



# INSTALLATION, OPERATION AND MAINTENANCE MANUAL

## API 6D/API 594 CAST STEEL DUAL PLATE WAFER CHECK VALVE





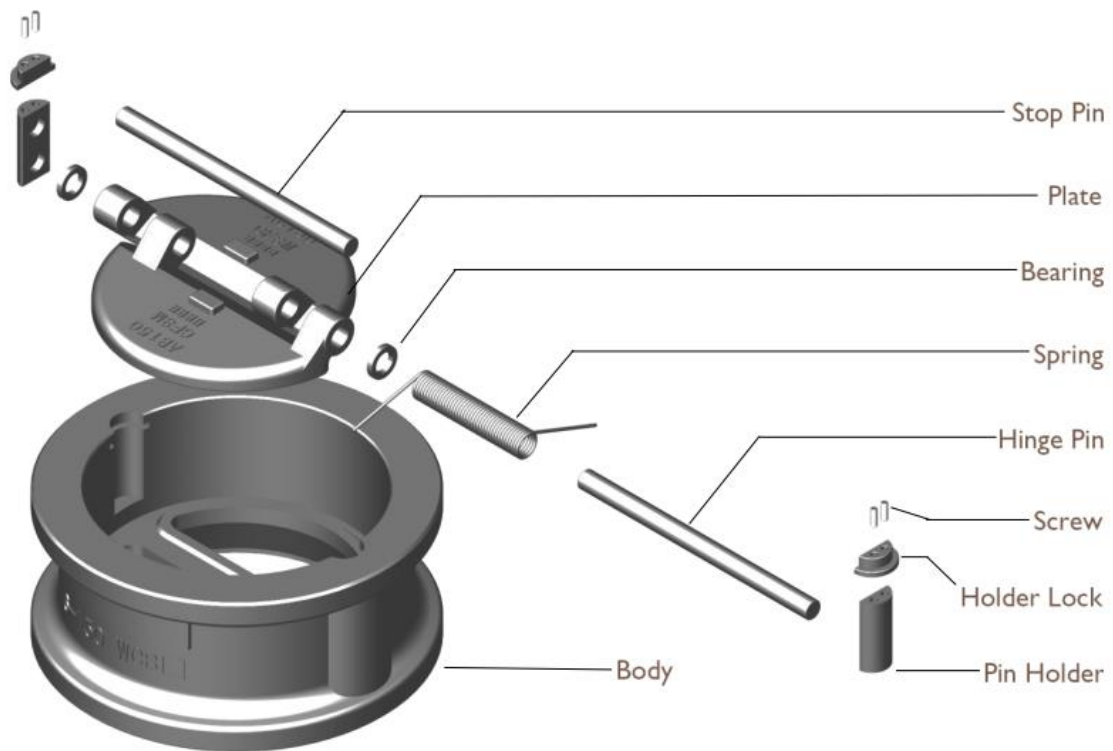
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## TYPICAL CONFIGURATION

### API 6D/API 594 DUAL PLATE WAFER CHECK VALVE





## FOREWORD

Personal Safety and Long Term Ownership of your DHV API 6D/API 594 Dual Plate Wafer Check Valve is the most important matter in reviewing our Installation, Operation & Maintenance Manual. This manual will provide all the necessary safety guidelines for our valve including information for the valve transportation, storage, installation, operation and maintenance. Please read carefully before installing or servicing the valve.

DHV provides general guidelines in this manual, and cannot provide specific data and warnings for all possible applications. The purchaser/end user must therefore assume responsibility for proper valve selection, sizing, installation, operation, and maintenance of DHV valve products. The purchaser/end user should read and understand this document and any instructions provided with the product, and conduct training with its employees and contractors to ensure they are aware of the proper and safe use of DHV valve products in connection with the specific application.

## 1. ENDUSER INSTRUCTION

Personnel safety is always the most important factor in the transportation, storage, installation, operation and maintenance of any valve. DHV valves are designed to meet the customer's order requirements and specifications. DHV disclaims all responsibility for problems that may be caused by applications other than the specified use. Valve service pressure/temperature information is detailed on the valve name plate. When selecting a valve, always consider the application, service and temperature for the intended service. Select the applicable valve material for anti-corrosion and anti-abrasive service. For safety of personnel and plant/environment: Prior to conducting any service on the valve, ensure the valve is not under pressure, properly vented, and drained. When performing any operation, maintenance or service, personal protective equipment should be used, such as protective clothing, oxygen masks, safety glasses, work gloves, etc. DHV will not be responsible for any loss or expense resulting from the failure of equipment, damage to any property, or death or injury to any person resulting in whole or in part from repairs or modification performed by other than authorized DHV personnel. Such unauthorized repairs shall also serve to terminate any contractual or other warranty, if any, on the equipment and may result in the equipment no longer meeting applicable requirements.



## 2. VALVE TRANSPORTATION AND STORAGE

### 2.1 TRANSPORTATION

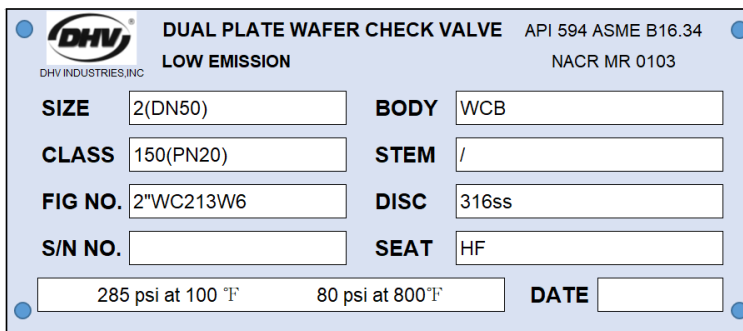
1. Use the proper hoisting equipment to transport the valve, especially when lifting or lowering the valve. Special attention to personnel safety and the care of the valve should be made when transporting the valve. Avoid impacting or striking the valve during transportation. Lay the valve on a clean flat surface; avoid laying the valve on the flange face. Ensure there is adequate clearance around the valve for proper operation and maintenance.  
When lifting the valve, use the lifting eye.
2. During transportation, ensure the valve's paint, name plate and flange sealing surfaces are fully protected. Do not drag the valve across the floor, or place the valve flange sealing face on the floor.
3. The disc should remain stationary during handling to avoid damage of sealing surfaces of both the disc and body seat due to impact.
4. For those valves not required to be immediately installed, do not open the end flange protective covers. Ensure the valves are stored in a safe, clean environment and are protected from rain and dust.


### 2.2 STORAGE

1. Valves should be stored in the closed position. Valve ports and flange serration surfaces should be kept sealed with protective flange covers.
2. Valves should be stored in a dust free, low humidity and well-ventilated room, not in direct contact to the floor. If possible, the valves shall be kept in the original packing box. If the valves must be stored outdoors, keep the valve in the original crate or shipping container. Ensure the valve's packaging is stored on raised blocking to avoid moisture damage. Protective covering should be used for protection against dust and rain.
3. Valves should never be stacked on top of each other, to avoid any valve distortion which may affect valve performance and cause personnel injury.
4. Valves that have been stored for an extended time should be cleaned and inspected prior to installation. Inspect the sealing surface to ensure it is clean and free of any debris or damage.
5. Do not expose the valve to any corrosive environment.

### 3. VALVE INSTALLATION

- Review all documentation to fully understand the valve and related information that will provide safe installation and a long service life for your valve.
- Valve information can be found on the valve body, and the name plate. Figure 1 is a typical nameplate.
- Valve ends should have a protective cover to protect the valve bore from any foreign particles and dust which will damage the disc and seat sealing surfaces.




**DUAL PLATE WAFER CHECK VALVE** API 594 ASME B16.34  
 LOW EMISSION NACR MR 0103

**SIZE** 2(DN50) **BODY** WCB  
**CLASS** 150(PN20) **STEM** /  
**FIG NO.** 2"WC213W6 **DISC** 316ss  
**S/N NO.** **SEAT** HF

285 psi at 100 °F      80 psi at 800 °F      **DATE**

**Figure 1 Typical Valve Nameplate**

<b>SIZE</b>	Nominal Valve Size
<b>CLASS</b>	Pressure Class
<b>FIG NO.</b>	Figure NO. See DHV's Catalog
<b>S/N NO.</b>	Valve Series Number
<b>BODY</b>	Body Material
<b>STEM</b>	Stem Material
<b>DISC</b>	Disc Material
<b>SEAT</b>	Seat & Seat Insert Material
<b>psi at °F</b>	Pressure–temperature Rating
<b>DATE</b>	Manufacture Date

**Nameplate Information**

#### 3.1 INSPECTION BEFORE INSTALLATION

- 3.1.1** Before installation, check the valve name plate and valve body information to ensure the valve is suitable for the intended service.
- 3.1.2** Before installation, remove the flange cover and the protective film on the flange sealing face, and disc support, inspect the bore and the flange sealing surface, remove any dirt with clean soft cloth, use an anti-corrosive cleaning liquid to clean if necessary, and never use any other chemical products.
- 3.1.3** Inspect the flange gasket (including ring gasket) sealing surface and ensure it is in acceptable condition for installation.

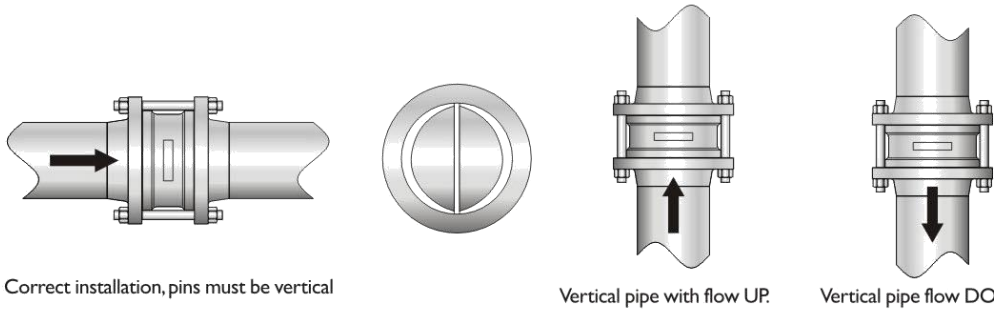
#### 3.2 INSTALLATION

- 3.2.1** Position the valve into the pipe or the flange connection; ensure that any stress caused by improper pipe alignment is relieved first. Valves are not intended to be a means of aligning improperly fitted pipe.
- 3.2.2** Valves marked with flow direction must be installed in line with the piping flow.
- 3.2.3** In horizontal flow installation, the hinge pin must be vertical.

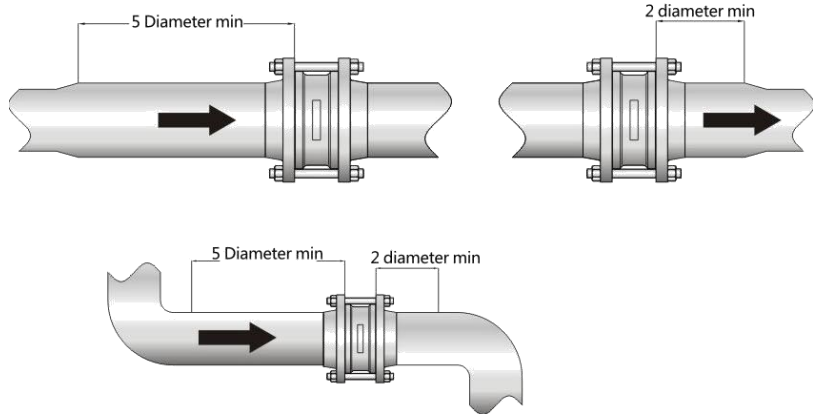
**3.2.4** In liquid service we recommend valve be installed at least five pipe diameters downstream from a pump discharge and/or other pipe fittings for maximum service life.

**3.2.5** Dual plate check valves are not piggable.

**3.2.6** To maximize the life of check valve, it should be installed a sufficient distance from turbulence source to ensure the valve is in fully developed flow. Recommended best practice installation for dual plate check valves are as flowing:



In general, flow down Installation is not recommended. Consult factory with specific size, rating, and application.



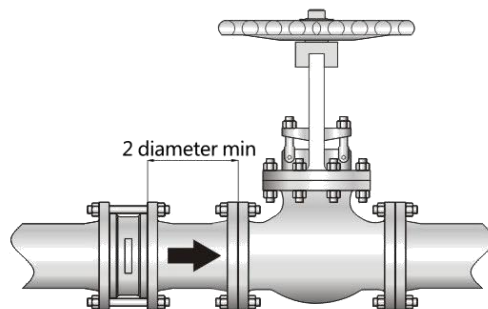
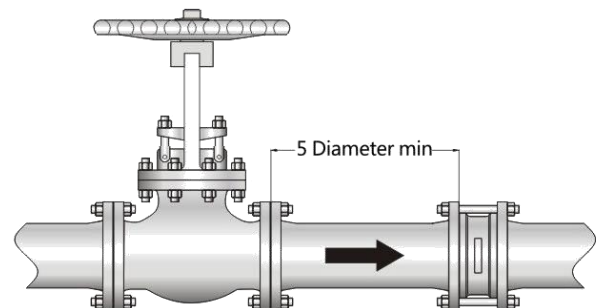
Check valve should be installed a minimum of 5 diameters downstream of a reducer/expander or bend to ensure flow at valve is fully developed and turbulence is minimised.

Check valve should be installed a minimum of 2 diameters upstream of a reducer of bend to avoid choked flow, which would cause the valve to only partially open.

When installed near a throttling valve, the check valve should be installed a minimum of 5 diameters downstream, or 2 diameters upstream, of the throttling valve.

Check valves can be close coupled upstream or downstream of non-throttling isolation valve (e.g. Full Port Ball Valves). On ball valves, disc clearance must be considered to ensure full operation of the ball valve.

Indicates direction of flow



## FLANGE ENDS:

- Select the proper gasket (including ring gasket) to install, line up the bolt holes between the valve flange and pipeline flange, then install the bolts and nuts and tighten to the accepted piping and bolting standards. The bolt threads should be lubricated first for ease of bolting.
- Use an appropriate sized torque wrench when tightening the bolt/nut, to avoid flange deformation. Please follow Fig 2 and Table 1 for bolting sequence and bolting torque. If the bolting quantity is different from the chart shown, please follow the same principle to get a new sequence to follow.
- For large diameter valves, the valve must be properly and safely supported during installation. After installation is completed, valve supports should be moved to the bottom of the valve flanges.
- After valve installation is complete, recheck and tighten the bolts as necessary to the values provided in Table 1 & Figure 2.
- It is recommended that the tightness of the joint bolt tension be inspected at least yearly. Refer to Table 1 & Figure 2.



**DURING INSTALLATION, IF VALVE IS NOT IN LINE WITH THE PIPELINE, FLANGE FACES ARE NOT PARALLEL TO EACH OTHER, OR BOLTING TORQUE IS NOT UNIFORM, VALVE LEAKAGE MAY BE EXPERIENCED.**





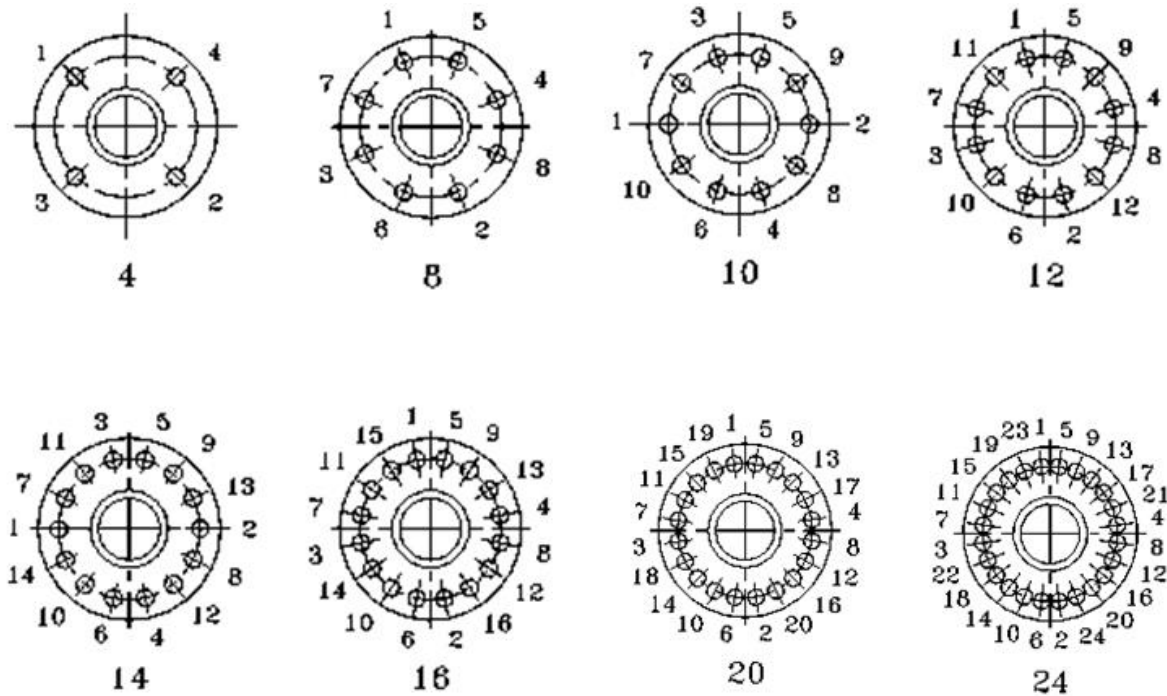
**Table 1 Bolting Tightening Torque Chart**

Stud Size (Inch)	Measurement: Newton-meters N·m Tolerance: +/- 10%						
	(Conversion: 1 ft·lb= 1.36 N·m    1 N·m = .74 ft·lb)						
	B7M/L7M	B7/L7	B8 (I)/ B8M(I)	B8M (II)	B8 (II)	B8MLCuN	B16
5/16-18UNC	21	27	8	25	26	9	28
3/8-16UNC	36	47	13	43	45	16	48
1/2-13UNC	85	111	32	101	107	37	112
9/16-12UNC	121	158	45	144	152	53	160
5/8-11UNC	165	217	62	197	208	72	218
3/4-10UNC	289	378	108	344	362	126	380
7/8-9UNC	459	601	171	459	-	200	605
1-8UNC	683	894	255	683	-	298	901
1-1/8-8UN	992	1298	370	811	-	433	1308
1-1/4-8UN	1381	1807	515	1130	-	602	1820
1-3/8-8UN	1860	2435	693	1167	-	812	2452
1-1/2-8UN	2438	3192	909	1530	-	1064	3214
1-5/8-8UN	3126	4092	1165	-	-	1364	4120
1-3/4-8UN	3931	5146	1465	-	-	1715	5182
1-7/8-8UN	4863	6367	1813	-	-	2122	6411
2-8UN	5933	7767	2211	-	-	2589	7820
2-1/4-8UN	8519	11152	3175	-	-	3717	11229
2-1/2-8UN	11764	15400	4385	-	-	5133	15507
2-3/4-8UN	15742	18747	5867	-	-	6869	18747
3-8UN	20528	24447	7651	-	-	8958	24447

**Table 1 Bolting Tightening Torque Chart (cont.)**

Stud Size (Metric)	Measurement: Newton-meters N·m      Tolerance: +/- 10%						
	(Conversion: 1 ft·lb= 1.36 N·m      1 N·m = .74 ft·lb)						
	B7M/L7M	B7/L7	B8 (I)/ B8M(I)	B8M (II)	B8 (II)	B8MLCuN	B16
M10	43	56	16	51	54	19	56
M12	73	96	27	87	92	32	96
M16	175	230	66	209	221	77	232
M20	338	443	126	338	424	148	446
M24	578	757	215	578	-	252	762
M30	1134	1484	422	928	-	495	1495
M36	1964	2572	732	1232	-	857	2589
M42	3125	4091	1165	1960	-	1364	4119

**Figure 2 Bolt Tightening Sequence**





## 4. VALVE OPERATION

- To assure maximum valve performance, only use a valve that is suitable for the rated pressure/temperature and corrosive environment.
- For your safety and normal operation, please read the following valve operation procedures: Never operate the valve without authorization and a full understanding of the safe operation procedures, inspections and proper handling instructions.
- For sizing, Cv value and cracking pressure, reference Table 2 & 3:

**Table 2 Cv value (Class 150 & 300)**

NPS	Cv	NPS	Cv
2	48	26	24300
2.5	77	28	28800
3	130	30	36000
4	270	32	41400
5	450	34	46800
6	720	36	54000
8	1400	38	60300
10	2400	40	67500
12	3700	42	72900
14	4500	44	80100
16	6525	46	88200
18	9000	48	99900
20	11160		
24	20400		

**Units** (gal/min)/(lbf/in<sup>2</sup>)<sup>0.5</sup>  
 For higher pressure valve Cv, please contact with DHV engineer.



**Table 3 Cracking Pressure (Class 150 & 300)**

NPS	mbar	Psi	NPS	mbar	Psi
2	35	0.6	12	20	0.28
3	35	0.5	14	18	0.26
4	30	0.43	16	25	0.39
6	24	0.35	18	22	0.32
8	21	0.3	20	24	0.34
10	21	0.3	24	20	0.27

For higher pressure class valves, please contact DHV.

## 5. VALVE MAINTENANCE

Valves should be inspected regularly during operation and any findings should receive immediate attention in order to avoid any further damage to the valve or the system. Regular inspection and maintenance should be scheduled at a minimum of twice per year, or more often if required.

**5.1** Valve surfaces are areas that will easily accumulate dust, corrosion, oil and debris, thus resulting in excessive wear and damage. Therefore regular inspection and cleaning of these components is necessary.

**5.2** Regular maintenance and inspection of the valve is required to assure smooth operation. Pin should be inspected and lubricated frequently to ensure proper operation. Inspection should confirm that the valve is sealing properly. For water & oil service, regular maintenance should be scheduled every three months. For more corrosive mediums, inspection and maintenance should be completed once a month.

**5.3** During maintenance or servicing of the valve, all replacement parts must be the same as the original specification (parts dimensions and materials). End user may also purchase the spare parts such as packing, gaskets, bolts/nuts etc. when ordering the valve. With the new gasket or bolt/nuts installed, the valve must pass the applicable pressure testing prior to installation and service.

**5.4** If the seating surfaces of the disc or the seats are scratched or show slight pitting of less than 0.005" (0.1 mm): these can be removed by lapping. If defects are deeper than 0.005", proper machining practices of grinding and machining by qualified machinist should be implemented. To assure the sealing capability, the valve must pass all required applicable pressure tests before returning to service. If all pressure containing parts are in need of repair, consideration of replacing the valve should be made.



5.5 At NO time shall any weld repair be conducted on the valve while in service. Never strike the valve with a hammer or other impact device. Ensure that no excess weight is placed on the valve that was not part of the original manufacturer design.

**⚠ WARNING ! ANY MAINTENANCE OR REPAIR MUST NOT OCCUR UNTIL THE VALVE BODY PRESSURE IS COMPLETELY RELEASED. NO REPAIR WORK SHALL BE CONDUCTED WHILE THE VALVE IS UNDER PRESSURE.**

## 6. DETAILED DISASSEMBLY AND ASSEMBLY

### 6.1 WAFER CHECK VALVE DISASSEMBLY

- 6.1.1 Remove screw and holder lock (for 6 inch and larger).
- 6.1.2 Remove the part (include pin holder, pins, bearings springs and discs) from the body.
- 6.1.3 Remove the pin holder.
- 6.1.4 Remove the pins and bearings.
- 6.1.5 Remove the spring.

### 6.2 WAFER CHECK VALVE ASSEMBLY

- 6.2.1 When re-assembling the valve, Inspect and ensure that all components are thoroughly clean before installing into the valve body. All rust and dirt should be removed with a wire brush or emery cloth. Oil solids and grease adhered to the valve internals should be removed with approved solvents.
- 6.2.2 Apply a thin layer of light oil on the sealing surface to avoid any scratches that may occur during the assembly process.
- 6.2.3 Place the parts (include pin holder, pins, bearings springs and discs) together.
- 6.2.4 Place the parts into body.
- 6.2.5 Place the holder into body (for 6 inch and larger).
- 6.2.6 Pull the screw into holder tightly.

## 7. TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Leakage between disc and seat	Dirt on the sealing surface	Clean the sealing surface
	Sealing surfaces damaged by abrasion and erosion	Re-overlaying and machining sealing surfaces till meet requirement
	Disc distorted caused by loading force due to too quick closing speed	Replacing with new disc
valve is without function of controlling back-flow of medium	Reverse direction of installation	Install valve again to keep consistent with flow direction
Opening and closing not easily	Distortion of pin axis due to wearing and tearing	Replacing pin
	Rust erosion of pin axis	Take it out, repair the surface and put on lubricant grease before assembly



## 8. WARRANTY AND SERVICE

### 8.1 VALVE WARRANTY PERIOD

**8.1.1** Valve warranty period is 12 months from the date shipped from the factory.

**8.1.2** In the event the end user encounters an issue of quality, please notify DHV immediately. DHV reserves the right to investigate and settle all issues of quality concerns directly with the end user. Refer to DHV's standard warranty policies for questions or concerns regarding warranty concerns.

**8.1.3** Addressing a valve quality issue within the warranty period:

DHV reserves the right to review and respond to all requests for warranty repair or replacement, prior to making any replacement or repairs by the end user.

**8.1.4** DHV will not be held responsible for any damage due to natural disaster, such as earthquake, hurricane etc. during valve shipment.

**8.1.5** DHV must be consulted for any warranty issue before being held responsible for any repairs or valve replacement.

### 8.2 SERVICE

**8.2.1** If required by the contract, DHV may provide and perform field installation and start up testing.

**8.2.2** Upon end user request, DHV can provide services in monitoring the valve quality and history for Long Term Ownership. Additionally, DHV can provide all the necessary training of repair services to the valve, as well as training on safe valve operations.



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DHV is committed to providing you with the necessary information to support our products. Our global network of authorized service centers, technical support personnel and warranty support personnel are ready to serve your needs for support on applications, products, service and warranty. Contact our USA Bakersfield headquarters for immediate assistance to your support needs.