Operating Instructions for Throttle and Motorized Valves

Throttlemaster™ and Motor Operated Gate Valves

VRC Gate Valves with electric motor actuators require either 120 or 220 volt, 50/60 Hz power. The valve will be shipped wired for the voltage on your order. (The voltage can easily be changed in the field.)

The valves also need a control signal from your control system. All valves can accept either 0 to +10 VDC or 4 to 20 mA. The standard factory fail safe wiring is 0 volts for closed and 10 volts to open. This means that if the control signal is lost (goes to 0) the valve will shut. Should you prefer that 0 volts is open you can move a jumper on the PC board to do this.

You also have the option to use these signals to throttle the valve. For example, a 1 volt signal will open the valve to 10%. A 2 volt signal will open the valve to 20%.

VRC Valves with electric motor actuators are used in 2 ways; Throttle and simple Open-Close operation.

For valves in sizes ISO-200 (8 inch) and smaller, the Standard Positioner is needed for either Throttle or Open-Close operation. For Throttle, the thumbwheel on the front panel is used for "local operation." As an alternative, the customer may choose "remote operation." If "remote" is selected, the gate position is controlled by a 0-10 VDC or 4-20 mA signal from the customer's PLC or other controller. The VRC "Optional Hand Held Control," shown at right and described in the VRC catalog, can also be used.

If the customer using a motorized valve with ISO-200 (8 inch) port or smaller wants Open-Close only, he still needs the Standard Positioner. There is a 10 VDC source built into our Positioner and available on the rear panel. The customer connects that source to the rear panel input and installs an on/off switch in that line. Closing the switch will connect the 10 VDC and close the valve. Opening the switch will make the signal 0 VDC, and the valve will open. (There is a jumper inside the positioner to make 10 VDC open and 0 Volt close.)

Larger motorized valves with ports of ISO-250 (10 inch) to ISO-630 (24 inch) give the customer 3 options.

1. For Throttle Operation. No Positioner at all (this is our standard.) The circuit boards are mounted on the valve. The customer sends a signal of 0-10 VDC (or 4-20 mA) to throttle the gate position from 0% to 100%. Usually this signal is from the customer's PLC or other controller. The customer also provides 115 or 220 VAC as required to power the valve motor.

2. For Open-Close only (this is also standard and no Positioner is needed.) The customer sends a 0 VDC or 10 VDC or 4-20 mA signal from his PLC or other controller. Also AC power for the valve motor.

Hand Held Control Unit

Traditional Positioner

3. The customer buys the new Mini-Positioner P/N X801420 (not shown above) to drive the circuit boards on the valve. This product looks similar to the traditional Positioner shown above and in our catalog, but has an additional switch on the front panel to select "Command" or "Feedback" for the Digital Display. Command displays the signal sent to the valve. Feedback displays the position sent back from the valve. This Mini-Positioner will generate 0 - 10 VDC and 4 - 20 mA current loop for cable lengths up to 30 m (100 ft). No PLC or other Controller is needed. AC power for the valve motor is also required.

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Connect Power here
120 V or 220 V, 50/60 Hz

Line Voltage Select Jumper on
KBVF Series Drives

⚠ CAUTION

Operating this valve with improper main voltage will cause serious damage to the valve.

⚠ WARNING

Disconnect main power before making or changing connections.

Motorized Gate Valve with Covers Removed

Glossary:

ROTARY FEEDBACK CONTROL (RFC)
Circuit Board P/N: X114005 (Fig. # 1):

Rotary Feedback Control Sensor is an absolute non-contact magnetic field sensor. A ratio metric voltage of .5 to 1.5 volt DC is obtained from a permanent magnet north/south orientation at the face of the device. This permanent magnet is embedded into the valves rotary crankshaft that is mounted into the hollow bore of the 3-phase 230-vac electric motor actuator. As the motor is rotated from full open to full closed positions, i.e., 180 degrees of rotation; the magnet rotates and the RFC sends a DC output signal in proportion to the angle of rotation. Full open gate valve RFC output voltage is .5 volt DC and a full closed gate valve RFC output voltage is 1.490 volt DC (typically).

NOTE: Each RFC sensor has slight variations in the minimum and maximum output voltages. The linearity of the device is not affected between the min and max ratio metric output voltage.

FEEDBACK SERVO LOOP Circuit Board P/N: X801399
(Figures #1 and # 2)

Feedback servo loop circuitry allows command signals to be transmitted and received in an analog fashion. The complete feedback, RFC and command signals basically are scaled to a 0 to 1 volt DC range for control of the motorized gate valve's position from full open to full closed, using either:

A) Zero to +10 vdc signal, or
B) 4 to 20-milliamp current loop signal.

NOTE: Valves shipped from the factory are configured for voltage input (0 to +10 volt DC) Where zero volts causes the valve to close and +10 volts causes the valve to open.

The feedback servo loop circuit board also has adjustments and terminals for control of the motorized gate valve. Refer to Figure 1 & 2 of the servo feedback loop drawing. Three terminals are provided for the RFC sensor connections.

Black/Brown wire	is the common circuit ground.
White wire	is the ratio metric +. 5 to +1.5 volt DC position sensing voltage.
Green wire	is stable +5 volt DC power source.

Optional (OPT.) Drive Command:
For end users who do not have a readily available +10 volt voltage source. To actuate the valve (command signal) can use this output voltage as the command signal. This command voltage is +10.25 volt DC that is greater than 10 volts required for full Motor rotation. Reference: See Input Signal Clip trimpot adjustment.

RFC POSITION OUT: An op-amp buffered signal derived directly from raw RFC ratio metric voltage. End user may send this voltage to computer or PLC for position monitoring of the gate valve.

VALVE CLOSED TRIMPOT ADJUSTMENT: Accurately scales the command signal with that of the RFC feedback to produce a Closed valve condition (isolation) of the vacuum system.

VALVE OPEN TRIMPOT ADJUSTMENT: Accurately scales the command signal with that of the RFC feedback to produce a FULL Open valve condition.

VALVE DIRECTION SELECT JUMPER (Refer to Figure # 1): Direction of valve operation may be reversed from the factory default setting of Zero volt = valve closed to +10 volt = valve closed. Recalibration of valve open and valve closed trim pots are usually not affected when this change is configured.

GAIN ADJUSTMENT TRIMPOT: For proper step response in command signal to valve movement the loop gain needs to be adjustable. Loop gain is factory set to provide optimum command signal step change to valve position change without under shoot or over shoot of the gate valve to the desired position.

DRIVE SIGNAL A & B (Refer to Fig. # 1): Reversing DC drive voltage of approximately 11 volt DC to command the drive signal isolation board (SIVFR) to the Motor Drive KBVF Series to start and stop the 3 phase motor, and to change directions.

INPUT SIGNAL CLIP TRIMPOT: The feedback servo loop circuitry is analog by design so that digital processing and lag time are avoided. However the command signal should never go over +10 volt DC range, i.e., over 100 % of valve travel. An adjustable trimpot is used in conjunction with a semiconductor clipping circuit to accurately clip anything above +10.00 volt DC. This signal has been factory adjusted to provide optimal performance.

VOLT/mA JUMPER SELECT (Refer to Fig. # 1): The command signal to actuate the gate valve can be either a current signal of 4 to 20 mA or a stable voltage source of 0 to +10 volt DC.

+10 VOLTS INPUT: Command voltage input terminal connection.

SIGNAL GROUND: Common ground reference for command input signal.

4 to 20 CURRENT LOOP INPUT: Command current signal input terminal connection.

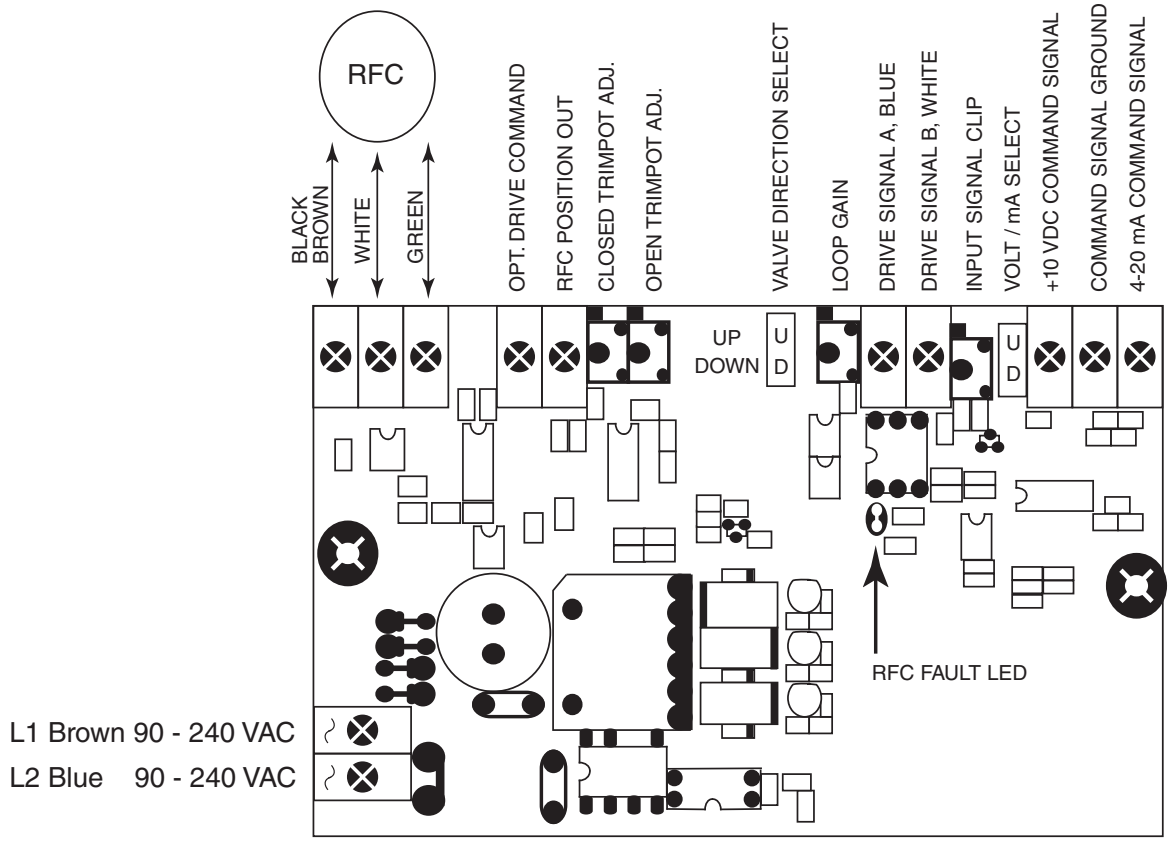

FIGURE 1
FEEDBACK SERVO LOOP PCB, P/N: X801399

Command Signal and Valve Direction Settings

For Voltage Input:

Locate Volt/mA jumper (2 pin removable jumper). Place jumper from center pin to “U” up position. Select terminals: +10 VDC command signal and command signal ground.

For Current Input:

Locate Volt/mA jumper (2 pin removable jumper). Place jumper from center pin to “D” down position. Select terminals: 4-20 mA command signal and command signal ground.

Valve Direction Select: **Factory default direction**: zero volts closed, +10 volts open

Locate Valve Direction Select (2 pin removable jumper). Place jumper from center pin to “D” down position.
Wire Drive Signal A with Blue wire from SIVFR Board
Wire Drive Signal B with White wire from SIVFR Board

Valve Direction Select: +10 volts closed, zero volts open

Locate Valve Direction Select (2 pin removable jumper). Place jumper from center pin to “U” up position.
Wire Drive Signal A with White wire from SIVFR Board
Wire Drive Signal B with Blue wire from SIVFR Board

RFC Fault LED:

Feedback Servo Loop circuitry incorporates an electronic window detector circuit for the RFC ratio-metric voltage from the Rotary Feedback Control angle sensor. This voltage detector is .5 volts to 1.5 volts window. If the RFC ratio-metric voltage from the sensor falls outside of this window, the circuit will latch and illuminate the RED fault LED, disabling the drive signal to the KBVF Series drive.
Possible reasons for the LED to light:

A) RFC feedback device has broken wire
B) Absent +5 volts supply to the RFC device
C) RFC device faulty

The Complete Closed Loop System consists of the following components:

The Feedback Servo Loop	SIVFR circuit
KBVF motor drive	Motor Actuator
RFC device	

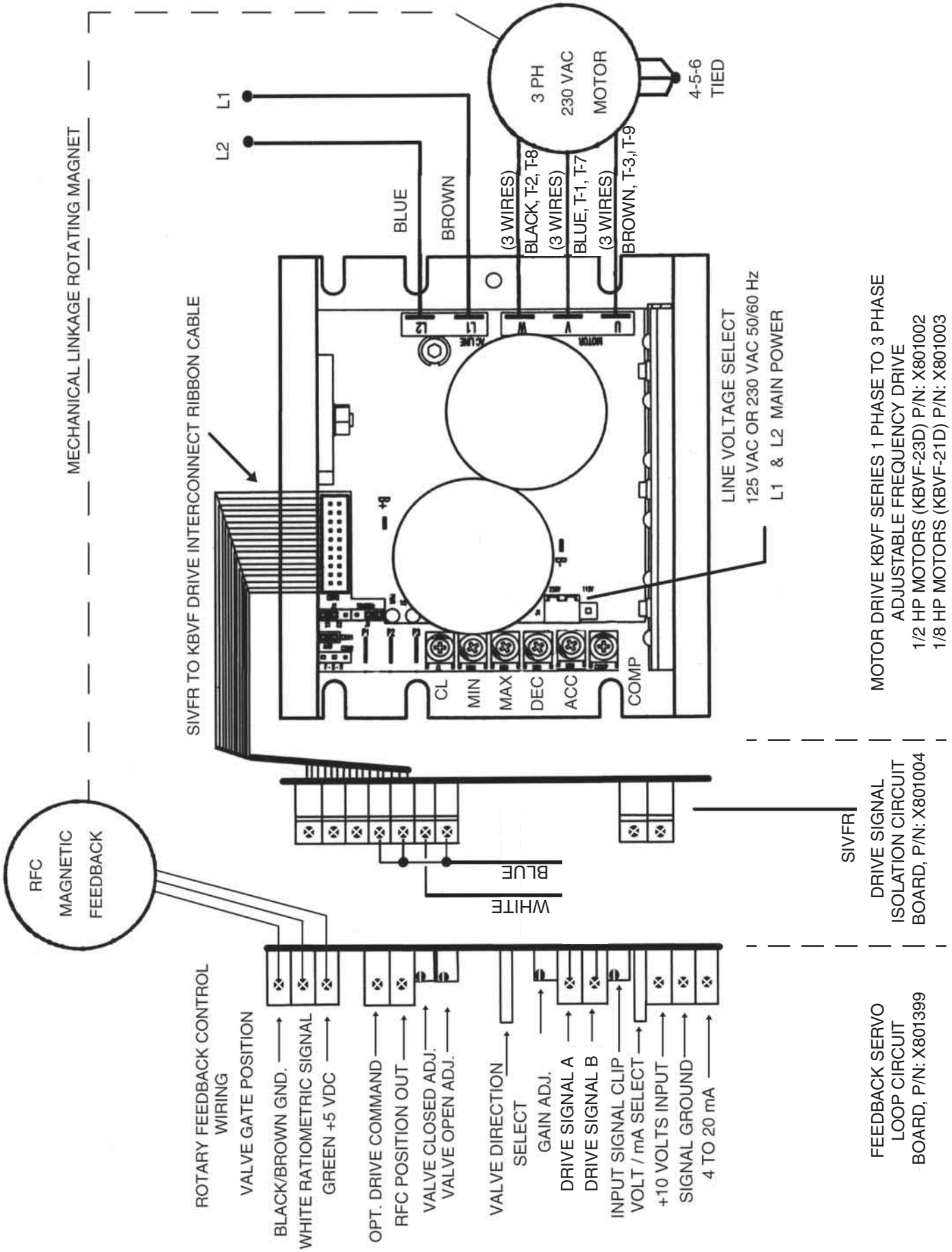

FIGURE 2
DRIVE ASSEMBLY, P/N: X801411

revised 3/8/14