

TorqPlus EM-Series Actuator Installation and Operating Instructions



Actuator Models: All
Bulletin: 21077- 06/00

This bulletin provides installation and operating information for the Bettis TorqPlus EM-Series Actuator. Should you have any questions about the controller that are not covered under this bulletin, please contact an authorized Bettis Valve Automation Center or Bettis Electric Division, Mansfield, Ohio U.S.A.

1.0 Caution

Electrical shock and/or explosion hazard. To avoid serious personal injury, death, or property damage due to electrical shock and/or ignition of hazardous atmospheres, **turn off all power to the actuator before removing the actuator cover.**

2.0 Inspection

Because many models look alike, verify the actuator's nameplate to insure correct model number, torque, operating speed, voltage, and enclosure type before installation or use.

3.0 Storage

The actuator must be stored in a clean, dry, temperature controlled area. The unit shall be stored with the cover installed and with the conduit openings sealed. Storage must be off the floor, covered with an unsealed dust protector that will allow side and bottom ventilation. Care must be taken to guard the actuator from condensation in extreme temperature variations. If no other means are available, internal heaters are recommended.

4.0 Maintenance

Each Bettis electric actuator is a totally enclosed unit with a permanently lubricated gear train. Once installed, formal maintenance should not be required. However, periodic preventative maintenance will extend the operating life of the actuator. PM checks include:

- Insure that alignment relative to the load on the actuator is proper. Mis-alignment is a major cause of premature actuator failure.
- Insure all wiring is insulated, connected, and terminated properly.
- Insure all screws are present and tight, including set screws for the cams.
- Insure cleanliness of the internal electrical devices.
- Insure conduit connections are installed properly and are dry. No signs of condensation or water infiltration should be present inside the conduit or conduit ports on the actuator.
- Check internal devices for condensation or corrosion.
- Upon installation of cover, insure proper seal and verify that o-ring is not pinched between the flange.
- Verify declutch mechanism and manual override operates properly.
- Inspect label to verify model number, serial number, and electrical ratings are readable.
- Verify actuator is operating in the proper quadrant.
- During operation, perform a visual inspection during an open and close cycle. Also, listen for any abnormal noises or sounds.

Under normal conditions, this inspection is recommended at six month intervals. But where conditions are more severe, more frequent inspection may be advisable.

5.0 Manual Operation 100 Series

The 100 series has no manual override. Therefore, to transition the end device, the actuator must either be removed or electrically operated.

300 and 500 Series (reference photo next page)

CAUTION: Do not apply more torque to the manual override shaft than the actuator is rated for. Cover should always be installed when manually overriding the actuator.

- Pull declutching/position indicator knob up and hold.
- Engage wrench on exposed shaft drive flats and move back and forth to disengage output shaft from drive train.
- After disengagement, rotate in desired direction. *Avoid rotation beyond the driven device's operating quadrant.*

- Once manual rotation is complete, remove the wrench and release the knob. *Note: The knob will remain up until the actuator is electrically operated and the engagement slots on the output shaft align themselves with the engagement slots on the output gear. Maximum time for re-engagement should be no greater than 45 seconds. Never pound on the center shaft.*



Manual Declutch On 300 and 500 Series

800 Series

CAUTION: Do not apply more than the maximum rim pull rating of the handwheel. Rim pull should be no greater than 5 pounds for a 2,000 in•lb actuator, 12.5 pounds for a 5,000 in•lb actuator, and 25 pounds for a 10,000 in•lb actuator.

- Turn handwheel in the direction desired, as marked on the handwheel. Avoid rotating beyond the driven device's operating quadrant.

6.0 Actuator Attachment

- Manually operate the driven device several times to insure smooth trouble free operation and place in the full CCW position as viewed from above.
- It is highly recommended that each driven device be torque tested in its worst case condition to verify proper sizing of the actuator.
- If the driven device is equipped with mechanical stops, verify the travel limit cams toggle short of the mechanical stop's contact points.
- Unless specially ordered, the actuator is shipped in the fully CCW position.
- Carefully follow all instructions supplied with the device and/or the interconnecting hardware. When mounting is complete, all connections should be tight, but not binding. It is also recommended to declutch and manually operate the actuator during the mounting process to ease installation and eliminate binding.

7.0 Cover Removal

- Shut off all power to the actuator.
- Loosen the socket set screw in the position indicator and remove the declutching/indicator knob from the top of the unit. *Note: This step is not required on the 100 and 800 series.*
- Remove all the cover attachment screws located around the flange and carefully lift the cover up and off. **Note: If manual operation is required with the cover removed, it is imperative that the declutching/indicator knob be replaced on the output shaft after the cover has been removed.**

8.0 Wiring Instructions

CAUTION: Electrical operation of each actuator must be through an individual single pole switch to isolate the unused motor winding. Parallel power circuits may create noise in the line and cause the actuators to operate sporadically.

- Each actuator is provided with the latest revision wiring diagram. Should the actuator come without the wiring diagram, please contact your local distributor or supplier.
- Each actuator is equipped with a terminal strip to which all field connections should be made. Route all wiring through the actuator's conduit connections and wire to the provided wiring diagram.
- All wiring, conduit connections, and materials should be made in accordance with local and national codes.
- Securely tighten all screws and check all other connections.

9.0 Cover Replacement

- Visually inspect actuator to insure that the output shaft seal and the o-ring seal is in place and undamaged.
- Carefully replace the cover on the actuator.
- Install the cover screws and tighten evenly.
- Replace the declutching/indicator knob being sure that the set screw is located against flat on the center shaft. Note: This step is not required on the 100 and 800 series.

10.0 Cam Adjustment (reference photo below)

Torque Switches

All 800 series actuators are equipped with two torque limiting switches. These switches are factory pre-set for the rated torque of the actuator and are not field adjustable. Should these switches ever be tripped, it is to safeguard the driven device and the actuator from damage. In cases where the torque cam has tripped, it is recommended that the driven device is fully tested with a torque wrench.



Cam Setting For All Actuators

Travel Limit Switches

Each actuator is supplied with two travel limit switches operated by an individual cam. One cam/switch controls the actuator's CW rotation while the other controls the CCW rotation. To adjust the limit setting for either extreme, perform the following steps:

- Remove cover from actuator per section 7.0. **Caution:** Some of the following steps will be performed with the actuator energized. Remove all tools, equipment, and body parts while the actuator is energized.
- Determine which cam/switch is controlling the CW and CCW direction by reviewing the wiring diagram supplied with the actuator. Note: Standard industry installation uses limit switch/cam #1 (bottom) for the CCW direction and limit switch/cam #2 (2nd from bottom) for the CW direction.
- Determine which cam requires adjustment and energize the actuator until the cam set screw is accessible.
- Remove power and loosen the set screw using a 3/32" allen wrench.
- Re-energize the actuator position it to the proper position.

- Remove power and rotate the proper cam to the position which toggles the limit switch.
- Tighten the set screw on the cam.
- Operate the actuator to verify proper cam setting.
- Once adjustments are satisfactory, replace cover per section 9.0.

11.0 Troubleshooting

The following instructions are offered as a guide to the most common difficulties encountered during installation and startup.

The actuator is receiving power but the motor does not respond.

- Verify the line voltage into the actuator via the field connections and insure that it matches the rating on the nameplate of the actuator.
- Check internal actuator wiring against the wiring diagram supplied with the actuator.
- Check the limit switch cams to insure that they are properly set and depressing the appropriate limit switches.
- On 800 series only, verify the torque switches are not tripped.
- Perform a visual inspection to verify no shipping or handling damage has occurred.
- Verify no corrosion has contaminated any of the electrical or mechanical devices on the actuator.

Problem: Actuator is receiving power but does not operate. Motor hums and is warm to the touch.

- Verify the line voltage into the actuator via the field connections and insure that it matches the rating on the nameplate of the actuator.
- Check torque requirement of driven device to insure that it is less than that shown on the actuator's nameplate. *Note: In some cases, we have noted that the actual torque needed to operate an end device has been over two times that published by the manufacturer. It may be necessary to perform an actual torque test during worst case conditions.*
- Verify coupler/bracket is properly installed and is not causing any binding.
- Verify both the CCW and CW field connections are not receiving power at the same time.
- Verify the limit cams are set properly and not allowing the actuator to travel outside its quadrant or against stops.
- Verify, if installed, that the electronic brake is operating properly and is not locking up the motor rotor.
- Verify no corrosion has contaminated any of the electrical or mechanical devices on the actuator. Any sign of corrosion potentially reduces the capability of the actuator.

Problem: Actuator runs erratically/sporadically.

- Check ambient temperature. Standard actuators have a maximum ambient operating temperature rating of 140 °F. Any temperatures above this rating may cause the actuator to fail.
- Verify that the published duty cycle has not been exceeded.
- Verify that the actuator is not wired in parallel to other actuators. All actuators must have their own isolated control switch.
- Inspect the manual override and disengagement mechanism.
- Gear train may be damaged due to overtorque.
- Verify proper signals are being supplied to the actuator.

Note: All AC voltage Bettis TorqPlus EM series actuators are standard with built in thermal overload motor protectors. Should any of the above cause the protector to open, it will automatically reset when the motor temperature is lowered to a safe level. Please consult the Bettis authorized Valve Automation Center or Bettis Electric Division, Mansfield, Ohio.

12.0 Spare Parts and Product Information

Each Bettis TorqPlus actuator is manufactured complete with a nameplate containing important and detailed information. This information will be needed anytime parts or additional data is requested. Please keep a file on with all nameplate information for reference when calling the factory.