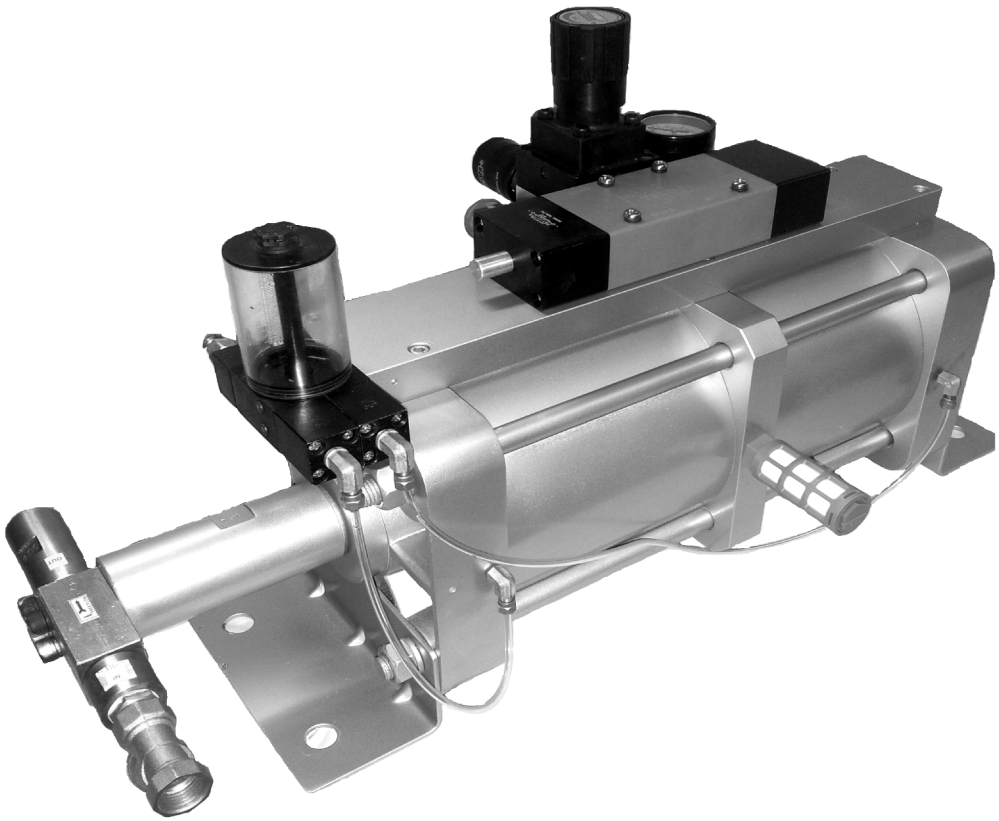
# Hydro Pneumatic Pumps

The efficient, economical alternative to centrifugal, vane, piston & plunger pumps and hand operated pumps



- AUTOLUBE SYSTEM FOR AUTOMATIC LUBRICATION OF THE PUMP
- WATER INLET FILTER
- PUSH TO LOCK REGULATOR KNOB

## General Description

The general layout of components used for proper installation of our Hydro Pneumatic Pump is given in **Fig.1.** The principle of operation is given in **Fig. 2**, **Fig. 3** and **Fig. 4.**

**NOTE : Items marked * are not supplied by us and have to be provided by the customer.**

**ADVANTAGES OF "MERCURY" HYDRO PNEUMATIC PUMPS**

The New **MERCURY** Series **N** Hydro Pneumatic Reciprocating Pumps are an efficient, low cost alternative to motorised and hand operated pumps. The salient features are:-

(i) Compact and lightweight. Can be mounted in any orientation.

(ii) Low air consumption. When used in conjunction with a low pressure, high discharge centrifugal prefill pump, the energy consumption and time for building desired pressure is very low. Once pressure has built up there is no further consumption of compressed air.

(iii) Automatically compensates for leakages to maintain set pressure.

(iv) Can be used in explosive environments as all components are pneumatically actuated.

(v) Designed for use with water and other non corrosive liquids, as all wetted parts are made from stainless steel and brass.

(vi) Non return valve assembly can be easily dismantled for quick servicing.

(vii) Precise air pressure regulator with push to lock knob, to infinitely vary the output pressure.

(viii) Automatic and adjustable lubrication through our unique **AUTOLUBE** pump.

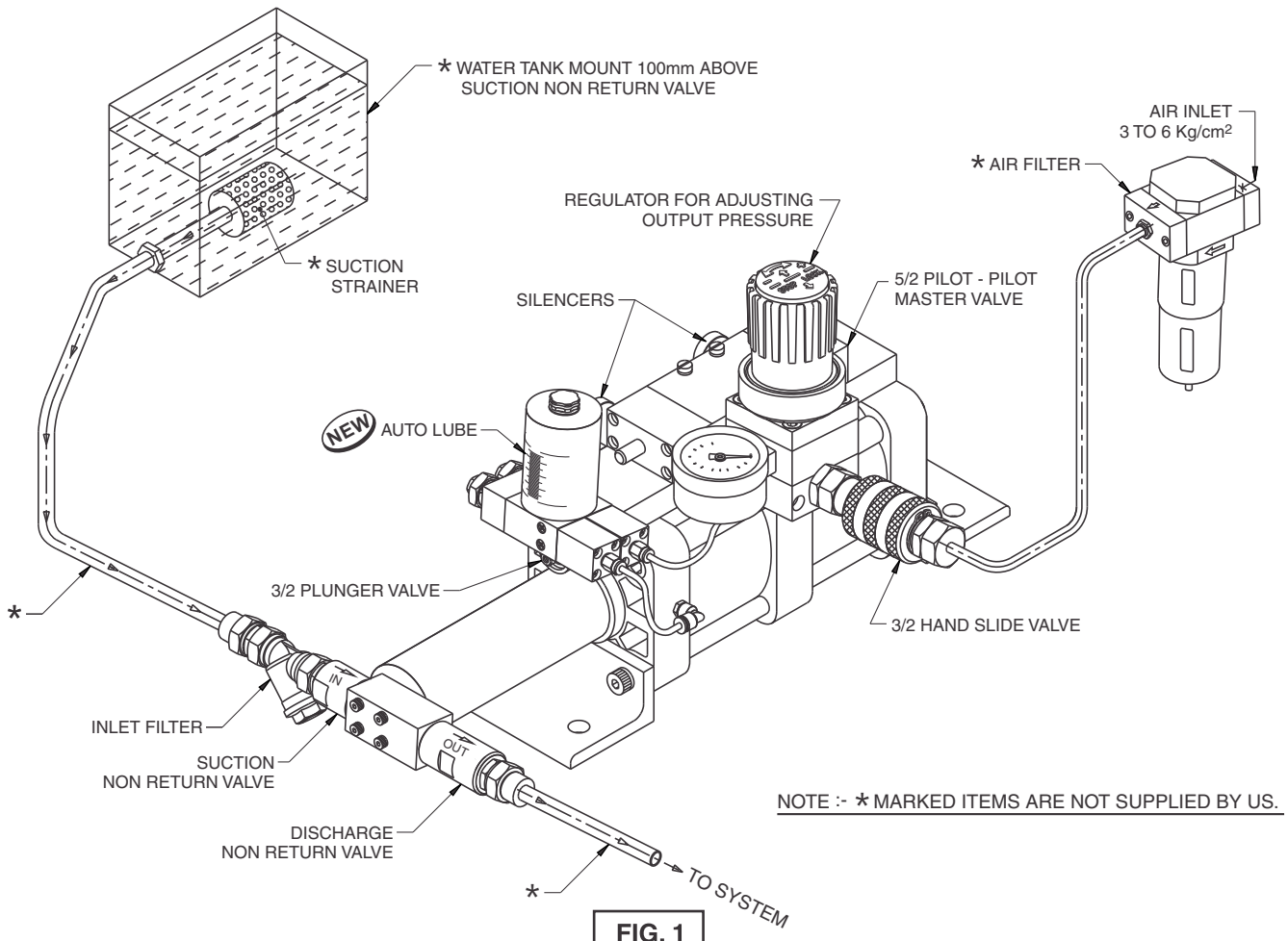
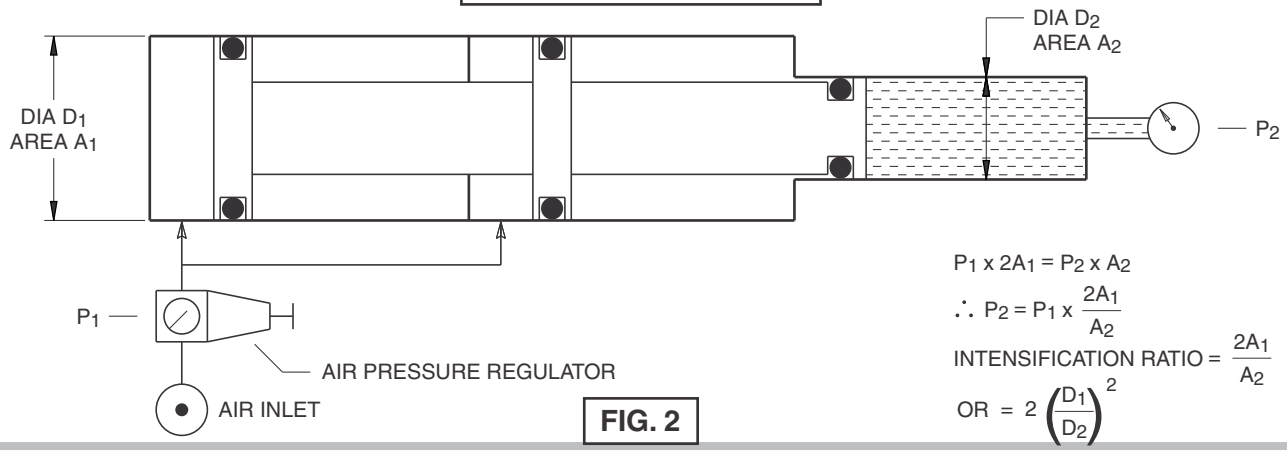



**FIG. 1**

## DASH 2 INTENSIFIER




$P_1 \times 2A_1 = P_2 \times A_2$

$\therefore P_2 = P_1 \times \frac{2A_1}{A_2}$

INTENSIFICATION RATIO = $\frac{2A_1}{A_2}$

OR $= 2\left(\frac{D_1}{D_2}\right)^2$

**FIG. 2**

## PNEUMATIC CIRCUIT DIAGRAM FOR SERIES 'N' HYDRO PNEUMATIC RECIPROCATING PUMP

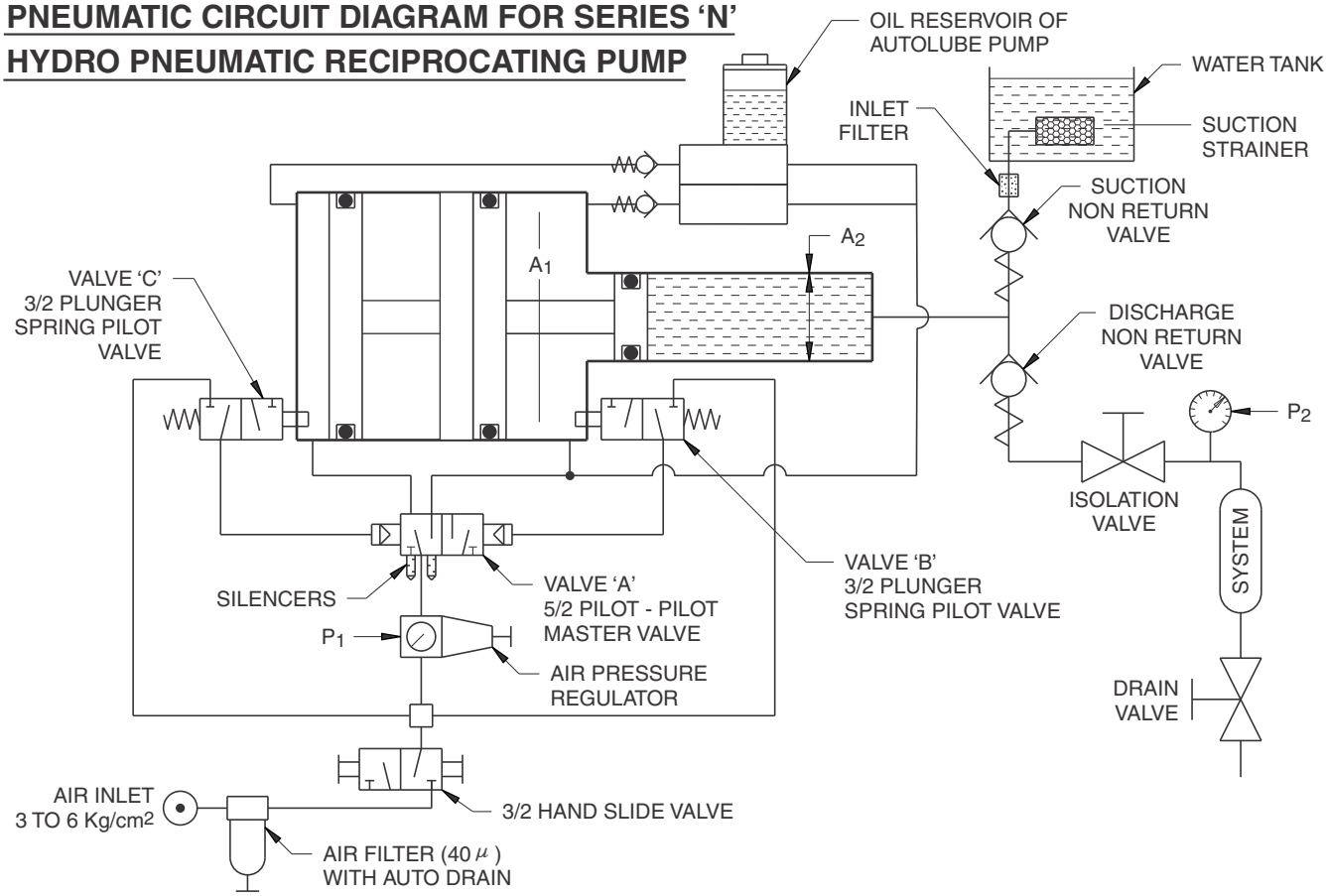



**FIG. 3**

## Principles of Operation for Series 'N' Single head pneumatically operated.

The heart of **MERCURY** pumps is an air to liquid Intensifier or Booster which is diagrammatically shown in **Fig. 2.**

The pneumatic cylinder of large diameter **D1** is coupled to an hydraulic cylinder of small diameter **D2**. When regulated compressed air at pressure **P1** is applied on **D1**, the pressure of liquid in **D2** increases as per Pascals Law.

$$P_1 \times A_1 = P_2 \times A_2 \qquad \text{Where } A_1 = \frac{\Pi}{4} \times D_1^2$$

$$\therefore \quad P_2 = P_1 \times \frac{A_1}{A_2} \qquad \text{and } A_2 = \frac{\Pi}{4} \times D_2^2$$

The ratio $\frac{A1}{A2}$ is called the intensification ratio.

For high ratio pumps, area **A1** is increased by coupling two pneumatic cylinders **D1** to a single hydraulic cylinder **D2** as shown in **Fig. 2.** Low pressure, low ratio pumps are called **Dash 1 (Fig. 2)** and high pressure, high ratio pumps are called **Dash 2 (Fig. 2). Dash 1 and Dash 2** pumps can be identified by the last digit in the model number.

The air to liquid intensifier shown in **Fig. 2** is converted into a pump by automatically reciprocating the pneumatic cylinder by suitable valves as shown in **Fig. 3.**

When regulated air at pressure **P1** is supplied through 5/2 pilot-pilot master **Valve A,** the cylinder piston starts moving to the right. When the piston presses the inbuilt 3/2 plunger **Valve B,** a pilot signal is given to the right end of **Valve A,** causing it to reverse and the cylinder piston starts moving to the left. When the piston presses inbuilt 3/2 plunger spring **Valve C,** a pilot signal is given to left end of **Valve A,** causing it to reverse and the piston starts moving to the right. Hence the pneumatic piston starts reciprocating continuously as long as compressed air is supplied.

On the liquid side of the pump, a suction and discharge non return valve assembly is fitted. When the piston moves to the left, vacuum is created in the hydraulic cylinder and liquid is sucked in due the opening of suction non return valve. When the piston moves to the right, the suction non return valve shuts and the sucked liquid is discharged through the discharge non return valve. The constant reciprocation of the cylinder causes suction and discharge of liquid in pulses. The discharged liquid is fed into the product which has to be pressurised.

As liquid fills into the product, the pressure starts rising and when it reaches value **P2,** the forces in the pump balance and the pump stops reciprocating automatically. If there is any leakage in the output line, then the pump starts reciprocating automatically to compensate for the leakage and maintain output pressure **P2.**

Automatic lubricating system

With every operation of **Valve A**, an air signal is given to the **AUTOLUBE** Pump. The Pump injects oil at high pressure directly into the cylinder. This guarantees lubrication of the cylinder and valves.

**Typical Pressure Testing Circuit**

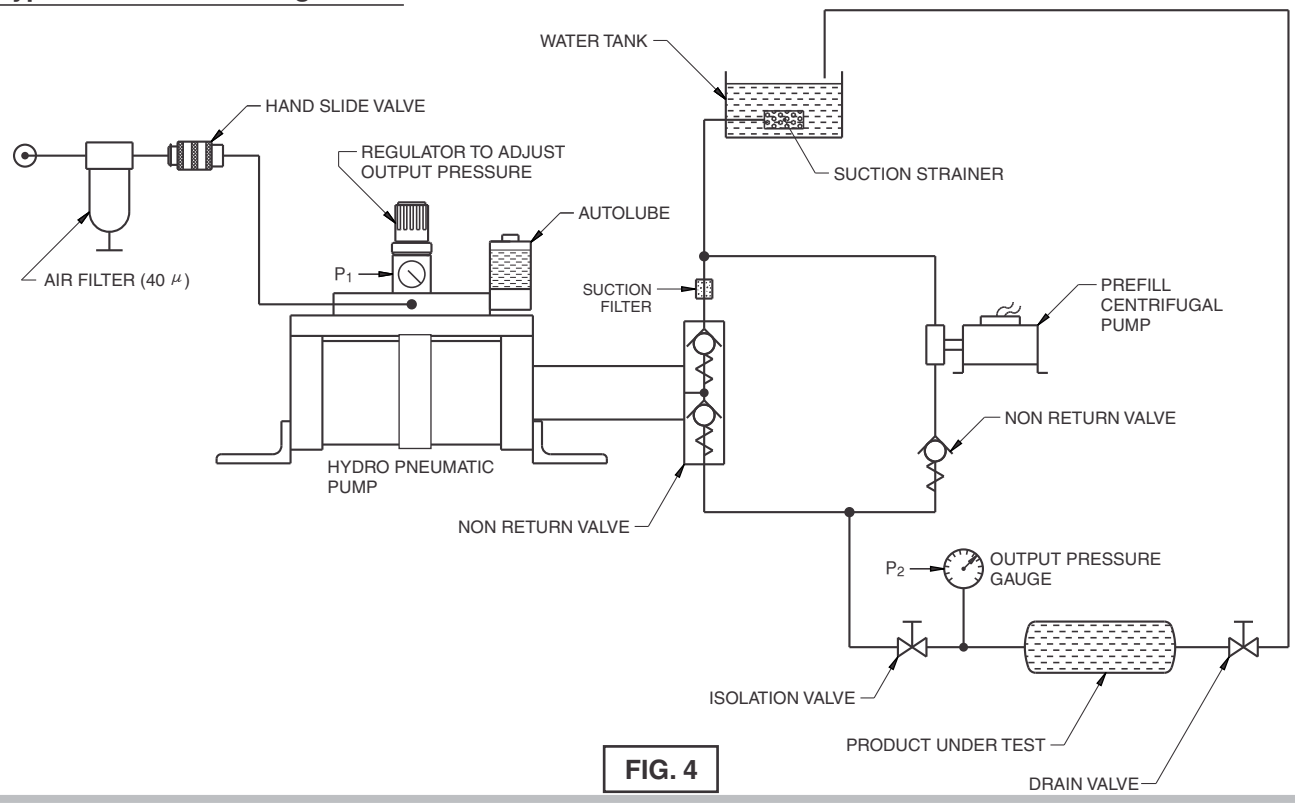



**FIG. 4**

## Typical Applications

One of the most popular applications of **MERCURY** Hydro Pneumatic Reciprocating Pumps is for pressure / burst testing of Castings, Valves, Hoses, Pressure Vessels etc.

The general layout of a hydrostatic pressure testing setup is shown in **Fig.4.**

The product under test (ex. casting) is first prefilled with water using a low pressure, high discharge **CENTRIFUGAL PUMP .** When all trapped air escapes and the casting is fully filled, the **DRAIN** valve and the **CENTRIFUGAL PUMP** are switched **OFF** and the **HYDRO PNEUMATIC PUMP** is switched **ON** by sliding **Hand Slide Valve** forward. When pressure in gauge **P2** rises to the value set in regulator **P1**, the **ISOLATION** valve is closed and after a slight delay the **HYDRO PNEUMATIC PUMP** should be switched **OFF** by sliding **Hand Slide Valve** backward**.** Any leakage in the product is detected by drop in pressure gauge **P2.**

After the test time, the drain valve is opened to release pressure and drain the water.

**OTHER APPLICATIONS**

Some of the other applications where **MERCURY** Hydro Pneumatic Pumps can be used as a low cost alternative to hand operated and motorised hydraulic pumps are:

(i) Cyclic Pressure / life Testing of Pressure Gauges, Pressure Switches, Hoses etc.

(ii) Burst Strength Testing of pressurised vessels such as LPG / Nitrogen / Oxygen gas cylinders, storage tanks, hoses, pipes etc.

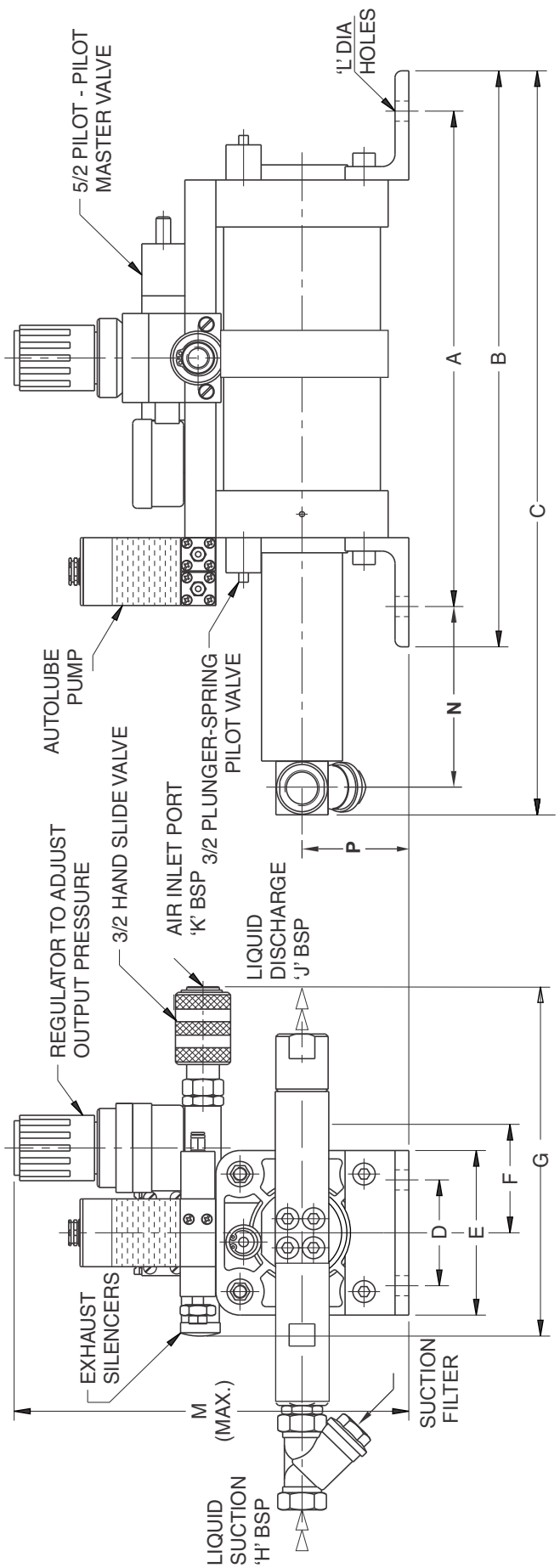
(iii) Seat leakage test of Control Valves.

(iv) Operation of Single Acting Hydraulic Cylinders used in lifting platforms, hydraulic clamps, compression moulding presses etc.

(v) Isostatic Pressing of powder metals and ceramics.

(vi) Transferring of liquids from barrels, storage tank etc.

(vii) Pumping oil or grease in centralized lubrication systems.



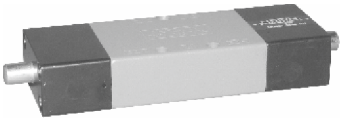

| MODEL No. | RATIO | OUTPUT PRESSURE AT 5Kg/cm² | A | B | C | D | E | F | G | H BSP | J BSP | K BSP | Ø L | M | N | P | FREE DISCHARGE LITRES / MIN. | FREE AIR CONSUMPTION LITRES / MIN. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160-14-2 | 260 | 1300 | 558 | 639 | 690 | 115 | 185 | 76 | 280 | ½" | ½" | ½" | 18 | 365 | 92 | 115 | 0.80 | 1201 |
| 160-20-2 | 128 | 640 | 558 | 639 | 690 | 115 | 185 | 76 | 280 | ½" | ½" | ½" | 18 | 365 | 92 | 115 | 1.60 | 1196 |

FIG. 5

# Spare Parts for Hydro Pneumatic Pumps

MERCURY

## 5/2 PILOT-PILOT MASTER VALVES FOR PNEUMATICALLY OPERATED PUMP



| PART No. | DESCRIPTION | SEAL KIT No. |
|---|---|---|
| S692PU | 1/4 5/2 PILOT-PILOT VALVE FOR PNEUMATICALLY OPERATED PUMPS | SKS692PU |
| S694PU | 1/2 5/2 PILOT-PILOT VALVE FOR PNEUMATICALLY OPERATED PUMPS | SKS694PU |

## AIR PRESSURE REGULATOR WITH INLET BLOCK

| PART No. | DESCRIPTION | SEAL KIT No. |
|---|---|---|
| RP2 | 1/4 REGULATOR FOR PUMP | SKRP2 |
| RP4 | 1/2 REGULATOR FOR PUMP | SKRP4 |

## SUCTION STRAINER

| PART No. | DESCRIPTION |
|---|---|
| 40-6282 | SUCTION STRAINER FOR A-100-40,100-56 160-40 &160-56 SERIES PUMP |
| 40-6296 | SUCTION STRAINER FOR REST OF THE MODELS |

## SILENCERS

| PART No. | DESCRIPTION |
|---|---|
| SL2 | 1/4 SILENCER FOR A-100-40,100-56,160-40 &160-56 SERIES PUMP |
| SL4 | ½ SILENCER FOR REST OF THE MODELS |

## 3/2 HAND SLIDE VALVES

| PART No. | DESCRIPTION | SEAL KIT No. |
|---|---|---|
| SV2 | 1/4 HAND SLIDE VALVE FOR A-100-40,100-56 A-160-4 &160-56 SERIES PUMP | SKSV2 |
| SV4 | ½ HAND SLIDE VALVE FOR REST OF THE MODELS | SKSV2 |

## HIGH PRESSURE SUCTION & DISCHARGE NON-RETURN VALVE


| PART No. | DESCRIPTION | SEAL KIT No. |
|---|---|---|
| HP2 | HIGH PRESSURE NON-RETURN VALVE | 59-019 |