MX Actuators

Technical Specifications

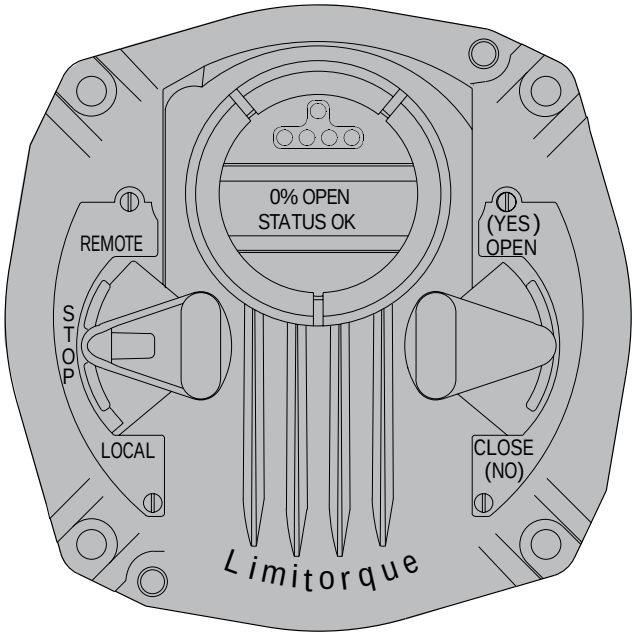
The actuator shall consist of a three-phase electric motor, worm gear reduction, absolute position encoder, electronic torque sensor, reversing motor contactor, electronic control, protection, and monitoring package, manual override handwheel, valve interface bushing, 32-character LCD, and local control switches all contained in an enclosure that is sealed to NEMA 4, 4X, 6, IP68, and (XP as required). Actuator design life shall be one million drive sleeve turns.

The power transmission shall be completely bearing-supported, and consist of a hardened alloy steel worm and bronze alloy worm gear, oil-bath lubricated using a synthetic oil designed specifically for extreme pressure gear transmission service.

The motor shall be 3-phase/60- cycle/(208 volt)(230 volt)(360 volt) (460 volt)(575 volt) or 3-phase/50- cycle/(380 volt)(400 volt)(415 volt) with Class F insulation, and a thermistor embedded within the motor windings to prevent damage due to overload. The motor shall be easily removed through the use of a plugin connector and shaft coupling.

Valve position shall be sensed by a 15-bit, optical, absolute position encoder. Open and closed positions shall be stored in permanent, nonvolatile memory. The encoder shall measure valve position at all times, including both motor and handwheel operation, with or without 3- phase power present, and without the use of a battery.

An electronic torque sensor shall be included. The torque limit may be adjusted from 40-100% of rating in 1% increments. The motor shall be de-energized if the torque limit is exceeded. A boost function shall be included to prevent torque trip during initial valve unseating, and a "Jammed Valve" protection feature, with automatic retry sequence, shall be incorporated to de-energize the motor if no movement occurs.



The control module shall include power and logic circuit boards, control transformer, and protection fuses, all mounted to a steel plate and attached in the control compartment with captive screws. The module shall be easily removed through the use of plug-in connectors. The module shall also include a reversing contactor, local control switches, 32-character LCD, and LED indicators. All internal wiring shall be flame-resistant, rated 105°C, and UL listed.

The LCD module shall use solid-state Hall-effect devices for local communication and configuration. The use of reed switches for this purpose on the LCD module is prohibited.

The reversing contactor shall be mechanically interlocked to prevent simultaneous energizing of the open and close coils. The control module shall also include an auto reversal delay to inhibit high current surges caused by rapid motor reversals. The control transformer shall include vacuum-impregnated coils and dual primary fuses. A phase correction circuit shall be included to correct motor rotation faults caused by incorrect site wiring. The phase correction circuit shall also detect the loss of a phase and disable operation to prevent motor damage.

Remote control may be configured as 2, 3, or 4 wires for open-stopclose control. Terminals must also be provided for ESD (Emergency Shutdown) and Inhibit Movement commands. The ESD signal shall override any existing signal (except LOCAL, STOP, and INHIBIT) and send the valve to its configured emergency position. The ESD may be configured to

override LOCAL, STOP, and/or INHIBIT. Remote control functions may be powered by external 24 VDC, 125 VAC, or the actuator's internal supply of 110 VAC or 24 VDC. The internal supplies shall be protected against overcurrent and short circuit faults.

Terminals shall be included to connect the electronic controls package, including display, to a back-up 24VDC power source.

A dedicated circuit to prevent undesired valve operation in the event of an internal circuit fault or erratic command signal shall be included. An open or short-circuit in the internal circuit board logic shall not energize the motor contactor, nor shall a single fused control relay contact fail to de-energize the motor contactor. The command inputs shall be optically coupled and require a pulse width of at least 250 ms to 350 ms to turn on or off. In the event of an internal circuit fault, an alarm shall be signaled by tripping the Monitor Relay and through LCD indication.

A padlockable LOCAL-STOP-REMOTE switch and an OPEN-CLOSE switch shall be included for local valve actuator control. The control switches shall not penetrate the controls cover and shall be designed to electrically isolate the actuator's internal components from the external environment. The OPEN-CLOSE switch may be configured for maintained or push-to-run (inching) control.

Four latched contacts shall be provided for remote indication of valve position, configured as 1-N/O and 1-N/C for both the open and closed positions. The contacts may be configured to represent any other actuator status; mid-travel position, switched to local, overtorque, motor overtemperature, manual operation, switched to remote, switched to stop, valve moving, close torque switch, open torque switch, hardware failure, ESD active, inhibit active, or valve jammed.

A monitor relay shall be included and shall trip when the actuator is not available for remote operation. Both N/O and N/C contacts shall be included, rated 250 VAC/30 VDC, 5 amps. The yellow LED shall blink when the monitor relay is active.

A 32-character, Liquid Crystal Display (LCD) shall be included to display valve position as a percent of open, 0-100%, and current actuator status. "STATUS OK" shall be displayed for an operable actuator. If the actuator is not operable, the appropriate alarm shall be displayed. The alarm shall be continuously displayed until the actuator is operable. Red, green, and yellow LEDs shall be included for open, close, stopped, and moving indication.

All calibration shall be possible without removing any covers and without the use of any special tools. All calibration shall be performed by answering the "YES" and "NO" questions displayed on the LCD. "YES" is signaled by using the OPEN switch and "NO" by using the CLOSE switch, as indicated adjacent to the switches. A configurable password option shall be available to prevent unauthorized changes.

All customer connections shall be located in a terminal chamber that is separately sealed from all other actuator components. Site wiring shall not expose actuator components to the environment. The internal sealing within the terminal chamber is suitable for NEMA 4, 6, and IP68. The chamber shall include screw-type terminals, 3 power and 50 control, for site connections. Three conduit entries, available as: (2) - 1.25" NPT (M32) and (1)-1.5" NPT (M40) shall be located in the terminal chamber.

The actuator shall be coated with a polymer powder coat. The coating system shall be suitable for an ASTM B117 salt spray test of 1500 hours. External fasteners shall be highstrength carbon steel, zinc plated, chromate-hexavalent coated, and then top coated with a highstrength, high-endurance polymer. The fasteners shall be suitable for an ASTM B117 salt spray test of 500 hours.

A handwheel and declutch lever shall be provided for manual operation. The handwheel shall not rotate during electric operation nor can a seized motor prevent manual operation. Changing from motor to manual operation is accomplished by engaging the declutch lever. Energizing the motor shall return the actuator to motor operation. The declutch lever is padlockable in the motor position.

The actuator shall include a removable bushing to mate with the valve shaft.

Diagnostic facilities shall be included to accumulate and report the performance of the motor, encoder, contactor, cycle time, handwheel operations, actuator ID, and output turns. In addition, a torque profile of the reference baseline valve stroke and the last valve stroke shall be included. All diagnostic information shall be displayed on the LCD.

Every actuator shall be factory tested to verify: rated output torque, output speed, handwheel operation, local control, control power supply, valve jammed function, all customer inputs and outputs, motor current, motor thermistor, LCD and LED operation, direction of rotation, microprocessor checks, and position-sensor checks. A report confirming successful completion of testing shall be included with the actuator.

All actuator designs shall have been tested to demonstrate electromagnetic compatibility with the following:

- EFT Immunity; EN 50082-2
- Conducted Immunity; EN 50082-2
- Conducted Immunity; Mains (power) Harmonic Distortion per MIL-STD-461, Method Conducted Emissions; EN 55011
- Radiated Emissions; EN 55011
- ESD Immunity; EN 50082-2
- Radiated Immunity; EN 50082-2
- Radiated Immunity; 1-2 Ghz per IEC 801-3
- CSO1 & CSO2
- Surge Immunity; IEC 1000-4-5 & ANSI/IEEE C62.41 to 4 KV
- Magnetic Field Immunity; IEC 1000-4-8

Vibration and seismic capability shall be in accordance with MILSTD- 167, IEEE-344-1975, and IEC68-2-6.

The actuator shall be tagged with CE mark per compliance with directives 89/336/EEC and 89/392/EEC.

Options

Analog Position Transmitter (APT)
A non-contacting, internally powered, electrically isolated position transmitter shall be included to provide a 4-20 mA signal that is proportional to valve position.

Analog Torque Transmitter (ATT)
A non-contacting, internally powered, electrically isolated torque transmitter shall be included to provide a 4-20 mA signal that is proportional to rated output torque.

Modutronic Option
A controller that alters valve position in proportion to a 4-20 mA analog command signal shall be included. Positioning shall be accomplished by comparing the command signal to an internal position feedback. The internal feedback shall be of the non-contacting type. An automatic pulsing feature to prevent overshoot at the setpoint shall be included. Proportional band, deadband, signal polarity, motion inhibit time, and fail position shall be adjustable through the LCD.

Alarm Relays
Two additional N/O and one N/C non-latching output contacts rated 125 Vac, 5 amps and configurable to represent any actuator status: valve position, overtorque, switched to local, switched to remote, switched to stop, handwheel operation, motor overtemperature, open torque switch, close torque switch, hardware failure, ESD active, valve moving shall be included.

2-Speed Timer
A 2-speed timer that permits the motor to be pulsed to achieve a longer stroking time shall be included. The pulsing mode may be configured for the open and/or close direction, for any portion of valve stroke with the ON pulse cycles configurable from .5-20 seconds and the OFF pulse cycles configurable from 1-200 seconds.

DDC
A digital communication control system that provides the ability to control and monitor up to 250 actuators over a single twisted-pair cable shall be included. The communication network shall employ Modbus (Bitbus) protocol on an RS- 485 network, and shall be redundant such that any single break or short in the communication cable shall not disable any actuators. Each actuator shall include an addressable field unit that communicates over the twisted pair network and executes open, close, stop, ESD, and GO TO position commands. The field unit shall also communicate all actuator status and alarm diagnostic messages over the same communication network.

Auxiliary Control Station
An auxiliary control station shall be provided in a separate enclosure for control of the actuator. The enclosure shall meet the same requirements as the actuator and shall be suitable for either surface mounting or stanchion mounting. The control station shall include three buttons (OPEN-STOP-CLOSE) and two lights for position indication (RED for OPEN and GREEN for CLOSED). The control station shall also include a three-position selector switch (LOCAL-OFF-REMOTE). The selector switch shall be padlockable in each position. The enclosure shall have two conduit entries for control wiring.

Power Interruption Switch
A disconnect switch (load break switch), rated 20 amps at 600 Vac, shall be provided to isolate the actuator from the 3-phase supply. The switch shall be suitable for breaking motor locked rotor amperage. The disconnect switch shall be enclosed in its own NEMA 4, 4X, and 6 housing that is separate from all other actuator components. The disconnect housing can be coupled to an actuator conduit entry and the power wires connected from the disconnect to the actuator terminal block. Site wiring shall be direct to the disconnect switch which shall be accommodated by a 1.25" NPT conduit entry in the disconnect housing. All connection terminals shall be shrouded and the switch shall be padlockable in either position.

Arctic Temperature Applications
The lubrication shall be Petro Canada SYNGEAR 75W-90 w/TOS and shall be suitable for an ambient temperature range of -50°C (-58°F) to +60°C (+140°F). A relief valve tube/device shall be supplied to allow for thermal expansion of the gear case oil when temperature conditions change dramatically. The motor-reversing electro-mechanical contactor shall include a solid-state, self-regulating heater. Standard hardware shall be acceptable. Where applicable, side-mounted handwheels shall be required to provide a mechanical advantage when operating in cold extremes.

Optional Equipment:
Gearboxes Worm or bevel gearboxes shall be rated to -50°C.

Solid State Motor Reverser (SSMR)

An Accutronix MX with an SSMR shall be a standard option and shall meet the following conditions:

- It shall not be necessary for the user to install fuses/circuit breakers to protect peripheral equipment.
  - An SSMR package shall include two in-line fuses: (1) an overload protection fuse that protects user and equipment and (2) a semiconductor fuse that protects semiconductors from voltage-induced spikes (surges).
- The standard functionality and performance of the I/O and network boards shall be maintained.
- Actuators with the SSMR standard option shall be suitable for modulating service up to 1200 starts per hour as listed:
  - 1200 starts per hour is suitable for continuous duty as defined by IEC- 34, ROTATING ELECTRIC MACHINES
    - Rating category = S4_33%_1200 S/H, where
      - S4 = intermittent periodic duty, with starting
      - 33% = total duration factor of each cycle, i.e. 1 second “ON,” 2 seconds “OFF,” for 3 seconds total duration factor
        - 1200 S/H = 1200 starts per hour

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