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STANDARD

American National Standard
ANSI/ISA-96.02.01-2024

Guidelines for the Specification of Electric Valve Actuators

Approved: 15 MAY 2024

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ANSI/ISA-96.02.01-2024, Guidelines for the Specification of Electric Valve Actuators

ISBN: 978-1-64331-249-1

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1 Scope

This standard covers the development of specifications, minimum design requirements, and sizing criteria for electric actuators.

Electric actuators shall be self-contained assemblies comprising an electric motor, reduction gearing, position sensing and limiting mechanisms, torque sensing and limiting mechanisms, handwheel for manual override, and a motor control package.

This standard is not intended to address the range of compact electric actuators rated less than 5.65 Nm (50 in-lbs), and it is not intended for electrically powered actuators that use hydraulic fluid for power transmission (refer to ANSI/ISA-96.06.01).

2 Purpose

The purpose of this standard is to provide a guide to assist the user in specifying electric valve actuators.

3 Design types

3.1 Actuator design categories

- intrusive: This version requires opening of the electrical enclosure for commissioning or troubleshooting activities such as setting of mechanical travel limit and torque switches, adjusting position feedback, and internal signal monitoring.
- nonintrusive: This version does not require opening of the electrical enclosure for commissioning or troubleshooting activities. Microprocessor-based controls, including status and diagnostics, are accessible externally to the actuator.

3.2 Actuator motion

- part-turn: actuator that transmits torque to the valve for less than one revolution. A combination of a multi-turn actuator plus a part-turn gearbox may be considered a part-turn actuator.
- multi-turn: actuator that transmits torque to the valve/gearbox for at least one revolution. A combination of a multi-turn actuator plus a multi-turn gearbox may be considered a multi-turn actuator.
- linear: actuator that transmits thrust to the valve for a defined linear stroke. A combination of a multi-turn actuator plus a linear drive may be considered a linear actuator.

3.3 Actuator design types

3.3.1 Electro-mechanical design

An electro-mechanical design actuator can be described as one that has the following characteristics:

- torque and position sensors are mechanical, which are adjusted manually to the desired setting;
- internal control wiring is point to point with limited or no circuit boards to allow operation of the sensors, reversing contactor, and input/output control signals;

- single control chamber for all control and power wiring, which requires the opening of the compartment to make adjustment to the actuator settings;
- does not have microprocessor-based electronics that allow programming of actuator controls.

3.3.2 Electronic design type

An electronic design actuator can be described as one that has the following characteristics:

- has microprocessor-based electronics that allow configuration of actuator controls;
- actuator housing has separate chambers for the power and control wiring;
- setup can be achieved by use of local control interface or software without opening electrical chambers;
- LCD display, intelligent control sensors, and diagnostics capabilities are common design features.

4 User-defined requirements

The following user inputs are required to specify an electric valve actuator. If these items are not explicitly covered in the specification and/or purchasing documents for the actuator, the actuator manufacturer's default specifications will apply.

4.1 Ambient conditions

4.1.1 Temperature

The user shall specify the ambient temperature range for the installation. Severe environments, such as arctic, desert, marine, and tropical, and applications near heat sources may require special considerations.

4.1.2 Hazardous area classification

If required, the user shall specify the need for explosion-proof equipment and specify which governing standards are applicable (e.g., INMETRO, CSA, NEC, IECEx, ATEX).

4.1.3 Ingress protection – Electrical

The user shall specify the required ingress protection from either the International Electrotechnical Commission (IEC) 60529 Standard or the National Electrical Manufacturers Association (NEMA) standard number 250.

4.2 Performance requirements

4.2.1 Actuator sizing

The user shall provide the necessary process conditions (i.e., pressure, temperature, characteristics of process media, maximum differential shutoff pressure, etc.) so that the actuator can be sized.

The user shall specify the maximum valve movement (stroke length/rotation angle).

Variations in the mounting hardware, valve internals, and lost motion in the valve coupling shall be considered when selecting an actuator with adequate over-travel.

When applicable, the user shall specify that actuator shall be capable of maintaining a specific position.

4.2.2 Operating time

The user shall provide any required response times. The following nomenclature shall be used when specifying response times:

- a) opening speed – time from input signal change, measured across the actuator's input, for the actuator to move from a full closed position to a full open position;
- b) closing speed – time from input signal change, measured across the actuator's input, for the actuator to move from a full open position to a full closed position;
- c) maximum frequency of operation (e.g., number of cycles per hour or per week), and number of cycles expected during the service life of the valve, number of starts per hour, and number of consecutive valve strokes.

4.3 Valve details

The user shall specify the valve closing direction as follows:

- a) rotary – clockwise (CW) or counterclockwise (CCW) (when looking down on valve stem);
- b) linear – extend or retract;
- c) rising-rotating – clockwise (CW) or counterclockwise (CCW) (when looking down on valve stem);
- d) valve position on low signal/high signal (e.g., increasing signal to open).

The following valve information shall be provided, which will allow the actuator manufacturer/ automator to better understand the actuation/sizing requirements:

- a) valve type,
- b) valve manufacturer,
- c) valve model,
- d) valve size,
- e) valve pressure class,
- f) valve stem details,
- g) self-locking gear arrangement (to prevent valve stem reversal), and
- h) the user shall specify the installed valve stem orientation relative to ground (vertical, horizontal or degrees angled).

4.4 Controls

The user shall specify the method or combination of methods used to monitor and control the actuator. This subclause defines the available methods for control.

4.4.1 Local control capabilities

The user shall specify when a local-off-remote switch and an open-stop-close mechanism shall be included for local control.