Suggested Specification

GENERAL Electric actuator shall include the integral reversing controls, double reduction gearing, removable valve-stem drive nut/bushing, mechanically interfaced position and torque overload limits, ductile iron gear case and automatic declutchable hand-crank. The mechanical actuator design shall have a minimum of 10 years of proven dependable service.

GEARS Motor speed reduction shall be by means of a gear train consisting of hardened steel spur gears and self-locking worm and worm gear set. The worm shall be heat-treated alloy steel and have worm thread surface rolled or ground. The worm gear shall be bronze. Non-metallic gears in the power train are not acceptable.

ROTATING COMPONENTS All gearing and shafting shall be supported on antifriction bearings. All thrust components shall be supported by use of tapered roller bearings. Power shall be transmitted via splined connections. Keys are not acceptable.

MANUAL OVERRIDE The actuator shall be furnished with a handcrank located in a 90-degree plane from the actuator output drive, with a maximum rim pull requirement of 80 pounds (350 Newtons) for valve travel loads. An external manual declutch lever shall be included to place the actuator in the manual mode. The lever shall not require more than a 10-pound (44 Newtons) force to engage or disengage, even when the valve has been tightly seated. The lever is to be padlockable in either manual or motor mode. Operation by motor shall not cause the handcrank to rotate, or operation of the handcrank shall not cause the motor to rotate. Handcrank shall operate in the clockwise direction to close as a standard.

LUBRICATION All gearing and bearings shall be oil or grease lubricated and suitable for year-round service based on prevailing ambient temperature conditions of -40ºF to 160ºF (-40ºC to 70ºC).

ELECTRIC MOTORS shall be specifically designed for valve actuator service, and be totally enclosed, nonventilated (TENV). Motor shall be capable of operation under maximum specified loads when voltage to the motor is +/- 10% of the nominal voltage. Motor shall have Class F insulation with thermal overload sensors embedded in the motor windings. The motors shall be external frame-type, with a 15 minute duty rating at 104ºF (40ºC), and a range of power outputs to provide full rated torque from each actuator model over the complete range of speed . The actuator shall not require recalibration when motor is changed or replaced. Actuator's motor shall be powered by either single-phase or three-phase power source, in accordance with the project specifications.

POSITION LIMITS shall be mechanically geared to the drive mechanism. They will be in step with actual valve position at all times. The actuator shall utilize an Absolute Position Detector***** (APD) to continuously monitor valve position, even during a power failure. A battery shall not be required to maintain APD limit settings. Position limits shall be rated 5 amps at 250 VAC and 5 amps at 30 VDC. A minimum of four (4) contacts, configurable as N.O. or N.C., shall be provided for reporting of valve position. ***Patented**

TORQUE LIMITS The actuator shall include an adjustable torque limit to interrupt the motor power circuit if an obstruction is encountered in either direction of travel, or when torque seating of valves is required for tight shut-off. The torque limit shall be calibrated between 15% and 100%. Torque output must be displayed on the Local Display Module (LDM) when the actuator is in either motor or manual operation to maintain awareness of loads being applied to a valve. Mechanical torque springs shall be field-replaceable without dismantling the actuator, and allow the actuator's torque output range to be field modified when required.

POSITION INDICATION shall be in step with valve position at all times whether operation is electrically or manually operated. Local valve position shall be displayed graphically on the LCD display in 1-degree increments on a 0 to 100% scale. When specified, an optional Display Backup Module (DBM) shall be provided to power the LDM and discrete ouputs when the primary power is lost. When specified, a 4-20mA position feedback signal shall also be provided. In addition, all part-turn actuators shall have an indicator dial located on top of the output drive gear.

CONTROL COMPARTMENT shall include, as a minimum, a thermostatically controlled space heater, position and torque limits and reversing controls, all housed in a control compartment that complies with NEMA 4/IP67 (Weatherproof), NEMA 6/IP68 (Submersible up to 50 FT Head for 7 Days), NEMA 7 Factory Mutual Class I, Division 1, Groups C&D and Class II, Division 1, Groups E, F&G or CENELEC (ATEX) EEx d IIB T4 (Explosionproof), as specified for the project.

Suggested Specification

SEPARATE TERMINAL CHAMBER (STC) The actuator shall be furnished with a sealed 48-point terminal chamber. The terminals shall allow installation of bare wire(s) or with crimped terminations. The primary control fuses must be located within the STC for ease of replacement. Removal of any other sealed control compartment cover in order to change a fuse is not acceptable. All wire termination screws shall be factory installed; loose terminal screws are not acceptable. Terminal identification shall be clearly marked as an integral part of the terminal strip. Separate cards for terminal identification are not acceptable.
The termination cover shall be threaded rather than bolted for easy access.

LOCAL DISPLAY MODULE (LDM) shall have an LCD graphic display for displaying mode of operation, status, position, torque and any alarm condition. The display shall have a 32 character alphanumeric message center for displaying actuator setup selections and data entry feedback. The standard language shall be English, but a means for allowing the user to change messages to other languages via a laptop computer or PDA device shall be available utilizing the actuator's IrDA port.

- Local Operation shall be by an Open and Close control knob and a Local, Stop, and Remote selector knob. The actuator shall include three (3) long-life, high-intensity LED-type pilot lights to indicate valve open (red), opening (flashing red), closed (green), closing (flashing green), stopped in mid-travel (yellow), and alarm conditions (flashing yellow). Standard colors for open and closed can be easily reversed during configuration. The local-operation, display and calibration of the actuator shall be through the Local Display Module (LDM). The LDM can be located in either of two positions (Front or Side) in the control compartment and rotatable in 90-degree increments to suit the orientation of the valve and allow the best viewing angle for the plant operator.

REMOTE DISPLAY MODULE (RDM) shall be provided when actuator location is unaccessible to the plant operator, and shall have identical features and perform the same functions as the LDM. The RDM shall communicate with the actuator via RS-485 twisted, shielded wires. It can be located up to 4,000 feet (1200 meters) from the actuator. Each actuator shall support (1) LDM and up to two (2) RDM's. One RDM may be powered from the actuator's internal 24VDC power supply and the other from an external 115VAC or 220VAC power supply.

CALIBRATION of the actuator controls shall be accomplished through the use of the LDM or RDM control knobs, PC or PDA device (via RS-485 or IrDA port), or by a Vendor supplied key-chain sized remote control device (Clicker). Responding to Yes, No, Back and Next prompts shall accomplish all configurations of the actuator. All calibration prompts shall be via easy to understand statements; no special symbols shall be used.

DISCRETE OUTPUTS The actuator shall have as standard five (5) relay outputs, configurable as N.O. or N.C., of which four (4) can be configured for any of the following conditions. (The same condition may be assigned to two or more outputs.)

- Valve opening or closing
- Loss of control voltage
- Monitor relay (actuator not available)
- Local ESD input active
- Open or close inhibit input active
- Valve stalled (valve not moving on command)
- Loss of analog input (when Futronic ACM installed)
- Low battery (when optional display backup module (DBM) is installed)
- Motor overload (thermal contacts or overload relays (when installed))
- Generic output (when Controlinc ACM digital module installed)
- Open or close overtorque
- Selector switch Local-Stop-Remote
- Lost phase (one or more phases lost)
- ESD active
- Actuator fail alarm (failed self-diagnostics)
- Valve drift (valve moving without command)
- Fully opened/closed or intermediate position indication

The fifth relay output shall be a non-latching monitor relay that will report any internal fault condition (blown fuse, voltage loss, etc).

An optional Auxiliary Relay Module (ARM) can be installed to provide additional four (4) relay outputs that function as described above.

Suggested Specification

ELECTRONICS FAULT MONITOR (EFM) shall be independent circuits that ensure safe operation or shut down of the motor control circuits to protect the actuator and valve. The EFM monitors all internal modules and shuts down the actuator if an unsafe condition is detected. It shall be constructed completely with independent hardware and shall not contain a microprocessor or be dependent upon software programming. All unsafe conditions are reported to the user through the LDM or connected digital network (if installed). The EFM shall independently sense a 95-100% overtorque condition and shut down the motor control if the condition lasts for more than 10 seconds. After shutdown, the actuator must be commanded to move in the opposite direction before normal operation can resume.

OPEN-CLOSE SERVICE CONTROLS shall include as a minimum (refer to the Suggested Wiring Diagram TEC-001 on back page):

- Reversing Controls The reversing contactor shall be both electrically and mechanically interlocked. A control power transformer assembly and a phase correction circuit shall also be provided. Remote operation shall be accomplished by use of 2, 3, or 4-wire control and shall be powered internally by 24VDC, or externally by a 18-150VDC or 20-250VAC power source. Other options, such as two speed pulse timers and anti-water hammer, shall be configurable when required.

ANALOG CONTROL The analog comparator circuit shall be a solid-state, plug-in PC board that will accept a 4-20mA input control signal from a remote position controller. The circuit shall provide, as standard, one (1) 4-20mA output signal for remote position indication and one (1) 4-20mA output signal for torque indication. The system shall allow calibration of Zero, Span, Band and Delay. Both input and output signals shall be optically isolated. The circuit shall be configurable for Remain-In-Last Position or Travel-To-Any-Preset-Position upon loss of control signal. Feedback of valve position shall be through the Absolute Position Detector (APD). Resolution of analog input and output signals shall be 12 bits or 0.025%.

- Positioning Control Service shall allow for 1200 starts per hour for all 3-phase motors. Single-phase motors will be rated for 100 starts per hour. Positioning accuracy of +/- 1.0%, independent of valve operating time, shall be provided. A reversing contactor which is both electrically and mechanically interlocked, shall be provided. The system shall be equivalent to EIM Futronic II.

- Process Control Service when specified, shall allow for 1200 starts per hour for 3-phase power. All reversing mechanisms shall be of the solid-state type. Positioning accuracy of +/- 0.5%, independent of valve operating time, shall be provided. The control system shall be equivalent to EIM Futronic IV.

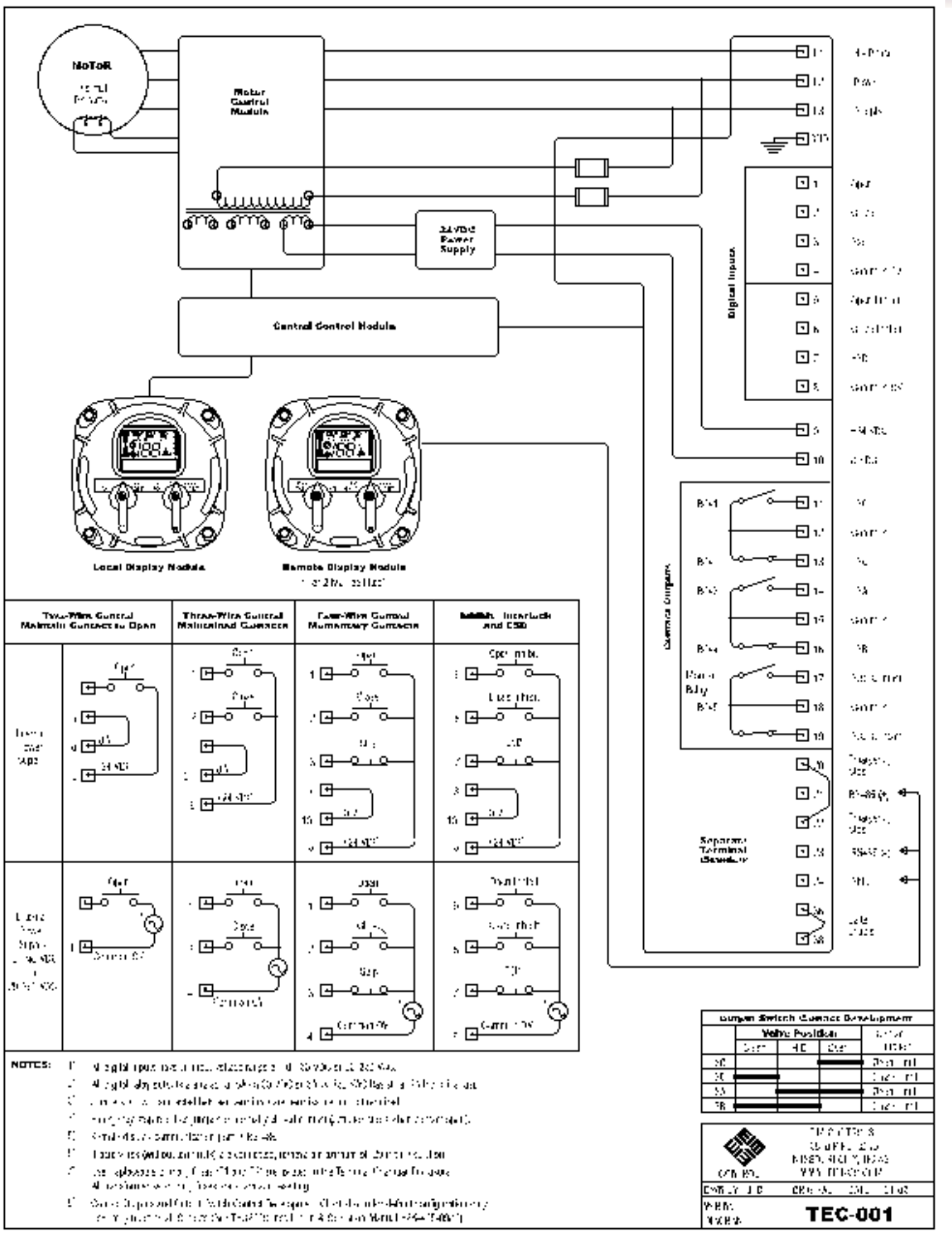
DIGITAL NETWORK when specified, shall provide an Auxiliary Control Module (ACM) that will allow for digital communication across a single RS-485 twisted, shielded wire network. The communication protocol shall be Modbus RTU, DeviceNet, Foundation Fieldbus or ProfiBus DP as stated in the project specifications. All actuators shall have the ability to communicate directly to the Host (DCS) or, if required by the project specifications, through the use of a network master station.

PROJECT REQUIREMENTS All actuators on the project shall be by the same manufacturer for control circuit consistency, ease of maintenance, and availability or stocking of spare or replacement parts.

ACCEPTABLE ACTUATOR MANUFACTURERS shall be limited to the following:

- EIM Company, Inc. - Missouri City, Texas - Series TEC2000 or Engineer pre-qualified equivalent.

SUGGESTED WIRING DIAGRAM TEC-001



For more information, contact your local distributor: