SPECIFICATION FOR
ELECTRICAL MOTOR
OPERATED
VALVE ACTUATORS
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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.

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 2148** Flameproof enclosures for electrical apparatus
- **IS 4691** Degrees of protection provided by enclosure for rotating electrical machinery
- **IS 4722** Rotating electrical machines- Specification
- **IS 9334** Electric Motor Operated Actuators
- **IS 13947** Low Voltage Switchgear and Controlgear

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 Indian Electricity Rules 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 following order of decreasing priority shall govern:

- Statutory regulations
- Data sheets
- Job specifications
3.0 GENERAL REQUIREMENTS

3.1 The offered equipment shall be brand new with state of the art technology and 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 15 years from the date of supply. HPCL shall contact the vendor only for any requirement.

3.3 Vendor shall give a notice of at least one year to the end user of equipment 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 AND SYSTEM CONDITIONS

The electrical motor operated valve actuators shall be suitable for operating under site conditions and system conditions as specified in the requisition and data sheet. If not specifically mentioned therein, a design ambient temperature of 50°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 ± 10%, 50 Hz ±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, push button 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 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 motor shall be provided with thermostat(s)/thermister(s) embedded in the hot spots of motor winding for protecting the motor.

6.1.4 The motor shall be able to operate the actuator at 75% of rated voltage.

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.

6.2 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 tappings and protected with suitable easily replaceable fuses.

c) Terminal block for external cable connection fully prewired for internal devices of valve actuator.

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:

a) Push buttons for ‘Opening/Closing/Stop’ or alternatively ‘Open/Close’ selector switch.

b) ‘Local/Off/Remote’ selector switch, pad-lockable in each position

c) 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.

d) External PUSH Button operation for actuators 15-20 metres away from actual position of valve installation with flame proof enclosure.

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 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, if specified in the data sheet. The remote control circuits shall be powered from internally derived control supply voltage, unless the use of external supply for remote control is specified in data sheet. In order
to cater to remote control and indication requirements for ‘Position of Remote/Local/Off selector switch’, if specified in the data sheet, an additional Monitoring relay/auxiliary relays shall be provided as a part of the valve actuator. As an alternative, a common status contact indicating the availability of the MOV actuator for remote control may 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 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 remote setting device, even if number of valve actuators are less than ten).

6.6 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.

6.7 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. Unless specified otherwise in the data sheet, 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.
In case of a fault at any location in the cable loop, the field units shall still have
accessibility to/from the master station through the other section of the cable loop.
The master station shall be suitable for hook-up with the plant DCS system.

6.8 Remote Position Indicator
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.

6.9 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:
a) Actuator tag number as per data sheet
b) Motor kW rating, motor time rating, motor supply voltage, nominal motor phase
current, auxiliary switch rating
c) Maximum torque setting
d) Actuator enclosure type, lubricant type
e) Actuator type, wiring diagram number/catalogue number, actuator serial number.
A separate nameplate shall be provided for hazardous area application.

6.10 The enclosure of complete MOV actuator including motor, integral starter, control
transformer unit and all control devices shall have minimum IP-65 degree of ingress
protection or as mentioned in Data sheet, which ever is more stringent.

6.11 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.

6.12 Vendor shall be solely responsible for the compatibility of the MOV actuator with the valve and for the selection and sizing of various electrical devices and components in the actuator.

6.1.3 The actuator shall be provided with minimum three adequately sized cable entries viz., one for power cable and two for control cables. 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.

7.0. EQUIPMENT FOR CLASSIFIED HAZARDOUS AREAS

7.1 Actuators meant for hazardous areas shall meet the requirements of IS 2148, IEC 79 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 (CMRI/ 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 CCE 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 (CMRI or equivalent), test certificate number with date, statutory approval number with date, approval agency (CCE/DGMS or equivalent), 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 If specified in the Data Sheet, the MOV Actuators shall be provided with ‘K-Mass’ type or equivalent fireproofing. Unless specified otherwise, the fireproofing shall be rated for 30 minutes. 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 & SCOPE OF THIRD PARTY INSPECTION:

9.1 The equipment shall be subject to inspection by Owner & by third party agency. Manufacturer shall furnish all necessary information concerning the supply to Owner’s inspector & TPI. 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 Routine and acceptance tests shall be carried out at the manufacturers’ works under His & TPI’s supervision and at his own cost. Two weeks’ notice shall be given to Owner for witnessing the final testing of the complete assembly along with TPI to ensure satisfactory operation of the MOV actuators. Type test certificates shall be furnished with bids. Final acceptance of MOVs at site shall be subject to successful testing of the MOV actuators with the valves.

9.3 Type test certificates, original drawings referred in certificates and statutory approval certificates and BIS license, where applicable, shall be vetted by inspection
agency & thereby to be approved by HPCL along with the QAP. The certificates and BIS license must be valid at the time of despatch.

9.4 Test certificates of bought-out components shall be duly signed and stamped by TPI.

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.