

INTERVALVE

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR RUBBER LINED BUTTERFLY VALVE MODELS IVGK / IVTL / IVDF / IVGE / IVTLE & IVGKL

1. INTRODUCTION :

Intervalve Butterfly valves are designed and manufactured to perform optimally at the specified design conditions. In order to achieve the optimum performance, we recommend the user to adhere to the following instructions. Intervalve reserves the right to decline responsibility for any premature failure or damage to the valves due to non-adherence to the instructions given in the manual.

2. GENERAL DESIGN FEATURES:

The IVs range of rubber lined Butterfly Valves are tight shut off type, with a wafer or wafer lugged body. The valve design and manufacture generally conforms to the requirements of API 609 / BS 5155 / MSS SP-67 standards. The valves are bi-directional and hence there is no pre-specified flow direction. The wafer type valves up to 300 NB size have a truly universal body design, that can fit between companion flanges of the following standards. The lugged body valves and higher size wafer valves have predrilled flange locating holes as specified in the valve name plate.

ANSI : 125 / 150 class
DIN : PN 6/10/16
IS : 6392 NP 0.6 / 1.0 / 1.6
JIS : 5K / 10 K / 16K
BS : 10 TAB D & E
BS : 4504 PN 6/10/16

The elastomeric body liner enveloping the entire wetted surface and the flange contact faces of the body functions as the valve seat. The seat liner extending on either side of the body contact faces acts as a gasket eliminating the need for using a separate gasket during installation.

3. MODELS, SIZE RANGE, BODY TYPES & GENERAL APPLICATION AREAS :

The size ranges and body types covered under each model of the rubber lined Butterfly Valves are given in the table below along with broad areas of application.

Table A

Valve Model	Size Range	Body Type	Seat Type	Pressure Rating	Application
IVGKL	40 ~ 300	Wafer	Integrally Bonded	PN10	General purpose utility / HVAC
IVGK / IVTL	50 ~ 600	Wafer/Lugged	Replaceable	PN10	General purpose valve for process industries
IVGK / IVTL	40 ~ 600	Wafer/Lugged	Integrally Bonded	PN16	General purpose valve for process industries
IVGK / IVTL	650 ~1200	Wafer/Lugged	Integrally Bonded	PN10	General purpose valve for process industries
IVGE / IVTLE	50 ~ 350	Wafer/Lugged	Integrally Bonded	PN10	Elastomer encapsulated disc chemical industry

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4. VALVE IDENTIFICATION AND NAME PLATE DETAILS :

Each valve is identified by a unique sl.no. punched on the name plate. The name plate attached to each valve provides information on the valve model, pressure rating, material of construction, etc. The sl no. of the valve may be quoted whilst reporting about any complaints or malfunctioning of the valve.

5. VALVE CONSTRUCTION :

Refer to the general arrangement drawing of the valve for assembly details, sectional view, parts list and overall dimensions. The lugged type valves are self-centering on the pipeline flanges. The wafer bodies upto 80 NB are not provided with any locating lugs and hence requires centering while mounting between the flanges. Wafer type valves of 100 NB to 300 NB are provided with a pair of locating lugs on the top neck and 350 NB to 600 NB are provided with 2 pairs of locating lugs on the top and bottom necks. Valves of 650 NB to 1200 NB are provided with a pair of threaded locating lugs on top and bottom necks.

6. ELASTOMER SEAT MATERIALS - OPERATING TEMPERATURE LIMITS, GENERAL CHEMICAL RESISTANCE AND PREDICTED LIFE:

6.1 All centric disc resilient seated Butterfly valves, achieve their seat tightness (sealing) by the principle of disc-seat interference. The seat inside diameters of these valves are slightly lower than the disc outside diameter. The disc closes by squeezing the seat which provides the necessary sealing against pressure. This squeeze value has been engineered to form the basis for the valve pressure rating capability. Consequently the valve seating and unseating torque for a given pressure rating also chiefly depend on this squeeze value.

6.2 The elastomer is prone to a wear due to the squeezing and rubbing of the disc every time the disc seats and unseats. The elastomer also suffers a gradual deterioration in its resilient properties due to aging. Intervalve has made an honest attempt to adequately warn the user of this wear and aging of the resilient seat on the performance of the valve and recommend replacement of the seat based on predicted life as given in the table below. The recommendations have been arrived at on the basis of accelerated life cycle tests and proof of design tests carried out by factory as well as the recommendations of the elastomer manufacturers. Generic sizes of all models of valves have successfully undergone proof of design test as per AWWA C504 and number of cycles as specified by the standard may be referred to for guidelines.

Seat Material	Operating Temperature Limits	Predicted life in years	General Chemical Resistance	
			Recommended for	Not Recommended for
NITRILE	-30 ~+90° C	4	Oils, fuels, water, sea water, air, powders, pellets, slurries, hydrocarbons	Oxidizing media, acids & alkalies, chlorinated hydrocarbons, steam, hot water
NEOPRENE	-30 ~+100°C	6	Oils, fuels, water, sea water, air, powders, pellets, slurries, hydrocarbons	Oxidizing media, acids & alkalies, chlorinated hydrocarbons, steam, hot water
EPDM	-40 ~+130°C	6	Dilute to medium acids & alkalies, water, hot water & LP stream, ammonia.	Petroleum products, mineral oils, grease hydrocarbon.
HYPALON	-25 ~+130°C	6	Dilute acids & alkalies, chemicals in general excepts solvents.	Concentrated and oxidizing acids, chlorinated hydro-carbons
SILICON	-60 ~+200°C	8	Hot air, hot gases, vegetable oils, food & pharmaceuticals	Solvents, concentrated acids & alkalies, steam and hot water, slurries, powders
VITON	-30 ~+180°C	6	Chemicals, mineral oils & fats, halogenated hydro-carbons.	Steam, ketons, caustic solutions, hydrogen sulfide & ammonia.

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7. STORAGE PRIOR TO INSTALLATION :

The valves are supplied wrapped in polyethane bubble sheets and packed in individual card board boxes or wooden boxes. The valves must be retained in the original packing itself until installation and must be stored indoors, away from direct sunlight and heat. Exposure to direct sunlight and heat can cause deterioration of the elastomeric seats and can jeopardize operational life. Avoid mechanical damage to the valve seat during storage. Rubber lined valves must not be stored for more than 2 years without installation, unless specified otherwise. Valves must be inspected for damage to rubber parts if any prior to installation.

The valves are supplied with the discs in partially opened condition. This must be maintained until the valves are installed in position in the pipeline.

8. PREPARATION FOR INSTALLATION & PRECAUTIONS :

- 8.1 Butterfly valves should be installed preferably with a minimum of 6 pipe diameters from other piping elements i.e. elbows, pumps, valves pipe fitting etc. wherever these 6 pipe diameters are not practical, provide the maximum straight distance as possible. Avoid connecting the valve directly to the inlet or outlet of a pipe fitting except as a terminal valve or discharge valve.
- 8.2 Companion flanges must be welded in place and the flange faces must be parallel to each other. Use of a dummy is recommended to ensure proper flange face alignment and sufficient pre-installation gap between the flanges.
- 8.3 ***NEVER CARRY OUT WELDING OF THE FLANGES WITH THE VALVE INSTALLED BETWEEN THEM AND NEVER USE THE VALVE AS DUMMY FOR FLANGE ALIGNMENT DURING WELDING. THIS WILL RESULT IN PERMANENT DAMAGE TO VALVE SEAT AND IMPAIRED VALVE PERFORMANCE.***
- 8.4 The pipeline and flange faces, must be clean and free of any foreign material such as pipe scale, metal chips, welding splatters, projecting weldments, electrode bits, etc. Presence of the above can obstruct disc movement and cause damage to the elastomeric seal. Flushing of the pipeline with the dummy piece before valve installation is advisable.
- 8.5 Clean the mating faces of any mineral oil or grease in case of EPDM and HYPALON seats. Presence of mineral oil / grease can deteriorate the seat material properties in these cases.
- 8.6 Align the piping and then widen the pipe flanges apart so as to permit easy dropping of the valve between the flanges. Use a pair of jack bolts to widen the flanges, if required. Driving the valve between a pair of flanges with insufficient clearance can dislodge the seat from the body in case of replaceable seat and damage and distort the seat in case of bonded seats.
- 8.7 The valves are provided with an in-built gasket which is integral with the seat. This eliminates the need for flanges gaskets during installation. Please read CAUTION TAG placed on valve. Use of gasket can impair valve performance.
- 8.8 The valve disc shall be kept in the partially OPEN position, with the disc edge about 5 to 10 mm inside from the face of the valve. Refer to CAUTION TAG instruction no. 2.

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8.9 Ensure that the pipe ID available is sufficient to provide the required min. disc clearance. Refer to IVED – 015 as recommended min. pipe IDs for safe installation of IV valves.

8.10 In general, butterfly valves can be installed in any orientation (direction) depending on operational requirement. However mounting with shaft (stem) in horizontal orientation is preferable except in certain specific applications where vertical shaft installation is a must. Refer to conditions as listed under.

- a) Vertical shaft installation is recommended for valves installed immediately at the downstream of a bend, elbow, tee or reducer.
- b) Valves installed in pump discharge side also requires vertical shaft orientation (except vertical pump shafts.)

CAUTION: Please note that valves shall never be mounted with the operator vertically downwards.

8.11 Horizontal shaft installation is always advisable for the following media conditions viz. Slurries, sludge, pulp stock, dry cement, media containing sediments and solid particles, as well as highly viscous fluids. The valves shall be installed with the shaft in horizontal orientation and the lower disc edge opening in the downstream direction. This ensures self-cleaning of the valve due to local high velocity areas above and below the disc edges.

8.12 Horizontal shaft installation is recommended for valve sizes 500 NB and above which ensures the following advantages and these are critical to large size valves.

- a) Weight of the disc and shaft gets evenly supported by the bearings.
- b) The disc centres itself on the seat with even peripheral pressure on disc.
- c) Any solids in pipeline do not settle near the disc causing damage to seat or bearing.

9.0 INSTALLATION IN PIPE LINE

CAUTION- Refer to figures 2,3 & 4 in ANNEXURE to avoid installation pit falls

9.1 Insert the valve between the flanges, taking care not to damage the seat faces. Always hold the valve using the locating lugs or the neck of the body. Never lift the valve by the actuator or operator mounted on the top flange.

9.2 Centre the valve between the flanges to ensure concentricity of the valve bore w.r.t. the pipe bore. Check the valve body outside diameter is equidistant from the flange OD. Provide the studs / bolts through the upper and lower locating lugs and hand tighten the nuts. Insert all the flange / studs and hand tighten the nuts. Slowly open the valve to full OPEN position and close it again to ensure that there is no disc fowling the adjacent pipe ID.

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9.3 Open the valve fully and tighten all the bolts / nuts. While tightening ensure that the diametrically opposite bolts / nuts are tightened in sequence. A preferred tightening sequence is given in Fig. 1 of ANNEXURE. Finally repeat a full CLOSE to OPEN cycle of the valve to ensure smooth operation.

9.4 Lugged body valves are installed in the same manner as wafer type valves except for the type of fasteners to be used. These valves are provided with either THROUGH DRILLED HOLES or TAPPED (Threaded) HOLES. Lugged bodied valves with threaded lugs can be used as terminal end valves by directly clamping to the terminal flange.

9.5 Lugged bodied valves with through drilled holes require through studs / bolts exactly identical to the ones used for wafer of valves. Valves with threaded holes require full thread studs of shorter length inserted from either side. The no. of studs required would be double that of wafer or through lugged versions.

10.0 FLOW HANDLING LIMITATIONS :

10.1 Rubber lined Butterfly valves are not recommended for flow velocities exceeding 5 m/sec in case of liquids and 80m/sec in case of gases. Please ensure that fluid velocities are well under the above specified limits.

10.2 Butterfly valves employed for throttling duties shall be limited to a max. pressure drop of 20% of the inlet pressure at max. open position.

11.0 OPERATION:

11.1 Butterfly valves OPEN and CLOSE through a 90° (quarter turn) rotation of the disc. Conventionally the valves CLOSE by clockwise rotation of the hand lever / hand wheel and OPEN by counter-clock-wise rotation which is adopted as the standard for the Intervalve Butterfly Valves.

11.2 Operator types :

IV Butterfly valves are fitted with any one of the following operators:

- Manual hand lever
- Manual worm gear box
- Pneumatic actuators with or without manual override
- Electrical actuators with or without manual override

11.3 Manual hand lever operated valves:

11.3.1 Valves upto 200 NB size are normally provided with manual hand levers. The hand levers are provided with mechanical stoppers at the fully CLOSED and OPENED positions with provision to lock the handle in 5 or 8 intermediate positions depending on the model of the handle. The OPEN/CLOSE directions are marked on the hand lever and OPEN / CLOSE positions are marked on the notch disc.

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11.3.2 The hand levers have been designed to OPEN and CLOSE the valve with a max. pull of 40 kg on the lever. No extension levers or crowbars must be used as these may damage the handles.

11.4 Manual Gear Operators:

11.4.1 Manual gear operators provided on the butterfly valves are essentially quarter turn worm and worm – wheel type gear boxes. These gear boxes are grease filled and lubricated for life.

11.4.2 The gear boxes are provided with an indicating pointer which shows the angular movement of the disc as well as OPEN and CLOSE positions. The self-locking feature ensures precise disc positioning anywhere between 0° to 90°.

11.4.3 The gear boxes are provided with an adjustable OPEN & CLOSE end stops which are factory preset. These shall not be disturbed unless really warranted. By adjusting the stopper bolts the rotation of the gear box can be adjusted anywhere between $\pm 5^\circ$ at either end.

11.4.4 The hand wheel provided on the gear boxes are capable of generating the required output torque with a pull of 36kg (356 N) on the hand wheels. No extra lever or crowbars shall be used with the hand wheels, which may result in damage to the hand wheels.

11.4.5 The gear boxes are designed to provide a clockwise output to CLOSE the valve with a clockwise rotation of the hand wheels. Counter-clockwise rotation of the hand wheel will OPEN the valve.

11.5 Pneumatic Actuators :

In case of pneumatic actuator operated Butterfly valves, refer to the separate maintenance manual of the actuator for details of installation, commissioning and operation of the actuator.

11.6 Electric Actuator :

In case of electrical actuator operated Butterfly valve (motor operated), refer to the separate instruction manual of the actuator for details of installation commissioning, operation and maintenance of the actuator.

12.0 MAINTENANCE & REPAIR

12.1 Many of the major design features incorporated in the valve keeps wear and maintenance requirements to a minimum. As such there is no routine maintenance to be carried out on the rubber lined Butterfly Valves.

12.2 All components viz. Disc, shafts, bearings, stem seal O-rings, bottom plug, taper pins, etc. are all field replaceable. The seat is field replaceable in the case of REPLACEABLE seat version valves. In the case of bonded seat version the whole valve body has to be sent to factory for replacement if required.

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- 12.3 In case of component replacements, the valve has to be removed from the pipeline (disc should be placed in nearly closed position) by isolating the line or using line blinds or dummies. Use jack bolts to widen the flanges to facilitate easy removal of the valve.
- 12.4 Recommended Spares :
Seat (in case of replaceable seat valves), shaft sealing O-rings, top bush, taper pins, handle dowel pins.
- 13.0 **DISASSEMBLY & ASSEMBLY (REFER TO CROSS SECTIONAL ASSEMBLY DRAWING)**
- 13.1 Remove valve from pipeline and bring valve to a convenient location where it can be disassembled conveniently and required toolings are available.
- 13.2 Remove the operator from the (hand lever, worm gear box, pneumatic actuator or electrical actuator) actuator mounting flange of the valve. Remove the bottom plug or bottom cover, as the case may be (valves upto 500 NB are provided with bottom plug and valves of 600 NB & higher are provided with bottom cover).
- 13.3 Keep the disc nearly closed. Remove the taper pin from the top shaft and bottom shaft end (bottom shafts are not doweled to the disc for valve sizes upto 300 NB) by striking it with a mallet from the smaller end side. In case of taper pin jamming use unlocking sprays or remove the taper pin by drilling it out the.
- 13.4 Pull out the top shaft and bottom shaft from the disc. Threaded holes are provided at the outer ends of the top and bottom shaft for insertion of puller bolts.
- 13.5 Push the disc edge towards open direction and bring disc to the fully open position. Push the disc out of the body seat. It will be easier to remove the disc from the seat in the open condition, since the seat contact area is minimal under this condition.
- 13.6 In case of replaceable seat valves, remove the seat from the body by pulling the seat inwards at any edge and folding it inside the body.
- 13.7 Carry out the replacement of the parts required to be changed; and reassemble the valve with new parts.
- 14.0 **ASSEMBLY :**
CAUTION : Do not use mineral based grease or oil during assembly of EPDM parts.
- 14.1 Follow the steps mentioned for disassembly in the reverse order for re-assembling the valve. Collect all the parts, clean them thoroughly and check whether the parts to be replaced are in order. Check the condition of bush bearings inside body bore. Replacement of bearings are normally not required.
- 14.2 In case of replaceable seat valves, fold the seat and insert in the body bore. Ensure alignment of shaft bores, in seat and body. After fitment, the seat must not be loose inside the body bore. In case of bonded seat valves clean the seat and keep ready for assembly.

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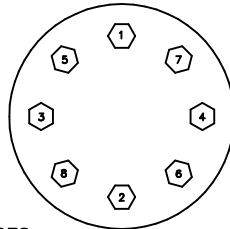
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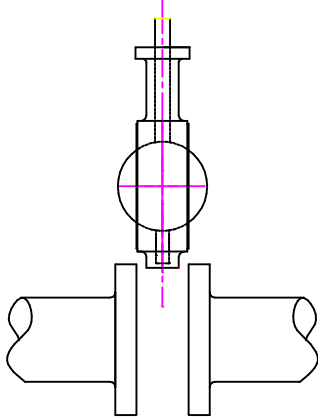
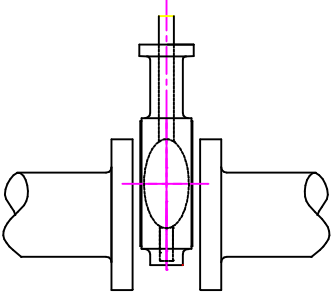
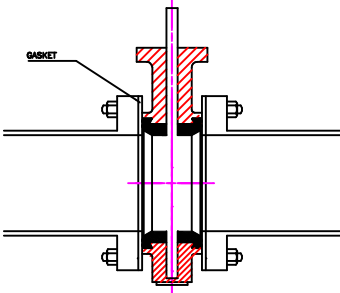
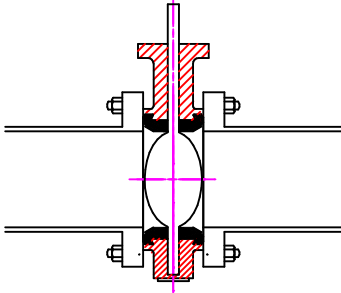
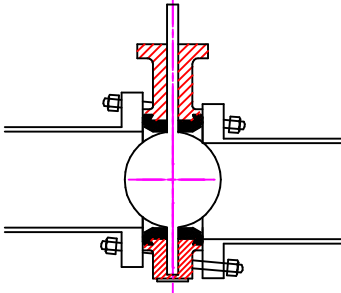
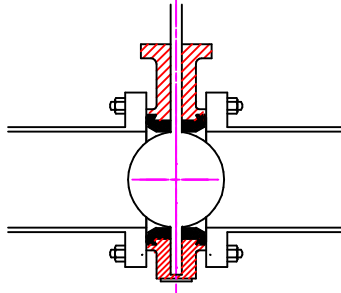
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- 14.3 Insert the 'O' ring and top bush from the flange end & press the bush flush with the flange.
- 14.4 Insert the disc inside the seat with disc kept perpendicular to the seat bore (only the disc shoulder will be in contact with the seat in this position and not the periphery)
- 14.5 Position the disc inside the body and assemble the bottom shaft and then the top shaft. Push the shaft inside until it enters the disc bore to the required depth.
- 14.6 Position the disc to CLOSED position. Orientate the top shaft for correct keyway position. Adjust the stand outs/ shaft positions correctly.
- 14.7 Check correct taper pin hole positions and clean and ream the taper pin holes. Apply LOCTITE- 642 Sealant on taper pins and drive them through the holes to position. Avoid excess hammering
- 14.8 Remove all metal chips and foreign particles from the seat / disc face. Check the valve for correctness of assembly and for fixing of the operator. Mount the operator on the top flange. Tighten the nuts/bolts and operate the valves 5 times to see functional performance.
- 14.9 Carry out body test and seat leakage test corresponding to the valve pressure rating (Body test is carried out at 1.5 times the rated pressure & seat test is carried out at 1.1 times the rated pressure with water.)
- 14.10 Drain & dry the valve after testing & bring the disc to nearly closed position (Do not close fully!) Valve is now ready for installation.

FIG1. –RECOMMENDED BOLT TIGHTENING SEQUENCE FOR FLANGES TIGHTENING.



RECOMMENDED SOUND INSTALLATION PRACTICES.

STAGE OF INSTALLATION	WRONG INSTALLATION	RIGHT INSTALLATION
<p>1.VALVE INSERTION BETWEEN FLANGES (FIG.2)</p>	 <p>DISC FULLY OPENED AND PROJECTING BEYOND VALVE BODY FACE INSUFFICIENT GAP BETWEEN FLANGES.</p>	 <p>DISC PARTIALLY OPEN WITH IN VALVE BODYFACE. FLANGES WIDENED ENOUGH FOR SMOOTHINSERTION.</p>
<p>2.INITIAL CENTERING & BOLTING BETWEEN FLANGES. (FIG.3)</p>	 <p>FLANGES NOT WIDENED ENOUGH DISC IN CLOSED POSITION: GASKETS USED. RESULTS: SEAT DISTORTED AND OVER COMPRESSED CAUSING HIGH INITIAL UNSEATING TORQUE POSSIBLE DAMAGE TO SEAT.</p>	 <p>BOLTS SPANNED,DISC EDGE WITHIN BODY FACE TO FACE. NO DISC EDGE DAMAGE,PROPER SEALING ALLOWED WITHOUT GASKETS.</p>
<p>3.ALIGNING OF FLANGE BOLTS. (FIG.4)</p>	 <p>PIPING MISALIGNED,RESULTS: DISC OD FOULS WITH PIPE ID CAUSING DISC EDGE DAMAGE.INCREASED TORQUE AND LEAKAGE. SEAT FACE TO FACE IMPROPERLY SQUEEZED WITHOUT ENGAGEMENT</p>	 <p>PIPING ALIGNED PROPERLY WHEN BOLTS TIGHTENED,DISC IN FULL OPEN POSITION.RESULTS: DISC CLEARS ADJACENT PIPED. SEAT FACE SEAL PROPER,NO EXCESSIVE INITIAL TORQUE. NO LEAKAGE.</p>

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR SEATLESS BUTTERFLY DAMPER VALVE MODEL IVR

1. INTRODUCTION :

Intervalve Butterfly valves are designed and manufactured to perform optimally at the specified design conditions. In order to achieve the optimum performance, we recommend the user to adhere to the following instructions. Intervalve reserves the right to decline responsibility for any premature failure or damage to the valves due to non-adherence to the instructions given in the manual.

2. GENERAL DESIGN FEATURES :

2.1 The Intervalve range of Butterfly dampers are essentially seatless butterfly valves with a wafer body intended for low pressure gas lines & air lines. The valves are designed and manufactured as per Intervalve's internal manufacturing standard.

2.2 The valves are bi-directional and hence there is no pre-specified flow direction.

2.3 The valves upto 300 size have a truly universal body design that can fit between companion flanges of listed flange standards.

2.4 The valves of higher sizes have pre-drilled flange locating holes as specified :

- I) ANSI # 150
- II) DIN PN 6 / PN 10
- III) BS10 TAB D

3. MODELS, SIZE RANGE, BODY TYPES; PRESSURE & TEMPERATURE LIMITS.

The size ranges and body type covered under Seatless Butterfly Damper valve are given in the Table below:

Valve Model	Size range	Body type	Seat type	Pressure Rating	Temperature Limits
IVR	40 to 1200	Wafer	Seatless	2.5 bar for body. Max working pressure 0.5 bar	-25 to 600° C

4. VALVE IDENTIFICATION AND NAME PLATE DETAILS :

Each valve is identified by a unique sl.no. punched on the name plate. The name plate attached to each valve provides information on the valve model, size, pressure rating and material of construction besides the year of manufacturing. The sl. no. punched on the name plate may be quoted whilst reporting about any complaints or malfunctioning of the valve.

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5. VALVE CONSTRUCTION:

Refer to the general assembly drawing of the valve for assembly and constructional details, cross sectional view, parts list, materials of construction and overall dimensions. The valves upto 350 NB sizes are not provided with any locating lugs. Valves of 400 NB to 1200 NB sizes are provided with 2 pairs of locating holes, one at the top neck and other at the bottom neck. This provides the self-centering of the valve in the pipeline during installation.

6. STORAGE PRIOR TO INSTALLATION :

The valves are supplied, wrapped in polyethene bubble sheets packed in individual boxes or stacked together with proper separators in wooden boxes. The valves must be retained in the original packing itself until installation and preferably to be stored in-doors. Avoid mechanical damage to the valve disc seating edge and flange mating faces while handling in the unpacked condition.

7. PREPARATION FOR INSTALLATION AND PRECAUTIONS :

- 7.1 Butterfly valves should be installed preferably with a minimum of 6 pipe diameters from other piping elements i.e. elbows, blowers, valves, pipe fittings, etc. Wherever these 6 pipe diameters are not practical, provide the max. Straight distance as possible. Avoid connecting the valve directly to the inlet or outlet of a pipe fittings, except as terminal end valve or discharge valve.
- 7.2 Companion flanges must be welded in place and the flange faces must be parallel to each other. Use of a dummy is recommended to ensure proper flange face alignment and sufficient pre-installation gap between the flanges.
- 7.3 ***IT IS NOT RECOMMENDED TO CARRY OUT WELDING OF THE FLANGES WITH THE VALVE INSTALLED BETWEEN THEM AND NEVER USE THE VALVE AS DUMMY FOR FLANGE ALIGNMENT DURING WELDING.***
- 7.4 The pipeline and flange faces, must be clean and free of any foreign materials such as pipe scale, metal chips, welding splatters, projecting weldments, electrode bits, etc. Presence of the above can obstruct disc movement. Flushing of the pipeline with the dummy piece before valve installation is advisable.
- 7.5 Align piping and then widen the pipe flanges apart so as to permit easy dropping of the valve between the flanges. Use a pair of "jack bolts" to widen the flanges if required.
- 7.6 The valve must be provided with suitable flange gaskets on either side of mating faces to obtain perfect sealing with the pipe flanges. Selection of proper gasket material may be done by the user depending on the operating conditions and nature of media.

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7.7 The valve disc must be kept in the “fully closed” position while dropping the valve between the pipe flanges, to prevent damage to machined edges of the valve disc.

7.8 In general butterfly valves can be installed in any orientation (direction) depending on operational requirement. However mounting with shaft (stem) in horizontal orientation is preferable except in certain specific application where vertical shaft installation is a must. Refer conditions as listed under.

a) Vertical shaft installation is recommended for valves installed immediately at the downstream of a bend, elbow, tee / reducer, blower.

CAUTION: Please note that valves shall never be mounted with the operator vertically downwards.

7.9 Horizontal shaft installation is always advisable for the following media condition viz. dusty air gases as well as pneumatic conveying systems. The valves shall be installed with the shaft in horizontal orientation and the lower disc edge opening in the down stream direction. This ensures self-cleaning of the valve due to local high velocity above and below the disc edges.

7.10 Valve sizes of 400 NB and higher, are also recommended, to be mounted with the shaft in the horizontal orientation which will provide the following advantages

a) Weight of the disc and shaft gets evenly supported by the bearings.

b) Any solid particles in the pipeline do not settle near the seating, causing damage to discs edges or bottom bearing / bush.

8.0 INSTALLATION IN PIPELINE

8.1 Slip the valve down between the widened flanges with the gaskets placed on either side. Always hold the valve using the locating lugs or neck of the body. Never lift the valve by holding the actuator or using operator mounted on the top flange.

8.2 Center the valve between the flanges. Provide the studs / bolts through the upper and lower locating lugs and hand tighten the nuts. Insert all the other flange bolts / studs and hand tighten the nuts. Slowly open the valve to full OPEN position and close it again to ensure that there is no disc fouling on the adjacent pipe ID.

8.3 Open the valve fully and tighten all the bolts / nuts. While tightening ensure that diametrically opposite bolts / nuts are tightened in sequence. (Ref fig. 1-IN ANNEXURE for preferred tightening sequence). Finally repeat a full OPEN to CLOSE to OPEN cycle of the valve to ensure smooth operation.

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR SEATLESS BUTTERFLY DAMPER VALVE MODEL IVR

9.0 FLOW HANDLING LIMITATIONS :

- 9.1 Seatless Butterfly Damper valves are not recommended for flow velocities exceeding 80 m/sec in case of gases. Please ensure that fluid velocities are well under the above-specified limits.
- 9.2 Butterfly valves employed for throttling duties shall be limited to a max. pressure drop of 20% of the inlet pressure at max. open position.

CAUTION : Intervalve Butterfly dampers should never be installed where service condition could exceed the valve ratings .Failure to do so may result in personal injury or property damage.

10.0 VALVE OPERATION:

- 10.1 Butterfly valves OPEN and CLOSE through a 90° (quarter turn) rotation of the disc. Conventionally the valve CLOSE by clockwise rotation of the hand lever / hand wheel and OPEN by counter-clock-wise rotation, which is adopted as the standard for Intervalve make Butterfly Valves also.

10.2 Operator types :

IV Butterfly valves are fitted with any one of the following operators :

- Manual hand lever
- Manual worm gear box
- Pneumatic actuators with or without manual override
- Electrical actuators with or without manual override

10.3 Manual hand lever operated valves:

Valves upto 600 NB sizes are normally provided with manual hand levers. The hand levers are provided with mechanical stoppers at the fully CLOSED and OPEN positions with provision to lock the handle in 5 or 8 intermediate positions depending on the model of the handle. The OPEN/CLOSE directions are marked on the hand lever and OPEN / CLOSE positions are marked on the notch disc.

The hand levers have been designed to OPEN and CLOSE the valve with a max. pull of 40 kg on the lever. No extension levers or crowbars must be used as these may damage the handles.

10.4 Manual Gear Operators:

- 10.4.1 Manual gear operators provided on the butterfly valves are essentially quarter turn worm and worm – wheel type gear boxes. These gear boxes are grease filled and lubricated for life.
- 10.4.2 The gear boxes are provided with an “indicating pointer” which shows the angular movement of the disc as well as OPEN and CLOSE positions. The self-locking feature ensures, precise disc positioning anywhere between 0° to 90°.

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR SEATLESS BUTTERFLY DAMPER VALVE MODEL IVR

10.4.3 The gear boxes are provided with adjustable OPEN & CLOSE end stops which are factory preset. These shall not be disturbed unless really warranted. By adjusting the stopper bolts the rotation of the gear box can be adjusted anywhere between $\pm 5^\circ$ at either end.

10.4.4 The hand wheel provided on the gear boxes are capable of generating the required output torque with a pull of 36 kg (356 N) on the hand wheels. No extra lever or crow bars shall be used with the hand wheels, which may result in damage of the hand wheels.

10.4.5 The gear boxes are designed to provide a clockwise output to CLOSE the valve with a "clockwise" rotation of the handwheels. Counter-clockwise rotation of the hand wheel will OPEN the valve.

10.5 **Pneumatic Actuators:**

In case of pneumatic actuator operated Butterfly valves, refer to the separate maintenance manual of the actuator, for details of installation, commissioning and operation of the actuator.

10.6 **Electric Actuator :**

In case of electrical actuator operated Butterfly valves (motor operated), refer to the separate instruction manual of the actuator for details of installation commissioning, operation and maintenance of the actuator.

11.0 **MAINTENANCE & REPAIR**

11.1 Many of the major design features incorporated in the valve keeps wear and maintenance requirements to a minimum. As such there is no routine maintenance to be carried out on the IVR Butterfly Valves, except for the gland packing adjustments if required.

11.2 All components viz. Disc, shafts, bearings, bottom plug, taper pins, gland packing etc. are all field replaceable.

11.3 Prior to any replacement or repair the valve must be removed from pipeline , following precautions should be taken :

- A) The pipeline on either side of valve must be depressurized & drained.
- B) Ensure that disc is in the closed position before removing the valve from line.
- C) Use jack bolts to widen the flanges to facilitate easy removal of valve.
- D) DO NOT remove an actuator or operator from the valve while the line is still pressurized.

11.4 **Recommended Spares :**

Gland packings, gland, packing rings, taper pins, handle dowel pins.

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR SEATLESS BUTTERFLY DAMPER VALVE MODEL IVR

12.0 Disassembly & Assembly (Refer to cross sectional assembly drawing)

- 12.1 Remove valve from pipeline and bring valve to a convenient location where it can be disassembled conveniently and required toolings are available.
- 12.2 Remove the operator from the (hand lever, worm gear box, pneumatic actuator or electrical actuator) actuator mounting bracket of the valve. Remove the bottom plug or bottom cover, as the case may be (valves upto 350 NB are provided with bottom plug and valves of 400 NB & higher are provided with bottom cover).
- 12.3 Keep the disc nearly closed. Remove the taper pin from the top shaft and bottom shaft end by striking it with a mallet from the smaller end side or pulling it out using pullers (after grinding of the flaring around the taper pin) . In case of taper pin jamming use unlocking sprays or remove the taper pin by drilling it out.
- 12.4 Loosen the gland bolts and remove the gland flange and gland. Pull out the top shaft and bottom shaft from the disc. Threaded holes are provided at the outer ends of the top and bottom shaft for insertion of puller bolts. The top shaft will come out along with the packing rings and split rings. The disc will come out free once the shafts are removed.
- 12.5 Carry out the replacement of the parts required to be changed; and reassemble the valve with new parts.

13.0 ASSEMBLY :

- 13.1 Follow the steps mentioned for disassembly in the reverse order for re-assembling the valve. Collect all the parts, clean them thoroughly and check whether the parts to be replaced are in order. Check the condition of bush bearings inside body bore. Replacements of bearings are normally not required.
- 13.2 Keep the body horizontally on the table. Place the disc inside the body bore. Insert the bottom shafts through the body bore and into the disc shoulder. The top shaft is required to be inserted with split rings in position on the shaft groove. Push the shaft inside till it enters the disc shoulders. Insert the packing rings and gland into the packing bore. Place the gland flange in position and hand tighten.
- 13.3 Position the disc inside the body. Push the shaft inside till it enters the disc bore to the required depth.
- 13.4 Check correct taper pinhole positions and clean and ream the taper pinholes. Apply LOCTITE- 642 Sealant on taper pins and drive them through the holes to position. Avoid excess hammering.
- 13.5 Remove all metal chips and foreign particles from the disc face. Check the valve for correctness of assembly and for fixing of the operator. Mount the operator on the bracket. Tighten the nuts/bolts and operate the valves 5 times to see functional performance.

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR SEATLESS BUTTERFLY DAMPER VALVE MODEL IVR

- 13.6 Carry out body test corresponding to the valve pressure rating (Body test is carried out at 1.5 times the rated pressure.)
- 13.7 Drain & dry the valve after testing & bring the disc to closed position. Valve is now ready for installation.

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR DOUBLE ECCENTRIC HIGH PERFORMANCE BUTTERFLY VALVE MODELS IVEX-T, IVEX-F AND IVEX-M

1. INTRODUCTION :

Intervalve Butterfly valves are designed and manufactured to perform optimally at the specified design conditions. In order to achieve the optimum performance, we recommend the user to adhere to the following instructions. Intervalve reserves the right to decline responsibility for any premature failure or damage to the valves due to non-adherence to the instructions given in the manual.

2. GENERAL DESIGN FEATURES :

2.1 The Intervalve's range of high performance Butterfly Valves have a double offset design disc with a wafer or wafer lugged body. The valves are designed and manufactured meeting the requirements of ANSI B16.34 as well as API 609 category B and is available in 3 different design versions viz. soft seated, fire safe and metal seated. (see section 3 for model details).

2.2 Eventhough IVEX models are capable of bi-directional sealing, the valves are marked with a specified flow direction and shall be installed in the marked direction only. A mechanical stopper provided on the valve body ensures precise closure of the disc exactly at zero position. Both wafer and wafer lugged versions of the valve are standardised for fitment between flanges of ANSI class 150. Optionally the valve can be made available suiting to DIN PN16 / PN10 flanges also with certain restrictions on sizes. (See name plate details prior to valve installation). The valve body mating faces (flange contact faces) are provided with a serrated finish for better sealing of the gasket during installation.

3. MODELS, SIZE RANGE, BODY TYPES; PRESSURE & TEMPERATURE LIMITS.

The size ranges and body type covered under each model of the high performance valve are given in the Table below:.

Valve Model	Size range	Body type	Seat type	Pressure Rating	Temperature Limits
IVEX-T	80 to 600	Wafer & wafer lugged	Soft seated (PTFE / GFT)	ANSI 150	-50 to 220° C
IVEX-F	80 to 600	Wafer & Wafer lugged	Fire safe (PTFE + Inconel)	ANSI 150	-50 to 220° C
IVEX-M	80 to 600	Wafer & Wafer lugged	Metal to Metal (Inconel)	ANSI 150	-50 to 600° C

4. VALVE IDENTIFICATION AND NAME PLATE DETAILS :

Each valve is identified by a unique sl.no. punched on the name plate. The name plate attached to each valve provides information on the valve model, size, pressure rating and material of construction besides the year of manufacturing. The sl. no. punched on the name plate may be quoted whilst reporting about any complaints or malfunctioning of the valve.

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5. VALVE CONSTRUCTION:

Refer to the general assembly drawing of the valve for assembly and constructional details, cross sectional view, parts list, materials of construction and overall dimensions. The wafer valves upto 300 NB size are provided with a pair of locating with 2 pairs of locating lugs on the top neck end. Valves of 350 NB to 600 NB sizes are provided with 2 pairs of locating lugs, one at the top neck and other at the bottom neck. This provides the self centering of the valve in the pipeline during installation. Lugged body valves are provided with locating lugs of "through drilled" or "threaded" holes, and ensure precise bolt location during installation in the pipe line. Lugged body valves with threaded holes are suitable for installation as end of the line or terminal end valves. Terminal end valves shall always be installed with the clamping facing the upstream flange.

6. STORAGE PRIOR TO INSTALLATION :

The valves are supplied, wrapped in polyethene bubble sheets packed in individual boxes or stacked together with proper separators in wooden boxes. The valves must be retained in the original packing itself until installation and must be preferably be stored in-doors. Avoid mechanical damage to the valve seat, disc seating profile and flange mating faces while handling in the unpacked condition.

7. PREPARATION FOR INSTALLATION AND PRECAUTIONS :

7.1 Butterfly valves should be installed preferably with a minimum 6 pipe diameters from other piping elements i.e. elbows, pumps, valves, pipe fittings, etc. Wherever these 6 pipe diameters are not practical, provide the max straight distance as possible. Avoid connecting the valve directly to the inlet or outlet of pipe fittings, except as terminal end valve or discharge valve.

7.2 Companion flanges must be welded in place and the flange faces must be parallel to each other. Use of a dummy is recommended to ensure proper flange face alignment and sufficient pre-installation gap between the flanges.

7.3 NEVER CARRY OUT WELDING OF THE FLANGES WITH THE VALVE INSTALLED BETWEEN THEM AND NEVER USE THE VALVE AS DUMMY FOR FLANGE ALIGNMENT DURING WELDING. THIS WILL RESULT IN PERMANENT DAMAGE TO VALVE SEAT AND IMPAIRED VALVE PERFORMANCE.

7.4 The pipeline and flange faces, must be clean and free of any foreign material such as pipe scale, metal chips, welding splatters, projecting weldments, electrode bits, etc. Presence of the above can obstruct disc movement and cause damage to the soft PTFE seat. Flushing of the pipeline with the dummy piece before valve installation is advisable.

7.5 Align piping and then widen the pipe flanges apart so as to permit easy dropping of the valve between the flanges. Use a pair of "jack bolts" to widen the flanges if required.

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7.6 The valve must be provided with suitable flange gaskets on either side of mating faces to obtain perfect sealing with the pipe flanges. Selection of proper gasket material may be done by the user depending on the operating conditions and nature of media.

7.7 The valve disc must be kept in the "fully closed" position while dropping the valve between the pipe flanges, to prevent damage to machined edges of the valve disc.

7.8 IVEX model valves are provided with an arrow mark indicating the specified flow direction. Check the pipe line flow direction before valve installation and ensure that the valve is installed as per the indicated flow direction only.

7.9 In general butterfly valves can be installed in any orientation (direction) depending on operational requirement. However mounting with shaft (stem) in horizontal orientation is preferable except in certain specific application where vertical shaft installation is a must. Refer to conditions as listed under.

a) Vertical shaft installation is recommended for valves installed immediately at the downstream of a bend, elbow, tee or reducer.

b) Valves installed in pump discharge side also require vertical shaft orientation (except vertical pump shafts.)

CAUTION: Please note that valves shall never be mounted with the operator vertically downwards.

7.10 Horizontal shaft installation is always advisable for the following media conditions viz. slurries, sludge, pulp stock, dry cement provides media containing sediments and solids, as well as highly viscous fluids. The valves shall be installed with the shaft in horizontal orientation and the lower disc edge opening in the down stream direction (body stopper must be vertically above). This ensures self cleaning of the valve due to local high velocity above and below the disc edges.

7.11 Valve sizes of 350 NB and higher, are also recommended, to be mounted with the shaft in the horizontal orientation which will provide the following advantages

a) Weight of the disc and shaft gets evenly supported by the bearings.

b) Any solid particles in the pipeline do not settle near the seating, causing damage to seat or bottom bearing / bush.

8.0 INSTALLATION IN PIPELINE

8.1 Slip down the valve between the widened flanges with the gaskets placed on either side. Always hold the valve using the locating lugs or neck of the body. Never lift the valve by holding the actuator or using operator mounted on the top flange.

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- 8.2 Centre the valve between the flanges. Provide the studs / bolts through the upper and lower locating lugs and hand tighten the nuts. Insert all the other flange bolts / studs and hand tighten the nuts. Slowly open the valve to full OPEN position and close it again to ensure that there is no disc fowling on the adjacent pipe ID.
- 8.3 Open the valve fully and tighten all the bolts / nuts. While tightening ensure that diametrically opposite bolts / nuts are tightened in sequence. (Ref fig. 1 IN ANNEXURE for preferred tightening sequence). Finally repeat a full OPEN to CLOSE to OPEN cycle of the valve to ensure smooth operation.
- 8.4 Lugged bodied valves are installed in the same manner as wafer type valves except for the type of fasteners to be used. Lugged bodied valves are provided with either THROUGH DRILLED HOLES or TAPPED (Threaded) HOLES.
- 8.5 Lugged bodied valves with through drilled holes require through studs / bolts exactly identical to the ones used for wafer valves. Valves with threaded holes require full thread studs of shorter length inserted from either side. The no. of studs required would be double that of wafer or through lugged versions.
- 8.6 Lugged body valves can be used as an end of the line valve and can be installed at pipe terminals by directly clamping to the terminal flange. Ensure that the clamping side of the valve always rests against the upstream flange.
- 9.0 **FLOW HANDLING LIMITATIONS :**
- 9.1 High performance Butterfly valves are not recommended for flow velocities exceeding 8 m/sec in case of liquids and 100m/sec in case of gases. Please ensure that fluid velocities are well under the above specified limits.
- 9.2 Butterfly valves employed for throttling duties shall be limited to a max pressure drop of 30% of the inlet pressure at max. open position.
- 10.0 **VALVE OPERATION:**
- 10.1 Butterfly valves OPEN and CLOSE through a 90° (quarter turn) rotation of the disc. Conventionally the valves CLOSE by clockwise rotation of the hand lever / hand wheel and OPEN by counter-clock-wise rotation, which is adopted as the standard for the Intervalve Butterfly Valves
- 10.2 **Operator types :**
- IV Butterfly valves are fitted with any one of the following operators :
- Manual hand lever
 - Manual worm gear box
 - Pneumatic actuators with or without manual override
 - Electrical actuators with or without manual override

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10.3 Manual hand lever operated valves:

Valves upto 125 NB sizes are normally provided with manual hand levers. The hand levers are provided with mechanical stoppers at the fully CLOSE and OPEN positions with provision to lock the handle in 5 or 8 intermediate position depending on the model of the handle. The OPEN/CLOSE directions are marked on the hand lever and OPEN / CLOSE positions are marked on the notch disc.

The hand levers have been designed to OPEN and CLOSE the valve with a max. pull of 40 kg on the lever. No extension levers or crowbars must be used as these may damage the handles.

10.4 Manual Gear Operators:

10.4.1 Manual gear operators provided on the butterfly valves are essentially quarter turn worm and worm – wheel type gear boxes. These gear boxes are grease filled and lubricated for life.

10.4.2 The gear boxes are provided with an “indicating pointer” which shows the angular movement of the disc as well as OPEN and CLOSE positions. The self locking feature ensures, precise disc positioning anywhere between 0° to 90°.

10.4.3 The gear boxes are provided with adjustable OPEN & CLOSE end stops which are factory preset. These shall not be disturbed unless really warranted. By adjusting the stopper bolts the rotation of the gear box can be adjusted anywhere between $\pm 5^\circ$ at either end.

10.4.4 The hand wheel provided on the gear boxes are capable of generating the required output torque with a pull of 36 kg (356 N) on the hand wheels. No extra lever or crow bars shall be used with the hand wheels, which may result in damage of the hand wheels.

10.4.5 The gear boxes are designed to provide a clockwise output to CLOSE the valve with a “clockwise” rotation of the handwheels. Counter-clockwise rotation of the hand wheel will OPEN the valve.

10.5 Pneumatic Actuators :

In case of pneumatic actuator operated Butterfly valves, refer to the separate maintenance manual of the actuator, for details of installation, commissioning and operation of the actuator.

10.6 Electric Actuator :

In case of electrical actuator operated Butterfly valves (motor operated), refer to the separate instruction manual of the actuator for details of installation commissioning, operation and maintenance of the actuator.

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR DOUBLE ECCENTRIC HIGH PERFORMANCE BUTTERFLY VALVE MODELS IVEX-T, IVEX-F AND IVEX-M

11.0 MAINTENANCE & REPAIR

11.1 Many of the major design features incorporated in the valve keeps wear and maintenance requirements to a minimum. As such there is no routine maintenance to be carried out on the High performance Butterfly Valves, except for the gland packing adjustments if required.

11.2 All components viz. Disc, seat, shafts, bearings, clamp ring, bottom plug, taper pins, gland packing etc. are all field replaceable. The seat is field replaceable and can be accessed after removal of the clamping ring.

11.3 In case of component replacements, the valve has to be removed from the pipeline (disc should be placed fully closed position) by isolating the line or using line blinds or dummies. Use jack bolts to widen the flanges to facilitate easy removal of the valve.

11.4 Recommended Spares :

Seat, gland packings, gland, support ring, packing rings, taper pins, handle dowel pins.

12.0 Disassembly & Assembly (Refer cross to sectional assembly drawing)

12.1 Remove valve from pipeline and bring valve to a convenient location where it can be disassembled conveniently and required toolings are available.

12.2 Remove the operator from the (hand lever, worm gear box, pneumatic actuator or electrical actuator) actuator mounting bracket of the valve. Remove the bottom plug or bottom cover, as the case may be (valves upto 300 NB are provided with bottom plug and valves of 350 NB & higher are provided with bottom cover).

12.3 Keep the valves fully closed, with the clamp ring facing upwards. Loosen & remove the clamp ring screws and take out the clamping ring. The seat and support ring can be accessed now. Remove the same from the body step.

12.4 Reverse the body & keep the disc nearly closed. Remove the taper pin from the top shaft and bottom shaft end by striking it with a mallet from the bigger end side or pulling it out using pullers. In case of taper pin jamming use unlocking sprays or remove the taper pin by drilling it out.

12.5 Loosen the gland bolts and remove the gland flange and gland. Pull out the top shaft and bottom shaft from the disc. Threaded holes are provided at the outer ends of the top and bottom shaft for insertion of puller bolts. The top shaft will come out along with the packing rings and split rings. The disc will come out free once the shafts are removed.

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR DOUBLE ECCENTRIC HIGH PERFORMANCE BUTTERFLY VALVE MODELS IVEX-T, IVEX-F AND IVEX-M

12.6 Carry out the replacement of the parts required to be changed; and reassemble the valve with new parts.

13.0 ASSEMBLY :

13.1 Follow the steps mentioned for disassembly in the reverse order for re-assembling the valve. Collect all the parts, clean them thoroughly and check whether the parts to be replaced are in order. Check the condition of bush bearings inside body bore. Replacement of bearings are normally not required.

13.2 Keep the body horizontally on the table. Place the disc inside the body bore. Insert the bottom shafts through the body bore and into the disc shoulder. The top shaft is required to be inserted with split rings in position on the shaft groove. Push the shaft inside until it enters the disc shoulders. Insert the packing rings and gland into the packing bore. Place the gland flange in position and hand tighten.

13.3 Position the disc inside the body. Push the shaft inside till it enters the disc bore to the required depth. Check the condition of the packing rings (gaskets) on the body and clamping ring-sealing face. Repeat with new packing rings if required.

13.4 Position the disc to CLOSED position. Place the seat on the body-locating groove. For soft seated and fire safe valves a support ring or backup ring respectively is required to be assembled with the valve seat. Place the clamping ring above the seat/ support ring / backup ring.

13.5 Locate the clamping ring to align with the body-threaded holes & assemble the socket head screws. Tighten the screws uniformly to get equal clamping force all around. (Do not tighten fully!).

13.6 Check correct taper pinhole positions and clean and ream the taper pinholes. Apply LOCTITE- 642 Sealant on taper pins and drive them through the holes to position. Avoid excess hammering.

13.7 Remove all metal chips and foreign particles from the seat / disc face. Check the valve for correctness of assembly and for fixing of the operator. Tighten the clamping ring screws fully. Mount the operator on the bracket. Tighten the nuts/bolts and operate the valves 5 times to see functional performance.

13.8 Carry out body test and seat leakage test corresponding to the valve pressure rating (Body test is carried out at 1.5 times the rated pressure & seat test is carried out at 1.1 times the rated pressure with water.)

13.9 Drain & dry the valve after testing & bring the disc to nearly closed position (Do not close fully!) Valve is now ready for installation.

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR PTFE LINED BUTTERFLY VALVE MODEL IVTFE

1. INTRODUCTION :

Intervalve Butterfly valves are designed and manufactured to perform optimally at the specified design conditions. In order to achieve the optimum performance, we recommend the user to adhere to the following instructions. Intervalve reserves the right to decline responsibility for any premature failure or damage to the valves due to non-adherence to the instructions given in the manual.

2. GENERAL DESIGN FEATURES :

The Intervalve's IVTFE range of Butterfly Valves have a fully PTFE lined, 2 piece short pattern wafer body construction. These are centric disc design tight shut off valves generally conforming to the requirements of API 609 / BS 5155 / MSS - SP 67 standards.

The valves are bi-directional and hence there is no specific flow direction marked on the valve. The short wafer type body is designed to fit between companion flanges of the following standards.

ANSI : 125 / 150 class
DIN : PN10 / PN16
IS : 6392 NP 1.0 / 1.6
BS : 10 Tab D & E
BS : 4504 PN10 /16

The PTFE liner enveloping the entire wetted surfaces and flange contact faces of the body functions as the valve seat. The seat liner extending on either side of the body contact faces and acts as a gasket eliminating the need for using a separate gasket during valve installation.

3. SIZE, RANGE, SEAT TYPES, APPLICATION AREAS & OPERATING TEMPERATURE LIMITS :

Valve Model & type : IVTFE (Centric disc Butterfly valve)
Body Type & Construction : Wafer pattern, 2-piece body.
Size range : 50 NB to 300 NB
Seat type & material : Replaceable, Liner Type Virgin PTFE or glass filled PTFE
Pressure rating : PN10 (max.)
Operating temperature limits : 200° C (max.) for PTFE
220°C (max.) for Glass filled PTFE
Back up elastomer : VITON rubber

4. VALVE IDENTIFICATION AND NAME PLATE DETAILS :

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR PTFE LINED BUTTERFLY VALVE MODEL IVTFE

Each valve is identified by a unique sl.no. punched on the name plate. The name plate attached to each valve provides information on the valve model, pressure rating, material of construction, etc. The sl no. of the valve may be quoted whilst reporting about any complaints or malfunctioning of the valve.

5. VALVE CONSTRUCTION:

Refer to the general assembly drawing of the valves for assembly details, cross sectional view, parts list and overall dimensions. The two piece wafer bodies are bolted together after assembling all the internals, using stainless steel socket head cap screws. The bodies are provided with a pair of locating lugs near the top neck for easy location in the pipe line. The valves have a unique line loaded “disc shoulder” sealing arrangement at both drive end and non-drive end. The bolts joining the two body halves shall be NEVER be loosened when valve is in pipeline.

6. STORAGE PRIOR TO INSTALLATION :

The valves are supplied wrapped in polyethane bubble sheets and packed in individual cardboard boxes or wooden boxes. The valves must be retained in the original packing itself until installation and must be stored indoors, away from direct sunlight and heat. Exposure to direct sunlight and heat can cause deterioration of the “PTFE seat and back up elastomer and may jeopardize operational life. Avoid mechanical damage to the valve seat during storage. PTFE lined valves must not be stored for more than 2 years without installation, unless specified otherwise. Valves must be inspected for damage to PTFE parts if any prior to installation.

The valves are supplied with the discs in partially opened condition. This must be maintained until the valves are installed in position in the pipeline.

7. PREPARATION FOR INSTALLATION & PRECAUTIONS :

7.1 Butterfly valves should be installed preferably with a minimum of 6 pipe diameters from other piping elements i.e. elbows, pumps, valves pipe fitting etc. wherever these 6 pipe diameters are not practical, provide the maximum straight distance as possible. Avoid connecting the valve directly to the inlet or outlet of a pipe fitting except as a terminal end valve or discharge valve.

7.2 Companion flanges must be welded in place and the flange faces must be parallel to each other. Use of a dummy is recommended to ensure proper flange face alignment and sufficient pre-installation gap between the flanges.

7.3 **NEVER CARRY OUT WELDING OF THE FLANGES WITH THE VALVE INSTALLED BETWEEN THEM AND NEVER USE THE VALVE AS DUMMY FOR FLANGE ALIGNMENT DURING WELDING. THIS WILL RESULT IN PERMANENT DAMAGE TO VALVE SEAT AND IMPAIRED VALVE PERFORMANCE.**

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR PTFE LINED BUTTERFLY VALVE MODEL IVTFE

- 7.4 The pipeline and flange faces, must be clean and free of any foreign material such as pipe scale, metal chips, welding splatters, projecting weldments, electrode bits, etc. Presence of the above can obstruct disc movement and can cause damage to the elastomeric seal. Flushing of the pipeline with the dummy piece in place before valve installation is advisable.
- 7.5 Align the piping and then widen the pipe flanges apart so as to permit easy dropping of the valve between the flanges. Use a pair of jack bolts to widen the flanges, if required. Driving the valve between a pair of flanges with insufficient clearance can deform the seat or dislodge it from the body.
- 7.6 The valves are provided with an in-built gasket, which is integral with the seat. This eliminates the need for flange gaskets during installation. Please read CAUTION TAG placed on valve. Use of gasket can impair valve performance.
- 7.7 The valve disc shall be kept in the partially OPEN position, with the disc edge about 5 to 10 mm inside from the face of the valve. Refer to CAUTION TAG instruction no. 2.
- 7.8 Ensure that the pipe ID available is sufficient to provide the required min disc clearance. Refer to IVED – 015 for recommended min. pipe inside diameters for safe installation of IV valves.
- 7.9 In general butterfly valves can be installed in any orientation (direction) depending on operational requirement. However mounting with shaft (stem) in horizontal orientation is preferable except in certain specific application where vertical shaft installation is a must. Refer conditions as listed under.
- a) Vertical shaft installation is recommended for valves installed immediately at the downstream of a bend, elbow, tee or reducer.
- b) Valves installed in pump discharge side also require vertical shaft orientation (except vertical pump shafts.)
- CAUTION: Please note that valves shall never be mounted with the operator vertically downwards.
- 7.10 Horizontal shaft installation is always advisable for the following media conditions viz. Slurries, sludge, pulp stock, dry cement, media containing sediments and solid particles, as well as highly viscous fluids. The valves shall be installed with the shaft in horizontal orientation and the lower disc edge opening in the downstream direction. This ensures self-cleaning of the valve due to local high velocity areas above and below the disc edges besides the following advantages.
- Weight of the disc and shaft gets evenly supported by the bearings.
 - The disc centers itself on the seat with even peripheral pressure on disc.
 - Any solids in pipeline do not settle near the disc causing damage to seat or bearing.

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8. INSTALLATION IN PIPE LINE

CAUTION: Refer to figure 2,3 & 4 in ANNEXURE to avoid installation pitfalls.

- 8.1 Insert the valve between the flanges, taking care not to damage the seat faces. Always hold the valve using the locating lugs or the neck of the body. Never lift the valve by the actuator or operator mounted on the top flange.
- 8.2 Center the valve between the flanges to ensure concentricity of the valve bore w.r.t. the pipe bore. Check if the valve body outside diameter is equidistant from the flange OD. Provide the studs / bolts through the upper locating lugs and hand tighten the nuts. Insert all the flange / studs and hand tighten the nuts. Slowly open the valve to full OPEN position and close it again to ensure that there is no disc fowling on the adjacent pipe ID.
- 8.3 Open the valve fully and tighten all the bolts / nuts. While tightening ensure that the diametrically opposite bolts / nuts are tightened in sequence. A preferred tightening sequence is given in Fig.1 at ANNEXURE. Finally repeat a full CLOSE to OPEN cycle of the valve to ensure smooth operation.

9. FLOW LIMITATIONS :

- 9.1 PTFE lined Butterfly valves are not recommended for flow velocities exceeding 5 m/sec in case of liquids and 80m/sec in case of gases. Please ensure that fluid velocities are well under the above specified limits.
- 9.2 Butterfly valves employed for throttling duties shall be limited to a max. pressure drop of 20% of the inlet pressure at max Open position.

10. OPERATION AND MAINTENANCE :

- 10.1 Butterfly valves OPEN and CLOSE through a 90° (quarter turn) rotation of the disc conventionally the valves CLOSE by clockwise rotation of the hand lever / hand wheel and OPEN by counter-clock-wise rotation which is adopted as the standard for the Intervalve Butterfly Valves.

10.2 Operator types:

IV Butterfly valves are fitted with any one of the following operators:

- Manual hand lever
- Manual worm gear box
- Pneumatic actuators with or without manual override
- Electrical actuators with or without manual override

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10.3 Manual hand lever operated valves:

10.3.1 Valves upto 150 NB sizes are normally provided with manual hand levers. The hand levers are provided with mechanical stoppers at the fully CLOSED and OPEN positions with provision to lock the handle in 5 or 8 intermediate positions depending on the model of the handle. The OPEN/CLOSE directions are marked on the hand lever and OPEN / CLOSE positions are marked on the notch disc.

10.3.2 The hand levers have been designed to OPEN and CLOSE the valve with a max. pull of 40 kg on the lever. No extension levers or crowbars must be used as these may damage the handles.

10.4 Manual Gear Operators:

10.4.1 Manual gear operators provided on the butterfly valves are essentially quarter turn worm and worm – wheel type gear boxes. These gear boxes are grease filled and lubricated for life.

10.4.2 The gear boxes are provided with an indicating pointer which shows the angular movement of the disc as well as OPEN and CLOSE positions. The self locking feature ensures precise disc positions anywhere between 0° to 90°.

10.4.3 The gear box is provided with adjustable OPEN & CLOSE end stops which are factory preset. These shall not be disturbed unless really warranted. By adjusting the stopper bolts the rotation of the gear box can be adjusted anywhere between $\pm 5^\circ$ at the either side.

10.4.4 The hand wheel provided on the gear boxes are capable of generating the required output torque with a pull less than 36kg(356 N) on the hand wheels. No extra lever or crow bars shall be used with the hand wheels.

10.4.5 The gear boxes are designed to provide a clockwise output to CLOSE the valve with clockwise rotation of the hand wheels. Counter-clockwise rotation of the hand wheel will OPEN the valve.

10.5 Pneumatic Actuators :

In case of pneumatic actuator operated Butterfly valves, refer to the separate maintenance manual provided for the actuator for details of installation, commissioning and operation of the actuator.

10.6 Electric Actuator :

In case of electrical actuator operated Butterfly valve (motor operated), refer to the separate instruction manual of the actuator for details of installation commissioning, operation and maintenance of the actuator.

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11.0 MAINTENANCE & REPAIR :

11.1 Many of the major design features incorporated in the valve keeps wear and maintenance requirements to a minimum. As such there is no routine maintenance to be carried out on the rubber lined Butterfly Valves.

11.2 All components viz. Disc, Seats, Backup elastomer shafts, bearings, stem seal O-rings, bottom plug, taper pins, disc springs etc. are all field replaceable.

11.3 In case of component replacements, the valve has to be removed from the pipeline (disc should be placed in nearly closed position) by isolating the line or using line blinds or dummies. Use jack bolts to widen the flanges to facilitate easy removal of the valve.

11.4 Recommended Spares :
Seat, backup elastomer, shaft sealing O-rings, top bush, taper pins, handle dowel pins, disc springs.

12.0 DISASSEMBLY & ASSEMBLY (REFER CROSS SECTIONAL ASSEMBLY DRAWING) :

12.1 Remove valve from pipeline and bring valve to a convenient location where it can be disassembled conveniently and required toolings are available.

12.2 Remove the operator from the (hand lever, worm gear box, pneumatic actuator or electrical actuator) actuator mounting flange of the valve. Remove the bottom plug or bottom cover, as the case may be.

12.3 Keep the disc nearly closed. Remove the taper pin from the top shaft and bottom shaft end (bottom shafts are not doweled to the disc for valve sizes upto 250 NB) by striking it with a mallet from the bigger end side. In case of taper pin jamming use unlocking sprays or remove the taper pin by drilling it out.

12.4 Loosen the socket head screws holding the two body halves. Remove these screws from both sides and pull apart the body halves. The body halves will slide through the shafts & come out separately. Remove the back up elastomer, disc springs, pushes pad from both drive end & non drive end.

12.5 Pull out the top shaft and bottom shaft from the disc. Threaded holes are provided at the outer ends of the top and bottom shaft for insertion of puller bolts.

12.6 Push the disc edge towards open direction and bring disc to the fully open position. Push the disc out of the body seat. It will be easier to remove the disc from the seat in the open condition, since the seat contact area is minimal under this condition. The seat separates out as an individual item.

12.7 Carry out the replacement of the parts required to be changed; and reassemble the valve with new parts.

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR PTFE LINED BUTTERFLY VALVE MODEL IVTFE

13.0 ASSEMBLY :

- 13.1 Follow the steps mentioned for disassembly in the reverse order for re-assembling the valve. Collect all the parts, clean them thoroughly and check whether the parts to be replaced are in order. Check the condition of bush bearings inside body bore. Replacements of bearings are normally not required.
- 13.2 Insert the 'O' ring and top bush from the flange end & press the top bush flush with the flange.
- 13.3 Insert the disc inside the seat with disc kept perpendicular to the seat bore (only the disc shoulder will be in contact with the seat in this position and not the periphery)
- 13.4 Wrap the backup elastomer around the seat and align them correctly with the shaft bore is seat and backup elastomer in line with each other. The projection provided on the PTFE seat ensure easy location of backup elastomer.
- 13.5 Rest the bottom half of the body on a flat surface and place the disc spring & pusher in the counter bore.
- 13.6 Insert the top shaft into the disc bore. Slide the disc springs and pusher through top shaft and locate them above the backup elastomer. Place the whole assembly on the bottom half of the body. Use bottom shaft for location.
- 13.7 Slide in the top half of the body with the top shaft as location. Close the body halves together and screw in the socket head screws from below. Check the body alignment and tighten the screws gradually from either side.
- 13.8 Position the disc to CLOSED position. Orientate the top shaft for correct keyway position. Adjust the stand outs/ shaft positions correctly.
- 13.9 Check correct taper pinhole positions and clean and ream the taper pinholes. Apply LOCTITE- 642 Sealant on taper pins and drive them through the holes to position. Avoid excess hammering
- 13.10 Remove all metal chips and foreign particles from the seat / disc face. Check the valve for correctness of assembly and for fixing of the operator. Mount the operator on the top flange. Tighten the nuts/bolts and operate the valves 5 times to see functional performance.
- 13.11 Carry out body test and seat leakage test corresponding to the valve pressure rating (Body test is carried out at 1.5 times the rated pressure & seat test is carried out at 1.1 times the rated pressure with water.)
- 13.12 Drain & dry the valve after testing & bring the disc to nearly closed position (Do not close fully!) Valve is now ready for installation.

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INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR IVC AND IVCT MODEL CHECK VALVES

1. INTRODUCTION :

Intervalve Check valves are designed and manufactured to perform optimally at the specified design conditions. In order to achieve the optimum performance, we recommend the user to adhere to the following instructions. Intervalve reserves the right to decline responsibility for any premature failure or damage to the valves due non-adherence to the instructions given in the manual.

2. GENERAL DESIGN FEATURES :

The IVC and IVCT model check valves manufactured by IV are primarily single plate, wafer type swing check valves that generally conform to the short pattern dimensions of API 6D standards as well as ANSI B16.10. The valve has a very simple but reliable design and construction which ensures easy installation and trouble free operation.

3. BASIC MODELS:

IVC : Check valve with an elastomer O-ring seat on the disc and O-ring face sealings on the body.

IVCT : Check valve with a PTFE seat on the disc and serrated body faces.

4. INSTALLATION SUITABILITY :

Both the models are suitable for installation in either a horizontal or vertical pipeline. Suitability for mounting in pipelines with other orientation may be decided before installation of valve (The thumb rule is that the valve disc should remain closed in the installed condition by gravity force without any flow).

The flow direction marked on the valve body shall always be adhered to while installing the valve in the pipeline.

When installing the valve in the delivery side of a pump, do not install it directly on to the pump flange or on to a following bend or elbow. Install the valve at a distance of approximately 6 time's valve diameter from the stabilizing zone.

The valves have been designed to operate with low-pressure differentials and may tend to be unstable with pulsating flows and very low differential pressures, which should be avoided.

5. STORAGE PRIOR TO INSTALLATION:

Store the items in the original containers in which they are received from the factory till ready for installation. Storing in an open condition can cause damage / deterioration of the O-rings so should be avoided.

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6. PREPARATION FOR INSTALLATION :

Prepare the pipeline and weld the mating flanges on the upstream and down stream side with a dummy piece on to maintain the correct face to face dimension (Refer fig. 1).

Ensure that the welded flanges are vertical to the axis of the pipeline and parallel to each other. Remove any welding splatters or sharp edges on the flange faces.

Open the packing when ready for installation. The lifting hook, kept separately in the packing shall be screwed on to the threaded hole provided on the top of the body.

Hold the valve assembly vertically using the lifting hook. Ensure that the flap (disc) is freely swinging in the pivot and remains closed in the vertical position. Remove any foreign particles in the hinge cavity.

Never carryout the flange welding after fitment of the valve on the pipeline! This can seriously damage the O-rings.

7. INSTALLATION IN PIPELINE (Refer Fig. 2 for details)

The valve body outside diameters provides automatic self-centering of the valve body in the pipeline. This enables easy installation of the valve.

Do not use any gaskets in case of IVC model valves. The O-rings will provide adequate face sealing in case of IVC models.

Flange gaskets are required while installing IVCT model valves. The valve body is provided with a serrated finish for better gasket grip and sealing.

Check the flow direction in the pipeline and ensure installation of the valve in the marked flow direction only.

Before inserting the valve between the flanges, install the flange bolting on one half of the flange holes. This will ensure support as well as centering for the valve body.

Hold the valve with lifting hook and gently slide it between the flanges, until the body comes and rests against the initially installed flange boltings. Ensure to install the valve with the flap vertically hanging downwards (This will be ensured when the lifting hook comes vertically on a horizontal pipeline).

Install the remaining flange bolts also and tighten uniformly till sealing is achieved. The tightening torque required on IVCT model valves would be higher than IVC models due to the sealing gaskets on either side.

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In case of installation on vertical pipeline the lifting hook will be horizontal and project out between the two flange bolts. Select the most optimum orientation for installation. Flow has to be always in the upward direction for pipeline installation of swing check valves.

8.0 MAINTENANCE & REPAIR:

No maintenance is normally required for the IVC or IVCT model check valves. In case of valve passing, check for integrity of sealing O-rings on the disc. In case of damage replace O-rings with new ones, available as spare from the factory.

Change the sealing O-rings on the body face also whenever valve is removed from pipeline and reinstalled.

Valve sizes upto 6" (160 NB) have a disc hinged and held on to the body by means of 2 nos. counter sunk section screws. These screws can be removed using an allen key and the disc can be taken out if required for maintenance.

9. VALVE IDENTIFICATION AND NAME PLATE DETAILS :

Each valve is identified by a unique sl.no. punched on the name plate. The name plate attached to each valve provides information on the valve model, size, pressure rating and material of construction besides the year of manufacturing. The sl. no. punched on the name plate may be quoted while reporting about any complaints or malfunctioning of the valve.