Technical Specification

RCS Electric Actuators with a ProfiBus™ Field Control and Communication Module

The following specification defines the minimum requirements for the supply of motor operated valve actuators with a field communication bus system for remote control. The complete system shall consist of an electric motor actuator with an integral field control and communication module. A field communication bus system is being utilized to decrease the initial cost of automating valves as well as, reducing the overall costs of the plant or installation.

The total cost of ownership evaluation shall include:

- Initial total installed cost
- Ease of maintenance
- Reliability of equipment
- Reliability of communication system
- Flexibility to modify the system
- Flexibility and cost to expand the system

Actuator Design

General

The valve or damper actuator shall consist of an aluminum enclosure containing a split-phase, capacitor-type electric motor, a high-efficiency gear train, double-throw limit switches and a terminal block. Internal wiring shall be 18-AWG 600-volt UL/CSA-approved insulated wire that is terminated at a marked terminal block. A printed terminal identification strip shall be provided for ease in field wiring. Each actuator shall include a copy of the relevant wiring diagram and field installation instructions. The actuator housing shall have a suitably sized female NPT entry to facilitate the installation of conduit or cabling. The actuator shall be capable of operating in any mounting position.

Enclosure

The actuator enclosure shall be designed to meet the following environmental requirements:

- NEMA 4 (weatherproof) or
- NEMA 4X (weatherproof/corrosion resistant) or
- NEMA 7 (explosionproof) or
- NEMA 4/6/7 (weatherproof/submersible/explosionproof)

When required, certification of the above shall be provided by a recognized, independent testing authority, such as the following certifications by the Canadian Standards Association:

CSA NRTL/C* – Class I, Divisions 1 & 2, Groups C & D
CSA NRTL/C* – Class II, Divisions 1 & 2, Groups E, F & G
CSA NRTL/C* – approved to UL standard No. 429 – Electrically Operated Valves
CSA NRTL/C* – approved to UL standard No. 1604 – Electrical Equipment for Use in Class I and II, Division 2; Class III Hazardous (Classified) Locations

**The "NRTL/C" indicator adjacent to the CSA Mark signifies that the product has been evaluated to the applicable ANSI/UL and CSA Standards for use in the U.S. and Canada. NRTL, i.e. Nationally Recognized Testing Laboratory, is a designation granted by the U.S. Occupational Safety and Health Administration (OSHA) to laboratories that have been recognized to perform certification to U.S. Standards.*

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Actuator mounting shall be universal to facilitate field or factory installation to the valve, damper or other type of driven equipment. The mounting surface shall permit 90º degree indexing to allow efficient electrical conduit runs with minimal interference from piping or structural components. The actuator shall be capable of operating in any mounting position. The enclosure will have an industrial quality coating. The actuator output shaft shall be electroless nickel plated to prevent corrosion. External bolting will be stainless steel.

Sizing

The actuator shall be sized and selected against operating torque requirements as stated by the equipment manufacturer. The actuator shall be sized to have a minimum safety factor of 1.5 to 1, or so that the rated actuator output torque is 1.5 times the maximum actual valve torque. Maximum valve torque is defined as actual torque encountered during the stroke of the valve when operating under maximum working pressure condition.

Intermittent (Open/Close) Service

For on/off service, the actuator shall be rated for 50% duty at the maximum rated output torque. To minimize overrun and prevent back driving of butterfly valves or dampers, the actuator shall include an electro-mechanical motor brake.

Throttling or Modulating Service

For throttling or modulating applications, an extended duty motor shall be used with an electro-mechanical motor brake. A feedback potentiometer shall be furnished in the actuator to provide a feedback signal for the positioning module. Speed of rotation shall be 15 seconds per 90° rotation (4 rpm), or slower.

Temperature Range

The actuator shall be suitable for operation in ambient temperature ranging from –40° to +150° Fahrenheit (+65°C).

Actuators with Alternating Current Motors

The AC motor shall be a fractional horsepower, permanent split-phase capacitor-type electric motor designed to operate on a 120VAC-1PH-60HZ power supply. The motor winding insulation shall be class "B". A thermal switch shall be imbedded in the motor for overload protection.

Actuators with Direct Current Motors

The DC motor shall be a fractional horsepower, brush commutator-type operating on a 12 or 24 VDC supply. The motor winding insulation shall be class "B". A thermal switch shall be imbedded in the motor for overload detection.

Gearing

Reduction gearing shall be designed to withstand the actual motor stall torque. This gearing shall be high efficiency, spur type. The gearing shall be manufactured of hardened alloy steel and permanently lubricated. An electro-mechanical motor brake shall be supplied, when specified, to provide the position locking function.

Limit Switches

Two adjustable, cam-actuated, end-of-travel switches shall be provided to stop the actuator at the ends of travel. These switches shall be of the snap-acting, double-throw type rated to 250VAC. The limit switches shall be UL/CSA listed to carry a power load equal to or greater than the locked rotor current of the actuator.

Manual Override

The actuator shall be equipped with a manual override to permit operation of the valve in the event of electrical power failure or system malfunction. The override device must be permanently attached to the actuator. When in manual operation, electrical power to the actuator motor will be automatically interrupted, or motor operation will be mechanically detached from output shaft rotation. This feature is to insure the safety of the individual in the event that electrical power is restored during manual operation. The actuator shaft shall not be capable of electrical operation when the manual override is engaged, and the override will not rotate while the actuator is electrically operated. After manual operation, the override shall automatically disengage to allow for electrical operation.

Visual Position Feedback

The actuator shall be supplied with local visual indication of valve position.

Accessories

The actuator shall have provisions for the following options:

- Temperature controlled space heater to prevent the build up of moisture due to condensation.

Field Control & Communication Module

General Requirements:

- The actuator field control and communication module shall be supplied integrally to the actuator.
- Power for the field control and communication module shall be derived from the actuator power to minimize field wiring.
- Each actuator shall include, in addition to the field control and communication module, two Open/Close, illuminated (red and green) push button assemblies and a Remote/Off/Local selector switch. The local “off” shall override all other commands.
- Each actuator shall have a unique communication address.
- The field control and communications module shall be supplied with an RS-485 networking port
- Three configurable discreet inputs shall be provided on the field control and communication unit

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- Calibration of each field control and communication module shall be automatic, utilizing a single pushbutton on the unit

- Three LED's shall be provided on the field control and communication module which provide indications of the units health, status and communication to the network

- Three pushbuttons shall be provided on the field control and communications module to allow for local operation and calibration

The field control and communication module shall provide for on/off or positioning control of the actuator. In addition, the unit shall communicate the following actuator fault conditions to the network:

- Open limit status - i.e. fully Opened
- Closed limit status - i.e. fully Closed
- Percentage of open
- Valve seeking position
- Motor running
- Valve closing
- Valve opening
- Motor thermostat tripped
- Incomplete travel
- Valve opening or closing manually
- Valve jammed / current limiting
- Motor still energized after stop or end of travel
- Controller self-test
- Communication failure
- Average running current
- Peak running current
- Idle current

Remote Control and Communication System

General Requirements:

The remote control and communication system shall utilize proven microprocessor and digital communication technology to minimize wiring costs, while providing reliable control and communication to remote field devices. Proprietary systems which do not allow more than one manufacturer's products to utilize the same common data highway will not be allowed as these types of systems lock the end user into one manufacturer's product line. The remote control and communication system protocol shall be Profibus DP (Distributed Process)

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Communication System:

The communication system shall be capable of the following:

- The communication network shall consist of a two wire, twisted pair, shielded cable.
- Multiple communication media may be used in a single or plural fashion on the same data highway, such as: twisted pair or fiber optics.
- Must be an open architecture system, proprietary communication structures for the networking of field devices is not acceptable. To maximize data throughput, the communication system will utilize a report by exception design.
- The communication system must be capable of handling a minimum of 126 individual field devices. Additional groups of actuator may be added to the system with the use of repeaters or additional Profibus scanner modules.
- The remote control and communication system shall be capable of interfacing with a PLC or computer system via Profibus Scanner card.