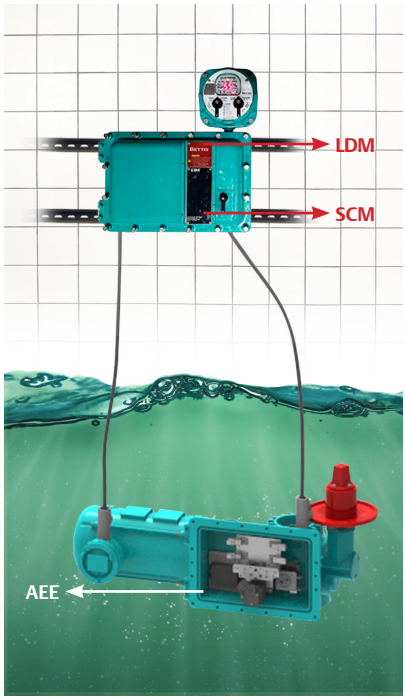
Submersible Actuator - Aquanaught

Motorized Operations for Under Water Valves

- Engineered and designed for water and waste water applications
- Water Proof Electrical Enclosure
- AEE – Actuator Electrical Enclosure can continue to function even if completely submerged in water
- Optional Quick connectors between AEE & SCM (Separate Control Module)
- Ease of installation & service related to maintenance
- Compact Size and Weight
- IP68:
  - 150ft, Continuous 7 days, Cover Closed
  - 70ft, Continuous 7 days, Cover Open
- FM, Class 1 Div 1, Group D for N. America NEC 500 standard
- 24VDC battery operated version available for emergency shutdown operations

Figure 1.



- AEE - Actuator Electric Enclosure
- SCM - Separate Control Module
- LDM - Local Display Module

Suggested Specification

Aquanaught Series Features

General

- Electric actuator, specifically designed for submersion applications, shall include the electric motor, reduction gearing, valve stem drive nut/bushing, position limit switches, mechanical overload torque switches, ductile iron gear case and declutchable handwheel or 2” wrench nut. Its power and monitoring electrical system shall be in a separate control module for mounting away from the water source.

Gears

- Motor speed reduction shall be by means of a double-reduction 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. Operating time/output RPM changes shall easily be accomplished by spur gear set changes without having to change motor RPM.

Rotating Components

- All gearing and shafting shall be supported on anti-friction bearings. All thrust components shall be supported on tapered roller bearings. Electric actuator drive sleeve shall be supported from the top and bottom by tapered roller bearings. Bushings are not acceptable.

Handwheel Drive

- The actuator shall be furnished with a handwheel or hand-crank located in a 90 degree plane from the actuator output drive, with a maximum rim pull requirement of 60 pounds for valve travel loads. An external manual declutch lever shall be included to place actuator in the manual mode.

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The lever shall not require more than a 10 pound force to engage even when the valve has been tightly seated. The lever is to be padlocked in either handwheel or motor mode. Operation by motor shall not cause the handwheel to rotate and operation of the handwheel shall not cause the motor to rotate. Handwheel shall operate in the clockwise direction to close. Engagement of the handwheel gearing shall not disconnect actuator self-locking worm gearing from the driven load. This is a safety feature, independent of valve stem nut (drive nut) static friction, to prevent movement of the driven load.

Optional 2" AWWA wrench nut operation When specified an optional 2" AWWA Wrench Nut with input torque limiter shall be provided instead of handwheel or hand-crank for manual operation. The 2" AWWA wrench nut shall be parallel to the drive sleeve of the actuator to permit remote operation on loss of electric power. Load shall be torque only. Auxiliary drive wrenches shall be limited to 100 RPM. Impact drivers are not allowed.

Lubrication

- All gearing and bearings shall be grease or oil lubricated to above 90% of the actuator filled volume and it shall be suitable for year-round service based on ambient temperature conditions.

Electric Motor and MCB (Motor Conduit Box)

- Electric motors shall be specifically designed for valve actuator service under submersion application, and shall be totally enclosed, non-ventilated. The motors shall be capable of operation under maximum specified loads when the voltage to the motor is +/- 10% of the nominal voltage. Motors shall be Class F insulated with Class-B thermal overload sensors imbedded in the motor windings. Motor replacement shall not require recalibration of the actuator's torque output or the use of computers. Motors shall be field replaceable as a complete assembly including motor housing, inboard and outboard bearings, rotor, stator and end bells/flanged mounting adapter. Each motor shall be helium proof tested to pass the 2X10E-6 std. cc/sec leak rate ensuring the long service life under submergence where routine maintenance is not possible.

The motor shall come with MCB (Motor Conduit Box) where all the motor wire leads shall be located and protected. The MCB shall feature the following:

- Motor wire leads entry potted to prevent water entry
- MCB threaded cover with o-ring seal
- Motor wire splicing protected by high voltage rated hermetic sealed quick connectors

Limit Switch (LS)

- Open and Close limit switches shall be geared to the drive mechanism and in step with actual valve position at all times during power and manual override operating modes. Limit switches shall be hermetically sealed within fused glass to metal enclosures. Switches shall be activated by a rotor type design. Limit switch gear mechanism shall be enclosed to prevent entrance of foreign matter or wire entanglement.
  - Switch contacts shall be rated for 0.5 amps @ 125 VAC

Torque Switch (TS)

- The actuator shall include an adjustable torque switch to interrupt the motor power circuit when an obstruction is encountered in either direction of travel or when torque seating of valves is required for tight shut off. The torque switch shall have a calibrated dial for adjustment and have means to ensure maximum actuator rating is not exceeded. Torque switches shall be hermetically sealed within fused glass to metal enclosures. Contacts shall have the same construction and rating as the limit switches. Mechanical torque springs for load control shall be field replaceable without need of actuator dismantling or removal of the worm assembly. Torque switch shall operate in both motor and handwheel modes of operation. Torque control designs that do not use mechanical torque springs are unacceptable.
  - Torque Switch shall be rated for 0.5 amps? @ 125 VAC

Position Indication

- Position indication and feedback shall be mechanically driven using a non-contacting absolute, Hall-Effect encoder. The encoder shall not require batteries to track position when power is removed and actuator is manually operated. The absolute encoder shall be epoxy encapsulated and sealed. The actuator shall also include a 4-20mA signal for remote position indication. The position indication signal shall be powered by the actuator's internal 24VDC power.

Submersible Quick Connector

- Each LS, TS, Hall Effect and water sensor shall be coupled with quick connector consisting of receptacle and plug portion. The connectors are sized differently to prevent installation error. The cable will be factory manufactured with plug portion of the connectors staged at different location allowing clearance through the electrical enclosure port for quick removal if needed. Quick connector design allows each critical component to be removed from the actuator at ease for re-calibration or replacement purposes.

Actuator Enclosure (AEE)

- The actuator electrical enclosure shall be FM approved for hazardous locations NEMA 7 Class 1, Division 1, Group D. The enclosure shall be ABS American Bureau of Shipping (US Coast Guard) tested and approved for submersion to 150 feet, continuous operation for 7 days. Without the protection of the electrical enclosure, the actuator shall be ABS tested and approved for submersion to 70 feet, continuous operation for 7 days.

  The rectangular electrical enclosure shall have a bonded O-ring seal and a hinged cover. Cover bolts shall be captive 316 stainless steel hex head screws. The actuator electrical enclosure shall house the hermetically sealed limit, torque switches and quick connectors, epoxy encapsulated absolute position encoder, and optional water sensor. The maximum distance between the AEE & SCM shall not exceed 200 ft.
  - Cabling:
  - The actuator shall be factory supplied with 60 feet of power and control

SCM (Separate Control Module)

- The SCM Separate Control Module for electrical controls shall be remotely located above the actuator and shall include electrically and mechanically interlocked reversing contactor, epoxy impregnated control power transformer with primary and secondary fuses, inverse time overload relay(s) (current sensors) and terminal strips for power and control wiring. Fuses shall be easily accessed and replaced without having to remove components or assemblies other than removal of a terminal strip cover.

  The SCM shall include an integral mounted circuit breaker/ disconnect switch per NEC National Electrical Code with external handle through the enclosure cover that must be turned off to open the cover. The SCM enclosure shall have a hinged cover with bonded O-Ring and captive 316 stainless steel hex head bolts. The enclosure shall be FM certified NEMA 7, Class 1, Division 1, Group D. All printed circuit boards shall be rated from -40oC to 70oC.

LDM (Local Display Module)

- The SCM Separate Control Module shall be provided with close-coupled LDM Local Display Module containing the micro-processor controller used as the main controller to setup and operate the actuator. The LDM shall display operating parameters, valve position, alarms, and provide for configuration of the actuator controls. The LDM shall include 2-digit LED (light emitting diode) digital position indication showing percentage open and CL for close and OP for 100% open. LED lights shall be provided for:
  - Valve position indication – Close- Mid- Open.
  - Close and Open direction torque switch trip
  - Selector switch position – Local-Off-Remote
  - Alarm indications: communication error, stall, local ESD (emergency shut down), phase alarm, control failure, actuator failure, motor overload, lost analog input, lost control voltage, and water detection. All possible alarms that may be displayed shall be listed on the name plate of the LDM.

    The LDM shall have two selector knobs. One selector knob shall function as a spring-return Open-Close selector, and Down or UP functions during setup. The second selector knob shall function as a Local-OFF-Remote selector, and Back, Stop or Next functions during setup. The Local-Off-Remote selector shall be padlockable in any position. The LDM shall be programmable to select either position or torque seating.

Optional RDM (Remote Display Module)

- When specified, an optional RDM Remote Display Module shall be provided that can be mounted up to 500 feet from the SCM Separate Control Module. The RDM enclosure shall have the same enclosure rating as the SCM and LDM. The RDM shall have the same display and selector knobs as the LDM Local Display Module. Selector switch LEDs shall indicate the combined logic of the LDM and RDM selector switch positions, the selected mode of operation Local-Off-Remote. Electric operation shall be prevented when either the LDM or RDM selector is in OFF position.
  Remote operation shall require both LDM and RDM selectors are in Remote position.

ESD (Emergency Shut Down) Feature

- The actuator shall include a hardware circuit within the LDM Local Display Module to detect an externally wired closed loop circuit. When an open circuit is detected the local ESD shall be activated. Valve operation shall be DIP switch (dual inline pin) selectable for valve to go OPEN or go Close on an ESD signal. The LOCAL hardwired ESD when set by the DIP switches shall override microprocessor electronics and shall force the valve to the state selected by the DIP switches.

Startup and Configuration

- The actuator manufacturer or factory authorized service facility shall assist in startup and configuration of the actuator. The contractor shall install and wire the actuator including connections between the AEE and SCM, and optional RDM (when specified).

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