

Specification for three phase electric actuators with conventional I/O (contact closure / discrete signals or analog signal)

2.00 Electric Valve Actuators

1. General

A. Equipment Requirements:

The actuators shall be suitable for use on a 460 volt 3 phase 60 Hz power supply and must include motor, integral reversing starters, local controls and terminals for remote control and indication housed within a self contained, sealed enclosure.

B. Actuator sizing:

The actuator shall be sized to guarantee valve closure at the specified torque and/or thrust requirement as indicated by the valve manufacturer or supplier. The actuator must be adequately sized to provide the torque required to operate the valve at 90% of the nominal voltage. The operating speed shall provide valve closing and opening at approximately 12 inches per minute for gate valves, 4 inches per minute for globe valves and as indicated in the valve list for quarter turn valves. Quarterturn valves will be furnished with mechanical stops that restrict the valve/actuator travel.

C. Environmental

Actuators shall be suitable for indoor and outdoor use. The actuator shall be capable of functioning in an ambient temperature ranging from -20°F to +160°F in open/close service and -20°F to +140°F in modulating service, up to 100% relative humidity.

D. Enclosure

Actuators shall be O-ring sealed, watertight to NEMA 4X/6 (6 feet for 30 minutes). Where required, actuators for hazardous locations shall be certified explosion proof for Class I, Division 1 & 2, Groups C & D. All external fasteners shall be of stainless steel. Gear case shall be cast iron.

E. Motor

The electric motor shall be Class F insulated, with a duty rating of at least 15 minutes at 104°F (40°C). Motor shall be specifically designed and built by the actuator manufacturer for electric actuator service. Commercially available motors shall not be acceptable. Electrical disconnection of the motor shall be by means of a plug and socket and motor removal shall be possible without loss of lubricant. The actuator must include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel regardless of the connection sequence of the power supply.

F. Motor protection

The following criteria shall be provided for motor protection:

- 1) The motor shall be de-energized without damage in the event of a stall condition when attempting to move a jammed valve.
- 2) The motor shall be de-energized in the event of an overtorque condition
- 3) A minimum of three thermal devices imbedded in the motor windings shall be provided to de-energize the motor in case of overheating.
- 4) Lost phase protection

G. Gearing

The actuator gearing shall be totally enclosed in a grease-filled cast iron gearcase suitable for operation in any orientation. Actuator gearing shall be hardened steel with alloy bronze worm wheel. The design should permit the opening of the gearcase for inspection or disassembly without releasing the stem thrust or taking the valve out of service. Where required per application, electric actuators will be provided with worm gearboxes. The worm gearboxes shall be supplied with full 360° bronze worm wheels and end-of-travel mechanical stops on the worm shaft. Designs with segmented worm gears and end-of-travel stops in the gearbox housing will not be permitted.

H. Manual operation

Manual operation shall be by handwheel. Manual operation shall utilize the actuator worm shaft/worm wheel to maintain self-locking gearing and to facilitate changeover from motor to manual operation when the actuator is under load. Actuator designs that bypass electric actuator worm gears when declutched are unacceptable. The declutching from motor operation shall be at the motor shaft to minimize declutching effort. Designs that break the valve load at the worm and worm gear are unacceptable. Return from manual to electric mode of operation will be automatic upon motor operation. A seized or inoperable motor shall not prevent manual operation.

I. Drive nut and thrust base assembly

For multi turn rising stem applications, the drive nut shall be installed in a detachable thrust base. The design shall allow actuator removal from the thrust base, leaving the thrust base attached to the valve to retain valve position. Thrust bearings shall be lubricated by means of an easily accessible grease fitting.

J. Valve position and torque calibration

Limit switches shall be furnished at each end of travel. Limit switch adjustment shall not be altered by manual operation. Limit switch drive shall be by countergear. Limit switches must be capable of quick adjustment requiring no more than five (5) turns of the limit switch adjustment spindle. One set of normally open and one set of normally closed contacts will be furnished at each end of travel where indicated.

Contacts shall be of silver and capable of reliably switching low voltage DC source from the control system furnished by others.

Mechanically operated torque switches shall be furnished at each end of travel. Torque switches will trip when the valve load exceeds the torque switch setting. The torque switch adjustment device must be calibrated directly in engineering units of torque.

K. Wiring and terminals

Internal wiring shall be tropical grade insulated stranded cable of appropriate size for the control and 3-phase power.

All external wiring shall terminate in a removable plug and socket head, which allows easy disconnection of all power and control voltages. Actuators furnished without plug and socket terminal connections must have power and control disconnect switches for ease of maintenance and safety.

2. Electric Actuator Control (contact closure / discrete signals or analog signal) Controls

A. Controls

All actuators will be furnished with integral actuators / motor controls. The integral controls shall be electrically connected to the actuator via a plug and socket connection. It shall be possible to re-position the integral controls at 90° increments, so that the push buttons and indication lights will face the operator.

In case the actuators have to be mounted in un-accessible positions, it shall be possible to separate the integral controls including all the electronic control elements from the actuator. A wall bracket shall be available as an option to mount the controls at a convenient position near the actuator.

B. Control components

The following components/features shall be included with the integral controls:

- 1) Reversing contactors (mechanically and electrically interlocked).
- 2) Internal power supply / transformer for control power.
- 3) Control and signal voltage shall be either 24V DC or 110 V as indicated, internally or externally supplied.
- 4) Programmable control logic
- 5) Automatic phase correction
- 6) Control system interface by one of two modes as follows:
 - a. Control by contact closure / discrete input signals via OPEN-STOP-CLOSE signals (either 24 V DC or 115 V as indicated) potentially separated from actuator controls by opto-isolators.

- b. Control by analog signal via positioner board capable of accepting a 4-20mADC command signal and positioning the valve by comparing the command signal with the present valve position as indicated by the feedback potentiometer mounted inside the actuator. The positioner shall be field adjustable to fail to the "open", "closed" or "last" position on loss of analog (i.e. 4-20mADC) command signal.

C. Local controls

Local controls with 'OPEN - STOP - CLOSE' pushbutton type controls and a lockable selector switch with 'LOCAL - OFF - REMOTE' function. Local controls shall be supplied with indicating lights red for 'OPEN', yellow for 'FAULT' and green for 'CLOSED'.

D. Output signals and for remote indication

The following output signals shall be furnished for remote indication:

- 1) Output signals from selector switch when switch is in LOCAL or REMOTE positions via potential-free contacts.
- 2) Signals for end-of-travel positions OPEN and CLOSED shall be via potential-free contacts.
- 3) Monitor relay for collective fault signal (power failure, phase failure, thermal switch tripped and torque switch tripped in mid travel) shall be provided.
- 4) Where required, 4-20 mA position feedback signal.

3. Electric Actuator Commissioning and Test Reports

A. Commissioning Kit

Each actuator will be provided with a commissioning kit consisting of a wiring diagram and installation and operation manual. No special commissioning tools or parts will be required for start-up.

B. Performance Test Documentation

Each actuator shall be performance tested. Test documentation must be provided if requested indicating the following:

- 1) torque sensing tripping points in both the open and closed directions of travel
- 2) current at the maximum torque tripping point
- 3) actuator output speed
- 4) high voltage test

4. Electric Actuator Manufacturers

A. All actuators shall be manufactured by AUMA Actuators, Inc. of Canonsburg, PA.

B. No substitution is permitted