

# REGAL SERIES 7000 SMARTVALVE™

## GENERAL

The REGAL Series 7000 SMARTVALVE™ shall be a modular system component capable of automatically varying the gas chemical flow rate from a REGAL Gas Feed System using standard 4-20 milliamp DC analog input signals from field mounted transmitting devices such as water flowmeter transmitters or contact closures from pump motor starter auxiliary contacts.

The REGAL SMARTVALVE™ shall offer the user a choice of two (2) automatic control schemes; "Flow Proportional Control (FPC)" or, "Step Rate Control (SRC)".

**Model 7001 — FPC (10 to 500 PPD)**

**Model 7002 — SRC (10 to 500 PPD)**

**Model 7006 — FPC (1,000/2,000 PPD)**

**Model 7007 — SRC (1,000/2,000 PPD)**

Each control scheme is briefly defined as follows:

### A. Flow Proportional Control (FPC)

This control scheme is needed whenever the water flow rate to be treated varies and will work well as long as the quality of the water remains constant. In this control scheme, the SMARTVALVE™ automatically regulates the magnitude of gas flow rate through a REGAL Gas Feed System proportionally to the varying water flow rates. The required ratio "dosage" of chemical to the water flow rate is easily set by the operator to maintain the desired residual using the keypad on the SMARTVALVE™ enclosure.

### B. Step Rate Control (SRC)

This control scheme can be used whenever fixed speed pumps (up to four) are used to move the water to be treated through a common line. The SMARTVALVE™ responds to on/off signals supplied by the pump circuits and automatically positions the valve plug so that the correct amount of chemical is added to the system regardless of which or how many pumps are running at any given time.



## SPECIFICATIONS

The REGAL SMARTVALVE™ shall be available in eight (8) maximum capacities: 10, 25, 50, 100, 250, 500, 1,000, and 2,000 PPD (200, 500, 900, 2,000, and 5,000 gms/hr and, 10, 20, and 40 kg/hr) using only four (4) different valve plugs.

The REGAL SMARTVALVE shall include a four phase linear, heavy duty stepper motor, feedback potentiometer and modulating gas flow control valve. The circuitry shall produce a series of pulses such that the motor position is a function of the number of pulses generated. Shaft direction shall be a function of phase sequence, and speed shall be a function of the pulse ratio. The rotary motion of the motor shall be converted to a linear motion driving a precision machined valve plug in an orifice via a lead screw.

The valve plug shall move linearly a maximum of 1" for all capacities through 2,000 PPD based on a maximum of sixteen revolutions of the stepper motor with two hundred precise motor positioning points per revolution. The lead screw and valve plug shall move linearly a maximum of 0.0003125" per motor pulse.

For maximum system accuracy, and to compensate for manufacturing tolerance differences in the various parts making up the complete gas feed system, the SMARTVALVE™ shall include a program by which the factory and/or the end user can easily "linearize" the valve's digital display to precisely match the gas feed systems metering tube reading in PPD at 25%, 50%, 75%, and 100% of capacity.

The SMARTVALVE™ must contain a program whereby the operator can easily reset "typical electrical linear values" by simply pressing two (2) keypad buttons at the same time.

The SMARTVALVE™ shall include a program by which the factory and/or the end user can easily decrease or increase the speed of response of the stepper motor from one motor revolution every ten (10) seconds to one motor revolution every one (1) second.

All REGAL SMARTVALVES™ shall include a manual feed rate adjustment knob with indicator pin and plate for use during times when electrical power to the SMARTVALVE™ is lost. This feature shall give the operator four (4) ways to operate the SMARTVALVE™; fully automatic, electric/manual and two (2) forms of manual ( manual via the adjustment knob on the SMARTVALVE™, and manual via the rate adjustment valve furnished as part of the gas feed system).

Should an electrical surge, etc. upset or scramble the programmed "engineering" or "configuration" parameter settings, the operator must be able to re-load "TYPICAL" values into the microprocessor by pressing and holding one keypad button while reapplying AC electrical power to the SMARTVALVE™.

The digital display of the REGAL SMARTVALVE™ shall indicate the following conditions without the need of meters or test equipment: an analog input signal is not being received; signal wires are reversed; analog signal is too high.

The REGAL SMARTVALVE™ shall also include an "averaging" parameter in the "configuration mode" that can be used to smooth out fluctuations caused by the flowmeter and/or the flowmeter transmitter.

Operator interface in all program modes shall be via a four button keypad. The left two buttons shall enable the operator to scroll up or down through the active program parameters. The remaining two keypad buttons shall allow the operator to view the value of, and/or change the value of, the active parameter. Scrolling to the next parameter shall automatically enter into the microcontroller, the value selected in the previous parameter. There shall be no need for a separate "enter" key.

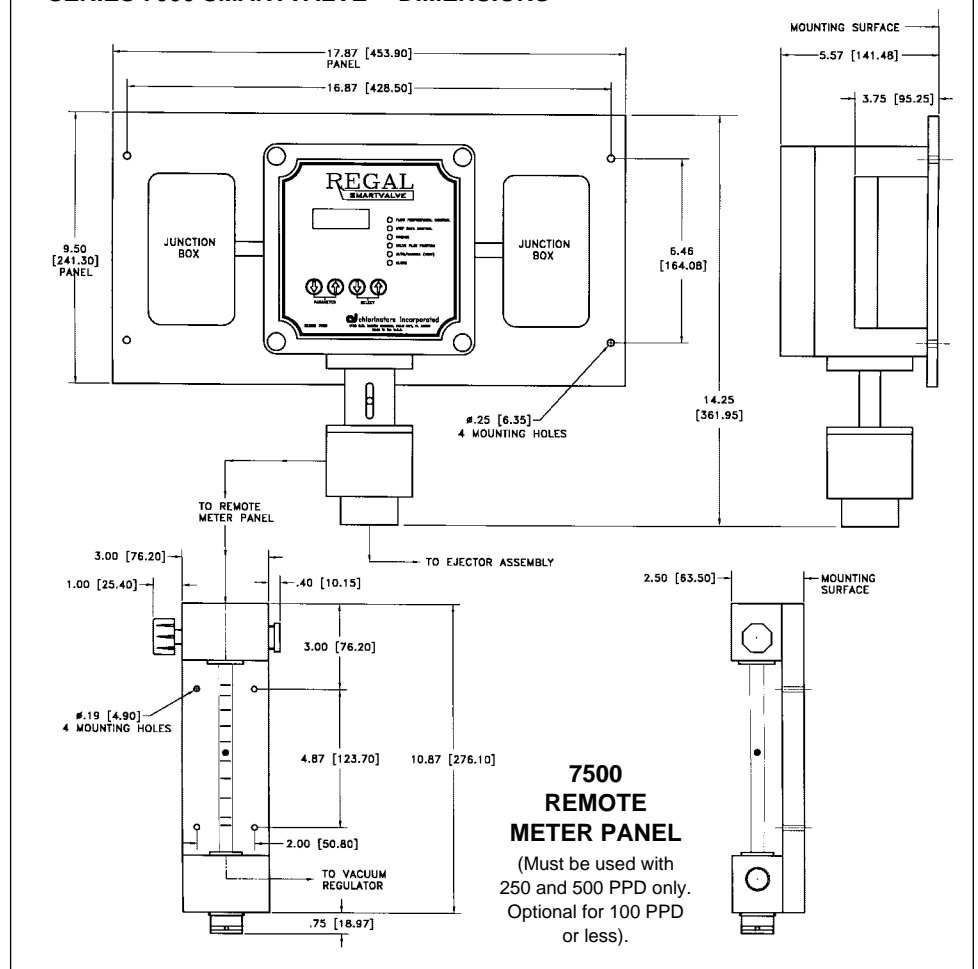
The SMARTVALVE™ shall include a serial communications output. A 20 milliamp digital current loop shall be provided as standard and shall be accessed (turned on or off) through the "Engineering" mode. Two (2) choices of communications shall be available. Selection of a "continuous" output will provide a digital output of valve plug position in PPD of instantaneous gas feed rate. Selection of a "full duplex" output will allow serial data to flow both ways simultaneously and will provide the user with full control of the SMARTVALVE™ from a remote site.

If the serial communications interface to field mounted devices requires analog rather than digital inputs, the optional REGAL Serial to Analog Converter can be used to convert the "continuous" digital output to a 4-20 milliamp analog output representing instantaneous gas feed rate in PPD.

The REGAL SMARTVALVE™ shall include the following easy to read digital displays and annunciator LEDs to indicate the following conditions:

- A. Water flow rate being treated in actual numbers or as a percent of flow.
- B. Current dosage setting.
- C. Valve plug position in PPD.
- D. Automatic or manual operation.
- E. Low flow rate alarm condition.
- F. Parameter and parameter value.

## SERIES 7000 SMARTVALVE™ DIMENSIONS



### ADDITIONAL SPECIFICATIONS

**Power Requirements:** Field selectable 115/230 VAC  $\pm$  15%, single phase. Operating frequency is 50 or 60 Hertz.

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

**Power Consumption:** 45 Watts.

**Input Signal:** 0-10 Volts, d.c., 4-20 mA, d.c.

**Input Impedance:** 60.4 Ohms for current inputs. 100K Ohms for voltage inputs.

**Output Signals:** Switch Contacts rated at 3 amps @ 240 VAC or 28 VDC, resistive load.

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

**Calibration Accuracy:**  $\pm$ 1/4% from zero.

**Speed of Response:** Variable and field selectable.

**Operating Range:** 10:1.

**Operator Interface:** Four (4) button keypad.

**Display:** 4 digit, red, .43" numeric LED and six (6) annunciators.

**Control Mode:** Automatic - Manual.

**Dosage Ratio:** 4:1, via keypad.

**Serial Communications:** Bi dir. 20 mA Current Loop. RX is opto-coupled.

**Analog to Digital Converter:** 12 bit, Unipolar, Successive Approximation.

**Reliability & Protection:** Watchdog for microprocessor, MOV & fuse for power supply. Transorb for digital power supply and analog input.

**EEPROM:** 128 Byte of EEPROM. Stores configuration and engineering parameters.

**Memory:** 8K RAM. 32K ROM.

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