

Basics of Operation

An electric actuator is basically a geared motor. The motor can be of various voltages and is the primary torque-generating component. To prevent heat damage from overwork or excessive current draw, electric actuator motors are usually equipped with a thermal overload sensor embedded in the motor windings. This sensor is wired in series with the power source and opens the circuit should the motor be overheated, then closes the circuit when the motor reaches a safe operating temperature.

An electric motor consists of an armature, an electrical winding, and a gear train. When power is supplied to the winding, a magnetic field is generated causing the armature to rotate. The armature will rotate as long as there is power to the windings when the power is cut, the motor stops. Standard end of travel limit switches, which are a necessity for an electric actuator, handle this task.

Electric actuators rely on a gear train, which is coupled directly from the motor to enhance the motor torque and dictate the output speed of the actuator. The only way to change the output speed is to install a cycle length control module. This module allows an increase in cycle time only. If a decrease in cycle time is required, an alternate actuator with the desired cycle time and proper output torque must be used.

Types of Motors

There are two types of motors used for electric actuators: unidirectional and bidirectional (commonly known as reversing motors).

- Unidirectional motors are motors in which the armature rotates in one direction, causing the valve to rotate in one direction. These actuators are typically used with a ball valve and rotate in 90 or 180 degree increments strictly for an on/off type of service.
- Reversing motors are motors in which there are two sets of windings allowing the armature to rotate in either direction depending on which set of windings is powered. One set of windings controls the clockwise direction for closing a valve, while the other set of windings controls the counter-clockwise direction for opening the valve. A major benefit of a bidirectional actuator is precise flow control, as the actuator is not required to travel the full stroke to begin the reverse stroke.

Electric or Pneumatic?

The pneumatic actuator will probably continue to be the actuator of choice in the process industry however; there are many applications where an electric actuator should be considered.

No Air Supply:

In many remote installations, it may be impractical to run an air supply line and maintain it.

Colder Climate:

Compressed air systems are vulnerable to freezing and clogging of the air lines, or potentially damaging the equipment if located in a climate that frequently sees temperatures below freezing.

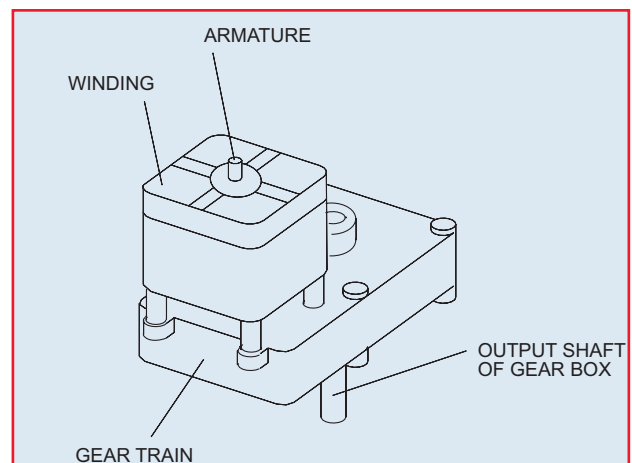
PLC/DCS Controlled Process:

In the past, standard engineering practice called for pneumatically actuated valves even when the rest of the system was electronically controlled. This required a conversion from electric to pneumatic (I/P) that made systems more complicated to start up and maintain. With the increasing popularity of PLC/DCS systems, many process and instrumentation engineers are now specifying fully electronic actuation packages.

Installation Savings:

The cost to prepare a plant for pneumatically actuating a few valves (compressor, regulators, air lines, etc.) far exceeds the cost of using electrically actuated valves.

* Even though pneumatic actuators are used, electricity is still required to energize the solenoid valve coils that cycle the pneumatic actuators.



- **Auxiliary limit switches:** Auxiliary (additional) limit switches are typically used as valve position confirmation (end of travel) with a PLC, DCS, etc. Other applications are for interlocking with other equipment or valves. These switches are SPDT with a 15 amp rating, and dry contact.
- **Heater and thermostat:** A pre-wired heater and thermostat is available for maintaining a constant temperature inside of the actuator housing, eliminating condensation that can form when the temperature fluctuates. It is imperative when the actuator is used in lower operating temperatures. The heater and thermostat is effective to -40 degrees F.
- **RHM Module:** The RHM Module is a combination of a 15Watt heater and thermostat arrangement along with 2-SPDT dry contact 8Amp relays that act as auxiliary limit switches. This module operates via standard control wiring, and is a cost effective solution to separate installs of the heater and thermostat option and the auxiliary limit switch option.
- **Feedback potentiometer:** A 1000-ohm, 1 watt feedback potentiometer with 5% linearity can be installed for position feedback. This varies from the auxiliary limit switches, as the feedback potentiometer provides a varying degree of opening percentage from 0-1000 ohms
- **Modulation/Positioner:** A digital positioner can be installed inside of the actuator for precise modulating control. The positioner accepts a variety of supply voltages and can be calibrated for various control signals (4-20mA, 0-10vdc, 0-5vdc, 1-5vdc, etc.).
- **Transmitter:** A transmitter can be installed in the unit to provide precise valve position (position feedback) to a PLC, DCS, etc. via current or voltage. This feedback is output from the actuator NOT a control signal to the actuator. Certain transmitter models are also equipped with 3-SPST dry relay contacts.
- **Mechanical brake:** This prevents oscillation typically found with rubber seated Butterfly Valves. The brake is installed on top of the motor armature and is electro-mechanical. When power is applied to the actuator, it is also applied to

the brake, which releases the armature and allows the unit to cycle. When the power is lost the springs within the brake lock the armature so that it can no longer rotate, thus eliminating oscillation

- **Cycle length control (CLC):** This option allows the field adjustment of the cycle time up to 10 minutes. The CLC can be configured at the factory for the open cycle only, for the close cycle only, or for the combination of open and close cycles.
- **Two-wire control:** The two-wire control option is a relay installed inside of the actuator for direct wiring to timers, level switches (SPST), etc. A constant power supply and a SPST switch of some sort are required for cycling of the actuator. When the SPDT switch is closed, the valve opens, and vice versa
- **Center off:** This option is used when a 90-degree "off" position is required while using a three-way ball valve. Two limit switches and two cams are installed in the unit (not to be confused with auxiliary limit switches) and allow three positions for a three way valve; 0 degrees or left port open, 180 degrees or right port open, and 90 degrees or both ports closed
- **Failsafe battery back up:** A solid state PCB along with a rechargeable battery pack is installed inside of the actuator. When supply power is lost, the unit will then travel to a pre-determined "fail position". It is imperative that there be constant supply power to the unit to ensure that the battery pack maintain a full charge.
- **Multiturn:** This option allows the actuator to make multiple revolutions that are needed when automating valves such as diaphragm, gate, needle, etc. This option is only available with the Series 92 Electric Actuator.
- **Voltages:** There are five voltage options available to meet a variety of customer needs: 230 VAC, 12 VDC, 24 VDC, 12VAC, 24 VAC