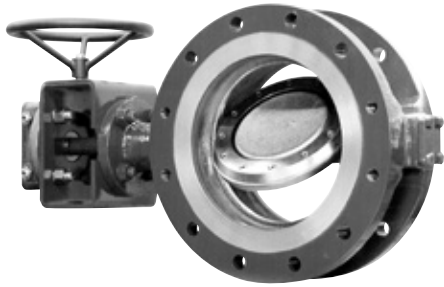




VANESSA SERIES 30,000 INSTALLATION AND MAINTENANCE INSTRUCTIONS

Installation and Maintenance Instructions Vanessa Series 30,000 - Basic configuration
body style double flanged, wafer, lug and butt weld



- All actuated valves must be securely palleted or crated with particular attention, in order to ensure that parts of actuator (especially pneumatic piping or accessories) do not extend beyond the skid/crate.
- 4 The type of packing must be defined in the customer's order and will be appropriate to ensure safe transportation to final destination and eventual conservation before installation.

Applicable product range

- Series 30,000 Basic configuration, double flanged body style, which can be installed between two flanges or stud-bolted to either flange.
- Series 30,000 Basic configuration, lug-single flange body style, which must be bolted to either flange.
- Series 30,000 Basic configuration, wafer body style, which can be installed between two flanges.
- Series 30,000 Basic configuration, butt weld ends, which must be welded to the line.

SECTION 1 - VALVE STORAGE

1.1 Preparation and preservation for shipment

All valves are properly packed in order to protect the parts that are subject to deterioration during transportation and storage on site. In particular, the following precautions should be taken:

- 1 The valves must be packed with the disc in the closed position. The flange sealing surfaces (raised faces) of the valves will be protected with suitable protective grease. The end faces of the valve must be protected with plastic or wooden discs fixed with straps.
- 2 Bare shaft valves: the ends of the shaft must be protected with plastic tubes.
- 3 Valves with actuators: in case of "fail open" pneumatic - hydraulic actuators with manual override, the manual override shall be used to manually close the valves and to lock them in position. If there is no manual override, cut outs are made in the flange protectors for the disc, and the disc is securely protected.

1.2 Handling requirements

A - Packed valves

Crates: Lifting and handling of the packed valves in crates will be carried out by a fork lift truck, by means of the appropriate fork hitches.

Cases: The lifting of packed valves in cases will be carried out in the lifting points and in the center of gravity position which have been marked. The transportation of all packed material must be carried out safely and following the local safety regulations.

B - Unpacked valves

- 1 The lifting and the handling of these valves has to be carried out by using appropriate means and by respecting the carrying limits. The handling must be carried out on pallets, protecting the machined surfaces to avoid any damage.
- 2 With large dimension valves, the sling and the hooking of the load must be carried out by using the appropriate tools (brackets, hook, fasteners, ropes) and load balancing tools in order to prevent them from falling or moving during the lifting and handling.

VANESSA SERIES 30,000

INSTALLATION AND MAINTENANCE INSTRUCTIONS

1.3 Storage and preservation before installation

In case the valves have to be stored before installation, the storage has to be carried out in a controlled way, and has to be performed in accordance to the following criteria:

- 1 The valves have to be stocked in a closed, clean and dry storage room.
- 2 The disc must be in the closed position, and the end faces must be protected with plastic or wooden discs fixed with straps. If possible, keep the original protection.
- 3 Periodical checks have to be carried out in the storage area to verify that the above mentioned conditions are maintained.

NOTE

Storage in an open area for a limited period can be considered only in case the valves have appropriate packing (packed in cases lined with tarred paper, and contents well protected with barrier sacks).

CAUTION

For valve handling and/or lifting, the lifting equipment (fasteners, hooks, etc.) must be sized and selected while taking into account the valve weight indicated in the packing list and/or delivery note. Lifting and handling must be made only by qualified personnel.

Fasteners must be protected by plastic covers in sharp corner areas.

Caution must be taken during the handling to avoid that this equipment passes over the workers or over any other place where a possible fall could cause damage. In any case, the local safety regulations must be respected.

NOTE

Solutions A and C are applicable when the protrusion of the bottom hub from the flange or body is sufficient to position securely the lifting strap.

Solutions B and D are applicable when the protrusion of the bottom hub from the flanges is NOT sufficient to position securely the lifting strap.

In presence of solution B, insert a stud bolt and fix it securely with nuts as indicated in the drawing detail.

In presence of solution D, insert a lifting eyelet in the flange threaded holes close to the bottom hub and fix it securely as indicated in the drawing detail.

LIFTING AND HANDLING OF VALVES INSTALLED IN HORIZONTAL PIPELINE

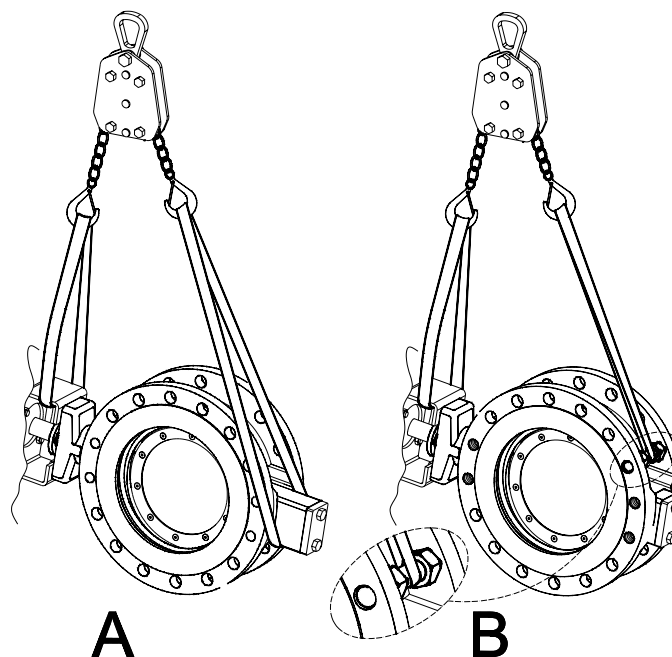


FIGURE NO. 1A

LIFTING AND HANDLING OF VALVES INSTALLED IN VERTICAL PIPELINE

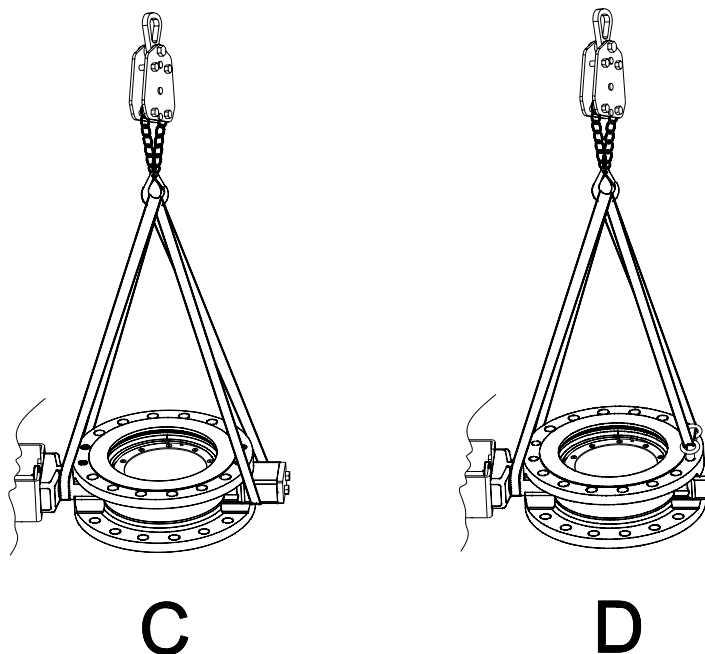


FIGURE NO. 1B

SECTION 2 - INSTALLATION

2.1 Valve inspection

- 1 Carefully remove the valve from the shipping package (box or pallet) avoiding any damage to the valve or, in case of automated valves, to the electric or pneumatic/hydraulic actuator or instrumentation.
- 2 The valves are shipped with the ends protected with caps and a thin layer of protective grease. Before installing the valve, remove the caps and clean carefully, then de-grease both surfaces with a solvent. Clean the inside of the valve using an air line. Ensure that there are no solid objects such as pieces of wood, plastic or packing materials within the valve or on the valve seat.
- 3 Inspect the seal ring to ensure that it was not damaged during handling. This is especially important in case of valves shipped with the disc in the open position and with "fail-open" actuators.
- 4 Confirm that the materials of construction listed on the valve nameplate are appropriate for the service intended and are as specified.
- 5 Ensure that the packing gland adjusting nuts against the packing gland flange cannot be rotated by hand.

2.2 Valve installation

Vanessa recommends that the optimum valve installation is with the shaft in the horizontal plane, after which it is preferable to have the shaft at an angle so as to minimize any problem associated with solid particles present in the fluid that otherwise could deposit in the lower bearing area.

NOTE

The Vanessa valve is designed to withstand design differential pressure in both directions.

Isolating applications

The valve operating torque affects the sealing performances. Vanessa attached the indication plate ΔP (figure 2) on the upstream flange as a reference for the direction of the installation.

The best sealing performance, also for bi-directional service, will be maintained when pressure acts on the shaft side of the valve, which is recommended when the service tightness requirements are more stringent in one specific direction.

Control applications (uni-directional, where perfect sealing is not required)

The plate could be fixed on either flange indicating the preferred direction. Please respect the direction of installation indicated on the relevant flange. The selection of the actuator has been made for that specific direction of installation.

Unless otherwise recommended by Vanessa, the valve should be installed with the disc in the closed position to ensure that the seal ring in the disc is not damaged during installation. Particular care should be taken with those valves equipped with 'fail-open' actuators. For operating temperatures above 200°C (392°F) thermal insulation of the valve body is recommended.

If the valve has threaded tapped holes in the hub areas, Vanessa recommends to use hexagonal head bolts or shorter studs to connect the valve in this zone. The depth of the tapped holes in the bodies of all Series 30,000 valves is specified in the technical literature. Failure to use correct bolts/studs may result in damage to the valve.

If the valve has welded ends, perfectly clean and degrease the ends to be welded (of both valve and pipe), using a cloth with acetone or similar product. Insert correctly the valve between the edges of the pipe to be welded, taking care of the plate that indicates the preferential side for sealing. Carry out an initial accurate spot welding verifying the perfect alignment of the edge and axis of the valve. Carry out the welding of the edge proceeding in alternate way on both sides to reduce the tensions introduced by the welding. It is important to respect the interpass temperature which must not go above 150°C (302°F). Handling and lifting of the valves during installation MUST be performed following the same criteria and instructions described in previous points "1.2 Handling requirements" and "1.3 Storage and preservation before Installation".

IMPORTANT

The valve trim is designed to withstand and to seal against the design differential pressure marked on the valve nameplate which data are supplied together with the present document.

Since it is impossible to maintain complete control on the external input forces to the trim coming from gear/actuator, the valve trim shall not be used as a final protective mean against the hazard caused by the closed valve upstream pressure.

IMPORTANT

It is recommended to perform piping flushing before installation of valve.

If this is not possible, the valves must be set with the disc in full open position before starting with flushing.

CAUTIONS

When the pipe is lined, be careful that the disc does not come into contact with the lining during its stroke, especially in lug and wafer body styles. This verification is very important to avoid any damage to the valve.



FIGURE 2

VANESSA SERIES 30,000

INSTALLATION AND MAINTENANCE INSTRUCTIONS

2.3 Valve verification

- 1 Tighten the packing just enough to prevent stem leakage. Over-tightening will decrease packing life and increase operating torque.
- 2 Check the operation of the valve by stroking it to "full open" and "full close". To verify the valve orientation, the disc position indicator mark on the shaft (during the normal open to close cycle) should rotate clockwise from a position in line with the pipe (see figure 3a) to a position parallel to the pipe flanges (see figure 3b).

IMPORTANT

If piping system is pressurized with water for testing, and in case the piping system has been shut down after testing for a long time, the following recommendations should be adopted:

- a. Use corrosion inhibitor with water to pressurize the piping system.
- b. After testing, the piping system should be depressurized and the test water completely drained.
- c. After testing, valves must be maneuvered through a complete opening/closing cycle and disc left in half-open position. Apply a film of protective oil in the packing area by means of a paintbrush. The protective oil must fill the area between shaft and packing bushing.

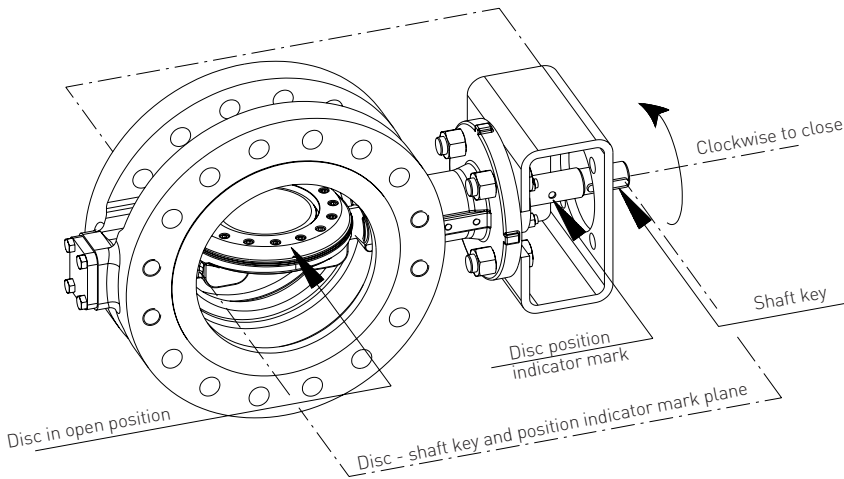


FIGURE NO. 3A

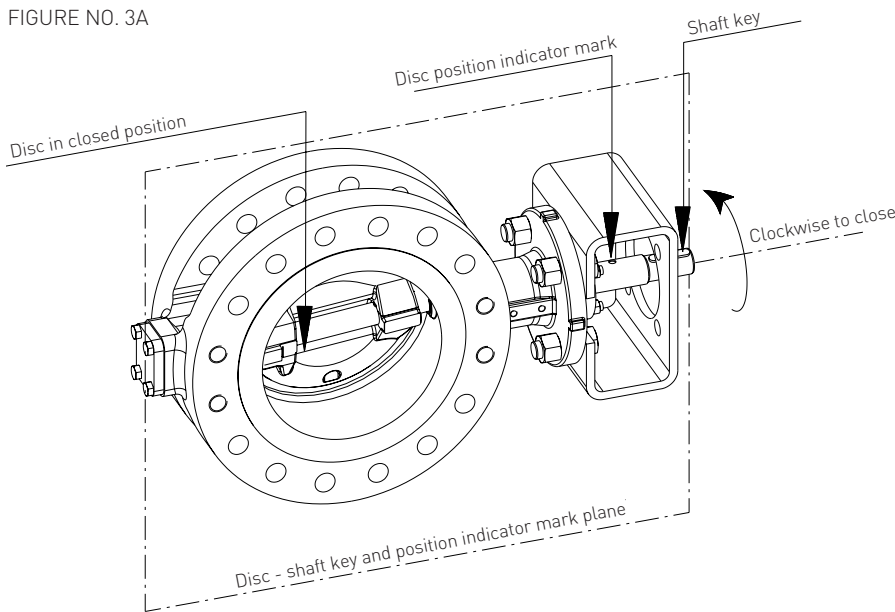


FIGURE NO. 3B

VANESSA SERIES 30,000

INSTALLATION AND MAINTENANCE INSTRUCTIONS

2.4 TROUBLESHOOTING GUIDE

Symptom	Possible cause	Resolution
Valve won't rotate	<ol style="list-style-type: none">1. Packing is too tight2. Actuator has failed3. Valve packed with debris4. Stem key has sheared5. Fluid solidification between bearings and shaft	<ol style="list-style-type: none">1. Loosen gland nuts2. Replace or repair3. Flush or clean valve to remove debris4. Determine cause of shearing and correctly replace stem key5. Flush bearings by flushing holes (if present)
Stem packing leaking	<ol style="list-style-type: none">1. Gland flange nuts too loose2. Packing damaged	<ol style="list-style-type: none">1. Tighten gland flange nuts2. Replace packing - see Paragraph 3.1
Bottom flange gasket leaking	<ol style="list-style-type: none">1. Bottom flange bolting loose2. Spiral wound gasket damage	<ol style="list-style-type: none">1. Tighten bottom flange bolting2. Replace gasket - see Paragraph 3.3
Valve leaking	<ol style="list-style-type: none">1. Valve not fully closed2. Debris trapped in valve3. Actuator mechanical stops improperly set4. Seal ring damaged	<ol style="list-style-type: none">1. Close valve2. Cycle and flush (with valve open) to remove debris3. Remove the stop for closure and reset properly4. Replace seal ring - see Paragraph 3.2
Jerky operation	<ol style="list-style-type: none">1. Packing is too tight2. Air supply inadequate3. Actuator/stem adapter misaligned	<ol style="list-style-type: none">1. Loosen gland nuts, cycle valve, retighten2. Increase air supply pressure and/or volume3. Remove actuator mounting and realign

VANESSA SERIES 30,000

INSTALLATION AND MAINTENANCE INSTRUCTIONS

SECTION 3 - MAINTENANCE

The Vanessa Series 30,000 has been designed to require a minimum of maintenance.

WARNING

Depressurize the line before starting any maintenance. Failure to do so may cause serious personal injury and/or equipment damage.

3.1 Packing maintenance

If shaft leakage is observed through the packing, tighten the gland nuts slowly and evenly until the leakage stops.

CAUTION

Do not over-tighten packing gland nuts. Over-tightening will increase the torque required to operate the valve.

When tightening the gland nut, use half-turn increments until leakage has stopped.

Please refer to the figure no. 4.

To replace the packing proceed as follows:

- 1 Remove the gear/actuator and relevant connecting keys (4f). Please note the actuator position relative to the valve position for reassembly of gear/actuator later.
- 2 Remove gland nuts (5d). If present, remove belleville springs (5n), taking care of noting their assembly configuration to reassemble them correctly (point 7).
- 3 Remove packing gland flange (5f), anti blow-out ring if present (5g), and gland bushing (5c).
- 4 Remove packing (5a). If valve is with packing flush option, remove lantern ring also (5h).
- 5 Carefully clean packing cavity and shaft (4a).

- 6 Apply a thin film of lubricant on each new packing ring (5a) surfaces (lubricant should be in accordance with Table IV). Insert new packing rings, paying attention to insert the two braided rings at the bottom and top of the entire packing. If valve is with packing flush option, insert the lantern ring (5h) in the same sequence as previously removed (or as indicated in figure 4). If the packing rings are of the split variety, install with splits staggered at 180° from each other.
- 7 Reassemble gland bushing (5c), anti blow-out ring if present (5g), and gland flange (5f). If present, assemble the belleville springs (5n), following the assembly configuration noted in the previous point 2, then assemble by hand the gland nuts (5d) without tightening (after applying a thin film of lubricant on the threads of the stud bolts, in accordance with Table IV).
- 8 Reassemble keys (4f) on the upper stem end.
- 9 Reassemble gear/actuator and close the valve.

CAUTION

Do not force actuator on the stem! This should be a free moving fit.

- 10 Tighten gland nuts (5d) in accordance to Table I (Torque values for gland nuts).
- 11 Cycle the valve.
- 12 Pressurize again the line.
- 13 If a leakage is detected, tighten the gland nuts slowly and evenly until the leakage stops.

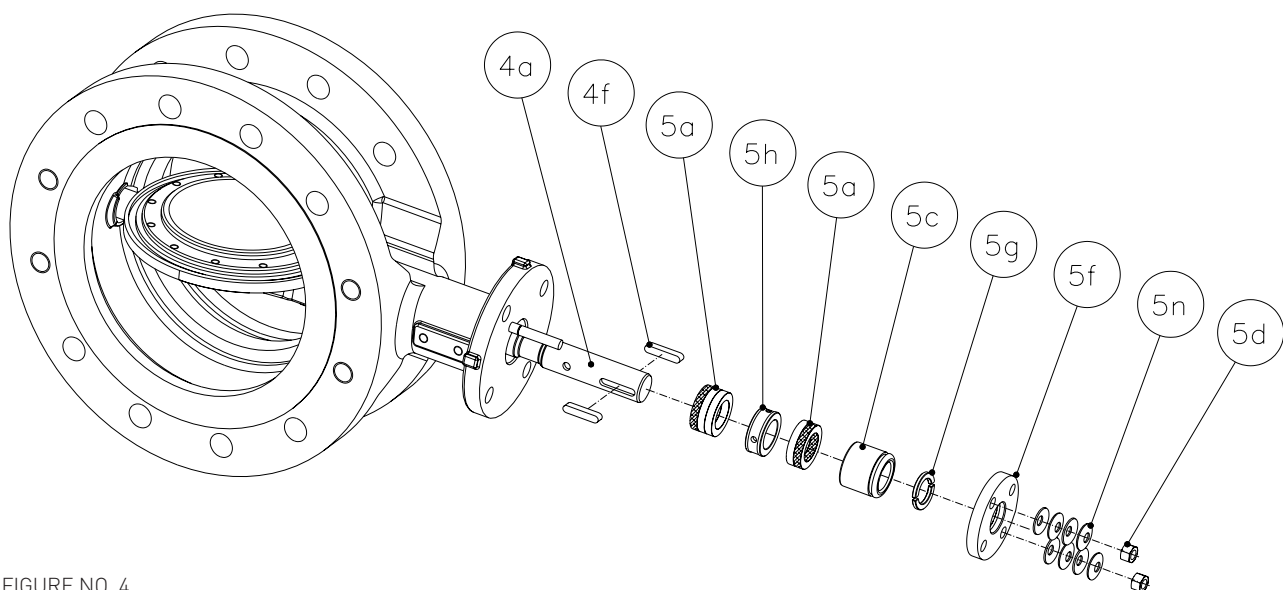


FIGURE NO. 4

VANESSA SERIES 30,000

INSTALLATION AND MAINTENANCE INSTRUCTIONS

3.2 Sealing elements maintenance

To replace the sealing elements proceed as follows (please refer to figure no. 5):

WARNING

Depressurize the line before starting any maintenance. Failure to do so may cause serious personal injury and/or damage to the valve.

- 1 Remove the valve with the disc in the closed position from line. Clean the valve according to proper cleaning procedure as outlined by the plant or according to a recommended procedure.
- 2 Open the valve a few degrees.
- 3 Loosen the seal retainer ring screws (2c).
- 4 Open valve to full open position.

NOTE

In small size valves it may be easier to unbolt the actuator and rotate the disc beyond the full-open position to provide more space to work with components.

- 5 Carefully remove the retainer ring screws (2c) with security washers (2d), then remove the seal retaining ring (2b).
- 6 Remove seal ring (3a) and spiral wound gasket (3b).
- 7 Inspect the body seat. Clean it, if necessary, with fine abrasive cloth (No. 600 or finer), after having cleaned it perfectly with solvent.
- 8 Inspect and clean the disc seal ring area and spiral wound gasket groove. No foreign particles must be present before spiral wound gasket and seal ring assembly.

- 9 Apply a thin film of lubricant on the surface area of the disc (2a) where seal ring (3a) and spiral wound gasket (3b) will be located (lubricant should be in accordance with Table IV).

CAUTION

Apply only a thin film of lubricant where indicated. Failure to do so will hinder the assembly and may cause damage to the valve.

- 10 Assemble the new spiral wound gasket (3b) in the disc groove, without forcing and taking care not to damage it.
- 11 Replace seal ring (3a) on the disc through the shaft side of the body. To properly locate the seal ring, there are two different solutions:
 - solution 1 - ref. to figure no. 6a: align the internal slot of the seal ring (3a) to the reference pin (F).
 - solution 2 - ref. to figure no. 6b: align the reference mark (C) on the seal ring (3a) with the relevant reference mark (D) on the disc.
- 12 Assemble the seal retainer ring (2b). There are two different solutions as per previous point 11:
 - solution 1 - ref. to figure no. 6a: make sure that the slot on the edge of the seal retainer ring (B) is in correspondence with reference pin (F).
 - solution 2 - ref. to figure no. 6b: ensure to locate the hole (E) of the seal retainer ring with the relevant marks on the disc (D) and seal ring (C).

- 13 Hand tighten all the fastening screws (2c), with relevant lock washers (2d) after applying Loctite® 270 or equivalent on the bottom side of the threads (they have to be perfectly cleaned with solvent before applying Loctite®). Then, verify that the seal ring can be moved freely by hand without rotating it.
- 14 Apply a thin film of lubricant to the body seat and to the external edge (sealing conical surface) of the seal ring (3a). Lubricant should be in accordance with Table IV.
- 15 Seat and unseat the valve twice.
- 16 Keep the valve in the closed position without applying torque. Tighten at least two retaining screws (2c) to avoid the seal ring moving from the position found.

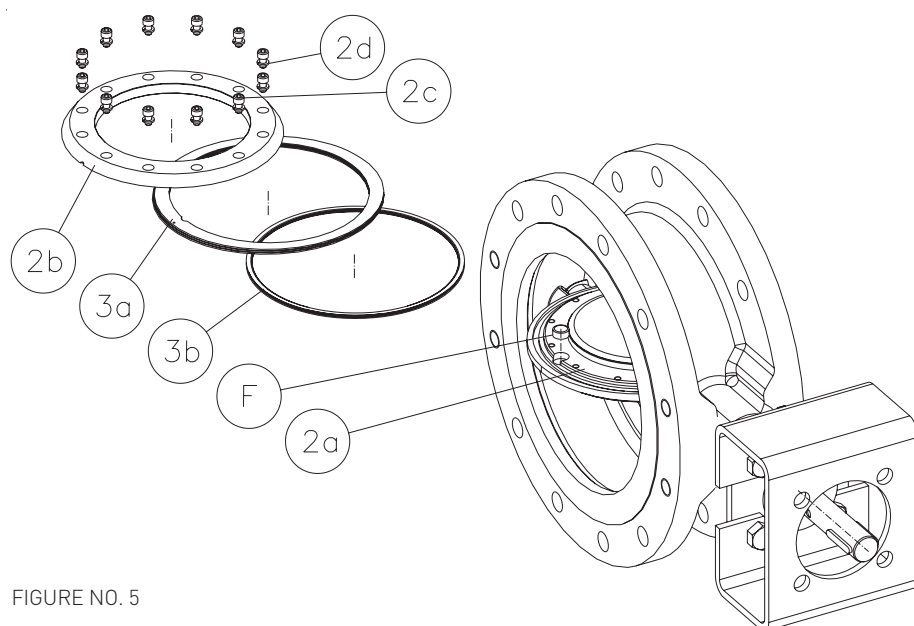


FIGURE NO. 5

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INSTALLATION AND MAINTENANCE INSTRUCTIONS

17 Open the disc a few degrees and tighten, using a torque wrench, all screws (2c).
Use a torque value from Table III for valves according to solution 1 (ref. to figure no. 6a).
Use instead a torque value from Table II for valves according to solution 2 (ref. to figure no. 6b).
It is recommended to use the crossover method to tighten all retaining screws.

IMPORTANT

• *Solution 1 - ref. to figure no. 6a:*
The seal ring is supplied with an index marking (A). After the complete assembling, verify that the index marking (A) can be seen in the slot (B) of the seal retainer flange.
Slot (B) and marking (A) have to be perfectly aligned.
If not visible or not aligned, loosen the retaining screws, re-align the index marking and start again the procedure from point 12.

• *Solution 2 - ref. to figure no. 6b:*
The seal ring and the disc are completed with two reference markings, (C) and (D). After the complete assembling, verify that both markings can be seen through the hole (E) of the seal retainer flange. The two markings have to be perfectly aligned.
If not visible or not aligned, loose the retaining screws, re-align the index markings and start again the procedure from point 12.

3.3. Bottom flange gasket maintenance

If necessary to replace the bottom spiral wound gasket, proceed as follows (see fig. no. 7):

- 1 Remove the bottom flange (6a).
- 2 Remove the spiral wound gasket (6c).
- 3 Inspect and clean the groove of the spiral wound gasket in the body and in the bottom flange.
- 4 Apply a thin film of lubricant on the bottom spiral wound gasket (6c), then insert it on the bottom flange (6a), centering and positioning all on the body bore (lubricant should be in accordance with Table IV). Rotate the bottom flange to accommodate the correct position and center the holes with the threaded holes on the body.
- 5 Apply a thin film of lubricant on the threads of the screws (6b), then introduce and tighten them using a torque value from Table III (lubricant should be in accordance with Table IV).

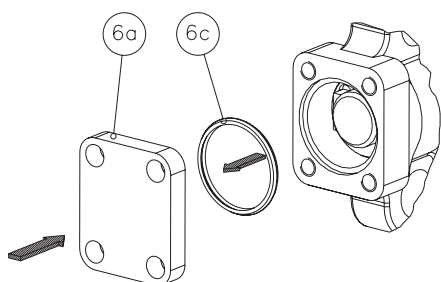


FIGURE NO. 6A

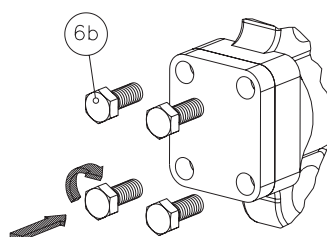


FIGURE NO. 7

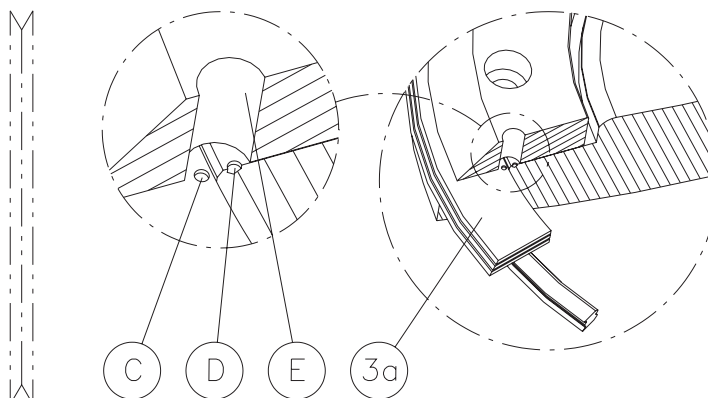
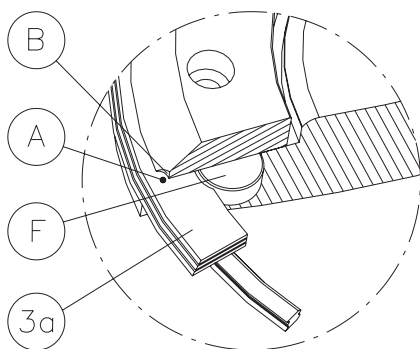


FIGURE NO. 6B

SECTION 4 - STANDARD OPTIONS

This section (4) is referred only to Vanessa products configured with the following options:
 - bearing and packing flushing,
 - live loaded packing.

4.1 Bearing and packing flushing
 4.1.1 *Bearing flushing*

The bearing flushing option is obtained by adding two tapped holes, one in the bottom flange and one in the neck of the valve (see fig. 9). This option includes the introduction of a lantern ring at the bottom of the valve packing. Bearing flushing is recommended when the valve is installed in a service where the particles present in the fluid or the line fluid itself can migrate into the shaft/bearing area causing problems. A typical example is sulphur recovery services, where the sulphur in a liquid or gaseous state may enter this area and crystallise as a consequence of the plant shutdown.

This crystallisation may result in an increase in the torque requirement of the valve. Another example may be a fluid that contains particles (e.g. catalyst) that may cause similar problems to those highlighted above.

In these types of situations the bearing flushing may be used to introduce an inert fluid compatible with the process via the bearing flush taps (see fig. 8) so as to create a pressure barrier which prevents the introduction of the unwanted products from the line into the shaft/bearing area. The pressure of the flushing fluid must be slightly higher than the line pressure (i.e. $P_1 + \text{approx } 5\%$). This both acts as a safety measure and is a positive step in increasing the lifetime of the valve, as well as maintaining the constant torque requirement and hence operability of the valve.

The bearings may be continuously flushed, this is recommended by Vanessa for critical services such as described above. Periodic flushing may be used for less critical services in order to clean the bearing/shaft interface or in order to prepare the valve for a shutdown of the process.

The bearing flush taps may also be used to introduce a lubricant compatible with the process to the bearing areas for high cycle or dry gas service. The presence of the bearing protector drastically reduces the consumption of the flushing or lubricant by reducing the amount of fluid required to give efficient service (see fig. 8).

Further information is available from Vanessa on request.

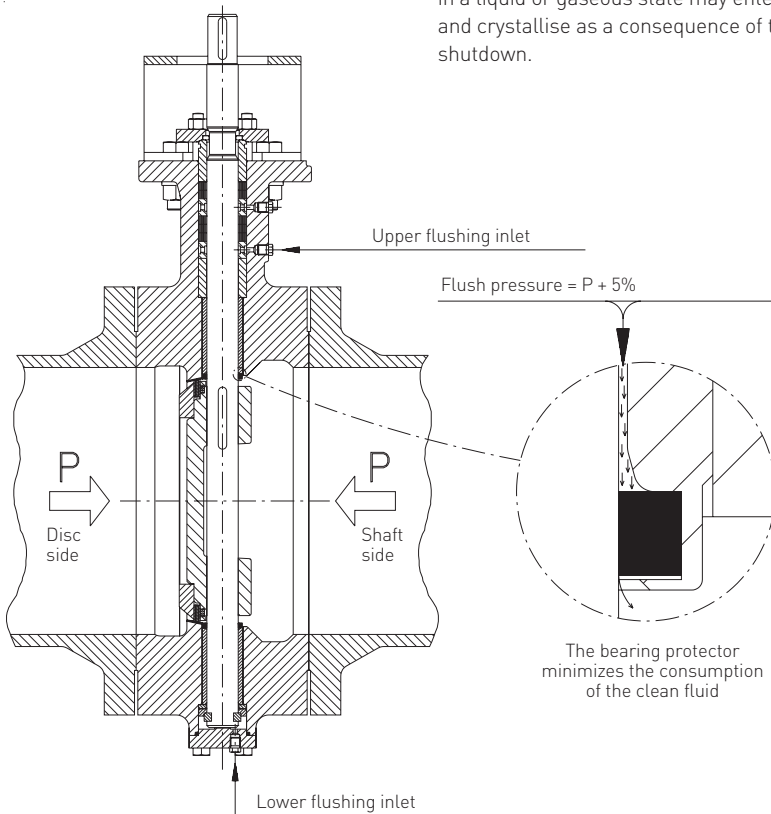


FIGURE NO. 8

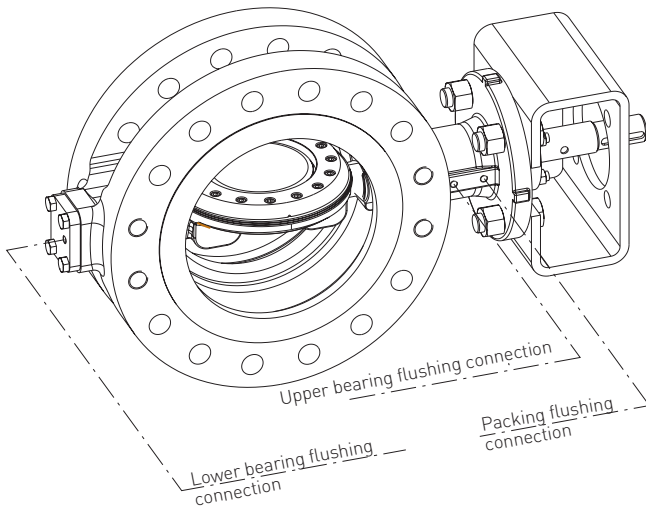


FIGURE NO. 9

VANESSA SERIES 30,000

INSTALLATION AND MAINTENANCE INSTRUCTIONS

4.1.2 Packing flushing

The packing flushing option is obtained by the introduction of a tapped hole that communicates directly to the packing set in the neck of the valve via a lantern ring. This option can be used to monitor the rate of emission of the line fluid toward the atmosphere (it is important to point out that the packing of the Vanessa valve fully complies with TA Luft and EPA requirements). This flush tap may also be used to capture and evacuate line fluid so as to prevent any atmospheric loss, with the lantern ring and split packing configuration acting as a double block and bleed unit.

A suitable fluid may also be introduced via the packing flush tap into the packing area so as to eliminate any possible fugitive emissions (see fig. 9). By keeping the fluid pressurized at a pressure that is higher with respect to the line pressure, the passage of any line fluid towards the atmosphere can be effectively blocked giving the valve excellent fugitive emissions control. However, the fluid used must be compatible with the line fluid as it may have the possibility of finding its way into the line as well as toward the atmosphere.

As with the bearing flushing option this may also be used to introduce a lubricant compatible with the process.

The type of lubricant used for flushing is at the clients' care. Vanessa may be contacted to supply further detailed, process specific information.

4.3 Live loaded packing

The live loaded packing option is designed to supplement the already excellent characteristics of the Vanessa valve packing. This option guarantees a constant compression of the packing set giving a further guarantee of the fugitive emissions control of the Vanessa valve. The fact that the packing is subject to a near constant force supplied by the Belleville washers reduces the maintenance cycle required by the packing (see fig. 10).

Care should be taken in replacing the Belleville springs as their order (parallel or series) should be noted.

The packing nuts should be tightened in accordance with Table I.

At this point it is worth mentioning that the TA Luft test has shown that the Vanessa Series 30,000 std. Packing is more than adequate in passing its stringent requirements.

The live loaded packing option should be considered in valves that are subject to severe cycling duty or valves that are subject to severe thermal cycles.

The drawing shows typical set ups for the live loaded packing option.

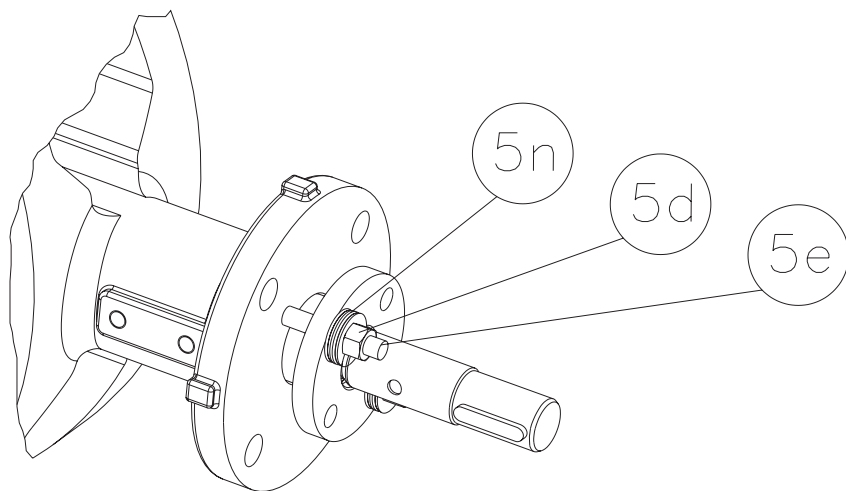


FIGURE NO. 10

VANESSA SERIES 30,000

INSTALLATION AND MAINTENANCE INSTRUCTIONS

TABLE I: Torque values for gland nuts

ND in.	mm	Trim A		Trim B		Trim C		Trim D		Trim E	
		Nm	ft-lb	Nm	ft-lb	Nm	ft-lb	Nm	ft-lb	Nm	ft-lb
3	80	-	-	15	11	15	11	30	22	-	-
4	100	-	-	15	11	15	11	30	22	-	-
6	150	-	-	15	11	20	15	35	26	50	37
8	200	-	-	15	11	20	15	60	44	105	78
10	250	-	-	25	18	20	15	70	52	135	100
12	300	-	-	25	18	25	18	75	55	240	177
14	350	-	-	30	22	30	22	75	55	240	177
16	400	-	-	30	22	35	26	100	74	175	129
18	450	-	-	35	26	40	30	205	151	480	354
20	500	-	-	35	26	45	33	320	236	195	144
24	600	-	-	45	33	55	41	420	310	605	446
28	700	30	22	85	63	100	74	465	343	-	-
30	750	30	22	105	78	135	100	485	358	-	-
32	800	30	22	105	78	165	122	505	372	-	-
36	900	30	22	110	81	220	162	545	402	-	-
40	1000	30	22	110	81	225	166	-	-	-	-
42	1050	30	22	110	81	230	170	-	-	-	-
48	1200	30	22	110	81	235	173	-	-	-	-
54	1350	50	37	155	115	-	-	-	-	-	-
60	1500	65	48	160	118	-	-	-	-	-	-
64	1600	65	48	-	-	-	-	-	-	-	-
72	1800	65	48	-	-	-	-	-	-	-	-
84	2100	65	48	-	-	-	-	-	-	-	-

Note: the torque values are those suggested for the hydraulic test of the body.

TABLE IV: Lubrication

Type	Component to lubricate
Light mineral oil	<ol style="list-style-type: none"> Packing rings (5a) Disc surface areas (2a) for seal ring and spiral wound gasket location Spiral wound gasket (6c)
Molykote® - P74 (grease) or equivalent	<ol style="list-style-type: none"> Stud bolts/nuts (5d) Screw (6b)
Molykote® spray - 321 R (dry lubricant) or equivalent	<ol style="list-style-type: none"> Seal ring (3a) Body seat

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TABLE II: Tightening torque values for bolts and screws

Bolt dimensions (mm)	Torque values	
	Torque (Nm)	Torque (ft-lb)
8	12	9
10	24	18
12	41	30
14	66	49
16	103	76
18	142	105
20	201	148
22	274	202
24	348	257

TABLE III: General torque values for bolting

Bolt dimensions (mm)	Torque values	
	Torque (Nm)	Torque (ft-lb)
6	10	7
8	20	15
10	45	33
12	70	52
14	110	81
16	175	129
18	235	173
20	335	247
22	370	273
24	460	339
27	595	439
30	760	561
33	785	579
36	1010	745
39	1315	970
42	1625	1199
45	2035	1501