KVC7934, KVC7936

MODULATING ACTUATORS WITHOUT AND WITH POWER FAILURE REPOSITION FOR KVC SERIES CARTRIDGE VALVE

INSTALLATION INSTRUCTIONS

The KVC7934 series Non-power Failure Reposition and the KVC7936 Fail Safe modulating control actuators when used with the KVC series hydronic valve provides proportional control of hot or chilled water in commercial heating and cooling applications, such as unit ventilators.These KVC7900 series valve actuators are used with any thermostat or controller with a 0 - 10¯Vdc direct-acting output.

On a power failure, this patented KVC7936 actuator design drives the valve to the fail safe position, either fully open or closed, according to the installer's wiring connections. The KVC7936 uses a microprocessor-controlled, low voltage stepper motor with a supercapacitor-based power supply capable of storing enough power to drive the valve to its fail safe position when 24V power is removed from the actuator. DIP switches are used to select actuator response time, flow characterization, motor timing, and control signal type.

The KVC series hydronic valve consists of a valve body and replaceable characterized cartridge assembly. When used with a KVC7900-series actuator, the valve provides proportional flow control. Three-way bodies may be used in either diverting or mixing applications. KVC valves use cam-operated cartridge travel to resist water hammer. Limit switches prevent motor overrun.

SPECIFICATIONS

The specifications following are nominal and conform to generally accepted industry standards. Kele is not responsible for damages resulting from misapplication or misuse of its products.

Electrical Ratings:

KVC7934, KVC7936: 24 V, 50-60 Hz. Class 2 circuit

Power Consumption:

KVC7934: 4 Watt maximum at nominal voltage (during valve position change). Use 24V Class 2 transformer and provide 6 VA for connection wire sizing for each valve.

KVC7936: 18 VA maximum (during start up).

Control Signal:

KVC7934: 2-10 VDC Modulating Signal (Direct Acting)

KVC7936:
Analog Control Signal
- 0–10 or 2–10 Vdc, proportional signal into polarity-protected, 19 kilo-ohm input impedance.
- 4–20 mA dc proportional signal with external 499 ohm 1% dropping resistor (not included).

Digital Control Signal
- 24 Vac, 1.5mA Floating Signal (two mutually-exclusive momentary contacts for open and close, with minimum 0.5 seconds on and off timing.)
- 24 Vac, 1.5mA Pulse Width Modulated Signal (repeating voltage pulse up to 30 second period, with minimum 0.5 seconds on and off timing.)
- 24 Vac, 1.5mA on-off control (contact closure over 30 seconds in duration, not suitable for use with power stealing thermostats or thermostats with anticipators)

Annunciation:

KVC7934: red LED on cable end

Nominal Timing:

KVC7934: 165 seconds @ 50 Hz/140 seconds @ 60 Hz

KVC7936: 60 or 120 seconds full stroke depending on DIP switch setting.

Electrical Termination: 5 feet (1.5 m) plenum-rated cable per UL94-5V. Flexible conduit (3/8") clamp included.

Operating Ambient:
32 to 140 °F (0 to +60 °C)
5-95% RH (non-condensing)

Shipping and Storage Temperature:
-40 to 150 °F (-40 to +65 °C)

Atmosphere: Non-corrosive, non-explosive.

Approvals: UL (plenum rating), CE; FCC Part 15 Class B

Fluid temperatures: 34 to 203 °F (1 to 95 °C)

Flow Characteristics: Linear or equal percentage per Table 1 and DIP switch setting per Table 3.

Models: Modulating 24 Vac Actuator

Model No.	Voltage (50/60 Hz)	Power Failure Return	Nominal Stroke Timing	Electrical Connection
KVC7934zz11	24 Vac	No	140 seconds @ 60 Hz	5' (1.5m) plenum-rated cable
KVC7936zz11		Yes	120 seconds *Power Failure: 12 seconds*	

Models:
Bodies (Order Separately): KVC..., per table 1.

Table 1: KVC Series Valve Bodies

2-way Valve Number	Cv Rating	Flow Type	Body Fitting	3-way Valve Number	Cv Rating
KVC2050N32	3.2	Linear	1/2" NPT	KVC3050N37	3.7
KVC2050N29	2.9	Equal Percentage			
KVC2050N07	0.7				
KVC2050N13	1.3				
KVC2075N47	4.7	Linear	3/4" NPT	KVC3075N66	6.6
KVC2100N66	6.6		1" NPT	KVC3100N87	8.7
KVC2125N71	7.1		1-1/4" NPT	KVC3125N92	9.2

For example, to order a 2- way, 3/4" FNPT valve with linear control characteristic for chilled water, order KVC2075N47.

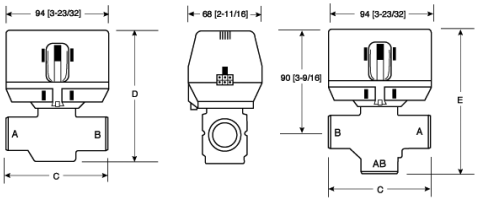


Fig. 1. Nominal Dimensions in inches and millimeters

Table 2. KVC Valve Assembled Dimensions

Dimensions	C		D (2-way)		E (3-way)	
Pipe Fitting Sizes	inches	mm	inches	mm	inches	mm
1/2" NPT	3-7/8	98	4-3/8	111	5-11/32	136
3/4" NPT	3-11/16	94	4-7/16	113	5-3/32	130
1" NPT	3-11/18	94	4-7/18	113	5-11/32	136
1-1/4" NPT	4-5/16	110	4-5/8	118	5-5/8	142

Manual Opener

The manual opener can be manipulated only when in the up position. The motorized valve can be opened by firmly pushing the red manual lever down to midway and in. This holds the valve in the open position. This "manual open" position may be used for filling, venting, draining the system or for opening the valve in case of power failure. The valve can be restored manually to the closed position by depressing the red manual lever lightly and then pulling the lever out. The valve and actuator will return to the automatic position when power is restored.

NOTE: If the valve is powered open, it can not be manually closed unless actuator is removed.

INSTALLATION

When Installing This Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. Always conduct a thorough checkout when installation is completed.
5. While not necessary to remove the actuator from the body, it can be removed for ease of installation. The actuator can be installed in any position to suit the most convenient wiring mode.
6. An extra 1" (25 mm) head clearance is required to remove the actuator.

PLUMBING

Refer to the KVC Series Cartridge Valve Installation and Instruction Sheet, form number 95C-10918, for detailed plumbing instructions.

IMPORTANT

For trouble-free operation of the product, good installation practice must include initial system flushing, chemical water treatment, and the use of a 50 micron (preferably 5 micron) 10% side stream system filter(s). Remove all filter(s) before flushing. Limit flow through the filter to 5~10% of total system flow to prevent 'starving' the system. Ensure filter cartridge is changed frequently enough to prevent clogging.

Put the VC actuator manual lever in the manual open or the fully open (down) position to allow initial system flushing with the actuator mounted. This may be done without electrical hook-up. Alternatively, reusable flush caps, part # 272866B, may be purchased separately for use in initial flushing of dirty hydronic systems.

Do not use boiler additives, solder flux and wetted materials which are petroleum based or contain mineral oil, hydrocarbons, or ethylene glycol acetate. Compounds which can be used, with minimum 50% water dilution, are diethylene glycol, ethylene glycol, and propylene glycol (antifreeze solutions).

TO INSTALL ACTUATOR

Installation of the actuator does not require draining the system, provided the valve body and valve cartridge assembly remain in the pipeline. Wiring may be done either before or after the actuator is installed.

1. The actuator head is automatically latched to the valve. Align the coupling hole in the bottom of the actuator with the valve stem. Press the actuator down towards the body with moderate hand force and turn the actuator counter-clockwise by 1/8 turn (45 degrees) to line up the actuator with the piping. The latch will click when engaged. See Figure 2.

   NOTE: The actuator can also be installed at right angles to the valve body but in this position the latch mechanism will not engage.

2. Connect leadwires. See figure 3 for flexible conduit installation with plenum-cable models.

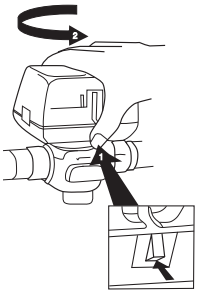


Fig. 2. Latch Mechanism to detach Actuator

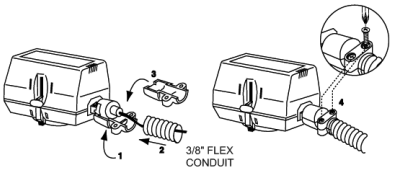


Fig. 3. Flexible Conduit Attachment

WIRING (KVC7934)

See Figure 4 for single unit wiring details. Multiple valves may be connected in parallel to a single controller and transformer, up to the current rating of the controller and transformer.

⚠ CAUTION

Disconnect power supply before connecting wiring to prevent electrical shock and equipment damage.

On 24 V systems, never jumper the valve coil terminals, even temporarily. This may damage the thermostat.

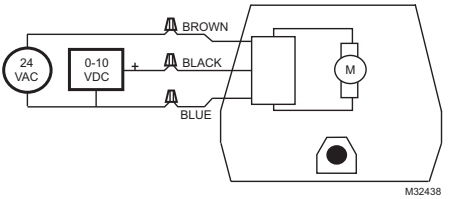


Fig. 4. Wiring Colour Code for Cable Models for 0-10 Vdc Controller (KVC7934).

OPERATIONS (KVC7934)

WITH SERIES 80, 0/2-10 VDC CONTROLLER:
(refer to figure 7)

In the KVC7934, an electronic circuit compares the voltage of the feedback potentiometer to the signal voltage. If they are different, then the circuit closes the appropriate triac and drives the motor in the direction that will bring the circuit back into balance. In addition, the standard limit switches maintain the travel to the normal operating range.

In a direct acting model, 2V signal will be fully closed, and 9V will be fully open. In a reverse acting model, 9V is closed and 2V is open. However, because of the soft close off of the KVC valve, initial (and final) movements of the actuator will not cause any significant changes in the valve stem position.

On a loss of power, the actuator will remain in the last position, and will resume normal operation on power up. On loss of signal, a direct acting device will go to the closed default position. A reverse acting device will default open.

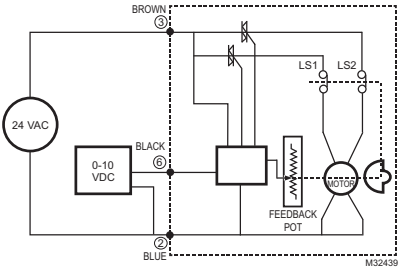


Fig. 5. Wiring Schematic of the KVC7900 Series Actuator

CHECKOUT (KVC7934)

1. Raise the set point of the thermostat above room temperature to initiate a call for heat.
2. Observe all control devices - The 2 way valve should open. Port A of the 3 way valve should open, port B should close.

3. Lower the set point of the thermostat below room temperature.
4. Observe the control devices. The 2 way valve should close. Port A of the 3 way valve should close, and Port B should open.

WIRING (KVC7936)

⚠ CAUTION

1. Disconnect power supply before connecting wiring to prevent electrical shock and equipment damage.
2. Never jumper the supply wires or actuator terminals even temporarily. This may damage the controller.
3. Verify wiring connections of the brown and blue lead wires with respect to the controller. The actuator will not operate if these are wrong. Inputs are switched from the “hot” side of the controller's power supply.
4. Multiple valves may be connected in parallel to a single controller and transformer, up to the current rating of the controller and transformer.

OPTION SWITCH SETTINGS

The KVC 7936 has four DIP switches for setting operating characteristics. These are accessible through the slots in the upper part of the case on the end of the actuator with the wiring connections, and may be operated with the tip of a mechanical pencil, or a straightened paper clip. A DIP switch is ON when the switch lever has been moved UP, away from the valve body. They number 1 to 4 from left to right. See table 3.

Table 3. Dip switch on/off selection for operating characteristics

DIP SWITCH	1	2	3	4
ON ↑	REV	0-10V	Equal%	60s
OFF ↓	DIR	Floating	Linear	120s

Sw.1 sets the actuator response.
OFF = direct (normal) operation: A port open with 10 Vdc input (factory setting).
ON = reverse operation, A port closed with 10 Vdc input. This is useful, for example, for correcting plumbing errors with 3-way valves. This setting affects all control modes.

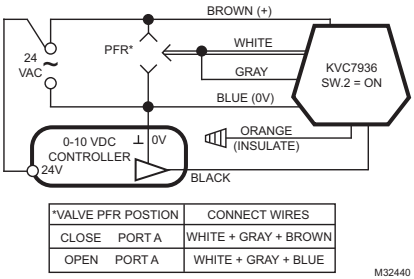
Sw.2 sets control signal type.
OFF = floating, PWM, or on-off (digital) inputs.
ON = analog voltage modulating input (factory setting). The KVC7936 accepts a variety of control inputs.

Sw.3 sets valve flow characterization.
OFF = linear response, where the stem position is a linear function of the input voltage, and flow is solely a function of the valve body (factory setting).
ON = equal percentage, where the stem position is a 50% equal percent function of input voltage. Equal percentage response improves comfort control during mild weather in heating systems with constant, high temperature supply water, or in chilled water systems in arid desert climates. Please refer to the Resideo Engineering Manual of Automatic Control, publication #77-1100, for a detailed explanation.

Sw.4 sets actuator timing.
OFF = 2 minute end-to-end valve travel (factory setting).
ON = 1 minute travel. The faster response may be needed in lower mass systems.

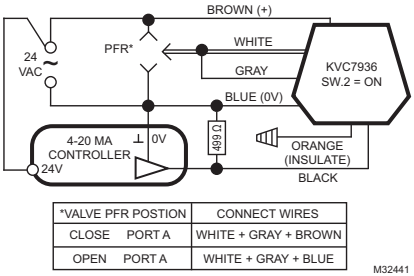
OPERATION (KVC7936)

WITH SERIES 70 MODULATING CONTROLLER
Refer to figure 6, DIP switch #2 must be ON (factory default)
The controller output may be either 0 to 10 Vdc or 2 to 10 Vdc, but the KVC7936 will be closed at 2 V to minimize false control signals caused by induced electrical noise on the wiring. In direct acting mode (DIP switch #1 off), the valve will be fully closed with a 2 V or lower signal, and fully open with a 10 V signal. In reverse acting mode, 10 V is closed and 2 V is open.
For a 4-20 mA control signal, wire a 499 ohm, 1/2 W resistor between the black and brown actuator input leads to develop a 2–10Vdc signal. If the controller is nearby, the resistor may be installed on the controller's terminal block. See figure 7.



*VALVE PFR POSTION	CONNECT WIRES
CLOSE PORT A	WHITE + GRAY + BROWN
OPEN PORT A	WHITE + GRAY + BLUE

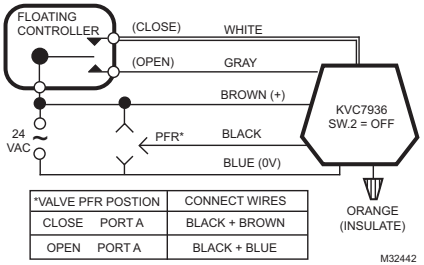
Fig. 6. Wiring Color Code for Cable Models for Modulating (0-10V or 2-10V) Controller



*VALVE PFR POSTION	CONNECT WIRES
CLOSE PORT A	WHITE + GRAY + BROWN
OPEN PORT A	WHITE + GRAY + BLUE

Fig. 7. Wiring Color Code for Cable Models for Modulating (4-20mA) Controller

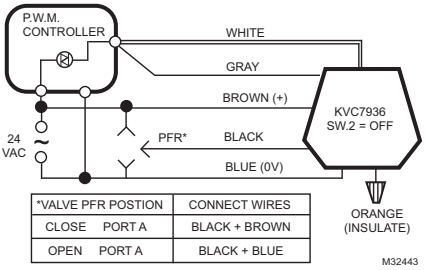
WITH SERIES 60 FLOATING (TRISTATE) CONTROLLER
Refer to figure 8, DIP switch #2 must be OFF, switch #1 = OFF.
A Series 60 floating controller has SPDT contact closure outputs with a center-off position. On a change in temperature from the set point, the controller will close either the Open or Close contacts creating a momentary voltage pulse on the gray or white input leads, driving the valve to a new position. The pulse must be at least 1/2 second long in order to be detected by the KVC7936. The pulse can be held as long as necessary.
For control stability, the stroke time of the actuator while powered has been simulated at either 120 or 60 seconds, depending on DIP switch #4. In fail safe and testing operation, the actuator travels through its stroke in 12 seconds.



*VALVE PFR POSTION	CONNECT WIRES
CLOSE PORT A	BLACK + BROWN
OPEN PORT A	BLACK + BLUE

Fig. 8. Wiring Color Code for Cable Models for Floating (Series 60 or "tristate") Controller

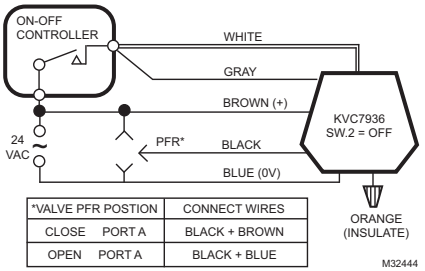
WITH SERIES 70 PWM CONTROLLER
Refer to figure 9, DIP switch #2 must be OFF
A Pulse Width Modulating controller has a SPST contact closure output that supplies a repetitive voltage pulse. The duty cycle of the pulse (percentage on time) is proportional to the position of the valve. This control signal was originally developed for use with electromechanical thermal actuators.
If the KVC7936 sees the a voltage pulse simultaneously on the gray and white input leads, it automatically interprets this as a PWM signal, and changes the valve to the new position on the second pulse.
PWM pulses must be at least 1/2 second long in order to be detected by the KVC7936. A 1/2 second pulse is interpreted as an Off signal. The pulse period may be up to 30 seconds, and pulses must be separated by an off period no shorter than 1/2 second. The KVC7936 will automatically synchronize to the period of the pulse train.
If DIP switch #1 is on, valve position is proportional to the off time percentage of the pulse train.



*VALVE PFR POSTION	CONNECT WIRES
CLOSE PORT A	BLACK + BROWN
OPEN PORT A	BLACK + BLUE

Fig. 9. Wiring Color Code for Cable Models for Pulse Width Modulating (PWM) Controller

WITH SERIES 80 ON-OFF CONTROLLER
Refer to figure 10, DIP switch #2 must be OFF
A Series 80 controller has a SPST contact closure output that supplies 24V power to the controlled device. KVC7936 wiring is identical to the PWM installation, above. If a "PWM" pulse extends longer than 30 seconds, the KVC7936 interprets this as an on-off control signal, and opens the valve at its 12 second speed. Note that the valve response is delayed by 42 seconds from application of the controller signal. If DIP switch #1 is on, the valve closes when the signal is received. NOTE: the current draw of the control inputs of the KVC7936 is not high enough to operate either a power stealing electronic thermostat, or the anticipator of an electromechanical low voltage thermostat.



*VALVE PFR POSTION	CONNECT WIRES
CLOSE PORT A	BLACK + BROWN
OPEN PORT A	BLACK + BLUE

Fig. 10. Wiring Color Code for Cable Models for ON-Off (Series 80) Controller

POWER FAILURE REPOSITION (FAIL SAFE OPERATION)
On a loss of power, the actuator will drive to its stand-by position using energy stored in the super-capacitors, and will resume normal operation on power up. On loss of signal, a KVC7936 wired for PFR-Open will open the A port fully. A KVC7936 wired for PFR-Close will open the A port fully. The motor can drive the valve through its full stroke in 12 seconds.
PFR position is chosen during installation. In analog mode (DIP switch #2 ON), the white and gray wires are connected to signal common (blue) to fail safe open, or to 24¯V (brown) to fail safe closed. In digital mode (DIP switch #2 OFF), the black wire is connected to common (blue) to fail safe open, or to 24 V (brown) to fail safe closed. The PFR position can be controlled dynamically with a SPST signal by applying 24 V power to the appropriate PFR direction selection lead(s) while power is present. Applying 24 V will cause the valve to close the A port when power is lost. Not applying power will cause the valve to open the A port when power is lost. This can

be useful in 2-pipe systems where both hot and chilled water may be used depending on the season, and a different fail safe mode is required for each condition. Because of the soft close off characteristic of the KVC valve, initial (and final) movements of the actuator do not cause significant changes in the valve stem position.

START UP
On initial power-up, the capacitors will take about 60 seconds to charge. When ready, the actuator will drive the valve through one full stroke cycle over 24 seconds to calibrate its position, and exercise the valve cartridge.

This self-calibration action repeats daily.

CHECKOUT (KVC7936)

1. Raise the set point of the thermostat above room temperature to initiate a call for heat.
2. Observe all control devices - 2 way valve should open. Port A in 3-way valve should open, and port B should close in 90 seconds.
3. Lower the set point of the thermostat below room temperature
4. Observe the control devices. 2 way valve should close. Port A in 3-way valve should close, and port B should open in 90 seconds.
5. Remove power from actuator. Actuator waits 3 seconds then drives valve to default position, i.e.: open (or close), in 12 seconds or less.
6. Restore power to actuator. Valve should drive to the position required by the thermostat or controller in 90 seconds or less.

SERVICE

This valve should be serviced by a trained, experienced service technician.

1. If the valve is leaking, drain system OR isolate valve from the system.
2. Check to see if the cartridge needs to be replaced.
3. If the motor or other internal parts of the actuator is damaged, replace the entire actuator assembly.

NOTE: These hydronic valves are designed and tested for silent operation in properly designed and installed systems. However, water noises may occur as a result of excessive water velocity. Piping noises may occur in high temperature (over 212 °F [100 °C]) systems with insufficient water pressure.

TO REPLACE ACTUATOR

Replacement of an actuator does not require draining the system, provided the valve body and valve cartridge assembly remain in the pipeline.

1. Check replacement part number and voltage ratings for match with old device.
2. Disconnect power supply before servicing to avoid electrical shock or equipment damage.
3. Disconnect leadwires to actuator and remove. Where appropriate, label wires for rewiring.
4. The actuator head is automatically latched to the valve. To remove, press up on the latch mechanism with your thumb. It is located directly below the white manual open lever (see Figure 2). Simultaneously press the actuator down towards the body with moderate hand force and turn the actuator counter-clockwise by 1/8 turn (45 degrees). Lift the actuator off the valve body.
5. Install the new actuator by reversing the process in (4).
6. Reconnect leadwires.
7. Restore power, and check out operation.

WEEE Directive 2012/19/EU Waste of Electrical and Electronic Equipment Directive

Disposal Information

Do not dispose this device and contained batteries with the general household waste. For proper treatment, recovery, and recycling, please take the device and contained batteries to designated collection points. Disposing of this device and of contained batteries correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

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