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MILITARY SPECIFICATION

VALVE ACTUATOR, DIRECT COUPLED, GEAR DRIVEN ELECTRICALLY POWERED FOR NAVAL SHIPBOARD PROPULSION AND AUXILIARY SYSTEMS (METRIC)

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification describes an electrically powered, directly coupled, gear driven valve actuator primarily for valves in main propulsion, auxiliary and cargo systems of Naval ships.

1.2 Classification. Actuators shall be characterized by the following types, classes, and services, as specified (see 6.2.1):

Type I - Actuator for gate and globe valves
Type II - Actuator for quarter turn valves (90 degrees)

Class I - Material for general application
Class II - Material for non-magnetic and corrosive environment
Class III - Material for light weight application

Service I - Submersible
Service II - Explosion proof
Service III - Submersible and explosion proof

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-C-465	- Copper-Aluminum Alloys (Aluminum Bronze) (Copper Alloy Numbers 606, 614, 630, 632M, and 642); Rod, Flat Products With Finished Edges (Flat Wire, Strip, and Bar), Shapes, and Forgings.
QQ-N-286	- Nickel-Copper-Aluminum Alloy, Wrought.
TT-P-1757	- Primer Coating, Zinc Chromate, Low-Moisture-Sensitivity.

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MIL-S-901	- Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for.
MIL-E-917	- Electric Power Equipment, Basic Requirements (Naval Shipboard Use).
MIL-S-1222	- Studs, Bolts, Hex Cap Screws, and Nuts.
MIL-E-2036	- Enclosures for Electric and Electronic Equipment, Naval Shipoard.
MIL-C-2212	- Controllers, Electric Motor A.C. or D.C., and Associated Switching Devices.
MIL-G-3787	- Glass, Laminated, Flat; (Except Aircraft).
MIL-S-8660	- Silicone Compound, NATO Code Number S-736.
MIL-P-15024	- Plates, Tags and Bands for Identification of Equipment.
MIL-P-15024/5	- Plates, Identification.
MIL-E-15090	- Enamel, Equipment, Light-Gray (Formula No. 111).
MIL-E-16298	- Electric Machines Having Rotating Parts and Associated Repair Parts: Packaging of.
MIL-M-17059	- Motors, 60-Cycle, Alternating-Current, Fractional H.P. (Shipboard Use).
MIL-M-17060	- Motors, 60-Hertz, Alternating-Current, Integral-Horsepower, Shipboard Use.
MIL-L-17331	- Lubricating Oil, Steam Turbine and Gear, Moderate Service.
MIL-S-22473	- Sealing, Locking, and Retaining Compounds: (Single-Component).
MIL-L-24131	- Lubricant, Colloidal Graphite In Isopropanol.
MIL-L-24478	- Lubricant, Molybdenum Disulfide in Isopropanol.
MIL-L-24479	- Lubricant, Red Lead and Graphite in Mineral Oil.
MIL-B-24480	- Bronze, Nickel-Aluminum Castings, for Seawater Service.

MILITARY (Continued)

DOD-G-24508 - Grease, High Performance, Multi-Purpose (Metric).
MIL-P-24548 - Penetrating Fluid.
MIL-S-45180 - Sealing Compound, Gasket, Hydrocarbon Fluid and Water Resistant.

STANDARDS

FEDERAL

FED-STD-H28 - Screw-Thread Standards for Federal Services.

MILITARY

MIL-STD-108 - Definitions of and Basic Requirements for Enclosures for Electric and Electronic Equipment.
MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
MIL-STD-271 - Nondestructive Testing Requirements for Metals.
MIL-STD-461 - Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference.
MIL-STD-462 - Electromagnetic Interference Characteristics, Measurement of.
MIL-STD-740 - Airborne and Structureborne Noise Measurements and Acceptance Criteria of Shipboard Equipment.
DOD-STD-1399, Section 300 - Interface Standard for Shipboard Systems Electric Power, Alternating Current (Metric).

(Copies of specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form). (DoD adopted)

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

AMERICAN PETROLEUM INSTITUTE (API)

STD 607 - Fire Test for Soft-Seated Ball Valves.

(Application for copies should be addressed to the American Petroleum Institute, 2101 L Street, NW, Washington, DC 20037.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2.1), a sample shall be subjected to first article inspection (see 4.3 and 6.3).

3.2 Materials.

3.2.1 Actuator housing. Actuator housing material shall be in accordance with table I. Actuator housing class shall be as specified (see 6.2.1).

TABLE I. Actuator housing material.

Class	Application	Material
Class I	General	Ductile iron, nodular iron, steel, titanium, bronze MIL-B-24480 or QQ-C-465, alloy 632M
Class II	Non-magnetic and corrosive environment	Titanium, bronze MIL-B-24480 or QQ-C-465, alloy 632M
Class III	Light weight	Titanium

3.2.2 Drive assembly. The actuator valve stem drive assembly materials shall be compatible with the valve stem to preclude galling and limit wear.

3.2.3 Painting. External surfaces, except threads and nuts, constructed of non-corrosion resistant material shall be cleaned and painted in accordance with TT-P-1757 and MIL-E-15090, type II, class II materials. Mechanical contact surfaces of supports, items requiring adjustments, internal surfaces and surfaces prepared for welding shall not be painted.

3.2.4 Prohibited materials.

3.2.4.1 The following materials and forms of materials shall not be used:

(a) Magnesium.
(b) Cadmium.
(c) Cast iron.
(d) Gravity fed aluminum castings.
(e) Zinc castings.
(f) Zinc plating.

3.2.4.2 The actuators shall not contain metallic mercury or mercury compounds, and shall be free from mercury contamination during manufacturing, testing, and inspection.

3.2.4.3 Any material emitting toxic gases or liquids during high temperature operation or during fire shall not be used.

3.2.5 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.2.6 Lubricants and compounds. Lubricants and compounds identified as shown below shall be specified for shipboard maintenance. This requirement only applies to applications where forces afloat may have to maintain or assemble and disassemble the valve on board ship. This requirement does not apply to lubricants and compounds used only in the manufacturing process such as cutting oils.

(a) Lubricants

(1) Lubricating oil in accordance with MIL-L-17331 (Military symbol 2190 TEP).
(2) Grease in accordance with DOD-G-24508.

(b) Anti-galling compounds

(1) Graphite in isopropanol in accordance with MIL-L-24131 (Military symbol CGI).
(2) Molybdenum disulfide in isopropanol in accordance with MIL-L-24478.
(3) Red lead and graphite in mineral oil in accordance with MIL-L-24479.

(c) Sealing compound in accordance with MIL-S-45180, type II.
(d) Silicone compound in accordance with MIL-S-8660.
(e) Locking compound in accordance with MIL-S-22473, grade AV.
(f) Penetrating fluid in accordance with MIL-P-24548.

3.3 Mechanical requirements. The actuator shall consist of the mechanical and electrical components in an enclosure and shall be mounted upon the valve or shall be attached to the valve by a rigid rod transmission system, as specified (see 6.2.1). The actuator shall be motor driven with an integral manual actuator.

3.3.1 Installation, operation and maintenance space. Actuator installation, operation and maintenance space shall be as specified (see 6.2.1).

3.3.2 External seals. External seals of the actuator and the valve drive assembly shall be constructed to prevent damage by shipboard environmental dirt, and shall be compatible with steam condensate, lubricating oil, Naval distillate fuel (F-76), aviation fuel (JP-5), seawater, and mixtures of the preceding.

3.3.3 Bolting. The actuator to valve fasteners shall be in accordance with MIL-S-1222 and shall be corrosion resistant steel for class I and III housings and nickel-copper-aluminum alloy in accordance with QQ-N-286 for class II housings. Threads shall be in accordance with FED-STD-H28 or ANSI B1.1. Set screws shall not be used.

3.3.4 Gears. The actuator shall transmit power from the motor to the valve stem through worm gear, hypoid gear, planetary gear, bevel gear or spur gear systems. Gear systems that are not self-locking shall employ ratios that will result in no change of position of the valve upon interruption of electric power to the actuator from the forces applied to the valve disc by the piping system fluid. Brakes, palls or other latching mechanisms shall not be used. The gears shall be steel, bronze or a combination of steel and bronze.

3.3.4.1 Lubrication. The gear train and stem drive assembly shall be lubricated with grease in accordance with DOD-G-24508 or shall be permanently lubricated.

3.3.4.2 Hammer blow. Type I actuators may be provided with a hammer blow device for electric and manual actuation.

3.3.5 Manual actuation.

3.3.5.1 Handwheel.

3.3.5.1.1 The handwheel shall be nonrising. The valve shall close by a clockwise rotation of the handwheel when facing the handwheel.

3.3.5.1.2 The direction of movement for closing and opening the valve shall be indicated by arrows and "←——OPEN/SHUT——→" shall appear on the face of the handwheel rim.

3.3.5.1.3 Handwheel diameter and maximum tangential force shall be as specified in table II.

TABLE II. Handwheel diameter and tangential force.

Handwheel diameter millimeters (mm) (inches)	Maximum tangential force newtons (pounds)
50 (2)	400 (90)
80 (3)	440 (98)
100 (4)	470 (106)
125 (5)	500 (112)
150 (6)	530 (118)
180 (7)	540 (121)
200 (8)	550 (124)
230 (9)	570 (127)
250 (10)	580 (130)
280 (11)	590 (133)
300 (12)	600 (135)
350 (14)	615 (138)
400 (16)	630 (141)
450 (18)	640 (144)
535 (21)	655 (147)
600 (24)	670 (150)
690 (27)	670 (150)
750 (30)	670 (150)
900 (36)	670 (150)

3.3.5.2 The actuator shall be provided with a differential drive or with a positive engagement, non-slipping motor priority mechanism to automatically shift from the electric to manual and the manual to electric mode of operation. Electric operation shall not cause the handwheel to turn.

3.3.5.2.1 Failure of the electrical components shall not prevent manual actuation of the valve.

3.3.6 Enclosure. The actuator shall comply with MIL-STD-108 and MIL-E-2036 for one of the enclosure services specified in table III (see 6.2.1).

TABLE III. Actuator enclosure.

Service	Description
Service I	Submersible, 15 meters
Service II	Explosion proof
Service III	Submersible and explosion proof, 15 meters

3.3.7 Torque and travel activated devices. Valve stem travel in both opening and shutting directions shall be stopped by means of a switch activated by stem position and by another adjustable switch activated by torque applied to the valve stem by the actuator. The position switch shall be capable of adjusting the valve stroke such that the valve stem will cycle between any two points within the allowable range of stem travel as determined by valve design. Torque

switches shall be provided with calibration markings. The travel activated device shall remain in step with the valve position during both electrical and manual actuation of the valve. The accuracy of the torque switch shall be plus or minus 5 percent of the torque setting. The accuracy of the travel activated device shall be plus or minus 1/2 degree for rotational position and plus or minus 1.2 mm (0.05 inch) for linear position.

3.3.7.1 Indicator lights and other equipment. When specified (see 6.2.1), the travel activated device shall control indicator lights and other equipment.

3.3.7.2 Electrical contacts. Unless otherwise specified (see 6.2.1), electrical contacts of the travel and torque activated devices shall be rated at 450 volts alternating current (Vac) and 1 ampere inductive load.

3.3.8 Local mechanical position indication. The actuator shall be provided with a local mechanical position indication. The mechanism shall indicate the open, shut, and intermediate positions using a linear or dial type indicator. Dial type indicators shall have a maximum travel of 180 degrees and shall include stops at the extremes to preclude travel overlap. The position indicator shall be readable during local manual actuation. When specified (see 6.2.1), the indicator shall provide an indication of valve stem position within plus or minus 2.5 mm (0.1 inch) of actual valve stem position.

3.3.8.1 Windows. Where windows are used for position indicators, they shall be safety glass and shall be secured by means of clips or other devices. The use of cement alone for securing the glass window is not acceptable. Glass shall conform to class I, type I of MIL-G-3787.

3.3.9 Actuator mounting and orientation. The actuator shall meet the requirements of this specification when mounted in any position. Change in actuator orientation with respect to the valve body shall be accomplished with a minimum of disassembly or field modification of the actuator.

3.3.10 Temperature. The actuators shall function at any continuous shipboard environmental temperature between minus 29 degrees Celsius (°C) (minus 20 degrees Fahrenheit (°F)) and 65°C (149°F). When specified (see 6.2.1), the actuator shall function at a continuous environmental temperature of 94°C (200°F).

3.3.11 Shock. The actuator shall withstand the grade A, class 1 hull mounted shock requirements of MIL-S-901 when mounted upon a valve and when mounted directly on the shock table.

3.3.12 Vibration. The actuator shall withstand the vibration requirements of MIL-STD-167-1 when mounted upon a valve and when mounted directly on the vibration test fixture.

3.3.13 Airborne noise. The actuator shall meet the grade A noise requirements of MIL-STD-740 during actuation.

3.3.14 Operation. The actuator shall be capable of 20,000 cycles of motor and manual operation from fully open to fully shut and 1,000 transfers between manual and motor operation and motor to manual operation without repair or adjustment under design load conditions (see 3.5.1).

3.3.15 Fire resistance. The actuator in the manual mode shall pass the fire test of 4.3.7.

3.3.16 Humidity. The actuator shall operate at relative humidities up to 100 percent for both continuous and intermittent periods, including conditions where condensation takes place in and on the actuator.

3.4 Electrical requirements. The actuator shall be designed in accordance with MIL-E-917 and be capable of passing the tests specified in 4.3.1 through 4.3.14. The actuator shall be powered by either single phase 115 Vac or three phase 440 Vac, type I power in accordance with DOD-STD-1399, section 300 as specified (see 6.2.1).

3.4.1 Motors. The motors of the actuators shall meet service A requirements in accordance with MIL-M-17059 for fractional horsepower motors and MIL-M-17060 for integral horsepower motors. Single phase motors shall be permanent split capacitor. Motor winding temperature rise shall not exceed 55°C. During stalled motor operation, motor winding temperature rise shall not exceed the thermal rating of the motor winding insulation system. The duty of motors shall be as specified (see 6.2.1).

3.4.2 Controller. When specified (see 6.2.1), the motor controller shall be provided and shall be in accordance with MIL-C-2212 and may be mounted separately from the actuator. Internally mounted reversing contactors shall function in any orientation.

3.4.2.1 Thermal sensor. When specified (see 6.2.1), the motor shall contain a thermal sensor that shall remove power from the motor if motor winding temperature rise exceeds the thermal rating of the motor insulation system. A minimum of three positive temperature coefficient thermal sensors shall be used and have a change in resistance with temperature of not less than 15 percent per degree Celsius at the thermal rating of the insulation system.

3.4.2.2 Thermal sensor monitor. When thermal sensors are specified (see 3.4.2.1), thermal sensor monitors shall be included with the controller and shall operate with the controller to remove power from the actuator if motor winding temperature rise exceeds the thermal rating of the motor insulation system as indicated by the thermal sensors. Provision for remotely overriding the thermal sensor monitor shall be provided in the controller.

3.4.3 Electrical position indicators. The actuator shall contain provision for indicator lights at the actuator and at the remote control station to indicate the open, the shut and the mid-position of the valve. This shall be accomplished by a two light system. A green light shall indicate the open position. A red light shall indicate the shut position. Both lights shall be energized at all intermediate positions. Actuators for throttling valves shall be provided with remote linear potentiometer position indicators ranging from open to shut.

3.4.4 Sealed insulation system. When specified (see 6.2.1), fractional and integral horsepower motors shall be provided with sealed insulation systems in accordance with MIL-M-17060.

3.4.5 Multipin connectors. Unless otherwise specified (see 6.2.1), multipin connectors shall not be used.

3.4.6 Electromagnetic interference. The valve actuator shall conform to the applicable limits of MIL-STD-461 requirements CE01, CE03, CS01, CS02, CS06, RE01, RE02, RS01, RS02 and RS03. The test method shall be in accordance with MIL-STD-462.

3.5 Application.

3.5.1 Actuating time. Unless otherwise specified (see 6.2.1), the actuating rates shall be as follows:

(a) Gate valves shall open and shut at a mininum speed of 30 centimeters per minute (cm/min) (11.8 inches per minute (in/min)).
(b) Globe valves shall open and shut at a minimum speed of 10 cm/min (3.94 in/min).
(c) Quarter turn valves shall have the following opening and shutting speeds for the sizes indicated:

(1) Valve sizes 350 mm (14 inches) and less shall open and shut fully in a minimum time of 20 seconds and a maximum time of 30 seconds.
(2) Valve sizes 400 mm (16 inches) and larger shall open and shut fully in a minimum time of 30 seconds and a maximum time of 60 seconds.

3.5.1.1 Motor startup. The time to transfer from manual to motor operation and attain the minimum rate of operation shall be 10 seconds maximum.

3.5.2 Axial thrust or torque. The actuator shall be capable of fully opening, shutting and seating the valve within the actuating time specified in 3.5.1 under the following conditions:

(a) Minimum steady state user voltage and maximum steady state frequency as defined in DOD-STD-1399, section 300.
(b) Worst case combination of internal pressure and differential pressure.
(c) Maximum frictional force due to resistance of the packing used to seal the valve stem and resistance in the valve during operation.
(d) Maximum seating force.
(e) Estimated maximum torque transmission losses shall be as specified when the actuator is mounted separately from the valve (see 6.2.1).

3.5.3 The actuator and valve combination shall be designed such that with maximum voltage and frequency, the valve will not be damaged in either the open or shut direction assuming failure of all devices installed to limit actuator travel.

3.5.4 Manual actuation. Unless otherwise specified (see 6.2.1), the actuator manual handwheel (see 3.3.5.1.3) shall be sized as follows:

(a) Open or shut, the valve with a maximum running rim pull of 135 newtons (30.3 pounds) within five times the electric actuating time (see 3.5.1). This is not seating or unseating torque.

(b) The valve stem thrust developed by the handwheel when actuated at the maximum allowable handwheel force specified in table II shall be at least 150 percent of the stem thrust required to open or shut the valve under worst case stem load conditions.
(c) The actuator and valve shall not be damaged when a force of 150 percent of the force specified in table II is applied to the handwheel.

3.6 Identification plate. Actuators shall be provided with an identification plate in accordance with MIL-P-15024 and MIL-P-15024/5 and contain the following information:

(a) Manufacturer's name.
(b) Manufacturer's drawing number.
(c) Model number, size and serial number.
(d) Maximum torque rating.
(e) Motor voltage, frequency and number of phases.
(f) Motor locked rotor amperes.
(g) Motor rated load amperes.
(h) Maximum ambient temperature.
(i) Motor insulation class.
(j) Indicator system voltage.
(k) Technical manual number (if known).
(l) National stock number (if known).
(m) APL/CID (if known).

3.7 Special tools. Installation and maintenance of the actuator shall be accomplished without the need for special tools. Special tools are defined as the tools not listed in Federal Supply Catalog. Copies of this catalog may be consulted in the office of the Defense Contract Administration Services Management Area (DCASMA).

3.8 Part interchangeability. All parts or subassemblies furnished in accordance with the same drawing shall be interchangeable without further machining or custom fitting.

3.9 Technical manuals. The contractor shall prepare technical manuals in accordance with the data ordering document (see 6.2.2), and the following unique features shall be included:

(a) Photo views and drawings or exploded views of the actuator and motor shall be included as part of the general description.
(b) A section shall be provided at the back of the manual containing reduced size copies of the assembly drawings, wiring diagrams, motor drawings, including motor performance and rewind data and electrical controller drawings, including the indicating circuit.
(c) The text shall describe operation, maintenance procedures, assembly, disassembly, alignment, adjustments, and shall be supplemented with sketches, sectional views, photographs, exploded views or schematics, as appropriate, and shall be located as near as possible to the text. A parts list shall be included. Text and amplifying material shall be sufficiently detailed to permit accomplishment of the procedures without repeated references to the drawings in the back of the manual.

(d) Tables listing wrench sizes and torque or other equivalent procedures for assembling joints and threaded parts shall be provided.
(e) Instructions shall be provided to permit overhaul by shipyards or other repair facilities and shall include procedures for checking critical dimensions subject to wear or change and the acceptable dimensional limits and surface finish condition. Also, the appropriate procedures for part replacement, correction at repair facility, or repair at manufacturer's facility shall be provided.
(f) Detailed disassembly and reassembly procedures shall be provided. Maintenance and trouble-shooting sections shall contain, or refer to, only the limited disassembly and reassembly required to accomplish each particular action.

3.10 Drawings. The contractor shall prepare drawings in accordance with the data ordering document (see 6.2.2), and the following unique feature shall be included:

(a) Accurately scaled cross-sectional assembly which depicts the design and construction of the actuator, including identification of critical clearances, weight and center of gravity.
(b) Bill of materials listing specification, grade, condition and other data required to identify the properties of the materials.
(c) Detail drawings of parts and subassemblies with tolerances and finish requirements. Subassembly parts which cannot be acquired or serviced individually, shall be shown as a single part. Multi-detail drawings are preferred, but mono-detail drawings may be used.
(d) Tabulation of required gasket characteristics including all dimensions with tolerances and load versus compression characteristics with tolerances.
(e) Overall dimensions, accessibility space including disassembly clearances and all dimensions pertinent to installation shall be provided.
(f) Surface finishes for all bearing areas.
(g) Name of laboratory conducting shock and vibration tests, test report identification and the Navy approval letter.

3.10.1 Electrical component drawings. The content and format of electrical component drawings shall conform with the requirements of the applicable component specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Inspection system. The contractor shall provide and maintain an inspection system in accordance with the data ordering document included in the contract or order (see 6.2.2).

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

(a) First article inspection (see 4.3).
(b) Quality conformance inspection (see 4.4).

4.3 First article inspection. First article inspection shall consist of the examination and tests specified in 4.3.1 through 4.3.15 as follows:

(a) The examination and tests specified in 4.3.1 through 4.3.9 shall be conducted on the actuator. Mounting of the actuator on the valve is not required.
(b) The tests specified in 4.3.10 and 4.3.11 shall be conducted with a pressurized valve of the size and type specified in the contract or order (see 6.2.1), or with a load which simulates the load on the valve stem due to the conditions specified in 3.5.2.
(c) The tests specified in 4.3.12 and 4.3.13 shall be conducted mounted upon a valve of the size and type specified in the contract or order (see 6.2.1), except that if the application requires mounting the actuators remotely from the valve (see 3.3), then the actuator shall be mounted directly on the test table.
(d) The test specified in 4.3.14 shall be performed if the application requires that the actuator be mounted directly upon the valve (see 3.3).

A first article test report shall be prepared in accordance with the data ordering document (see 6.2.2).

4.3.1 Visual examination. The actuator shall be visually examined to determine conformance with the requirements of section 3 and the drawings.

4.3.2 Dielectric high-potential test. A dielectric high-potential test shall be performed on the actuator in accordance with MIL-STD-202, method 301. Alternating current test voltage shall be twice the rated voltage plus 1000 volts.

4.3.3 Insulation resistance test. Insulation resistance test shall be performed in accordance with MIL-STD-202, method 302, test condition B.

4.3.4 Electro-magnetic interference test. Electro-magnetic interference tests shall be performed on the actuator and shall conform with the requirements of 3.4.6.

4.3.5 Humidity test. The humidity test shall be performed in accordance with MIL-STD-202, method 103, test condition A except that exposure shall be 100 percent relative humidity at 65°C.

4.3.6 Enclosure test. The enclosure test shall be conducted as specified in MIL-E-2036 and MIL-STD-108 for the enclosure class specified in 3.3.6.

4.3.7 Fire test. The actuator without added thermal insulation shall be subjected to fire test temperature and time conditions in accordance with API 607 to determine conformance with the requirements specified in 3.3.15. The manual actuator shall be capable of providing the rated torque output at a handwheel torque increase not greater than 130 percent of the torque required prior to the fire test. The manual actuator shall be cycled three times after the fire test.

4.3.8 Airborne noise test. The actuator shall be subjected to an airborne noise test to determine conformance with the requirements specified in 3.3.13.

4.3.9 Stalled motor heat rise test. The stalled motor heat rise test shall be conducted as follows:

(a) The actuator drive mechanism shall be held so as to lock the rotor of the actuator drive motor.
(b) Within the tolerances of voltage and frequency established for type I power in accordance with DOD-STD-1399, section 300, energize the motor with power that results in the highest motor winding temperature. Power shall be applied for the period defined by the duty cycle rating for the motor for other than continuous duty motors. For continuous duty motors, power shall be applied until no temperature rise is measured in four consecutive temperature readings approximately 15 minutes apart. Winding temperature shall be measured in accordance with MIL-E-917.
(c) The temperature shall not exceed the rating of the motor.

4.3.10 Thrust and torque test. A thrust and torque test shall be performed to demonstrate that the actuator when operated at the conditions specified in 3.5.2 for electric and manual operation can produce the stem thrust or torque specified in 3.5.2 in both the opening and shutting directions. This test shall be performed without lubrication on the valve stem and drive assembly.

4.3.11 Operational test. The actuator shall be subjected to an operational test to determine conformance with the requirements specified in 3.3.14. The electric actuating time for an opening or shutting cycle shall be recorded each 200 cycles and shall be as specified in 3.5.1. After each 200 cycles, the actuator valve shall be manually opened and closed to determine compliance with 3.5.4. The actuator shall be cycled 10,000 times with the stem in the vertical position, 5000 times with the stem in the horizontal position, and 5000 times with the stem in the inverted vertical position. This test shall be conducted with a simulated load or a pressurized valve (see 3.5).

4.3.11.1 The cycle testing shall be done with a running torque of not less than 25 percent of the seating torque or maximum operating torque. At the end of the stroke, the torque to seat and unseat shall be increased to 100 percent of the required torques. Torque values shall be as specified by the valve manufacturer based upon the internal pressure, differential pressure and frictional loads.

4.3.12 Shock test. The actuator shall be subjected to a shock test to determine conformance with the requirements specified in 3.3.11.

4.3.13 Vibration test. The actuator shall be subjected to a vibration test to determine conformance with the requirements specified in 3.3.12.

4.3.14 Overload test. An overload test shall be performed as specified in 4.3.14.1 through 4.3.14.6 with the actuator mounted on, a valve, of the size and type specified in the contract or order (see 6.2.1).

4.3.14.1 The overload test shall be performed with the stem and drive bushing lubricated and the packing gland unloaded.

4.3.14.2 The valve shall be electrically shut with the torque limit switch and position actuated limit switch bypassed. The valve shall seat under power by allowing the motor to run until it stalls. With maximum valve design pressure tending to seat the valve, the valve shall be manually opened without exceeding the maximum rim pull of 3.5.4.

4.3.14.3 The valve shall be electrically opened and backseated. The valve shall backseat by running the actuator until it stalls. With maximum valve design pressure within the valve, the valve shall be manually unseated without exceeding the maximum pull of 3.5.4.

4.3.14.4 The valve shall be manually shut using maximum torque. For gate and globe valve actuators ten handwheel hammerblows shall be applied in the closing direction, if a hammerblow feature is provided. With maximum valve design pressure tending to seat the valve, the valve shall be manually unseated without exceeding the maximum rim pull of 3.5.4.

4.3.14.5 Gate and globe valves shall be manually backseated using maximum torque. If a hammerblow feature is provided, ten handwheel hammerblows shall be applied in the backseating direction. With maximum valve design pressure within the valve, the valve shall be manually unseated without exceeding the maximum rim pull of 3.5.4.

4.3.14.6 Seat leakage test. The actuator and valve assembly shall pass the seat leakage test specified for the valve.

4.3.15 Post test inspection. The valve and actuator shall be inspected for damage. The overload test shall not result in failure of any portion of the valve or actuator, or cause damage, permanent deformation, or any detrimental effect to any portion of the valve or actuator. For gate and globe valves the valve frame, body seat, both sides of the bridgewall, stem disc and seat shall be liquid penetrant inspected in accordance with MIL-STD-271. Acceptance criteria for liquid penetrant inspection shall be in accordance with the original acceptance criteria for the part. Liquid penetrant inspection acceptance criteria for the valve frame shall be no linear indications longer than 1/8-inch.

4.4 Quality conformance inspection. Each actuator or actuator and valve assembly shall be examined as specified in 4.3.1, 4.3.2, 4.3.3 and 4.3.8 and shall be cycled alternately five times electrically and five times manually from open to shut to open to ensure proper functioning and adjustment of the unit. During this test, proper adjustment of position indicators, torque and travel activated devices shall be verified.

4.5 Inspection of packaging. Sample packages and packs, and the inspection of the preservation-packaging, packing and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified herein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.5.)

5.1 Preservation-packaging, packing and marking. Actuator and valve assemblies shall be individually preserved-packaged level A or C, packed level A, B or C as specified (see 6.2.1) and marked in accordance with MIL-E-16298.

5.2 Cushioning, dunnage, and wrapping materials.

5.2.1 Level A preservation-packaging and levels A and B packing. Use of all types of loose-fill materials for packaging and packing applications such as cushioning, filler, or dunnage is prohibited for materials destined for shipboard installation or stowage.

5.2.2 Level C preservation-packaging and packing. When loose-fill type materials are used for packaging and packing applications such as cushioning, filler, and dunnage, all containers (unit, intermediate, and shipping) shall be marked or labeled with the following information:

"CAUTION

Contents cushioned etc., with loose-fill material. Not to be taken aboard ship. Remove and discard loose-fill material before shipboard stowage. If required, recushion with cellulosic material, bound fiber, fiberboard, or transparent flexible cellular material."

5.2.3 Cushioning, filler, dunnage, and wrapping materials selected, whenever available, shall exhibit improved performance for resistance to fire.

6. NOTES

6.1 Intended use. The valve actuator described by this specification is intended for use in naval shipboard propulsion plants and auxiliary systems service. This specification is intended to be used in conjunction with a valve specification or drawing for an identified system application.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

(a) Title, number and date of this specification.
(b) Actuator type, class and service (see 1.2, 3.2.1 and 3.3.6).
(c) First article inspection is required (see 3.1).

(d) Mounting of actuator (see 3.3).
(e) Installation, operation and maintenance space if required (see 3.3.1).
(f) Control of indicator lights and other equipment, if required (see 3.3.7.1).
(g) Electrical contact rating if other than specified (see 3.3.7.2).
(h) Accuracy of stem position indicator if required (see 3.3.8).
(i) If actuator must function at continuous environmental temperature of 94°C (see 3.3.10).
(j) Electrical requirements (see 3.4).
(k) Motor duty (see 3.4.1).
(l) Controller requirements (see 3.4.2).
(m) Thermal sensor, if required (see 3.4.2.1).
(n) Sealed insulation system if required (see 3.4.4).
(o) Multipin connectors, if required (see 3.4.5).
(p) Actuator closure rates, if required (see 3.5.1).
(q) Transmission losses if actuator is mounted remotely (see 3.5.2(e)).
(r) Manual actuation if other than specified (see 3.5.4).
(s) Valve size and type required for first article inspection (see 4.3(b) and 4.3(c)).
(t) Level of preservation-packaging and packing required (see 5.1).

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of FAR 52.227-7031 are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs.

Paragraph no.	Data requirement title	Applicable DID no.	Option
3.9	Manual, technical, standard	DI-M-2044	Type I of MIL-M-15071
3.10	Drawings, engineering and associated lists	DI-E-7031	Level 2 Drawing number - contractor Design activity - contractor Certification data sheets - required
4.1.1	Inspection system program plan	DI-R-4803	----
4.3	First article inspection report	DI-T-4902	----

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L., Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in sections 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 First article inspection. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection as to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.3.1 Successful first article test results may be extended to subsequent contracts. When approved actuators are mounted on smaller size or different configuration valves, then the shock, vibration, thrust, and stem overload tests must be repeated.

6.4 Provisioning. Provisioning Technical Documentation (PTD), spare parts and repair parts should be furnished as specified in the contract.

6.4.1 When ordering spare parts or repair parts for the equipment covered by this specification, the contract should state that such spare parts and repair parts should meet the same requirements and quality assurance provisions as the parts used in the manufacture of the equipment. Packaging for such parts should also be specified.

6.5 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

Preparing activity:
Navy - SH
(Project 4810-N046)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
DOD-V-24657(SH)	

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*:

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	d. DATE OF SUBMISSION *(YYMMDD)*

DD FORM 82 MAR 1426 PREVIOUS EDITION IS OBSOLETE.