

Specification for Compact Electrical Control Valve Actuators

General

The actuators shall be suitable for use on a nominal _volt, 1 phase, _Hz power supply or direct current power supply and are to incorporate motor, integral reversing starter and terminals for remote control and indication connections housed within a self-contained, sealed enclosure.

As a minimum, the actuators should meet the requirements set out in EN15714-2 and ISA SP96.02

Commissioning of the actuator position limits and force limits shall only be possible using an internal interface and must not require any special tooling.

Actuator Sizing

The actuator must be sized based on the process operating conditions and characteristics of the control valve. The safety margin of motor power available for seating and unseating the valve must be sufficient to ensure torque switch trip at maximum valve torque with the supply voltage 10% below nominal. For linear operating valves and 90 - 360° valve types the operating time must be specified and the optimal actuator shall be selected to meet sizing requirements.

The actuator must be 1-phase AC or DC powered, capable of delivering sufficient thrust or torque to operate at the required speed for the applicable process. Actuator must be capable of continuous modulation.

Enclosure

Actuators shall be O-ring sealed, watertight to IP66/IP67, NEMA 4, 6. The motor and all other internal electrical elements of the actuator must be protected from ingress of moisture and dust. The actuator enclosure must allow for temporary site storage without the need for electrical supply connection. The actuator enclosure shall be formed from cast aluminium and treated with suitable protective coating for the actuator corrosivity category and installation environment indicated on the datasheet.

Performance

Performance parameters must all be as follows:

Linearity	1.0%	
Deadband	0.00% to 10.0%	Adjustable
Repeatability	0.5%	
Hysteresis	0.70%	
Resolution	0.2%	Linear & Part-turn
Resolution	2 degrees	Multi-turn

Motor

The motor must be an integral part of the actuator, designed specifically for valve actuator applications. The motor must be a permanent magnet 24VDC type with power derived internally from a 1-phase or DC supply. The motor shall be a low inertia, high torque design and capable of Class D continuous modulation (EN15714-2) / S9 continuous duty (IEC60034). Temperature shall be limited by an embedded thermostat directly integrated into the actuator control. The actuator must include a speed adjustment setting to change the motor operating speed in 1% increments between 50 – 100%.

Gearing

The actuator gearing must be totally enclosed in a grease-filled gearcase suitable for operation at any angle. Lubrication must be suitable for the full operating life of the actuator with no maintenance requirement. All drive gearing and components must be of metal construction. For 90° operating type valves, drive gearing shall incorporate a final drive quadrant that prevents over rotation through integral adjustable stop bolts. Stop bolts must facilitate $\pm 5^\circ$ adjustment for each end of travel.

Actuator/valve Yoke

Yoke assemblies are to be supplied when requested, with the actuator and shall provide rigid support, not only static support for the actuator, but to preclude any flexing during rapid operation.

Manual Hand Wheel

A knob for manual operation of the actuator shall be provided as standard such that the maximum knob operating torque shall not exceed 30 lbf.in. Where appropriate the actuator manufacturer shall supply a handwheel to meet increased operating forces.

HMI and Set up

Actuator and option configuration settings must be configurable through an LCD via push button switches located inside the actuator enclosure. No other configuration method is acceptable. The following actuator configuration parameters must be available for indication or adjustment.

- Actuator position status
- Demand input set point
- Torque/Thrust limit, adjustable 50 - 100% of rated value. In addition, a shut off torque/thrust of 150% must be available for force seating applications
- Local/Remote mode selection
- Manual jog function to adjust actuator position with push button switches when in Local mode
- Close position limit configuration
- Open position limit configuration
- Command signal calibration for positioning control.
- Deadband setting to control the minimum input signal step change required for movement, adjustable 0 – 10%
- Status indication for all actuator attributes in any mode of operation.
- Fault history log displaying alarms and faults listed by event number and type
- Operating speed must be adjustable 50 – 100% of the maximum speed in increments of 1%

Local Controls

The actuator must be available with optional integral local controls for Open/Close operation and include a Local/Stop/Remote mode selector switch. Mode selection must be lockable in any one of the following three positions: local control plus local stop only, stop (no electrical operation), remote control plus local stop only. It must be possible to select maintained or non-maintained local control. The local controls shall be arranged so that the direction of valve travel can be reversed without the necessity of stopping the actuator. The selector switch will be designed in such a way as to prevent the ingress of water or dust into the actuator enclosure.

Position and availability Indication

Continuous remote position indication in the form of a 4-20mA output shall be provided as standard. A non-contacting absolute encoder driven directly from the actuator output drive must be used to determine the actuator's position. Two programmable relays must be provided to indicate actuator availability status and/or valve position. The actuator must be capable of positioning using a 4-20mA control signal either full range or split range configuration.

Where specified and shown on the plan drawings, digital fieldbus communication cards will be supplied integral to the actuator to facilitate control & indication. Compatible optional cards will include HART, Profibus, Foundation Fieldbus, Modbus, DeviceNet and Pakscan systems.

Environment

Actuators must be suitable for indoor and outdoor use with a standard corrosivity category, C4 medium durability as per ISO 12944. The actuator must be capable of functioning in an environment with up to 100% relative humidity and ambient temperature of -30°C to +70°C (-22°F to +158°F) for non-hazardous applications and -20°C to +65°C (-4°F to +149°F) for hazardous applications. Actuators supplied with integral local controls for hazardous and non-hazardous applications must be suitable for an ambient temperature environment of -20°C to +60°C (-4°F to +140°F). Actuators for hazardous area applications must meet the area classification, gas group and surface temperature requirements specified in the data sheet. All external fasteners shall be stainless steel as standard.

Auxiliary input/output options

An optional auxiliary card must be available to add four additional inputs and four additional outputs. Remote auxiliary inputs must include functionality as detailed below:

Function	Description
Disabled	Input is not active
Open	Input signal for Open operation
Close	Input signal for Close operation
Stop/Maintain	Switch to accommodate maintained or push to run
ESD	Input signal for Emergency Shutdown operation
Primary Control Switch	Input signal for switching control between option and hardwired

Remote auxiliary outputs must include functionality as detailed below:

Function	Description
No Function	Always de-energised to reduce power consumption
Intermediate position indication	Active if the actuator passes an intermediate position (open or close direction)
General Fault	General fault detected. Stall Open/Close, Over Torque/Thrust-Open/Close, Loss of Communication, or Loss of Command.
Loss of Demand Signal	Active when the demand signal is lost
Loss of Feedback Signal	Active when the feedback signal is lost
Motor Stalled in Open Direction	Active when the motor fails to move after a valid open command
Motor Stalled in Closed Direction	Active when the motor fails to move after a valid close command
Open Torque/Thrust Overload	Active when the opening thrust / torque (at any position) reaches the configured value
Close Torque/Thrust Overload	Active when the closing thrust / torque (at any position) reaches the configured value
Over Temperature	Active when temperature is over limit.
Loss of Bus Communications	Active when communications signal is lost
Local Selected	Active when LOCAL mode is selected
Closed Position Limit	Active when the actuator is at Fully Closed position
Open Position Limit	Active when the actuator is at the Fully Open position
Emergency Shutdown Active	Active when an ESD signal is present
Critical Fault	Critical Fault detected -Actuator disabled. Loss of Feedback. EEPROM fault
Dither	Active if the output exceeds 2000 1% position changes per hour.
Monitor Relay Active (Available)	Active when the actuator is available for remote control - selector set to REMOTE and no faults present that would inhibit operation.

Remote outputs shall have a rating of 3 Amps, and switching power of 60W inductive and 150W resistive. The contact form for all auxiliary inputs and outputs shall be configurable to suit normally open or normally closed system philosophy.

Power or Signal Failure Mode

Should the control signal be lost, the actuator must have a means of operating to a pre-configured position or remain at the last position. This pre-configured position must be easily programmable via the integral HMI. No physical change to the build or construction of the actuator shall be needed to achieve the change in fail position.

The actuator must include compatibility with an optional reserve power pack to provide a means of positioning the valve to a safe position on loss of power supply or emergency shutdown (ESD) signal. The power loss action is to be achieved with super capacitors utilising stored electrical energy sufficient to drive the actuator through full stroke at rated torque/thrust. The power loss action shall be configurable for fail to close or fail to open. Indication via a built in LCD must be available during the power loss action showing actuator position, critical and non-critical fault symbols plus reserve power pack status.

Commissioning Kit

Each actuator shall be supplied with a commissioning kit comprising installation instructions, electrical wiring diagram and sufficient spare seals to make good any site losses during the commissioning period.

Performance Test Certificate

Each actuator must be performance tested prior to leaving the manufacturing factory. Individual test certificates shall be created and supplied free-of-charge. The test equipment must simulate a typical valve load and the following parameters must be verified and recorded:

- Torque or thrust at maximum setting
- Torque or thrust at minimum setting
- Speed
- Stroke
- Input command calibration at 0% and 100% positions
- Output position calibration at 0% and 100% positions

In addition, the test certificate should record details of specification, such as installed options, wiring diagram code, model number and power supply voltage.

Warranty

Each actuator shall be warranted for a minimum of 12 months of operation from date of shipment. This warranty shall be held in effect regardless of pre-commissioning conditions in a typical indoor or outdoor environment as long as the actuator is not abused, disassembled or conduit plugs removed. This warranty shall not require the use of special storage procedures (such as the use of indoor storage, plastic bags, desiccants or the connection of heaters) in order to be maintained.

An extended warranty shall apply from the date of start-up if the actuator is installed and commissioned by a factory-trained Field Service Technician employed by the actuator manufacturer.