

## MVF461H Series

### Modulating Control Valves with Magnetic Actuators, Positioning Control and Position Feedback for Hot Water and Steam



|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                              |                 |  |                                                                                             |                 |  |                                                                                              |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------|--|---------------------------------------------------------------------------------------------|-----------------|--|----------------------------------------------------------------------------------------------|
| <b>Description</b>               | Control valves with magnetic actuators, for modulating control of hot water, high temperature hot water, and steam.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                              |                 |  |                                                                                             |                 |  |                                                                                              |
| <b>Features</b>                  | <ul style="list-style-type: none"> <li>• Fast positioning time (&lt; 2 seconds)</li> <li>• Selectable valve characteristic: Equal percentage or linear</li> <li>• Selectable standard interface: 0/2 to 10 Vdc or 0/4 to 20 mA</li> <li>• High resolution (&gt;1:1000)</li> <li>• High rangeability</li> <li>• Wear-free inductive stroke measurement</li> <li>• Spring return A → AB closed when de-energized</li> <li>• Positioning control and position feedback signal</li> <li>• Low-friction, heavy-duty and maintenance-free</li> <li>• Phase-cut signal input for Staefa controllers</li> </ul> |                                                                                              |                 |  |                                                                                             |                 |  |                                                                                              |
| <b>Product Numbers</b>           | See Table 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                              |                 |  |                                                                                             |                 |  |                                                                                              |
| <b>Warning/Caution Notations</b> | <table border="1"> <tr> <td><b>WARNING:</b></td><td></td><td>Personal injury or loss of life may occur if you do not follow the procedures as specified.</td></tr> <tr> <td><b>CAUTION:</b></td><td></td><td>Equipment damage or loss of data may occur if you do not follow the procedures as specified.</td></tr> </table>                                                                                                                                                                                                                                                                            |                                                                                              | <b>WARNING:</b> |  | Personal injury or loss of life may occur if you do not follow the procedures as specified. | <b>CAUTION:</b> |  | Equipment damage or loss of data may occur if you do not follow the procedures as specified. |
| <b>WARNING:</b>                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Personal injury or loss of life may occur if you do not follow the procedures as specified.  |                 |  |                                                                                             |                 |  |                                                                                              |
| <b>CAUTION:</b>                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Equipment damage or loss of data may occur if you do not follow the procedures as specified. |                 |  |                                                                                             |                 |  |                                                                                              |
| <b>Application</b>               | <p>The MVF461H Series valves are through-port or mixing valves with magnetic actuators. The actuator is equipped with an electronics module for positioning control and position feedback. If the power is off, the valve control path A → AB is closed.</p> <p>The short positioning time, high resolution and high rangeability make these valves ideal for proportional control of district heating stations, and heating applications using high temperature hot water and steam.</p>                                                                                                               |                                                                                              |                 |  |                                                                                             |                 |  |                                                                                              |

**Table 1. Product Numbers.**

| Product Number | Line Size (in) | Cv   |              |                   | $S_{NA}$ (VA) | $P_{med}$ (W) | $I_N$ Fuse | Wire Gauge (AWG) |        |     |
|----------------|----------------|------|--------------|-------------------|---------------|---------------|------------|------------------|--------|-----|
|                |                |      | $\Delta p_s$ | $\Delta p_{vmax}$ |               |               |            | 16               | 14     | 12  |
|                |                |      | (psi)        | (psi)             |               |               |            |                  | L (ft) |     |
| MVF461H15-0.6  | 1/2            | 0.7  | 145          | 145               | 33            | 15            | 3.15       | 130              | 215    | 360 |
| MVF461H15-1.5  | 1/2            | 1.8  | 145          | 145               | 33            | 15            | 3.15       | 130              | 215    | 360 |
| MVF461H15-3    | 1/2            | 3.5  | 145          | 145               | 33            | 15            | 3.15       | 130              | 215    | 360 |
| MVF461H20-5    | 3/4            | 5.9  | 145          | 145               | 33            | 15            | 3.15       | 130              | 215    | 360 |
| MVF461H25-8    | 1              | 9.4  | 145          | 145               | 33            | 15            | 3.15       | 130              | 215    | 360 |
| MVF461H32-12   | 1-1/4          | 14.0 | 145          | 145               | 43            | 20            | 4          | 100              | 165    | 260 |
| MVF461H40-20   | 1-1/2          | 23.3 | 145          | 145               | 65            | 20            | 6.3        | 100              | 165    | 260 |
| MVF461H50-30   | 2              | 35.0 | 145          | 145               | 65            | 26            | 6.3        | 65               | 100    | 165 |

**Key:**

- $\Delta p_{vmax}$  = Maximum permissible differential pressure across the valve's control path, valid for the entire actuating range of the motorized valve (maximum recommended operating differential pressure).
- $\Delta p_s$  = Maximum permissible differential pressure at which the motorized valve will close securely against the pressure (close-off pressure).
- $S_{NA}$  = Nominal apparent power for selecting the transformer.
- $P_{med}$  = Average true power.
- $I_N$  = Slow fuse (mandatory).
- Cv = Nominal flow rate of cold water [41°F to 86°F (5°C to 30°C)].
- L = Maximum cable length. With four-wire connections the maximum permissible length of the separate 14 AWG Cu signal cable is 656 feet (200 m).

**Ordering**

The valve body and magnetic actuator assemblies cannot be separated. The assemblies can also be ordered with NPT flanges or weld flanges. To order with NPT flanges, add an "-N" suffix to the part number. To order with Weld Flanges, add a "-W" suffix to the part number. When placing an order, specify the quantity, product number and description.

- Examples:** (without flanges) 1 MVF461H15-0.6 valve  
 (with NPT flanges) 1 MVF461H15-0.6-N valve with NPT flanges  
 (with weld flanges) 1 MVF461H15-0.6-W valve with weld flanges

**Accessory**

ASE12 Replacement Circuit Board

**Technical/  
Mechanical Design**

**Automatic Control**

The electronics module converts the positioning signal to a phase-cut power signal, which generates a magnetic field in the coil. This causes the armature to change its position according to the interacting forces (magnetic field, counterspring, hydraulics, etc.). The armature responds rapidly to any change in signal, transferring the corresponding movement directly to the valve plug. This enables fast changes in load to be corrected quickly and accurately.

The valve's position is measured continuously. Any disturbance in the system is rapidly corrected by the internal positioning controller, which ensures that the positioning signal and the valve stroke are exactly proportional, and also delivers the position feedback signal.



## Manual adjustment

Press (a) and turn the hand wheel (b):

- clockwise (CW). Control path A → AB can be mechanically opened to between 80% and 90%, or
- counterclockwise (CCW). The actuator will be switched off and the valve closed.

As soon as the hand wheel is pressed and turned, neither the forced control signal Z, the input signal Y, nor the phase-cut signal acts on the actuator. The green LED will flash.

For automatic control, the hand wheel must be set to the Auto position. The green LED will be lit.

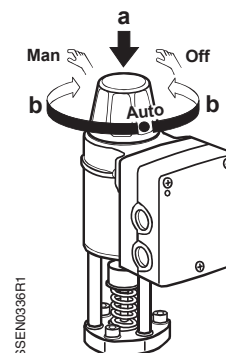


Figure 1.

## Calibration

If the electronics module is replaced or the actuator turned through 180°, the valve's electronics must be recalibrated. To recalibrate, the hand wheel must be set to Auto.

The printed circuit board has a slot (see Figure 2). Calibrate by bridging the contacts located behind the slot on the printed circuit board, using a screwdriver. The valve will then travel across the full stroke to store the end positions.

While calibration is in progress, the green LED will flash for about 10 seconds (see Table 2. Indication of Operating State).

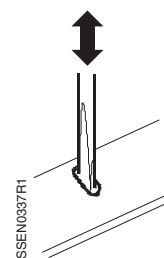


Figure 2.

## DIP Switches

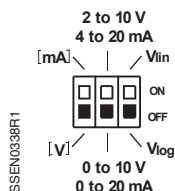


Figure 3. Configuration DIP Switches.

| DIP                                                                                             | Function                             | OFF (Default)                       | ON                         | Remarks                                      |
|-------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------|----------------------------|----------------------------------------------|
| <b>1</b><br> | Voltage or current input             | [ V ]                               | [ mA ]                     | Assignment of terminal Y: Voltage or current |
| <b>2</b><br> | Correcting span<br>Terminals Y and U | 0 to 10 Vdc,<br>0 to 20 mA          | 2 to 10 Vdc,<br>4 to 20 mA | Offset settings of input and output          |
| <b>3</b><br> | Characteristic                       | V <sub>log</sub> (equal percentage) | V <sub>lin</sub> (linear)  |                                              |

DIP Switches, Continued

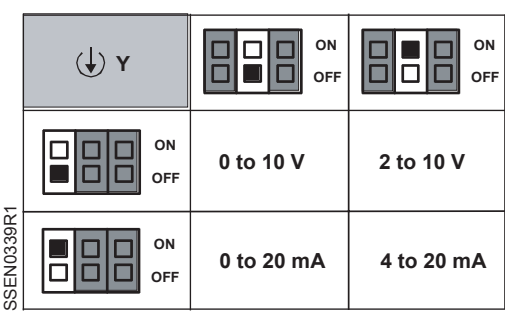


Figure 4. Assignment of Positioning Signal Y: Voltage or Current.

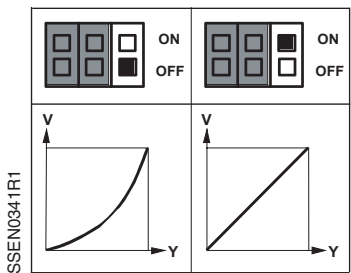


Figure 5. Selection of Valve Characteristic: Equal-Percentage or Linear.

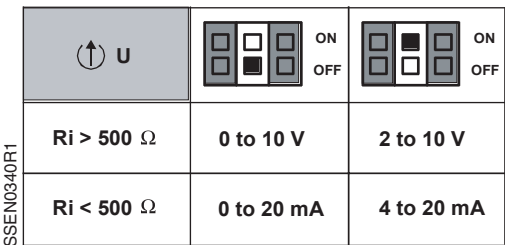


Figure 6. Assignment of Correct Span Y and U: 0 to 10 Vdc/0 to 20 mA or 2 to 10 Vdc/4 to 20 mA.

Output signal U (position feedback signal) is dependent on the load resistance. Above 500 ohm, it is automatically a voltage signal; below 500 ohm a current signal.

Forced Control Input

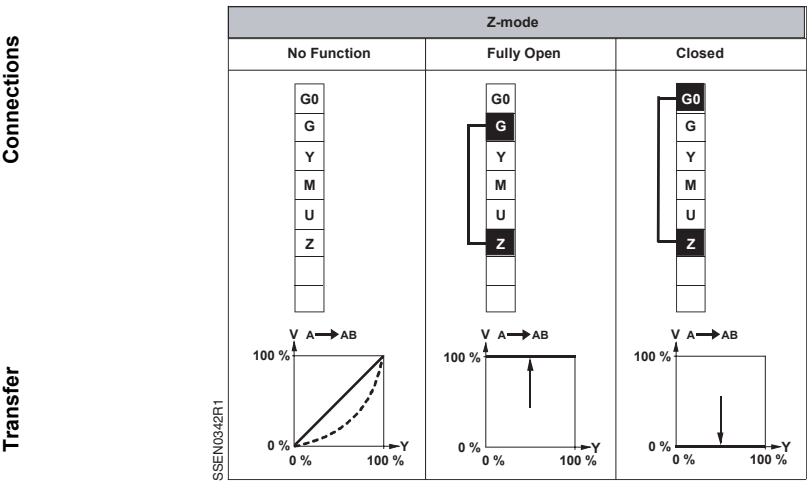


Figure 7.

If terminal Z for the forced control input is:

- not connected, the valve will follow the Y-signal or the phase-cut signal.
- connected to G, the valve will fully open via control path A → AB.
- connected to G0, the valve will close via control path A → AB.

Signal Priority

1. Hand wheel position Man or Off
2. Forced control signal Z
3. Phase-cut signal
4. Signal input Y

## Characteristic

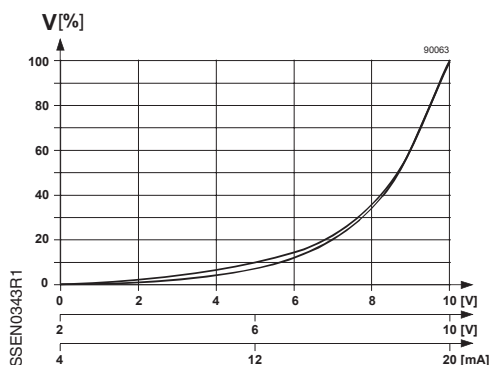


Figure 8. Equal Percentage.

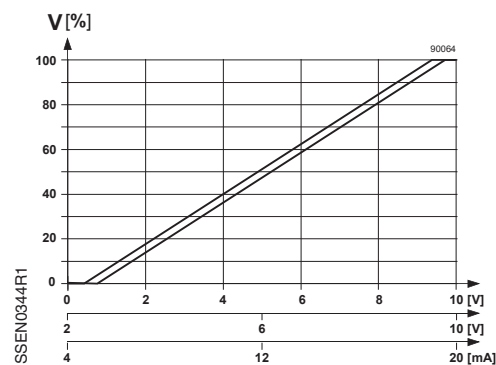


Figure 9. Linear.

## Installation Notes

- Installation instructions for the valve and terminal housing are enclosed with the valve.
- For electrical installation, see *Wiring Diagrams*.



### CAUTION:

- Always disconnect the power before fitting or removing the terminal housing. The terminal housing is calibrated and matched to the actuator, and should be replaced only by qualified personnel.
- Valve may only be used in flow direction (A → AB). Note the flow direction.
- Do not allow the surface temperature of the actuator to fall below the dew point temperature of the surrounding air (causing condensation). If necessary, insulate the valve. **Do not** insulate the actuator.

## Mounting Position

Vertical to horizontal mounting:  
Do not mount the valve below horizontal.

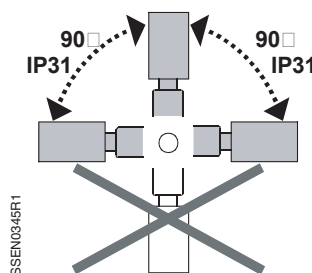


Figure 10. Acceptable Mounting Positions.

## Specifications

### Electrical

Low-voltage use only  
24 Vac  
Operating voltage  
Frequency  
Typical power consumption  
Standby  
Nominal apparent power  
Suitable fuse  
24 Vdc  
Operating voltage

Class 2 (SELV, PELV)

24 Vac +20/-15%  
45 to 65 Hz  
See Table 1,  $P_{med}$   
<1 W (valve fully closed)  
See Table 1,  $S_{NA}$   
Slow, see Table 1,  $I_N$   
20 to 30 Vdc

|                                      |                                                   |                                                                               |
|--------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------|
| <b>Specifications,<br/>Continued</b> | Input                                             |                                                                               |
|                                      | Positioning signal Y                              | 0/2 to 10 Vdc, 0/4 to 20 mA,<br>or 0 to 20 Vdc Phs                            |
|                                      | Functional data of actuator                       | Impedance 0/2 to 10 Vdc<br>0/4 to 20 mA<br>100K ohm//5nF<br>240 ohm//5nF      |
|                                      | Forced control                                    |                                                                               |
|                                      | Impedance                                         | 22K ohm                                                                       |
|                                      | Closing the valve (Z connected to G0)             | <1 Vac; <0.8 Vdc                                                              |
|                                      | Opening the valve (Z connected to G0)             | >6 Vac; >5 Vdc                                                                |
|                                      | No function (Z not wired)                         | Phase-cut or positioning signal Y<br>active                                   |
|                                      | Output                                            |                                                                               |
|                                      | Position feedback signal voltage<br>current       | 0/2 to 10 Vdc; load resistance > 500Ω<br>0/4 to 20 mA; load resistance ≤ 500Ω |
|                                      | Stroke measurement                                | Inductive                                                                     |
|                                      | Nonlinearity                                      | ±3% of end value                                                              |
| Functional data of valve             | Nominal pressure                                  | ANSI 125 (PN 16)                                                              |
|                                      | Permissible Operating pressure <sup>1)</sup>      |                                                                               |
|                                      | Water up to 248°F (120°C):                        | 232 psi (16 bar)                                                              |
|                                      | Water above 248°F (120°C):                        | 188 psi (13 bar)                                                              |
|                                      | Saturated steam:                                  | 130 psi (9 bar)                                                               |
|                                      | Pressure differential $\Delta p_{max}/\Delta p_s$ | 145 psi (10 bar)                                                              |
|                                      | Leakage at $\Delta p = 0.1$ MPa (1 bar)           | A → AB Maximum 0.05% $C_v$                                                    |
|                                      | Media temperature                                 | 34°F to 356°F (>1°C to 180°C)                                                 |
|                                      | Valve characteristic <sup>2)</sup>                | Equal percentage or linear, optimized<br>near the closing point               |
|                                      | Resolution $\Delta H/H_{100}$                     | 1:1000 (H = Stroke)                                                           |
|                                      | Type of operation                                 | Modulating                                                                    |
|                                      | Position when de-energized                        | A → AB closed                                                                 |
|                                      | Orientation:                                      | Upright to horizontal                                                         |
|                                      | Positioning time                                  | < 2 seconds                                                                   |
| Materials                            | Valve body                                        | Modular cast iron                                                             |
|                                      | Cover flange                                      | Modular cast iron                                                             |
|                                      | Seat/Inner valve                                  | Stainless Steel                                                               |
|                                      | Valve stem seal                                   | EPDM (O-ring)                                                                 |
| Electrical connections               | Cable entries                                     | 3 × M20 × 1.5 or PG13.5/G1/2                                                  |
|                                      | Connection terminals                              | Screw terminals for up to 12 AWG<br>wires                                     |
|                                      | Min. cross-sectional area <sup>3)</sup>           | 0.75 mm <sup>2</sup>                                                          |
|                                      | Max. cable length                                 | See Table 1                                                                   |
| Ambient conditions                   | Temperature                                       |                                                                               |
|                                      | Operation and storage                             | 23°F to 113°F (-5°C to 45°C)                                                  |
|                                      | Transport                                         | -13°F to 158°F (-25°C to 70°C)                                                |
|                                      | Humidity                                          | 5 to 95% rh (non-condensing)                                                  |

1. Tested at 1.5 × PN (24 bar), similar to DIN 3230-3.

2. Can be selected via DIP switch.

3. In case of strong vibrations, use high-flex stranded wires.

|                                                          |                                                      |                                                                                                                                                                                                                                               |
|----------------------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Specifications, Continued</b><br><br>Agency approvals | Degree of protection<br>Canadian registration number | IP31 to IEC 529<br>0C12337.5<br>Conforms to CE requirements<br>UL 873<br>Certified to Canadian standard C22.2 No. 24<br>C-Tick N-474<br>PED 97/23/EC:<br>pressure-carrying parts<br>Par. 1, section. 2.1.4/Par. 3, section 3<br>Fluid group 2 |
| Miscellaneous                                            | Weight<br>Dimensions                                 | See Figure 15<br>See Figure 15                                                                                                                                                                                                                |

Connection  
Terminals



**WARNING:**

If the controller and the valve receive their power supply from separate sources, the valve transformer must not be grounded on the secondary side.

A four-wire connection is mandatory with DC power supply.

Controllers with:  
0 to 10 Vdc  
2 to 10 Vdc  
0 to 20 mA  
4 to 20 mA

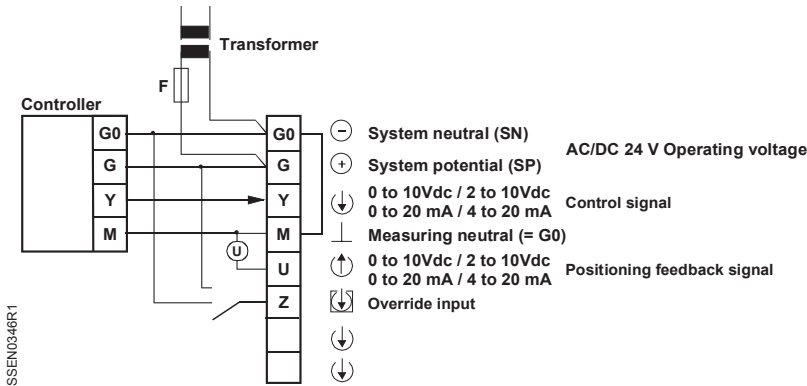


Figure 11.

Controllers with phase-cut  
0 to 20 Vdc

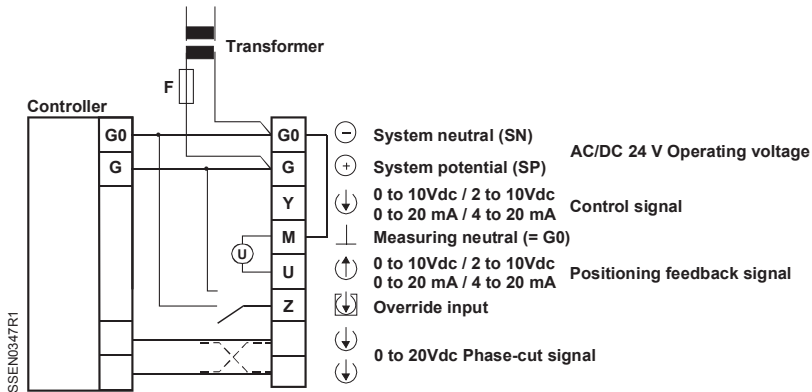


Figure 12.

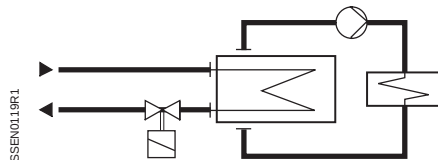
## Application Examples

This example shows only a schematic diagram, without installation-specific details.

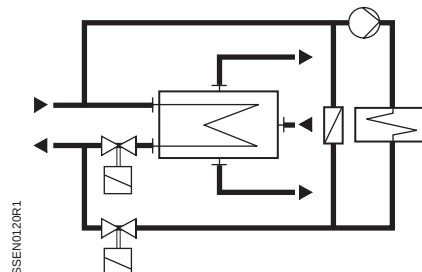


### CAUTION:

Valve may only be used in flow direction (A → AB). Note the flow direction.



**Figure 13. Direct Heating (Supply) System, Indirect Connection.**



**Figure 14. Direct Heating (Supply) System, Directly connected to Water-Heating System.**

## Service



### CAUTION:

Do not disassemble the valve and actuator combination. This assembly is factory-calibrated, and should only be replaced by qualified personnel.

Always disconnect power before fitting or removing the electronics module.

- The low-friction and robust, maintenance-free design makes regular servicing unnecessary and ensures a long service life.
- The valve stem is sealed from external influences by a maintenance-free gland.
- If the red LED is lit, the electronics must be recalibrated or replaced.
- If the valve electronics are faulty, they must be replaced. After replacing the electronics, they must be recalibrated. See *Calibration*.
- If required, the circuit board can be replaced. Order Part Number ASE12.

## Dimensions

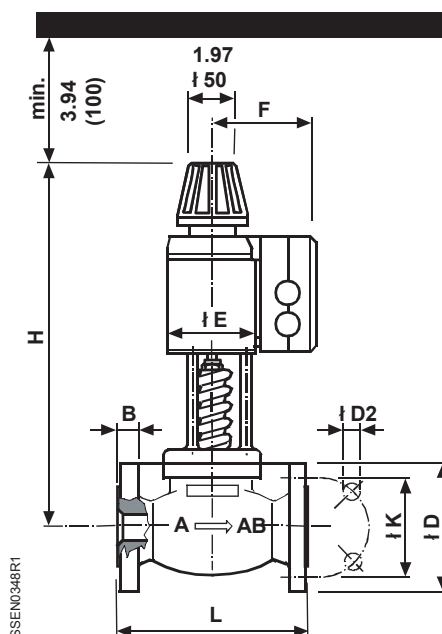


Figure 15. Dimensions in Inches (Millimeters).

| Product Number | DN | L             | ØD            | ØD2                 | B            | ØK            | H              | ØE            | F             | W<br>lb<br>(kg) |
|----------------|----|---------------|---------------|---------------------|--------------|---------------|----------------|---------------|---------------|-----------------|
| MVF461H15-0.6  | 15 | 5.12<br>(130) | 3.74<br>(95)  | 0.16×0.55<br>(4×14) | 0.55<br>(14) | 2.56<br>(65)  | 13.4<br>(340)  | 3.15<br>(80)  | 4.53<br>(115) | 18.3<br>(8.3)   |
| MVF461H15-1.5  | 15 | 5.12<br>(130) | 3.74<br>(95)  | 0.16×0.55<br>(4×14) | 0.55<br>(14) | 2.56<br>(65)  | 13.4<br>(340)  | 3.15<br>(80)  | 4.53<br>(115) | 18.3<br>(8.3)   |
| MVF461H15-3    | 15 | 5.12<br>(130) | 3.74<br>(95)  | 0.16×0.55<br>(4×14) | 0.55<br>(14) | 2.56<br>(65)  | 13.4<br>(340)  | 3.15<br>(80)  | 4.53<br>(115) | 18.3<br>(8.3)   |
| MVF461H20-5    | 20 | 5.91<br>(150) | 4.13<br>(105) | 0.16×0.55<br>(4×14) | 0.63<br>(16) | 2.95<br>(75)  | 13.3<br>(339)  | 3.15<br>(80)  | 4.53<br>(115) | 19.6<br>(8.9)   |
| MVF461H25-8    | 25 | 6.30<br>(160) | 4.53<br>(115) | 0.16×0.55<br>(4×14) | 0.63<br>(16) | 3.35<br>(85)  | 13.6<br>(346)  | 3.15<br>(80)  | 4.53<br>(115) | 22.1<br>(10.0)  |
| MVF461H32-12   | 32 | 7.09<br>(180) | 5.51<br>(140) | 0.16×0.71<br>(4×18) | 0.71<br>(18) | 3.94<br>(100) | 15.12<br>(384) | 3.94<br>(100) | 4.92<br>(125) | 34.6<br>(15.7)  |
| MVF461H40-20   | 40 | 7.87<br>(200) | 5.91<br>(150) | 0.16×0.71<br>(4×18) | 0.71<br>(18) | 4.33<br>(110) | 15.79<br>(401) | 3.94<br>(100) | 4.92<br>(125) | 39.2<br>(17.8)  |
| MVF461H50-30   | 50 | 9.05<br>(230) | 6.50<br>(165) | 0.16×0.71<br>(4×18) | 0.79<br>(20) | 4.92<br>(125) | 17.58<br>(449) | 4.92<br>(125) | 5.43<br>(138) | 60.0<br>(27.2)  |

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