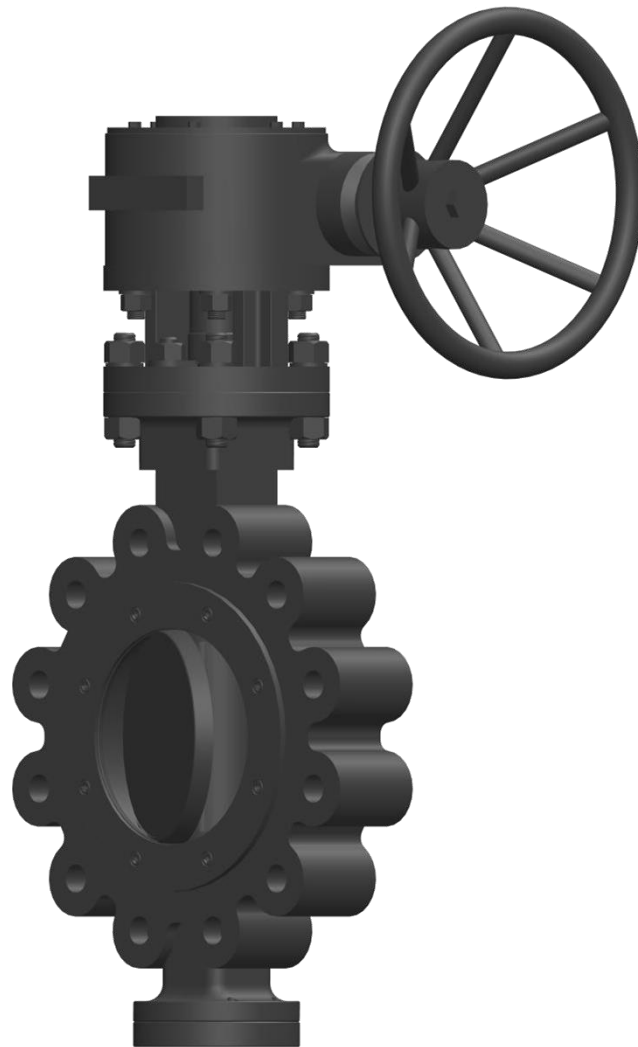


# INSTALLATION, OPERATION AND MAINTENANCE MANUAL

## API 609 DOUBLE OFFSET BUTTERFLY VALVE





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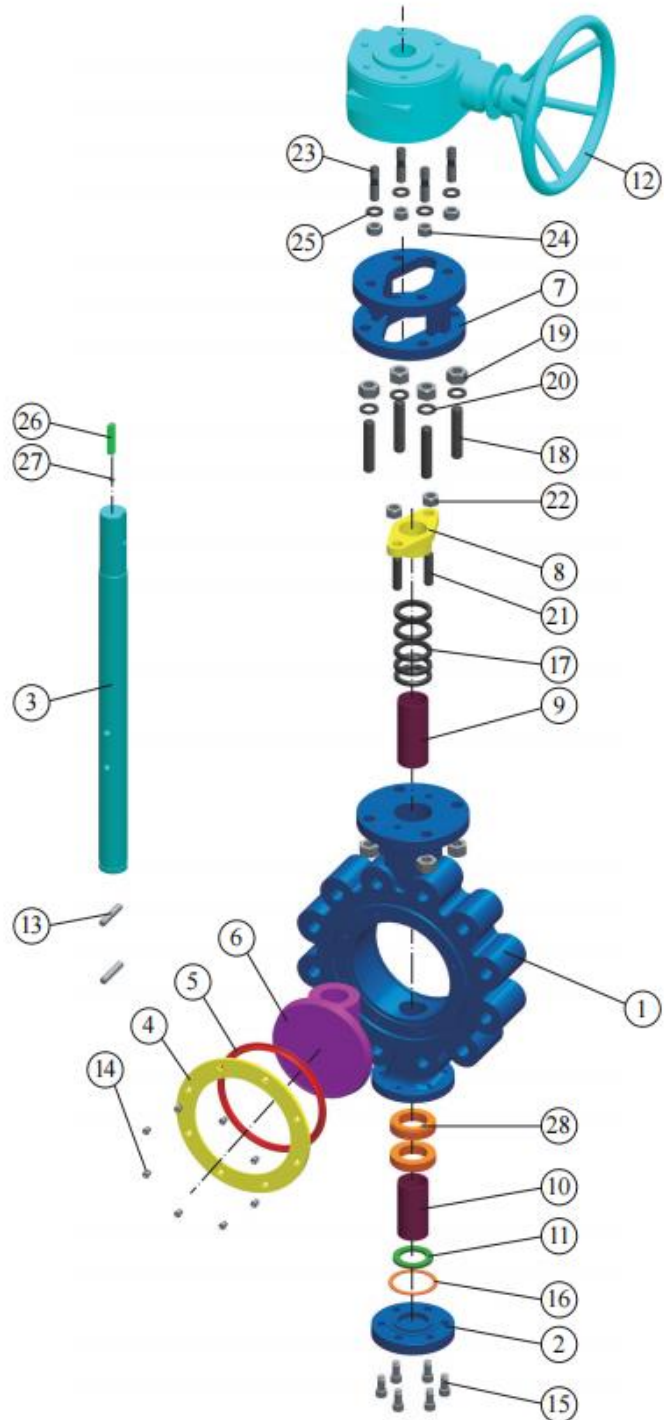
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## TYPICAL CONFIGURATION

### Material Specification

No.	Description	Material
1	Body	ASTM A216 WCB
2	End cover	ASTM A105
3	Stem	ASTM A182 F316
4	Disc	ASTM A216 WCB
5	Seal ring	PTFE
6	Pressure ring	STAINLESS STEEL
7	Yoke	ASTM A216 WCB
8	Packing Gland	ASTM A216 WCB
9	Bushing	316 NITRIED
10	Bushing	316 NITRIED
11	Split Collar	ASTM A276 410
12	Gear	ASTM A216 WCB
13	Straight Pin	STAINLESS STEEL
14	Hex, -socket Screw	STAINLESS STEEL
15	Hex, -socket Screw	STAINLESS STEEL
16	Spiral Wound Gasket	316+FLEXIBLE GRAPHITE
17	Packing	FLEXIBLE GRAPHITE
18	Bolt	ASTM A193 B7
19	Nut	ASTM A194 2H
20	Flat Washer	CARBON STEEL
21	Bolt	ASTM A193 B7
22	Nut	ASTM A194 2H
23	Bolt	ASTM A193 B7
24	Nut	ASTM A194 2H
25	Flat Washer	CARBON STEEL
26	Key	CARBON STEEL
27	Pin	STAINLESS STEEL
28	Washer	STAINLESS STEEL

*General Note: Materials shown in the table are typical configurations, a variety of other material configurations are available according to customer requirements. Please consult a DHV representative for further details.*





## FOREWORD

Personal safety and long-term ownership of your DHV API 609 Double Offset Butterfly 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 on 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. END USER 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. For all electric, hydraulic or pneumatic actuated valves, all power connections to the valve/actuator must be turned off before performing any maintenance and service. 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 modifications 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. Valves should remain in the closed position to prevent damage to the seating surface during shipping and handling. Each valve should be securely packaged either on a pallet or in a crate to avoid any damage during shipping.
2. 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 given 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 valve lifting lugs; if the valve does not come with lifting lugs, use an appropriate sized sling through the valve yoke to lift the valve.
3. 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.
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 with the disc in the "almost closed" position (slightly open 4~5 degrees) for extended storage. Valve ports and flange surfaces should be kept sealed with protective flange covers.
2. Valves should be stored in a dust-free, low humidity and well-ventilated room, and not in direct contact to the floor. If possible, the valves shall be kept in the original packing crate. If the valves must be stored outdoors, keep them 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.

### 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.

**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 Insert Material
<b>psi at T</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, inspect the bore and the flange sealing surface, remove any dirt with a 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.
- 3.1.4** After cleaning the valve and before installation, open and close the valve one time. Ensure the valve operates smoothly. If abnormal operation is experienced, stop the operation and inspect the valve stem and valve bore for any obstructions that may be preventing normal operation.
- 3.1.5** After successfully cycling and assuring the proper operation of the valve, return the valve to the closed position until installation is complete. If for any reason the valve must remain in the open position, ensure the valve sealing surfaces are protected.



## 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 pipes.

**3.2.2** Install the valve using qualified piping standards and practices. Valves marked with flow direction must be installed in line with the piping flow.

**3.2.3** The recommended orientation for butterfly valves is upright with the valve in a horizontal line with the hand wheel positioned vertically above the valve centerline.

### 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 appropriately 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 including the gland bolts as necessary to the values provided in Table 1 & Figure 2.
- It is recommended to inspect the tightness of the joint bolt tension and gland bolts 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.**



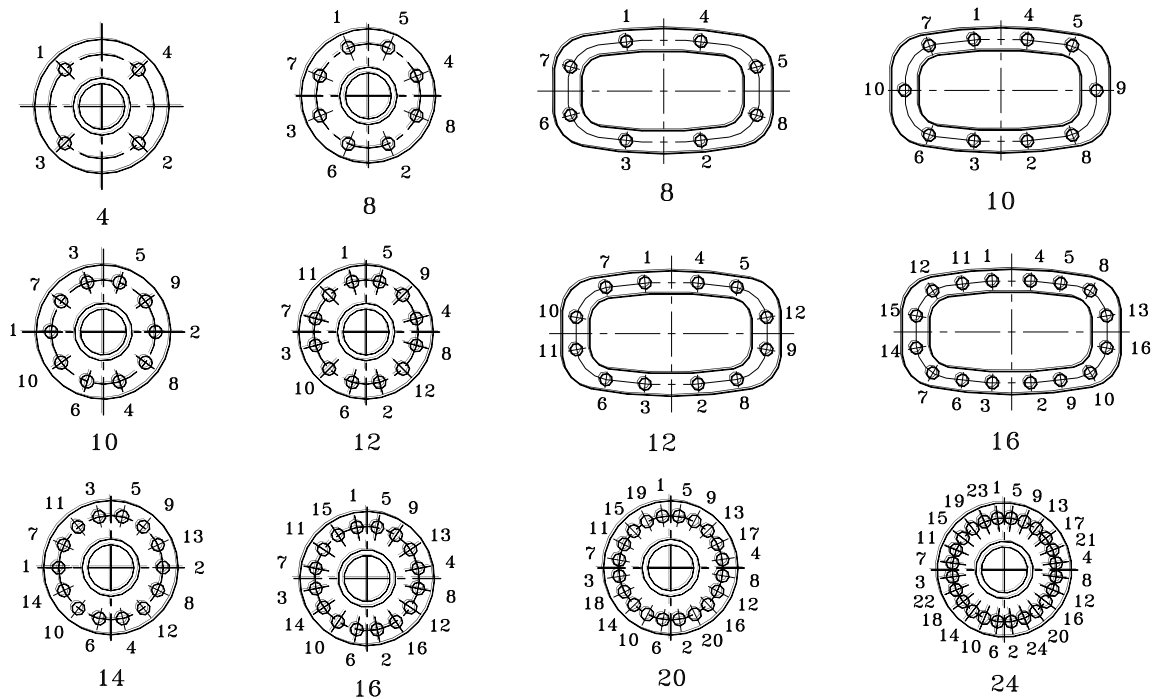
**Table 1 Bolting Tightening Torque Chart**

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 (mm)	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**





## WAFER ENDS:

- Install the valve between two mating flanges, then install the two upper and lower flange bolts that pass through the body holes, then install the remaining bolts, shifting the valve as necessary to permit the bolts to pass by the valve body. Tighten the bolts and nuts according to Figure 2 and Table 1.

## LUG ENDS:

- Install the valve between two mating flanges, then install all the bolts between two mating flanges. Tighten the bolts and nuts according to Figure 2 and Table 1.

## 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:
  - 4.1** The valve must be kept either in the fully open or fully closed position. Never throttle or leave the valve at the half-open position as erosion of the disc and seating surface may occur and stem damage will result.
  - 4.2** Rotating the valve hand wheel clockwise will close the valve; counterclockwise operation will open the valve; this is also applicable to gear or motor actuated operation. Closing the valve requires the specified stem torque to assure the closure of the valve at the rated pressure.
  - 4.3** Never operate the valve without authorization and a full understanding of the safe operation procedures, inspections and proper handling instructions.

## 5. VALVE MAINTENANCE

Valves should be inspected regularly during operation, and any findings should receive immediate attention to avoid further damage to the valve or the system. Regular inspection and maintenance should be scheduled at least every six months.

**5.1** Valve sealing surfaces and other moving parts such as the stem, hand wheel or gear operators, 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 of the valve is required to ensure smooth operation. Stem packing should be inspected at least every six months to ensure zero leakage from the packing chamber.



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

**5.6** 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 BUTTERFLY VALVE DISASSEMBLY

- 6.1.1 Rotate the valve disc to the closed position, then loosen the bolts and nuts and remove the valve from the pipeline.
- 6.1.2 Remove the gearbox and yoke from the body. Loosen the packing gland bolts and remove the gland flange if stem packings need to change.
- 6.1.3 Loosen and remove the hex screws from the disc retainer, then remove the seal ring.
- 6.1.4 If necessary, remove the tack welding point using a grinding device, then remove the tap pins.
- 6.1.5 Loosen and remove the bolts from the bottom cover, then remove the bottom cover.
- 6.1.6 Push down the stem until the split collar comes out of the body if the stem is downward assembly, then remove the split collar. Or pull out the stem from the body if the stem is upward assembly.
- 6.1.7 Remove the stem from the body, make sure to support the disc.
- 6.1.8 Remove the stem packing from the body stuffing box.

### 6.2 BUTTERFLY VALVE ASSEMBLY

- 6.2.1 Install new seal rings into the disc, then install the ring retainer to the disc with the hex screws, tighten the screws.
- 6.2.2 Install the stem through body stem hole, disc stem holes, then install the split collar to the stem if necessary.
- 6.2.3 Install new packing into the stuffing box and then install the gland bolts, tighten the bolts to the recommended torque.



- 6.2.4 Install the bottom cover to the body with bolts.
- 6.2.5 Install the yoke and gearbox, rotate the valve to check operation functionality.
- 6.2.6 To ensure the valve is sealing properly, perform the required pressure testing per recognized and applicable design standards.

## 7. TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Packing Chamber Leakage	Eye bolts are loose	Evenly tighten the eyebolts
	Not enough packing / Gland bushing binding	Increase packing ring quantity
	Packing worn / Packing chamber damaged	Replace with new packing
	Stem sealing surface damaged	Replace or repair the stem
Leakage at sealing surface	Foreign matter on the sealing surface	Clean the sealing surface
	Sealing surface damaged	Repair the sealing surface
Cannot operate normally	Packing compressed too tight	Adjust eye bolt torque
	Foreign matter may be trapped between stem/stem nut, or gland flange/gland	Remove foreign matter
Cover gasket leakage	Loosen flange bolt/nut	Re-torque the flange bolt/nut
	Bonnet gasket failed	Replace with new gasket
Disc will not operate normally	Actuators or connecting parts are damaged.	Disassemble and repair actuators or connecting parts.
	Stem may be deformed and/or jammed	Replace valve stem



## 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 reserve 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.



## **DHV Industries, Inc.**

3451 Pegasus Drive

Bakersfield, CA 93308 USA

Call Toll Free: (833) DHV-USA1

TEL: (661) 392-8948

Fax: (661) 392-8947

E-mail: [sales@dhvindustries.com](mailto:sales@dhvindustries.com)

Website: [www.dhvindustries.com](http://www.dhvindustries.com)

## **DHV Valve Canada Co., Ltd**

100, 3060 12 Street

Nisku, Alberta, T9E 0SCanada

Phone: 780-669-9420

E-mail: [sales@dhvindustries.com](mailto:sales@dhvindustries.com)

Website: [www.dhvindustries.com](http://www.dhvindustries.com)

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.