BHARAT HEAVY ELECTRICALS LIMITED

CONDENSER & HEAT EXCHANGER ENGINEERING

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SPECIFICATION FOR GEARBOX & ELECTRICAL ACTUATORS WITH GEARBOX FOR BUTTERFLY VALVES

SCOPE

The scope of supply and works includes design, engineering, manufacture, assembly, testing and inspection at manufacturer's works and supply in packed condition of the gearbox for quarter turn ON-OFF duty Butterfly valve application as per AWWA C504 and suitable electrical actuator as per AWWA C540 and technical requirements mentioned in this specification (refer Annexure-I, II, III, IV). Manufacturer shall have his own design, engineering, manufacturing and testing facility for testing of gearbox and electrical actuator in both as separate unit and in assembled condition.

Items and accessories which are not specifically mentioned but are essential for sound performance of gearbox and electrical actuator for ON-OFF duty butterfly valve application shall be supplied by bidder without any cost implication to BHEL.

QUALIFICATION CRITERIA

The bid is open for participation to those bidders who satisfy the following technical requirements –

1. Bidder shall be the OEM from the point of view of design, engineering, manufacture and testing of gearbox and electrical actuator as individual unit and in assembled condition for butterfly valve application. Bids through agents/promoters/liaison shall not be considered.
2. Bidders, if having technical collaboration, have to provide certification from their principal along with a letter regarding their relationship with the bidder and their involvement in assuring the quality of bidder's product.
3. Bidders who are manufacturing both gearbox and electrical actuator in compliance to AWWA standard for butterfly valves for entire range as per this specification shall only be considered.
4. Bidder shall have completed life cycle test as per AWWA C504 for gearbox and as per AWWA C540 for electrical actuators for the entire manufacturing range as per BHEL's requirement.
5. Bidder shall have service facilities (inclusive of assembly/testing) in India.
6. Bidder should have designed, engineered, manufactured, tested and supplied at least two (2) nos. of gearboxes and electrical actuators in similar ratings/range for butterfly valve application in both as separate unit and assembled condition to two (2) different Thermal Power Plants of minimum 250 MW rating and at least one (1) NTPC project.
7. Above gearboxes and electrical actuators should be in successful operation in India for a period of at least two (2) years in the preceding seven (7) years on the date of submission of bid.
8. The bidder shall be approved / registered with M/s NTPC for supply of gearboxes and electrical actuators in both as separate unit and in assembled condition for butterfly valve application.
9. Bidder shall provide documentary evidences in support of his claim for having experience in design, engineering, manufacture, testing and supply and meeting the requirement as mentioned above with the bid submission.
10. BHEL reserves the right to assess the capabilities and capacity of bidder to perform the contract if such assessment is needed for evaluation of offer/facts submitted by bidder.

11. The following information shall be submitted by bidder about customers where similar equipment has been supplied. This is required from all bidders for qualification of their offer:
    a. Name of customer with specification of elec. actuator with sec. gearbox
    b. Complete contact details of the customer
    c. Month and year of supply and commissioning of equipment by the end user/customer.
    d. Products inspected by the customer/Third party Inspection – (Yes/No); if inspected by third party, indicate the name of inspection agency.
    e. Furnish catalogue and applicable test certificates of elec. actuators/gearbox supplied.
    f. Performance certificates from the customer/end user.

BHEL reserves the right to reject any or all bids or cancel/withdraw the bids without assigning any reason whatsoever and in such case no bidder/intending bidder shall have any claim arising out of such action.

TECHNICAL SPECIFICATION FOR GEARBOX

Refer Annexure-I & II & Technical Datasheet-A (to be filled in by bidder) regarding technical requirement for gearboxes for ON-OFF duty butterfly valve application.

TECHNICAL SPECIFICATION FOR ELECTRICAL ACTUATOR

Refer Annexure-III & IV & Technical Datasheet-B (to be filled in by bidder) regarding technical requirement for gearboxes for butterfly valve application.

INSPECTION & TESTING

Inspection and testing shall be carried out in presence of BHEL-Bhopal/BHEL appointed third party and customer/customer approved agency. The bidder, after receipt of order, shall furnish the inspection and testing procedure, QAP and drawing/datasheets for due approval from BHEL/Customer. Bidder is to furnish all above required documents along with the bid/offer for review and evaluation.

PACKING

Items shall be supplied in suitable wooden crates/Carton boxes which shall be wrapped with polythene sheets. Special precaution notations such as Fragile, weight, Owner's particulars, purchase number etc. shall be clearly marked on the package together with other details as per purchase order. The packing should suitable such that equipment may be stored in a covered shed for long periods before installation.

DOCUMENTS TO BE FURNISHED ALONGWITH THE OFFER

The following documents are to be necessarily enclosed by the bidder as a part of the offer-

For Gearbox as per AWWA for Butterfly Valve application – (Annexure-I, II & Technical Datasheet-A)

a. Manufacturer's QAP, Inspection and Testing procedure
b. GA drawings for all applicable models with dimensions and weight
c. Product Selection & dimensional catalogue with maximum spindle acceptance & stem entry
d. Identification of critical component with its MOC
e. Duly filled in datasheet for all applicable models
f. Bidder shall submit the signed copy of all the pages of enquiry specification
g. Point wise confirmation/acceptance to the enquiry specification
h. Life cycle (POD) test certificates for gearboxes as per AWWA C504
i. Painting Schedule

For Gearbox assembled with Electrical Actuator as per AWWA for Butterfly Valve application –

(Annexure-III, IV & Technical Datasheet-B)

a. Manufacturer's QAP, Inspection and Testing procedure
b. GA drawings for all models with dimensions including dismantling clearances and weight
c. Product Selection and dimensional catalogue with maximum spindle acceptance & stem entry
d. Identification of critical component with its MOC
e. Duly filled in datasheet for all applicable models
f. Bidder shall submit the signed copy of all the pages of enquiry specification
g. Point wise confirmation/acceptance to the enquiry specification
h. Life cycle (POD) test certificates for gearboxes as per AWWA C504
i. Life cycle (POD) test certificates for electrical actuators as per AWWA C540
j. Painting Schedule

In addition to above, BHEL can ask from bidder for any other relevant document which may be felt necessary during bid evaluation.

DOCUMENTS TO BE FURNISHED AFTER PLACEMENT OF PO/LOI

a. Manufacturer's QAP and Testing procedure for approval
b. GA drawings for all applicable models as per PO/LOI for approval
c. Technical Datasheet for all applicable models as per PO/LOI for approval
d. O & M manuals and Instruction manual for information/distribution
e. Painting Schedule
f. Any other relevant document which may be felt necessary during execution of order/contract
g. Successful bidder shall submit all the above with proper title block within a week of receipt pf LOI/PO. Bidder's LD on account of delay on submission and revised submission of these documents/drawings shall not be entertained.
h. The approval time for drawing/document from BHEL/Customer shall be considered by bidder as three weeks for their planning of supply of equipment within time frame.

ANNUAL ESTIMATED REQUIREMENT

Annual estimated requirement covering the gearboxes and elec. actuators with gearbox for butterfly valve sizes and torque ranges listed in Annexure-II & IV is as below –

Annual Estimated Requirement (Quantity wise) – 500 nos.

Annual Estimated Requirement (Value Wise) - 5 Crores

Above figures are tentative and showing the bulk requirement which can vary at later stage before finalization of ordering. Bulk requirement will not be ordered at once as ordering shall be need based.

ANNEXURE - I

Specification for Gearboxes

1. Gearboxes for BF Valves shall be offered as per the details given in annexure – II.
2. Supplier to furnish the maximum torque, which the gearbox of each type can deliver.
3. Keyway in the second stage gearbox to be as per **IS 2048** and should have tolerance of **Js9**. Vendor shall furnish size of keyway in the drawing.
4. The gearbox shall be provided with removable drive sleeve for repositioning of Gearbox assembly on the B.F. Valve. Removable sleeve shall be supplied in loacked condition with gearbox.
5. The handwheel size of gearbox shall be designed such that not more than **20 kg (10 kg per hand)** pull is required for rated torque output. Calculation for the same is required alongwith the offer.
6. The secondary gearboxes shall be as per the vendor's / his Principal's design.
7. The gearbox shall be watertight type, complete with lubricants and position indicator. **Gearbox may also be required with limit switches to indicate open / close position.** Each limit switch shall have 2 NO & 2 NC contact. All contacts of limit switches at each position shall be actuated by a single shaft.
8. The gearbox unit shall be of **self-locking** type. The gearbox shall be painted with epoxy based paint. Paint shade shall be admiralty grey.
9. The **Specific Quality Plan** for secondary gearbox to be furnished by the supplier alongwith the offer (bearing the name of the contract & model nos. offered). This should include the following tests for which test certificates are also required to be furnished.
    a. Chemical & Mechanical properties' test for the material of the material of warm, worm wheel and drive sleeve.
    b. Operation test.
    c. Torque test at the **rated torque** on all gearboxes.
    d. Type test at **twice the rated torque** for one number gearbox.
    e. Heat treatment record for Nitriding of worm shaft & worm wheel of secondary gear box.

    TC for life cycle test conducted as per AWWA C504 in supplier's works, on the offered model of gear box. The tested gearbox shall not be supplied.
10. The gearbox shall be inspected by BHEL / TPIA / Customer's Representative at supplier's works. Inspection of gearbox shall be as per supplier's QA plan duly approved by BHEL.
11. The offer should include the GA drawing of gearbox assembly showing all three views in Autocad format, all major dimensions, weights and limit switches for **"APPROVAL".**
12. The enclosure for gearbox shall be as per IP 65.
13. The gearboxes shall be guaranteed for a period of 12 months from the date of commissioning or 18 months from date of dispatch.
14. The supplier shall furnish the separate offer for two no. limit switches (having 2 NO + 2 NC contacts). Price of plug & socket pair be also indicated separately.

ANNEXURE-II

Details of Gearbox variants required for BF Valves

Sl. No.	BFV Size (MM)	Rated Output Torque (Kg- m)	Bore in the Gear box for Valve Shaft (mm)	Mounting details of Gear Box			Maximum Handwheel Dia (mm)
				No. of holes - off centres	size of holes	PCD - mm	
1	1400	1510	114	8	M20	298	750
2	1200	1080	125	8	M20	298	750
3	900	1170	96	8	M20	254	750
4	800	863	90	8	M16	254	600
5	700	525	76	4	M20	165	500
6	600 (16 Ata)	632	76	4	M20	165	500
7	600	335	68	4	M20	165	500
8	500 (16 Ata)	310	72	4	M20	165	500
9	500	210	60	4	M20	165	400
10	450	150	54	4	M16	140	400
11	400 (16 Ata)	205	60	4	M16	140	350
12	400	110	48	4	M12	125	350
Angle of rotation from fully Open to fully Close condition - 90 degree (Quarter Turn)							

TECHNICAL DATASHEET-A

BHEL ENQUIRY REF.		BIDDER's REF.	
BF VALVE SIZE & QTY :			
GEARBOX MODEL:			
Sl No.	**Description**	**Unit**	**Data**
01	Manufacturer		
02	Gear box model		
03	Type of Gearbox		
04	Gear ratio/Version		
05	Maximum output torque	Nm	
06	Enclosure		
07	Position limit switches	YES/NO	
08	Lubrication		
09	Painting Shade		
10	Weight (Approx.)	KGs	
11	Hand wheel	YES/NO	Indicate the material
12	Means to prevent travel beyond full open/full close condition (beyond 90 degree rotation)	YES/NO	
13	Mechanical Position Indicator	YES/NO	
14	MOC DETAILS & MAKE OF BOUGHT OUT ITEMS		
15	**OTHER**		**ANY OTHER INFORMATION FELT NECESSARY BY BIDDER**

ANNEXURE - III

Specification for Electrical Actuators / Gearboxes

1. Electrical actuator/gearbox (ON-OFF duty) for BF Valves shall be offered as per the details given in annexure IV.
2. Supplier to also furnish the maximum torque, which the actuator / gearbox can deliver.
3. The secondary gearbox shall be provided with removable drive sleeve for repositioning of Actuator / Gearbox assembly on the B.F. Valve. Removable sleeve shall be supplied in loacked condition with gearbox.
4. Keyway in the second stage gear box to be as per IS 2048 and should have tolerance of Js9. Vendor shall furnish size of keyway in the drawing.
5. The hand wheel diameter shall be designed such that not more than 20 kg force is required for desired torque output. Calculations for the same is required.
6. The Actuator / Gearbox shall be inspected by BHEL / Third party as per supplier's QA plan approved by BHEL. For **NTPC** projects, inspection will be carried out by NTPC and for non-NTPC projects inspection will be done by BHEL / TPIA / Customer's Representative. Supplier to furnish one copy of the latest QA plan for approval along with the offer. The QA PLAN should bear the name of the contract & model No. offered. This should also include the following tests for which test certificates are required to be furnished .
    a. Chemical & Mechanical properties' test for the material of worm , worm wheel and drive sleeve.
    b. Operation test.
    c. Circuit continuity test.
    d. Insulation resistance test
    e. Type and routine test for motor.
    f. Torque test at the rated torque for all actuators.
    g. Heat treatment record for Nitriding of worm shaft & worm wheel of secondary gear box.
7. The QA plan of gearbox is also to be furnished. TC for life cycle test conducted as per AWWA C504 in supplier's works, on the offered model of gear box is also required.
8. **The offer should include the GA drawing of Actuator / Gearbox assembly showing all 3 views in AUTOCAD format, major dimensions, weight & KW rating. The wiring diagram of actuator & Motor Data sheet is to be furnished along with the offer.**
9. The enclosure for Actuator / Gearbox shall be as per IP 65.
10. The actuator shall be provided with hammer blow device to unseat sticky valves.
11. The actuator motor shall be suitable for 415 Volts ± 10 %, 50 HZ ± 5%, 3 phase supply voltage.
12. The Actuator & its Secondary Gearbox shall be as per the vendor's/his principal's design.
13. The actuator shall be guaranteed for a period of 12 months from date of commissioning or 18 months from the date of despatch.
14. The offer shall be submitted by the vendor considering the following variants/optional extras:
    A.) Actuator/Gearbox including 4 no. – 1" size cable glands and **without integral starter**
    B.) Actuator/Gearbox including 4 no. – 1" size cable glands and **with integral starter + OLR**
    C.) Position transmitter : LVDT type - Electronic (2 wire) Contactless
    D.) Position transmitter : Potentiometric type - Electronic (2 wire) R/I Converter
    E.) 9 pin plug & socket (**NTPC** std.)
    F.) Limit switches for [Open : Intermediate : Close] configuration of [1 : 2 (Adj) : 1]

ANNEXURE-IV

Details of Actuator variants required for BF Valves

Sl. No.	BFV Size (mm)	Rated Output Torque (Kg- m)	Open / Close time (seconds)	Bore in the Gear box for Valve Shaft (mm)	Mounting details of Gear Box			Maximum Handwheel Dia (mm)
					No. of holes - off centres	size of holes	PCD - mm	
1	2500	11186	Alt 1 : 20-30 Alt 2 : 50-60	200	12	M36	483	750
2	2300	8665	Alt 1 : 20-30 Alt 2 : 50-60	190	12	M36	483	750
3	1800	3400	Alt 1 : 20-30 Alt 2 : 50-60	160	8	M30	356	750
4	1400	1510	Alt 1 : 20-30 Alt 2 : 50-60	114	8	M20	298	750
5	1200	1080	40-60	125	8	M20	298	750
6	900	1170	40-60	96	8	M20	254	750
7	800	863	40-60	90	8	M16	254	600
8	700	525	40-60	76	4	M20	165	500
9	600 (16 Ata)	632	40-60	76	4	M20	165	500
10	600	335	40-60	68	4	M20	165	500
11	500 (16 Ata)	310	40-60	72	4	M20	165	500
12	500	210	40-60	60	4	M20	165	400
13	450	150	40-60	54	4	M16	140	400
14	400 (16 Ata)	205	40-60	60	4	M16	140	350
15	400	110	40-60	48	4	M12	125	350
Elec. Act. are required for ON-OFF duty for angle of rotation from fully Open to fully Close condition - 90 degree (Quarter Turn)								

Note - Bidder shall have design and manufacturing facility to cater the requirement of varying open/close timings other than the above range as and when required during technical evaluation.

TECHNICAL DATASHEET-B

BHEL ENQUIRY REF.		BIDDER's REF.	
BF VALVE SIZE & QTY :			
ELEC. ACTUATOR MODEL(WITH GEARBOX) :			
Sl No.	**Description**	**Unit**	**Data**
01	Manufacturer		
02	Torque range & Speed	Nm & rpm	
03	Regulating torque	Nm	
04	Type of service (ON-OFF)		
05	Enclosure (TENV)		
06	Admissible ambient temperature	^{0}C	
07	Cable Glands — Double compression		
08	Position limit switches		
09	Torque switches		
10	Rating of switches		
11	Thermo switch		
12	Wiring Diagram		
13	Lubrication		
14	Motor nominal output	kW	
15	Duty (S2-15 minutes)		
16	Rated voltage	V	
17	Rated frequency	Hz	
18	No. of phases		
19	Frame size		
20	Admissible voltage fluctuation	%	
21	Admissible frequency fluctuation	%	
22	Admissible voltage & frequency fluctuation	%	
23	Full load Current	A	
24	Starting Current	A	
25	Full load speed	rpm	

26	Insulation class			
27	Power factor			
28	Full load efficiency	%		
29	Temperature rise over ambient temp. 50^0C	^{0}C		
30	Type of starter recommended			
31	Motor type & reference standard			
32	Tolerance for motor data			
33	ELECTRONIC POSITION TRASMITTER	1 No		
34	SPACE HEATER	1 No		
35	INTERNAL WIRING			
36	OLR SET VALUE & RANGE	A		
37	Gear box model			
38	Gear ratio/Version			
39	Maximum output torque	Nm		
40	PAINTING SHADE			
41	WEIGHT (Approx.) Actuator with Gearbox	KGs		
42	PLUG & SOCKET (INTEGRAL MOUNTED ON THE ACTUATOR)			
43	THE COLOUR CODING OF CABLES FOR 9 PIN PLUG & SOCKET SUITABLE FOR 4 PAIR, 0.5 SQ.MM COPPER CABLES		Pin No. A (1) B (2) C (3) D (4) E (5) F (6) G (7) H (8) J (9)	Cable Color
44	SINGLE-PHASE PROTECTION, WRONG PHASE SEQUENCE PROTECTION OVERHEATING OF THERMOSTAT FEATURES &DESIGN OF LOCAL DIAGINOSIS OF TYPE OF FAULTS AVAILABLE.	YES/NO		
45	HANDWHEEL	YES/NO	Indicate the material	
46	MOC DETAILS & MAKE OF BOUGHT OUT ITEMS			
47	**OTHER**		**ANY OTHER INFORMATION FELT NECESSARY BY BIDDER**	