# Controls & Instrumentation/Fossil Boilers
# E, C&I input for ELECTRICAL ACTUATOR

**CI: SAGARDIGHI: ECI: EA, Rev. 00**

Project: SAGARDIGHI
Cust. No.: 1731

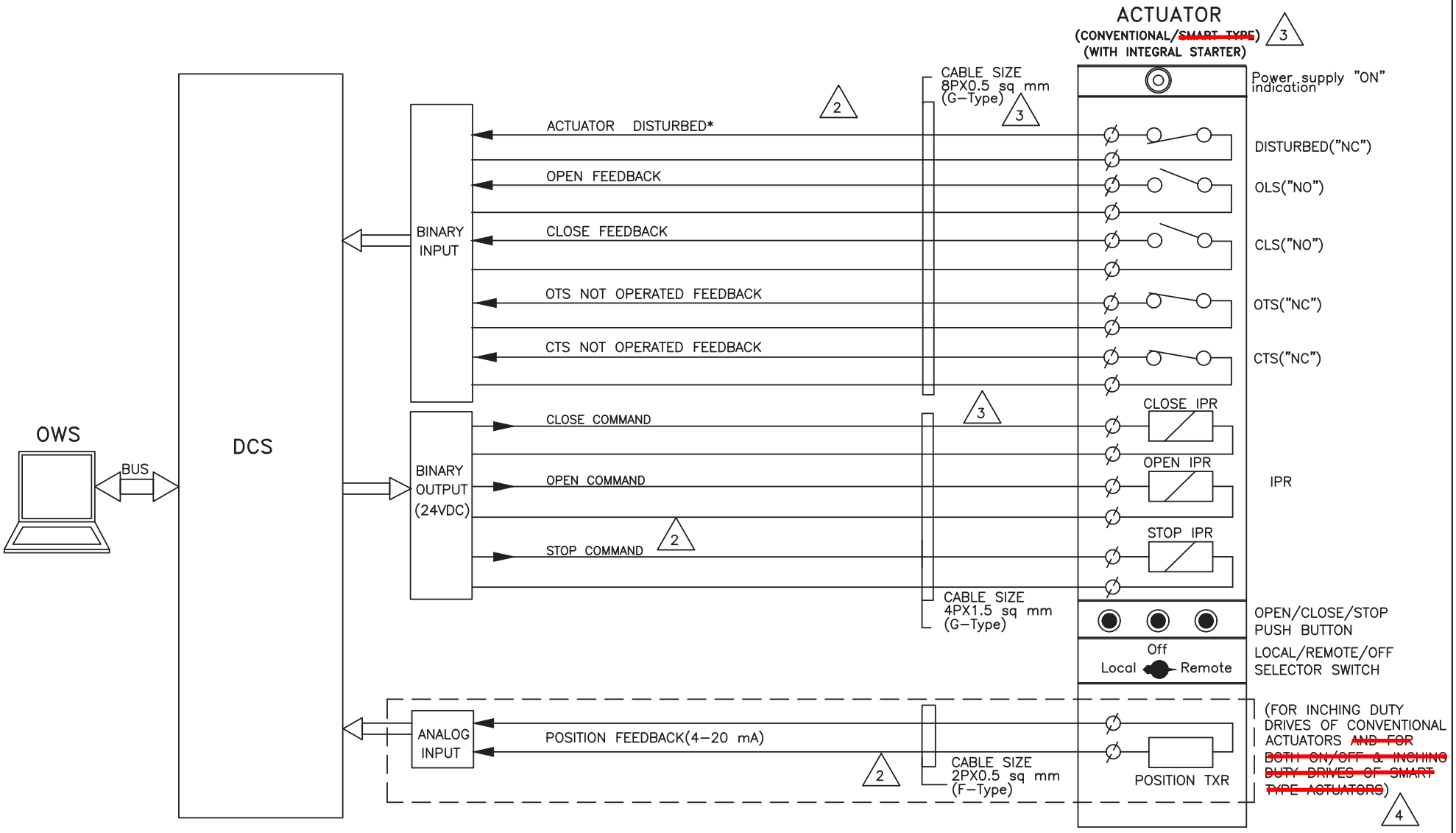
| Sl. No | Description |
|---|---|
| 1. | • Vendor to supply Electrical actuator as per the requirements indicated in the Technical specification TCI:318/Rev. 01.<br>• ACTUATOR TYPE : ***TYPE 2*** (Actuator with Integral Starter) |
| 2. | SIGNAL EXCHANGE : Vendor to provide the necessary signals in the actuator as per the attached wiring drawing for interfacing with DCS. |

**Note to Vendor:**

A. Taking care of the above indicated technical requirements in full, vendor to submit signed & sealed copy of Sub-delivery enquiry deviation (SDED) format sent along with the purchase enquiry, without any deviations, quoting the document reference.

B. Any deviation in the technical requirements has to be indicated only in the SDED format. Other than the SDED format, hidden deviations indicated elsewhere in the offer will not be considered.

# DCS INTERFACE FOR BIDIRECTIONAL DRIVE(WITH INTEGRAL STARTER)




NOTE:

* DISTURBED= Loss of Power supply (1 Phase/3 Phase)/ Loss of control supply/ Motor thermostat trip/ Thermal over load/ Local/Off/Remote Sel. switch in local or off mode/ Stop PB optd/ Torque open/close cutoff/ Valve jammed

1

| | | |
|---|---|---|
| BHEL | PROJECT: | 1X660MW SAGARDIGHI THERMAL POWER EXTENSION PROJECT (UNIT #5) |
| | TITLE | DDCMIS INTERFACE FOR BIDIRECTIONAL DRIVE |

# BHARAT HEAVY ELECTRICALS LIMITED,
## THIRUCHIRAPALLI-620 014

## CONTROLS & INSTRUMENTATION/FOSSIL BOILERS



Technical specification for Electrical Actuator
(Open/Close duty & Inching duty applications)

## Specification Number: - TCI: 318/Rev. 01

Revision History

| Rev. No. | Date | Description | Prepared | Reviewed | Approved |
|---|---|---|---|---|---|
| 00 | 09-12-2013 | Initial release | -sd- | -sd- | -sd- |
| 01 | 08-02-2019 | Revision after revisit | | | |

| Sl. No. | Details | Requirements | | |
|---|---|---|---|---|
| 1 | Site Conditions | Ambient Temperature: -20° C to +50° C<br>Relative Humidity : 95%<br>Atmosphere : Tropical, dusty, salty, corrosive and highly polluted | | |
| 2 | Actuator Application | Open/Close, inching duty, suitable for Valve/Gate applications. | | |
| 3 | Actuator type | Type 1 | Type 2 | Type 3 |
| | | Electrical Actuator without integral starter. | Electrical Actuator with integral starter. The Starter shall be as per technical specification. | Electrical Actuator with integral starter and 9 pin plug & socket arrangement. The Starter shall be as per technical specification. |
| 4 | Actuator Construction | Actuator shall be of totally enclosed weatherproof construction. Protection Class: - IP 65 | | |
| 5 | Gearing | Suitable gearboxes shall be coupled (if required) to achieve the torque requirements of the load. All the gears available in the actuator shall be of suitable metal. Actuator shall have self-locking facility. | | |
| 6 | Manual operation through Hand-wheel | Shall have a de-clutch lever and a hand wheel mechanism for manual operation. The hand wheel mechanism shall be designed such that it is declutched automatically when the power supply to the motor, is restored. | | |
| 7 | Torque requirement | Shall be designed to meet with the required torque at the output shaft as per the load requirement. | | |
| 8 | Operating time | The operating time of the actuator required for the complete travel has to match with the load requirement. | | |
| 9 | Supply voltage | 415 V, 3 phase AC supply, 50Hz. | | |

| Sl. No. | Details | Requirements |
|---|---|---|
| 10 | Power supply variation | The actuator shall operate without any trouble under power supply voltage variation of ± 10% of the rated value, power supply frequency variation of ± 5% of the rated value, combined voltage and frequency variation of 10% of the rated value. |
| 11 | Motor construction | Shall be of Totally Enclosed, Self-Ventilated construction. Shall have double shielded, grease lubricated anti-friction bearings. |
| 12 | Motor Insulation | Motor winding shall be tropicalized, suitable for the site conditions as indicated above.<br><br>Shall have class F insulation with temperature rise of the motor winding limited to Class B. Temperature rise over ambient temperature of 50° C shall be 70° C. |
| 13 | Motor duty cycle | The duty cycle of the motor shall be short time S2 duty cycle rated for the period of operation of 15 minutes or rated for 3 successive open-close operations whichever is longer.<br><br>For inching duty, the motor shall be suitable for 150 starts/hour. |
| 14 | Standards | Actuator shall be conforming to the standard EN15714 - 2 for all requirements. |
| 15 | Motor Thermostat | Motor winding shall be provided with inbuilt thermostat connected in series (one thermostat in each phase) and shall be wired to terminal box. |
| 16 | Space heater for Motor | Shall have a space-heater with suitable rating and the power supply shall be derived internally from the main power supply. |
| 17 | Earth terminals | 2 Nos. of earth terminals shall be provided on the body of the motor. |

| Sl. No. | Details | Requirements |
|---|---|---|
| 18 | Torque & position limit switches | 2 numbers of adjustable torque limit switches (one for open and one for close), each with 2 NO and 2 NC potential free contacts. The torque limit switches shall have calibration in Kg-m (for whole actuator including gear box if supplied), so that the switches could be easily set to any desired value, within the range specified for each actuator.<br><br>Torque switches shall be bypassed in both the end positions using the position Limit switches available at the other end of the travel.<br><br>Actuators shall have provision for bypassing the torque switch, initially for 3 seconds or during initial 5% opening of the valve.<br><br>4 numbers of position limit switches, rotary drum type capable of being set at any position (2 nos. for open and 2 nos. for close) each with 2 NO & 2 NC potential free contacts.<br><br>Contacts of limit and torque switches shall be Silver plated having high conductivity and non -corrosive type.<br><br>Contact rating of all the above limit switches shall be 2A at 240 V AC and 0.2 A at 220 V DC. |
| 19 | Local position indicator | Shall be provided to indicate 0 to 100% travel. |
| 20 | Position Feedback transmitter | For inching duty applications, position feedback transmitter has to be supplied. Shall be 2 wire, non-contact type (LVDT) electronic position feedback transmitter with an output of 4-20 mA DC and shall be loop powered from external power supply. The output shall also be capable of driving minimum 500 ohms load in the control circuits. |
| 21 | Internal wiring | Shall be done with 1.5 sq.mm PVC insulated, stranded copper wire of 650V grade for control signals. For Power circuits, internal wiring shall be done by using suitable size of stranded copper conductor cables, taking care of the motor current rating.<br><br>Ferrules should be used for easy identification. Internal wiring and the terminal block drawing shall be neatly pasted on the internal side of the terminal box. |

| Sl. No. | Details | Requirements |
|---|---|---|
| 22 | Terminal box | Motor terminals shall be of stud type. All terminals of the position limit switches, torque limit switches, space heaters shall be terminated in the terminal box. The terminals shall be of plug in cage clamp type, suitable for the cables of size 2.5 sq.mm.<br><br>Minimum 6 numbers of spare terminals shall be made available in the terminal board.<br><br>Terminal box of actuator shall be weatherproof, conforming to IP 65 and shall have enough space for connecting cable glands/plug and sockets. Terminal box shall be fitted with a removable front cover-plate. |
| 23 | Cable Termination philosophy | Vendor to refer the respective terminal block drawing (Type 1/Type 2/Type 3) furnished by BHEL along with the enquiry and shall follow the same. |
| | | Power Cable :- (Common to Type1/Type 2/Type 3))<br>Double compression type, Brass with Nickel plated, weather proof cable glands shall be provided for the termination of power cable. Cable gland along with blanking washers shall be selected suitable for the power cable sizes as indicated below.<br>a) Upto 3 kW – 3C x 2.5 sq.mm. Copper, OD – 17 mm $\pm$ 2 mm.<br>b) > 3 kW & upto 7 kW - 3C x 6 sq.mm, Aluminium, OD – 19 mm $\pm$ 2 mm. |
| | | Termination of Control Cable (Type 1 & Type 2) :-<br>For Type 1 and Type 2 actuators, 3 Nos. of Double Compression type, Brass with Nickel plated, weather proof cable glands have to be supplied for the termination of the control/instrumentation cables suitable for a cable OD of 18mm. |
| | | Termination of Control Cable (Type 3) :-<br>For Type 3 actuator, 9 Pin plug & sockets (2 Nos. wired + 1 No. spare as loose supply) shall be provided to suit 4 pair 0.5 sq.mm. Copper overall shielded (16 mm OD), instrumentation cable. |
| 24 | Paint & finish | All external Parts shall be finished and painted to produce a neat and durable surface which would prevent Corrosion & Rusting. All fasteners used in the equipment shall be of a corrosion resistant material. |

| Sl. No. | Details | Requirements |
|---|---|---|
| 25 | Lubricant | The gear box of the actuator shall be either oil filled or grease filled. |
| 26 | Inspection & Testing | For the purpose of inspection & testing of the electrical actuator, Quality Plan Ref. QA:CI: STD: QP:13 has to be referred. |

**Technical Specification for Electronic Integral Starter (Applicability as per the project requirement)**

| Sl. No. | Details | Requirements |
|---|---|---|
| 1. | Integral starter | Control logic of the starter shall be designed by using suitable electronic control circuit. The starter shall have the following minimum features:<br>• Power supply isolation switch & fuses of suitable rating.<br>• Thermal Over load relay.<br>• Lockable Local- Off -Remote selector switch.<br>• Push buttons for Local Operation (OPEN, CLOSE, STOP)<br>• Indication lamps (OPEN, CLOSE, TRIP)<br>• Remote Signal interface<br>• Output Contacts<br>• Status indication<br>• Fault annunciation |
| 2. | Open/Close Command | Interposing relays of coil burden <=2.5VA shall be provided to initiate opening and closing using 24V DC command from the external control system, respectively.<br>Actuator shall also be suitable for remote operation by potential free contacts for Open & Close, the necessary 24V DC power supply shall be derived internally.<br>Contactors shall be provided for forward and reverse operation and the same shall be suitably rated and interlocked in the control circuit. |
| 3. | Protection Features in Starter | Shall have various protection features such as Single Phasing prevention, Wrong phase sequence protection, Automatic phase correction, Over heating protection through thermostat, Short Circuit protection, Overload, Supply Under Voltage, over and above other standard protection features as per manufacturer's design. |
| 4. | Control Supply | Control supply voltage of the starter shall be 24V DC and the same shall be derived internally by the manufacturer. If control voltage rating other than 24 V DC is used, then necessary primary and secondary fuses shall be provided. Also, Opto isolation circuits shall be provided with suitable coupling relays for 24V DC commands from external control system. |

| Sl. No. | Details | Requirements |
|---|---|---|
| 5. | Local Operation | Provision shall be available to operate the actuator locally. Lockable local/off/remote selection shall be provided on the front panel of the actuator. |
| 6. | Status indication | The following status indication signals shall be provided in the actuator over and above the standard signals available in the actuator as per the manufacturer's standard<br>• Actuator Open<br>• Actuator Close<br>• Actuator in travel |
| 7. | Group Fault/Output Contacts | A Common potential free contact for collective fault annunciation of following faults such as Thermal Overload trip, Motor Thermostat trip, Control supply failure, Power Supply Failure/Single Phasing, Local/Remote switch in LOCAL/OFF, Torque Switch acted along with Other protections acted shall be provided for customer's use.<br><br>Potential free output contacts shall be provided for Local/Remote/Off positions of the selector switch. |
| 8. | Fault Annunciation | The following fault annunciation signals shall be provided in the actuator over and above the standard signals available in the actuator as per the manufacturer's standard,<br>• Open Torque Switch/Close Torque Switch acted<br>• Motor thermostat trip<br>• Motor Overload relay acted<br><br>Actuator shall have necessary provision for diagnosing the fault locally. |
| 9. | Details to be furnished | The ratings of the various components of the starter, various signal exchanges to/from the starter and the wiring interconnections shall be clearly indicated in the wiring drawing of the actuator. |

**BHARAT HEAVY ELECTRICALS LIMITED**
**TIRUCHIRAPPALLI - 620 014**

**FUEL SYSTEMS / PE/ FOSSIL BOILERS**

# ***TITLE SHEET***

## *SPECIFICATION FOR TORQUE LIMITING TYPE ELECTRIC ROTARY ACTUATOR*

*SPECIFICATION NUMBER:* ***GF-331*** *REVISION No. : 03*

| | | | |
|---|---|---|---|
| | | | |
| *03* | *03/04/2014* | *Clause 19.4 added. Note-3 included in drawing (sht.9/15)* | *Rajmohan K & Aruna Kumar JVV* |
| *02* | *19/10/04* | *Clauses 1.2,1.3 altered Annexure II added.* | *KRM* |
| *01* | *16/09/04* | *Updated* | *DVK* |
| *Rev.No.* | *Rev. Date* | *Description* | *Chd.& Appd.* |

| | Name | Signature | Date |
|---|---|---|---|
| Prepared | S.Manivannan | -sd- | 10/03/01 |
| Checked | J.V.V.Arunkumar | -sd- | 10/03/01 |
| Approved | D.Vijayakumar | -sd- | 10/03/01 |

**MATERIAL CODE** : **COAL VALVE** :36" size

**QTY / RAW COAL GATE** : 1 **PGMA** : 67-27x

**1.0 Scope:**

1.1 This specification covers the **standard** requirements of design, manufacture, testing inspection (at vendor's works) and supply of Torque limiting type rotary actuator and it's necessary accessories like position indicators, torque limit switches, travel limit switches, space heaters etc.

1.2 **Special Contractual** requirements are specified in Annexure-II. In case of any difference between the standard requirement in this specification and special requirement in Annexure-II, the requirement of Annexure II shall be final.

1.3 The extent of supply stated above is not necessarily exhaustive and shall not relieve the vendor from his responsibility to provide goods and services necessary to satisfy the performance criteria and guarantees specified.

**2.0 Final control element:**

2.1 Plate type coal gate operated by rack and pinion arrangement.

**3.0 Actuator type:**

3.1 Actuator shall be of non-rising stem type.

3.2 The Starters are required as per Annexure-I. (Inching operation is required)

3.3 Thrust load if any should not be transferred from the actuator to driven equipment.

**4.0 Motor:**

4.1 Shall conform to IS: 325 of S2-15 duty 'B' class insulation.

4.2 1440 rpm – 415V, 3PH – 50HZ.

4.3 Motor rating shall be selected suitably for this application.

**5.0 Actuator output shaft (termed as shaft hereunder):**

5.1 Actuator output shaft speed 12 rpm.

5.2 No off revolutions of actuator output shaft for full travel from open to close vice versa 13.5 Revolutions.

5.3 Tripping torque to be set at factory 22Kgm - for 36" coal valve at the actuator output shaft.

5.4 Tripping torque range required on the torque switch 12 To 31 Kgm. (Setting procedure required to reset in the field if required should be furnished by supplier).

5.5 Output shaft shall be designed with bore and slot for feather key (Ref. Sketch-2 shown in sheet 10 of 15)

5.6 Direction of rotation and orientation of shaft shall be as shown in sketch-1 (refer sheet 09 of 15)

**6.0 Type of mounting:**

6.1 Direct - Horizontal.

**7.0 Manual operation:**

7.1 Chain wheel to be provided instead of hand wheel for manual operation with declutch lever and chain guide.

7.2 Chain wheel shall declutch automatically upon energising actuator motor.

7.3 Chain wheel should be suitable for chain pitch 36mm - ∅6 - t=18.

7.4 The direction of rotation for gate open/close shall be clearly indicated (should be visible to a distance of 8m) on the chain wheel.

**8.0 Electrical local position indicator:**

8.1 2 nos, 100 Ω potentiometric types (required for 0 to 100% position)

**9.0 Torque limit switches:**

9.1 Quantity shall be 2 nos.

9.2 Shall be Rated for 240V - AC 5Amps/ 220V DC-0.5Amps (inductive) and each switch shall have 2NO+2NC independent contacts.

9.3 Name plate for torque limit switch calibration shall be provided with torque value IN Kgm *.

* 1. Torque value set at shop . . . . . .. Kgm #
2. Torque value reset at field . . . . . Kgm ##

# To be filled by actuator supplier
## to be filled by person setting the value in the field

9.4 The gear train used for limit switches shall be metal. Fibre gears are not acceptable.

**10.0 Travel limit switches:**

10.1 Quantity shall be 4 Nos.
10.2 Shall be rated for 240V-AC 5Amps, 220V-DC 0.5Amps (inductive) and each switch shall have 2NO+2NC independent contacts.
10.3 The gear train used for limit switches shall be metal, Fibre gears are not acceptable.
10.4 The position limit switches shall be of rotary drum type and shall be capable of being set at any position.

**11.0 Terminal strip requirement:**

11.1 66 (Refer sketch –4 shown in sheet 12 of 15)

**12.0 wiring:**

12.1 Internal wiring shall be done as per BHEL diagram (refer sheet 11 & 12).
12.2 Complete wiring diagram of actuator with integral starter shall be submitted along with offer meeting Annexure-I requirements.

**13.0 Terminal Box:**

13.1 All terminals of position limit switches, torque limit switches, space heaters and position transmitters shall be brought to a common terminal board. The terminals shall be of cage clamp type with sufficient insulation between two adjacent terminals.
13.2 Minimum 5 numbers of terminals shall be available in the terminal board as spare terminals.
13.3 Terminal box of actuator shall be weather proof. Insulation voltage for power terminal block & control terminal block is 600V.
13.4 9 pin plug & socket for control shall be provided as per sl.no.11.00 of Annexure-I.
13.5 Terminal box of actuator shall be weather proof and have enough space for connecting 1 no. Power cable as mentioned below. Motor terminals shall be stud type.
13.5.1 Cable sizes to select 1 no. power cable gland with blanking washers.

a) Upto 3kW - 3c x 2.5 sq.mm. (Al) unarmoured: 14 $\pm$ 2 mm OD.
b) >3kW & upto 7kW - 3C x6 sq.mm (Al) UNARMOURED: 17 $\pm$ 2 mm OD.
c) >7kW & upto 13kW - 3C x 16 sq.mm. (Al) unarmoured: 20$\pm$ 2 mm OD.
d) >13kW & upto 24kW - 3C x 35 sq.mm. (Al) PVC insulated: 25 $\pm$ 2 mm OD.

13.6 The terminal box shall be fitted with a removal front cover plate.

13.7 Internal wiring shall be done with 1.5 sq.mm PVC insulated copper wires. Ferrules should be provided on the wires for easy identification.

**14.0 Space heater:**

14.1 Actuator shall be provided with space heater (approx. 25 watts) suitable for 240V AC single-phase 50Hz in limit switch compartment. The supply for the same shall be derived internally.

**15.0 Documents:**

15.1 The following documents / details shall be furnished along with the offer.

i) Filled in data sheet as per the sheet 07& 08.
ii) Total cross sectional assembly drawing with BOM.
iii) Unit weight of Actuator assembly
iv) Commissioning spares, if required
v) List of spares for 2 years trouble free operation
vi) Suppliers' catalogues for Actuators

15.2 The following documents shall be furnished after placement of purchase order.

i) Filled in data sheet as per the sheet 07& 08 (for approval)
ii) General Arrangement and Cross Sectional Drawing (for approval)
iii)Quality plan (for approval)
iv)Lubrication details
v) Graph showing the relation between torque switch setting and unit output torque (Kgm)
vi) Load Vs Efficiency curve
vii) Load Vs Power factory curve
viii) Test certificate for each actuator.

15.3 The documents to be supplied along with the main supply shall include the following.

i) 25 sets (Minimum) of Operation and instruction manuals
ii) 6 sets of test certificates for each actuator
iii) Packing and shipping details

**16.0 O & M manuals:**

16.1 Manuals shall be in printed form.

16.2 The manuals shall be made of correct A4 size sheets with drawings in A3 size. Larger size drawings (greater than A3 size) should be reduced to A3 size and inserted.

16.3 Drawings shall be of printed or laser printed only.
16.4 Spiral or comb bound copies should be totally avoided.
16.5 If manuals are supplied in folders, the folder shall have 3 hole punching system.
16.6 O & M manuals, shall be submitted to BHEL/ Tiruchirapalli prior to despatch of the equipment
16.7 Manuals, generally should contain the following:

i) Data sheet
ii) Brief description
iii) Operation
iv) Maintenance (including lubrication, where necessary) and service, recommended spares for 2/3 years trouble free service.
v) Trouble shooting
vi) Assembly drawings with part list, dimensional drawings & other applicable drawings
vii) Manuals should pertain only to the type or model supplied for a particular order. Copies shall be sent to BHEL / Tiruchirappalli

**17.0 Working condition:**

17.1 Actuator should be suitable to operate in damp, dusty, polluted atmospheres of 100% relative humidity at an ambient temperature of $-20^0$ C to + $70^0$ C.

**18.0 Packing:**

18.1 The Actuator shall be packed in such a way that it does not get damaged during transport. It shall be properly covered with thick tear proof polythene sheet and dispatched in suitable moisture proof wooden crates.

**19.0 General:**

19.1 Colour of the actuator shall be smoke grey shade 692 of IS: 5. However the colour may be altered to the requirement of customer.
19.2 The gear boxes supplied shall be guaranteed for operation even under worst condition like dynamic stall torque.
19.3 Vendor shall highlight the deviations from the specification (if any) or special features of the Actuators, which are not covered in the specification during the offer stage itself.
19.4 Stainless steel name plate with following information, as a <u>minimum,</u> shall be firmly fixed to actuator body

- Make & Model No
- Actuator type & Sl. No
- **BHEL material code**

# DATA SHEET

*Supplier shall fill up this information and furnish along with offer in the following format only. Absence of any detail result in incomplete offer and will not be considered.*

**Actuator model:**

**Project:**

**P.O No.**

| Sl. No. | DESCRIPTION | UNITS | DATA |
|---|---|---|---|
| | Actuator Manufacturer | | |
| 1. | Torque Range & speed | Kgm & rpm | |
| 2. | Starting Torque (approx.) | Kgm | |
| 3. | Stall Torque (min.) | Kgm | |
| 4. | Duty Cycle | | |
| 5. | Enclosure (Type & Protection) | | |
| 6. | Admissible Ambient Temperature | Deg C | |
| 7. | Cable Gland :<br>(Double Compression)<br>a. Size for power cable -1 No<br>b. Size for control cable - 3 Nos. | | |
| 8. | Position Limit Switches (Nos.) | | |
| 9. | Torque Switches (Nos.) | | |
| 10. | Ratings of Switches | | |
| 11. | Position Transmitter | | |
| 12. | Space Heater | | |
| 13. | Thermostat (Nos.) | | |
| 14. | Internal Wiring | | |
| 15. | Terminal Plan | | |
| 16. | Contact Development Diagram | | |
| 17. | Painting | | |
| 18. | Weight | Kgs | |
| | | | |
| | | | |

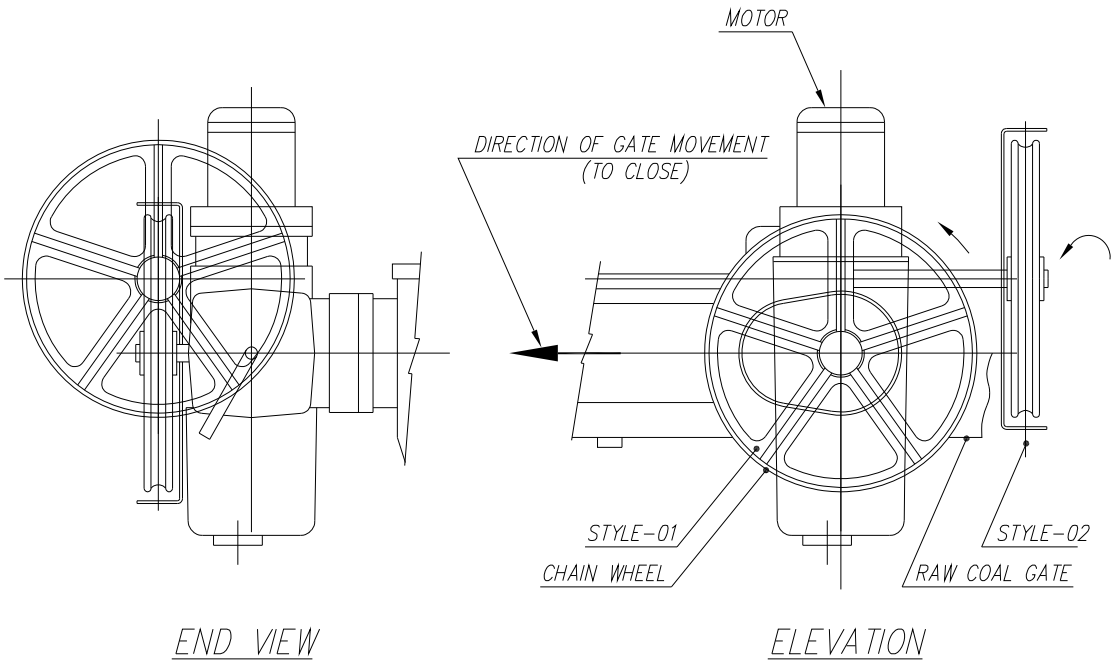
**Motor:**

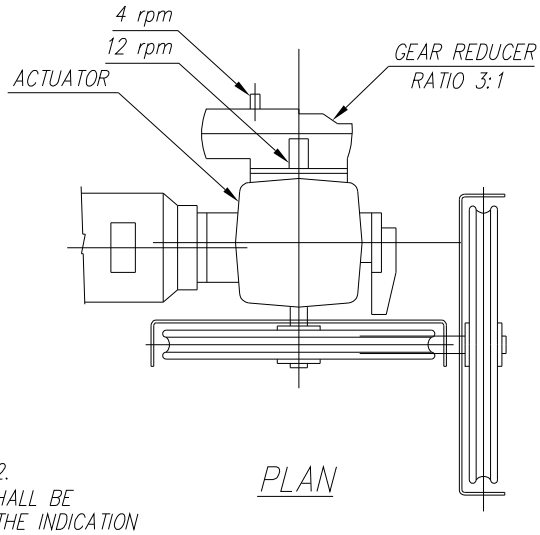
| Sl. No. | DESCRIPTION | UNITS | DATA |
|---|---|---|---|
| 1. | Nominal Output | KW | |
| 2. | Rated Voltage | V | |
| 3. | Rated Frequency | Hz | |
| 4. | No. Of Phases | | |
| 5. | Admissible Voltage Fluctuation | % | |
| 6. | Admissible Frequency Fluctuation | % | |
| 7. | Admissible Voltage & Frequency Fluctuation | % | |
| 8. | Full load torque | Kgm | |
| 9. | Starting torque | Kgm | |
| 10. | Run torque | Kgm | |
| 11. | Nominal Current | A | |
| 12. | Starting Current | A | |
| 13. | Stall Current | A | |
| 14. | Full Load Speed | rpm | |
| 15. | Insulation Class (B / F) | | |
| 16. | Power Factor | % | |
| 17. | Full Load Efficiency | | |
| 18. | Temperature rise over ambient temperature 40° C | Deg C | |
| 19. | Type of Starter | | |
| 20. | Motor Type & Ref. Standard | | |
| 21. | OLR Value | | |

**Gear Box:**

| | | | |
|---|---|---|---|
| 1 | Primary gear box type | | |
| 2 | Gearbox ratio. | | |
| 3 | Gear box efficiency | % | |
| 4 | Max. Operating torque. | Kgm | |
| 5 | Gearbox lubrication. | | |

**Supplier Signature With Stamp**



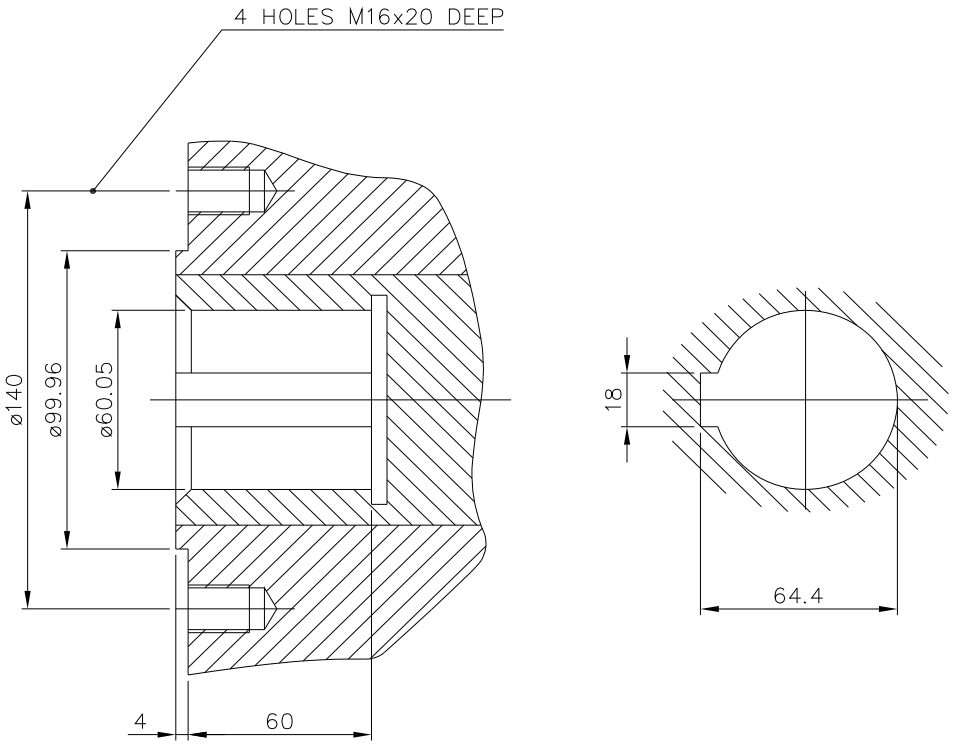

DIRECTION OF ROTATION :–
ACTUATOR OUTPUT SHAFT SHOULD ROTATE IN CLOCKWISE DIRECTION FOR CLOSING.
(WHILE FACING THE ACTUATOR OUTPUT SHAFT BY STANDING IN FRONT OF THE OUTPUT SHAFT, THE ACTUATOR OUTPUT SHAFT SHOULD ROTATE IN CLOCKWISE DIRECTION.)

(See note-3 below)

NOTE :–
1. CHAIN WHEEL MOUNTING STYLE–01 OR STYLE–02.
2. A NAME PLATE WITH OPEN/CLOSE INDICATION SHALL BE FIXED ON THE OUTSIDE OF THE CHAIN WHEEL. (THE INDICATION SHOULD BE CLEARLY VISIBLE TO A DISTANCE OF 8m)

**3. BHEL material code shall be indicated in the actuator name plate. (Refer to clause 19.4)**

SKETCH-1




MOUNTING & OUTPUT SHAFT DETAILS

SKETCH-2

| | | POSITION OF GATE | | | |
|---|---|---|---|---|---|
| | LIMIT SWITCH CONTACT TERMINAL No. | FULL OPEN | INTERMEDIATE | FULL CLOSE | |
| OLS-1 & OLS-2 | 17 – 18 & 33-34 | – | X | X | THESE LIMIT SWITCH CONTACTS ACT ON VALVE REACHING RESPECTIVE POSITION |
| | 19– 20 & 35-36 | X | – | – | |
| | 21-22 & 37-38 | - | X | X | |
| | 23-24 & 39-40 | X | - | - | |
| CLS-1 & CLS-2 | 25-26 & 41-42 | X | X | – | |
| | 27 –28 & 43 –44 | – | – | X | |
| | 29-30 & 45-46 | X | X | - | |
| | 31-32 & 47-48 | - | - | X | |
| OTS | 1 – 2& 5 – 6 | – | X | X | THESE LIMIT SWITCH CONTACTS ACT ON THE TORQUE SET BEING REACHED |
| | 3– 4& 7– 8 | X | – | – | |
| CTS | 9 –10 & 13– 14 | X | X | – | |
| | 11 – 12& 15 – 16 | – | – | X | |
| "X" INDICATES CONTACT CLOSED | | "-" INDICATES CONTACT OPEN | | | |

REFER WIRING DIAGRAM PAGE-12 OF 15

CTS – TORQUE SWITCH FOR C.W.ROTATION (CLOSE)

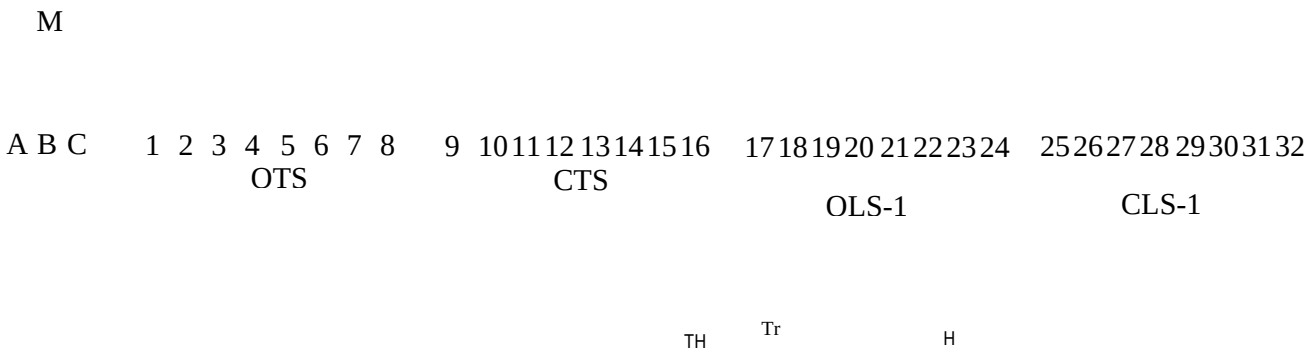
OTS – TORQUE SWITCH FOR C.C.ROTATION (OPEN)

OLS –1 & OLS-2 – LIMIT SWITCHES FOR POSITION OPEN

CLS –1 & CLS-2 – LIMIT SWITCHES FOR POSITION CLOSE

SKETCH-3

# INTERNAL WIRING DIAGRAM FOR ACTUATOR




| | |
|---|---|
| CTS | - TORQUE SWITCH FOR C.W.ROTATION (CLOSE) |
| OTS | - TORQUE SWITCH FOR C.C.W.ROTATION (OPEN) |
| OLS-1, OLS-2 | - LIMIT SWITCHES FOR POSITION OPEN |
| CLS-1, CLS-2 | - LIMIT SWITCHES FOR POSITION CLOSE |
| Tr | - 4-20mA, LVDT type,2 WIRE TYPE POSITION TRANSMITTERS, 24V DC. |
| H | - HEATER, 25 WATTS (APPROX) 240V AC, 1$\phi$, 50 Hz |
| TH | - THERMOSTAT |

**NOTES: -**

**1. WINDING THERMOSTAT SHOULD BE CONNECTED TO MOTOR CONTROL CIRCUIT.**

**2. ALL THE CONTROL TERMINALS SHALL BE SUITABLE FOR 2 Nos. 2.5 Sq.mm STRANDED COPPER CABLE.**

**3. CABLE GLANDS OF DOUBLE COMPRESSION TYPE. BRASS MATERIAL SHALL BE PROVIDED AS PER SPECN. CL.14.**

**4. DRAWN FOR INTERMEDIATE POSITION OF GATE.**

SKETCH-4

# ANNEXURE - I TO SPECIFICATION GF-331

(SPECIFICATION FOR VALVE ACTUATORS WITH INTEGRAL STARTER)

1.00 TYPE:

The actuators shall have integral starters along with over load relays with built-in SPP (Single Phasing Preventor). A 415V, 3phase 3-wire power supply shall be given to the actuator from BHEL switchboard through a switch fuse unit. Control voltage of the motor starter shall be 24V DC, derived suitably from 415V power supply.
In case supplier's standard control voltage for Open / Close Contactors is 110V AC, the same is acceptable if suitable Opto Isolation circuit is provided with coupling relays for 24V DC command inputs.

2.00 INTER FACES

Open / Close command termination logic with position & torque Limit Switches, positioner circuit shall be suitably built in the PCB inside the actuator.

FOR BINARY DRIVE: Open / Close command & status thereof and disturbance monitoring signal (common contact for Overload, Thermostat, control supply failure, L/R selector switch in local & other protections operated) shall be provided. Interface with the control system shall be through hardware signal only. Inter posing relays provided (with coil burden 2.5 VA) in the actuator shall be energized to initiate opening and closing, by 24V DC signal from the external control system.

3.00 RATING:

a) Supply Voltage & frequency: 415 +/ - 10%, 3 Phase, 3 Wire 50Hz +/- 5%.

b) Sizing: Open / Close at rated speed against designed differential pressure at 90% of rated voltage. For isolating service three successive open-close operations or 15 mins. Whichever is higher? For regulating service, 150 starts per hour or required cycles, whichever is higher?

4.00 CONSTRUCTION:

a) ENCLOSURE: Totally enclosed weatherproof minimum I5 degree of protection.

b) GEAR TRAIN: Metal (Fibre gears are not acceptable) self-locking to prevent drift under torque switch (where ever applicable) spring pressure when motor is de-energized.

c) MANUAL HAND WHEEL: Shall disengage automatically during motor operation.

5.00 MOTOR:

a) TYPE: Squirrel cage induction motor. Direct on line starting with starting current limited to six times the rated current.

b) ENCLOSURE: Totally enclosed, self-ventilated, IP-55 degree of protection.

b) INSULATION: Class B or better. Temperatures raise 70 deg C. over 50 deg Cambient.

d) BEARINGS: Double shielded, grease lubricated antifriction.

e) EARTH TERMINALS: Two

f) PROTECTION: Single Phasing Protection, Over heating protection through Thermostat and wrong phase sequence protection shall be provided over and above other protection features standard to bidders design. Suitable means shall be provided to diagnose the type of fault locally.

6.00 POSITION / TORQUE SWITCHES:

Four nos. (2 each in open and close position) position limit switches & two nos. (one each in open and close direction) torque switches each having two nos. NO and two nos. NC contacts, shall be provided.

All contacts of limit switches at each position shall be actuated by a single shaft.

7.00 LOCAL OPERATION:

It shall be possible to operate the actuator locally also.

Lockable local/ remote selection shall be provided on the actuator.

8.00 POSITION INDICATOR:

To be provided for 0 to 100% travel.

9.00 TERMINAL BOX:

To terminate command and position feed back signals with external control systems, 9 pin plug and socket (1 no. Per actuator to suit 4 pair 0.5 sq.mm.copper over all shielded (16mm OD), instrumentation cable shall be mounted in the starter box itself. For actuators with 4-20 mA position transmitters (regulating and inching duty) additional one number 5 pin plug and socket (to suit 2 pair 0.5 sq.mm copper (13 mm OD) individual and overall shielded instrumentation cable shall be mounted in the starter box itself. Necessary cable glands for power cable shall be provided.

10.00 TERMINAL BLOCK:

650 V grade for power cables.

11.00 SPACE HEATER:

Space heater of suitable rating. The supply shall be derived from the main power supply available in the actuator.

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