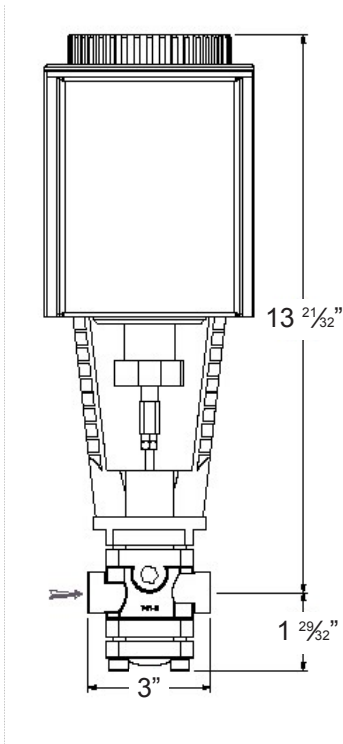




# Technical Data

SPENCE ENGINEERING COMPANY, INC. 150 COLDENHAM ROAD, WALDEN, NEW YORK, 12586-2035



## TYPE VH210

### ELECTRONIC ACTUATOR PILOT

Inlet Pressures to 250 PSIG

#### SPECIFICATION

The electronic actuator pilot shall maintain a system variable and modulate the valve travel in response to that system variable as requirements dictate. A continuous signal (4-20mA, 0-10 VDC) is transmitted by the system controller to the actuator which positions the valve stem. In the event of power loss, the electronic actuator pilot shall return to a closed position.

#### APPLICATIONS

- Building Control Systems
- SCADA
- PLC
- Upgrading E Main Installations for Automated Control

#### ELECTRONIC DATA

- 4-20 mA or 0-10 VDC Input Signals
- 24 VAC 50-60 Hz Power Supply
- 17VA/12W Power Consumption
- UL Listed (UL873)

#### MATERIALS OF CONSTRUCTION

Body.....ASTM 126 CI B  
 Stem.....303 SS ASTM 582 Cond. A  
 Disc.....440 SS ASTM 276-75 Cond. A  
 Seat.....420 SS ASTMA582 Cond. A  
 Gasket.....Non-Asbestos

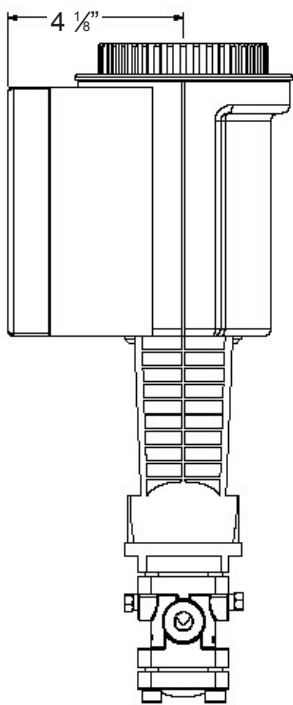
#### THEORY OF OPERATION

The complete regulator consists of a Spence Type E or C series Main Valve, equipped with a Spence Type VH210 Pilot. The end user supplies a process controller, which transmits a continuous proportional electronic signal (4-20 mA or 0-10 VDC) to the actuator.

The Main Valve is normally closed, held by an internal spring and initial pressure acting on its disc. The VH210 Pilot is controlled by the continuous proportional electronic signal received by the actuator from the process controller.

When the process controller signals the VH210 Pilot to open, process fluid flows through the pilot to the main valve via the bends and fittings, actuating the main valve by causing pressure to build under the main valve diaphragm. Depending on the signal received by the process controller, the VH210 Pilot may be closed, partially open or fully open.

Once the Main Valve opens, the downstream fluid variable is affected, measured and fed back to the pilot via a variable transmitter and the process controller.



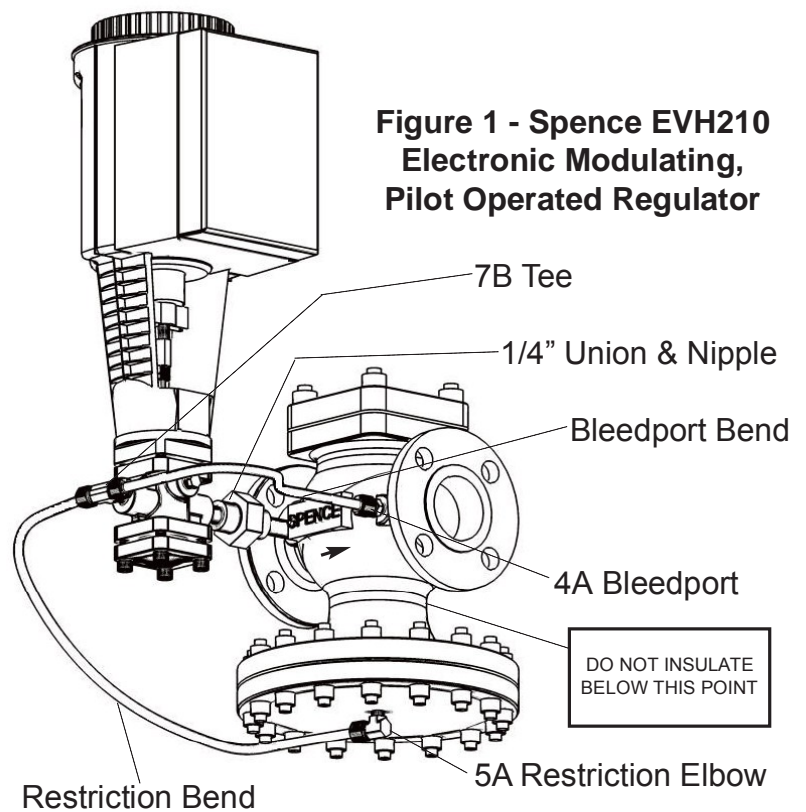
**TYPE VH210 ELECTRONIC PILOT  
 12.5 LBS (5.7 KG)**

## INTENDED PURPOSE

The Spence Type VH210 Pilot is intended for use with a Spence E or C Series Main Valve. The typical configuration as shown is the EVH210 Electronic Modulating, Pilot Operated Regulator. This pilot/main valve configuration is designed to control a process variable in proportion to a continuous electronic signal received from a user supplied process controller.

## PLANNING THE INSTALLATION

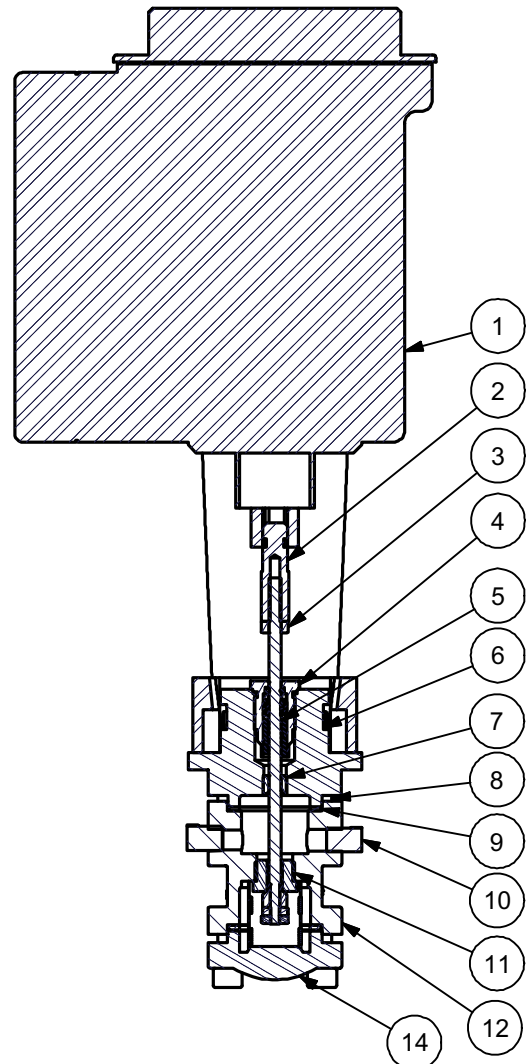
1. Locate the valve in a straight run of horizontal pipe. See Figure 3.
2. Allow headroom above the main valve for access through the blind flange. Provide clearance below the main valve for stem withdrawal.
3. Proper regulator installations have drip leg steam trap stations before and after the main valve(s).
4. Avoid damaging effects of scale and dirt in pipelines by using a strainer as shown in Figure 3.
5. Provide a three-valve-bypass to facilitate inspection without interrupting service.
6. Maximize efficiency with the Spence Insulcap and reduce heat loss through the regulator.



**Figure 1 - Spence EVH210 Electronic Modulating, Pilot Operated Regulator**

Parts List				
ITEM	DESCRIPTION	PART NUMBER	QTY	MATERIAL
1	ELECTRIC ACT.	05-17580-00	1	ALUMINUM
2	ADAPTER	04-17407-00	1	SS
3	HEX NUTS	05-17342-00	1	SS
4	PACKING KIT	204A104-01	1	SS/TFE
5	STEM	04-18341-00	1	SS
6	BONNET	04-18340-00	1	STEEL
7	GUIDE	SU260	1	SS
8	CAP SCREW	05-11719-00	8	STEEL
9	GASKET	05-02378-01	2	GRAPHITE
10	PLUG	05-03778-00	2	STEEL
11	SEAT RING	04-04057-00	1	420 SS
12	BODY	04-00741-00	1	ASTM A126 CL B CI
13	DISC	04-18493-00	1	440 CH
14	CAP	04-02151-00	1	ASTM A126 CI B CI
15	NUT	05-02888-00	2	STEEL
16	STRAINER	04-04700-00	1	SS
17*	RED BUSH 1/4 X 1/8	05-01104-00	1	BRASS
18*	7B TEE 5/16 X 1/8 NPT	05-05909-00	1	BRASS
19*	UNION M/F 1/4	05-06064-00	4	IRON
20*	NAMEPLATE	05-03819-00	1	-
21*	STICKER	05-13288-00	1	-
22*	NIPPLE	05-02804-00	1	STEEL

\* ITEMS 17 - 22 NOT SHOWN FOR CLARITY.



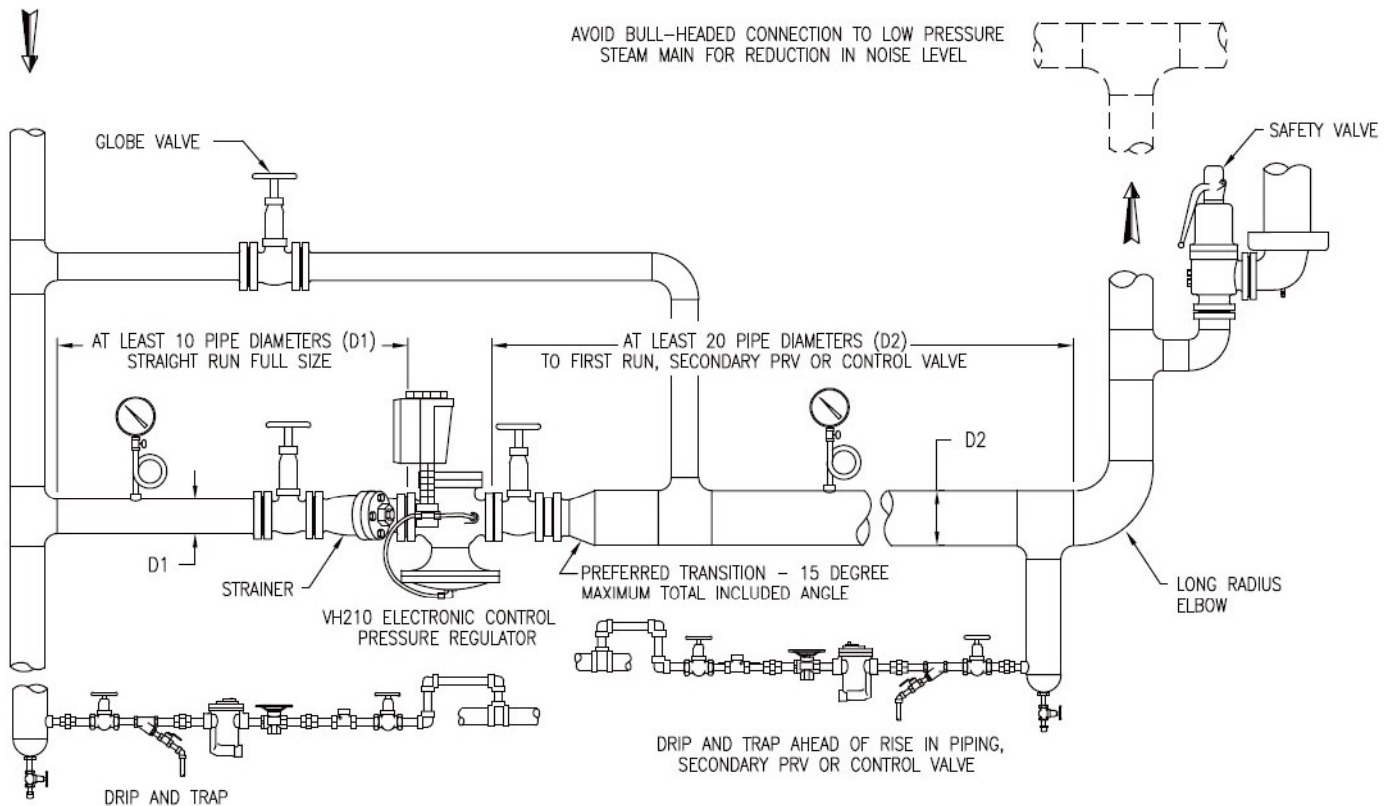
**Figure 2 - VH210 Parts List**

## PLANNING THE INSTALLATION (CONTINUED)

6. To eliminate excessive noise and erratic regulation with steam and other compressible fluids, enlarge the delivery pipe size to effect a reasonable flow velocity at the reduced pressure. A concentric transition is recommended. If possible, avoid a sharp turn close to the regulator outlet and a bullheaded tee connection to a low pressure main.
7. Install inlet (upstream) and delivery (downstream) pressure gauges to indicate performance. If the pressure rating of the delivery system or connected equipment is less than the upstream (inlet) steam pressure, provide a safety relief valve.
8. If it is anticipated that the ambient temperature at the VH210 pilot will be outside the 5°F to 130°F limitations, remote mounting of the VH210 pilot will be necessary.
9. If hydrostatic testing of the installation is necessary, proceed as follows:
  - a. Manually open the VH210 pilot by turning the knob on top of the actuator in a clockwise direction until the red "MAN" tab is displayed, then continuing to turn clockwise until the valve reaches its travel stop.
  - b. Before filling the system, open the inlet and outlet stop valves.
  - c. **Slowly** fill the system from the inlet (upstream) side of the regulator.
  - d. Bleed off trapped air.
  - e. **Slowly** develop hydrostatic test pressure up to 1.5 times the maximum working pressure. If a higher test pressure is necessary, contact the factory.
  - f. Hydrostatic type test pressure may cause normally acceptable leakage at the diaphragm joint.

## INSTALLING THE MAIN VALVE

1. Flush the piping system thoroughly to clear it of welding beads, sand, scale, etc.
2. Mount the main valve with diaphragm chamber down and arrow on the body oriented in the direction of flow.
3. Main valves with threaded connections should be mounted between unions.
4. Insulation may be applied to the upper portion (globe and flanges) of the main valve. Do not insulate the diaphragm chamber, condensation chamber (if used) or any part of the pilot. See Figure 1.



**Figure 3 - Recommended Installation of EVH210 Regulator with Strainer**

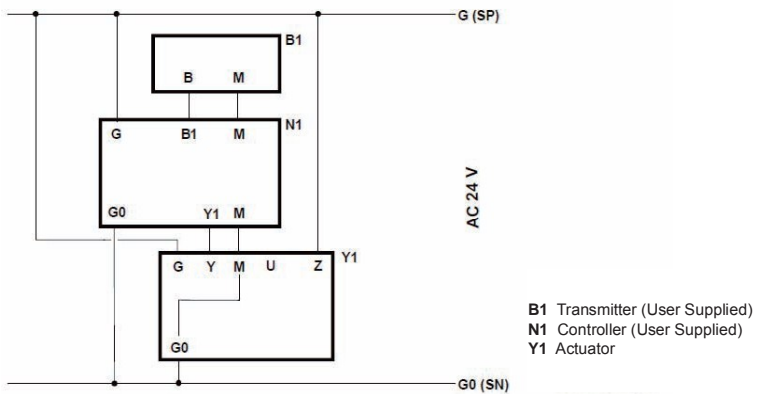
## INSTALLING THE PILOT

1. Mount the VH210 pilot with the arrow on the body pointing in the direction of flow, on either side of the main valve, by means of the 1/4" nipple and union provided. Make this connection to the 1/4" pipe tap at the inlet of the main valve as shown in Figure 1. Remote mounting of the VH210 pilot is recommended when the ambient temperature at the pilot exceeds 130°F. Caution should be taken to protect the electrical portion of the VH210 pilot from any dripping condensate.
2. Screw the 4A bleedport fitting into the 1/8" pipe tap at the outlet of the main valve body.  
**Note:** The restriction orifice in this fitting is vital to the operation of the valve.
3. Screw the 7B tee into the 1/4" pipe tap in the VH210 pilot using the branch connection of the tee.
4. Screw the 5A restriction elbow containing a restriction orifice into the 1/8" pipe tap on the underside of the main valve diaphragm chamber. If the initial pressure or pressure drop is less than 15 psi, a 5B open elbow (no restriction orifice) is used.
5. Connect the tubing bends as illustrated in Figure 1.
6. Connect the power and signal wiring to the actuator per wiring diagram shown in Figure 4.
7. There are (4) Dip Switches located under the wiring terminal. They should all be in the "Down" position for 0-10vDC input. For 4-20mA input, Dip Switch 3 should be in the "Up" position.

**WARNING:** Steam is potentially dangerous and should be treated with respect. Any steam line which is being filled and pressurized will form condensate. The steam system must be adequately trapped to remove the condensate as it forms. **NEVER** open a reducing valve without positive indication that the high pressure side is clear of condensate.

## INITIAL START-UP AND SETTING

1. Using the bypass, **slowly** fill the delivery system and raise the pressure to slightly below that which is required.
2. Crack open the inlet stop valve. Blow down the strainer.
3. Open the inlet stop valve. Crack open the outlet stop valve and allow the user supplied process controller to activate the pilot and take control of the system.
4. Alternatively choke down the bypass and open the outlet stop valve until the regulator is online.



## Connecting Terminals

24 Vac	
G	System Potential (SP)
G0	System Neutral (SN)
Y	Control Input: 0 to 10 Vdc or 4 to 20 mA (DIP switch selectable)
Z	Override Control (See <i>Technical Instructions 155-717</i> )
M	Measuring Neutral
U	Output for 0 to 10 Vdc or 4 to 20 mA measuring voltage. It will match the input signal type.

The position output signal U will switch from 0 to 10 Vdc to 4 to 20 mA when a 4 to 20 mA input signal is selected and used on the terminal.

**Figure 4 - VH210 Wiring Diagram**

**WARNING:** Steam is potentially dangerous and should be treated with respect. All installation, trouble shooting and maintenance should be performed by qualified personnel who are familiar with steam systems.

## TROUBLE SHOOTING

1. Failure to open or sagging delivery pressure
  - a. Inlet pressure may be down due to partially closed supply valve, clogged strainer or other obstruction
  - b. Orifice in 5A restriction elbow (see Figure 1) may be plugged
  - c. 4A bleedport may have been omitted and an open coupling substituted
  - d. The VH210 pilot may be inoperative
    - i. Check power supply and signal to pilot
    - ii. Check power and signal to process controller (customer supplied)
2. Failure to close or overriding delivery pressure
  - a. Orifice in 4A bleedport may be plugged
  - b. Bypass valve may be leaking
  - c. Main valve or pilot may be held open by foreign matter in seat
    - i. Close stop valves
    - ii. Remove bend from 4A bleedport
    - iii. Crack inlet stop valve. Steam will issue from the open bend. Using the manual override knob, fully open and close the pilot several times

## **TROUBLE SHOOTING (CONTINUED)**

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- to wash the seat. Completely close the pilot. If steam still issues from the bend, the pilot is not closing correctly.
- iv. Steam blowing back from the 4A bleedport means the main valve seat is held open by foreign matter.
  - v. Steam may wash the obstruction from the seat if the valve is made to open and close fully a few times. If the user supplied variable transmitter is installed downstream of the outlet stop valve, slowly opening and closing the outlet stop valve will accomplish this.
  - vi. If leakage continues from either the main valve or the pilot, dismantling and maintenance of one or the other may be required. See Maintenance section.
- d. Pilot may need recalibration, see Maintenance Step 3.
  - e. The VH210 pilot may be inoperative
    - i. Check power supply and signal to pilot
    - ii. Check power and signal to process controller (customer supplied)
3. Erratic operation may be caused by:
- a. Partial clogging of 4A bleedport
  - b. Sticking or binding of the pilot valve stem (5), Figure 2. Look for deposits or bits of scale on the stem (5) or guide (8).
  - c. Loose or dirty electrical connections
4. Power / Signal failure
- a. In the event of a power or signal failure, the VH210 returns to a closed position, which, in turn, will cause the main valve to lose pressure underneath it's diaphragm and close.

## **MAINTENANCE**

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1. Under normal conditions, complete dismantling at regular intervals is not recommended. A valve kept relatively free of dirt will function for years with minimum attention
2. After an initial period of operation and twice a year thereafter:
  - a. Inspect for dirt collected at 4A bleedport and 5A restriction elbow (see Figure 1)
  - b. Inspect all joints for leakage. Keep bolts tight and never allow a leak to persist.
3. After an initial period of operation and on regular maintenance schedule(set by the customer), it may be necessary to recalibrate the pilot.

## **MAINTENANCE (CONTINUED)**

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- a. Remove the front cover of the actuator
- b. Stick a flat head screwdriver in the "CALIB" slot to begin the calibration process.
- c. When the calibration process finishes there is a solid green light.
- d. To verify send either a 10vDC or 20mA signal to the actuator and measure the travel. The goal is to achieve 0.125" to 0.140" travel.

It is solely the responsibility of the system designer and the user to select products and materials suitable for their specific application requirements, and to ensure proper installation, operation and maintenance of these products. Assistance shall be afforded with the selection of materials based on the technical information supplied to Spence Engineering Company, Inc.; however, the system designer and user retain final responsibility. The designer should consider applicable Codes, material compatibility, product ratings and application details in the selection and application. Improper selection, application or use of the products described herein can cause personal injury or property damage. If the designer or user intends to use the product for an application or use other than originally specified, he/she must reconfirm that the selection is suitable for the new operating conditions.

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