



## CORPORATE STANDARD

AA735 00 02

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### VALVE ELECTRICAL ACTUATOR WITH INTEGRAL STARTER

#### 1.0 GENERAL:

The actuators are intended for operation of valves used in power stations, fertilizer plants, petro-chemical plants & refineries. These will generally be located outdoor where it will be exposed to atmosphere laden with fine coal dust, ammonia vapour, hydro carbon vapour. The actuators proposed shall be suitable for operation under aforesaid atmospheric condition.

#### 2.0 SCOPE:

This specification covers the design, manufacture, testing and delivery of electric actuators for open/close & regulating of valves. The actuator assembly shall be complete with drive motors, gears, hand wheel, signalling and switching units associated control and terminal boxes, internal wiring, earthing terminal and other accessories as required.

#### 3.0 STANDARDS:

The actuator shall comply with the requirements of latest issue of relevant IEC/Indian standard IS 325. In case of any conflict between this specification and the above standards, this standard shall prevail. The mounting dimensions shall be as per DIN 3210 as applicable.

#### 4.0 AMBIENT CONDITION:

The actuators shall be suitable for operation in an ambient temperature of 50°C, -15°C min. and max. Relative humidity of 100% unless otherwise specified.

#### 5.0 POWER SUPPLY

- 5.1 The actuator motor shall be of squirrel cage Induction type and suitable for operation on power supply of 415V, 3 Phase 50Hz AC unless otherwise specified. Only one feeder of 415V, 3 Ph, 50 Hz AC will be provided. Any other power supplies required for control circuit operation shall be derived from 415V, 3 Ph, 50 Hz AC only.
- 5.2 For isolating service the actuator shall be rated for minimum of fifteen minutes continuous operation or three successive open close operations of the valve whichever is longer.
- 5.3 For regulating service, the actuator shall be suitably time rated for the duty cycle with not less than 150 starts per hour.

**Revisions:**  
As per 18<sup>th</sup> MOM of WG-Valves

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5.4 The motor shall operate without any practical difficulty for any of the following conditions:

- a) Voltage variation :  $\pm 10\%$
- b) Frequency variation :  $\pm 5\%$
- c) Combined variation :  $\pm 10\%$

#### 6.0 PERFORMANCE:

- 6.1 Motor shall be suitable for direct on line starting.
- 6.2 Starting current shall not exceed six times full load current.
- 6.3 Motors shall meet the requirements of current, torque, axial thrust, acceleration & stall time as imposed by driven equipment. Thermal torque rating of each drive unit shall have adequate margin and at least equal to theoretical brake torque required to drive the equipment under full load, including all losses in speed reducers and power transmission.
- 6.4 The motors shall be capable of withstanding the torque and voltage stresses resulting from an out of phase condition between motor residual voltage and incoming source voltage equal to 150% of rated voltage during transfer of supply.
- 6.5 The motor temperature rise shall be limited to class 'B' values.
- 6.6 The motor shall be capable of running at 80% of rated voltage for a period of 5 minutes at 1/3 load. The motor shall also be capable of starting and accelerating to full speed along with the driven equipment without exceeding the acceptable winding temperature even when the supply voltage drops down to 85% of its rated value.
- 6.7 Margin of 20% shall be provided in motor rating over and above the continuous maximum demand of the driven equipment.

#### 7.0 CONSTRUCTION

- 7.1 Motors shall be totally enclosed to minimum protection class of IP67 as per IEC 345. The enclosure shall be suitable to protect the motor from leakage steam, water, gas or oil from valve joints and glands.
- 7.2 Cooling fans where ever provided shall be suitable for both directions of rotation.

#### 8.0 INSULATION:

Motors shall have class 'F' non-hygroscopic insulation.

#### 9.0 LUBRICATION:

The actuators shall be provided with double shielded, Grease prelubricated regressiveible, antifriction bearings having a minimum life rating of 1,00,000 hours.



**10.0 TORQUE SWITCHES :**

**10.1** Each actuator shall be provided with atleast one open and one close torque switches.

All torque switches shall be with 2 NO + 2 NC contacts.

**10.2** The torque switches shall have an accuracy  $\pm 3\%$  of set value. The exact value shall be furnished in the offer.

**10.3** The torque switches shall be provided with calibrated knobs for setting desired torque. Separate knobs shall be provided for close and open torque switches.

**10.4** The torque switches shall be provided with mechanical latching device to prevent operations when unseating a jammed valve in closed position. Similarly close torque switch shall not act while unseating from jammed open position. The latching device shall unlatch as soon as the valve leaves the end position. If such provision is not possible, the torque switches shall be bypassed by end position limit switches which opens on valve leaving end position.

**11.0 LIMIT SWITCHES:**

**11.1** One open and one close limit switches shall be provided. The type of limit switches shall be gear driven cam type or proximity type as given in the data sheet.

**11.2** Two intermediate position limit switches each independently adjustable for entire travel shall be provided. All limit switches shall be with 2NO + 2NC contacts.

**11.3** Actuator running in open/close direction (Blinker contact) contacts shall be provided if indicated in datasheet.

**12.0 CONTACTS:**

**12.1** The contacts of limit and torque switches shall be snap acting, self cleaning type. The contacts shall be Capable of making and breaking inductive current of 5A at 240V AC/0.25 A at 220V DC

**12.2** The actuator motor shall be provided with winding temperature protection by thermostat embedded in the hot spot of the motor windings directly sensing the winding temperature and giving tripping command to trip motor for overload.

**13.0 ENCLOSURE:**

**13.1** The torque and limit switches shall preferably be housed in a separate enclosure with protection class IP67 of IEC 144.

**14.0 HAND WHEEL :**

14.1 The actuator shall be provided with a hand-wheel for manual operation. The size of hand wheel shall be sufficiently big for easy operation. A lever shall be provided to engage the hand wheel but shall disengage automatically on energising the motor.

14.2 The hand wheel shall be so arranged that when looking from hand wheel the valve is closed by rotating the hand wheel in clock wise direction.

14.3 The hand wheel shall have plain polished rim.

**15.0 SPACE HEATER:**

A space heater shall be provided in limit switch and starter compartments to prevent condensation. The Power supply requirements of space heater shall be derived within the actuator compartment from 415V AC 3 phase supply.

**16.0 LOCAL POSITION INDICATOR**

16.1 Each actuator shall be provided with a mechanical position indicator to indicate valve position with sufficient accuracy.

16.2 The local position indicator should be factory calibrated so that it reads accurately the valve/ damper position when the actuator is mounted at purchaser's works or at site. It shall preferably be adjustable.

**17.0 REMOTE POSITION TRANSMITTERS**

Each actuator shall be provided with 4-20mA, 2wire 24V DC potentiometric type electronic position transmitter or with proximity type position transmitter or LVDT type position transmitter as indicated in the data sheet.

**18.0 INTEGRAL STARTER:**

18.1 Integral Starter shall be provided in a water tight enclosure with protection class 67 as per IEC 144.

18.2 The integral starter shall consist of the following equipment.

- a) Mechanically and electrically interlocked reversing contactors.
- b) Thermal overload relay.
- c) Step down control transformer.
- d) Interposing relays.
- e) Monitoring relay.
- f) Fuses on primary and secondary side of control transformer.



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- 18.3 The control transformer shall be provided with earther screen between primary and secondary winding.
- 18.4 One line of secondary of control transformer shall be earthed through a disconnecting link.
- 18.5 The control transformer shall be sized to feed an external load of at least 15 VA in addition to internal load.
- 19.0 LOCAL CONTROLS:**
- 19.1 Local open-stop push buttons shall be provided on the actuator. The stop push button shall stay put on depressing and require a key to reset. In addition to the push buttons, a two position key operated selector switch shall be provided for local remote operation mode selection. Contacts with 2 NO + 2 NC shall be provided for actuator in remote mode and actuator in local mode.
- 20.0 WIRING:**
- 20.1 The internal wiring shall be of minimum 1.5 sq.mm stranded PVC insulated copper conductor.
- 20.2 The wiring shall be identified by means of numbered ferrules on both ends of all wires.
- 21.0 Terminal & Terminal Boxes :**
- 21.1 Motor Terminal Box :**
- 21.1.1 The terminals, terminal boards, terminal boxes, winding details and associated equipment shall be suitable for connection to supply system having short circuit capacity 40 KA for 1 sec.
- 21.1.2 The terminals shall be stud type insulated from the frame. The insulation shall not be porcelain. The minimum size of studs shall be 6mm brass or 4 mm stainless steel or phosphor bronze.
- 21.1.3 The terminal boxes shall be totally enclosed to protection class IP 67 of IEC 144.
- 21.1.4 Terminal box shall have sufficient space to connect one no. of 3Cx2.5 sq.mm copper conductor, PVC insulated armoured cable.
- 21.2.0 Actuator Terminal Box :**
- 21.2.1 All terminals of limit and torque switches, space heater, position transmitters shall be brought to a common terminal box. The enclosure shall be to protection class IP 67 of IEC 144.



21.2.2 The terminal shall be screw type with sufficient insulation between two adjacent terminals.

21.2.3 There shall be at least five terminals spare to terminate spare cores of cable.

21.2.4 The actuator terminal box shall be suitable for receiving one power cable and three numbers of control cables.

#### 22.0 Cable Glands:

22.1 The motor terminal box and actuator terminal box shall be provided with double compression nickel plated brass cable glands to suit cable type and size specified in data sheet.

#### 23.0 Name Plate:

23.1 Name plate with inscription shall be provided for push buttons and selector switch.

23.2 Motor shall be provided with name plate as per IEC/IS standard.

23.3 Wiring diagram of actuator shall be fixed inside the actuator terminal box cover plate.

23.4 A name plate on the actuator shall be provided with the following minimum data.

- (a) Tag No (purchaser's Tag no of associated valve/damper)
- (b) Torque rating
- (c) Full travel time

#### 24.0 EARTHING TERMINAL :

Two earthing terminals with earth symbol shall be provided on either side of motor and also an actuator terminal box. The earth terminal shall be 4 mm brass stud.

#### 25.0 PAINTING :

The motor external parts shall be furnished and painted to produce a neat and durable surface which would prevent rusting and corrosion. The equipment shall be thoroughly degreased. All rust, sharp edges and scale removed and treated with one coat of primer and finished with two coats of grey enamel paint. Motor fans (if any) shall also be painted to withstand corrosion.

#### 26.0 TESTS :

26.1 **Type Tests :** 5 copies of type test certificates shall be furnished for perusal. The type test should have been carried out as per IEC/IS 325 specification. But the following minimum check should have been carried out.



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- a) Working check for all accessories.
- b) Pressurisation : the actual gear box shall be fitted with oil and pressurised at 1 bar for a period of not less than 15 minutes. No seepage or leakage shall be allowed.
- c) IR (Insulation Resistance) test.
- d) Torque characteristics : The manufacturer shall supply a set of curves showing maximum operating duration of actuator for various torque values corresponding to motor temperature rise.
- e) Supply variation
- f) Torque switch setting
- g) Consecutive starts of 60 starts
- h) Overheating test.
- i) Degree of protection test.
- j) Humidity cycling
- k) Endurance test.

### 26.2 Routine Test :

The following routine tests shall be carried out on each actuator.

- a) IR test and Impulse test.
- b) Wiring continuity test.
- c) Operational test for proper functioning of the valve along with actuator.
- d) Motor locked rotor test and check current at stand still.
- e) Load actuator to maximum rated torque and measure load current.
- f) Over voltage test.

### 27.0 SPARES:

A list of recommended spares with unit price shall be furnished for three years of trouble free operation.

### 28.0 DOCUMENTS :

- 28.1 Any deviation in the offered product from any clause / sub clause above must be clearly mentioned by the bidder in the offer.
- 28.2 Three copies of complete technical literature, wiring diagram and dimensional drawings shall be furnished along with the offer.
- 28.3 Three copies of technical datasheet of the actuator shall be furnished along with the offer.
- 28.4 Ten copies each of the following documents/drawings shall be furnished within 2 months after placement of order:
  - a) Final control circuit and wiring diagram showing external wiring.
  - b) Final overall assembly drawing of valve + actuator assembly
  - c) O & M Manuals.



28.5 Six copies of all 'type and routine test certification' shall be despatched separately.

**DATA SHEET :**

1. Tag No.
2. Service
3. Project
4. Power supply – Motor –415V, 3 phase AC, 50 HZ  
Space Heater –Power supply internally fed.
5. Electronic position transmitter (EPT) 4-20mA, 2 wire 24V DC potentiometric type.
6. Integral starter YES/ NO
7. Local push buttons YES/ NO
8. Local / Remote selector switch YES/ NO
9. Enclosure Weather proof (IP67).
10. Power cable size :
  - a) 4 core x 2.5 mm sq. Copper conductor PVC insulated upto 3.7 KW motor.
  - b) 4 core x 6.0 mm sq. Aluminium conductor PVC insulated and steel armoured for 3.8 to 5.0 KW motor.
  - c) 3 core x 16 sq. mm Aluminium conductor PVC insulated and steel armoured.
11. Control cable size : 2 nos. multi core 2.5 sq.mm copper conductor PVC insulated & armoured Cable.
12. Painting : Epoxy based shade 631 of IS-5
13. Fault withstand capacity of motor terminal box : 45 KA for 0.2 Seconds.

**29.0 PERFORMANCE GUARANTEE:**

Actuators shall be guaranteed for satisfactory performance under the specified conditions for a period of 24 Months.

**30.0 PACKING :**

Actuators shall be seaworthy for transport by rail, road or sea as applicable.

31.0 Where ever the integral bypass valve is provided the bypass valve also shall be fitted with electric actuator with similar technical features as of main actuator.

32.0 Extension spindle general arrangements Drg No. (vendor shall enclose the drgs. wherever applicable)

**NOTE :-** Wherever valves are required with extension spindle arrangement vendor shall supply the extension spindle arrangement with floor pedestal (pedestal shall have 4 x dia 18 holes on pcd 260 to fix the pedestal on floor) and with 2 universal joints and one expansion piece to accommodate the piping expansion/ movement for both main valve and bypass valve (where ever applicable)

