



## Digital Valve Control System



### Operation Overview

The Flow-Quip DVC Series is a modulating valve actuator system, driven by electrohydraulic power and controlled by a 32 bit microprocessor positioning controller. It is designed to accurately control the position of rotary or linear control valves. The system functions by comparing the valve command signal to the actual valve position and selectively energizing a series of direct acting, zero leakage hydraulic solenoids to move the valve to proper position. The hydraulic actuator can be of the double acting or spring return type.

The DVC has been engineered for service in severe field conditions. Particular care has also been taken to increase the level of immunity against the electronic interferences which are always present in industrial plants.

The DVC unit is designed to accurately modulate and in addition to allow actuator

emergency shutdown operations controlled by separate electrical control signals. Utilizing only one valve, having both modulating and fail-safe features, in place of two separate valves (one control, one shut off valve) a significant savings can be achieved.

### Typical Applications

- Positioning of actuators used in the control of the speed of the turbine in thermoelectric or geothermal or combined cycle power plants.
- Positioning of actuators used in the control of the water level in the condenser of geothermal power plants.
- Numerous industrial and pipeline applications where a hydraulic actuator is used in modulating flow control service (e.g. water, oil, gas, pipelines or steam lines in power plants, platforms, docks, petrochemical plants, etc.)



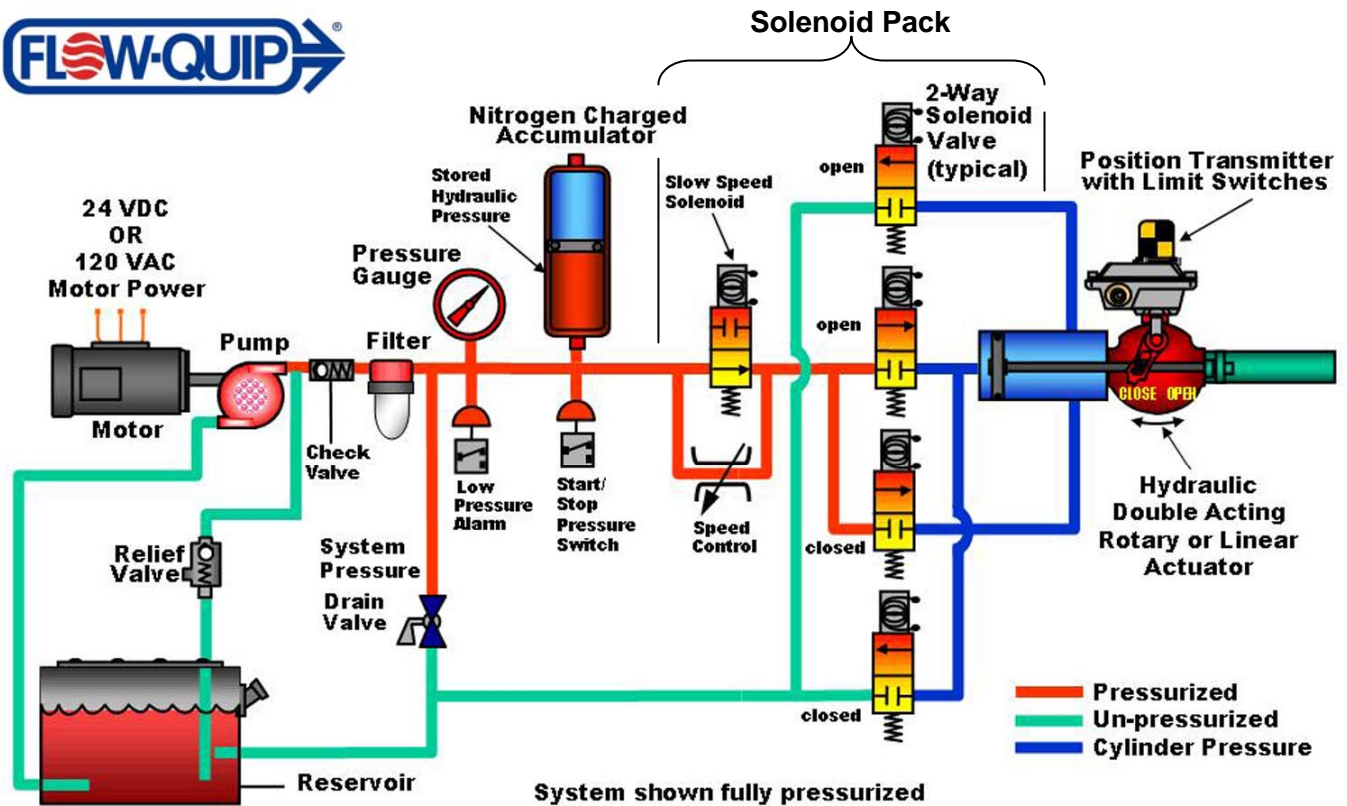


Fig. 1—Typical Hydraulic Schematic  
(Shown fully pressurized with the valve in a “steady state” position)

## Principal of Operation

Ref. Figure 1 & 2

The DVC actuator is equipped with an electronic valve position controller that continually compares the valve position with the valve command signal coming from the control system. When the system detects that a minor correction in position is needed, a slow speed solenoid circuit is energized causing movement to the correct position. If the position error is large the slow speed solenoid circuit is de-energized and full hydraulic flow is allowed to quickly move the valve to a new position. As the valve moves near the new position, the slow speed solenoid is again energized. This brings the valve into position slowly and prevents excessive overshoot and cycling.

Note that all control solenoids are zero leakage therefore there is no constant hydraulic “bleed” or leakage. This feature means that the hydraulic motor and pump need not run continuously. The hydraulic power unit need only recharge the system periodically and then will rest for long periods of time.

The microprocessor configuration parameters are stored in the re-writable and re-configurable EEPROM memory which allows it to maintain the configuration in case of electrical supply failure.

## Features

### Microprocessor

All functions of the DVC are controlled by a 32-bit microprocessor.

### Valve Command control signal-

The valve command analog input signal can either be 4 to 20 mA or 0-10 VDC type. The input has reverse polarity protection.

### Positioning Accuracy-

Is 0.5% of the position error range, excluding the linearity of the actuator position transmitter and its thermal drift.

### Valve Position Controller resolution-

The actuator resolution corresponds to 0.1% of the position error range.

### Turning of the actuator position control loop-

The following configuration parameters are available and adjustable to optimize the positioning features of the system:

- Slow speed - open
- Slow speed - close
- Allowable position error before valve movement (deadband)
- Fast speed- close
- Fast speed- open
- max opening speed
- max closing speed
- Pulse valve movement for extended valve operating times

### Controller Memory-

All the above configuration parameters are stored in the EEPROM memory.

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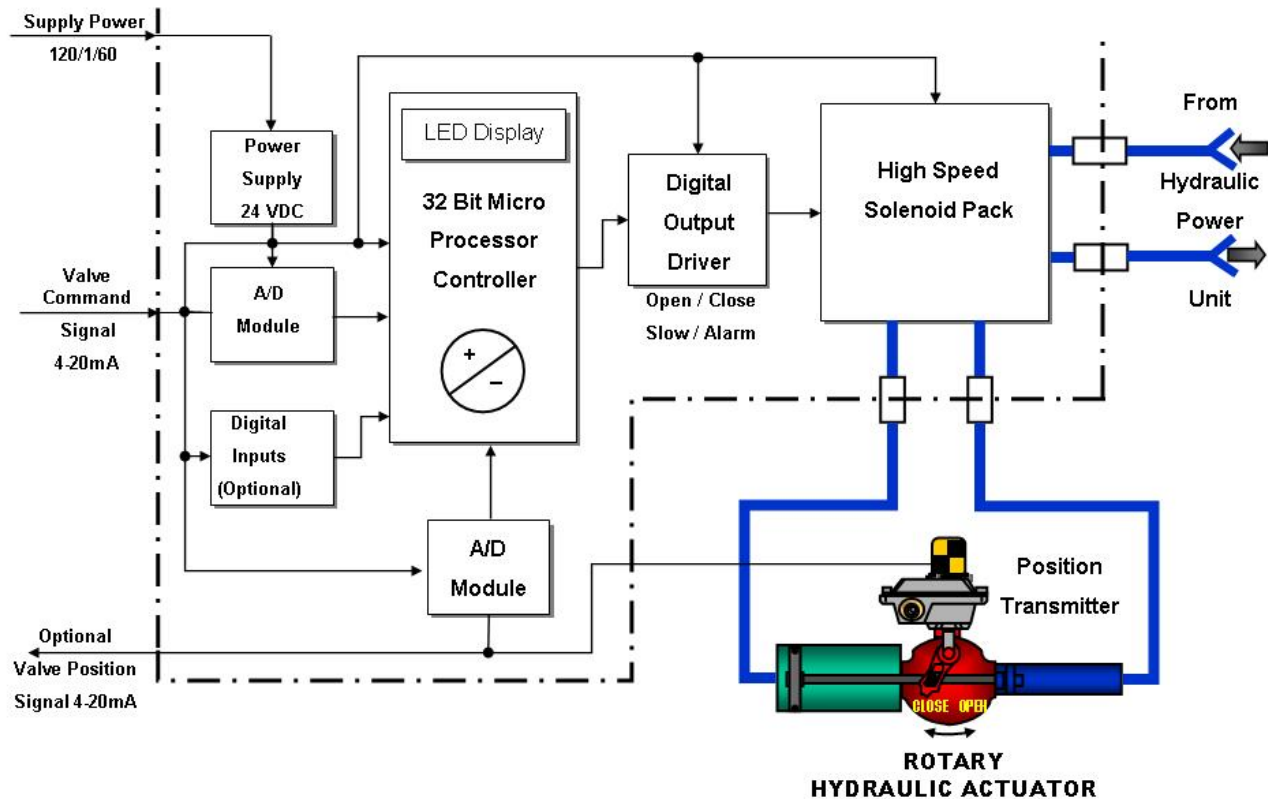


Fig. 2—Typical Electronic Positioning Control Logic

## **Features (continued)**

### **Alarm output**

1 output relay with voltage-free contact is available for the remote signaling of any malfunction (i.e. lack of electric supply, positioning failure, valve command signal failure, actuator position signal failure, etc.)

### **EMC compatibility**

DVC was engineered to meet CENELEC EN 50081-2, EN 50082-2 standards relevant to electro-magnetic compatibility in heavy industrial environments.

### **Isolation of digital I/O**

All analogical and digital inputs and outputs towards the control room are supplied with separators (optocouplers, relays, etc.).

### **Isolation of power supply**

The power supply coming from the main line is protected by a line filter and/or isolated by a transformer or by a DC/DC converter.

### **Field set up and commissioning**

Easy setup and tuning of the system is possible using the backlit digital display and keypad. All parameters may be password protected.

### **Accessories and Options**

A wide range of accessories and Options are available, they include:

- Lonworks communication module
- AS – Interface
- Expandable digital I/O, up to 40 total available
- Stepping functions for extra long stroking times

### **Actuator Position Transmitter**

The output signal of the actuator position transmitter can be 4 to 20 mA or 1 to 5 V. The supply to the position transmitter is provided by DVC internal power supply.

### **Actuator position re-transmission signal**

The actuator position can be sent to the control room through a 4 to 20 mA signal. Optional fully isolated retransmission of the valve position signal is available.

### **Local and Remote Controls-**

The selector has three positions: "local", "remote" and "off". In "remote" the positioning of the actuator is controlled by the valve command signal. While in "off" position the actuator maintains the last position it held before switching to "off". In the "Local" position the Open/Close pushbuttons are activated on the front panel.

### **Malfunction Display**

The following status or malfunctions are available on the DVC controller:

- presence of power supply
- valve opening
- valve closing
- valve command signal failure
- actuator position signal failure
- position error

### **Action in case of failure**

One of the following actions, which are carried out by the DVC if there is no valve command signal or valve position signal, may be chosen:

- the actuator holds position
- the actuator moves the valve open
- the actuator moves the valve closed

The setting of the fail action is carried out by Flow-Quip, stored in the controller configuration memory.



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