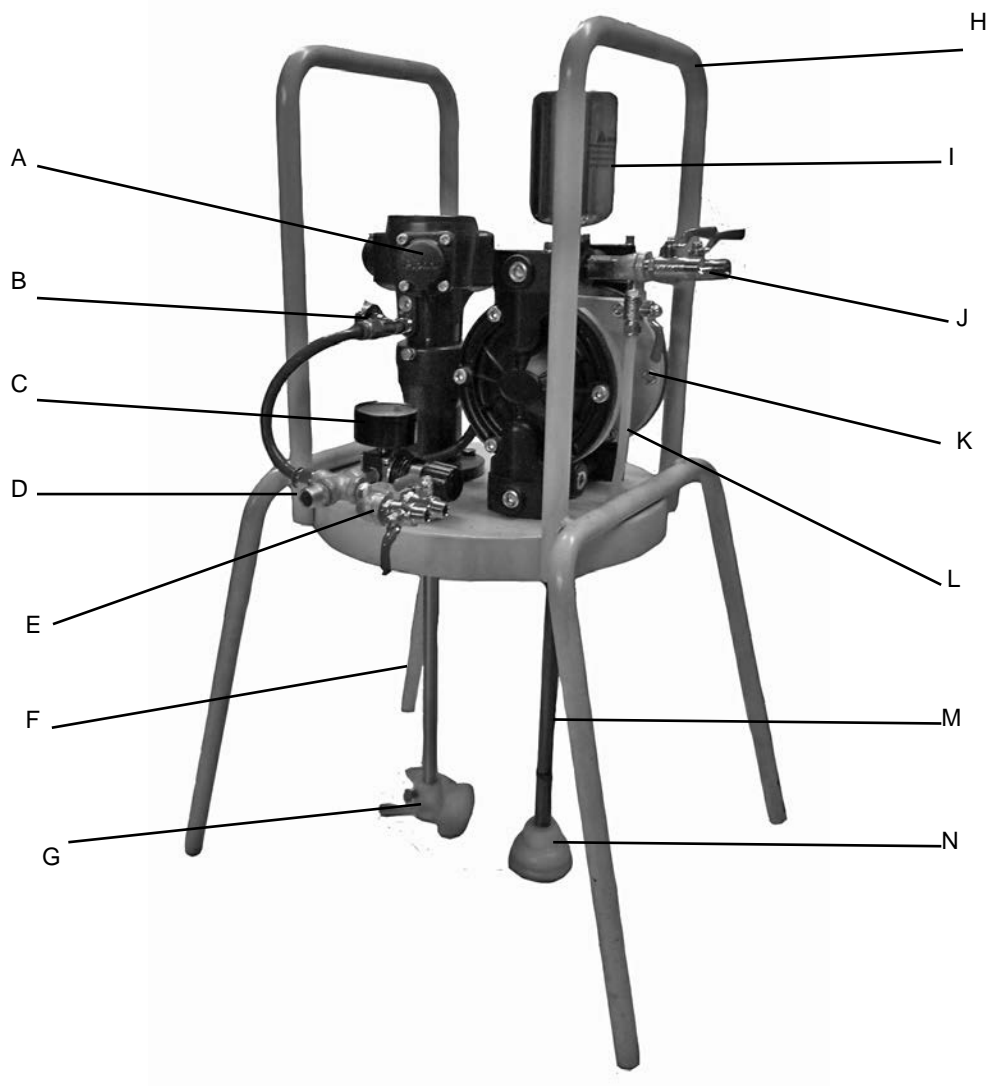
- Protective eyewear

- Clothing and respirator as recommended by the fluid and solvent manufacturer

- Gloves

- Hearing protection

Component Identification



Key :

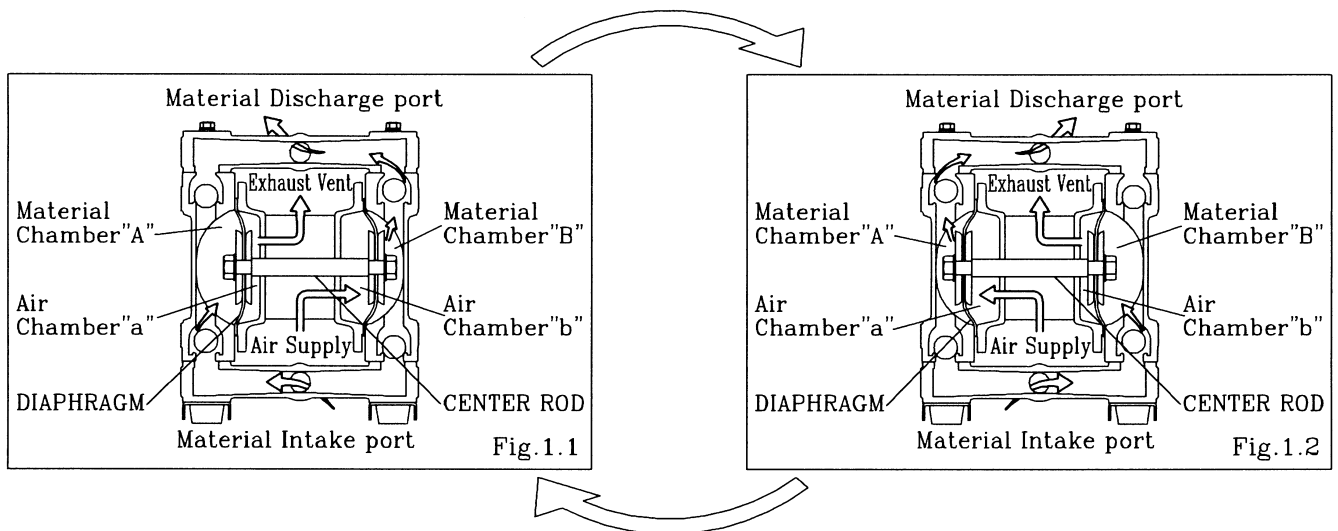
- A - Agitator Air Motor
- B - Agitator Control Valve
- C - Air Regulator and Gauge
- D - Air Inlet
- E - 2 x Air Outlet Valve(s)
- F - Agitator Shaft
- G - Agitator Blade
- H - Pump Stand
- I - Surge Chamber (Pulsation Damper)
- J - 2 x Fluid Outlet Valve(s)
- K - Pump Housing
- L - Fluid Return Pipe
- M - Suction Pipe
- N - Inlet Filter

Principles of operation

There are two diaphragms fixed to the centre rod, one at each end. When compressed air is supplied to air chamber b (right side, see Fig.1.1), the centre rod moves to the right, the material in material chamber B is pushed out, and at the same time material is sucked into material chamber A.

When the centre rod is moved full-stroke to the right, the air switch valve is switched, compressed air is sent to air chamber a (left side, see Fig.1.2), and the centre rod moves to the left. The material in material chamber A is pushed out, and at the same time material is sucked into material chamber B.

Repetition of this operation, causes material is repeatedly taken in and discharged out.



Tools, etc.

General tools

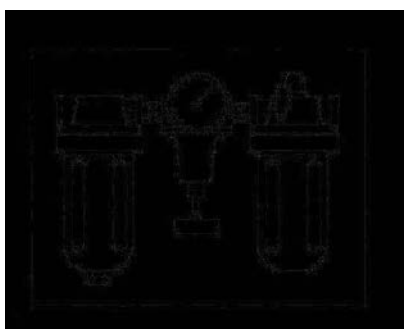
- Socket wrenches 13 mm
- Hexagonal box wrenches 5 mm, 6 mm
- Open-end wrenches 21 mm
- Vice Grip Pliers
- Snap ring pliers

Miscellaneous.

- Assembly oil Lubricating oil (SAE 10 grade or equivalent to)
- Nuts M8×1.25

Accessories

Filter Regulator and Lubricator Combinations or individual units are available to fit to this pump. These accessories increase the efficiency and useful life of your equipment.



INSTALLATION & SETUP

The installation must only be carried out by persons who have the necessary skills for this work (see chapter "Safety").

In order to avoid damage to the pump new installation sites should generally be checked for any debris (welding beads, pieces of wire, etc.) which could damage hoses or contaminate the coating.

Ensure all the connections on pump and pulsation dampener are checked and fastened if necessary before initial start-up.

The torque settings are specified in maintenance section of the manual.

Connection of Air Supply Line

We recommend a flexible hose (Minimum 13 mm I.D.) to supply the air to the pump

Any equipment requiring compressed air to operate it can be damaged by impurities in the line (including but not limited to moisture and grit) It is advisable and convenient to use a filter to remove liquid and impurities, which can rust or wear internal parts of the tool. An oiler can also be used in certain instances to help provide oil circulation through tool and increase the efficiency and useful life of the tool. Check oil level in the oiler daily. The filter must be checked on a daily basis and if necessary drained. These examples of additional control equipment can be used to regulate the flow capacity of the pump.

Connection of Paint Hose Set

First check the air outlet valve, for obstruction. If free of obstruction connect the hose.

Repeat the above mentioned procedure with the Fluid outlet valve, and connect the hose

Finally, connect the spray gun or another attachment to other end of the pipes/hoses

During setup, all pipelines must be fastened in a way that the basic weight of the lines is not resting on the pump. Check all pipelines for leaks. This applies in particular for the suction pipe, in order to avoid the intake of air.

Operating procedure:

Caution:

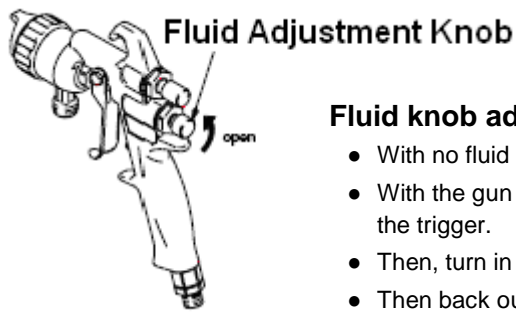
Check and make sure there is no pressurized fluid remained in the pump and pipes before using. If there is, release it by turning release valve until pressure bleeds down to Zero.

- Close the air outlet and fluid out let valves.
- Open the Priming / Flushing Valve to circulate the product.
- Adjust the Regulator slowly until the pump begins to cycle.
- Close and re-open the Priming / Flushing Valve to check the pump stops and restarts (pumps on demand).
- Slightly open the air and the fluid outlet valve(s) connected to the paint set.
- Check for any leakage on the lines.
- If no leaks are observed, open the valves completely.

N.B.

Fluids which change their viscosity must be permanently agitated. With increasing viscosity start the agitator This is of special importance for intermittent operation!

Setting the Spray Gun:

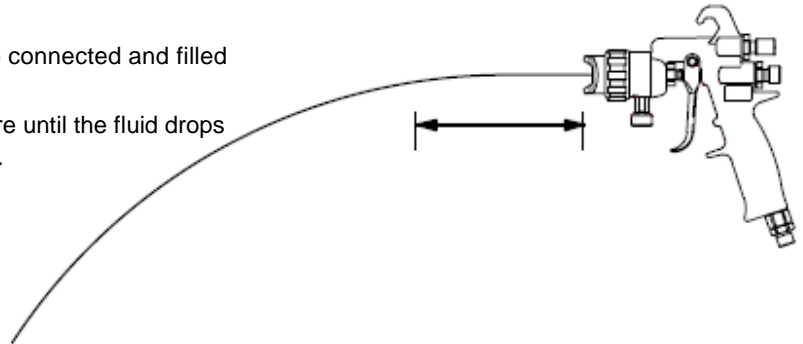


Fluid knob adjustment:

- With no fluid or air to the gun, pull the trigger and adjust the trigger travel.
- With the gun triggered, back the bottom knob out until it is not making contact with the trigger.
- Then, turn in the bottom knob until you feel it make contact with the trigger.
- Then back out $\frac{1}{4}$ turn. The gun is now set to full trigger travel.

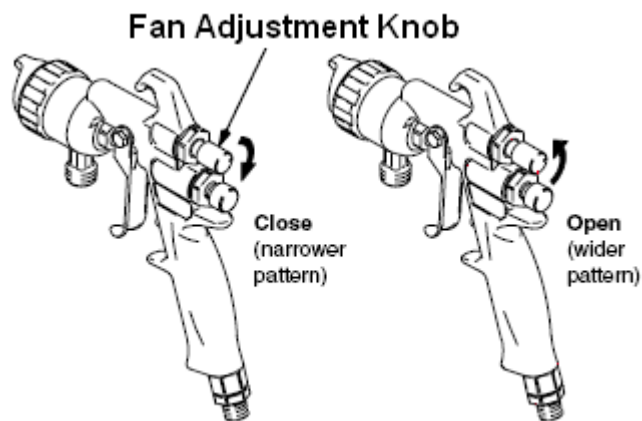
Fluid flow adjustment:

- With no air to the gun and your paint hose connected and filled with material.
- Pull the trigger and adjust the fluid pressure until the fluid drops off within 150 mm - 200 mm (6 - 8 inches).



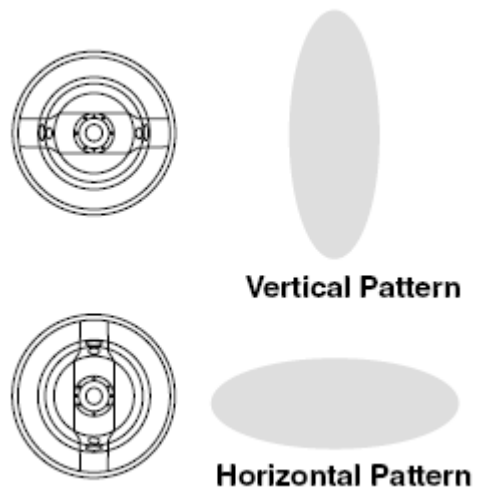
Fan knob adjustment:

Back the fan adjustment knob (top knob) all the way out. The gun is now set for full fan width.



Air Cap Adjustment:

The design intent of an Air Spray Gun is to take a light stream of fluid and shape it into a wide fan pattern, and disperse the material evenly throughout the whole pattern. The pattern used will be dependant on the



N.B. You want to set up your air cap to spray a horizontal pattern (for testing purposes)

Cleaning and maintenance

Thorough cleaning performed right after operating is always necessary.

This prolong the durability of the pump and also reduces the necessity for spare parts.

Cleaning procedure:

1. Turn the pressure regulator counter clock to set the pressure zero.
2. Open the fluid valve and fluid return valve.
3. Close the air adjustment valve on the gun. Then trigger the gun and force the remaining fluid in the pipe back to the fluid tank.
4. Place the pump with the fluid suction hose over a container with clean solvent.
5. Open fluid outlet valve to flush the inside of the pipe.
6. Close the fluid outlet valve and leave the fluid return valve open.
7. Turn the pressure regulator to necessary working pressure 0.5 - 1 Bar.
8. Leave the pump to recycle the solvent inside of the pump to clean out all the paint.
9. Once the pump is thoroughly clean, close the fluid return valve.
10. Open fluid outlet valve to flush the inside of the pipe.
11. Repeat step 1 to 3 let the solvent inside pipe return to the solvent tank. Close the fluid outlet valve and leave the fluid return valve open.

Troubleshooting

Fault	Possible cause	Remedy
Pump running, no delivery	Pump drawing air Suction capacity exceeded Valve ball and seat on suction side worn	Seal the suction line Consider different pump for application Replace seats and balls
Insufficient pumping capacity	Air inlet filter clogged Insufficient air supply Pipelines blocked Viscosity too high	Clean or replace Check supply line for leaks Flush to clean or replace pipes Add solvent to thin product if possible
Reduced flow, stronger Pulsation Air in product	Valve ball on suction side Blocked Diaphragm cracked	Check & ensure mobility of valve ball Replace diaphragm
After filling/priming the line the pump stops	Air pressure too low Product Viscosity too high	Increase air pressure Consider different pump for
Pump does not work despite air supply	Silencer blocked Air inlet filter clogged Valve balls sticking to valve seat	Clean or replace silencer Clean or replace filter unit Loosen and clean, or replace balls
Diaphragm cracked/damaged after short time	Large solids in product Pump not being flushed completely (Cured product in pump housing) Exceeding 7 bar pressure	Check Suction Filter and replace if necessary Flush pump Completely (Replace diaphragms) Reduce pressure
Insufficient suction head	Valve ball and seat leaking Pump completely dry	Replace Fill suction line

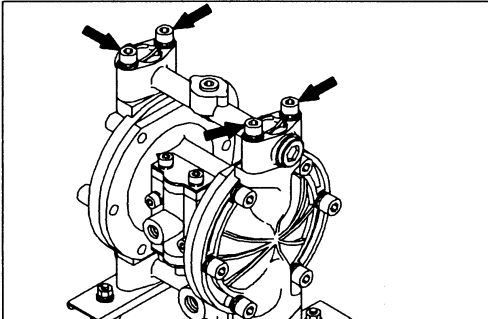
Troubleshooting the Pump (con td.)

Fault	Possible cause	Remedy
Piston rod hardly moving	Compressed air too dry (Instrument air) Temperature too high Compressed air dirty Piston rod run in	Lubricate the air Cool down Install a Filter Replace
Indicator on air pressure gauge is not working	Broken or damaged	Replace parts (#55)
Malfunction of pressure regulator	Broken or damaged of the pressure regulator	Replace parts (#56)

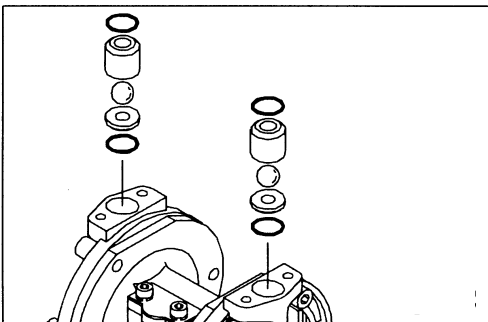
Troubleshooting the Agitator

Fault	Possible cause	Remedy
Motor not turning	Damage to Motor Parts	Replace Motor (ensure clean air supply to motor)
Uneven Mixing	Loose Agitation Blade	Fasten Agitation Blade

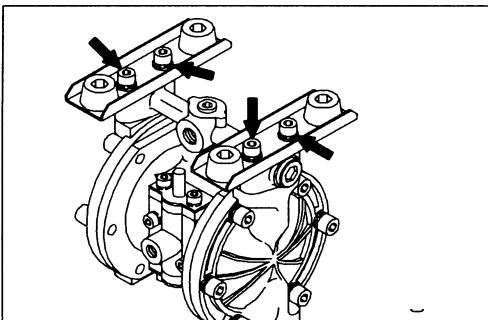
Balls and Valve seats Removal



- Remove the 4 retainer bolts from the outlet manifold, and remove the outlet manifold.



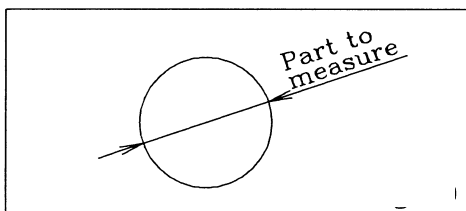
- Remove the O ring, valve stopper, ball and valve seat.



- Turn over the main body assembly. Remove the 4 retainer bolts from the inlet manifold, and remove the inlet manifold.

- Remove the O ring, valve seat, ball and valve stopper.

Inspection



Ball

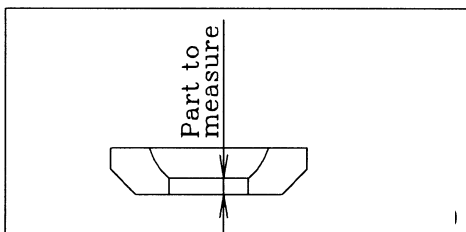
Measure the outside diameter, and if it is outside the usable range, replace the ball.

Usable range of ball
Sø14.3 ~ Sø16.3 mm

Valve seat

Measure the dimension shown at left, and if it is outside the usable range, replace the seat.

Usable range of ball
Sø 2.0 ~ Sø 5.1 mm



O ring (other than PTFE)

If O ring is worn out or cracked, replace it.

Reassembly

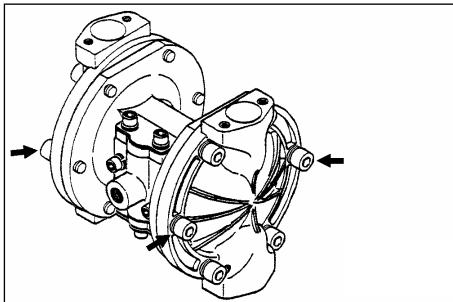
For reassembly, see [Exploded View] and install in the reverse order of disassembly.
Tightening torque for manifold retainer bolts is 8 Nm

N.B.

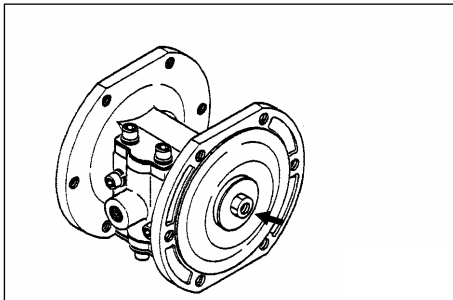
- Make sure there is no dust on the seal surface and the seal is not damaged.
- Replace the PTFE O ring regardless of its condition.

Diaphragm Replacement

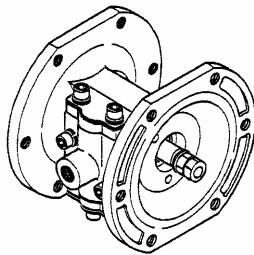
Removal



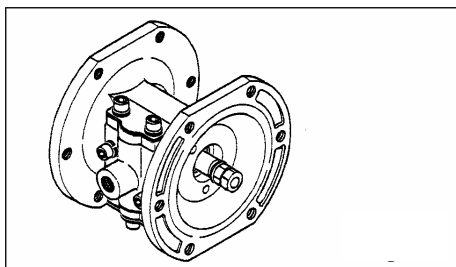
- Remove the ball and valve seat etc.
- Remove the 12 retainer bolts from the out chamber, and remove the out chamber.



- Remove the nuts on both sides of the center rod.
- After the nuts on one side have been removed, remove the center disk and diaphragm.



- Remove the nuts on the opposite side using the double nut.
- Remove the coned disk spring, center disk and diaphragm.



- Remove the center disk and diaphragm from the opposite side using the double nut.
Be careful not to scratch or score the center rod.

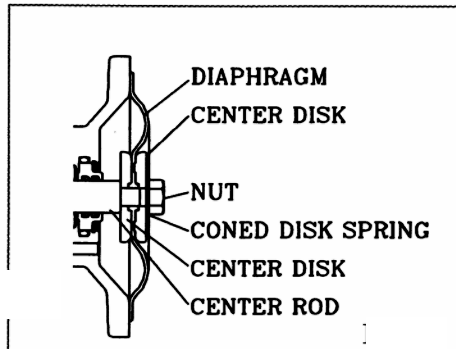
Inspection

▪ Diaphragm

If the diaphragm is worn out or damaged, replace it.
Never replace just one diaphragm.

Reassembly

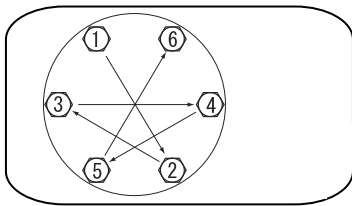
For reassembly, see [Exploded View] on the separate sheet and install in the reverse order of disassembly.



- Apply assembly grease to the center rod, and insert it into the main body.
- Keep the convex side to the outside (see diagram).
- Tighten the center disk using an open-end wrench. (No coned disk springs and nuts are needed.)
- Tighten the out chamber temporarily at first.
- After Reassembly of the outer chambers on both sides, place the pump on a flat surface and stand the pump upright for further assembly.

Tightening torque for center rod and out chamber

Center rod	Outlet chamber
14 N-m	12 N-m

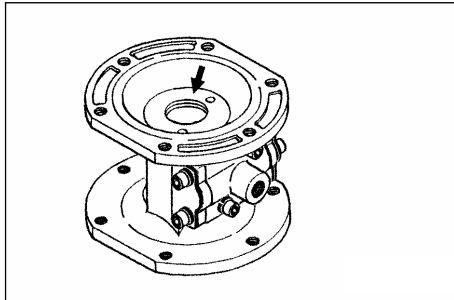


N.B.

- Make sure there is no dust on the seal surface in order to prevent seal damaged
- Tighten the bolts gradually in a diagonal sequence with even torque..

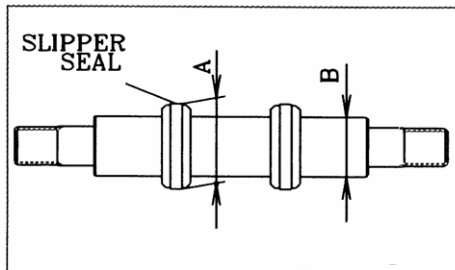
Centre rod, Body and Guide bushing

Removal



- Remove the diaphragm etc.
- Remove the snap ring using the snap ring pliers, and remove the guide bushing, spacer and center rod assembly.

Inspection



- Centre rod assembly
Measure the outside diameter (A), and if it is outside the usable range, replace the slipper seal.

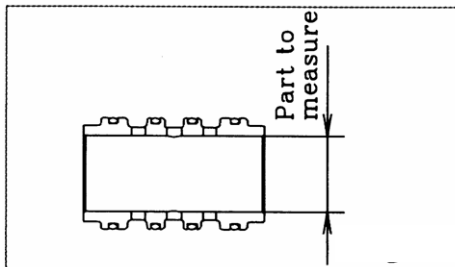
Usable range of Slipper seal (A)

$\phi 19.9 \sim \phi 20.0$ mm

Measure the outside diameter (B), and if it is outside the usable range, replace the center rod Slipper seal.

Usable range of Centre rod(B)

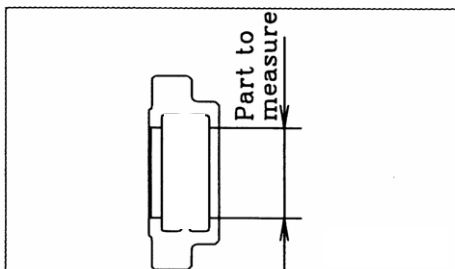
$\phi 13.9 \sim \phi 14.0$ mm



- Sleeve
Measure the inside diameter, and if it is outside the usable range, replace the Sleeve.
Remove the Sleeve from the Spacer side.

Usable range of sleeve

$\phi 20.00 \sim \phi 20.08$ mm



- Guide bushing
Measure the inside diameter, and if it is outside the usable range, replace the guide bushing.

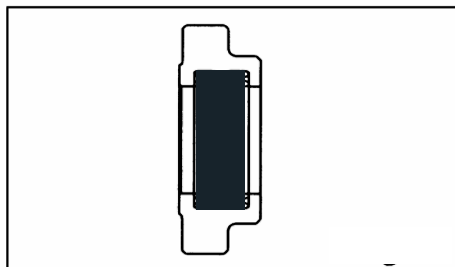
Usable range of Guide bushing

$\phi 14.02 \sim \phi 14.08$ mm

- O ring
If the O ring is worn out or cracked, replace it.

Reassembly

For reassembly, see [Exploded View] on the separate sheet and install in the reverse order of disassembly.

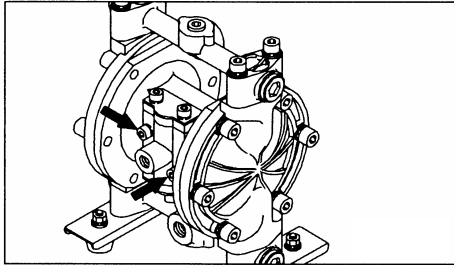


N.B.

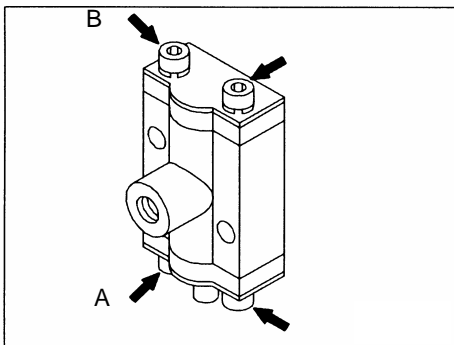
- Make sure there is no dust on the seal surface and it is not damaged.
- Apply grease to packing.

Spool valve case and Spool Assembly

Removal

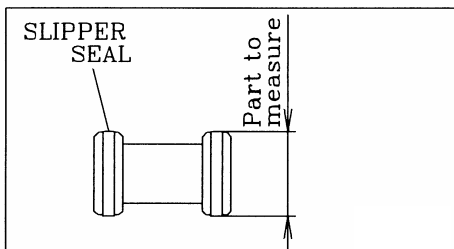


- Remove the 2 retainer bolts from the spool valve case, and remove the spool valve case.



- Remove the 2 retainer bolts from the cap, and remove the reinforcement plate A, cap and reset button.
- Remove the 2 retainer bolts from the cap, and remove the reinforcement plate B, and cap.
- Remove the spool valve assembly from the spool valve case.

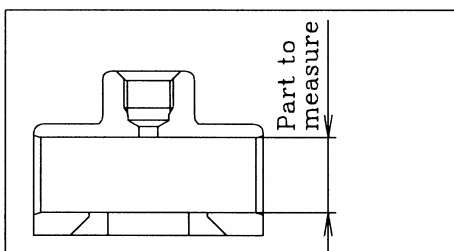
Inspection



- Spool valve assembly
Measure the outside diameter, and if it is outside the usable range, replace the slipper seal.

Usable range of spool valve assembly

$\phi 19.9 \sim \phi 20.0 \text{ mm}$



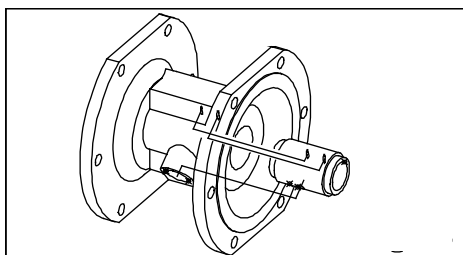
- Spool valve case
Measure the inside diameter, and if it is outside the usable Range, replace the Spool valve case.

Usable range of spool valve case

$\phi 20.00 \sim \phi 20.08 \text{ mm}$

Reassembly

For reassembly, see [Exploded View] on the separate sheet and install in the reverse order of disassembly.



Tightening torque for reassembly Cap

6 N-m

Tightening torque for reassembly Spool valve case

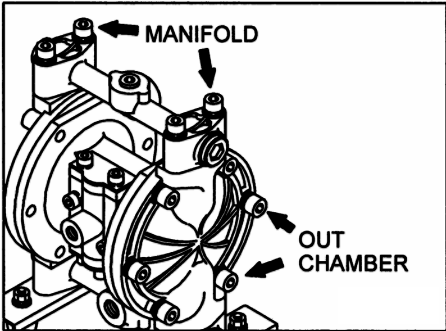
6 N-m

- Sleeve
When inserting the sleeve into the body, please make sure the position of the 3 holes in the sleeve match the corresponding holes in the body.

N.B.

- Make sure there is no dust on the seal surface and it is not damaged.

Re-tightening of Tie rods

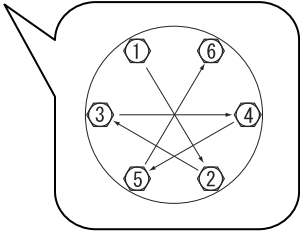


- All bolts should be retorqued:
 - (1) Right before start up.
 - (2) If there are any leaks observed in daily inspection of the pump.

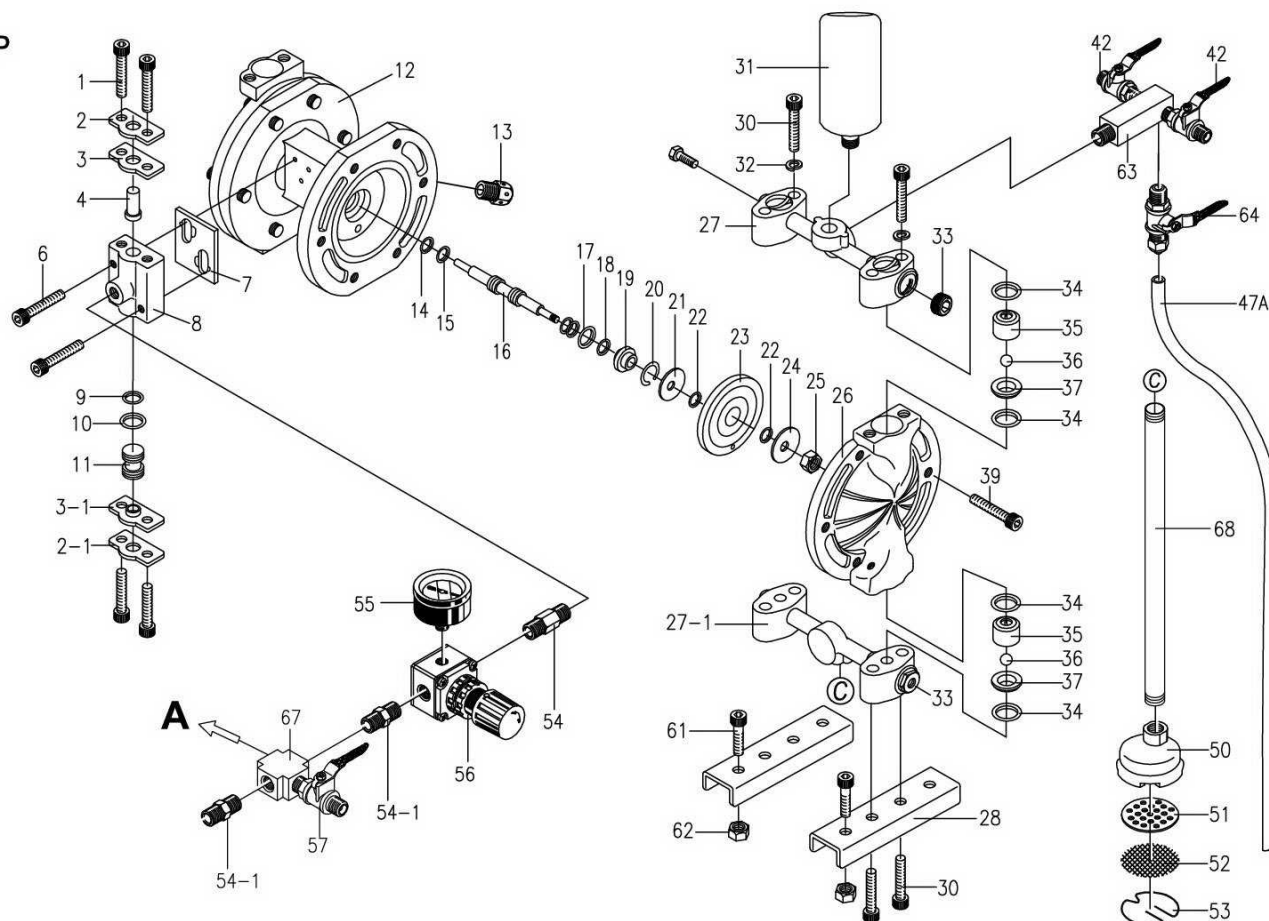
Retain bolts for the outlet chamber	Retain bolts for the manifold
12 N•m	12 N•m

N.B.

- Retighten the Outlet chamber and then the manifold in this order.
- Tighten the bolts in the order shown.



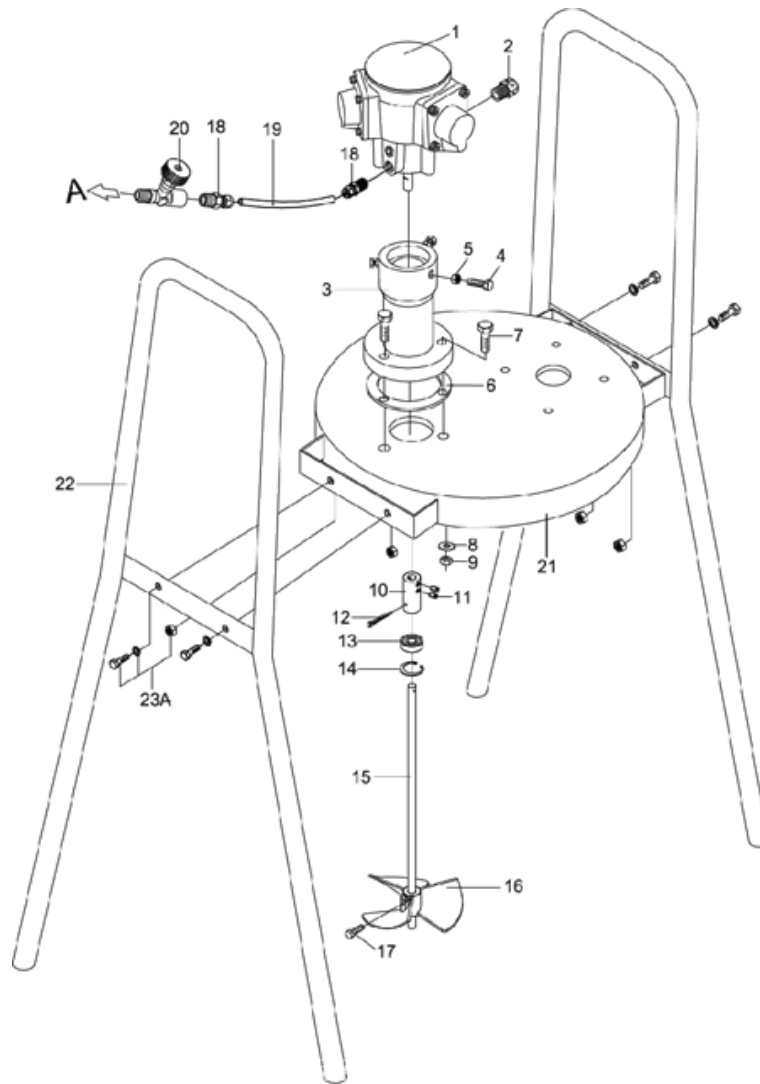
DP-5-P -PUMP



DP-5-P -PUMP PARTS

PARTS NO.	DESCRIPTION	QTY
1	Counter-sink Screw	4
2	Gasket	1
2-1	Gasket	1
3	Gasket	1
3-1	Gasket	1
4	Plunger	1
6	Counter-sink Screw	2
7	Gasket	1
8	Direct Valve	1
9	O-ring	2
10	O-ring	2
11	Piston	1
12	Pump Body	1
13	Silencer	1
14	O-ring	2
15	O-ring	2
16	Shaft	1
17	O-ring	2
18	O-ring	2
19	Bushing	2
20	C-snap Ring	2
21	Plate	2
22	O-ring	4
23	Diaphragm	2
24	Plate	2
25	Screw	2
26	Side Cover	2
27	Manifold	1

PARTS NO.	DESCRIPTION	QTY
27-1	Manifold	1
28	Base Rack	2
30	Counter-sink Screw	8
31	Storage Tank	1
32	Washer	4
33	Plug	5
34	O-ring	8
35	Ball Guide	4
36	Ball	4
37	Retaining Seat	4
39	Countersink Screw	12
42	Ball Valve (Fluid outlet)	2
47A	Fluid hose	1
50	Absorption Apparatus	1
51	Filter Base	1
52	Material Filter	1
53	Snap Ring	1
54	Adapter	1
54-1	Adapter	2
55	Pressure Gauge	1
56	Pressure Regulator	1
57	Ball Valve	1
61	Screw	4
62	Nut	4
63	Fluid outlet adapter	1
64	Ball Valve (nut)	1
67	Four-way Block	1
68	Fluid Tube	1



AGITATOR PARTS

PARTS NO.	DESCRIPTION	Q'TY	PARTS NO.	DESCRIPTION	Q'TY
1	AIR MOTOR	1	14	LOCK RING	1
2	SILENCER	1	15	AGITATION SHAFT	1
3	MOTOR BASE	1	16	AGITATION BLADE	1
4	HEXAGON SCREW	3	17	SCREW	1
5	NUT	3	18	ADAPTER	2
6	GASKET	1	19	AIR HOSE	1
7	HEXAGON SCREW	3	20	AIR VALVE	1
8	WASHER	3	21	LID	1
9	HEXAGON NUT	3	22	STAND	2
10	COUPLING	1	23A	HEXAGON NUT	4
11	SET SCREW	2		HEXAGON SCREW	4
12	PIN	1		WASHER	4
13	BEARING	1			

TECHNICAL SPECIFICATIONS

Pressure Ratio	1:1
Painting tank Volume	4 - 200 litre
Transmitting Capacity	5 l/min @ 0.4 Bar
	7.5 l/min @ 1 Bar
	10.5 l/min @ 2 Bar
Required Air Pressure	1 - 5 Bar
Max. Painting Pressure	5 Bar
Max. Pump Speed	160 cycles / min (@ 5 Bar)
Min. Pump Speed	80 cycles / min (@ 0.4 Bar)

