



## KEYSTONE SERIES GR RESILIENT SEATED BUTTERFLY VALVES GRW/GRL INSTALLATION AND OPERATION MANUAL

Before installation these instructions must be fully read and understood



### Intended valve use

The valve is intended to be used only in applications within the pressure/temperature limits indicated in the P/T diagram of the product manual.

When the valve is used in an end-of-line function, PED Cat-I applications are allowed only.

For other categories, please contact the factory.

## 1 STORAGE AND HANDLING

### 1.1 Storage

When valves are to be stored for some time (2 months or more) before being fitted, storage should be in the original delivery crates or cases.

#### 1.1.1 Storage conditions

The valves should be stored off the ground in a clean, dry indoor area.

Protect the valve from temperature and humidity extremes, and exposure to excessive dust, moisture, vibration, deformations, sunlight and ozone.

### Recommendations

1. Temperature: storage temperature below 25°C (77°F), above 0°C (32°F) preferable below 15°C (59°F).
2. Humidity: storage conditions should be such that condensation does not occur, store in a dry environment. Maximum 50% relative humidity.
3. Light: valve elastomers should be protected from light, in particular direct sunlight or strong artificial light with high ultra violet.
4. Ozone: storage rooms should not contain any equipment generating ozone. E.g. lamps, electric motors.

### IMPORTANT

*Before valves are installed or used the following actions are recommended.*

1. Valves/parts have to be inspected and thoroughly cleaned if required.
2. Elastomer parts need to be greased with silicone grease if not present anymore.
3. All surfaces in contact with seats have to be thoroughly cleaned and greased with silicone grease if stored for more than 5 months.

### 1.2 Handling

To prevent damage during handling, the valves should be lifted by hand or using appropriate lifting equipment. Do not fasten lifting devices around the valve operating shaft, actuator or through the valve waterway. The valve should be lifted with chains or slings which are fastened to rods or bolts which go through the bolt holes in the body flanges. The valves should be protected from external events e.g. (bumps, hitting and vibration) during transport. Any flange protection caps need to be removed before the valve is mounted in the pipeline. Lift the valve with great care from the transport package (crate, pallet). While handling or installing the valve, ensure that no damage occurs to the valve, the pneumatic/electrical/hydraulic actuator or other instrumentation.

## 2 SPARE PARTS

Only original Keystone spare parts are allowed to be used. Safe operation cannot be guaranteed if third party spare parts are used.

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### 3 INSTALLATION

#### WARNING!

For safety reasons, it is important to take the following precautions before you start work on the valve:

1. Personnel making any adjustments to the valves should utilize suitable equipment. All required personal protection means should be worn.
2. The line must be depressurized before installing the valve.
3. Installation and handling of valves should be done only by personnel who are trained in all aspects of manual and mechanical handling techniques.
4. Misuse of the valve is not allowed. For example: the valve, handles, actuators or other parts may not be used as 'climbing tools'.
5. Ensure that valve pressure/temperature limitations marked on the identification tag are within the service conditions. The trim number on the valve's nameplate identifies the valve materials. See Product Manual for valve specific P/T diagram and trim number definition.
6. Ensure that valve materials are compatible with the pipeline fluid.

#### 3.1 Visual valve inspection

1. Confirm that the materials of construction listed on the valve nameplate are appropriate for the service intended and are as specified.
2. Tag/name plate identification
 

Manufacturer:	Keystone
Model:	Series GRW or GRL
Nominal size:	DN or NPS
M.P.W.P.:	Maximum permissible working pressure
Flange compatibility:	e.g. ANSI 125/150 PN 10/16
Temperature:	e.g. -40/120°C [-40/250°F]
Trim:	Materials of construction

#### 3.2 Flange and pipe compatibility

Check matching of flange drilling pattern of valve and pipe before assembly.

Flanges have to meet the following requirements [see Figure 1]:

- The face inside diameter should be:
  - D min.: The valve Q-dimension + adequate disc clearance.
  - D max.: The optimum inside diameter (ID) is equal to the inside diameter of flange standard EN 1092-1, table 8, type 11 or ASME B16.5, table 8, Weld Neck, dimensions B. For D max. inside diameters larger than those listed previously and smaller than JIS B 2220 flange types SOP, SOH and SW the max. operational pressure is reduced to 70% of the valve rated

pressure (see pressure-temperature diagram). End Of Line (EOL) service is not recommended for applications with larger than D max inside diameters.

- If the flange (or pipe) is provided with a raised face, the diameter of this shall be at least 8 mm larger than the YY-dimension of the valve.

The use of the flange-gaskets is not allowed since it might damage the valve.

The Keystone seat-face design eliminates the need for the gaskets.

Use flange bolting in accordance with appropriate standard.

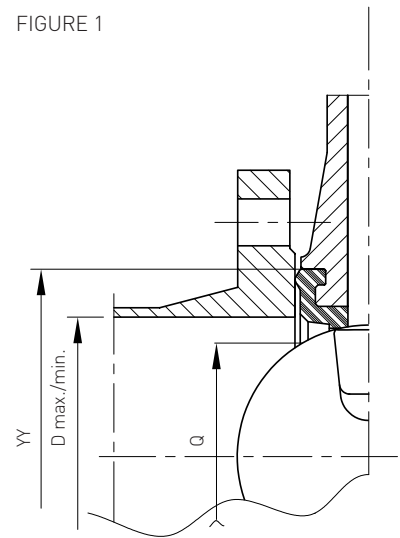
**Do not use flange gaskets, as this could lead to valve damage!**

#### 3.3 Valve installation

The valves are bi-directional and may be installed in either direction relative to the flow. The valve will control flow equally in either direction. The recommended installation position is shaft horizontal and the lower disc edge opening down-stream. (Especially for slurry service and media with a tendency for sedimentation). For optimum valve control and smooth performance, it is recommended to have a 10 to 20 pipe diameters of straight run inlet piping and 3 to 5 pipe diameters straight outlet piping.

A valve is not a crow-bar. Do not use the valve to spread the flanges. Seat damage might result.

FIGURE 1



# KEYSTONE SERIES GR RESILIENT SEATED BUTTERFLY VALVES GRW/GRL

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### NOTES

- The valve can be installed in the pipe-line either with or without the actuator mounted on top of the valve. Make sure to turn the disc slowly in the event there is a mismatch causing the disc to touch the adjacent piping.
- It is the responsibility of the valve user and not the valve manufacturer to ensure that the pipeline system has been built professionally and the valve has been properly installed.
- Adjacent piping must be positioned so that minimal piping stresses are transmitted to the valve flanges during or after installation.
- Handling and lifting of the valves during installation MUST be performed following the same instructions described in previous section '1.2 Handling'.

### IMPORTANT

*Mating flange faces should be in good condition and free of dirt and/or inclusions and pipe insides should be well cleaned.*

#### 3.3.1 Existing system (see Figure 2)

1. Check whether the flange distance meets the valve face-to-face dimensions. Spread the flanges with adequate tooling for easy insertion of the valve.
2. In case of a wafer valve, insert some flange bolts in the pipe flanges, to help you hold the valve after insertion.
3. Close the valve so that the disc edge is at least 10 mm (3/8") within the body.
4. Insert the valve between the flanges, center the valve body and insert all flange bolts. Tighten the flange-bolts hand tight.
5. Slowly open the valve completely. (The disc is in line with parallel flats or keyway in shaft head. Keyway points towards disc edge.)
6. Maintain the valve flange alignment while gradually removing the flange-spreaders and tighten the flange-bolts hand tight.
7. Slowly close and open the valve to check for adequate disc clearance.
8. Cross-tighten all bolting to the proper torque. Do not over tighten.

#### 3.3.2 New system (see Figure 2)

1. With the disc in the near-closed position, center each mating flange with the valve body. Fix the body with some flange-bolts and tighten the bolts.
2. Use the flange-valve-flange assembly for fit-up and centering to the pipe.
3. Tack-weld the flanges to the pipe.
4. Remove the bolting and remove the valve from between the flanges.

### IMPORTANT

*Do not finish-weld the flanges to the pipe with the valve bolted between the flanges as this will result in serious heat-damage to the seat.*

5. Finish-weld the flanges to the pipe and allow the flanges to cool completely.
6. Install the valve now according to the procedure for installing in existing systems.

### 3.4 Valve verification

Check the operation of the valve by operating it to 'full open' and 'full close'. To verify the valve operation, the disc position indicator on the actuator or the handle should rotate between the 'full open' and 'full close' indicators on the actuator or throttle plate. For normal installation the valve disc travels clockwise to close.

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### 3.5 Sources of possible danger

This section contains some examples of possible foreseen danger sources.

#### 3.5.1 Mechanical

- A. When manual operators are used, available space should be checked in order to avoid hands being clamped.
- B. Mechanical sparks caused on impact of valve and e.g. tooling, are a potential source of ignition of surrounding atmosphere.

#### 3.5.2 Electrical

If static charges or stray electrical currents can initiate explosions, the valve should be grounded to earth.

#### 3.5.3 Thermal

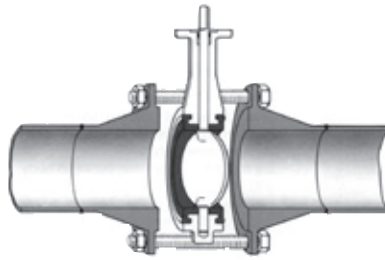
- A. Isolation should be used on valves with application temperatures  $> +40^{\circ}\text{C}$  ( $+104^{\circ}\text{F}$ ) and  $< -20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) to prevent them from being touched (to avoid burning).
- B. If the valve is used in hot gas/fluid applications that might give exothermic reactions, precautions must be taken so that the valve surface cannot lead to danger for people or the direct environment. In dust and possible explosion zones, the operation temperatures and ignition temperatures for dust should be reviewed.

#### 3.5.4 Operational

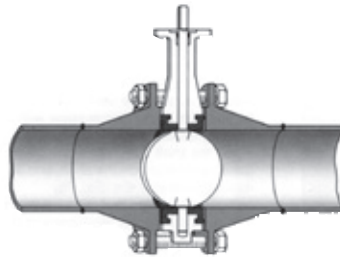
Closing a valve too fast may result in water hammer in the upstream part of the pipeline. Water hammer results in excessive stresses in the valve and will cause severe damage. Water hammer should be avoided in all circumstances.

Due to differential pressure across the valve disc, butterfly valves have the tendency to be closed by the flow. Take care when unlatching the valve operating mechanism.

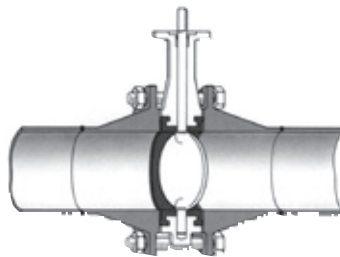
### EXISTING SYSTEM



1. Spread the flanges with the adequate tooling. Insert some flange bolts to hold the valve.

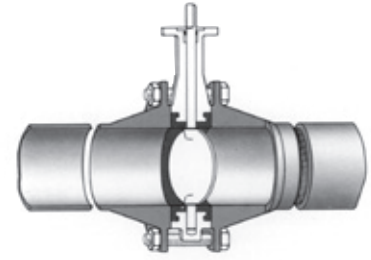


2. Open the valve and remove the flange spreads.

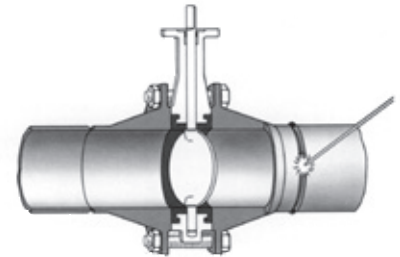


3. Close the valve clockwise, return to open position and cross-tighten all bolting.

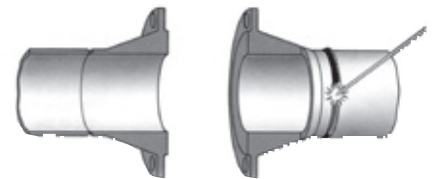
### NEW SYSTEM



1. Center a flange-valve-flange assembly between the pipes.



2. Tack weld the flanges to the pipes.



3. Remove the valve and finish weld. Install the valve according to the procedure in the left column.

FIGURE 2

# KEYSTONE SERIES GR RESILIENT SEATED BUTTERFLY VALVES GRW/GRL

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### 3.6 TROUBLESHOOTING GUIDE

Symptom	Possible cause	Resolution
Valve would not rotate	1. Actuator has failed 2. Valve packed with debris	1. Replace or repair 2. Flush or clean valve to remove debris
Valve leaking	1. Valve not fully closed 2. Debris trapped in valve  3. Seat is damaged	1. Close valve, check actuator stop settings 2. Cycle and flush (with valve open) to remove debris 3. Replace seat
Jerky operation	1. Extreme dry application  2. Air supply actuator inadequate	1. Put some silicone oil on seat or increase size of actuator 2. Increase air supply pressure and/or volume

**TABLE 1 - Bottom shaft tapped hole dimensions**

Valve size		Hole dimension
DN	NPS	
50	2	M6
65	2½	M8
80	3	M8
100	4	M8
125	5	M10
150	6	M10
200	8	M10
250	10	M12
300	12	M12

### 4 MAINTENANCE FOR SERIES GRW/GRL RESILIENT SEATED BUTTERFLY VALVES SIZES DN 50-300 (NPS 2-12)

#### WARNING!

Depressurize and, if necessary in case of dangerous fluids, drain the line and flush with appropriate cleaning fluid before starting any maintenance. Failure to do so may cause serious personal injury and/or equipment damage. Before disassembling the valve, ensure the valve has been decontaminated correctly from any harmful gasses or liquids and that it is within a safe temperature range for handling. Personnel making any adjustments to the valves should utilize suitable equipment. All required personal protection means should be worn. We recommend that personnel should be trained in all aspects of these instructions before carrying out handling of any valve.

#### 4.1 Routine maintenance

The Keystone Series GRW/GRL butterfly valves are designed to require a minimum of maintenance. Routine maintenance or lubrication is not required, we recommend periodic (visual) inspection to ensure satisfactory operation and sealing to the environment.

#### 4.2 Removing the valve from the pipe system

- Turn the disc to nearly closed position. (The disc is in line with the parallel flats in the shaft).
- Loosen all flange bolts and remove the bolts, which prevent removing of the valve.
- Spread the flanges with adequate tooling, and remove the valve.

#### 4.3 Valve disassembly (see Figure 3)

- Turn the disc to almost open position.
- Remove actuator.
- Remove the circlip from the top of the body.
- Pull the upper shaft out of the body.
- Remove the bushing, shaft seal and circlip from the shaft.
- Unscrew and remove the plug from the bottom of the body.

- Pull the lower shaft out of the body (a threaded hole is provided in the end of the shaft). [See Table 1 for tapped hole dimensions]
- Remove the disc by pulling or 'rolling' out of the seat bore.
- Remove the seat from the body: pry under both seat edges at one point, collapse the seat into the shape of a round bottom heart configuration and pull the seat out of the body bore.
- Remove bearings from shaft bores.

#### 4.4 Valve assembly (see Figure 3)

- Clean all parts. Use silicone grease on the disc to facilitate the assembly.
- Mount the two shaft bearings close to the bore of the body.
- If removed before, re-assemble the packing in the body.
- Collapse the seat in the shape of a round bottom heart and firmly place the 'bottom' part of the seat into position in the body. Align the holes in the seat properly with the holes in the body.
- Fit the circlip to the groove in the upper shaft.
- Insert the upper shaft with sufficient (silicone) grease so that it protrudes approximately 10 mm (¾") into the inside bore of the seat. Insert the lower shaft with sufficient (silicone) grease so that it is flush with the inside bore of the seat. Install the disc, with the hexagonal bore to the top. Insert the disc in the seat with the shaft bore on the topside against the shaft, leaving the bottom part of the disc just outside the seat. **Ensure the keyway or parallel flats on shaft are aligned to the disc edge.** Push the bottom part of the disc in place with a twisting motion.
- Insert the shafts completely using a rotating pressure on the shaft, and a rotating motion on the disc. Pay special attention in order that the seat is not damaged due to any misalignment of stem holes.
- Put some sealant on the plug and screw it into the lower shaft bore.

- Fit the bushing over the top of the shaft and into the top of the body. Retain it in place with the circlip.
- Mount the actuation.

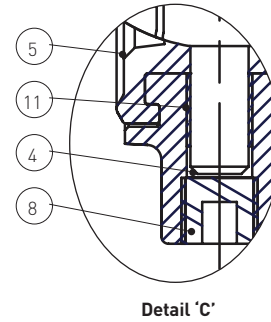
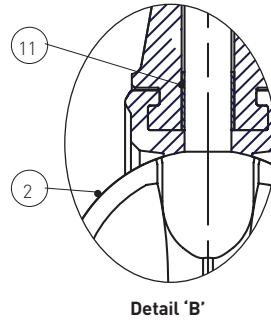
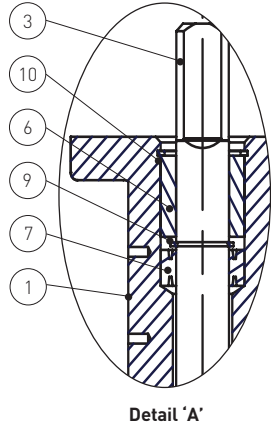
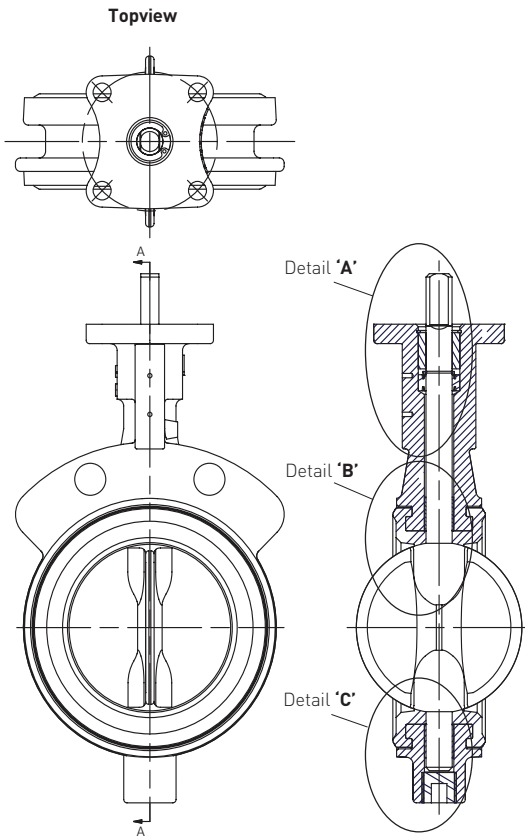
#### 4.5 Re-installing the valve

See section 3.3.1

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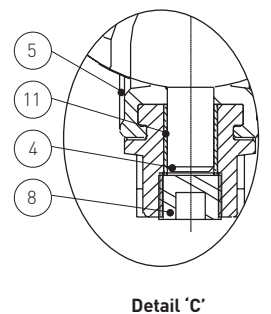
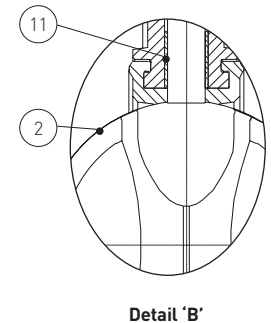
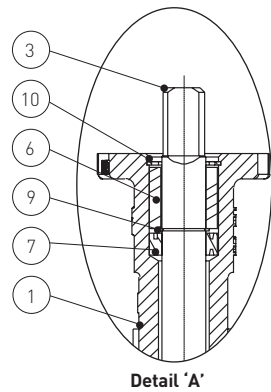
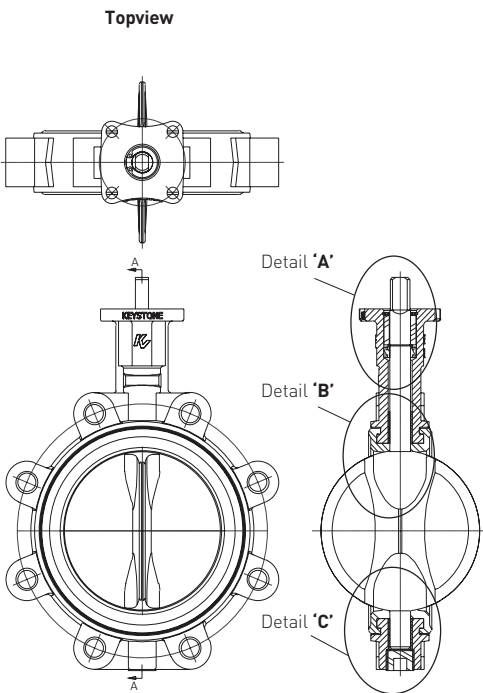
SERIES GRW (WAFER)  
DN 50-300 (NPS 2-12)



### PARTS LIST

Item	Description
1	Body
2	Disc
3	Upper shaft
4	Lower shaft
5	Seat
6	Upper bushing
7	Shaft seal
8	Plug
9	Shaft circlip
10	Body circlip
11	Upper and lower bearing

SERIES GRL (LUGGED)  
DN 50-300 (NPS 2-12)



### PARTS LIST

Item	Description
1.	Body
2.	Disc
3.	Upper shaft
4.	Lower shaft
5.	Seat
6.	Upper bushing
7.	Shaft seal
8.	Plug
9.	Shaft circlip
10.	Body circlip
11.	Upper and lower bearing

FIGURE 3

# KEYSTONE SERIES GR RESILIENT SEATED BUTTERFLY VALVES GRW/GRL

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### 5 MAINTENANCE BUTTERFLY VALVES SERIES GRW/GRL DN 350-900 (NPS 14-36)

The Keystone Series GRW/GRL butterfly valves are designed to require a minimum of maintenance.

**WARNING! See section 4!**

**5.1 Routine maintenance**

See section 4.1

**5.2 Removing the valve from the pipe system**

See section 4.2

**5.3 Valve disassembly (see Figure 4)**

1. Turn the disc to almost open position.
2. Remove actuator.
3. Remove the disc screw with the O-ring from the disc.
4. Remove the circlip from the top of the body.
5. Pull the shaft out of the body.
6. Remove the bushing, shaft seals and circlip from the top of the shaft.
7. Remove the disc by pulling or 'rolling' out of the seat bore.
8. Into the shape of a round bottom heart configuration and pull the seat out of the body bore.
9. Remove circlip from the bottom body plug and pull the plug out of the body.
10. Remove the O-ring from the plug.
11. Remove bearings from shaft bores.

**5.4 Valve assembly (see Figure 4)**

1. Clean all parts.
2. Fit bearings into shaft bores (2 bearings are to be installed close to the bore of the body and 2 bearings at the outer ends of the shaft bores). Collapse the seat in the shape of a round bottom heart firmly place the 'bottom' part of the seat into position in the body. Align the holes in the seat properly with the holes in the body.
3. Fit the shaft circlip to the groove in the shaft.
4. Insert the shaft with sufficient (silicone) grease so that it protrudes approximately 10 mm (3/8") into the inside bore of the seat. Install the disc, with the disc screw holes toward the valve top-plate, by inserting the disc in the seat with the shaft bore on the topside against the shaft, leaving the bottom part of the disc just outside the seat. Push the bottom part of the disc in place with a twisting motion.

5. Insert the shaft completely using a rotating pressure on the shaft, and a rotating motion on the disc. Pay special attention in order that the seat is not damaged due to any misalignment of stem holes.
6. Align the counter-drilled position of the shaft with the disc screw hole. Place the O-ring on the disc screw. Apply thread locking compound around disc screw thread. Install the disc screw and tighten securely. (see Table 2 for suggested tightening torques)
7. Place the O-ring onto the bottom plug. Place the plug into the body and position it with a circlip.
8. Place the shaft seals on the inside and outside of the bushing then fit it over the top of the shaft and into the top of the body. Retain it in place with the circlip body.
9. Mount the actuator.

**5.5 Re-installing the valve**

See section 3.3.1

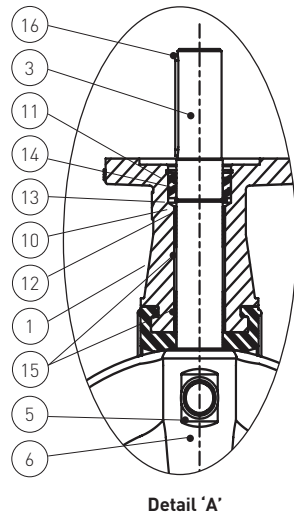
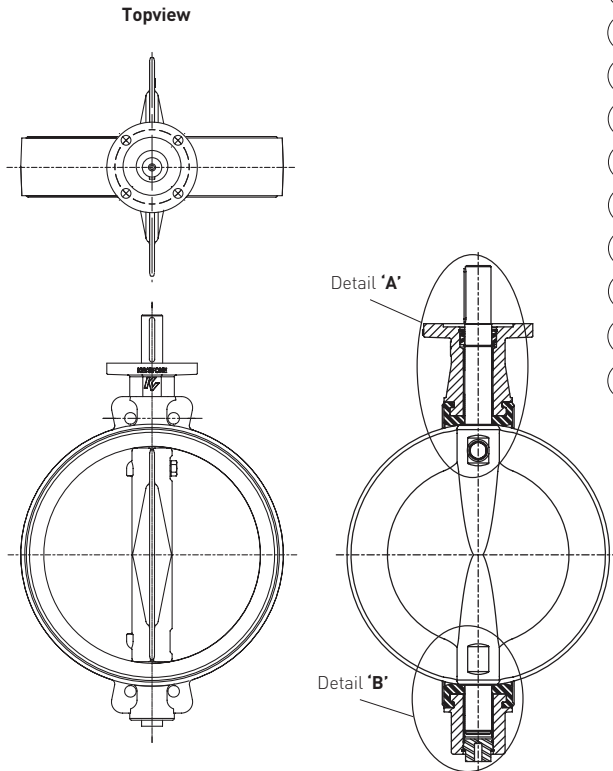
**TABLE 2 - Recommended disc screw tightening torques**

DN	Valve size		Tightening torque	
	NPS		Nm	ft•lbs
350-400	14-16		140	103
450-500	18-20		270	200
600-800	24-32		470	347
900	36		1270	937

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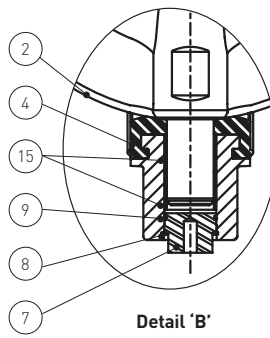
SERIES GRW (WAFER)  
DN 350-900 (NPS 14-36)



### PARTS LIST

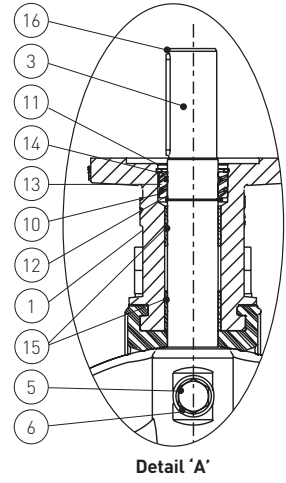
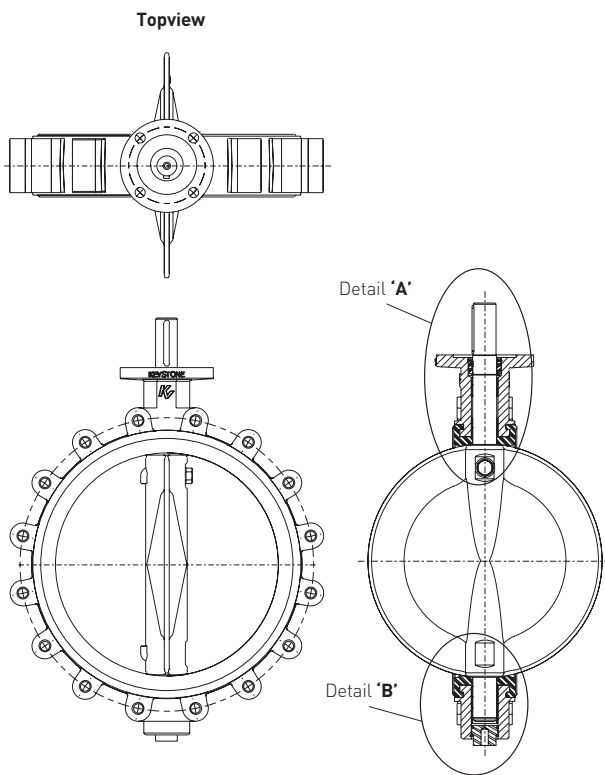
Item	Description
1.	Body
2.	Disc
3.	Shaft
4.	Seat
5.	Disc screw
6.	Disc screw O-ring
7.	Plug
8.	Plug circlip
9.	Plug O-ring
10.	Bushing
11.	Body circlip
12.	Shaft circlip
13.	Body O-ring
14.	Shaft O-ring
15.	Bearing
16.	Parallel key

Detail 'A'



Detail 'B'

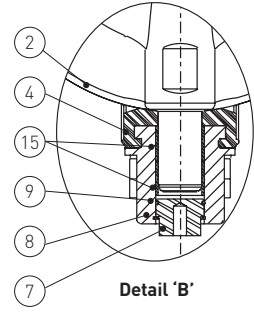
SERIES GRL (LUGGED)  
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### PARTS LIST

Item	Description
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6.	Disc screw O-ring
7.	Plug
8.	Plug circlip
9.	Plug O-ring
10.	Bushing
11.	Body circlip
12.	Shaft circlip
13.	Body O-ring
14.	Shaft O-ring
15.	Bearing
16.	Parallel key

Detail 'A'



Detail 'B'

FIGURE 4



