

Form No:	 PE&SD	BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION TECHNICAL SPECIFICATION FOR BUTTERFLY VALVES (WAFER/WAFER LUG) WATER SERVICE (RESILIENT SEAT)	PY 52 148		
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BUTTERFLY VALVES (WAFER/WAFER LUG)
WATER SERVICE (RESILIENT SEAT)

1. Scope

This specification covers the design, manufacture, inspection, testing and supply of inching type butterfly valves (WAFER TYPE, WAFER LUG TYPE) operated manually or through electrical / pneumatic actuator for water service applications.

2. Codes and Standards

The design, manufacture and testing of butterfly valves shall comply with the latest edition of BS EN 593. For other requirements like material grades of components, this specification has to be followed.

3. Designation

A 4" 150# Motor operated carbon steel wafer type Butterfly valve with integral starter to this standard shall be designated as follows:

4" BFLV CS MO IS CL150 WAFER

4. Design Requirements

4.1 Type of Valve

Valves covered under this standard are manually, pneumatically, hydraulically or electrically operated valve shall be supplied as per the description indicated against Material Code as per Variant Table-II.

4.2 Operation

- a. The butterfly valve shall suitable for inching duty
- b. Manual valves up to 6" size should have valve handle with throttling plate for locking valve in 10 different positions.
- c. Gear operator shall be provided for butterfly valve size 8" and above with directly mounted actuators. Each manual actuator shall have all gearing totally enclosed.
- d. For valves with electric actuator, the electric actuator shall be as per datasheet at Table-I.
- e. Pneumatically operated valves should be mounted with spring return air actuator.

4.3 End Connection/Body Type

- Shall be Wafer or Wafer Lug type as indicated in material description.
- For wafer lug type valves, valve shall be full lugged type and supplied with full lugs.
- Unless otherwise specified in variant table, the wafer lug flange drilling standard shall be of 150# as per ASME B16.5

4.4 Valve Size – As indicated against material code in the Variant Table-II

4.5 Valve body rating – As indicated against material code in the Variant Table-II

Form No:	LAYOUT & PIPING ENGINEERING PROJECT ENGINEERING & SYSTEMS DIVISION	PREPARED	CHECKED	APPROVED	DATE
		CHMANOJ/ SVNR	GS	SBR	14.07.16

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4.6 Material of construction:

S.NO.	Description	(CS) - MATERIAL FOR CARBON STEEL VALVE BODY (A216 WCB)
1	Body	(CS) CARBON STEEL AS PER A216 Gr WCB
2	Disc	STAINLESS STEEL A351 Gr CF8M
3	Shaft	SS AISI 410
4	Bearings	Manufacturer STD
5	Seat	EPDM Rubber
6	Body Seat Ring	AISI 316
7	Disc Seal Ring	EPDM Rubber
8	Seal Retaining Ring	AISI 410
9	Gear Casing	MFG STD
10	Gears	MFG STD
11	Handle	Malleable Iron only no alternate material allowed
12	Bolt/Nut	ASTM A193 Gr.B7/ ASTM A194 Gr.2H

S.NO.	Description	(SS) - MATERIAL FOR STAINLESS STEEL VALVE BODY (CF8M)
1	Body	(SS) STAINLESS STEEL AS PER A351 Gr CF8M
2	Disc	STAINLESS STEEL A351 Gr CF8M
3	Shaft	SS AISI 410
4	Bearings	Manufacturer STD
5	Seat	EPDM Rubber
6	Body Seat Ring	AISI 316
7	Disc Seal Ring	EPDM Rubber
8	Seal Retaining Ring	AISI 410
9	Gear Casing	MFG STD
10	Gears	MFG STD
11	Handle	Malleable Iron only no alternate material allowed
12	Bolt/Nut	ASTM A193 Gr.B7/ ASTM A194 Gr.2H

S.NO.	Description	(CI) - MATERIAL FOR CAST IRON VALVE BODY (FG 260)
1	Body	(CI) CAST IRON as per IS-210 Gr. FG 260 + Epoxy
2	Disc	STAINLESS STEEL A351 Gr CF8M
3	Shaft	SS AISI 410
4	Bearings	Manufacturer STD
5	Seat	EPDM Rubber
6	Body Seat Ring	AISI 316
7	Disc Seal Ring	EPDM Rubber
8	Seal Retaining Ring	AISI 410
9	Gear Casing	MFG STD
10	Gears	MFG STD
11	Handle	Malleable Iron only no alternate material allowed
12	Bolt/Nut	ASTM A193 Gr.B7/ ASTM A194 Gr.2H

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4.7 Constructional Features:-

- a. The butterfly valve shaft and disc shall be designed to withstand full differential pressure across the closed valve disc.
- b. For butterfly valves, the disc shall rotate from the full open to the tight shut position. The disc shall be contoured to ensure the least possible resistance to flow and shall be suitable for throttling operation. While the disc is in the throttled position, valve shall not create any noise or vibration. All butterfly valves shall be suitable for throttling application from 5 to 90 Deg. **i.e., by default, the valve shall be of Inching type.**
- c. The butterfly valves shall be suitable for indoor / outdoor installation with shaft either in horizontal or vertical position.
- d. Sleeve and other bearings fitted into the valve body shall be of self-lubricated materials shall not have any harmful effect on water or rubber and coefficient of friction of the material shall not exceed 0.25, when run at the maximum bearing pressure.
- e. All butterfly valves shall be closed by rotating the hand controls in the clockwise direction. The pulling force required on the hand wheel rim shall not exceed 25 kgf when operating the valve under full flow and operating pressure.
- f. Gear Operator shall be totally enclosed helical worm or combination of helical worm and spur gear in grease case with grease nipples / plugs with position indicators for open / close positions and with limit stops.
- g. Butterfly valve actuators shall be equipped with adjustable, mechanical, stop limiting devices to prevent over-travel of the valve disc in the open and closed positions.
- h. Actuator, housings, supports and connections to the butterfly valve shall be designed with a minimum safety factor of 5, based on the ultimate tensile strength, or a minimum safety factor of 3, based on the yield strength of materials used.
- i. The actuator shall be designed to control the butterfly valve in all positions from fully open to fully closed and from fully closed to fully open with control in any intermediate position.
- j. For Pneumatically operated valves purchaser will provide ½" connection of airline with an isolation valve. All further required air filters & tubing to be supplied by valve supplier.
- k. The butterfly valve shall be provided with locking device in both open & close position of the valve.
- l. The indication of the position of the disc shall be integral with shaft engraved on the body of the valve. The indication may be accomplished by a mark on the shaft. The design shall ensure that it indicates open, close and intermediate position of the valve correctly. Shaft to lever connections shall be designed so that the lever always correctly indicates the disc position.
- m. Butterfly valve body shall be internally rubber lined extending upto the edges of the flanges without any joints and disc of the butterfly valve shall be coated with epoxy.
- n. Valve seats & "O" rings shall be of EPDM of replaceable type.
- o. The rubber lining thickness shall be as per manufacturer's standard. However, the minimum thickness shall be 3 mm.
- p. No reclaimed rubber shall be used.
- q. The seals, both on the body (sleeve) and on the disc shall be of the material specified. Necessary shaft seal shall be provided and adequately designed to ensure no leakage across the seal. This seal

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shall be designed so that they will allow replacement without removal of the valve shaft. The sealing ring on the disc shall be continuous type and easily replaceable.

r. Direction of flow shall be marked on the valve body by stamping or embossing and the tag Nos. for all valves shall be either riveted or punched on the valve body.

s. Fabricated type butterfly valves are not acceptable.

t. No asbestos or cadmium based material shall be used.

5. Testing

a. Body test, Seat test and all other requirements of testing shall be as per BS EN 593 & BS EN 12266 (latest edition)

b. All valve major material shall be tested for chemical and mechanical properties as per the relevant codes and standards.

c. Performance test on valve with direct mounted actuator shall be operated three times from fully closed to fully opened position and the reverse under no flow conditions.

d. Ozone resistance testing on rubber compounds shall be performed in accordance with ASTM D 1149 using 50 PPHM minimum ozone concentration. The tests shall be conducted on unstressed samples for 70 hrs. at 40 Deg.C without visible cracking in the surfaces of the test samples after tests.

e. Volume expansion test on rubber compounds shall be performed in accordance with ASTM D 471. The rubber compound shall have less than 2% volume increase after immersing a sample in distilled water at 23 Deg.C + 1Deg.C for 70 hrs.

f. Rubber lining shall be spark tested for checking the continuity, as applicable.

g. Magnetic particle testing shall be carried out on disc and the trunnion portion.

h. Ultrasonic testing and dye penetrant testing shall be carried out on shaft.

6. Name Plate:

Each valve shall be provided with 2mm thick SS nameplate with 1mm deep engraving filled with black enamel indicating the TAG NO. & service description etc. Name plate data shall be inscribed on the plate in such a manner that it cannot erode or peel off.

7. Surface Preparation & Painting:-

7.1 Shall be as per PEMC Document, Project Specific painting specification issued along with enquiry documents.

7.2 Painting requirement shall be clearly indicated in the GA drawing issued for approval during detail engineering.

8. Packing:-

8.1 All the valves shall be packed suitably in closed wooden cases in order to avoid damage during transit and storage at BHEL.Suitable supports shall be provided inside the cases in order to avoid internal movement.Incase of imported consignments the packing shall be seaworthy

8.2 Each valve after end protection should be wrapped in polythene sheet before packing in the cases

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- 8.3 Valves of sizes up to 50mm(2") could be packed in one packing case taking care that they do not strike each other .Enough packing material shall be kept inside the case to avoid damage
- 8.4 Valves of sizes above 50mm (2") shall be packed separately in each case, the hand wheel extension spindle or any other accessory of a valve is removed at the time of packing, the same must be kept in the same case and not separately.
- 8.5 Each Packing case must contain 2 copies of the shipping list giving details of all the contents of the case.

9. Marking

The following marking shall be done on each packing case minimum on two sides and also at the top.

- Complete address of the consignee and destination as per BHEL Purchase Order.
- BHEL Purchase Order Number.
- BHEL Valve Standard Number(s).
- Number of pieces in each packing case.
- Net weight.
- Gross weight.
- Packing case numbers and total number of packing.
- Arrow indicating top of the packing case.

10. Documentation

Bidder shall confirm in their bid for compliance in all respect for the submission of documents as follows:

S. No	Description	Along with offer	After placement of Order (Note-2)	After Supply completion
1	Filled in technical data sheets, GA Drg.	I (2)	A (4)	
2	Leaflet / catalogue for the offered item indicating complete cross sectional arrangement, binding dimensions, bill of materials with material specification details, hydraulic / air test pressure for body / seat / back seat, overall height, dismantling clearances, weight and special features, if any, as specified in the main specification of the valves.	I (1)		
3	Quality Assurance Plan (QAP)	I (1)	A (4)	
4	List of recommended spares for 2 years trouble free operation of valves		I (2)	
5	Any deviations to this standard	A (1)		
6	Actuator technical data sheet, wiring diagram, limit switch development diagram, if applicable	I (1)	A (3)	
7	Test Certificate		I (5)	
8	Guarantee Certificate		I (2)	
9	Installation, operation and maintenance manual (with all approved drawings, data sheets, write-ups, safety procedures, catalogues, list of spares, lubrication schedule etc),		A (2)	F (12)

Notes:

- 1) I: For Information, A: For Approval
F: All above documents shall be made as 'FINAL' and submitted both in hard copies and 2 no's of CDs.
- 2) After placement of PO, all documentations required as applicable in above table shall be submitted within 7 days of PO placement.
- 3) BHEL will furnish their approvals / comments within 15 days after submission of drgs/ docs.

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TABLE-I

TECHNICAL DATA SHEET OF ELECTRIC ACTUATOR FOR VALVE
(TO BE FILLED IN BLANK SPACES AND FURNISHED BY BIDDER ALONGWITH OFFER)

S.No	PARAMETERS	VENDOR'S RESPONSE
1	Make of actuator / Model No.	As per approved Vendor list
2	Actuator (Motor) rating (kW)	
3	Type of motor (Sq. cage/Induction)	
4	Supply voltage/Frequency	AC 415V +/- 10%; 50Hz +/- 5%
5	Suitable for short time duty	15 min
6	Suitable for minimum no. of starts per hour	150
7	Enclosure protection class for complete actuator unit	Weather Proof to IP 67
8	Motor insulation	Class – F
9	Design ambient Temp.	50 Deg C
10	Minimum starting-voltage	80%
11	Min. Voltage during running for 5 Min.	75%
12	Motor full load current (Rated Torque Current)	
13	Motor starting current (Locked Rotor Current)	
14	Average Load Current	
15	Power factor at average load	
16	Type of bearings (Sealed for life –type) min. life	100,000hrs
17	Torque (Nm)	
18	Output speed (rpm)	
19	End of travel limit switch (4 No.+ 4NC)	2-nos for each direction of travel
20	Intermediate adjustable position limit switches	1 no. for each direction of travel
21	Built – in local position indicator	One
22	Built – in electronic positioner with power supply unit	Yes
23	In built electric positioner unit with position transmitter for remote indication	4-20 mA isolated output
24	Integral Starter	Integral starter shall be provided (Unless otherwise specified in the inquiry)
25	Local push button for local/ remote/ stop facility	
26	Local remote selector switch	
27	Torque limit switches-1 one for each direction (4 No + 4NC)	One for each direction of travel
28	Contact ratings	5 Amps at 240V AC 0.5 Amps at 110V DC
29	Space heater in terminal box	1No.
30	Hand wheel (with declutching lever)	1No.
31	Dimensional G.A drawing / Catalogue No.	
32	Control wiring drawing No.	
33	Action of loss of signal	Stay put
34	Motion inhibit feature between actuator movements	
35	Protection system provided (against single phasing, incorrect phase rotation, thermostat)	
36	Type of service	Regulating/ Inching
37	Cable glands & Lugs (shall be supplied along with valve/actuator)	Cable gland Size, Type & BOQ : Cable Lugs Size, Type & BOQ :

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38	Power Cables:	Actual cable Size & OD: provided during detail engineering
39	Power cable for space heater	Actual cable Size & OD: provided during detail engineering
40	Control Cables :	Actual cable Size, number of cables & OD: provided during detail engineering
41	Signal cables:	Actual cable Size, number of cables & OD: provided during detail engineering
42	Cable glands & Lugs:	Glands shall be double compression type Nickel plated Brass(ET) shall be provided with back nut and PVC shroud. Lugs shall be tinned copper heavy duty lug

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VARIANT TABLE-II

VAR NO.	MATERIAL DESCRIPTION	DRILLING STD	OPERN MODE	STARTER TYPE	MATERIAL CODE
01	3" BFLV CI (FG 260) HO PN16 WAFER LUG	CL150 -B16.5	HO		PY9752148018
02	4" BFLV CI (FG 260) HO PN16 WAFER LUG	CL150 -B16.5	HO		PY9752148026
03	6" BFLV CI (FG 260) HO PN16 WAFER LUG	CL150 -B16.5	HO		PY9752148034
04	8" BFLV CI (FG 260) GO PN16 WAFER LUG	CL150 -B16.5	GO		PY9752148042
05	10" BFLV CI (FG 260) GO PN16 WAFER LUG	CL150 -B16.5	GO		PY9752148050
06	12" BFLV CI (FG 260) GO PN16 WAFER LUG	CL150 -B16.5	GO		PY9752148069
07	3" BFLV CS (WCB) HO CL150 WAFER	CL150 -B16.5	HO		PY9752148077
08	8" BFLV CS (WCB) GO CL150 WAFER	CL150 -B16.5	GO		PY9752148085
09	3" BFLV CS (WCB) MO IS CL150 WAFER	CL150 -B16.5	MO	Integral	PY9752148093
10	8" BFLV CS (WCB) MO IS CL150 WAFER	CL150 -B16.5	MO	Integral	PY9752148107
11	14" BFLV CS(WCB) GO CL150 WAFER	CL150 -B16.5	GO		PY9752148115
12	8" BFLV CI (FG 260) MO PN16 WAFER	CL150 -B16.5	MO	Integral	PY9752148123
13	8" BFLV CI (FG 260) MO PN10 WAFER	CL150 -B16.5	MO	Integral	PY9752148131
14	6" BFLV CS (WCB) HO CL150 WAFER	CL150 -B16.5	HO		PY9752148140
15	2" BFLV CS (WCB) HO CL150 WAFER	CL150 -B16.5	HO		PY9752148158
16	2" BFLV CI HO IS CL150 WAFER	CL150 -B16.5	HO		PY9752148166
17	3" BFLV CI MO IS CL150 WAFER	CL150 -B16.5	MO	Integral	PY9752148174
18	1 1/4" BFLV CS (WCB) HO CL150 WAFER	CL150 -B16.5	HO		PY9752148182
19	1 1/2" BFLV CS (WCB) HO CL150 WAFER	CL150 -B16.5	HO		PY9752148190
20	1 1/2" BFLV CS (WCB) MO CL150 WAFER	CL150 -B16.5	MO	Integral	PY9752148204
21	2" BFLV CS (WCB) MO CL150 WAFER	CL150 -B16.5	MO	Integral	PY9752148212
22	4" BFLV CS (WCB) HO CL150 WAFER	CL150 -B16.5	HO		PY9752148220
23	4" BFLV CS (WCB) MO CL150 WAFER	CL150 -B16.5	MO	Integral	PY9752148239
24	6" BFLV CS (WCB) MO CL150 WAFER	CL150 -B16.5	MO	Integral	PY9752148247
25	8" BFLV CS (WCB) HO CL150 WAFER	CL150 -B16.5	HO		PY9752148255
26	10" BFLV CS (WCB) GO CL150 WAFER	CL150 -B16.5	GO		PY9752148263
27	10" BFLV CS (WCB) MO CL150 WAFER	CL150 -B16.5	MO	Integral	PY9752148271
28	12" BFLV CS (WCB) GO CL150 WAFER	CL150 -B16.5	GO		PY9752148280
29	12" BFLV CS (WCB) MO CL150 WAFER	CL150 -B16.5	MO	Integral	PY9752148298
30	12" BFLV SS (CF8) GO CL150 WAFER	CL150 -B16.5	GO		PY9752148301
31	14" BFLV SS (CF8) GO CL150 WAFER	CL150 -B16.5	GO		PY9752148310
32	16" BFLV CS (WCB) GO CL150 WAFER	CL150 -B16.5	GO		PY9752148328

BODY MATERIAL

CI - CAST IRON IS 210 GR FG260
 SS- STAINLESS STEEL A 351 CF8M
 WCB- CARBON STEEL A216 Gr.WCB

VALVE OPERATION

HO - HAND OPERATED
 GO - GEAR OPERATED
 MO - MOTOR OPERATED
 PO - PNEUMATICALLY OPERATED

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RECORD OF REVISIONS				
Rev. No.	Date	Revision Details	Revised	Approved
00	14.07.16	FIRST ISSUE	GS	SBR
01	15.10.16	GENERAL REVISION AND NEW VARIANTS ADDED.	Gtalyan GKC	Sneha GS
02	12.08.17	Added point no 42 in actuator datasheet and added variants 11,12,13	Gtalyan GKC	Sneha GS
03	21.10.17	Seat, Seal ring Material updated; Clause 4.7b, 4.7n updated; CI MOC SIno 1 updated; Actuator Data sheet clause 22, 23, 36 updated.	Gtalyan GKC	Sneha GS
04	25.01.18	Integral starter requirement added	Gtalyan GKC	Sneha GS
05	10.02.18	New Variants added 16 to 29	U.Pradeep UP	Gtalyan GKC
06	28.06.18	New Variants added 30 & 31	FRK	SVNR
07	08-07-19	Variant-32 added	SVNR SVNR	GS Sneha