



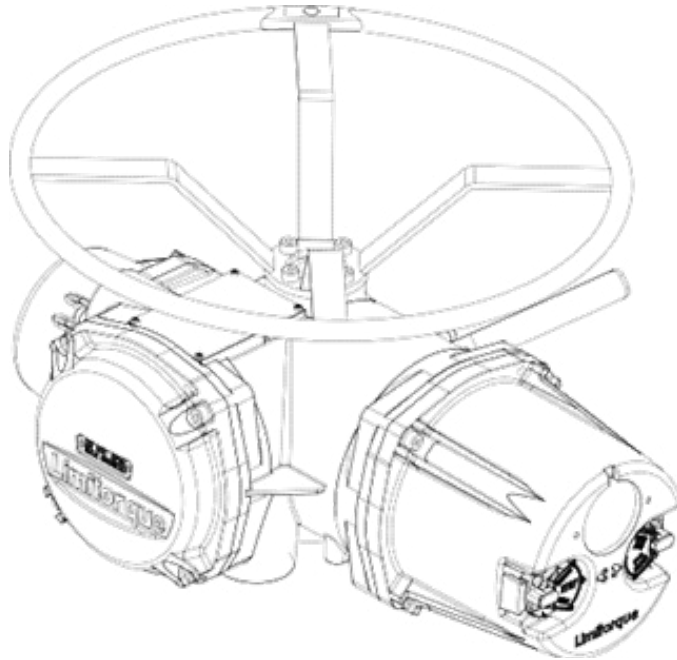
SPECIFICATIONS

Limitorque MX actuators

FCD LMENPS2334-02-AQ – (02/16)

Technical Specifications





The actuator shall consist of an electric motor, worm gear reduction, absolute position encoder, electronic torque sensor, mechanically and electrically interlocked reversing motor contactor, electronic control, protection, and monitoring package, manual override handwheel, valve interface bushing, 32-character graphical Liquid Crystal Display (LCD), and local control switches all contained in an enclosure that is sealed to NEMA 4, 4X, 6, IP68 to 15M for 96 hours (and XP as required). Actuator design life shall be at least 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 worm and worm gear transmission service.

The motor shall be three-phase / 60-cycle (208, 230, 360, 440, 460, 575 V) or three-phase / 50-cycle (380, 400, 440, 415, 525 V) with Class F insulation and a thermistor embedded within the motor windings to prevent damage due to over-load. The motor shall be easily removed through the use of a plug-in connector and shaft coupling.

A brushless DCV motor and electronic motor controller shall be supplied for single-phase ACV applications of 110, 115, 120 / 60 Hz and 220, 240 / 50 Hz applications. The motor shall be supplied with H class insulation and have a solid-state thermistor embedded within the motor to prevent thermal damage. The motor shall be easily removed through the use of a plug-in connector and shaft coupling.

Valve position shall be sensed by an 18-bit, optical, absolute position encoder with redundant position sensing circuits designed for Built-In-Self-Test (BIST). Each of the position sensing circuits shall be redundant, permitting up to 50% fault tolerance before the position is incorrectly reported. The BIST feature shall discern which failures signal a warning only and which require a warning plus safe shutdown of the actuator. 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 power present, and without the use of a battery. The absolute encoder will be capable of resolving $\pm 7\sigma$ of output shaft position over 10,000 output drive rotations.

An electronic torque sensor shall be included. The torque limit may be adjusted from 40 to 100% of rating in 1% increments. The motor shall be deenergized if the torque limit is exceeded. A boost function shall be included to prevent torque trip during initial valve unseating and during extreme arctic tempera-

ture operation (-55°C), 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 at least two primary power protection fuses, all mounted to a steel plate and attached in the control compartment with captive screws. The use of O-rings or other such devices to secure the control boards shall not be permitted. The module shall be easily removed through the use of plug-in connectors. The module shall also include a reversing contactor, or in single phase applications, a motor controller, local control switches, 32-character graphical LCD, and LED indicators. It shall also be Bluetooth ready. All internal wiring shall be flame-resistant, rated 105°C, and UL/CSA listed. Voltage shall be selectable via a jumper included on the power board.

The reversing contactor shall be mechanically and electrically 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 (3-phase ACV only) 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. The monitor relay shall trip and an error message shall be displayed on the LCD screen when loss of phase occurs and indicate the fault for remote operation. Phase correction circuitry is not required for single phase ACV applications.

Discrete remote control may be configured as two, three, or four wires for open-stop-close control. Remote control functions may be powered by external 24 VDC, 125 VAC, or the actuator’s internal 24 VDC supply. The voltage values for signal threshold shall be 19.2 VAC/VDC and 5.0 VAC/VDC, respectively. The maximum load for 24 VDC is 2 mA. The internal supplies shall be protected against over current and short circuit faults and utilize optical isolation to minimize electromagnetic interference. Discrete control shall have an isolated common.

Emergency Shut Down (ESD) provision shall be included in each actuator. The actuator shall permit up to three inputs for ESD and they shall be configurable. 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 also be configured to override LOCAL, STOP, and/or INHIBIT. Provision for an isolated common shall be provided.

Inhibit movement provision shall be included in each actuator. The actuator shall permit up to three inputs for Inhibits and they shall be configurable. Provision for an isolated common shall also be provided.

Terminals shall be included to connect the electronic controls package, including display, to a backup 24 VDC power source. As a standard alternative, the actuator shall have the ability to maintain the status and alarm contacts in order to update status to the control room and also provides status visibility on the LCD screen without main power applied. It should be configurable for at least one hour and, once main power is restored, be available for the next unforeseen power outage. The use of an integral battery is prohibited.

A dedicated circuit to prevent undesired valve operation in the event of an internal circuit fault or erratic command signal shall be included. A single point failure will not result in erratic actuator movement. 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 deenergize the motor contactor. The command inputs shall be optically coupled and require a pulse width from 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.

Four latched status contacts rated 125 VAC, 0.5 A and 30 VDC, 2 A 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. Two contacts may be configured to represent any other actuator status; mid-travel position, switched to local, overtorque, motor over temperature, manual operation, switched to remote, switched to stop, valve moving, close torque switch, open torque switch, hardware failure, ESD active, inhibits active, valve jammed, analog IP (input) lost, lost phase, and network controlled. The other two will be complementary.

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 125 VAC, 0.5 A and 30 VDC, 2 A. The monitor relay shall be configurable for these additional fault indications: lost phase, valve jammed, overtorque, inhibit, ESD and motor overtemp. The yellow LED shall blink when the monitor relay is active. The monitor relay configuration shall provide provision to be disabled.

The ACP (Actuator Control Panel) cover and module shall use solid-state Hall-effect devices for local communication and configuration. The use of reed switches on the module is prohibited. A 32-character, graphical 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. The Red and Green LEDs shall be reversible. 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.

The device shall be non-intrusive - All calibration shall be possible without removing any covers and without the use of any special tools. All calibration shall be performed in clear text languages; no icons shall be used. The languages shall be English, Spanish, French, German, Portuguese, Italian, Mandarin, Russian, Malay, Turkish and Katakana. 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.

Double sealed terminal compartment and terminal block - 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 to 15M for 96 hours. The chamber shall include screw-type terminals, three for power and 54 for control, for site connections. Three conduit entries, available as: (2) - 1.25" NPT (M32) and (1)-1.5" NPT (M40) shall be standard and located in the terminal chamber. An optional fourth conduit shall be available as 1"NPT (M25).

Coatings - 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 stainless steel or high-strength carbon steel that has been chromate-hexavalent coated, and then top coated with a high-strength, 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 shall be padlockable to permit motor operation only.

The actuator shall include a removable **torque or thrust 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, firmware revision, and output turns. In addition, a torque profile of the reference baseline valve stroke and the last valve stroke shall be included. A feature for reset shall be provided. All diagnostic information shall be displayed on the LCD. The actuator shall contain the ability for diagnostics information to be downloaded to a PC or PDA via both IRDA and Bluetooth ports.

Factory testing - 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.

Certifications

Non-hazardous (Weatherproof / Submersion) Certifications

- IEC 529 protection code IP68; 15 meters for 96 hours continuous
- USA & CSA; NEMA 3, 4, NEMA 4X, NEMA 6

Standard Hazardous Global certifications:

- FM – Class I, Groups B, C & D, DIV.1 and Class II, Groups E, F, & G, T4
 - T4A temperature classification is acceptable with operational times less than 15 min.
- ATEX Eex d IIB T4 ATEX II 2 G, CENELEC Norm EN50014 and EN50018
- ATEX Eex d IIC T4 ATEX II 2 G, CENELEC Norm EN50014 and EN50018
 - T4A temperature classification is acceptable with operational times less than 15 min.
- CSA or Factory Mutual Canada – Class I, Groups B, C & D, DIV.1 and Class II, Groups E, F, & G, T4
- IEC Eexd IIB T4, IIB T4
- IEC Eexd IIC T4, IIC T4

European Directives - All actuator designs shall have been tested to demonstrate compatibility with the following European Directives:

The actuator shall be tagged with CE mark per compliance with directives

2006/142/EC Machinery Directive

2004/108/EC- EMC – Electromagnetic Compatibility

94/9/EC ATEX Directive

2003/10/EC - Airborne Noise.

Machinery; EN 60204-1: 2006+A1:2009

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

EMC:

- Emissions Standards; EN 61000-6-3:2007+A1:2011, EN61000-6-4:2007+A1:2011, EN55011:2009+A1:2010
- Immunity Standards; EN 61000-6-1:2007, EN 61000-6-1:2007,
- See Table on the next page:

• For three phase ACV, EMC tests shall be performed per the table below

Applicable emissions standards	EN61326-1 (CISPR11)	Industrial Environments - Class A - Test Limits & Levels	
Radiated Emissions	EN55011:2009+A1:2010 (CISPR11)	30 MHz to 230 MHz 230 MHz to 1 GHz	40 dB (µV/m) 47 dB (µV/m)
	FCC Part 15, (CFR47 Part 15.109)	30 MHz to 88 MHz 88 MHz to 216 MHz 216 MHz to 960 MHz > 960 MHz	90 dB (µV/m) 150 dB (µV/m) 210 dB (µV/m) 300 dB (µV/m)
Conducted Emissions	EN55011:2009+A1:2010 (CISPR11)	150 kHz to 500 kHz	79 dB (µV) (quasi-pk), 66 dB (µV) (avg)
	FCC Part 15, (CFR47 Part 15.107)	500 kHz to 30 MHz	73 dB (µV) (quasi-pk), 60 dB (µV) (avg)
Applicable immunity standards		Industrial Environments - Test Limits & Levels	
ESD	IEC61000-4-2 (B)	Air: AC, DC, Signal	±2 kV, ±4 kV, ±8 kV
		Contact: AC, DC, Signal	±1 kV, ±2 kV, ±4 kV
Radiated RF immunity	IEC61000-4-3 (A)	Enclosure @ 80 MHz to 1 GHz	10 Vrms/m @ 80% AM, 1 kHz
		Enclosure @ 1 GHz to 2.7 GHz	3 Vrms/m @ 80% AM, 1 kHz
Fast transients/burst	IEC61000-4-4 (B)	AC, Signal	±2 kV, ±1 kV
Voltage surges	IEC61000-4-5 (B)	Common: AC, Signal	±2 kV, ±1 kV
		Differential: AC, Signal	±1 kV, ±1 kV
Conducted RF immunity	IEC61000-4-6 (A)	AC @ 150 kHz to 80 MHz	10 Vrms @ 80% AM, 1 kHz
Magnetic field immunity	IEC61000-4-8 (A)	Three mounting axis	30 A/m
Voltage dips and interrupts	IEC61000-4-11 (B)	3 dips, 10 sec apart	> 95% dip for 1 cycle @ 50/60 Hz 30% dip for 500 ms @ 50/60 Hz 60% dip for 200 ms @ 50/60 Hz
	IEC61000-4-11 (C)	3 dips, 10 sec apart	> 95% interrupt for 5 sec @ 50/60 Hz

• For single phase ACV EMC tests shall be performed per the table below:

Applicable emissions standards	EN61326-1 (CISPR11)	Industrial Environments - Class A - Test Limits & Levels	
Radiated Emissions	EN55011:2009+A1:2010 (CISPR11)	30 MHz to 230 MHz 230 MHz to 1 GHz	40 dB (µV/m) 47 dB (µV/m)
	FCC Part 15, (CFR47 Part 15.109)	30 MHz to 88 MHz 88 MHz to 216 MHz 216 MHz to 960 MHz > 960 MHz	90 dB (µV/m) 150 dB (µV/m) 210 dB (µV/m) 300 dB (µV/m)
Conducted Emissions	EN55011:2009+A1:2010 (CISPR11)	150 kHz to 500 kHz	79 dB (µV) (quasi-pk), 66 dB (µV) (avg)
	FCC Part 15, (CFR47 Part 15.107)	500 kHz to 30 MHz	73 dB (µV) (quasi-pk), 60 dB (µV) (avg)
Applicable immunity standards	EN61326-1 (Performance Criterion)	Industrial Environments - Test Limits & Levels	
Electrostatic Discharge	EN61000-4-2 (B)	Contact	±1 kV, ±2 kV, ±4 kV
		Air	±2 kV, ±4 kV, ±6kV, ±8 kV
Radiated RF Susceptibility	EN61000-4-3 (A)	Enclosure @ 80 MHz to 1 GHz	10 Vrms/m @ 80% AM, 1 kHz
		Enclosure @ 1.4 GHz to 2 GHz	3 Vrms/m @ 80% AM, 1 kHz
		Enclosure @ 2 GHz to 2.7 GHz	1 Vrms/m @ 80% AM, 1 kHz
Electrical Fast Transient/Burst	EN61000-4-4 (B)	AC Power, DC Power	±2 kV
		I/O (mains connected)	±2 kV
		I/O (non-mains)	±1 kV
Voltage Surge	EN61000-4-5 (B)	AC Power, DC Power	±1 kV (DM), ±2 kV (CM)
		I/O (mains connected)	±2 kV (CM)
		I/O (non-mains)	±1 kV (CM)
Conducted RF Immunity	EN61000-4-6 (A)	AC Power, DC Power, I/O @ 150 kHz to 80 MHz	3 Vrms @ 80% AM, 1 kHz
Magnetic Immunity	EN61000-4-8 (A)	Three mounting axis, X, Y, Z	30 A/m, 60 sec dwell
Voltage Dips and Interrupts	EN61000-4-11 (B)	3 dips, 10 sec apart 3 dips, 10 sec apart 3 dips, 10 sec apart	100% dip for 1 cycle @ 50/60 Hz 60% dip for 200 ms @ 50/60 Hz 30% dip for 500 ms @ 50/60 Hz
	EN61000-4-11 (C)	3 dips, 10 sec apart	100% interrupt for 5 sec @ 50/60 Hz

- Airborne Noise to EN 60204-1:2006+A1:2009
- SIL (Safety Integrity Level) – Certain configurations of the MX actuator shall be available as either SIL 2, in a 1oo1 installation, or SIL 3 in a 1oo2 installation. Only SIL certifications granted by exida Certifications are permissible. SIL certification shall be available with or without PST (Partial stroke testing), but PST is preferred as the FIT (Failures in time) calculations are significantly improved (not to exceed 388 FIT in a “Dangerous Undetected” mode).

Options

Lost Power Buffer

After the actuator has been powered by line power for one hour, it shall automatically withstand most power outages while maintaining the correct state of the S status contacts, even if the user repositions the actuator manually with the handwheel. To maximize its self-power time while the line power is lost, the actuator will place itself in its lowest possible power usage mode. The LCD will darken (sleep mode) until it is needed to be viewed. The LCD can be activated by moving the black knob to OPEN (YES) or by moving the actuator with the handwheel. After 10 seconds of inactivity, the LCD will return to sleep mode. The use of batteries to perform this function shall be prohibited.

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 bands, deadband, signal polarity, motion inhibits time, and fail position shall be adjustable through the LCD. Deadband shall be adjustable to +/- 0.1% full span.

Relays for Status and Alarms

Up to eight additional latching output contacts rated 250 VAC/30 VDC, 5 A and configurable to represent any actuator status in either N/O or N/C state shall be available: mid-travel position, switched to local, overtorque, motor over temperature, manual operation, switched to remote, switched to stop, valve moving, close torque switch, open torque switch, hardware failure, ESD active, inhibits active, valve jammed, analog IP (input) lost, lost phase, and network controlled.

Two-Speed Timer

A two-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 0.5 to 20 seconds and the OFF pulse cycles configu-

rable from one to 200 seconds.

Bluetooth

A Bluetooth option shall be available which permits a user to download or upload configuration routines via a standard low power wireless communication path to an actuator. The actuator shall communicate via Bluetooth to a Bluetooth-equipped PC, PDA, or cell phone, compatible with Windows Mobile platform and actuator diagnostics GUI (Graphical User Interface) software. The Bluetooth option shall contain Frequency Hopping Spread Spectrum (FHSS), which permits a reliable communication link even in a “noisy” environment. The Bluetooth option shall contain 128-bit data encryption enabled to protect the privacy of the link. Bluetooth communication shall be accessible up to 10 m from the actuator in all directions. The ability to enable the Bluetooth communication link shall be password protected. A visible blue LED in the controls LCD window shall be included to signify an active Bluetooth link to the actuator is established.

110 VAC, 15 Va - Discrete remote control may be configured as two, three, or four wires for open-stop-close control and powered by the actuator’s internal supply of 110 VAC, 20 W. The voltage values for signal threshold shall be 19.2 VAC/VDC and 5.0 VAC/VDC respectively. The maximum load for 110 VAC is 15 mA. The internal supplies shall be protected against over current and short circuit faults.

DDC (Distributed Digital Control)

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 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 address-able 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.

FOUNDATION Fieldbus

A FOUNDATION Fieldbus (FF) protocol shall comply with the IEC 61158-2 Fieldbus H1 standard. The device shall be able to support several topologies, such as point-to-point, bus with spurs, daisy chain, tree, or a combination of these. The FF device shall have network features that include:

- Link Active Scheduler (LAS) that controls the system
- High-speed communications up to 31.25 kbits/sec
- Peer-to-peer communication
- Input and output function blocks
- Device descriptions
- Network communication
- Configurable by user

LAS specification: Fieldbus segments have one active LAS at a given time, which is the bus arbiter, and does the following:

- Recognizes and adds new devices to the link
- Removes non-responsive devices from the link
- Schedules control activity in, and communication activity between, devices
- Regularly polls devices for process data

- Distributes a priority-driven token to devices for unscheduled transmissions

PROFIBUS DP_V1 Specification

A Profibus (PB) DP_V1 protocol shall comply with EN50170 Fieldbus Standard for RS-485 communications. The device shall be able to support several topologies, such as, point-to-point, bus with spurs, daisy chain, tree, or a combination of these. The PB device shall have network features that include:

- High-speed communications up to 1.5 m/bits/s
- Master-to-slave and peer-to-peer communication
- Standby communication channel
- Analog and digital input and output function blocks
- Device descriptions configurable by user
- Input and output function blocks

High Speed Data Exchange – Startup Sequence

- Power ON / Reset – power on / reset of master or slave
- Parameterization – download of parameters into field device (selected during configuration by the user)
- I/O Configuration – download of I/O configuration into the field device (selected during configuration by the user)
- Data Exchange – cyclic data exchange (I/O Data) and field device reports diagnostics

PROFIBUS PA Specification

A Profibus PA protocol shall comply with EN50170 Fieldbus Standard and Fieldbus physical layer per IEC 61158-2 for communications. The device shall be able to support several topologies, such as, point-to-point, bus with spurs, daisy chain, tree, or a combination of these. The PB device shall have network features that include:

- High-speed communications up to 31.25 kbits/s with Manchester coding
- Peer-to-peer communication
- Bus powered for 9 to 32 VDC and 15 mA per actuator
- Stand-by communication channel
- Analog and digital input and output function blocks
- Device descriptions
- Configurable by user

DeviceNet Specification

A DeviceNet device shall comply with CAN-based protocol and shall provide the following features:

- DeviceNet uses a trunk / dropline topology, certified for interoperability with ODVA.
- The device shall have as standard DeviceNet Group 2 server implementation.
- The device shall have as standard a bus-powered network interface that allows power alarm information to be communicated when actuator loses main power. The actuator does NOT drop off the network when 3-phase power is lost.
- The device shall have as standard various I/O connection types available to accommodate the network user's control and monitoring network architecture.
- The device shall have as standard polled I/O connection.

- The device shall have as standard bit strobed I/O connection.
- The device shall have as standard change of state / cyclic I/O connection.
- The device shall have as standard explicit connections defined as:
 - Various assembly objects and sizes which allow the network user to determine how much data to transfer to accommodate network installation data throughput requirements.
 - Automatic BAUD rate detection.
 - Node address configurable via local setup menu, or via the remote network user.
 - Broadcast or group network originated ESD support.

HART Specification

- Complies with HART Communication Protocol Specification (Document HCF_SPEC-13) for Revision 7.3
- Digital signal on conventional 4-20m ADC analog signal
- 1200 bps binary phase — continuous Frequency-Shift-Keying
- Master-Slave communication method
- Point-to-point or multi-drop network topology
- Distances up to 1800 meters/network (up to 15 devices)
- EDDL (IEC 61804-2, EDDL) with methods for all supported Common Practice & Device Specific commands

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 two selector switches (one for OPEN-STOP-CLOSE function) and two lights for position indication (RED for OPEN and GREEN for CLOSED). The other selector switch shall include three positions (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 A at 600 VAC, shall be provided to isolate the actuator from the three-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 TRAXON Synthetic 75W-90 gear oil and shall be suitable for an ambient temperature range from -60C (-76F), for certain hazardous environment classifications 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 LCD shall include a solid-state, self-regulating heater. Standard hardware shall be acceptable.

Solid State Motor Reverser (SSMR)

A solid state motor reverser shall be a standard option for three phase ACV applications 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: an overload protection fuse that protects user and equipment and a semiconductor fuse that protects semiconductors from voltage-induced spikes (surges).
- Actuators with the SSMR standard option shall be suitable for modulating service up to 1800 starts per hour as listed as defined by IEC- 34, ROTATING ELECTRIC MACHINES:
- Rating category = S4_50%_1800 S/H, defined as;
 - S4 = intermittent periodic duty, with starting
 - 50% = total duration factor of each cycle, i.e. one second “ON,” two seconds “OFF,” for three seconds total duration factor
 - 1800 S/H = 1800 starts per hour
 - A solid state motor controller shall be standard for single phase ACV applications

Negative Switching (Positive Earth)

The ability to accommodate a control scheme that utilizes positive earth shall be provided. All other functions shall not be affected when the earth ground is switched.

Class H, 30 Minute Duty Motors

The motor shall be three-phase / 60-cycle (208, 230, 360, 440, 460, 575 V) or three-phase / 50-cycle (380, 400, 440, 415, 525 V) with Class H 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 plug-in connector and shaft coupling.

Single phase ACV motors are supplied with H class insulation as standard.

Linear Base

A linear base shall be supplied that meets the requirements of EN 15714, Electric Actuators for Industrial Valves as it applies to the base configurations. The linear base shall be attached to an A1 thrust base to sustain the thrust loading of the valve. The actuator and linear base combination shall be capable of meeting at least the Class “C” requirements of the EN document, preferably to 2,000,000 overall modulating cycles. Preference shall be given to actuators and linear bases that meet Class “D” modulation, or continuous duty classification. The linear base stems shall be stainless steel and capable of being attached to the valve stem using a split ring clamp or internal female thread, depending on the valve stem requirement. The linear base shall be available in either MSS or ISO mounting flanges. A grease fitting shall be supplied to permit adding lubrication as necessary to the stem. A protective bellows shall also be supplied, protecting the stem and permitting lubrication to be retained on the stem.



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