Vx-2x13-5xx-9-xx Series
VB-2x13-500-9-xx Series

Ball Valve Assemblies
Ball Valve Body /Linkage Assemblies
Installation Instructions

Application

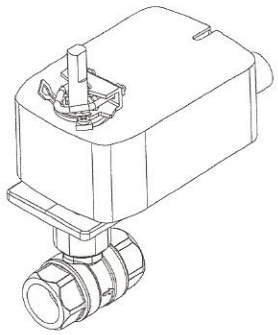
Ball Valve Assemblies

The TAC VA, VF, and VS-2x13-5xx-9-xx series Ball Valve Assemblies are complete actuator/valve assemblies that accept two-position, floating, or proportional control signals, respectively, from a DDC system or from a thermostat, for control of hot water or chilled water, or solutions of up to 50% Glycol. These valve assemblies consist of direct-coupled spring return or non-spring return actuators mounted on 2-way (1/2" to 3") and 3-way (1/2" to 2") ball valve bodies.

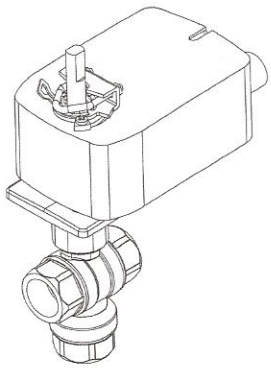
Typical applications include reheat on VAV boxes, fan coil units, hot and chilled water coils in air handling units, and unit ventilators.

Ball Valve Body/Linkage Assemblies

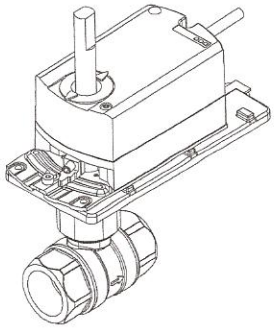
Ball Valve Body/Linkage Assemblies, which allow the field mounting of actuators, are also available.



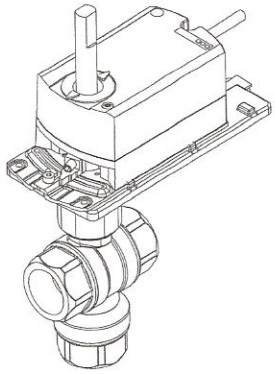
Vx-2213-5xx-9-xx
2-Way Ball Valve Assembly with 35 lb-in. Spring Return Actuator



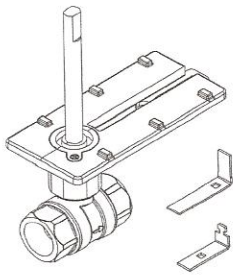
Vx-2313-5xx-9-xx
3-Way Ball Valve Assembly with 35 lb-in. Spring Return Actuator



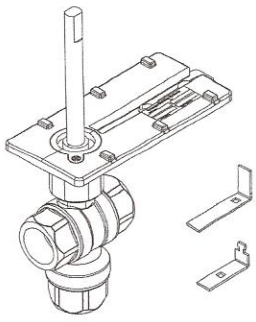
Vx-2213-50x-9-xx
2-Way Ball Valve Assembly with 35 lb-in. or 70 lb-in. Non-Spring Return Actuator



Vx-2313-50x-9-xx
3-Way Ball Valve Assembly with 35 lb-in. or 70 lb-in. Non-Spring Return Actuator



VB-2213-500-9-xx
2-Way Ball Valve Body/Linkage Assembly



VB-2313-500-9-xx
3-Way Ball Valve Body/Linkage Assembly

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Matlack Industrial Center
207 Carter Dr Unit C
West Chester, PA 19382
800-356-3774

Printed in U.S.A. 6-10

Applicable Literature

F-Number	Description	Audience	Purpose
F-26642	MA40-704x Series, MA4x-707x Series, MA4x-715x Series TAC DuraDrive Series Spring Return Two-Position Actuators General Instructions	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes the actuator's features, specifications, and possible applications. Provides step-by-step mounting instructions.
F-26644	MF4x-7xx3, MF4x-7xx3-50x TAC DuraDrive Series Spring Return Floating Actuator General Instructions		
F-26645	MS4x-7xx3, MS4x-7xx3-50x TAC DuraDrive Series Spring Return Proportional Actuator General Instructions		
F-27213	TAC DuraDrive Electric Damper Actuator MF41-6043/MF41-6083 Series Non-spring Return Rotary 24 Vac 3-position Control		
F-27214	TAC DuraDrive Electric Damper Actuator MS41-6043/MS41-6083 Series Non-spring Return Rotary 24 Vac – Modulating Control 0 to 10 Vdc		
F-27003	Mx40-704x Series 35 lb-in. Spring Return Actuators Mounting and Wiring Instructions	– Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes the actuator's specifications and possible applications. Provides step-by-step mounting instructions.
F-27086	Vx-2x13-5xx-9-xx Series Ball Valve Assemblies and VB-2x13-500-9-xx Ball Valve Body/Linkage Assemblies Selection Guide	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Provides features, specifications, mounting dimensions, and other criteria useful to the selection of ball valve assemblies.
F-26080	EN-205 Water System Guidelines	– Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes TAC approved water treatment practices.

INSTALLATION

Inspection

Inspect the package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return any damaged products.

Requirements

- Tools:
  - #2 Phillips screwdriver
  - 3 mm hex wrench (for setscrew on Mx41-6043 and Mx41-6083 non-spring return actuators)
  - 10 mm socket wrench (for shaft clamp nuts on Mx40-704x spring-return actuators)
  - Small screwdriver or 1/8" diameter steel pin (for manually turning the old-style shafts)
  - 10 mm open-end wrench or adjustable wrench (e.g. crescent wrench)
  - Torque wrench, range to include 55 to 120 lb-in. (6.2 to 14 N-m)
  - Pipe wrenches, two
  - Additional installation tools as specified in the actuator's installation document
- Training: Installer must be a qualified, experienced technician

Caution:

- Avoid locations where excessive moisture, vibration, or corrosive fumes are present.
- Avoid exceeding the maximum allowable actuator ambient temperature of 130 °F (55 °C) for non-spring return actuators and 140 °F (60 °C) for spring return actuators.

General Installation

Overview

Follow these subsections to install a ball valve assembly or valve body/linkage assembly:

- **Installation of Mx40-704x Spring Return Actuators (page 4)**
  To mount a spring return actuator onto a valve body/linkage assembly.
- **Installation of Mx41-6043 and Mx41-6083 Non-Spring Return Actuators (page 5)**
  To mount a non-spring return actuator onto a valve body/linkage assembly.
- **Valve Mounting (page 6)**
  To mount the valve assembly in the piping.
- **Manual Valve Positioning of Mx40-704x Spring Return Actuators (page 9)**
  To manually open a ball valve for system startup.
- **Manual Valve Positioning of Mx41-6043 and Mx41-6083 Non-Spring Return Actuators (page 11)**
  To manually open a ball valve for system startup.
- **CHECKOUT (page 12)**
  To verify correct installation and operation of the valve assembly.

Applicable Actuators

Table-1 Applicable Actuators for Ball Valves.

Valve Size	Actuators	
	Non-Spring Return	Spring Return
1/2" to 1-1/4"	Mx41-6043 (35 lb-in., 24 Vac)	MA40-7040 (35 lb-in., 120 Vac) Mx40-7043 (35 lb-in., 24 Vac)
1-1/2" to 3" (2-Way) 1-1/2" to 2" (3-Way)	Mx41-6083 (70 lb-in., 24 Vac)	

Installation of Mx40-704x Spring Return Actuators

Install the spring return actuator onto the ball valve according to Figure-1.

Note: Only the 35 lb-in. and 70 lb-in. actuators listed in Table-1 are compatible with Vx-2x13-5xx-9-xx Ball Valve Assemblies.

(1) For Normally Open 2-Way and Normally Open A to AB 3-Way

Verify that the valve is in the open position (A to AB open on 3-way valves).

For Normally Closed 2-Way and Normally Closed A to AB 3-Way

Verify that the valve is in the closed position (A to AB closed on 3-way valves).

△1 The flats on the sides of the shaft (or the index mark on top of old-style shafts) indicate the position of the ball port.

Shaft Style △1	2-Way		3-Way Mixing	
Current Flats on Sides of Shaft	Inlet Outlet Closed (Fully CW)	Inlet Outlet Open (Fully CCW)	A AB B Full Open to AB (Fully CW)	A AB A Full Open to AB (Fully CCW)
Old Style Index Mark on Top of Shaft	Inlet Outlet Closed (Fully CW)	Inlet Outlet Open (Fully CCW)	A AB B Full Open to AB (Fully CW)	A AB A Full Open to AB (Fully CCW)

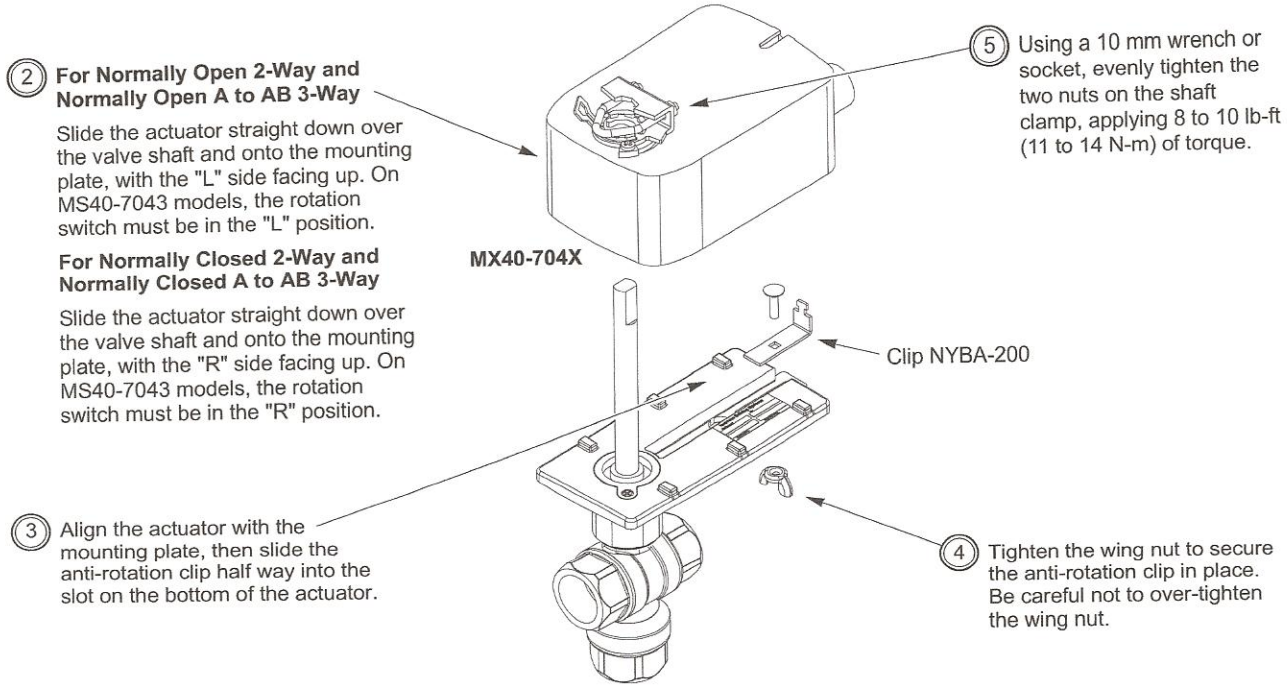

Figure-1 Installation of Spring Return Actuator on Ball Valve.

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Installation of Mx41-6043 and Mx41-6083 Non-Spring Return Actuators

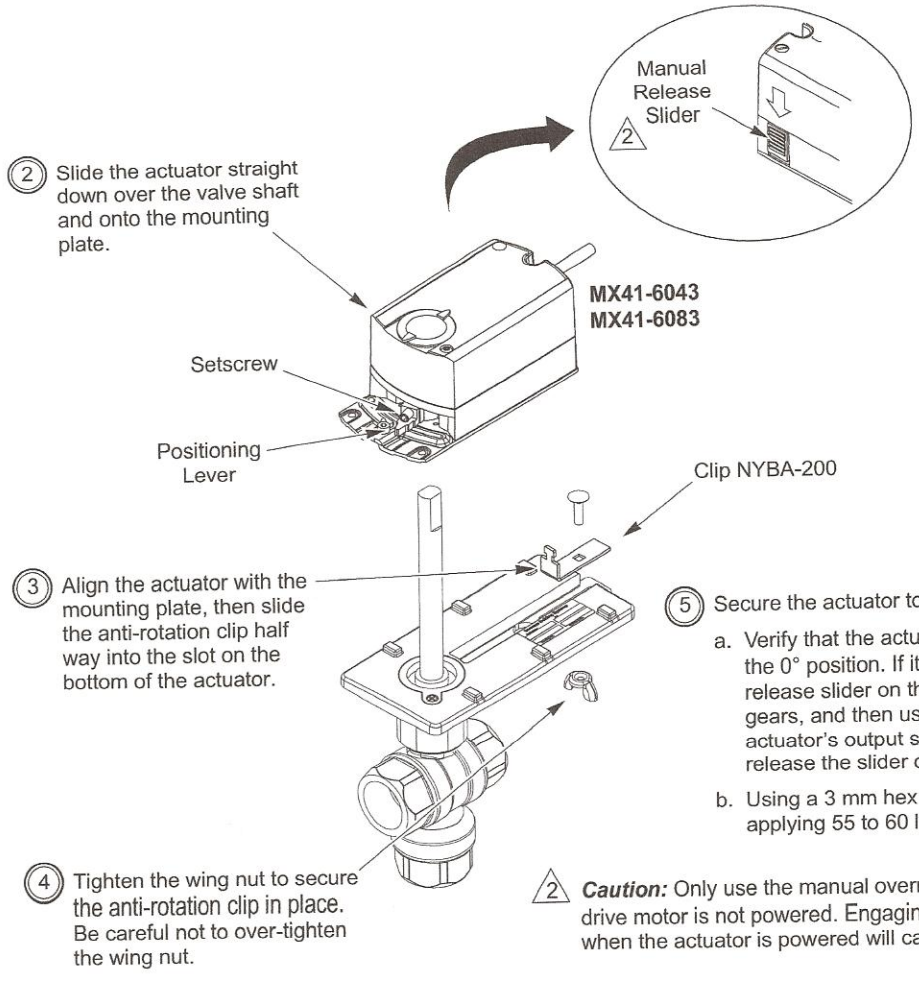
Install the non-spring return actuator onto the ball valve according to Figure-2.

Note: Only the 35 lb-in. and 70 lb-in. actuators listed in Table-1 are compatible with Vx-2x13-5xx-9-xx Ball Valve Assemblies.

(1) Verify that the valve is open.

△1 The flats on the sides of the shaft (or the index mark on top of old-style shafts) indicate the position of the ball port.

Shaft Style △1	2-Way		3-Way Mixing	
Current Flats on Sides of Shaft	Inlet Outlet	Inlet Outlet	A AB	A AB
	Closed (Fully CW)	Open (Fully CCW)	B Full Open to AB (Fully CW)	A Full Open to AB (Fully CCW)
Old Style Index Mark on Top of Shaft	Inlet Outlet	Inlet Outlet	A AB	A AB
	Closed (Fully CW)	Open (Fully CCW)	B Full Open to AB (Fully CW)	A Full Open to AB (Fully CCW)



(5) Secure the actuator to the valve shaft:

a. Verify that the actuator's position indicator is pointing to the 0° position. If it is not, slide and hold the manual release slider on the actuator housing to disengage the gears, and then use the positioning lever to turn the actuator's output shaft to the 0° position. When finished, release the slider or button to re-engage the gears. △2

b. Using a 3 mm hex wrench, tighten the setscrew, applying 55 to 60 lb-in. (6.2 to 6.8 N-m) of torque.

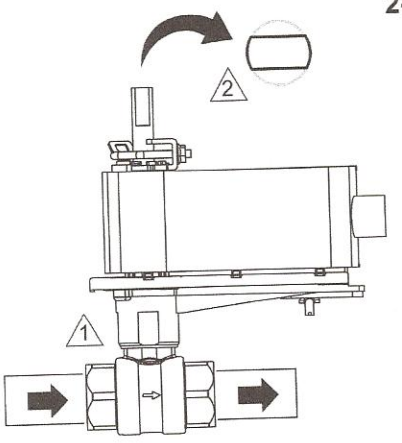
△2 ***Caution:*** Only use the manual override when the actuator drive motor is not powered. Engaging the manual override when the actuator is powered will cause damage to the gears.

Figure-2 Installation of Non-Spring Return Actuators on Ball Valve.

Valve Mounting

General Piping Practices

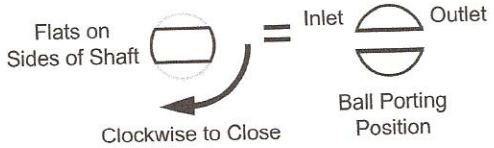
Figure-3 and Figure-4 illustrate how 2-way and 3-way ball valve assemblies are to be piped. 2-way ball valves with spring return actuators are shipped normally open with a voltage rise to close.



2-Way

1. Characterized 2-way ball valves should be piped in the direction of water flow (labeled with an arrow on one side of the valve body). While it is possible to pipe these ball valves in the opposite direction, doing so will adversely affect the equal percentage flow curves.
2. The flats on the sides of the shaft (or the index mark on top of old-style shafts) indicate the position of the ball port.

Current-style Shaft 2



Old-style Shaft 2

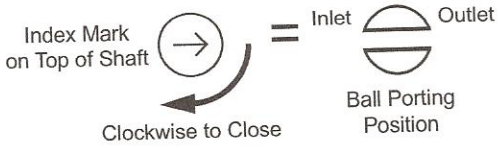
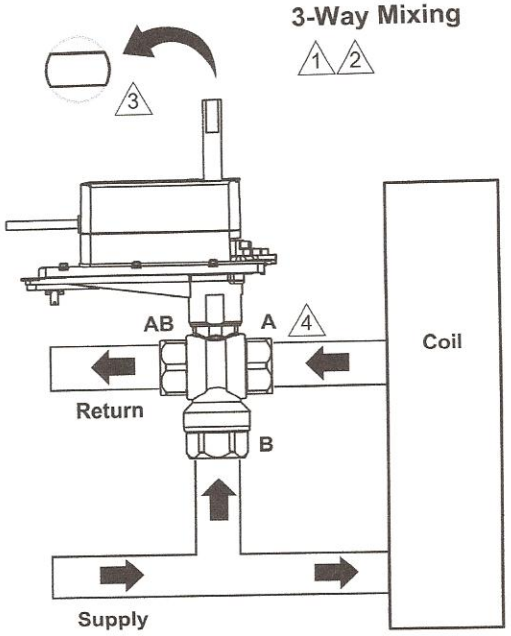


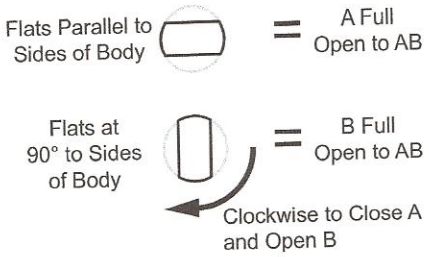
Figure-3 2-Way Valve Assemblies Piping Diagram.



3-Way Mixing 1 2

1. Fluid enters through two inlets (ports A and B) and exits through one outlet (port AB).
2. Not recommended for diverting applications (one inlet, port AB, and two outlets, ports A and B). Using these valves for diverting applications will adversely affect the equal percentage flow curves and Cv's.
3. The flats on the sides of the shaft (or the index mark on top of old-style shafts) indicate the position of the ball port.
4. Always pipe the A port to the outlet of the coil.

Current-style Shaft 3



Old-style Shaft 3

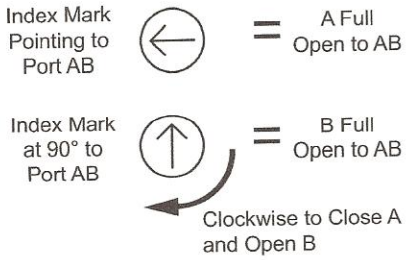


Figure-4 3-Way Mixing Valve Assemblies Piping Diagram.

Insulation of Ball Valve Assembly

The ball valve should be completely insulated to minimize the effect of heat transfer and condensation at the actuator.

Caution: The actuator itself must not be insulated. Doing so can result in excess heat or condensation within the actuator.

Temperature Limits for Ball Valve Assembly

When installing the ball valve assembly, observe the minimum and maximum temperature limits, given below (Table-2).

Table-2 Ambient Temperature Limits for Ball Valves Assemblies and Actuators.

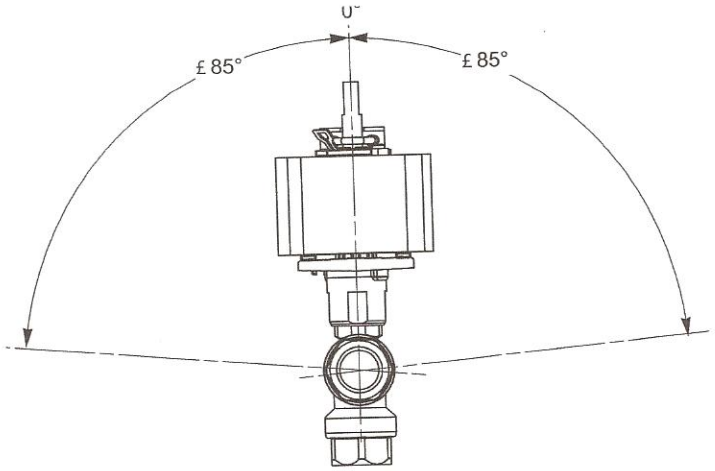
Ambient Temperature For		Temperature Limits	
		Minimum °F (°C)	Maximum °F (°C)
Valve Fluid (water)		20 (-7)	250 (121)
Mx41-6043 Mx41-6083	Storage	-40 (-40)	158 (70)
	Operating	-25 (-32)	130 (55)
Mx40-704x	Storage	-40 (-40)	160 (71)
	Operating	-22 (-30)	140 (60)

Installation of Ball Valve Assembly

Mount the valve assembly in the piping according to Figure-5.

Notes:

- 2-way ball valves containing characterized inserts must be piped in the direction of the arrow on the side of the valve body.
- 2-way spring return ball valve assemblies are shipped either normally open, voltage rise to close (actuator code 53x), or normally closed, voltage rise to open (actuator code 52x).
- Spring return 3-way ball valve assemblies are shipped either A to AB closed, voltage rise to open (actuator code 52x), or A to AB open, voltage rise to close (actuator code 53x).
- All 2-way non-spring return ball valve assemblies are shipped open, voltage rise to close.
- All non-spring return 3-way ball valve assemblies are shipped A to AB open, voltage rise to close.
- Mount the valve in a weather-protected area, in a location that is within the ambient temperature limits of the actuator.
- When selecting a location, allow sufficient clearance on all sides to allow for any maintenance that may be needed. Refer to *Ball Valve Assemblies and Ball Valve Body /Linkage Assemblies Selection Guide,* F-27086, for dimensions.
- Mount the valve assembly so that the actuator is above the horizontal, relative to the valve. This ensures that any condensate that forms on the valve body will not travel into the actuator, where it may cause corrosion or electrical malfunction.



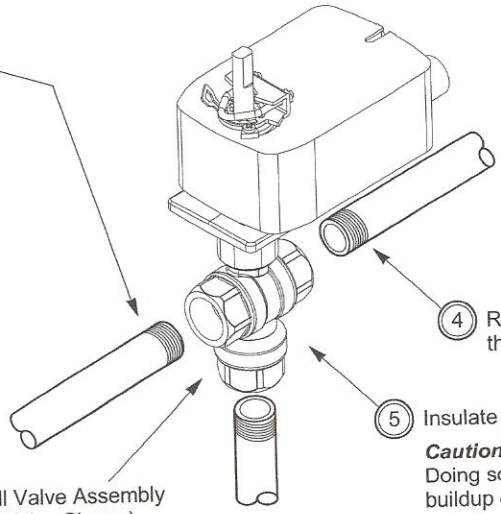
1. Apply pipe sealant sparingly to all but the end two threads of a properly threaded, reamed, and cleaned pipe. 2-way valves must be piped with an inlet and an outlet. 3-way mixing valves must be piped with two inlets and one outlet.

   Caution: Make sure the pipe chips, scale, etc. do not get into the pipe since this material may lodge in the valve seat and prevent proper closing and opening of the valve.

2. Start the joint by hand-threading the pipe into the valve. If the thread engagement feels normal, continue to turn the pipe by hand as far as it will go.

3. Use two wrenches. Secure one wrench on the hex pads nearest the joint being tightened while using the second wrench to screw in the threaded end, thereby preventing the retainer–to–body seal from being broken

   Caution: Do not over-tighten the pipe, which may cause stripped threads.



Typical Ball Valve Assembly
(3-Way Valve Shown)

4. Repeat steps 1, 2, and 3 for the remaining connection(s).

5. Insulate both the valve and the linkage.

   Caution: Do not insulate the actuator. Doing so may result in excess heat buildup or condensation within the actuator.

6. In chilled or cold water systems where the environment is humid, use a drip pan under the valve to catch condensate.

7. Wire the actuator, referring to the appropriate actuator General Instructions sheet (see "Applicable Literature").

Figure-5 Mounting Ball Valve Assembly in Piping.

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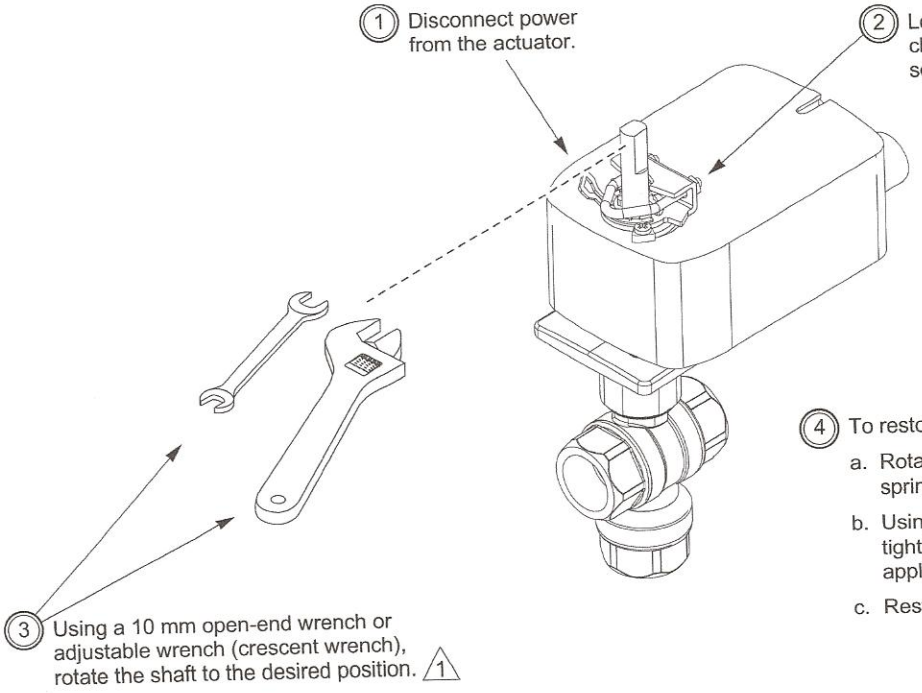
Manual Valve Positioning of Mx40-704x Spring Return Actuators

Before applying power to a ball valve assembly on a new installation, it may be desired to manually open the valve for system filling at startup. Manually open the ball valve assembly according to Figure-7 (current-style bracket) or Figure-7 (old-style bracket).



4 To restore normal operation:

a. Rotate the valve shaft back to its original spring return position.

b. Using a 10 mm wrench or socket, evenly tighten the two nuts on the shaft clamp, applying 8 to 10 lb-ft (11 to 14 N-m) of torque.

c. Restore power to the actuator.

Alternate Method

If the actuator is not yet wired:

a. Loosen the wing nut on the underside of the mounting plate, then slide the anti-rotation clip out of the slot on the bottom of the actuator.

b. Turn the actuator to the desired position. 1

c. To restore normal operation, rotate the actuator back into alignment with the mounting plate, then slide the anti-rotation clip half way into the slot on the bottom of the actuator. Tighten the wing nut to secure the anti-rotation clip, being careful not to over-tighten it.

1 The flats on the sides of the shaft indicate the position of the ball port.

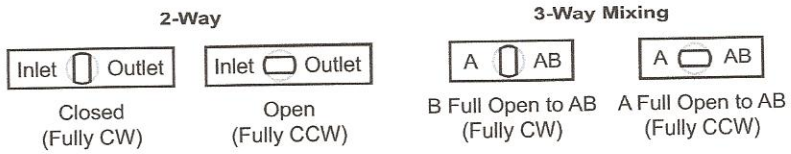


Figure-6 Manually Opening Valve Assemblies Equipped with Mx40-704x Series Actuators.

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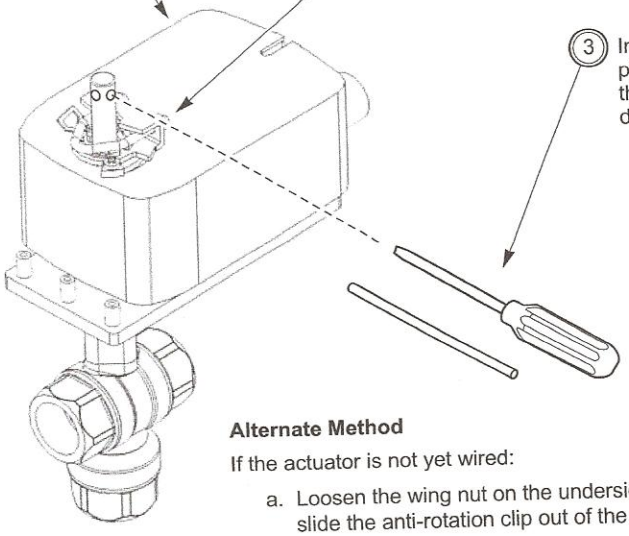


1. Disconnect power from the actuator.
2. Loosen the two nuts on the shaft clamp, using a 10 mm wrench or socket.
3. Insert a small screwdriver or a 1/8" steel pin into one of the two holes at the top of the valve shaft, then rotate the shaft to the desired position. ⚠1
4. To restore normal operation:
   a. Rotate the valve shaft back to its original spring return position.
   b. Using a 10 mm wrench or socket, evenly tighten the two nuts on the shaft clamp, applying 8 to 10 lb-ft (11 to 14 N-m) of torque.
   c. Restore power to the actuator.

Alternate Method

If the actuator is not yet wired:

a. Loosen the wing nut on the underside of the mounting plate, then slide the anti-rotation clip out of the slot on the bottom of the actuator.
b. Turn the actuator to the desired position. ⚠1
c. To restore normal operation, rotate the actuator back into alignment with the mounting plate, then slide the anti-rotation clip half way into the slot on the bottom of the actuator. Tighten the wing nut to secure the anti-rotation clip, being careful not to over-tighten it.

⚠1 The position of the ball opening is indicated by the index mark on top of the shaft: → = Index Mark on Top of Shaft

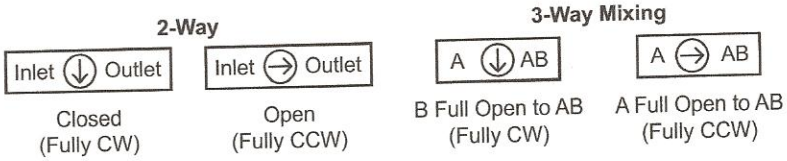
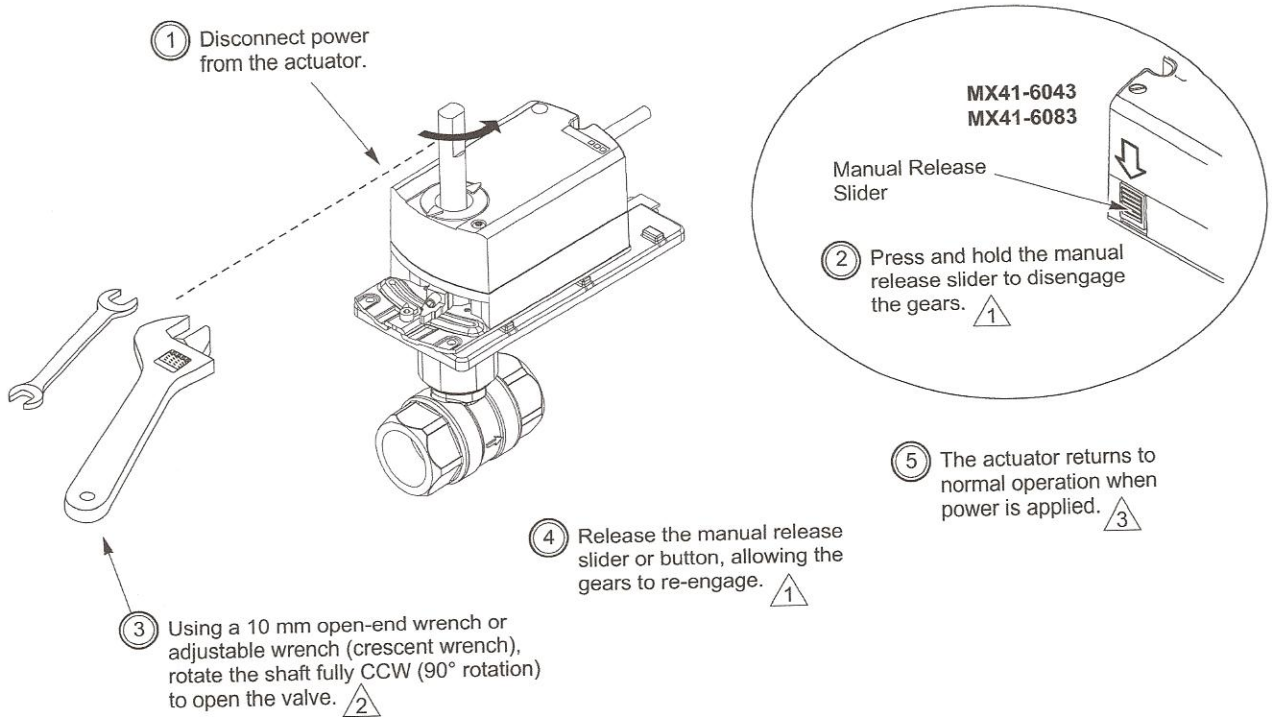


Figure-7 Manually Opening Valve Assemblies Equipped with Mx40-704x Series Actuators–Old-Style Bracket.

Manual Valve Positioning of Mx41-6043 and Mx41-6083 Non-Spring Return Actuators

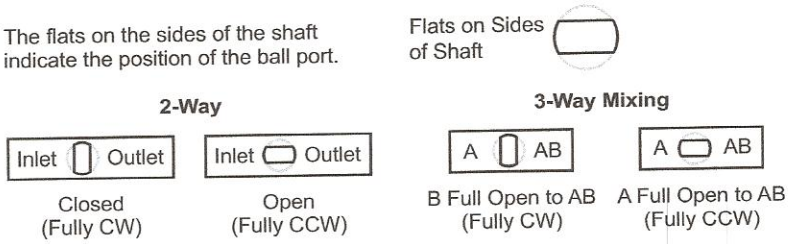
Before applying power to a ball valve assembly on a new installation, it may be desired to manually open the valve for system filling at startup. Manually open the ball valve assembly according to Figure-8 (current-style bracket) or Figure-9 (old-style bracket).

Note: The Mx41-6043 and Mx41-6083 series actuators feature a manual override that allows them to be manually positioned for system startup (or emergencies).



1 ***Caution:*** Only use the manual override when the actuator drive motor is not powered. Engaging the manual override when the actuator is powered will cause damage to the gears.

2 The flats on the sides of the shaft indicate the position of the ball port.



3 It may be necessary to reset a floating controller driving an MF41-6043 actuator.

Figure-8 Manually Opening Valve Assemblies Having Mx41-6043 Series Actuators.

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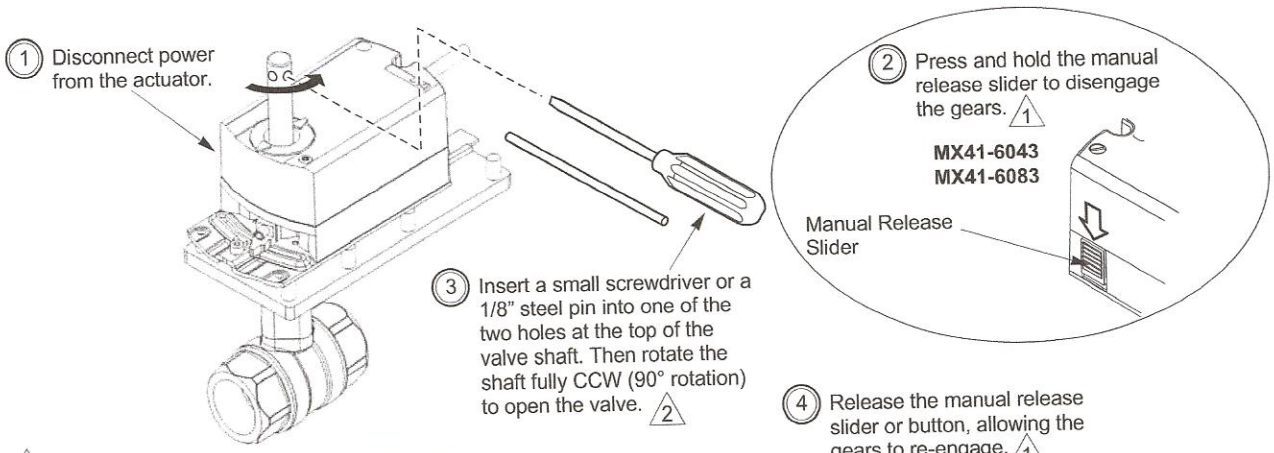
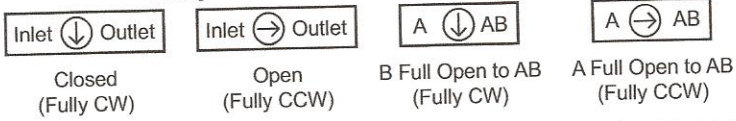


1 ***Caution:*** Only use the manual override when the actuator drive motor is not powered. Engaging the manual override when the actuator is powered will cause damage to the gears.

5 The actuator returns to normal operation when power is applied. 3

2 The position of the ball opening is indicated by the index mark on top of the shaft: = Index Mark on Top of Shaft



3 It may be necessary to reset a floating controller driving an MF41-6043 actuator.

Figure-9 Manually Opening Valve Assemblies Having Mx41-6043 Series Actuators–Old-Style Bracket.

CHECKOUT

1. Checkout valve/actuator assembly operations:
   a. Power the actuator and run the valve full stroke. The valve stem should operate smoothly. At the closed position, the valve should shut off tightly.
   b. For spring return actuators, allow the actuator to spring return to the normal position. Again, the valve stem should operate smoothly.
2. With the piping under pressure, check the valve body and the connections for leaks.

MAINTENANCE

The ball valve assembly itself requires no maintenance. The stem and packing design eliminates the need for packing adjustment for the life of the valve. However, regular maintenance of the total heating and cooling system is recommended to assure sustained optimum performance.

Water System Maintenance

All heating and cooling systems are susceptible to valve and system problems caused by improper water treatment and system storage procedures.

The following guidelines are to help avoid valve and water system problems resulting from improperly treated water or storage procedures, and to obtain maximum life from TAC valves.

To maintain non-damaging conditions, clean the system prior to start up. Use a nitrite or molybdate based treatment program. Use filtration equipment where needed. Properly store off-line systems and monitor water treatment results using corrosion test coupons.

Durability of valve stems, balls, seats, and packing is dependent on maintaining non-damaging water conditions. Inadequate water treatment or filtration, not in accordance with chemical supplier/ASHRAE handbook recommendations, can result in corrosion, scale, and abrasive particle formation. Scale and particulates can result in stem and packing scratches, and can adversely affect packing life and other parts of the hydronic system.

Follow the advice of a water treatment professional. Consult *EN-205 Water and Steam System Guidelines, Engineering Information*, F-26080, for further details.

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