

REGAL SERIES 7000 SMARTVALVE™

GENERAL

The REGAL Series 7000 SMARTVALVE™ shall be a modular system component capable of automatically regulating the chemical flow rate of a REGAL Gas Feed System. The SMARTVALVE will operate in response to standard analog input signals (4-20 milliamp DC) from field mounted transmitting devices such as water flow meters, residual analyzers, ORP monitors and/or contact closures from pump circuits.

The basic REGAL SMARTVALVE shall be available in capacities ranging from 10 to 2000 PPD and will be used for either "Flow Proportional" or "Step Rate" Control Schemes (see descriptions below). The following models and capacities will be available:

**Model 7001 – Flow Proportional
(10 to 500 PPD)**

**Model 7002 – Step Rate
(10 to 500 PPD)**

**Model 7006 – Flow Proportional
(1000/2000 PPD)**

**Model 7007 – Step Rate
(1000/2000 PPD)**

1. "Flow Proportional Control" should be used whenever the water flow rate varies but the quality of the water remains constant. In this control scheme, the SMARTVALVE will automatically regulated the chemical flow rate relative to the varying water flow. The required ratio of chemical to water flow will be determined and set by the operator.
2. "Step Rate Control" should be used in applications where fixed speed pumps (up to four) are used to move the water to be treated from multiple water lines into one common line. The SMARTVALVE will receive on/off signals from the pump circuits and respond by automatically adjusting the valve plug position based upon which, and how many pumps are currently running.



A more versatile, enhanced version of the REGAL SMARTVALVE shall be capable of operating in four different Control Schemes (described below). The following models and capacities will be available:

Model 7009 – 10 to 500 PPD

Model 7010 – 1000/2000 PPD

1. "Flow Proportional Control". See previous explanation.
2. "Residual Only Control" should be used when the water flow rate remains constant but the water quality varies. The SMARTVALVE receives 4-20 milliamp signals from a residual analyzer (located downstream from the point of application) and responds by automatically adjusting the gas feed rate to maintain the desired chemical residual.
3. "Compound Loop Control" is simply a combination of both "Flow Proportional" and "Residual Only" Control Schemes. It should be used when both the water flow rate and the water quality vary. In this scheme, the SMARTVALVE will continuously receive signals from both a water flow meter (located upstream from the point of application) and a residual analyzer (located downstream). The SMARTVALVE will respond by automatically adjusting the gas feed rate according to both signals to maintain the desired chemical residual.

4. "Feed Forward De-Chlorination" will require the use of two REGAL SMARTVALVES, with the first valve used to disinfect the water supply with chlorine and the second valve used to remove the chlorine residual with sulfur dioxide before the water returns to its natural environment. As in the case with "Compound Loop Control," continuous signals will be sent to the SMARTVALVES from both a water flow meter and a residual analyzer. The first point of application (chlorine) will be located between the flow meter and the analyzer while the second point of application (sulfur dioxide) will be located downstream from the residual analyzer.

SPECIFICATIONS

The REGAL SMARTVALVE shall be available in a total of eight (8) maximum capacities: 10, 25, 50, 100, 250, 500, 1000 and 2000 PPD with relative metric equivalents of 200, 500, 900, 2000, 5000 gms/hr and 10, 20, 40 kg/hr.

The REGAL SMARTVALVE shall include a four phase linear, heavy duty stepper motor, feedback potentiometer and modulating gas flow control valve. The circuitry will produce a series of pulses such that the motor position is a function of the number of pulses generated. The shaft direction will be a function of phase sequence while the speed will be a function of pulse ratio. The rotary motion of the motor will be converted into the linear motion required to drive the valve plug.

The valve plug shall move a total distance of one inch (1") for all capacities based on a maximum of sixteen revolutions of the stepper motor. Each motor pulse will move the lead screw and valve plug linearly a maximum of 0.0003125 inches.

The SMARTVALVE shall include a program by which the factory and/or the end user can "linearize" the valve's digital display to precisely match the gas feed system's metering tube reading.

The SMARTVALVE shall also include a program by which the factory and/or end user can easily increase or decrease the speed of response of the stepper motor from one half (0.5) to ten (10) seconds per revolution.

An averaging parameter in the "configuration mode" will prevent motor "chatter" by allowing for slight signal fluctuations transmitted from the flow meter and/or residual analyzer.

The SMARTVALVE shall provide a total of four (4) means of operation:

1. Fully Automatic.
2. Electric/Manual via an adjustment knob used to change the gas feed rates as shown on the PLED screen.
3. Manual via the adjustment knob which drives the lead screw of the valve plug. A pin attached to the lead screw will indicate the gas feed rate adjustment.
4. Manual via the remote rate valve assembly.

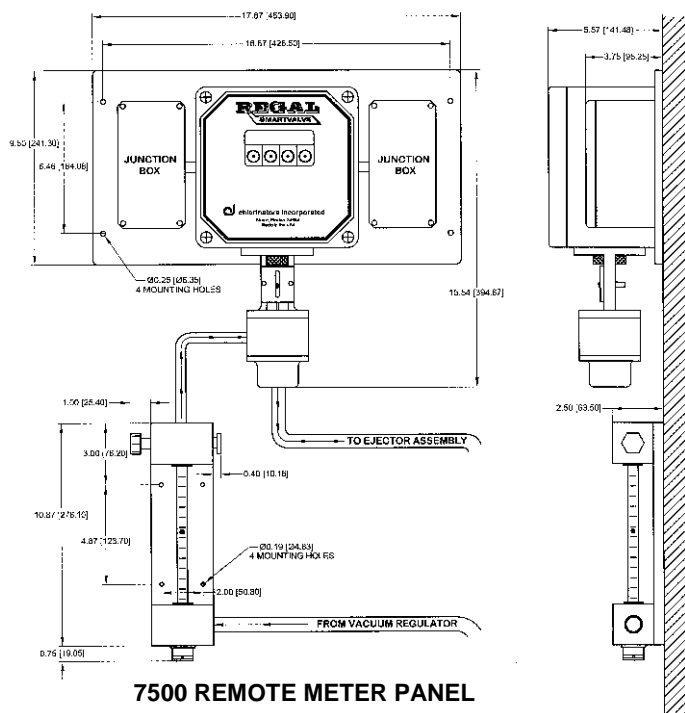
Operator interface in all three program modes (Engineering, Configuration and Operational) shall be via a four-button, integrated keypad that is used to access information which will be displayed alpha-numerically on a two line LED screen. The top line will be used to show information regarding the following conditions:

- 1- Water flow rate in actual volume or as a percentage
- 2- Current dosage setting
- 3- Valve plug position in PPD
- 4- Operational mode (automatic or manual)
- 5- Alarm conditions
- 6- Setpoint values
- 7- Parameter and parameter values
- 8- Residual process variable in PPM or ORP values (Models 7009/7010 only)

The bottom line will display commands (used to select and/or adjust parameters) that are vertically aligned with specific keypad buttons.

The SMARTVALVE shall have the option of full duplex (RS-232 and RS-422) or half duplex (RS-485) serial communications. Selection of a full duplex output will allow serial data to flow both to and from the SMARTVALVE providing full control from a remote site.

SERIES 7000 SMARTVALVE™ DIMENSIONS



ADDITIONAL SPECIFICATIONS

Maximum Gas Feed: 10 – 2000 PPD for Chlorine, 10 – 500 PPD for Sulfur Dioxide, 10 – 100 PPD for Ammonia

Power Requirements: Field selectable 115/230 VAC ± 15%, single phase. Operating frequency 50/60 Hz.

Fusing: 1/4A @ 230V, 1/2A @ 115V (Time Delay, 250V).

Power Consumption: 45 Watts absolute max.

Input Signals: 4-20 milliamps DC.

Input Impedance: 250 Ohms.

Output Signals: 4-20 milliamps DC, 12 Volt compliance (600 Ohms) isolated and powered.

Micro-Controller: MC9S12 with 128kB EEPROM, 2kB EEPROM, 8kB SRAM, 16 Bit.

Display: 20-character, 2-line, Polymer LED (PLED).

Decimal Point Setting: 0, 0.0, 0.00.

Operator Interface: Four button keypad integrated into overlay.

Relays: Three (3) each, 10A 250 VAC.

Calibration Accuracy: ±0.25% from zero.

Speed of Response: Variable and field selectable between 0.5 and 10.0 seconds per revolution of motor.

Control Modes: automatic, manual electric and manual

Operating Range: 10:1

Dosage Ratio: 4:1, keypad adjustable.

Environmental Limits: 32 to 120° F (0-50° C).

Serial Communications: OPTIONAL Isolated RS232/RS422/RS485 (2/4-Wire) module.

Step Rate Inputs: Active, designed for 100 ft., 20 AWG minimum. Remote contact closure with a voltage drop of no more than 0.8 volts at the valve terminals. Less than 5 mA flows through the contact.

Stepper Motor: Unipolar (5/6-Wire), 12 Volt, 1 A/winding, Size 23.

Gain: 1.0 to 9999.

Lag Time Setting: 0 to 9999 seconds.

Shipping Weight: 18 Lbs.

FOR MODELS 7009/7010 ONLY

Gain Setting: 1.0 to 9999.

Lag Time Setting: 0 to 9999 seconds.

Residual Full Scale Setting: 1.0 to 20 PPM.

ORP Full Scale Setting: 2000.

Residual Input Signal Filtering: 0.0 to 20.0 seconds.