BELIMO

# NV... Direct Coupled Globe Valve Actuator

**Non-spring return, on/off, floating point, proportional control**

**NV24-3 US**
**NVD24-3 US**
**NV24-MFT US**
**NVD24-MFT US**

**Application**
For on/off, floating point and proportional control of globe valves. Actuator will mate to an integrated adaptor bracket. Adaptor bracket shown fits valves manufactured by Siebe Environmental Controls under designations VB7000 and VB9000.

**Functional safety**
The actuator is secured against short circuiting and incorrect polarity. The stroke is adapted automatically and is overload-protected.

**Manual operation**
When a 3/16" or 5 mm hex is inserted and turned clockwise, the actuator plunger pushes out. The actuator plunger retains the position until the nominal voltage is applied.

**Display of function**
The stroke is shown mechanically on the adaptor bracket, and the maximum stroke is set automatically. Under the housing cover on -MFT models is a two-colored LED status display.

**Multi-Function Technology® (MFT)**
An integrated microprocessor allows for a variety of parameters to be easily configured at the factory or in the field.

**On/Off, Floating Point Control, 24 VAC/DC Power**

**NV24-3 US, NVD24-3 US**

| | |
|---|---|
| Power consumption: | 3W |
| Transformer sizing: | 5 VA (Class 2 power source) |
| Force: | ❏ **NV24-3 US**: 180 lbf [800N]<br>❏ **NVD24-3 US**: 90 lbf [400N] |

**Proportional Control, 24 VAC/DC Power**
Features Multi-Function Technology® (MFT)

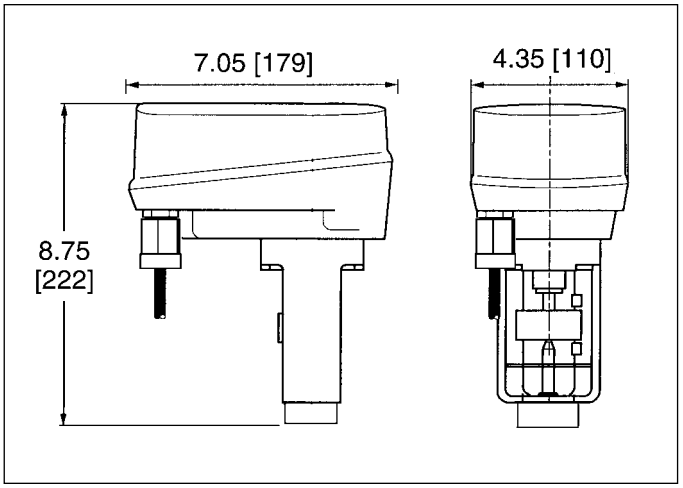
**NV24-MFT US, NVD24-MFT US**

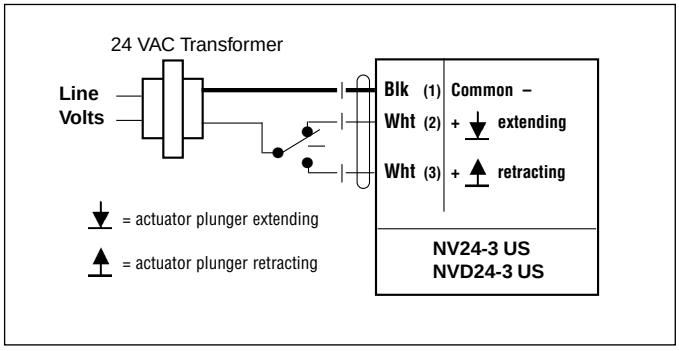
| | |
|---|---|
| Power consumption: | 5W |
| Transformer sizing: | 7 VA (Class 2 power source) |
| Operating range: | Default: 2 to 10 VDC, 4 to 20 mA (w/500Ω, 1/4 W resistor) |
| Input impedance | 100kΩ for 2 to 10 VDC |
| Feedback output 'U' | Default: 2 to 10 VDC, 2 mA max |
| Force: | ❏ **NV24-MFT US**: 180 lbf [800N]<br>❏ **NVD24-MFT US**: 90 lbf [400N] |

**Common Data**

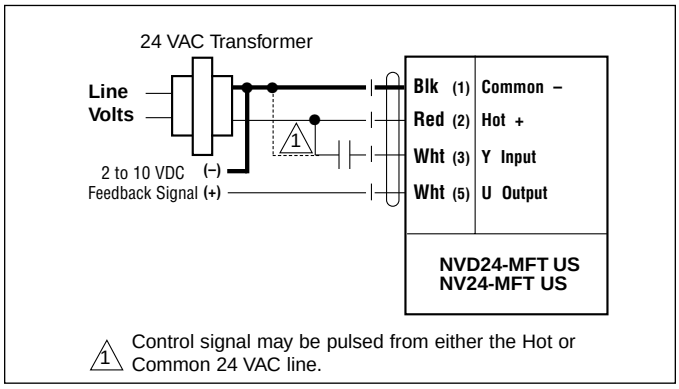
| | |
|---|---|
| Power supply: | 24 VAC ± 20% 50/60 Hz<br>24 VDC ±10% |
| Electrical connection: | 3 ft, 18 GA appliance cable,<br>1/2" conduit fitting |
| Overload protection: | electronic throughout stroke |
| Maximum stroke: | 3/4" [20 mm] |
| Position indication: | stroke indicator on bracket |
| Manual override: | 3/16" hex, 5mm hex, phillips head screwdriver |
| Running time: | 150 secs. independent of stroke (NV24-MFT US, NVD24-MFT US) |
| Actuating Time: | 50s/.25", [7.5s/mm] (NV24-3US, NVD24-3 US) |
| Run time stability | ± 5% |
| Humidity: | 5 to 95% RH, noncondensing |
| Ambient temperature: | -22° F to 122° F [-30° C to 50° C] |
| Media temperature: | 20° F to 250° F [-7° C to 120° C] |
| Storage temperature: | -40° F to 176° F [-40° C to 80° C] |
| Housing: | NEMA 2 / IP54 with cable entry down |
| Housing material: | UL 94-5V (flammability rating) |
| Agency listings: | CE, UL 873, CSA 4813 02 |
| Quality standard: | ISO 9001 |
| Noise level: | max. 35 dB(A) |
| Servicing: | maintenance free |
| Weight: | 3.3 lb [1.5 kg] |

**Dimensions in inches** (numbers in brackets are metric)

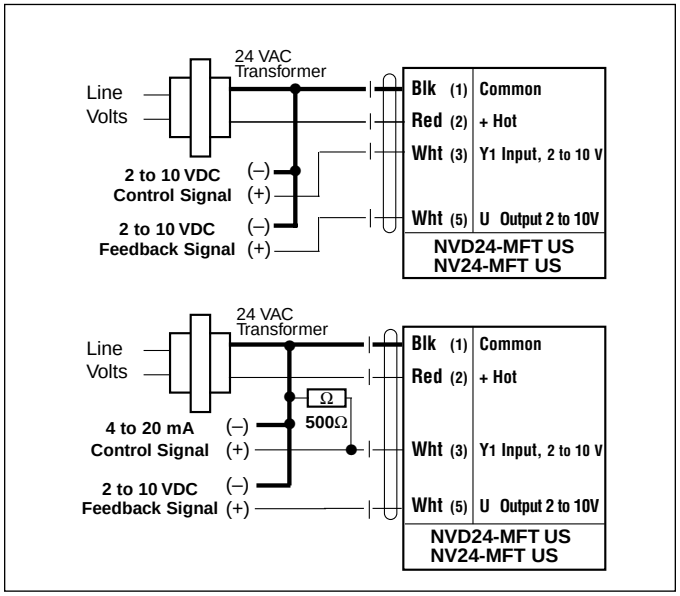




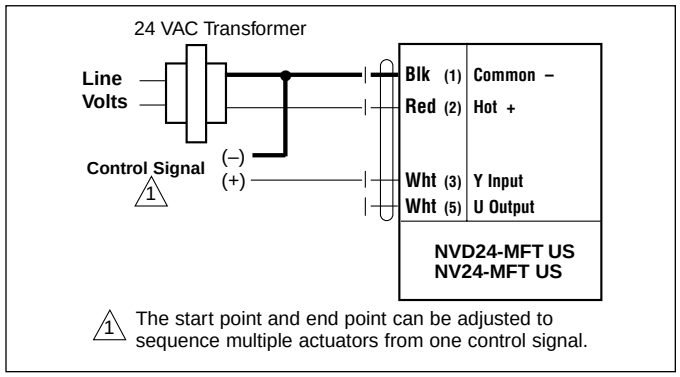

**Floating point or on/off control (With default position of S1.2: Off. See page 10.)**




**Pulse width modulation control wiring**
**Range Available: 20 ms to 50 sec.**
**Typical: 0.59 to 2.93**
**0.02 to 5.00**
**0.10 to 25.5**
**(With default position of S3.2: 3-way Off, 2-way On. See page 9.)**




**MFT typical 2 to 10 VDC or 4 to 20 mA wiring (With default position of S3.2: 3-way Off, 2-way On. See page 9.)**




**Start point and stop adjustable wiring (With default position of S3.2: 3-way Off, 2-way On. See page 9.)**

# NVF... Direct Coupled Globe Valve Actuator

**Spring return fail safe, on/off, floating point, proportional control**

**NVFD24 US**
**NVFD24-E US**
**NVFD24-MFT US**
**NVFD24-MFT-E US**
**NVF24-MFT US**
**NVF24-MFT-E US**

**Application**
For on/off, floating point and proportional control of globe valves. Actuator will mate to an integrated adaptor bracket. Adaptor bracket shown fits valves manufactured by Siebe Environmental Controls under designations VB7000 and VB9000.

**Functional safety**
The actuator is secure against short circuiting and incorrect polarity. The stroke is adapted automatically and is overload-protected. The spring return function in the actuator is pre-tensioned when delivered. Pressing a 3/16" or 5 mm hex into the housing cover releases the spring stop.

**Manual operation**
When a 3/16" or 5 mm hex is inserted, depressed and turned clockwise, the actuator plunger pushes out. The actuator plunger retains the position until the nominal voltage is applied.

**Display of function**
The stroke is shown mechanically on the adaptor bracket, and the maximum stroke is set automatically. Under the housing cover on -MFT models is a two-colored LED display which will verify that the actuator is set up properly.

**Multi-Function Technology® (MFT)**
An integrated microprocessor allows for a great variety of parameters to be easily configured at the factory or in the field.

**On/Off, 24 VAC/DC Power**

**NVFD24 US, NVFD24-E US**

| | |
|---|---|
| Force: | 90 lbf [400N] |
| Plunger: | ❑ **NVFD24 US** (spring up)<br>❑ **NVFD24-E US** (spring down) |

**Floating/Proportional Control, 24 VAC/DC Power**
Features Multi-Function Technology® (MFT)

**NVFD24-MFT US, NVFD24-MFT-E US**

| | |
|---|---|
| Operating range: | 2 to 10 VDC,<br>4 to 20 mA (w/500Ω, 1/4 W resistor) |
| Input impedance | 100kΩ for 2 to 10 VDC |
| Feedback output 'U' | 2 to 10 VDC, 2 mA max |
| Force: | 90 lbf [400N] |
| Plunger: | ❑ **NVFD24-MFT US** (spring up)<br>❑ **NVFD24-MFT-E US** (spring down) |

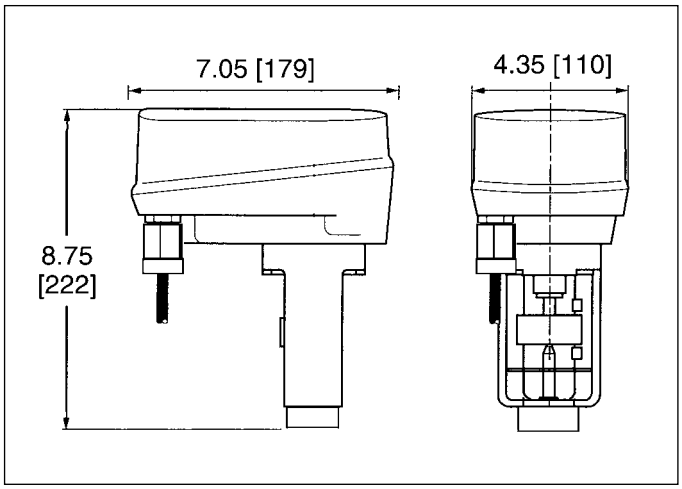
**NVF24-MFT US, NVF24-MFT-E US**

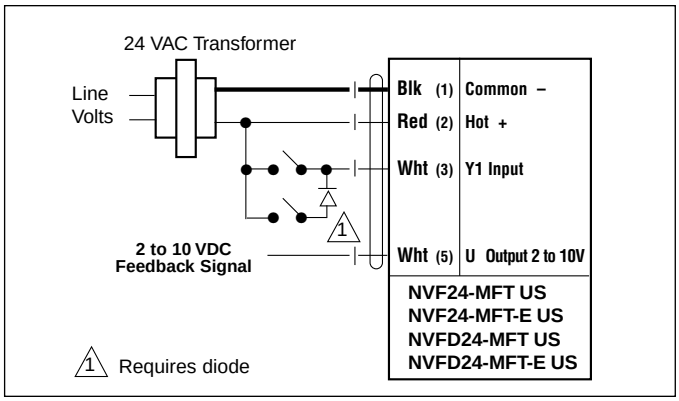
| | |
|---|---|
| Operating range: | 2 to 10 VDC,<br>4 to 20 mA (w/500Ω, 1/4 W resistor) |
| Input impedance | 100kΩ for 2 to 10 VDC |
| Feedback output 'U' | 2 to 10 VDC, 2 mA max |
| Force: | 180 lbf [800N] |
| Plunger: | ❑ **NVF24-MFT US** (spring up)<br>❑ **NVF24-MFT-E US** (spring down) |

**Common Data**

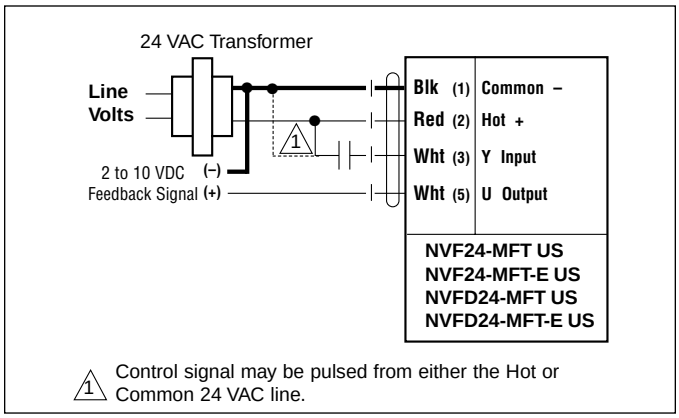
| | |
|---|---|
| Power supply: | 24 VAC ± 20% 50/60 Hz, 24 VDC ±10% |
| Power consumption: | 5.5 W |
| Transformer sizing: | 10 VA (Class 2 power source) |
| Electrical connection: | 3 ft, 18 GA appl. cable, 1/2" conduit fit. |
| Overload protection: | electronic throughout stroke |
| Maximum stroke: | 3/4" [20 mm] |
| Position indication: | stroke indicator on bracket |
| Manual override: | 3/16" hex, 5mm hex, phillips screwdriver |
| Running time: | motor: 150 secs. independent of stroke<br>spring: 30 secs. at 3/4"[20mm] stroke |
| Run time stability | ± 5% |
| Humidity: | 5 to 95% RH, noncondensing |
| Ambient temperature: | -22° F to 122° F [-30° C to 50° C] |
| Media temperature: | 20° F to 250° F [-7° C to 120° C] |
| Storage temperature: | -40° F to 176° F [-40° C to 80° C] |
| Housing: | NEMA 2 / IP54 with cable entry down |
| Housing material: | UL 94-5V (flammability rating) |
| Agency listings: | CE, UL 873, CSA 4813 02 |
| Quality standard: | ISO 9001 |
| Noise level: | max. 35 dB(A) |
| Servicing: | maintenance free |
| Weight: | 4 lb [1.8 kg] |

**Dimensions in inches** (numbers in brackets are metric)

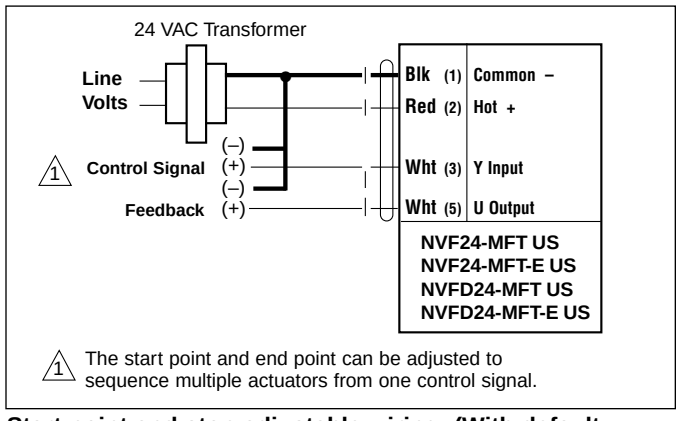




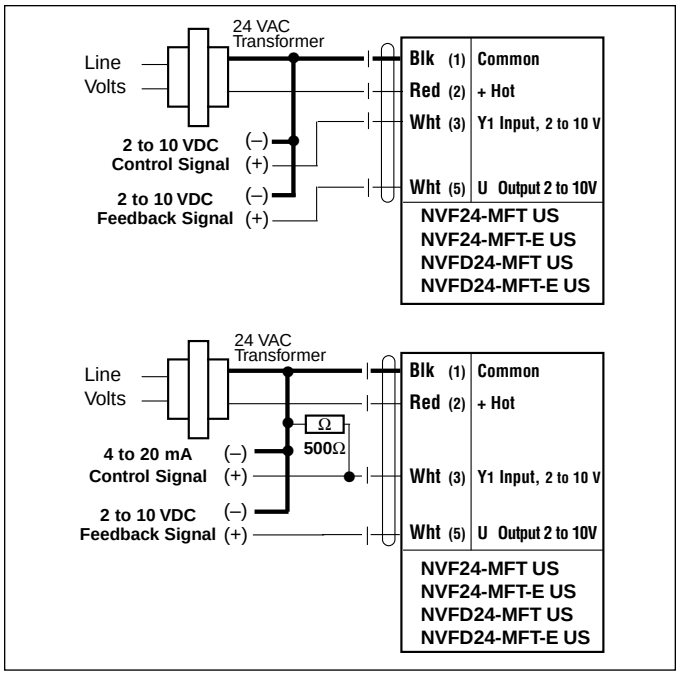

**Floating point control (With default position of S3.2: 3-way Off, 2-way On. See page 9.)**



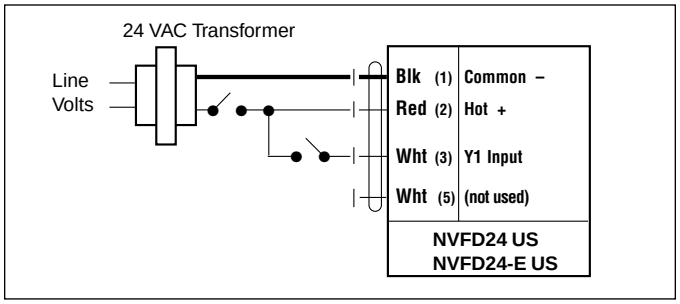

**Pulse width modulation control wiring (With default position of S3.2: 3-way Off, 2-way On. See page 9.)**



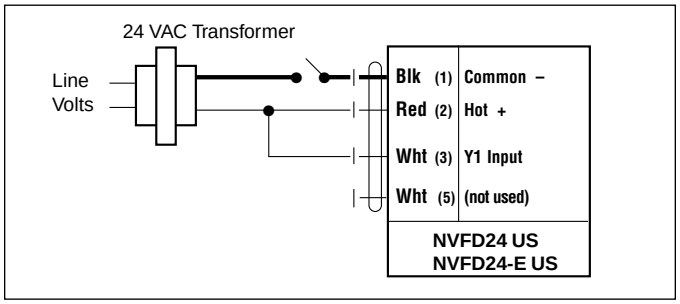

**Start point and stop adjustable wiring (With default position of S3.2: 3-way Off, 2-way On. See page 9.)**




**MFT typical 2 to 10 VDC or 4 to 20 mA wiring (With default position of S3.2: 3-way Off, 2-way On. See page 9.)**




**On/off control–using actuator to drive open/close, spring upon power loss. (With default position of S3.2: 3-way Off, 2-way On. See page 9.)**




**On/off control–using actuator to drive one direction and spring the opposite direction. Note:** A bridge must be made inside the NVF between terminals 2 and 3.
**(With default position of S3.2: 3-way Off, 2-way On. See page 9.)**

## Spring return actuators model designation

**NVFD24 US**
**NVFD24-MFT US**
**NVF24-MFT US**
retracting plunger (spring up)

**NVFD24-E US**
**NVFD24-MFT-E US**
**NVF24-MFT-E US**
extending plunger (spring down)

| Specifications | |
|---|---|
| Service | chilled or hot water, 50% glycol, steam |
| Flow Characteristic | equal percentage |
| Action | stem up open A to AB |
| Sizes | 1/2" to 2" |
| Type of End Fitting | NPT |
| Materials: | |
| Body | bronze |
| Seat | bronze |
| Stem | stainless steel |
| Plug | brass |
| Packing | spring loaded TFE |
| Disc | EPDM |
| ANSI Class | 250 (up to 400 psi below 150°F) |
| Leakage | Ansi IV Close-off |
| Maximum Inlet Pressure Steam | 15 psi [103 kPa] |
| Media Temp. Range | 20°F to 250°F [-7°C to 120°C] |
| Maximum Differential Pressure | water 35 psi [241 kPa]<br>steam 15 psi [103 kPa] |

Note: The NV/NVF actuator cannot be used for 2-way steam applications above 15 psi inlet pressure. For inlet pressures between 15 psi and 35 psi, call Belimo for standard G2 Series valve with another Belimo actuator. For steam applications exceeding 35 psi, stainless steel trim must be used. Call Belimo for pricing.

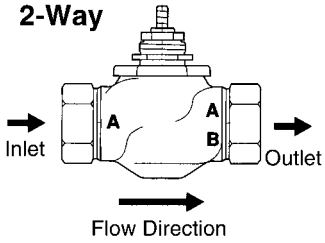
**G2 Series Two-Way**

**Application**
G2 Series two-way valves control water or steam for 2-position or modulating control applications. Valves conform to ANSI class 250 rating for screwed cast bronze bodies.

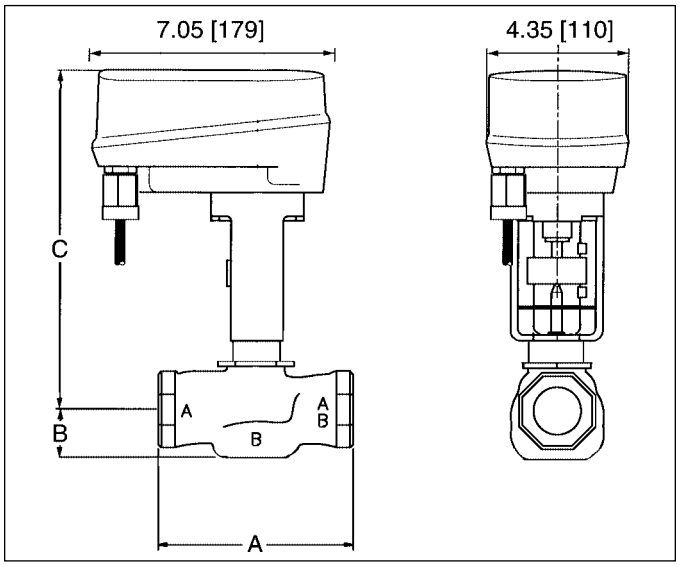
**Actuators**
A number of combinations are possible. Both spring return (NVF…) and non-spring return actuators (NV…) are available.

**Piping**
The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. Allow sufficient room for valve with actuator and for service. Allow 6" for cover removal and 12" for complete actuator removal. The assembly can be mounted with the actuator vertical or horizontal in relation to the pipe. G2 series two-way "A" port is inlet, "AB" port is outlet (Do not reverse flow direction).

**WARNING**
These valves are not for combustible gas applications as leaks and explosions could result.




**Assembly Dimensions in inches**
(numbers in brackets are metric)




**2-Way**

| Pipe Size | A | B | C |
|---|---|---|---|
| 1/2" [15] | 3-1/16" [78] | 1-1/16" [27] | 9-3/4" [248] |
| 3/4" [20] | 3-5/8" [92] | 1-1/16" [27] | 9-3/4" [248] |
| 1" (25) | 4-5/8" [117] | 1-1/8" [29] | 10-7/16" [265] |
| 1-1/4" (32) | 4-5/8" [117] | 1-3/8" [35] | 10-7/16" [265] |
| 1-1/2" (40) | 5-3/8" [137] | 1-1/2" [38] | 10-1/2" [267] |
| 2" (50) | 6-1/8" [156] | 1-9/16" [40] | 10-13/16" [275] |

| Specifications | |
|---|---|
| Service | chilled or hot water, 50% glycol |
| Flow Characteristic | linear - mixing only |
| Action | stem up open port B to AB |
| Sizes | 1/2" to 2" |
| Type of End Fitting | NPT |
| Materials: | |
| Body | bronze |
| Seat | bronze |
| Stem | stainless steel |
| Plug | brass |
| Packing | spring loaded TFE |
| ANSI Class | 250 (up to 400 psi below 150°F) |
| Leakage | Ansi III Close-off |
| Media Temp. Range | 20°F to 250°F [-7°C to 120°C] |
| Maximum Differential Pressure | water 35 psi [241 kPa] |

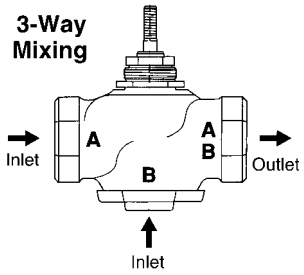
**G3 Series Three-Way (mixing)**

**Application**
G3 Series three-way mixing valves control water for two position or modulating control applications. Call Belimo for diverting applications. Valves conform to ANSI class 250 rating for screwed cast bronze bodies.

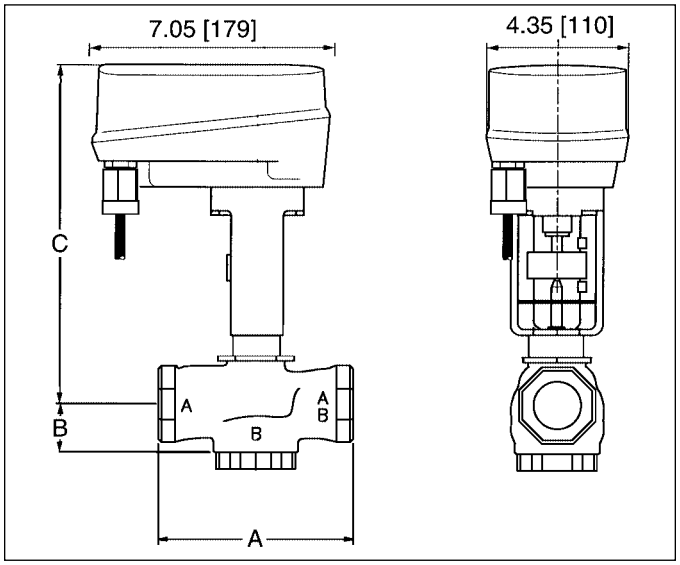
**Actuators**
A number of combinations are possible. Both spring return (NVF…) and non-spring return actuators (NV…) are available.

**Piping**
The valve should be mounted in a weather-protected area in a location that is within the ambient limits of the actuator. Allow sufficient room for valve with actuator and for service. Allow 6" for cover removal and 12" for complete actuator removal. The assembly can be mounted with the actuator vertical or horizontal in relation to the pipe. G3 series three-way: "A" port is inlet, "B" port is bypass, "AB" port is outlet. (Do not reverse flow direction).

**WARNING**
These valves are not for combustible gas applications as leaks and explosions could result.




**Assembly Dimensions in inches**
(numbers in brackets are metric)




**3-Way**

| Pipe Size | A | B | C |
|---|---|---|---|
| 1/2" [15] | 3-1/16" [78] | 1-3/8" [35] | 9-3/4" [248] |
| 3/4" [20] | 3-5/8" [92] | 1-11/16" [43] | 9-3/4" [248] |
| 1" (25) | 4-5/8" [117] | 1-9/16" [40] | 9-13/16" [249] |
| 1-1/4" (32) | 4-5/8" [117] | 1-5/8" [41] | 10-1/16 [256] |
| 1-1/2" (40) | 5-3/8" [137] | 1-5/8" [41] | 9-3/16" [234] |
| 2" (50) | 6-1/8" [156] | 1-7/8" [48] | 9-1/4" [235] |

## Operation/Installation UNV-001 Series

### Installation instructions for Siebe VB7000 and VB9000 series valves

**Preparing the Valve**

1. Remove all existing linkage and push stem to down position.
2. Screw lock nut (L) and stem adaptor (I) onto valve stem.
3. With stem pushed down completely adjust stem adaptor (I) height for corresponding valve. Tighten lock nut (L). (See Figure 1).

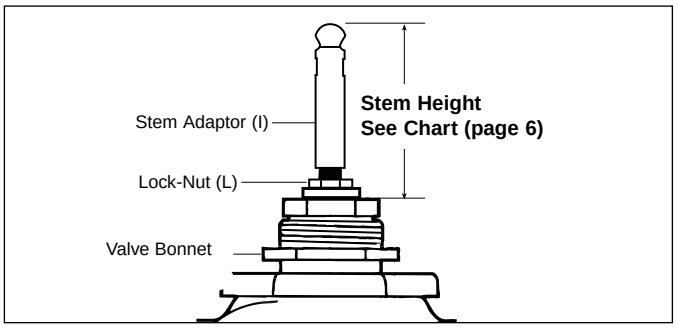



Fig. 1

**Preparing the Actuator and Mounting the Valve**

1. Slide the black coupling lock (C) up into the unlocked position. (See Figure 3).
2. Attach it to the end of the actuator plunger (K). This is done by pushing the bottom of the coupling apart with your thumbs while pressing it onto the actuator plunger. (See Figure 5).
3. Attach bracket (E) onto bottom of NV actuator (A) with 4 provided screws (B).
4. Attach stroke indicators (G) above and below the valve coupling.
5. Screw NV actuator (A) onto valve, and tighten valve bonnet nut (J).
6. Lower plunger (K) using manual override until stem adaptor (I) meets valve coupling. When connected, the valve stem adaptor will be captured by the valve coupling.

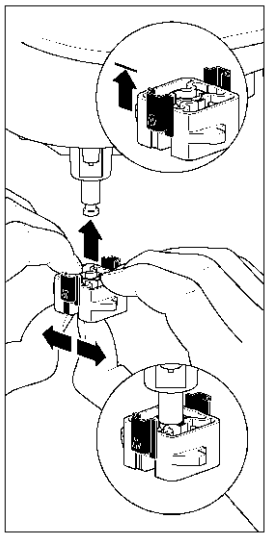


Fig. 5

7. Slide the coupling lock (C) down in to its locked position.
8. Move sliding stroke indicators (G) to sit above and below lip on valve coupling (H). Stroke indicators are automatically repositioned to the maximum stroke when power is applied to actuator.
9. Set actuator switches S3.1, S3.2 to desired settings (See attached data).

When disassembling, move the coupling lock (C) up to the unlocked position and squeeze the sides of the coupling while pulling the valve away from the coupling.

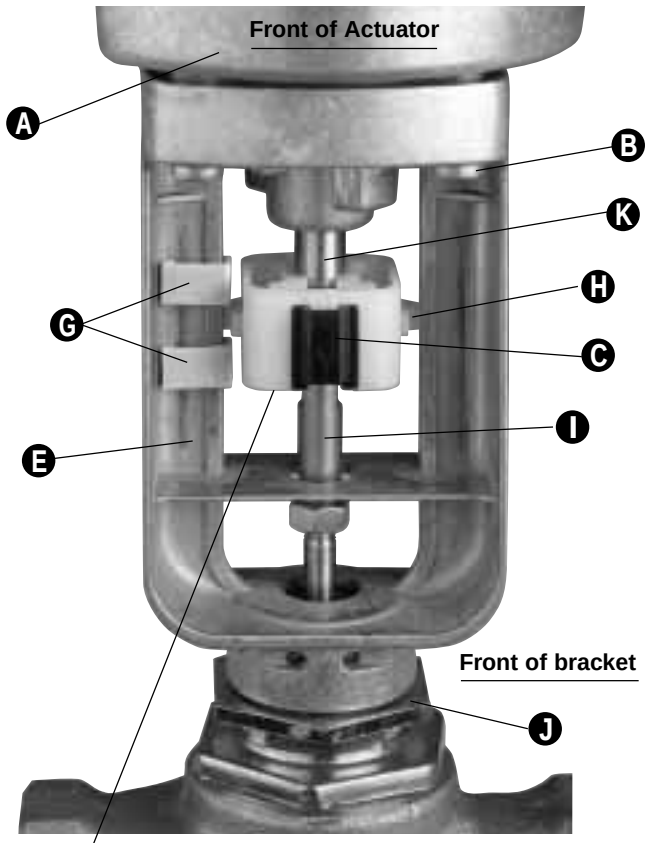



Fig. 2

**Recommended installation location**

It is permissible to install the NV actuator upright or horizontally. However, it is not recommended that the valve stem be installed facing downward. Allow 12 inches of clearance for removal of actuator and 6 inches for removal of actuator cover.

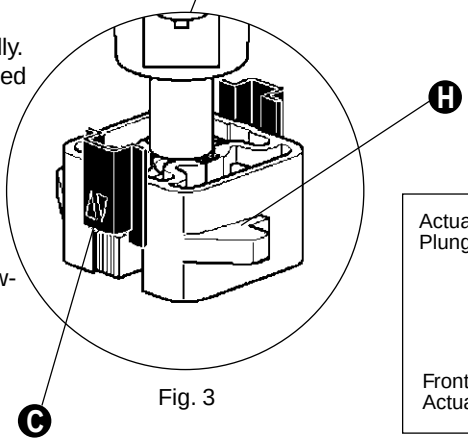



Fig. 3

**Initial start-up**

The unit must not be started up until the valve and actuator have been assembled according to instructions. Adaptation (initialization) will only occur the first time the actuator is powered. To reset, remove housing cover and press adaptation button S2. (See attached set-up information).

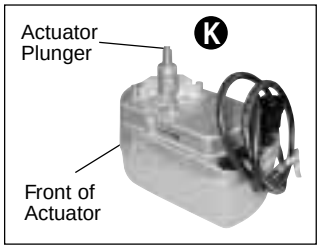



Fig. 4

**NV Series**

### Manual Override NV…Non-spring Return

The valve coupling can be adjusted by inserting a 3/16” or 5 mm hex in the housing cover. (Fig. 3).

If the hex is turned clockwise, the coupling moves down; counterclockwise turning moves it up. The manual override is protected against overload. The coupling remains in the manual position as long as the actuator is not connected to the nominal voltage. With the nominal voltage applied to the actuator, the coupling follows the positioning signal.

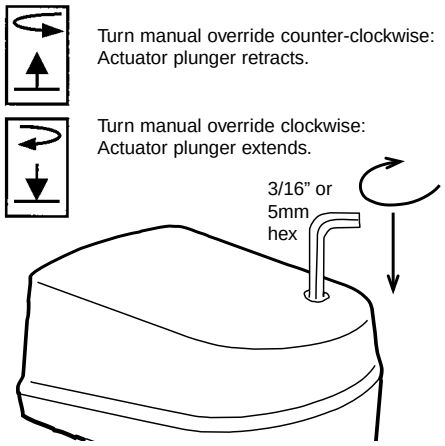



Fig. 3

Over-torquing manual override will not damage actuator.

### Manual Override NVF…Spring Return

The valve coupling can be adjusted by inserting a 3/16” or 5 mm hex in the housing cover. (Fig. 3).
The spring return function in the actuator is pre-tensioned when delivered.
The manual operating mechanism is overload-proof. The plunger will remain at the manual setting until the power supply to the actuator is turned on or, the next time the power supply is interrupted, it moves to whichever end position has been selected.

**NOTE:** (For first production series only-through March 2001)

1. Do not override the NVF while power is applied to the actuator.
2. If the actuator is overridden while power is applied, remove cover and perform manual adaptation function by pressing S2 button.
3. **When overriding the actuator turn the hex 3/4 turn and then press down to lock after the desired position is found. This prevents the gear from over-tightening into an end-position which would prevent the override mechanism from unlocking automatically during power up. If the manual override does not unlock automatically during power-up you must unlock the actuator manually with the hex.**
4. Use the NV… MFT in only closed control loops.

### NVF… Retracting, Spring Up

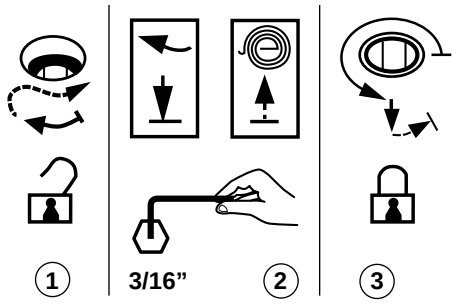
**① Disengaging manual operation**
Turn the hex clockwise 45° until resistance is encountered. Then lift the key approx. 1/4” [7 mm] until the black socket for the key is level with the top of the housing cover. The spring mechanism will now rotate the key counter-clockwise and the plunger will retract.

**② Manual operation**
Turning the hex clockwise causes the plunger to extend to the required position.

**③ Locking manual operation**
Turn the hex 3/4 turn counter-clockwise and then press it down into the cover of the housing (the black socket will move inwards approx. 1/4” [7 mm]). Slight counter-clockwise rotation of the key will then lock the manual operating mechanism in position.

**Note:** Do not trigger the spring mechanism and turn the manual operating mechanism clockwise to the "spring-up" end position at the same time.

**NVF24-MFT US**



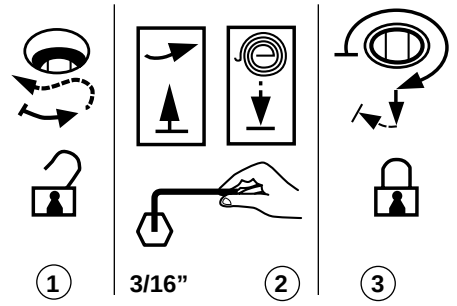

### NVF…-E Extending, Spring Down

**① Disengaging manual operation**
Turn the hex counter-clockwise 45° until resistance is encountered. Then lift the key approx. 1/4” [7 mm] until the black socket for the key is level with the top of the housing cover. The spring mechanism will now rotate the key clockwise, the plunger will extend.

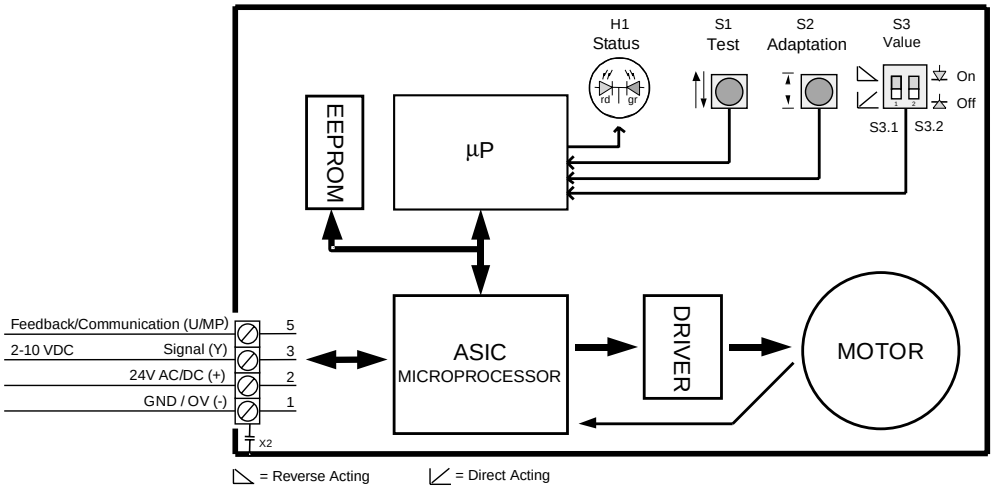
**② Manual operation**
Turning the hex counter-clockwise causes the plunger to retract to the required position.

**③ Locking manual operation**
Turn the hex back clockwise 3/4 turn and then press it down into the cover of the housing (the black socket will move inwards approx. 1/4” [7 mm]). Slight clockwise rotation of the key will then lock the manual operating mechanism in position.

**NVF24-MFT-E US**



**Block diagram: MFT and Spring Return Actuators**




**General**

Beneath the cover of the actuator are the terminals for the cable connection, the S1 and S2 buttons, S3 switch, and the LED status display H1.

The setting signal is processed in the microprocessor, and conveyed to the motor via drivers. By setting the slide switch S3 or pressing the buttons S1 and S2, the actuator can easily be configured on site to the requirements, if there are changes from the factory settings.

The NV and NVF actuators are maintenance-free. The two-color LED display is located beneath the cover of the actuator. This display allows immediate recognition of the functional state of the actuator. In addition, it permits simple set-up if the factory settings need to be changed.

**Operation of Switches/LED**

The S1 button makes it simple to check the wiring and overall functioning of the actuator. The first time voltage is applied, the stroke is adapted automatically. Independently of this, an adaptation can be repeated as necessary by pressing button S2. The stroke direction can be adjusted to be reverse or direct acting. Under the factory setting, the stroke increases as the setting signal increases. Depending upon the type of valve (NO/NC), the closing point (stroke = 0%) can be chosen with the valve stem retracted or extended.

**LED operating display H1**

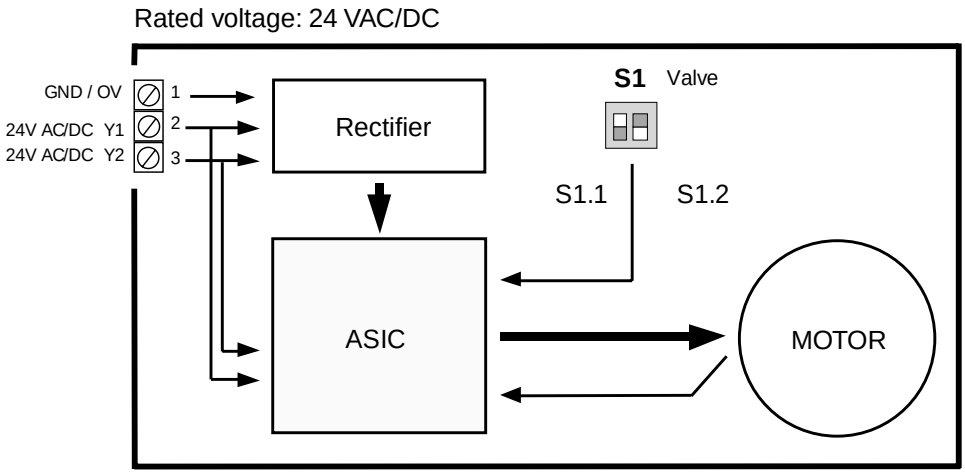
| | |
|---|---|
| Green steady light | Actuator working properly |
| Green flashing light | Test run or adaptation with synchronization in progress |
| Red steady light | Fault; repeat adaptation |
| Red flashing light | After power interruption (>2 sec.). By the next closing movement the valve will be automatically synchronized in the chosen closing point. The LED indicator will change from a red flashing into green steady light. |
| Alternating red/green light | Master control system being addressed and operation of the adaptation button S2 in progress |

**Functional description**

| | | |
|---|---|---|
| **S1** | Test | The valve performs full stroke at maximum running time and checks the adapted stroke. |
| **S2** | Adaptation | The stroke effected (between the two mechanical end-stops of the valve) is acquired as 100% stroke and stored in the microprocessor. The control signal and running time are then matched to this 100% stroke. |
| **S3** | **Setting the direction of stroke and selecting the closing point** | |
| S3.1 | Direction of stroke | The direction of stroke is inverted in relation to the control signal |
| | Off position (Default) | Control signal = 0% corresponding to 0% stroke |
| | On position | Control signal = 100% corresponding to 0% stroke |
| S3.2 | Selecting the closing point | Closing point is with the actuator plunger extended or retracted |
| | Off position (3-way Default) | Closing point is with the actuator lifting plunger retracted |
| | On position (2-way Default) | Closing point is with the actuator plunger extended |

**Only properly authorized and trained persons may change the settings of switch S3 and buttons S1 and S2.**

**Block diagram: NV24-3 US, NVD24-3 US**




**NV24-3 US, NVD24-3 US**
Beneath the cover of the actuator are the terminals for the cable connection and the S1 switch.

The floating point signal is processed in the microprocessor and conveyed to the motor.

Supply voltage is created by the rectifier.

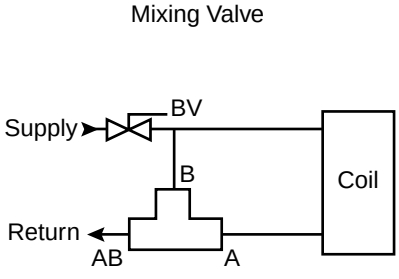
The stroke direction can be reversed with the switch S1.2 (On/Off is indicated on switch). This defines if the valve closes with the plunger up or down. The direction of the plunger can also be inverted by exchanging the wires Y1 and Y2.

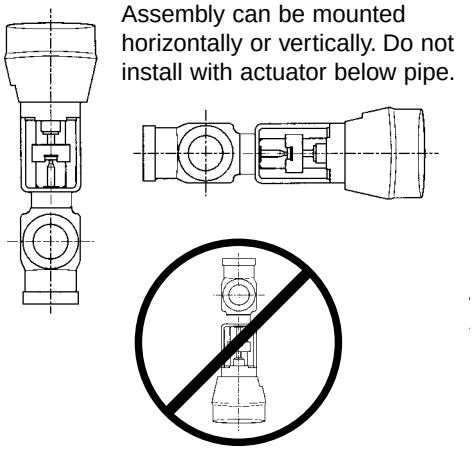
**Functional description**

| S1 | Setting the running times and selecting the valve closing point | |
|---|---|---|
| S1.1 | Actuating time | |
| | Off position (Default) | 50s/.25” [7.5s/mm] |
| | On position | Deactivated not used |
| S1.2 | Selecting the closing point | Valve closing point is with the actuator plunger extended or retracted |
| | Off position (3-way Default) | Valve closing point is with the actuator lifting plunger retracted |
| | On position (2-way Default) | Valve closing point is with the actuator plunger extended |

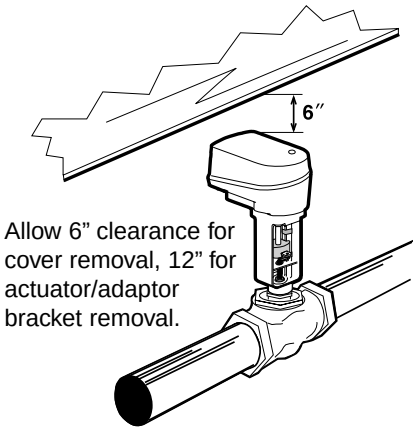
**Only properly authorized and trained persons may change the settings of switch S1.**

**Piping/Mounting Orientation**



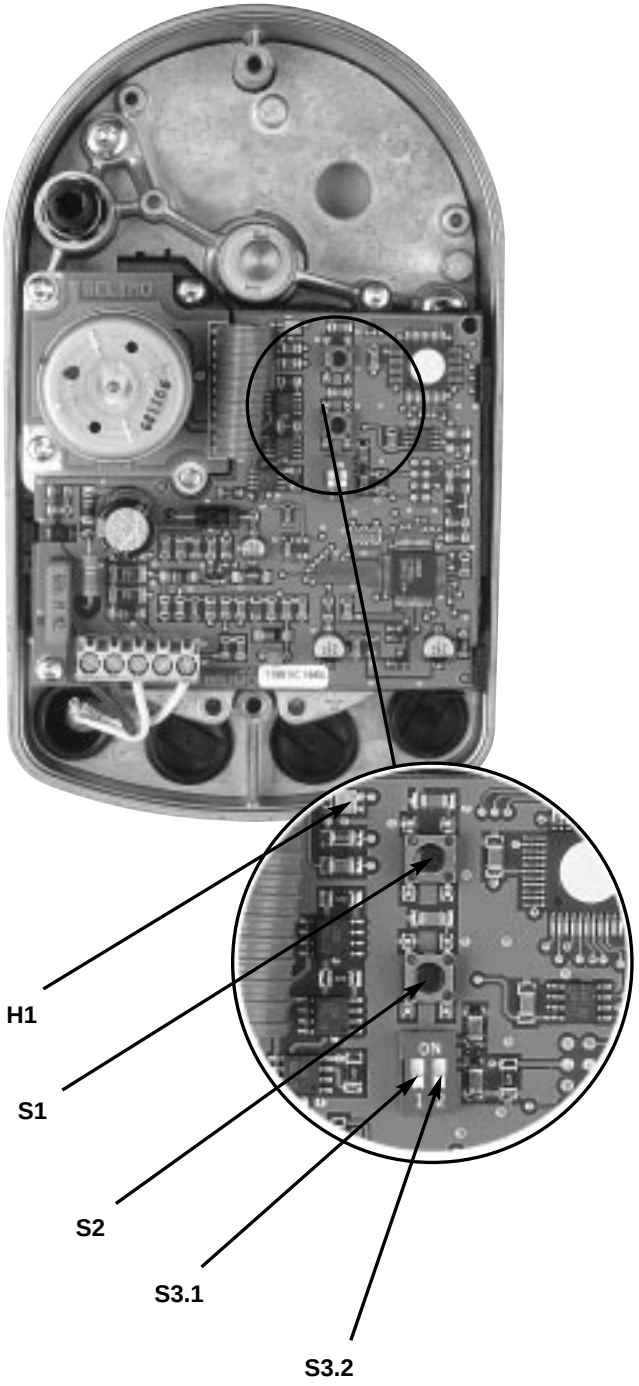
Assembly can be mounted horizontally or vertically. Do not install with actuator below pipe.




Allow 6” clearance for cover removal, 12” for actuator/adaptor bracket removal.

**Note:**
Do not cover adaptor bracket with insulation material.

**NV…MFT US**
**NVF…MFT US**




**NV24-3 US**