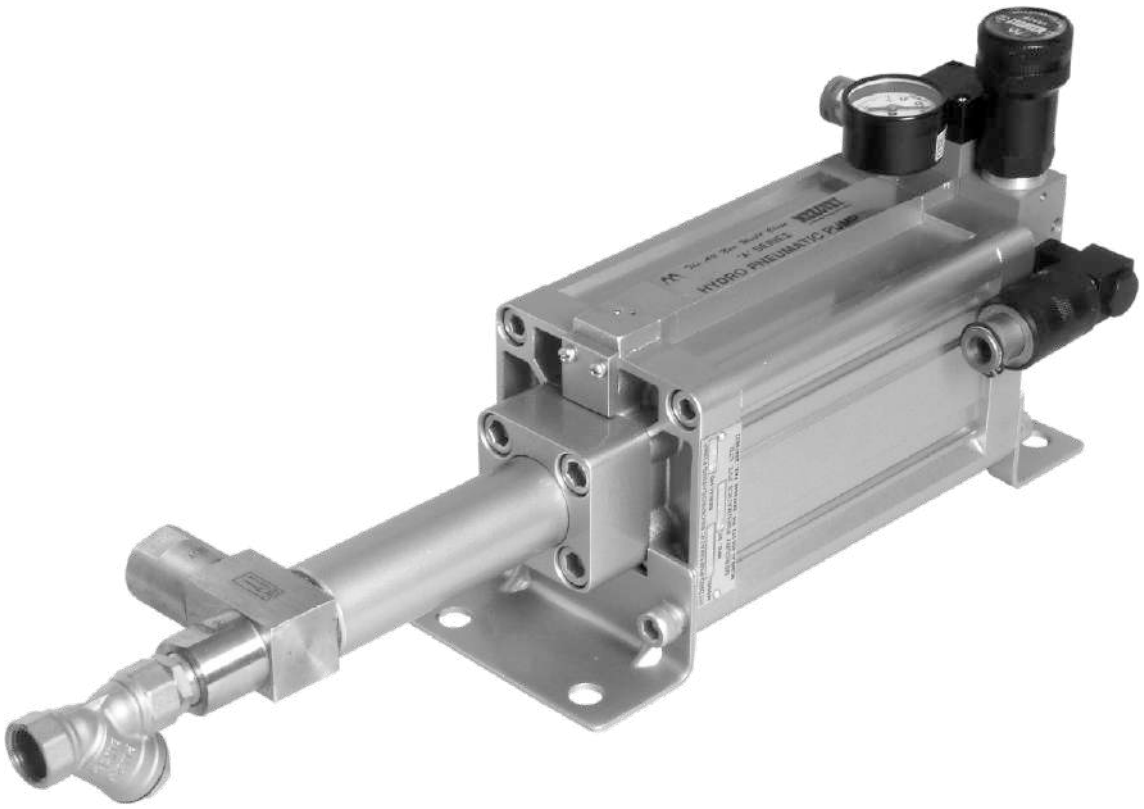
Hydro Pneumatic Pumps

The All New World Class

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



Typical Applications :

- Hydro static Pressure Testing
- Cyclic Pressure Testing
- Burst Strength Testing
- Operation of Hydraulic Jacks, Clamps & Presses
- Portable Systems for Construction, Mining & Defence Equipments
- Overload Protection of Mechanical Presses, Shears etc

1.0 General Description

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

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

1.2 ADVANTAGES OF "MERCURY" HYDRO PNEUMATIC PUMPS

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

1. Compact and lightweight. Can be mounted in any orientation.
2. 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.
3. Automatically compensates for leakages to maintain set pressure.
4. Can be used in explosive environments, as all components are pneumatically actuated.
5. Designed for use with water and other non corrosive liquids, as all wetted parts are made from stainless steel and brass.
6. Non return valve assembly can be easily dismantled for quick servicing.
7. Sub-base mounted valve regulator assembly for quick replacement and easy servicing.
8. 2/2 Plunger valves can be serviced without dismantling the pump.
9. Bleed hole to indicate high pressure water seal deterioration / failure.

General Layout of Pump Installation

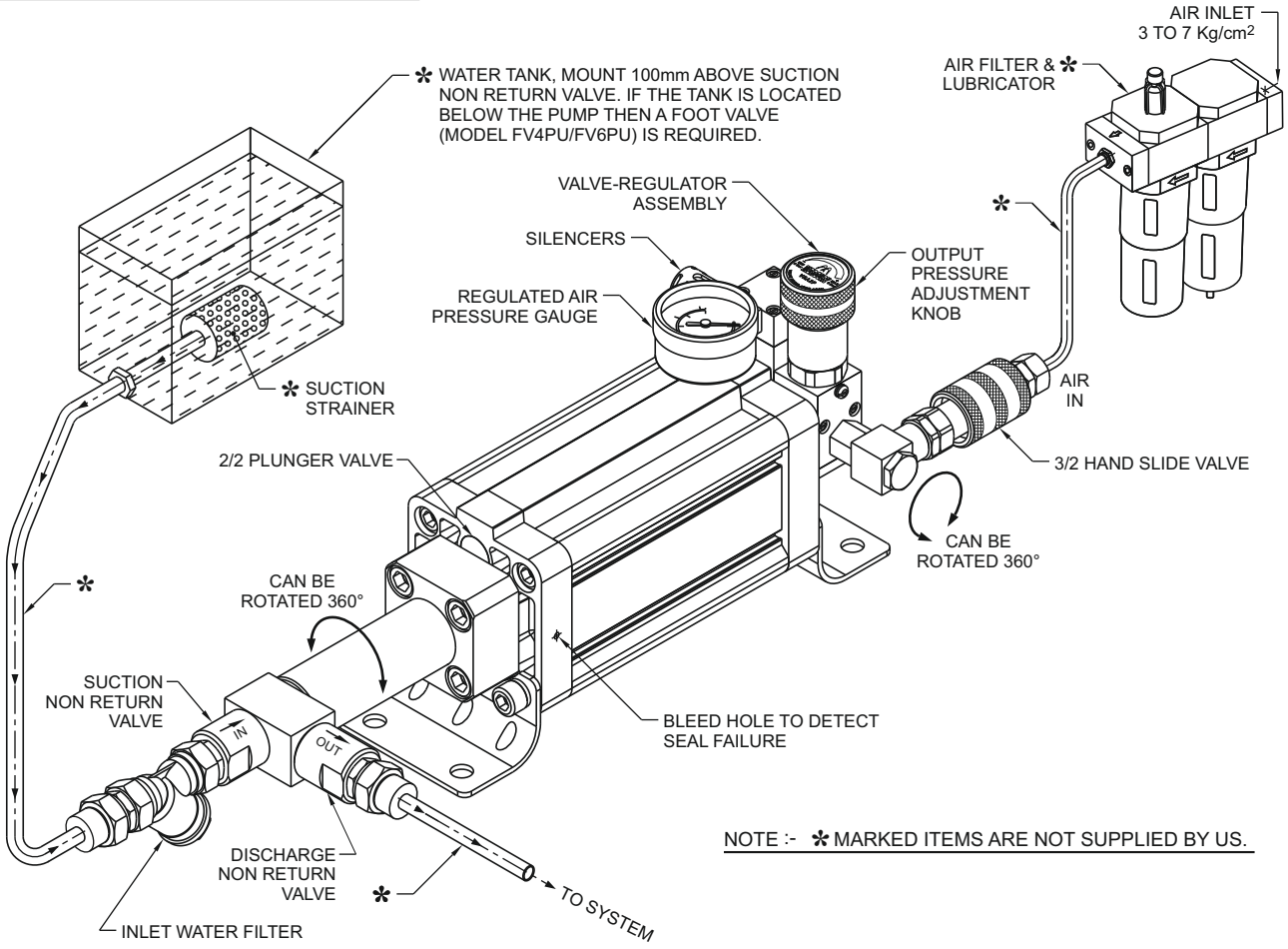
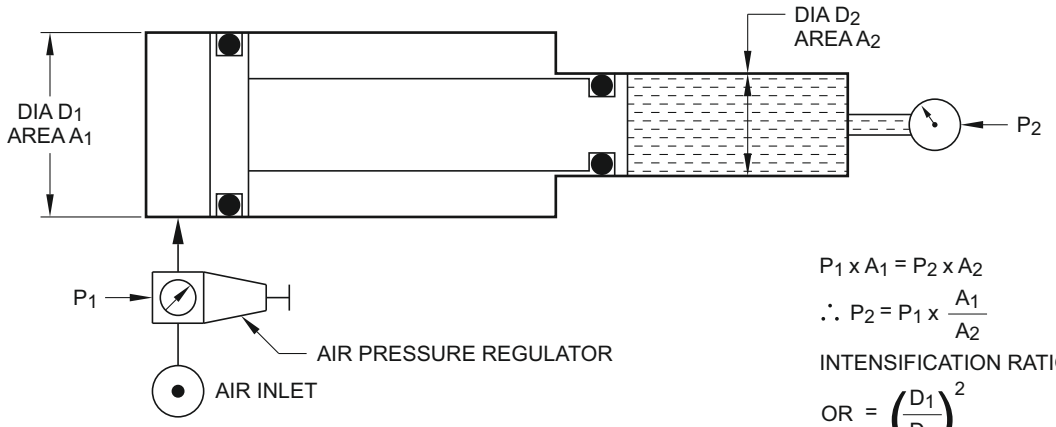


FIG. 1

DASH 1 INTENSIFIER



$P_1 \times A_1 = P_2 \times A_2$

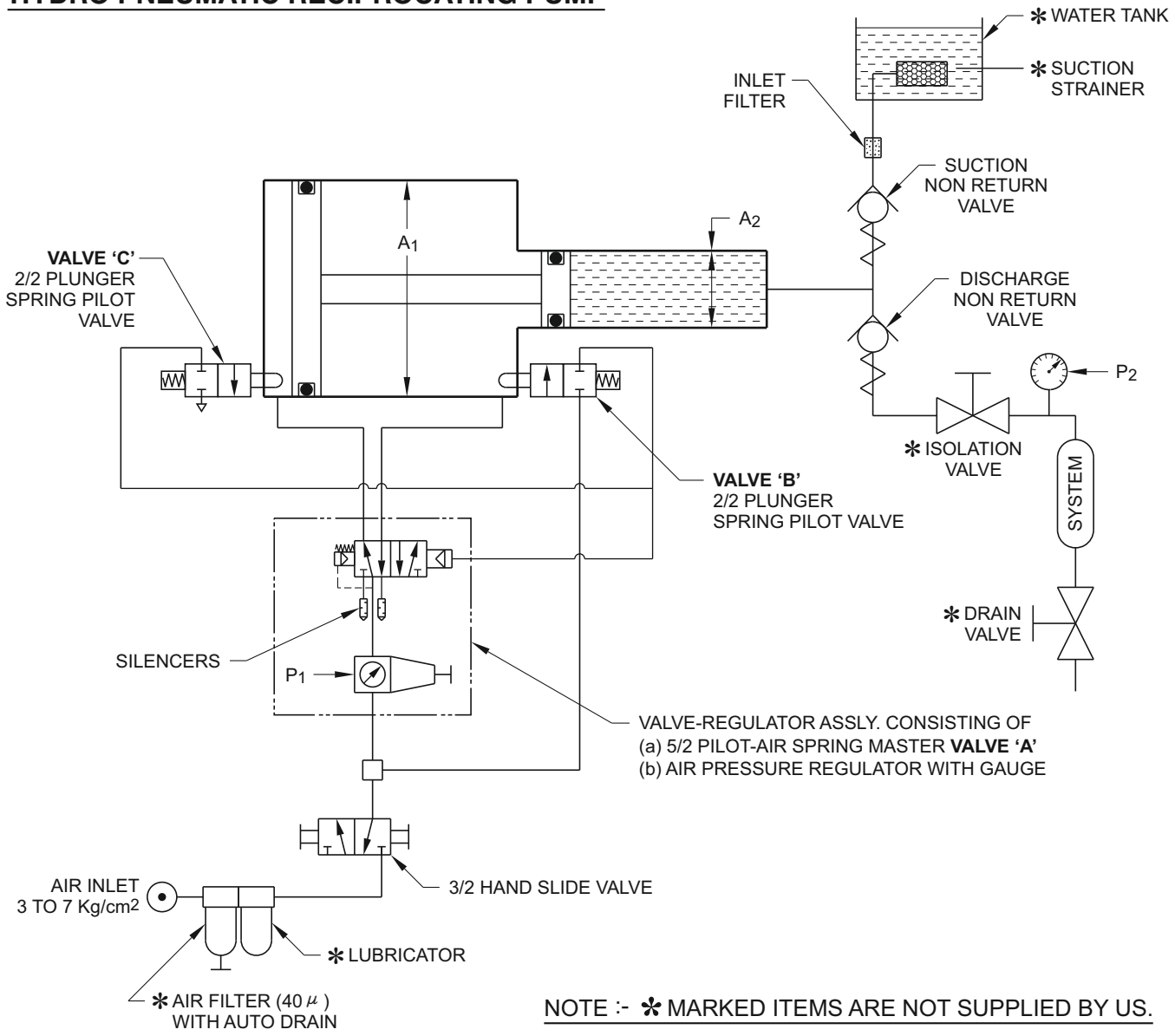
$\therefore P_2 = P_1 \times \frac{A_1}{A_2}$

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

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

FIG. 2

PNEUMATIC CIRCUIT DIAGRAM FOR SERIES 'A' HYDRO PNEUMATIC RECIPROCATING PUMP



NOTE :- ✻ MARKED ITEMS ARE NOT SUPPLIED BY US.

FIG. 3

1.3.0 Principles of Operation

1.3.1 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.

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-spring **Valve A,** the cylinder piston starts moving to the right. When the piston presses the inbuilt 2/2 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 2/2 plunger **Valve C,** the pilot air on right side of **Valve A** is exhausted, 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 under test, 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, the pump starts reciprocating automatically to compensate for the leakage and maintain output pressure **P2.**

Typical Pressure Testing Circuit

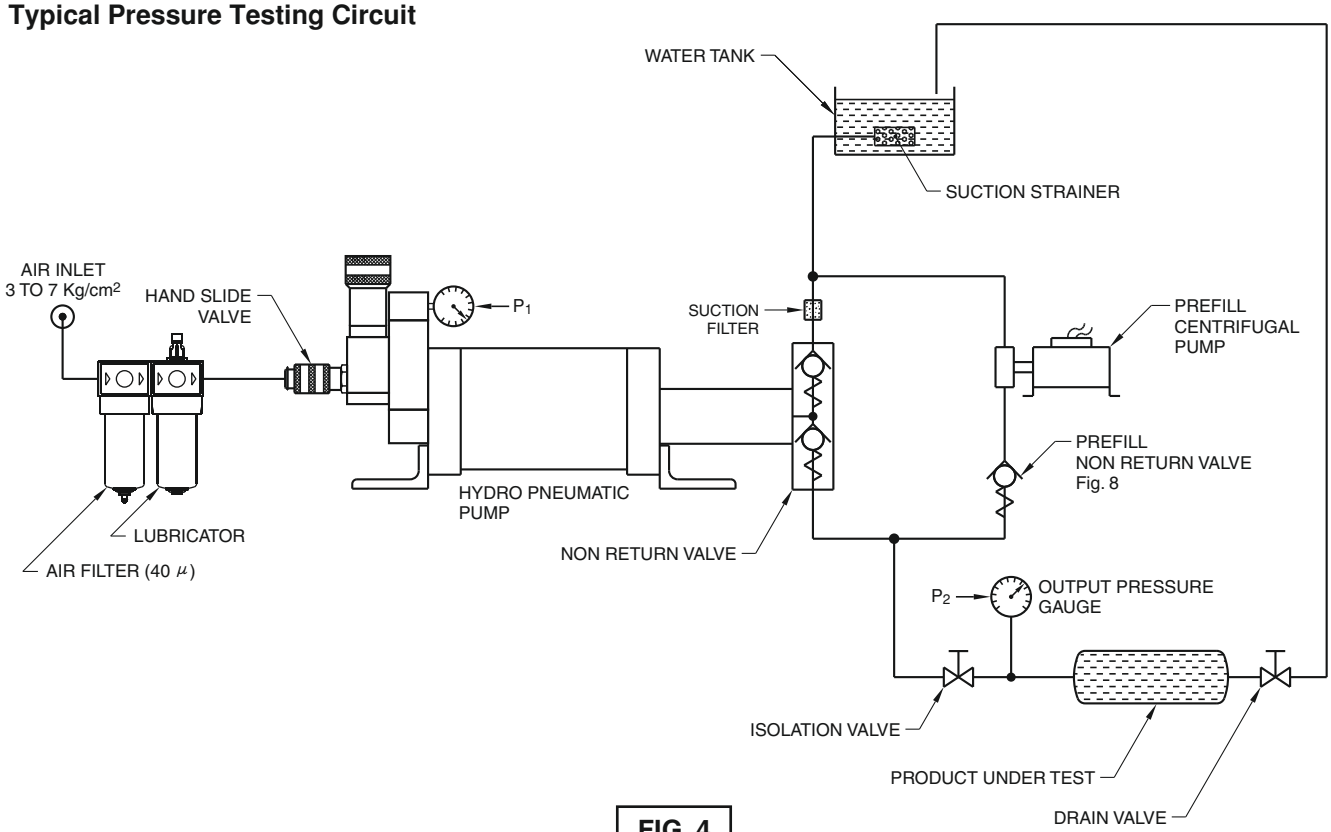


FIG. 4

1.4.0 Typical Applications

1.4.1 Hydrostatic Pressure Testing

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.

1.4.2 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 metal and ceramics.

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

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

Technical Specification

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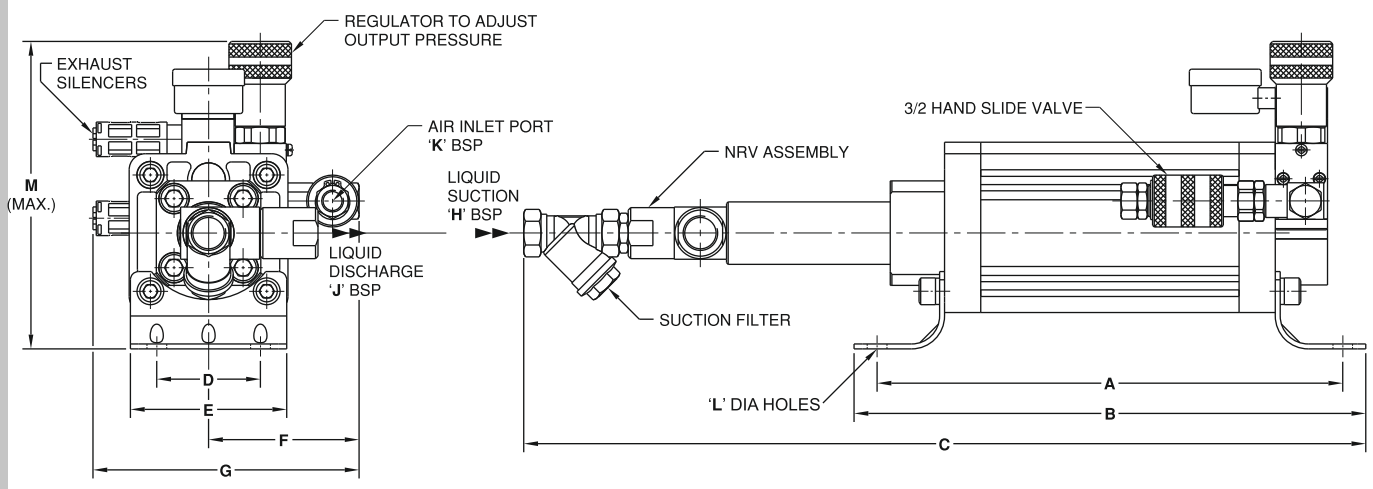

MODEL No.	RATIO	OUTPUT PRESSURE AT 5Kg/cm^2	A	B	C	D	E	F	G	H BSP	J BSP	K BSP	Ø L	M	NRV MODEL
A80-10	64	320	283	311	430	63	95	81.50	165	1/2"	1/2"	1/4"	12	201	HP2
A80-14	32	160	283	311	530	63	95	81.50	165	1/2"	1/2"	1/4"	12	201	LP3
A80-16	25	125	283	311	530	63	95	81.50	165	1/2"	1/2"	1/4"	12	201	LP3
A80-20	16	80	283	311	530	63	95	81.50	165	1/2"	1/2"	1/4"	12	201	LP3
A80-28	8	40	283	311	530	63	95	81.50	165	1/2"	1/2"	1/4"	12	201	LP3
A80-32	6.25	31	283	311	530	63	95	81.50	165	1/2"	1/2"	1/4"	12	201	LP3
A100-10	100	500	283	311	430	75	114	81.50	165	1/2"	1/2"	1/4"	12	201	HP2
A100-14	51	255	283	311	530	75	114	81.50	165	1/2"	1/2"	1/4"	12	201	LP3
A100-16	39	195	283	311	530	75	114	81.50	165	1/2"	1/2"	1/4"	12	201	LP3
A100-20	25	125	283	311	530	75	114	81.50	165	1/2"	1/2"	1/4"	12	201	Lp3
A100-28	12.75	64	283	311	530	75	114	81.50	165	1/2"	1/2"	1/4"	12	201	LP3
A100-32	9.75	49	283	311	530	75	114	81.50	165	1/2"	1/2"	1/4"	12	201	LP3
A100-40	6.25	31	301	329	548	75	114	81.50	165	3/4"	3/4"	1/4"	12	201	HF2
A100-56	3	15	301	329	548	75	114	81.50	165	3/4"	3/4"	1/4"	12	201	HF2
A160-14	130	650	336	386	482	115	180	169	216	3/4"	1/2"	1/2"	18	259	HP2
A160-16	100	500	336	386	482	115	180	169	216	3/4"	1/2"	1/2"	18	259	HP2
A160-20	64	320	336	386	482	115	180	169	216	3/4"	1/2"	1/2"	18	259	HP2
A160-28	32	160	336	386	572	115	180	169	216	3/4"	1/2"	1/2"	18	259	LP3
A160-32	25	125	336	386	572	115	180	169	216	3/4"	1/2"	1/2"	18	259	LP3
A160-40	16	80	336	386	482	115	180	169	216	3/4"	3/4"	1/2"	18	259	HF2
A160-56	8	40	336	386	482	115	180	169	216	3/4"	3/4"	1/2"	18	259	HF2
A160-80	4	20	336	386	482	115	180	169	216	3/4"	3/4"	1/2"	18	259	HF2
A160-20-2	128	640	511.5	561.5	660	115	185	76	280	1/2”	1/2”	1/2”	18	365	HP2
A160-14-2	260	1300	511.5	561.5	660	115	185	76	280	1/2"	1/2"	1/2”	18	365	HP2
A100-5	400	2000	273	305	411	75	114	81.50	165	1/2"	9/16"UNF	1/4"	14	201	HP3

Spare Parts for Hydro Pneumatic Pumps

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

PART No.	DESCRIPTION	SEAL KIT No.
VRA2P	VALVE REGULATOR ASSEMBLEY	SKVRA2P
VRA4P		SKVRA4P

SUCTION STRAINER

PART No.	DESCRIPTION
40-6282	SUCTION STRAINER FOR A-100-40,100-56,160-40, 160-56 & 160-80
40-8010	SUCTION STRAINER FOR REST OF THE MODELS

SILENCERS

PART No.	DESCRIPTION
SL2	1/4" SILENCER FOR 80 & 100 SERIES PUMP
SL4	1/2" SILENCER FOR 160 SERIES PUMP

3/2 HAND SLIDE VALVES

PART No.	DESCRIPTION	SEAL KIT No.
SV2	1/4" HAND SLIDE VALVE FOR 80 & 100 SERIES PUMP	SKSV2
SV4	1/2" HAND SLIDE VALVE FOR 160 SERIES PUMP	SKSV4

HIGH PRESSURE SUCTION & DISCHARGE NON-RETURN VALVE

PART No.	DESCRIPTION	SEAL KIT No.
HP2	HIGH PRESSURE NON-RETURN VALVE	SKHP2
HP3	HIGH PRESSURE NON-RETURN VALVE FOR MODEL No. A100-5	SKHP3

HIGH FLOW SUCTION & DISCHARGE NON-RETURN VALVE

PART No.	DESCRIPTION	SEAL KIT No.
HF2	HIGH FLOW NON-RETURN VALVE	SKHF2

STANDARD SUCTION & DISCHARGE NON-RETURN VALVE

PART No.	DESCRIPTION	SEAL KIT No.
LP3	LOW PRESSURE NON-RETURN VALVE	SKLP3

NON RETURN VALVE WITH 1/2” PORTS

PART No.	DESCRIPTION	SEAL KIT No.
NR4PUD	1/2” NON-RETURN VALVE	59-079

SUCTION FOOT VALVE

PART No.	DESCRIPTION	SEAL KIT No.
FV6PU	1” FOOT VALVE	59-080

SUCTION FOOT VALVE

PART No.	DESCRIPTION	SEAL KIT No.
FV4PU	1/2” FOOT VALVE	59-081

AIR PRESSURE GAUGE

PART No.	DESCRIPTION
20-938	1/8”, Ø40 DIAL, 0 to 10 bar AIR PRESSURE GAUGE