

# Sizing and Selection

## General Definitions

To clarify and standardize terminology, Bettis offers the following definitions for terms commonly used. Please become familiar with and use the following standard definitions when referring to Bettis quarter-turn actuators.

**Quarter-turn:** A device which rotates a minimum of 90 degrees.

All Bettis quarter-turn actuators will rotate more than 90 degrees.

**Position:** That degree of rotation describing an actuator's current location. The mid position of a quarter-turn actuator is generally at forty-five (45) degrees.

**CW:** Clockwise rotation.

**CCW:** Counterclockwise rotation.

**Stroke:** A continuous, ninety (90) degree rotation of a quarter-turn actuator. Bettis spring-return actuators have two (2) different strokes, a pressure stroke and a spring stroke. Bettis double-acting actuators have two (2) pressure strokes. Note that rack and pinon actuators have common torque valves for both pressure strokes, while scotch yoke actuators have different torque values depending on which side of the piston is doing the work.

**Cycle:** The collective reference to two (2) strokes, one (1) for clockwise (CW) rotation and one (1) for counterclockwise (CCW) rotation. Bettis actuators must rotate through two (2) stroke to complete one (1) cycle.

**Safety Factor:** Represents a protective component (an adjustment to torque requirement) sometimes added to a valve's required torque value. Often used when the user/specifier is not certain of the valve's torque requirements, or because of other application concerns.

## Sizing Bettis Actuators

The following information is generally the minimum required for sizing Bettis quarter-turn pneumatic and hydraulic actuators for specific valve requirements.

**A)** An accurate maximum torque requirement must be obtained before actuator sizing begins. Normal maximum stem torque for a properly applied and maintained valve is usually defined as: The maximum starting torque required to rotate the valve element (ball, disc, plug, etc.) from a fully closed position (unsealing), against the maximum normal valve rated different pressures. Most valve manufacturers make adjustments in the form of torque amendments under various operating conditions. Application operating conditions such as temperature extremes, actual differential pressure, unusual loading, high flow rates, operating speeds, etc. are some of the most common causes for adjustments.

Bettis recommends that the valve manufacturer supply the maximum required torque value(s) **(including any adjustments or suggested safety factors)**. Additionally, the valve manufacturer must identify at which position(s) and direction(s) of rotation (CCW or CW) these maximum requirements occur.

**B)** Bettis actuators include stops which will resist the maximum rated torque output of the actuator. The possibility exists, that should the valve become immobilized during rotation, the actuator could exceed the maximum allowable valve input torque rating. If this possibility is a concern, your application needs further review.

Once the maximum torque requirements, its position, and direction of rotation are identified, the appropriate Bettis actuator can be selected from torque output charts.



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## Actuator Selection Procedures

- A) Determine the type of Bettis actuator required: double-acting or spring-return.
- B) Determine the power supply media: pneumatic or hydraulic, and the minimum/maximum supply pressure(s) at the actuator.
- C) Using this information, select the applicable torque rating table and see the appropriate following examples.

### Scotch-Yoke, Double-Acting Actuators (example assumes CW to close)

Note: The valve's torque requirements must be exceeded by the actuator's torque output at all corresponding positions and directions of rotation.

Bettis has included Start, Minimum, and End pressure torque outputs for your use.

- A) Using your minimum operating pressure, select an operating pressure column from the Pressure Torque Rating Section of less than or equal pressure. Move down the column until both starting and minimum output torques are found which exceed the valve's maximum and minimum torque requirements. Determine the Bettis model number at the left, under the model number column.
- B) Once a Bettis actuator model has been selected, use the performance data tables to ensure your maximum supply pressure does not exceed the maximum operating pressure (M.O.P.) for your Bettis actuator. If the actuator selected is not rated for your maximum supply pressure, either the maximum supply pressure must be reduced or an actuator rated for a higher M.O.P. must be selected.

### Scotch-Yoke, Spring-Return, Fail CLOCKWISE Actuators (example assumes CW to close)

Note: The valve's maximum torque requirements must be exceeded by the actuator's torque output at all corresponding positions and directions of rotation.

Bettis has included Start, Minimum, and End Spring Torque outputs, as well as Start, Minimum and End Pressure Torque Outputs for your use. The minimum torque outputs listed on the Spring-Return torque charts are the lowest value of torque output available at any position, during either stroke (pressure or spring).

- A) Select from the Spring Torque column a Spring Ending torque output which exceeds that of the valve's maximum seating requirement.
- B) Proceed to the right using your minimum operating pressure and select an operating pressure column from the Pressure Torque Rating Section of less than or equal pressure. The Pressure Start torque output must exceed the valve's torque requirement at this position (unseating). The Pressure End torque output must exceed the valve's torque requirement at this position (full flow) and direction of rotation (CCW).
- C) Once a Bettis actuator model has been selected, use the performance data tables to ensure your maximum supply pressure does not exceed the maximum operating pressure (M.O.P.) for your Bettis actuator. If the actuator selected is not rated for your maximum supply pressure, either the maximum supply pressure must be reduced or an actuator rated for a higher M.O.P. must be selected.

**Contact your local Authorized Bettis distributor or a Bettis manufacturing facility if you require assistance.**



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USA: +1 281 727 5300 Europe: +31 74 256 1010 Asia-Pacific: +65 6501 4600



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