1. General Description

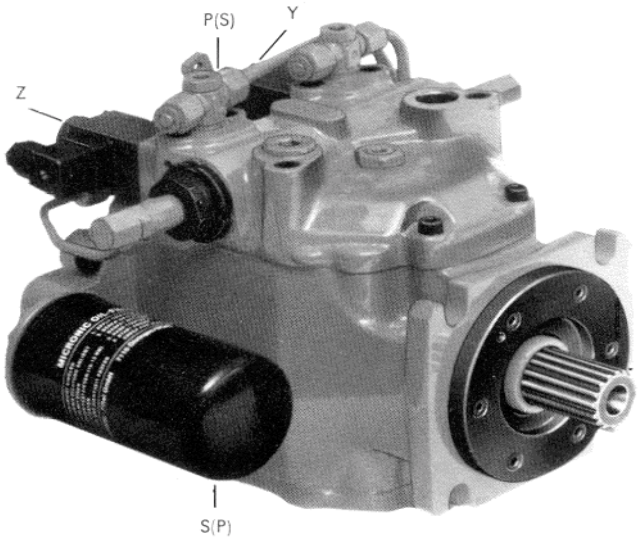
Control pressure is self generated in this automatic control and is based on the pump's input speed. The amount of oil flow from the boost circuit is proportional to the pump's input speed and is diverted through a series of orifices in the inching valve to produce control pressure. This control presure is fed to electrically operated on-off solenoid valves which, if energized, allow the pressure to act on the pump's servo piston. The movement of the servo piston manipulates a spool valve which leads the oil flow coming from the boost circuit to the actuation cylinders that control the position of the swash plate in the pump. The stroke of these cylinders determine the amount and direction of oil flow from the main pump. An additional description of the operation of this automatic control can be seen in the "BPV, Description of design and function" manual, catalog H-95, page 14.

2. Flow Direction

The pump is in neutral and will not deliver any oil flow from the main discharge ports when the neither solenoid is energized or when there is insufficient control pressure. Two reasons for insufficient control pressure are 1) the engine speed is not high enough or 2) the inching valve is in an open position which premits the bypass of boost flow through the valve without incurring a pressure signal. By closing the bypass in the inching valve and energizing one solenoid valve, control pressure will be developed with steadily increasing input speed, and will determine the amount of pump flow and the direction.

2.1 Control Logic:

	Energized Control Solenoid: Y	Z
CW PUMP in/out	S(P) - P(S)	P(S) - S(P)
CCW PUMP in/out	P(S) - S(P)	S(P) - P(S)

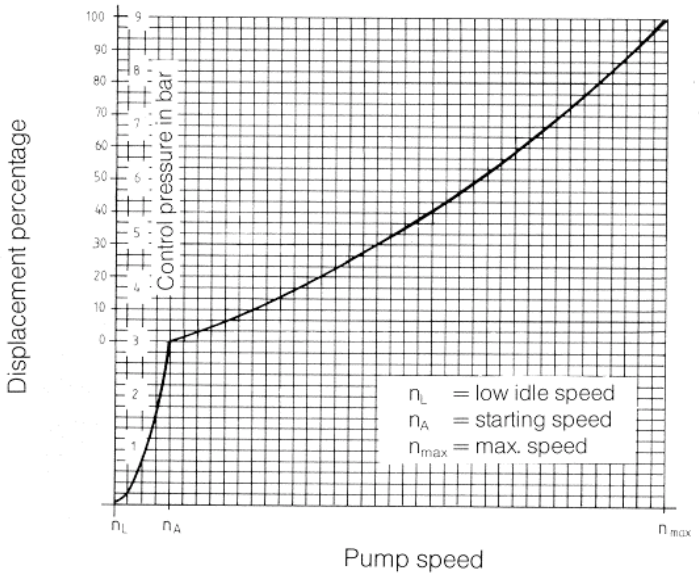


3. Rated Voltage:	12 VDC	24 VDC
4. Max. Power Input:	26 Watts	26 Watts
5. Max. Current:	2.5 A	1. 25 A
5.1 Required Current;	1. 82 A	1.1 A
6. Coil Resistance:	6.6 ohms	21 .8 ohms
7. Relative Duty Cycle;	100% ED	100% ED

8. Protection Level: IP 54 IP 54

9. Response Time: ≥ 1 sec

10. Geometric Displacement vs Input Speed



11. The Inching Valve
This sophisticated control valve is a series of orifices, one of which is operator adjustable. By changing the orifice size, the control pressure is altered independent of input speed to suit various conditions of pump operation.

Consider a street sweeper application where a BPV with automotive control is used to drive the propel motors. In the transportation mode where the sweeper is driven to and from the work area, full engine speed will be used for maximum travel speed. In this instance, the inching valve would be in its normally closed position so that the a high control pressure will be developed to stroke the pump to maximum displacement.

However, once the machine arrives at the work area, full engine speed would no longer be needed for propel but would be required to drive the various implements attachments such as brooms, fans and vacuums as well as the propel. In this case, the adjustable orifice in the inching valve is opened to reduce the development of control pressure by bypassing the boost oil flow through the inching valve. In this manner, the reduced the control pressure reduces the pump's displacement. Since travel speed is directly proportional to the pump displacement, the reduced pump displcement will reduce the travel speed even though the engine speed is at a maximum.

Thus ground speed can be adjusted to suit sweeping conditions. If the area is heavily littered with debris then the inching valve orifice may be required to be opened fully, so as to reduce the contorl pressure to only allow the sweeper to creep along. If on the other hand, the sweeping conditions are very light then a higher ground speed could be used and the inching valve would have to be opened only moderately.

The adjustable orifice is rotary lever operated. Linkage, cable or a cylinder actuator can be used the move the lever. Rotated fully in a clockwise direction, the adjustable orifice is closed to its smallest opening and full control pressure is readily developed. Rotated 50 degrees counterclockwise, the orifice is opened to its largest opening and only a marginal control pressure signal is developed.

12- The Anti-Stall Feature

The pump is standardly equipped with a special feature which prevents abrupt increases in engine speed from stoking the pump too fast as to overload the engine. This is the anti-stall feedback feature.

Consider the BPV automotive control pump in of a street sweeper application without this important anti-stall feature. With the adjustable orifice of the inching valve closed, the operator initates the propel function by energizing the appropiate direction solenoid and increases the engine speed to stroke the pump. System pressure will initially be very high since the inertia loads related to the movement of the sweeper will be initially high. If the engine speed is quickly increased, beyond the power/speed limitations which can be successfully transmitted by the system, the engine will not be able to deliver the power to stroke the pump to its speed related displacement at the required system pressure and the engine will lug down and/or stall.

But with the anti-stall feature, system pressure is fed back to the opposite side of the servo piston to counter the control signal imposed by the inching valve. This deliberately prevents the pump from stroking to its input speed related displacement and artifically keeps the pump at a lower displacement indicative of the required system pressure. This allows the engine to turn faster, without incurring a higher pump displacement, in order to keep up with the power demand and prevent the engine from lugging and/or stalling. Then as the sweeper gets under way the anti-stall control will premit the pump to upstroke but only at a rate equivalent to the deterioration of system pressure.

13. Required Information to Correctly Applying BPV's with Automotove Control:

13.1 Engine Specifications:
- a. Make/tpye
- b. Available power
- c. Full load governed speed
- d. High idle speed
- e. Performance curves

13.2 Parasitic Power Losses
- a. All PTO losses
- b. All continuous hydraulic services
- c. Others

13.3 HST
- a. Pump size
- b. Pump input speed at engine FLG speed
- c. Requested engine speed at the pump's regulation begin
- d. Pump relief valve setting
- e. Min. pressure at full flow

13.4 Incidentials
- a. Kind of machine/Application
- b. Available voltage