



BHARAT HEAVY ELECTRICALS LIMITED VALVES PURCHASE

MOU/TP-VALVE/VALVE GEAR BOX/ REV 06
DATE:30.05.2022

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TECHNICAL SPECIFICATION FOR SUPPLYING VALVES GEAR BOXES



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SCOPE

By this MOU, The specification for the Valve gearboxes is mutually agreed and applicable for the purchase orders finalised against the valve gearbox requirements from BHEL/Trichy during the period of validity of this MOU.

Project / order specific requirements will be indicated with each items of the order. However this specific requirement is over and above the specification finalized in this MOU.



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1.0 General requirements

- 1.1 During the validity of this MOU, only MOU specification will be applicable for all enquiries and it will not be discussed for any deviation/clarification etc.
- 1.2 In case of the conflict in any requirement between MOU and project specific specification, the requirement of the project section is the final and binding.
- 1.3 It is agreed that no deviations will be taken by the vendors on the specification while submitting their offers against future enquiries.
- 1.4 Since this MOU specifications is standardized and an understanding has been reached, the future enquiries will be floated on "SINGLE BID SYSTEM" only. Hence, if any offer is found with deviations, the same will be totally rejected and will not be considered for further evaluation
- 1.5 The validity of this MOU is for TWO years from the date of signing. After the expiry of the period, the same can be extended further with or without any modifications. However, in case any changes are required, the MOU may be amended before the expiry of the validity.
- 1.6 If any special or non-standard tools are required for installation, operation or maintenance, the same shall be supplied along with the equipment.
- 1.7 Trouble-free operation of the equipment shall be guaranteed for a period of 12 months from the date of commissioning OR 18 months from the date of dispatch whichever is earlier.
- 1.8 Since the vendors works alone is approved by BHEL, it is agreed the vendor will manufacture this item in their own works only and will not off-load the jobs to any other suppliers without the written approval by BHEL.
- 1.9 All components shall be packed in such a way that they should not get damaged during transport.
- 1.10 BHEL and the Vendor shall have an involvement which will commence at bid stage and follow through the completion and acceptance, thus ensuring total conformity to Purchaser's requirements.



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2.0 Technical Requirements

PRODUCTENGINEERING/VALVES	VAL/BG/SPEC/006Rev.:04
BHEL/TIRUCHIRAPPALLI-14	DATE:16-05-2018

SPECIFICATION FOR BEVEL GEAR OPERATORS FOR VALVES

1. **TYPE:**

All gear operators shall have bevel gear transmission with completely enclosed construction complying to IP65 or better. The gear casing shall be designed adequately to withstand shock and vibration of the pipeline. The design shall be compact and less weight and shall not cause any trouble during operation at sites.

2. **LUBRICANT:**

The Gearbox shall be filled with suitable lubricant. The specification of lubricant shall be furnished. There shall be no leakage of lubricant from the gearbox. The grease used shall be suitable for an ambient temperature of 80 deg. Centigrade.

2. **HANDWHEEL:**

All the gear operators shall have suitable hand wheel and the size of the hand wheel shall be designed to give the required input torque. The hand wheel shall be malleable iron or steel. The maximum hand wheel diameter shall not be more than 750mm.

3. **BASE:**

The gear operator shall have base suitable to take the thrust with ball/roller bearings. An Aluminum Bronze drive sleeve with a pilot bore shall be provided as a standard supply. If specified in the Purchase Order, Ni-Resist drive sleeve is to be supplied. The drive sleeve will be threaded by BHEL to suit the stem thread.

4. **ASSEMBLY:**

The assembly of all gears, shafts etc... shall be done properly to have smooth operation without any noise. Also the Gearboxes shall be suitable for mounting in any position.

5. **OUTPUT SHAFT FLANGE:**

The flange for connecting the valve shall have dimensions as per BHEL requirement indicated in the table.



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6. INPUT SHAFT FLANGE:

Wherever gearboxes are required to be assembled with Electrical Actuator, Gear operators are to be supplied with input flanges to suit the keyed shaft of the actuator. Details of the input flange for each model shall be furnished. Applicable Actuator models that can be coupled with each Gearbox shall also be indicated.

7. RANGE:

The gear operators with torque, thrust, maximum stem acceptance diameter, base details, etc., shall be supplied as per the details given below.

Sr.No.	Torque (kg-m) - Max.	Thrust (kgf)	Max. Stem Dia (mm)	Flange OD (mm)	Bolt Circle Dia (mm)	Locating Dia (mm) h7	Threaded hole size(mm)	Threaded hole depth(mm)	No. of Holes	Handwheel dia (mm)	Gear Ratio	Stem cover length(slotted)(m m)
1	11	2700	40	125	102	70	M10x1.5	16	4	250	2:1	200
2	35	6300	46	178	139.7	95.2	M16x2	26	4	310	2.5:1	250
3	50	16000	52	178	139.7	95.2	M16x2	22	4	310	4:1	250
4	75	10000	55	210	165.1	127	M20x2.5	26	4	460	3:1	250
5	100	19000	65	210	165.1	127	M20x2.5	30	4	460	4:1	250
6	150	20000	65	289	254	152.4	M16x2	34	8	460	4:1	400
7	200	32000	86	289	254	152.4	M16x2	25	8	460	6:1	400
8	300	35000	85	343	298.5	177.8	M20x2.5	31	8	610	6:1	400
9	400	45000	102	343	298.5	177.8	M20x2.5	25	8	610	8:1	400
10	600	63000	115	412	355.6	215.9	M24x3	45	8	610	8:1	400
11	800	82000	121	406	355.6	215.9	M24x3	30	8	610	8:1	400
12	1200	120000	130	476	406.4	228.6	M30x3.5	50	8	750	10:1	500
13	1600	135000	170	476	406.4	228.6	M30x3.5	50	8	750	10:1	500

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8. **MATERIAL:**

All machined components like bevel gear, bevel pinion, drive sleeve etc., shall be from superior grade material suitable for the application and shall be heat treated to the design requirement.

9. **STEM PROTECTION:**

All gear operators shall have stem protection covers. Stem protection covers are to be provided with a 'SLOT' for stem position indication. The length of stem protection cover shall be as indicated in the table. Wherever different length of stem protection cover is required, the same has to be supplied as indicated in the purchase order. The thread connection of the Stem Protection Cover shall be indicated in the GA drawing & Catalogue.

10. **DRAWING:**

Supplier to furnish the general arrangement drawing and cross sectional drawing of the gear operator incorporating the material specification for all critical components and overall dimensional details for BHEL approval. Also complete dimensional drawing of drive sleeve is to be furnished for all models.

11. **TYPE TESTS:**

The gear operator shall be tested to the design requirement of torque and thrust and type test certificates shall be furnished. The mechanical efficiency shall not be less than 95%.

12. **FINAL ASSEMBLY:**

To be inspected visually for surface smoothness, painting finish and smooth operation.

13. **NAME PLATE:**

Nameplate made of suitable corrosion resistant material, preferably stainless steel, is to be fixed on to the gearbox casing. The name plate contain the following information as minimum:

Maker's Name.....: Model

Number: Serial Number

.....: Output

Torque.....: Permissible

Thrust.....: Gear

Ratio.....: Material

Code(as indicated in P.O):



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14. **VENDOR TO FURNISH THE FOLLOWING DETAILS:**

Name of Supplier.....: Gear
Box Model No.: G.A.
Drawing No.....: Cross
sectional Drg. No.: Drive
sleeve Drg. No.....: Lubricant
Details: Bearing
details.....:
Suitability for Outdoor Application...: :

The vendor shall furnish the above details against each model of the Gearbox offered and enclose all the drawings & documents along with the offer.

15. **Recommended spares:**

The supplier shall indicate the list of commissioning spares if any and operational spares for five years of trouble free operation.



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3.0 Documentation Requirements

The following documents are to be attached with this MOU
a. GA drawings for all models including dismantling clearances.
b. The dimension drawing of the blank adopter bush
c. Dimensional catalogue with maximum spindle acceptance details
d. Outline dimension of gear box.
e. General arrangement drawing of gear box consisting following as minimum
1. Identification of critical component with its material composition.
2. Mounting flange dimension
3. Hand wheel dimensions
4. Weight of gear box
5. Stem protection cover length, thread size and type
f. The 3D CAD format shall be available for all the models.
g. Quality plan.
h. Valid Type test certificates

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4.0 Quality requirements

4.1 INSPECTION AND TEST REQUIREMENTS

All equipments shall be subject to inspection by BHEL/ Client and/or their nominated inspecting authority. Vendor shall make all provisions in his shop/sub-vendors shops for complete inspection and test of gear boxes

4.2 Tests & Inspection:

- 4.2.1 During fabrication/testing, the gearboxes shall be subjected to inspection by BHEL/CUTOMER or by any agency authorized by them. Manufacturer shall furnish all necessary information concerning the supply to BHEL/CUSTOMER inspectors.
- 4.2.2 All routine tests as specified by the applicable standards shall be conducted.
- 4.2.3 Shop tests shall be witnessed by an inspector of BHEL/CUSTOMER or of an agency authorized by customer.
- 4.2.4 Quality plan for the gear boxes to be followed.

4.3 Painting, Protection, Packing, Supply and Identification:

4.3.1 **Surface Preparation:** Weld slag & spatter shall be removed and the surfaces to be coated shall be free from contamination. Surface defects shall be removed by suitable methods. Sharp edges shall be smoothened by grinding. Prior to surface preparation oil, grease, drilling emulsions, cutting emulsions and preservative agents shall be carefully removed by suitable solvents. The surface shall be carefully dried with clean cloth to prevent the dissolved impurities from spreading over the entire surface. The surface shall be cleaned by wire brush and shot blasting if required. Proper adhesiveness of paint to the surface shall be ensured.

4.3.2 Paint Shade

The enclosures shall be treated and prepared for painting with suitable painting system for withstanding 500Hrs of salt spray as per ASTM B-117/ ISO 9227 standard.

Paint shade shall be 'shade 692 of IS 5 (Smoke Grey)'

4.4 Packing & Transport:

The gearbox shall be supplied to site packed in wooden boxes. They shall be wrapped with polythene sheets. They shall have skid bottoms for handling.



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All spares shall be packed separately in boxes marked SPARE. Special precaution notations such as Fragile. This side up, center of gravity, weight, and Owner's particulars. Purchase number etc. shall be clearly marked on the package together with other details as per purchase order.

The equipment may be stored in a covered shed for long periods before installation. The packing should be suitable for such storage Ref Annexure A - **Instruction for packing of Bevel Gearboxes.**

4.T.0	TEST REQUIREMENTS FOR GEAR BOXES
4.T.1.0	ROUTINE TEST:
4.T.1.1	Dimensions: Overall and mounting
	Details of painting as per specification: Anti-corrosiveness Epoxy.
	i. Shade.
	ii. Finish
	iii. Paint thickness
4.T.1.2	Manual operation through hand wheel.
4.T.1.3.	T.1.10 Leakage test for gear case (visual).
4.T.1.10	TYPE TEST certificates shall be provided for Thrust & Torque
4.T.2.0	Enclosure protection for the total assembly.
4.T.2.5.	NOTES:
4.N.0.	The quality plans shall be approved by BHEL.
4.N.0.1.	All testing facilities shall be arranged by the vendor, at his works before calling BHEL representative for inspection.
4.N.0.2.	Approved drgs., PO specification and relevant standards if any shall be made available during testing / inspection.
4.N.0.3.	All measuring and testing instruments shall be periodically calibrated from National test house and certificates made available during inspection.
4.N.0.4.	All relevant GA drawings, data sheets & wiring diagrams shall be submitted as controlled copy and approval shall be obtained from BHEL. All supply shall be as per these documents.
4.N.0.5	



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5.0 Additional Details required

The following details are required for Gear operators in addition to Technical requirements mentioned in **VAL/BG/SPEC/006 Rev.:04**

1. For gearboxes of Torque range 150KGM and less (S.no 1 to 6 of technical specification "Range" table), operating force required on hand wheel at full torque output shall not exceed 35 Kg F while operating with both hands. Accordingly gearbox ratios shall be selected.
2. All gearboxes shall be provided with Hammer blow effect.
3. All Gear operators shall have provision to accommodate raising spindle of the valve and the hole shall be properly covered with a removable lid. The Gear box shall be supplied with stem protection tube to accommodate larger spindle travel as indicated elsewhere in this specification. All the above parts, i.e. the threaded portion of Gear box, removable lids and stem protection tubes shall be able to withstand the prolonged outdoor storage without getting rusted or damaged.
4. All Gears used shall be metallic. Fiber gears are not acceptable. Metallic gear trains used shall be self-locking to prevent drift.
5. The gearbox shall be oil filled or grease filled. The oil/grease must be suitable for operation for 80 Deg. above ambient temperature. Furnish detail of lubricant used with Indian oil Company's BPCL, IOCL & HPCL's equivalent. The Gear box shall have proper seals to prevent leakage of oil at all installation positions. The Gear box construction shall be such that the oil/grease does not leak to other compartments or outside. In case of any complaint of such leakage, the complaint shall be attended free of cost within one week and root cause of the problem shall be eliminated within one month.
6. All gearboxes shall be suitable for both Hand operation and motor operation (for actuator combination).
7. Supplier shall quote for the applicable mandatory spares which will be used for spares requirement during rate contract period.



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ANNEXURE-A : Instruction for packing of Bevel Gearboxes

Packing box :

- 1.1) The Gearbox shall be supplied packed in any seasoned wood or plywood as wooden box as per relevant international standard. Sea worthy packing is envisaged for international shipments.
- 1.2) The box shall have inner lining of polythene sheet (minimum of 250G polythene sheet)/waxed paper/water proof paper or similar protection against water entry.
- 1.3) Use fillers like thermocol / loose fill or air-cellular cushioning material such as Bubble Wrap to fill void spaces and prevent movement inside the box during shipping.

Gearbox Covering:

- 1.4) Further the Gearbox shall be completely covered with a water-proof barrier highly resistance to the passage of water-vapour - like thick polythene bag (Minimum of 500G thickness). Sharp corners, edges and projects of the Gearbox should be covered to prevent abrasion or puncture of the water proof barrier with anti-abrasive material like felt. Extra length and projections of the polythene bags are to be wrapped and secured by strips of self-adhesive tapes.
- 1.5) After opening the box, the water-proof barrier shall be intact and it is intended to store Gearbox for long time with this water-proof barrier.
- 1.6) Suitable desiccants shall be provided in to the sealed water proof barrier. The desiccant shall be in small bags and disposed uniformly. They shall be secured in position to minimize chances of desiccant dust escaping. The amount of total desiccant shall be such to limit the relative humidity within the cover to a maximum value of 50 percent – for a long time of storage.
- 1.7) The equipment's covered with a polythene sheet shall be kept inside the box, followed by coir, wooden bottoms, loose fill or air-cellular cushioning material such as Bubble Wrap to fill void spaces, thermocol, etc. to prevent vibration effect during loading, transportation, etc.
- 1.8) On all sides of the inner case, black polythene sheet shall be nailed.
- 1.9) Loose items of the equipment if any shall be packed separately.

Marking on the box:

- 2.1) All spares shall be packed separately in boxes marked SPARE. Spare components are also to be covered separately with water-proof packing.
- 2.2) Gearbox model and material code shall be prominently marked on the box.



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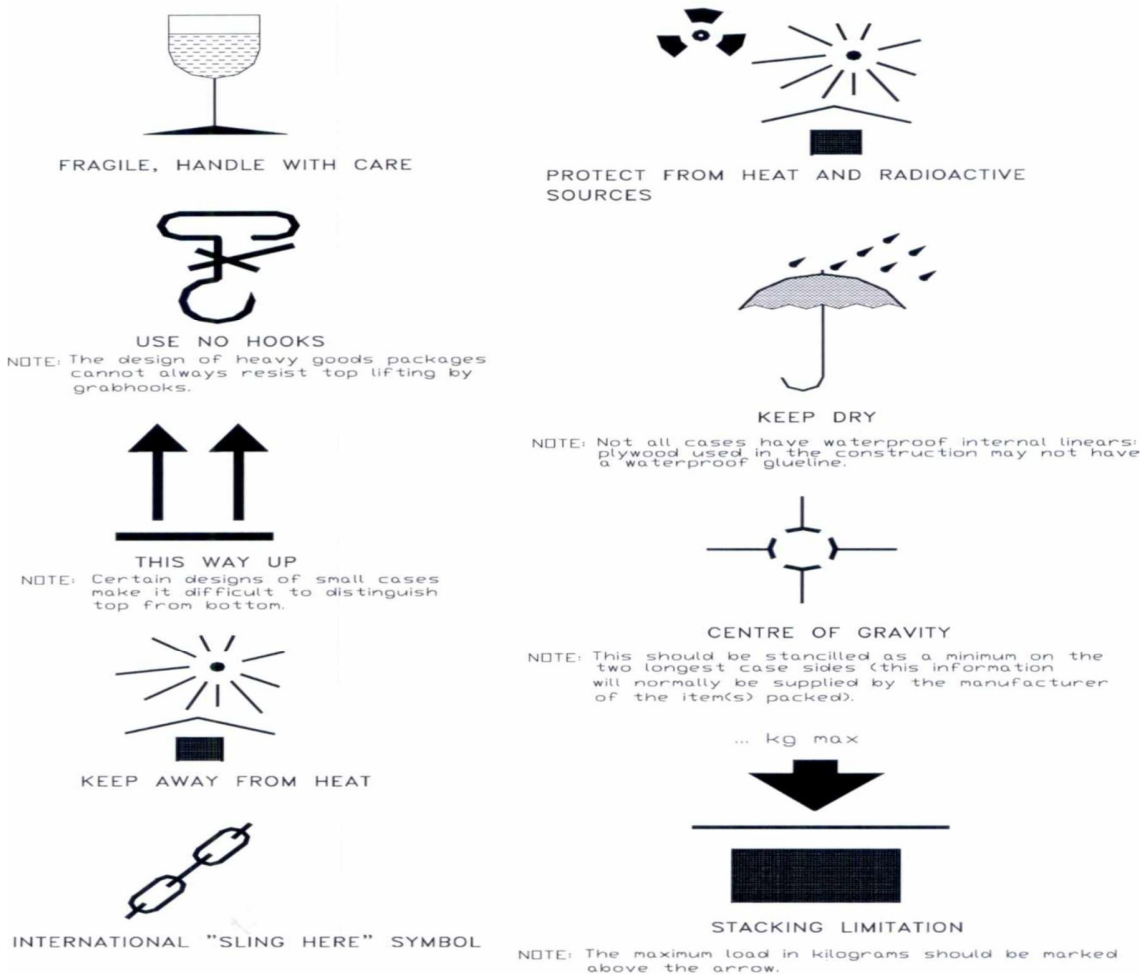
2.3) Special precaution notations such as 'Fragile', 'This side up', 'center of gravity', 'weight', 'Owner's particulars', 'Purchase Order No.', 'Order item No.' etc. shall be clearly marked on the package together with other details as per purchase order.

2.4) After completing the packing, Stencil marking, as per dispatch instructions and symbol marking as per **Annexure — 1** shall be made.

Packing slip

A copy of the packing slip, kept in a polythene cover shall be kept inside the box. Another copy of the packing slip, kept in a polythene cover shall be kept out side the box and covered with a metallic plate to the case. ...

ANNEXURE — 1


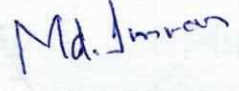





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Signature			
Name	M.VIJAYABHARATHI	MD.IMRAN	D.RAMACHANDRAN
Designation	ENGINEER	DY.MANAGER	SR.MANAGER
Date	03 June 2022	03 June 2022	03 June 2022
Action	Prepared By	Checked & Reviewed By	Approved By

Engineering

Purchase

Quality

Vendor