HAYWARD FLOW CONTROL

BYV SERIES BUTTERFLY VALVE
INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

PLEASE READ THE FOLLOWING INFORMATION PRIOR TO INSTALLING AND USING HAYWARD BYV SERIES BUTTERFLY VALVES. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY, OR EVEN DEATH.

1. Hayward Flow Control (Hayward), a division of Hayward Industries, guarantees its products against defective material and workmanship only. Hayward assumes no responsibility for property damage or personal injury resulting from improper installation, misapplication, or abuse of any product.
2. Hayward assumes no responsibility for property damage or personal injury resulting from chemical incompatibility between its products and the process fluids to which they are exposed. Determining whether a particular PVC, CPVC, or PP product is suitable for an application is the responsibility of the user. Chemical compatibility charts provided in Hayward literature are based on ambient temperatures of 70°F and are for reference only.
3. Hayward products are designed for use with non-compressible liquids.

WARNING

Hayward PVC and CPVC products should NEVER be used or tested with compressible fluids such as compressed air or nitrogen. Use of PVC and CPVC products in compressible fluid applications may result in product damage, property damage, personal injury, or even death.

WARNING

The Series BYV Butterfly Valve is intended for use in liquid service only. Do not attempt to use this valve for controlling air or gases. Use of this product in air or gas service may result in product damage, property damage, personal injury, or even death.

4. The maximum recommended fluid velocity through any Hayward product is eight feet per second (8 ft/s). Higher fluid velocity can result in damage due to the water hammer effect.
5. Piping systems must be designed and supported to prevent excess mechanical loading on Hayward products due to system misalignment, weight, shock, vibration, and the effects of thermal expansion and contraction.
6. The effect of temperature on plastic piping systems must be considered when the systems are initially designed. The pressure rating of plastic systems must be reduced with increasing temperature. Maximum operating pressure is dependent upon material selection as well as operating temperature. Before installing any Hayward product, consult Hayward product literature for pressure vs. temperature curves to determine any operating pressure or temperature limitations.
7. PVC and CPVC plastic products become brittle below 40°F. Use caution in their installation and operation below this temperature.

WARNING

Hayward PVC and CPVC products should not be used in services with operating temperature below 34°F.

8. Due to differential thermal expansion rates between metal and plastic, transmittal of pipe vibration and pipe loading forces, **DIRECT INSTALLATION OF PLASTIC VALVES INTO METAL PIPING SYSTEMS IS NOT RECOMMENDED**. Wherever installation of plastic valves into metal piping systems is necessary, it is recommended that at least 10 pipe diameters in length of plastic pipe be installed upstream and downstream of the plastic valve to compensate for the factors mentioned above.
9. Published operating requirements are based on testing of new valves using clean water at 70°F. Valve performance is affected by many factors including fluid chemistry, viscosity, specific gravity, flow rate, and temperature. These should be considered when sizing Hayward products.
10. Systems should always be depressurized and drained prior to installing or maintaining any Hayward product.

WARNING

Failure to depressurize and drain system prior to installing or maintaining valve may result in product damage, property damage, personal injury, or even death.

11. Always follow your site and or company procedures for any safety training and or site specific precautions or warnings in addition to those in this document.

1. INSTALLATION:

1.1. Transporting the Valve:

Valve should be stored inside factory packaging until product is ready to be installed. Packaged valve should be stored indoors, at room temperature, and out of direct sunlight. Avoid storing packaged valve in location where packaging may become wet. Valve should be moved as close to installation site as possible prior to removing from packaging. Do not cut through tape on box any more than necessary to avoid cutting the liner sealing face of the valve. After removing valve from carton, care must be taken not to damage valve or to allow debris to enter valve.

WARNING

System must be depressurized and drained prior to installing valve or performing maintenance. Failure to depressurize and drain system prior to installing or maintaining valve may result in product damage, property damage, personal injury, or even death.

CAUTION

Do not install valve directly to pump outlet. Allow a length of at least 5 pipe diameters between pump outlet and valve.

Do not install valve directly after a reducer / expansion fitting. Install at least 5 pipe diameters from an expansion or reducing fitting.

Pipe must be supported upstream and downstream of the valve. Sound piping system design principles should be applied when installing this valve.

Do not install valve directly into a metal system (see pg. 2). Wherever installation of plastic valves into metal piping systems is necessary, it is recommended that at least 10 pipe diameters in length of plastic pipe be installed upstream and downstream of the plastic valve.

When lifting valve do not lift by the handle of lever operated valves or the hand wheel on gear operated valves. When lifting the valve do not damage the disc or the liner, protect the face of the liner.

1.2. Installing the Valve into a System:

NOTE

Hayward BYV Series butterfly valves are bi-directional. There are no direction arrows or specific orientation requirements for proper operation.

1.2.1. Remove valve from packaging.
1.2.2. Verify that product is defect free and meets specifications.
1.2.3. BYV butterfly valves should be installed between flanges matching the bolt pattern of the valve; ANSI B16.5 class 150 flanges or DIN standard PN10.
  1.2.3.1. The use of additional gaskets is not necessary and not recommended.
  1.2.3.2. Suggested bolt lengths are listed in table 1. Mating flange thickness may vary by manufacturer, style of flange, and flange materials.
  1.2.3.3. The BYV butterfly valve is bi-directional in flow and shut off/sealing in any body configuration, and with or without body bolt hole threaded lugs.
  1.2.3.4. In dead end service it is recommended the valve is installed between one pipe flange and a downstream companion or blind flange, or ring flange.
1.2.4. ID of pipe must clear disc when valve is operated.
  1.2.4.1. Hayward butterfly valves are designed for use with all pipe flanges that have bores equal to or larger than Schedule 80 pipe as listed in table 1. If the bore is smaller than listed the inside of the pipe flange must be chamfered at a 45° angle to a diameter listed. Sharp edges and burrs must be removed.
1.2.5. Flanges must be aligned and square to valve.
  1.2.5.1. When installed between two existing flanges, the flanges should be separated to provide clearance on the face to face of the valve. This will prevent the valve sealing surfaces from distortion during installation.
  1.2.5.2. Pipe flange faces should be clean and free of debris including old gasket material.
  1.2.5.3. A light coating of a lubricant applied to the flange sealing surface may aid in installation. Make sure lubricant is compatible with valve materials of construction before applying.
1.2.6. Install valve between flanges.
  1.2.6.1. Valves should be opened to approximately 15° when installed.
  1.2.6.2. Do not open disc beyond face of valve to prevent damage to the edge of the disc by the mating flange during installation.
  1.2.6.3. The stem can be in any desired position (i.e. upright, sideways, etc.), provided the flange bolt holes align with the valve bolt holes. Typically a vertical location for the stem is preferred.
  1.2.6.4. Center the outside diameter of the valve to the outside diameter of the flanges.
1.2.7. Installations in systems with vertical pipe orientation:
  1.2.7.1. Follow guidelines as above.
1.2.8. Install bolting.
  1.2.8.1. Metal washers are recommended between nut/bolt head and the pipe flange.
  1.2.8.2. For wafer style valves, insert stud through holes in flanges and valve, install washers and nuts.
  1.2.8.3. For lugged valves, insert cap screws or bolts, both with washers, through flanges into threaded lugs in the body.

1.2.8.4. Install bolting loosely by hand.
1.2.8.5. With a torque wrench, uniformly tighten nut to approximately 8 ft*lbf (10.8 N*m) in an alternating sequence as shown in figure 1. Continue alternating tightening until the recommended flange bolt torque, in table 1, is achieved. Note: The proper tightening sequence is also molded into the valve body.

1.2.9. Install throttle plate and handle.
1.2.9.1. On lever operated valves the throttle plate is shipped installed into the top adapter flange of the valve. If it has become loose during shipping re-fit into the mounting flange of the body of the valve. The throttle plate can fit two ways. One way results in the handle on one side of the valve, alternatively it can be removed from the body mounting flange and rotated 180° opposite of the first way thus placing the handle on the opposite side of the valve. To install the handle on the opposite side of the valve, you may need to operate the valve, without the throttle plate, past the closed position then reinstall the throttle plate.


Step 1.2.9

1.2.9.2. Note: The handle will only fit completely into the throttle plate in one orientation. The valve is shipped partially open. If the desired position of the handle is on the opposite side of the pipe, remove the throttle plate, rotate it 180°, and refit into the mounting plate. The handle will now position on the opposite side of the pipe. Fit handle onto the stem of the valve. The handle will be slightly away from the body (note picture on cover of this document).
1.2.9.3. Once the handle is installed on the stem and over the throttle plate, install the provided lock washer and ¼" hex head screw (use a 3/8" hex socket) into the handle, threading the screw into the top of the valve stem. Tighten to 15 ft*lbf. Squeeze the grip of the valve completely and operate the valve 3-4 times to verify it moves from full open to full close and intermediate stops are working. Check the hex head screw is still at the required torque after operation of the valve.

1.2.10. Install handle bezel.
1.2.10.1. Align the tab cutout on the underside of handle bezel with the tab inside the handle.
1.2.10.2. Using a flat object, gently press fit the handle bezel into the handle until it is flush with the first step in the mating pocket of the handle.

1.2.11. Additional Notes:
1.2.11.1. Normal pipe hanger spacing is recommended.
1.2.11.2. Do not allow valve to support the weight of the pipe.
1.2.11.3. If the valve was provided with a gear box from the factory, the gear box stops will already be set by the factory during assembly.
1.2.11.4. When using pneumatic or electric actuators, additional support directly to the actuator is recommended. When large actuation is used, its' weight needs to be supported independent of the support given by the mounting flange of the valve.

1.3. Valve with gear box:
1.3.1. Follow steps above thorough 1.2.8 above.
1.3.2. Install hand wheel on shaft of gear box using pin.

1.4. Valve with actuator:
1.4.1. Follow steps above through 1.2.8 above.
1.4.2. If the valve was provided with an actuator from the factory, the actuator stops will already be set by the factory during assembly.
1.4.3. Support weight of actuator as necessary.
1.4.4. Refer to IOM provided with actuator for wiring and operating instructions.

Table 1: RECOMMENDED FLANGE BOLT TORQUE FOR BUTTERFLY VALVES[1]; ANSI B16.5 Bolt Patterns

Size Nominal	Minimum Pipe / Flange Bore at Valve Face(in.)	Nominal Valve Face to Face (in.) (ANSI B16.10)	Stud Length Wafer[2] (in)	Stud Diameter (In.) - Thread	Flat Face Type Flange Torque ft * lb.	Van-Stone Type Flange Torque ft * lb.
2"	1.40	1.69	5.5	5/8-11 UNC	15-25	10-20
2-1/2"	1.94	1.81	5.75	5/8-11 UNC	15-25	10-20
3"	2.97	1.81	6.0	5/8-11 UNC	20-25	10-20
4"	3.85	2.06	6.5	5/8-11 UNC	20-25	10-20
6"	5.84	2.19	7.25	3/4-10 UNC	30-40	20-30
8"	7.72	2.38	7.5	3/4-10 UNC	30-40	20-30
10"	9.64	2.69	8.0	7/8- 9 UNC	50-60	40-50
12"	11.34	3.06	8.5	7/8- 9 UNC	50-60	40-50

1: Check specific flange manufacturers recommendations for bolt torques.
2: Stud Length may vary because of type and brand of flange used

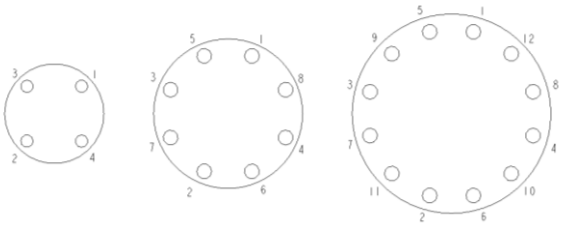

Figure 1: FLANGE BOLT TORQUE SEQUENCE

2.0 STARTUP AND OPERATION:

WARNING

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WARNING

The Series BYV Butterfly Valve is intended for use in liquid service only. Do not attempt to use this valve for controlling air or gases. Use of this product in air or gas service may result in product damage, property damage, personal injury, or even death.

WARNING

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2.1 Slowly purge air from system and pressurize and test as required.
2.2 Look for leaks around valve and check for proper valve operation. If any leaks are present, or valve does not perform properly, refer to troubleshooting guide. Depressurize and drain system prior to performing any maintenance.
2.3 BYV-Series butterfly valves are designed to seal bi-directionally.
2.4 Periodically check valve for leaks or external damage.
2.5 Periodically check flange bolts for correct torque. (NOTE: Retightening of nuts may be necessary after initial system start-up.)

2.6 Operation of valve to intermediate positions

2.6.1 Wrap fingers and hand around grip end of handle. (Palm is on the top side of the handle, fingers are on the grip)
2.6.2 While firmly holding the handle, squeeze end of handle so the grip moves into the handle. This will disengage the handle mechanism from the throttle plate.
2.6.3 Rotate the handle to the desired valve position while aligning the indicator on the side of the handle to the indication on the body bezel. The valve can be set at 5° increments from 0° to 90°. Slowly release the grip while maintaining the handle position.

2.7 Operation of valve to full closed

2.7.1 Wrap fingers and hand around grip end of handle. (Palm is on the top side of the handle, fingers are on the grip)
2.7.2 While firmly holding the handle, squeeze end of handle so the grip moves into the handle. This will disengage the handle mechanism from the throttle plate.
2.7.3 Rotate the handle clockwise to close.
2.7.3.1 Resistance will be felt while approaching closed as the disc engages the liner of the valve. Closed is indicated by the letter S (Shut) on the body bezel. Once the indicator on the handle is centered on the S, then release the grip.

2.8 Operation of valve to full open

2.8.1 Wrap fingers and hand around grip end of handle. (Palm is on the top side of the handle, fingers are on the grip)
2.8.2 While firmly holding the handle; squeeze end of handle so the grip moves into the handle. This will disengage the handle mechanism from the throttle plate.
2.8.3 Rotate the handle counter clockwise to open.
2.8.3.1 Resistance will be felt if the valve was fully closed while the disc disengages the liner of the valve. Open is indicated by the letter O (Open) on the body bezel. Once the indicator on the handle is centered on the O, then release the grip.

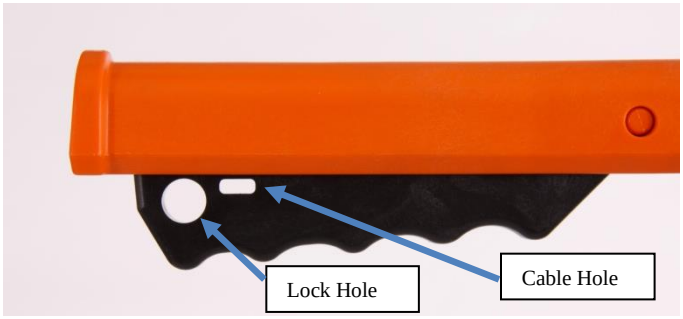
2.9 Body Bezel Indicators:

2.9.1 The body bezels in figure 2 indicate position of the valve.
2.9.1.1 One of the body bezels indicates the position of the disc in degrees.
2.9.1.2 The other body bezel indicates the position of the disc related to the % of Cv for the full open valve.

2.10 Locking Lever Operated Valve:

2.10.1 There is a hole in the grip near the underside of the end of the handle.
2.10.2 A Master Lock Number 5 can be used to lock the handle to prohibit squeezing of the grip, and operation of the handle.

Figure 2: Padlock



2.10.3 Once lock is installed, verify that squeezing the handle and grip does not disengage the handle mechanism and the valve cannot be operated.
2.10.4 Alternatively or in addition to the lock, a cable lock can be used through the rectangular slot. A 0.160" (4 mm) cable is the correct size.
2.10.5 An option exists for 2" – 8" valves to inhibit operation with a cap that replaces the handle. See your Hayward distributor, sales person, or representative for further details.

2.11 Periodic Operation

2.11.1 Where possible, for valves that are installed in locations where they are not operated frequently, it is recommended that valves are operated according to a routine maintenance schedule at least once every six months.

3.0 MAINTENANCE:

WARNING

System must be depressurized and drained prior to installing valve or performing maintenance. Failure to depressurize and drain system prior to installing or maintaining valve may result in product damage, property damage, personal injury, or even death.

3.1 Replacing Valve Disc and or Liner and Seals:

3.1.1 Please read above sections to be familiar with the valve.
3.1.2 Reference section 6 of this document for identification of parts.
3.1.3 Remove valve from line.
3.1.4 Removal of operator/actuator or, handle assembly and throttle plate:

WARNING

Make sure operator has no stored energy and is in its' fail position if applicable. For valves supplied with electric actuators, follow lock out/tag out procedures and remove all power from device before performing maintenance.

3.1.4.1 To remove handle assembly:
- 3.1.4.1.1 Remove handle bezel.
- 3.1.4.1.2 Remove socket head cap screw that attaches the handle assembly to the stem.
- 3.1.4.1.3 Slide the handle upward (away from the valve) and off of the stem.
- 3.1.4.1.4 Remove the throttle plate. Its' fit may be snug, gently pry it from the body.

3.1.4.2 To remove gearbox:
- 3.1.4.2.1 Prepare to support weight of gear box. Once bolting is removed using the next steps, it may freely slide from the stem.
- 3.1.4.2.2 Loosen the bolts (or nuts) on the underside of the body mounting flange.
- 3.1.4.2.3 Continue to loosen until disengaged from the threads in the gearbox.
- 3.1.4.2.4 Slide the gear box off of the stem. 2" – 8" may have one or more adapter sleeves between the gearbox and the stem. 10" and 12" may have one or more adapter sleeves between the gearbox and stem and a key to engage the stem to the sleeve.

3.1.4.3 To remove actuator:
- 3.1.4.3.1 Prepare to support weight of the actuator. Once bolting is removed using the next steps, it will freely slide from the stem.
- 3.1.4.3.2 Loosen the bolts (or nuts) on the underside of the body mounting flange.
- 3.1.4.3.3 Continue to loosen until disengaged from the threads in the actuator.
- 3.1.4.3.4 Slide the actuator off of the stem. There may be an adapter plate and or an adapter sleeve between the valve and the actuator. Remove these from the valve as well.

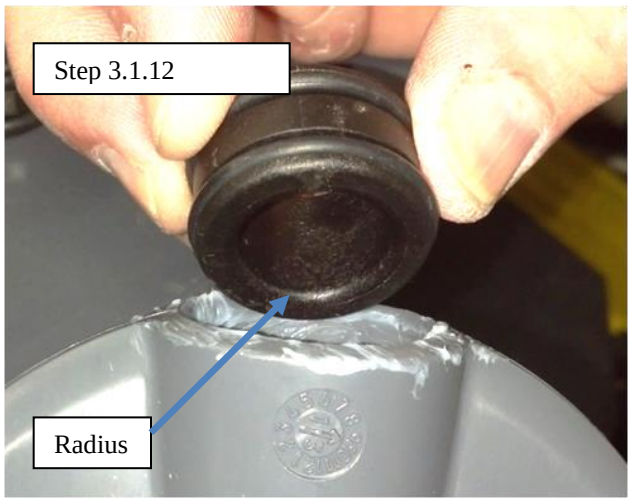
CAUTION

The edges of the square drive may be sharp or become sharp from usage. Avoid cutting hands.

3.1.5 Remove the weather seal. This can be accomplished by sliding a thin screw driver between the stem and the weather seal. Gently pull upward to slide the weather seal up the stem and away from valve.
3.1.6 Remove the gland using an extra deep socket. The gland has a right hand thread.

Gland Removal				
Valve Size	2"-3"; DN50-DN80	4"; DN100	6"-8"; DN150-DN200	10"-12"; DN250-DN300
Gland Hex Size	13/16"	1"	1-1/8"	1-3/4"

3.1.7 Remove the stem by pulling it from the valve. The stem will bring the upper bearing with it as it comes out of the valve.
3.1.8 Remove the upper bearing from the stem. Note condition of O-rings on the upper bearing. Replace if worn or nicked. Hayward highly recommends replacing O-rings any time the valve is maintained.
3.1.9 Gently push at the top of the face of the disc along the stem center line. The disc will move out of the liner and tilt around the seal retainer. The seal retainer will likely still be in the bottom of the disc when the disc is removed.
3.1.10 Remove the seal retainer from the disc. If the seal retainer is in the disc counter bore, use the stem to remove the seal retainer by inserting it in the "top" of the disc and push seal retainer out of the disc. Inspect the seal retainer O-rings. Replace if worn or nicked. Hayward highly recommends replacing O-rings any time the valve is maintained.
3.1.11 Apply a light coat of Krytox® grease to the counter bore in the bottom of the disc (bore opposite the one with the Hayward H on the outside of the disc).
3.1.12 Orientate the seal retainer with the O-rings installed so the end with the **radius** on the inside diameter will enter the disc first. Apply Krytox® to the lower counter bore in the disc. Push the seal retainer into the disc until it is flush with the bottom of the disc.
3.1.13 Before inserting the new disc in the liner, inspect the liner for tears, excessive wear, material erosion, and noticeable swell. If any of these exist, it is recommended the liner be replaced.



3.1.14 The liner has a definite orientation in the body. It is not symmetric from the top to the bottom. It is symmetric from face to face.

3.1.14.1 Notice the stem holes through the liner. One has a counter bore and one does not.

3.1.14.2 The end (top end) with the counter bore matches a lip in the inside diameter of the body at the top of the valve.

3.1.14.3 Fold one side of the liner mid-way between the top and bottom holes so that it forms a C shape.

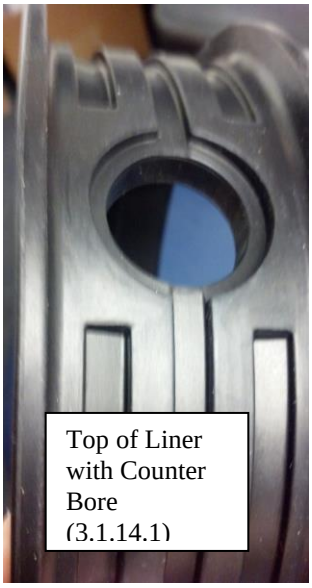
3.1.14.4 Starting on the top end on the liner fit the counter bore in the liner onto the lip inside the body. Center it on the lip.

3.1.14.5 As you work circumferentially away from the lip, and on the unfolded side, using hand force, press the liner into the inside of the body. A lip along the inside of the body corresponds to a groove in the center of the liner between the faces.

3.1.14.6 Check to see that the hole in the bottom of the liner is aligned with the boss around the hole in the interior lower portion of the body.

3.1.14.7 Unfold the liner while fitting it to the lip along the inside of the body.

3.1.14.8 Verify the hole in the top and bottom of the liner is aligned to the corresponding features in the body.



Top of Liner with Counter Bore (3.1.14.1)

Bottom of Liner with Straight Bore (3.1.14.1)

Steps 3.1.14.5 to 3.1.14.8

Step 3.1.15.1

3.1.15 Now resume replacing the disc.

3.1.15.1 Apply a light coating of Krytox® grease to one side of the face of the liner in the areas near the stem bores.

3.1.15.2 Align the top and bottom of disc with the top and bottom of liner. The Hayward H is nearest the top of the valve. (The seal retainer inside the disc is nearest the bottom of the liner.) Begin to work the disc into the liner; align the disc mid-way between open and closed.

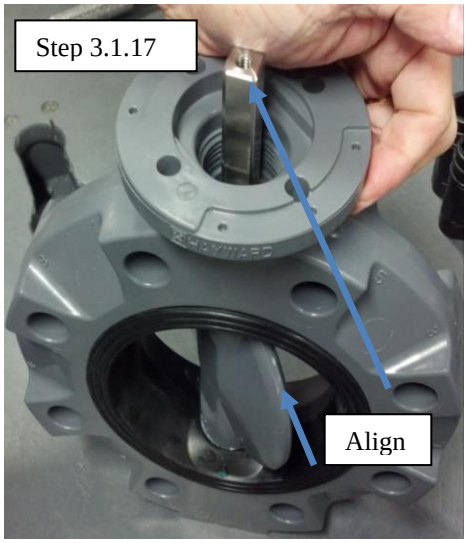
3.1.15.3 Work small amounts at the top and then the bottom until the disc is inserted into the liner. The top and bottom of the disc must be reasonably aligned with the top and bottom of the body.

3.1.15.4 The hex bore in the disc for the stem will be visible through the top of the valve.

3.1.16 If still in place, remove the upper bearing from the stem.

3.1.17 Note: There is a line scribed on the end of the stem. **Important:** This line must align in the same direction with the edge of the disc.
3.1.18 Insert the stem through the body into the upper portion of the disc.
  3.1.18.1 The stem can be moved from side to side to help the hex of the stem go into the disc.
  3.1.18.2 Verify the lower portion of the disc is still centered on the lower section of the liner.
  3.1.18.3 Gently push or lightly tap the stem until it is bottomed into the body.
3.1.19 Insert upper bearing.
  3.1.19.1 Apply a coat of Krytox® grease to the outside diameter of the end of the bearing containing the O-rings.
  3.1.19.2 Align the square shape on the upper bearing to the square shape on the stem. Insert the upper bearing, with the O-rings in their grooves, over the stem and into the stem bore of the body.
  3.1.19.3 Gently press the upper bearing into the body of the valve until it is near the bottom of the thread for the gland.
3.1.20 Insert gland.
  3.1.20.1 Place the gland over the stem with the hex side away from the valve.
  3.1.20.2 Start the thread by hand.
  3.1.20.3 Tighten only until snug using an extra deep socket; approximately 2 ft* lbs.
3.1.21 Apply a light coat of Krytox® to the outside diameter of the weather seal. Align square shape on weather seal to square shape on stem and replace weather seal.
3.1.22 Replace throttle plate and handle or worm gear or actuation package
3.1.23 Check operation of the valve from full closed to full open. Check intermediate stop positions to ensure throttle plate and handle properly engage.

Note: The 10” (DN250) and 12” (DN300) valves have a stem that is round with a keyway on the end shown in Step 3.1.17. Similar to the 8” (DN200) and smaller, the keyway and scribe line will align with the disc. Non-standard stems are sometimes used for direct mount to an actuator. The end configurations of these are specific to the valve and actuator package. Basic disassembly and re-assembly will follow the standard valve. Insure that the reassembled valve stem alignment matches the original orientation.



4.0 TROUBLESHOOTING:

Problem	Cause	Solution
Leak between flange and valve body.	Damaged face on liner.	Replace liner or valve.
	Damaged face on flange.	Loosen flange bolts, align flange and valve, and re-install bolts. Be certain pipe is evenly supported upstream and downstream of valve.
	Over / under / unequally tightened flange bolts.	Loosen all flange bolts. Re-torque flange bolts in alternating sequence. See Table 1 for flange bolt torques.
	Liner face and flange face incorrectly paired	Verify seal area on liner overlaps seal areas on flange. If flange has a face O-ring, verify it is concentric and within the inside and outside diameter of the liner face.
Leak through valve.	Disc is not fully closed.	Check that handle location indicator is on "S" for shut; handle is positioned perpendicular to the pipe run. Check that stop is properly set on gear or other actuating device; adjust stops if required. Remove handle or actuator to verify scribe line on top of stem is indicating fully closed – line is perpendicular to the pipe run.
	Damaged seal surface on disc.	Replace disc or valve.
	Damaged seal surface on liner.	Replace liner or valve.
	Excessive line pressure.	Verify line pressure has not exceeded maximum working pressure of the valve at operating temperature. Replace valve.
Valve difficult to operate.	Flange or pipeline misaligned to valve; disc striking mating flange inside diameter	Loosen flange bolts, align flange and valve, and re-install bolts. Be certain pipe is evenly supported upstream and downstream of valve.
	Liner is swollen.	Check compatibility of fluid in the valve with the liner. Call Hayward with fluid, temperature, and existing liner material for liner recommendations. Replace valve.
	Line not properly supported, transferring weight of system to valve, or crushing valve between flanges.	Add pipe support before and after, or adjacent to valve.
	Actuator is not properly supported, transferring weight and stress to valve.	Loosen body mounting flange bolts. Add supports to system so that actuator is independently supported. Retighten body mounting flange bolts.
Damaged disc or liner.	Excessive flow rate.	Maximum line velocities of 8 ft/sec. recommended for plastic piping systems. Resize system or valve.
	Water Hammer	Maximum line velocities of 8 ft/sec. recommended for plastic piping systems. Resize system or valve. Reduce line velocity. Reduce speed of operation (i.e. closure) of valve.
	Detrimental solids in process media.	Install a strainer upstream of valve to prevent damage to valve.
	Cavitation in line.	Maximum line velocities of to 8 ft/sec. exceeded. Valve should be installed at least 5 pipe diameters from the nearest pump or fitting. Resize system or valve.
	Process conditions.	Check chemical compatibility of disc material with fluids in valve.
		Check that valve was not in service or operated at temperatures below recommended.
		Verify arrow on valve body is in line with system flow. Correct valve orientation.
	Throttling position at low % opening	Limit time in position at reduced flow rate. Resize system or valve.
Leakage through top of valve at mounting flange near gland.	Failed liner and failed liner O-rings	Replace liner and O-rings. Inspect stem and replace if warranted.
	Line not properly supported, transferring weight of system to valve, or crushing valve between flanges.	Add pipe support before and after, or adjacent to valve.
	Actuator is not properly supported, transferring weight and stress to valve.	Loosen body mounting flange bolts. Add supports to system so that actuator is independently supported. Retighten body mounting flange bolts.
	Liner displaced into bore due to catching the face of the mating flange during installation.	Inspect liner after removing valve from the line. Insure some clearance between flange face and valve while inserting valves between flanges.
Valve does not open or close fully or will not stop at intermediate positions.	Debris in handle. Damaged throttle plate or lever	Remove handle and remove any debris from the handle mechanism. Replace handle if damaged. Replace throttle plate if damaged.

5.0 PRODUCT SPECIFICATIONS:

Maximum Pressure: 150 psi @ 70ºF (see Chart 1 for operating pressures at elevated temperatures)

Operating Temperature:

Material	Minimum Operating Temperature	Maximum Operating Temperature
PVC	**34°F (1.1°C)**	**140°F (60.0°C)**
CPVC	34°F (1.1°C)	180°F (82.2°C)
GFPP*	**20°F (-6.6°C)**	**240°F (115°C)**
PVDF*	**10°F (-12.2°C)**	**240°F (115°C)**
*Note: For GFPP body with PVDF disc, use PVDF rating and curve for upper temperature/pressure limits.		

Maximum System Flow Velocity: 8 ft/s for thermoplastic piping systems

Flow Capacity, Cv:

Size	Cv Values at disc position					
	15°	30°	45°	60°	75°	Full Open
2”	0.2	15	37	65	88	92
2-1/2”	1.1	24	45	80	145	165
3”	3.1	28	36	83	182	250
4”	20	58	84	183	390	470
6”	30	105	200	458	1000	1510
8”	125	203	375	770	1650	2820
10”	123	289	644	1396	3003	4723
12”	154	435	1011	2189	4586	6400

WARNING

The maximum recommended fluid velocity through any plastic piping system is eight feet per second (8 ft/s). Higher fluid velocity can create excess water hammer effect, resulting in property damage, personal injury, or even death.

CAUTION

Published operating requirements are based on testing of new valves using clean water at 70°F. Valve performance is affected by many factors including fluid chemistry, viscosity, specific gravity, flow rate, and temperature. These should be considered when sizing systems using Hayward products.

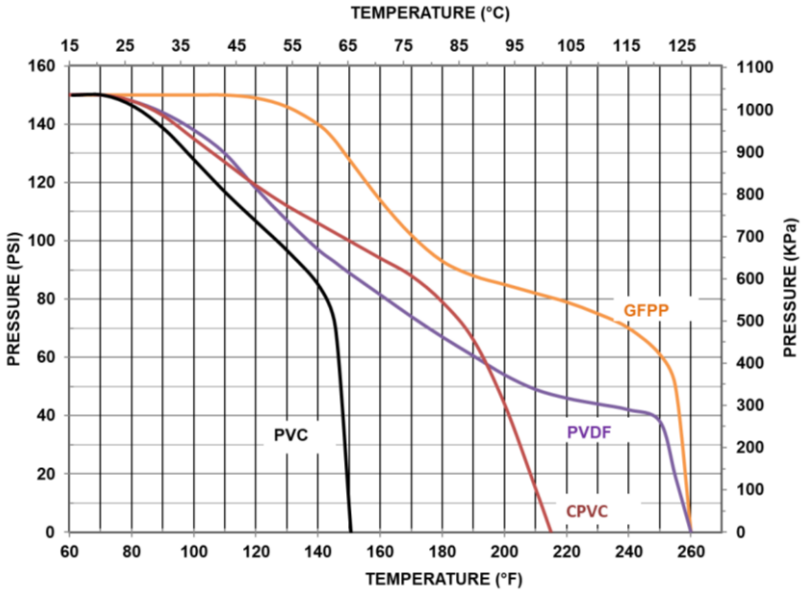
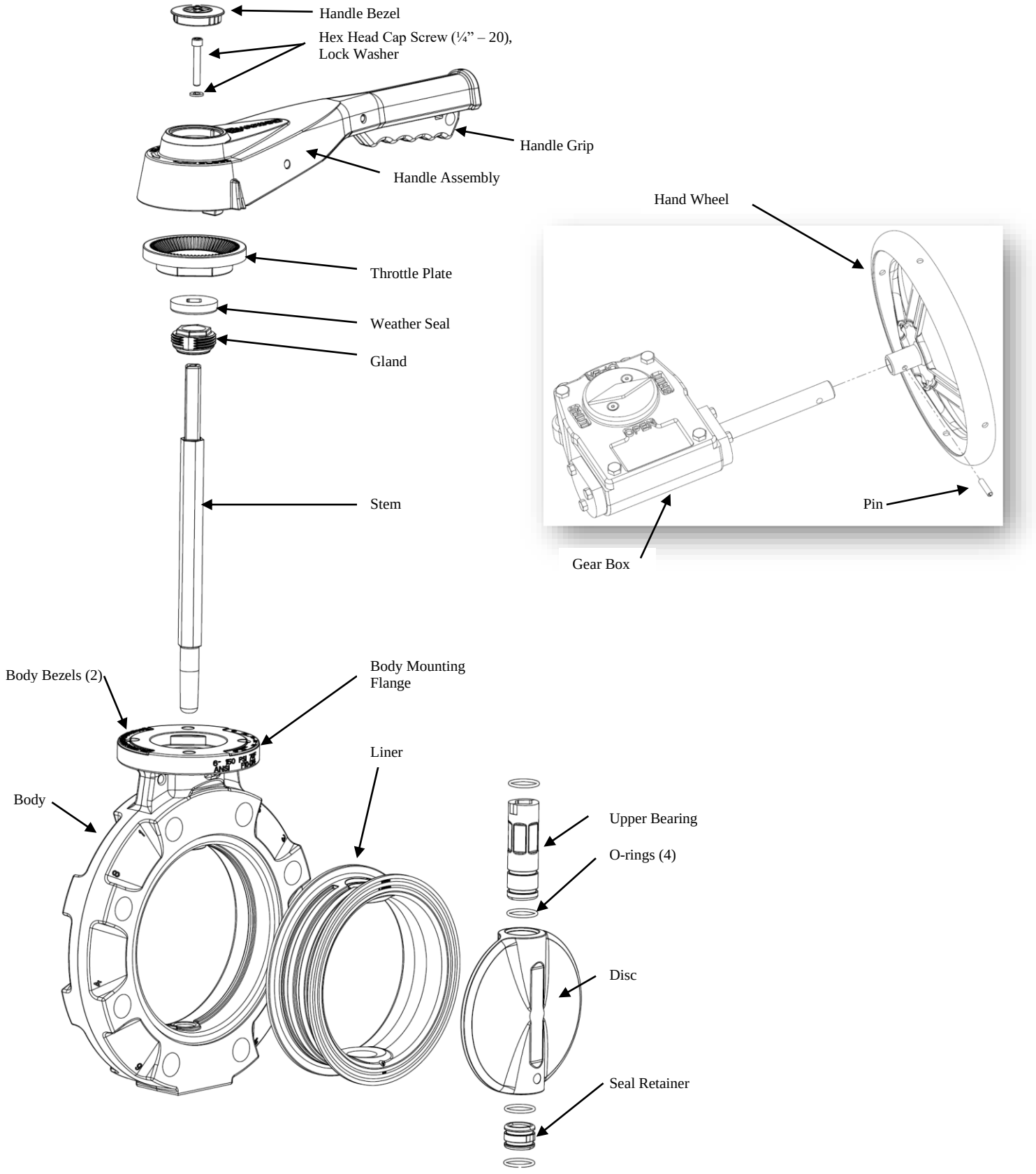


Chart 1: Operating pressures at elevated temperatures

6.0 PARTS LIST:

Fig. 3: Exploded view of BYV Series Butterfly Valve



7.0 WARRANTY TERMS AND CONDITIONS:

THREE YEAR WARRANTY: All products manufactured by Hayward are warranted against defects in material or workmanship for a period of three years from date of shipment. Our sole obligation under this warranty is to repair or replace, at our option, any product or any part or parts thereof found to be defective. HAYWARD MAKES NO OTHER REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The warranty set forth above is the only warranty applicable to Hayward products and in no event shall Hayward be liable for any delay, work stoppage, cartage, shipping, loss of use of equipment, loss of time, inconvenience, loss of profits of any direct or indirect incidental resulting from or attributable to a breach of warranty. The remedies under this warranty shall be the only remedies available. OUR MAXIMUM LIABILITY SHALL NOT IN ANY EVENT EXCEED THE CONTRACT PRICE FOR THE PRODUCT.

Notes:

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Hayward Flow Control has been a leading manufacturer of industrial thermoplastic valves and process control products for more than 60 years. In fact, Hayward was one of the originators of the first thermoplastic ball valves. Since then, we have remained committed to producing the highest quality products while providing outstanding service.

Liquid Filters and Strainers

Bag Filter vessel
- GFPP
- PVC
- CPVC

Y Strainers
- PVC
- CPVC
- Clear PVC
- PVDF

Simplex Strainers
- PVC
- CPVC
- GFPP
- PVDF
- Eastar® (Clear)

Duplex Strainers
- PVC
- CPVC
- GFPP
- Eastar® (Clear)

Valves and Flow Control

Ball Valves
- PVC
- CPVC
- GFPP
- PVDF

Check Valves
- Ball Check Valves
- Y-Check Valves
- Wafer Check Valves
- Swing Check Valves

Pressure & Chemfeed
- Injection Quills
- Back Pressure
- Pressure Relief
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Butterfly Valves
- PVC
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