

विद्युत मोटर प्रचालक वाल्व एक्टुएटर के लिए विनिर्देश

SPECIFICATION FOR ELECTRICAL MOTOR OPERATED VALVE ACTUATORS

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Abbreviations:

CEA	Central Electricity Authority
CIMFR	Central Institute of Mines & Fuel Research
DGMS	Director General of Mines & Safety
FM	Factory Mutual Research Corporation
IEC	International Electrotechnical Commission
LCIE	Laboratoire Central des Industries Electriques
MOV	Motor operated valve
PESO	Petroleum and Explosives Safety Organisation
PVC	Poly Vinyl Chloride
UL	Underwriters Laboratory

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1.0 SCOPE

The scope of this specification covers design, manufacture, assembly, shop testing and supply of electrical motor operated valve actuators intended for fully/ partially opening and closing valve duty with inching facility.

2.0 CODES AND STANDARDS

2.1 The equipment shall comply with the requirements of latest revision of the following standards issued by BIS (Bureau of Indian Standards) unless specified otherwise:

IS 5	Colours for ready mixed paints and enamels
IS 325	Three-phase Induction Motors
IS 4691	Degrees of protection provided by enclosure for rotating electrical machinery
IS 4722	Rotating electrical machines- Specification
IS 5571	Guide for Selection of Electrical Equipment for Hazardous area
IS 9334	Electric Motor Operated Actuators
IS 13947	Low Voltage Switchgear and Controlgear (Parts-1, 3, 4 & 5)

2.2 In case of imported equipment, the standards of the country of origin shall be applicable if these standards are equivalent or more stringent than the applicable Indian standards.

2.3 The equipment shall also conform to the provisions of Central Electricity Authority Regulation - 2010 and other statutory regulations currently in force in the country.

2.4 In case Indian standards are not available for any equipment, standards issued by IEC/ BS/ VDE/ IEEE/ NEMA or equivalent agency shall be applicable.

2.5 In case of any contradiction between various referred standards/ specifications/ data sheets and statutory regulations, the most stringent requirement shall govern and decision of Owner in this regard shall be final and binding.

3.0 GENERAL REQUIREMENTS

3.1 The offered equipment shall be brand new with state of the art technology having a proven field track record. No prototype equipment shall be offered.

3.2 Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment for at least 10 years from the date of supply.

3.3 Vendor shall give a notice of at least one year to the end user of equipment and EIL before phasing out the product/ spares to enable the end user to place order for spares and services.

3.4 The vendor shall be responsible for design, engineering and manufacturing of the complete actuator to fully meet the intent and requirements of this specification and attached data sheets.

4.0 SITE CONDITIONS

The electrical motor operated valve actuators shall be suitable for operating under site conditions as specified in the requisition and data sheet. If not specifically mentioned therein, a design ambient temperature of 40°C and an altitude not exceeding 1000m above mean sea level shall be considered.

5.0 POWER SUPPLY

The electrical motor operated valve actuators shall be suitable for power supply at 415V $\pm$ 10%, 50 Hz $\pm$ 3%, 3 phase, unless specified otherwise in the data sheet.

6.0 TECHNICAL SPECIFICATIONS

Each MOV actuator shall include the motor, actuator unit, gears, position indicators, limit switches, handwheel, electrical starter and controls, terminal box etc. as a self-contained unit. The actuator shall be sized to provide adequate torque and/ or thrust to ensure the complete intended travel of the valve under the worst operating and electrical power supply conditions.

6.1 Motor

- 6.1.1 The motor shall be 3-phase squirrel cage induction type unless specified otherwise in the data sheet. It shall have totally enclosed non-ventilated and surface cooled construction.
- 6.1.2 The motor shall be designed for valve actuator service with high starting torque and shall be suitable for Direct on line starting. It shall be rated for S2-15 minute duty and shall conform to IS 325 or equivalent international standards.
- 6.1.3 The actuator assembly shall be provided with Thermostat(s) embedded in it to achieve protection of motor against over-temperature.
- 6.1.4 The motor shall be suitable for starting under required torque with 75% of rated voltage at motor terminals.
- 6.1.5 The motor shall have class 'F' insulation with temperature rise limited to class 'B' limits. Motor winding shall be treated to resist corrosive agents and moisture.
- 6.1.6 Motor rotor shall preferably be of die-cast aluminium and, if brazed, shall be free from phosphorous.
- 6.1.7 Motor installed in actuator shall be rated for minimum of 60 starts/stop per hour. This is minimum requirement of actuator envisaged for ON-OFF duty only.
- 6.1.8 In case of intrusive type actuator, anti-condensation heater shall be provided irrespective of IP-65 enclosure. However, in case of non-intrusive type actuator, space heater is not required.

6.2 Integral Starter and Control Transformer

The reversing starter, control transformer and local controls shall be integral with the valve actuator, unless specified otherwise in the data sheet. Solid state control of valve actuator and electrically isolated interface for remote control requirement shall be provided, wherever these features exist in manufacturer's design.

The integral starter shall be supplied with the following devices:

- a) Electrically and mechanically interlocked reversing contactors for opening and closing operations
- b) Control transformer with necessary tapping and protected with suitable easily replaceable fuses
- c) Terminal block for external cable connection fully prewired for internal devices of valve actuator.
- d) MOV Actuators operating with AC power supply shall be provided with Instantaneous Phase reversal protection.

6.3 Integral Push Button, Selector switches, Indications and Control devices

The following local control devices shall be provided integral with the MOV actuator:

- Push buttons for 'Opening/ Closing/ Stop' or alternatively 'Open/ Close' selector switch
- 'Local/ Off/ Remote' selector switch, pad-lockable in each position
- Local continuous position indication from 'Valve fully open' to 'Valve fully closed' position, which may be of analogue or digital type using mechanical indication/ Indicating lamps/ LEDs.

6.4 Torque and Travel Limit Switches

Torque limit switches shall be provided to protect the motor from over-loading by cutting-off the power supply to motor during opening and closing operations. The limit switches shall be preset. However, it shall be possible to set the value of maximum torque during closing from 50% to 100% of rated torque of actuators. Travel limit switch shall be provided to cut-off the power supply to the motor at the end of preset limit of valve travel. The switches shall be provided with requisite number of potential-free contacts for valve actuator operation and for indication on remote panels as specified in data sheet. Instead of mechanical torque limit switches, magnetic pulse counter/encoders to measure and control the stroke of actuator may be provided, wherever this feature exists in manufacturer's design.

6.5 Control Facilities

The internal controls and monitoring circuits shall be incorporated within the integral starter along with transformer and control unit of valve actuator.

Remote control facility shall be provided as a standard feature. The remote control circuits shall be powered from internally derived control supply voltage. Common status contact indicating the availability of the MOV actuator for remote control shall be provided by monitoring the following:

- Loss of one or more phases of power supply
- Loss of control circuit supply
- Selector switch in local mode
- Local stop push button set to 'Off'
- Motor thermostat tripped
- Any other local fault/ abnormal condition.

Where applicable, one number hand-held infrared/blue tooth remote programming device required for site commissioning and reconfiguring (without the need of removal of the MOV cover) shall be supplied for each group of 10 valve actuators (subject to minimum one infrared/ Bluetooth remote setting device, even if number of valve actuators are less than ten).

6.6 Interface with Owner's PLC/DCS / REMOTE PUSH BUTTON STATION

Potential free contacts for the following shall be provided in actuator assembly for hardwire interface with Owner's DCS/PLC and/or Remote Push Button station:-

- Run indication
- Trip indication – 2 Nos.
- Open status – 2 Nos.
- Close status – 2 Nos.
- Ready to start indication
- Torque high indication

- g) Thermostat status
- h) Open command – 2 Nos.
- i) Close command – 2 Nos.
- j) Local/Remote

6.7 Hand Operation

A hand wheel with hand/ auto lockable lever shall be provided for emergency operation of the MOV. The energisation of the motor shall automatically re-engage power operation.

6.8 Two-Wire Control system

Where specified in the data sheet, the MOV actuators shall be suitable for 2-wire control system. These actuators shall have individual field units connectable to a master station through a single 2-core cable loop for control and monitoring of the MOVs. The vendor shall indicate the maximum number of field units that can be connected to a master station and the maximum distance from the field unit to the master station. The vendor shall also indicate maximum number of control inputs and control/ status outputs from each field unit that can be handled through the 2-wire control system.

Each field unit/ MOV actuator shall be addressable from the master station through a unique address code. All the field settable/ adjustable parameters of the MOV actuator shall be settable from the master station. Similarly all the indications available on the MOV actuator shall be available at the master station. Full diagnostic features for the MOV actuators shall be available from the master station as well.

Suitable redundancy feature shall be provided, such that in case of a single fault at any location in the cable, the field unit continues to communicate with the master station. The master station shall be suitable for hook-up with the plant DCS system.

6.9 Digital Control System

If specified in data sheet, electric actuator shall be provided with an integrally mounted device providing digital connectivity with Owner's PLC/DCS for actuator control, status indication & monitoring. In this case, master station is not required any more. The control device shall meet the appropriate recognized protocol or BUS standards. Selection of protocol shall be as per data sheet only. Typical protocol/buses include:-

- Modbus RTU
- Profibus DP
- Device Net
- Foundation FieldBus

Terminal for hardwired communication shall also be provided in addition to digital communication facility.

6.10 Remote Position Indicator

If requirement of remote position indication is specified in the data sheet, a 4-20 mA remote position transmitter shall be provided in the valve actuator and a continuous position indicator for mounting in purchaser's remote panel shall be supplied as a loose item. The remote position indicator shall continuously indicate the position of travel of the valve.

6.11 Nameplate

Each motorized valve actuator shall be provided with a stainless steel nameplate furnishing the following details, attached firmly to it at a place convenient for reading:

- Actuator tag number as per data sheet
- Motor kW rating, motor short time rating, motor supply voltage, nominal motor phase current, auxiliary switch rating
- Maximum torque setting
- Actuator enclosure type, lubricant type
- Actuator type, wiring diagram number/ catalogue number, actuator serial number.

A separate nameplate shall be provided for hazardous area application.

- 6.12 The enclosure of complete MOV actuator including motor, integral starter, control transformer unit and all control devices shall have minimum IP-65 degree of protection which shall include the 'O' ring for complete environmental protection.

6.13 Wiring and Terminals

All devices provided in the actuator shall be wired up to the terminal block. The contacts for remote operation and indication shall also be wired up to the terminal block. Minimum 10% spare terminals shall be provided for future interlocks. Internal wiring for power and control circuits shall be appropriately sized for MOV actuator rating. Each wire shall be identified at both ends using PVC ferrules. The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal so that the actuator electrical components are protected from the ingress of moisture and foreign materials when the terminal cover is removed during installation and maintenance.

- 6.14 The actuator shall be provided with minimum five adequately sized cable entries viz., one for power cable and two for control cables. However, the actual number of control cable entries in actuators with 2-wire control system shall be provided based on job requirements as specified in data sheets/specification for control systems for MOVs. Suitable double compression cable glands shall be provided with each actuator for all cable entries and sealing plugs for all control cable entries. The cable glands and plugs shall be made of Nickel-plated brass. Plastic plugs shall not be acceptable.

7.0 EQUIPMENT FOR CLASSIFIED HAZARDOUS AREAS

- 7.1 Actuators meant for hazardous areas shall meet the requirements of IS 5571, IEC 60079 or equivalent international standards and shall be suitable for Gas groups and Temperature class as specified in the data sheet. Gas group IIB and Temperature class T3 (200°C) shall be considered if not indicated in data sheet. The manufacturer shall possess valid test certificates issued by a recognized independent test house (CIMFR/ Baseefa/ LCIE/ UL/ FM or equivalent) for the offered actuators. All indigenous equipment shall conform to Indian standards and shall have been tested and certified by Indian testing agencies. All equipment (indigenous and imported) shall also have valid statutory approvals as applicable for the specified hazardous locations from Petroleum and Explosives Safety Organisation (PESO / DGMS) or any other applicable statutory authority. All indigenous flameproof equipment shall have valid BIS license and corresponding marking as required by statutory authorities.

- 7.2 Apart from the nameplate indicating the tag no., a separate nameplate shall also be provided on each actuator to indicate the details of the testing agency (CIMFR or equivalent), test certificate number with date, statutory approval number with date, approval agency (PESO /

DGMS), BIS license number with date, applicable Gas group and Temperature class etc. The nameplates shall be riveted/ fixed with screws and not pasted. In case any of the standard details listed above are embossed on the enclosures, the same need not be repeated.

8.0 FIREPROOFING

8.1 Electric actuators shall be provided with fire proofing if specified in data sheet. The fire proofing shall be rated for 30 minutes. Arrangement can be made by Intumescent paint/fire resistant blankets/fire resistant boxes. Specific requirement of fire proofing arrangement shall be mentioned in data sheet. In general case, if only fire proofing is required, Intumescent paint (brand name: - K-Mass/ERS/Equivalent) shall be provided. The required certificates for the fireproof rating shall be furnished from an independent test laboratory.

8.2 MOV Actuators with fireproofing shall be suitable for termination of mica insulated fire survival type power and control cables.

9.0 INSPECTION, TESTING AND ACCEPTANCE

9.1 The equipment shall be subject to inspection by EIL/ Owner or by an agency authorized by the owner. Manufacturer shall furnish all necessary information concerning the supply to EIL/ Owner's inspector. During the course of manufacturing, the purchaser or his authorized representative shall be free to visit the works and assess the progress of work and the manufacturer shall render him all possible assistance to do so.

9.2 Following routine tests shall be carried out at the manufacturers' works under his supervision and at his own cost for all the actuators:-

9.2.1 Functional and calibration test for torque and limit switches

9.2.2 Response time test

9.2.3 Variation of supply voltage

9.2.4 Variation of frequency

9.2.5 Test on output shaft at 100% torque

9.2.6 Tests for motor(As per relevant IS/IEC)

9.3 Following type test certificates of offered model of actuator shall be submitted for review & approval:-

9.3.1 Life test

9.3.2 Test on motor terminal box

9.3.3 Damp heat recycling test

Two weeks' notice shall be given to Owner / EIL for witnessing the final testing of the complete assembly to ensure satisfactory operation of the MOV actuators. Type test certificates shall be furnished during detailed engineering. Final acceptance of MOVs at site shall be subject to successful testing of the MOV actuators with the valves.

9.4 Type test certificates, original drawings referred in certificates and statutory approval certificates and BIS license, where applicable, shall be shown to the inspection agency on demand. The certificates and BIS license must be valid at the time of dispatch.

- 9.5 Test certificates of bought-out components shall be shown to the inspection agency on demand.

10.0 PACKING AND DESPATCH

All the equipment shall be divided into multiple sections for protection and ease of handling during transportation. The equipment shall be properly packed for the selected mode of transportation, i.e. by ship, rail or trailer. The equipment shall be wrapped in polythene sheets before being placed in crates/ cases to prevent damage to finish. The crates/ cases shall have skid bottoms for handling. Special notations such as 'Fragile', 'This side up', 'Center of gravity', 'Weight', 'Owner's particulars', 'PO no.' etc. shall be clearly and indelibly marked on the packages together with other details as per purchase order.

The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains and high ambient temperature unless otherwise agreed. In order to prevent movement of equipment/ components within the crates, proper packing supports shall be provided. A set of instruction manuals for erection, testing and commissioning, a set of operation and maintenance manuals and a set of final drawings shall be enclosed in a waterproof cover along with the shipment