

# DUAL EXPANDING PLUG VALVES (DBB Service)







This Installation, Operation and Maintenance instruction manual, which will be supplied on request together with the VE<sup>®</sup> Dual Expanding Plug Valves [DEPV], has been prepared and written by ERIKS for the purpose of facilitating the storage, handling, installation and maintenance of the VE® Dual Expanding Plug Valves.

However, should any further particular information be required, please contact ERIKS (www.eriks.nl) prior to taking any measures which could lead to a valve malfunction.

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### **1.** SAFETY PRECAUTIONS – GENERAL REMARKS

- 1.1. Valve has to be depressurised and cooled down sufficiently before starting any maintenance job.
- 1.2. Pipeline and valve need to be drained before starting any maintenance job. Specially in cold conditions water or other liquids can cause damages and injury of personnel.
- 1.3. If the valve has been provided with a bleed system, check always the flow direction at time of placement or replacement.
- 1.4. If the VE<sup>®</sup> Dual Expanding Plug Valve, is equipped with a manual handwheel or gearbox, it has been sized to operate the valve: DO NOT USE WHEEL KEYS OR ANY OTHER TOOL TO OPERATE THEM.

### **2.** SAFETY PRECAUTIONS – LIFTING

Valves 10" and larger are provided with integral lifting lugs casted in the bodies. The lugs are designed to lift the valve with the extra weight of the gearbox and electric actuator. In case of linear pneumatic actuators these lugs might not be supplied, depending on the actuator size and weight. When valves are provided with these lifting lugs, soft slings shall be used to lift the valve through those points without damaging the painting. Steel chains are not recommended as painting could be damaged.

For sizes smaller than 10" there is no special lifting device

supplied with the valves. Valves should be lifted by using at least 2 soft slings laced in different point of the bodies.

Points of attention when lifting:

- For small sizes loop the slings under the valve near the inlet and outlet.
- Use at least 2 slings of equal length when lifting.
- Never use handwheels as lifting points.
- Make sure that the bleed system cannot be damaged by the slings and during lifting.







#### **3.** INSTALLATION OF VE DUAL EXPANDING PLUG VALVES

- 3.1. Valve position: VE<sup>®</sup> Dual Expanding Plug Valves may be installed in any position
- 3.2. Flow Direction: The flow direction of a VE<sup>®</sup> Dual Expanding Plug Valve equipped with a bleed system must be checked during installation in the pipeline.
- 3.3. Pressure Testing: VE<sup>®</sup> Dual Expanding Plug Valves can be pressure tested before or after installation in the pipeline as indicated in the following table. During the test, no leakage is allowed.

PRESSURE CLASS		150	300	600	900	1500
Shell test (Valve	PSI	435	1132	2234	3336	5628
Hydrostatic	BAR	30	78	154	230	388
Seat test (Valve	PSI	320	827	1624	2451	4119
Hydrostatic	BAR	22	57	112	169	284
Seat test (Valve	PSI	100	100	100	100	100
Air test	BAR	6,9	6,9	6,9	6,9	6,9

- 3.4. Ensure that the valve and accessories are installed freely, properly supported and free of extraneous loads from connected components. Do not use piping or bolting loads to force valve into position.
- 3.5. For easy repair, free space should be allowed below the valve for removal of the lower plate and withdrawal of the seating slips. See table below for the clearance dimensions. Also sufficient clear space is required above the valve to allow free movement of the position indicator flag, for removal of the operator and for any top entry repairs.

Mínimum clearance standard bore valves for slip removal (mm)														
Size	2	3	4	6	8	10	12	14	16	18	20	24	30	36
Class 150	150	200	250	300	350	400	500	550	600	680	780	870	1245	137 0
Class 300	150	200	250	300	360	450	550	620	700	770	850	-	-	-
Higher pressure classes on request														

3.6. In order to meet the face to face dimensions required, some VE<sup>®</sup> Dual Expanding Plug Valves have tapped holes in the body for connecting pipe flanges.

In order not to damage bolt threading and once the valve is positioned in line with the connecting flanges and bolt holes, place all possible studs and nuts (except for the tapped ones) to allow placement of the gasket and to centre the flange.

When the gasket is in place, continue to place all other studs and nuts to achieve best possible alignment. At this point, the studs for the tapped holes can be screwed in by hand.





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When all studs are in place, tighten all cross wise to achieve positive sealing. Torque on the tapped studs is equal to the other ones.

Quantity and size of these tapped holes are:

Tapped Holes												
Valve Size		2	3	4	6	8	10	12	14	16	18	
Class 150	Qty tapped Holes	4	4	4	4	4	4	4	4	8	8	
	Thread UNC	5/8- 11 UNC -2B	5/8- 11 UNC -2B	5/8- 11 UNC -1B	3/4- 10 UNC -1B	3/4- 10 UNC -1B	7/8-9 UNC -1B	9 7/8-9 C UNC -1B	1-8 UNC - 1B	1-8 UNC - 1B	1-8 UNC - 2B	
	Stud length required	65 mm	70 mm	70 mm	80 mm	85 mm	95 mm	95 mm	100 mm	105 mm	105 mm	
Class 300	Qty tapped Holes	8		4		4	8	8				
	Thread UNC	5/8- 11 UNC -2B		3/4- 10 UNC -1B		7/8-9 UNC -1B	1-8 UNC - 1B	1 2 1/8-8 UN - 1B				
	Stud length required	65 mm		95 mm		115 mm	130 mm	140 mm				
Valves class $150 \ge 20$ " and class $300 3$ " & 6" & $\ge 14$ " do not have tapped holes; higher classes on request.												





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### 4. VALVE OPERATION

VE Dual Expanding Plug Valves are non-lubricated, resilient seal, plug type valves which have a mechanical means of freeing the plug before it is rotated from the closed to the open position. In opening the valve, the plug is raised, thus retracting the seating segments or slips through their tapered dovetail connections. Only after the slips are fully retracted perpendicularly from the body seat is the plug rotated to the open position.

When the valve is closing, the plug and slips are rotated freely, with no seal-to-body contact until the slips are positioned over the ports. The plug linearly descends and the slips and the tapered surfaces wedge out the slips for a positive upstream as well as downstream shut-off.

At the top of the valve, a position indicator flag shows the exact plug position. It appears in line with the flow when the valve is open, and perpendicular to the flow when the valve is closed. VE valves create a bubble-tight seal. It is important to prevent trapped body pressure from exceeding the working pressure of the valve. Therefore, a relief system is required to prevent pressure build-up in the body cavity.



### 1º. OPEN

Valve fully open. Seating slips are protected from flow path.



### 2°. ROTATING

Plug is rotating. As the valve begins to cycle, the plug rotates friction free. There is no contact between body and seating slips.





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#### 3°. EXPANDING (CLOSING)

Plug/slips have rotated 90°, and the plug then starts expanding the slips. A bubble tight seal is formed. Slips only move perpendicular to body seats

Plug/slip assembly is kept centred in body by top and bottom bushings



#### 4°. DOUBLE BLOCK & BLEED (CLOSED)

Valve fully seated.

Resilient seals have been compressed. Resilient seals cannot be damaged by operator over-torque. Valve sealing integrity can be confirmed through the external manual bleed.

4.1. How it works

The open – close mechanism of the valve converts the multiturn linear movement produced by the operator into a lift and turn movement of the internal components of the valve.

4.2. How to operate:

To close the valve, turn the hand wheel clockwise. To open the valve, turn the hand wheel counter-clockwise.

4.3. Double Block & Bleed Function (verification of tight sealing):

Only to be performed with the valve in closed position. Open the manual bleed valve or any other bleed system that has been provided with the valve. The valve will relief pressure from the body cavity and stop automatically. If the valve continues leaking please proceed to maintenance following the applicable instructions.





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#### Important remark:

All VE<sup>®</sup> Dual Expanding Plug Valves are sized in such a way that normal human force on the hand wheel is sufficient to operate the valve. Never use spanners, keys, etc....

When valves remain inactive for long periods of time, partial stroking or operating of the same is recommended to extend the maintenance periods of the seals. It's recommended not to keep the valves closed and dry for a period longer than <u>3 months</u>.

#### **5.** Thermal Relief System and Manual Bleed

When the VE valve is in the closed position, seal integrity can be verified by bleeding off pressure using an installed manual bleed valve (1). Once the seal is verified, the bleed valve must be closed before the VE valve is reopened. If body pressure from a closed VE valve continues to bleed through the manual valve, the VE valve and pipeline are to be safely drained and maintenance is to be performed on the VE valve.

When the VE<sup>®</sup> Dual Expanding Plug Valve is closed and completely filled with a liquid, any slight variation in temperature due to the sun's rays or ambient thermal fluctuations will cause significant changes in body cavity pressure resulting from thermal expansion. Dangerously high pressures will build up in liquid filled positive shut-off valves and therefore require a Thermal Relief System.

The Thermal Relief System is comprised of a tee outlet on the body that is piped to the upstream throat of the valve. A relief check valve (2) is set to open at 25 psi on all valves regardless of working pressure. With the valve closed, the relief check valve will open at 25 psi above upstream pressure. This system functions only when the valve is closed. A manual body bleed valve is included on the VE Thermal Relief System. An isolation valve (3) installed in the upstream throat tap is also included on the standard Thermal Relief System. It must be left open to permit the relief system to relieve pressure upstream. The isolation valve will be used only for maintenance and to be CLOSED ONLY FOR REPAIR. If closed during normal operation the automatic portion of the relief system (relief check valve) will be defeated.





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### **6.** MAINTENANCE INSTRUCTIONS

- 6.1. Inspection or replacement of the seats:
  - 6.1.1. The minimum space necessary for the bottom access to the slips (pos.5) is specified in this IOM (§3.5) and the ERIKS VE<sup>®</sup> catalogue and the drawings provided with the valve. Check that the access to the slips is physically possible. If not, the slips can be also taken out through the upper plate (pos.3), contact please ERIKS for further instructions.
  - 6.1.2. The valve may remain fitted in the pipeline. Put the valve in closed position, so the slips (pos.5) remain fitted in the body (pos.1) when the lower plate (pos.2) is removed.
  - 6.1.3. Drain the valve by loosening the drain plug (pos.26).
  - 6.1.4. Support the lower plate (pos.2) during the loosening of the nuts from the studs (pos.14). Remove or lower the lower plate (pos.2). For larger sizes use jack studs to lower it.
  - 6.1.5. Install a support under the slips (pos.5) if necessary.
  - 6.1.6. Start opening the valve carefully. As explained in point 2.2, the line has to be drained beforehand. Stop the opening process as soon as the slips (pos.5) have enough clearance to come out.
  - 6.1.7. Inspect the seat seals (pos.6) for wear or damages. In case a slip is damaged or worn replace it by a complete new one. Seat seals (pos.6) are directly vulcanized into the slips. They can only be re-vulcanized by ERIKS due to the special equipment needed.





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- 6.1.8. Re-assemble in reverse order, always use new O-rings (pos.6) and gaskets (pos.13).
- 6.1.9. In case parts do not fit easily together, check for sediment, corrosion or foreign deposits. Do not use extraordinary force during reassembly.

Pos	Description
1	BODY
2	LOWER PLATE
3	UPPER PLATE
4	PLUG
5	SLIP
6	O-RING
7	BACK SEAT
8	GLAND
9	PACKING
10	GLAND FLANGE
11	GLAND STUD
12	GLAND NUT
13	GASKET
14	BODY PLATE STUD/NUT
15	YOKE
16	STEM
17	COUPLING CAM
18	GUIDE PIN
19	PIN PLATE
20	RADIAL BEARING
21	PIN PLATE BOLT
22	GREASE FITTING
23	BOTTOM CAM PIN
24	FRICTION BEARING
25	YOKE STUD/NUT
26	DRAIN PLUG
27	YOKE PLATE + BOLT/NUT
28	TOP CAM PIN







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- 6.2. Inspection or replacement of the packing:
  - 6.2.1. Make sure that the valve is in closed position and bleed it to relief the pressure in the body cavity.
  - 6.2.2. Disassemble pin plates (pos.19)
  - 6.2.3. Take out both guide pins (pos.18).



6.2.4 Remove handwheel

- 6.2.5 Remove top cam pin (pos. 23)
- 6.2.6 Loose the nuts (pos.25) in the yoke (pos.15). Lift the yoke (pos.15) and gear.









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6.2.7 Remove bottom cam pin (pos 23). Then lift

Coupling cam (pos 17).

6.2.8. Remove the gland nuts (pos.12), gland flange

pos.10) and gland (pos.8).

- 6.2.9. Remove gland packing (pos.9).
- 6.2.10. Replace gland packing (pos.9).
- 6.2.11.Re assemble in reverse order.
- 6.3. Inspection or replacement of the O-rings:
  - 6.3.1 Lower plate O-ring:
    - 6.3.1.1. Follow instructions for seats inspection or replacement from 6.1.1 to 6.1.4. included.
    - 6.3.1.2. In case of valve installed, use a support for preventing the seats fall
    - 6.3.1.3. Replace O-ring if necessary
    - 6.3.1.4. Re-assemble in reverse order
  - 6.3.2 Upper plate O-ring:
    - 6.3.2.1. Follow instructions for packing replacement up to step 6.2.9 included
    - 6.3.2.2. Loose the nuts (pos. 14) and lift the upper plate (pos. 3)
    - 6.3.2.3. Replace O-ring (pos. 6) if necessary
    - 6.3.2.4. Re-assemble in reverse order

#### **REMARK:**

Only use components provided by ERIKS for maintenance of VE<sup>®</sup> Dual Expanding Plug Valves.











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6.4. Stem lubrication:

Valve stems shall be greased with water resistant multi-purpose grease (e.g. Fuchs Renolit EP 2).

6.5. Top Cam Pin replacement:

6.5.1. Make sure that the valve is in closed position (by checking the valve position indicator) and bleed it to relief the pressure in the body cavity

6.5.2. Disassemble both yoke plates (pos. 27)





6.5.3. Remove top cam pin (pos.28)



6.5.4. Insert new top campin(pos. 28)6.5.5. Re assemble yoke plates(pos. 27)

### 7. REGULATION OF E-ACTUATORS

All actuators are fitted on our valves shall be regulated as follows:

- <u>Close</u>: per torque according to data given by ERIKS.
- <u>Open</u>: 20% higher than the close torque, but limited by stroke one turn of stem before back seat to avoid damaging the same, so the last turn to reach the back seat will be done manually.

#### **8.** PRESERVATION, PACKING AND STORAGE INSTRUCTIONS

The quality of the painting for coated valves shall be checked on eventual damages before start of packing. Eventual damages shall be touched up. The applicable procedure to be obtained from ERIKS. Non stainless steel areas that are not painted such as flange facings shall be with a thin corrosion protective coating (e.g. "Tectyl Amber" by Valvoline).

Valve stems shall be greased when stem dryness is observed during preventive maintenance procedures (water resistant multi purpose grease e.g. Fuchs Renolit EP 2).

For long term storing, cover the packing access and the position indicator window by using dedicated protecting plastic cups to keep the stuffing box clear of dust and protect the area between the stem and gland.





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Grease nipples shall be coated with a thin layer of water resistant multi purpose grease (e.g. Fuchs Renolit EP 2) to avoid paint adhesion.

8.1. Preservation of inside surfaces of valves:

The inside of the valve must be checked to be fully dry and clean free from moisture and grease. Non stainless steel parts shall be protected by a thin layer of protective coating (e.g. "Tectyl Amber" by Valvoline).

It is not necessary to remove this coating before installation, however in case of long term preservation the protective coating should be applied in 2 layers for extra sealing. In this case cleaning with solvents before installation is preferred.

The valve should be transported and/or stored in closed position in order to avoid damage to the soft vulcanized seals.

8.2. Valve Storage:

For long term storage, indoors storage of the packed equipment is preferred. Leave the valves and/or valve-actuator units in the original packing (crates, cases, etc.) as long as possible before final installation in the pipeline. For valves packed in closed wooden cases, open creates or on wooden pallets depending on the individual project packing requirements. Cases are provided with interior waterproof lining and adequately ventilated. All crates, cases and pallets must be suitable for forklift transportation. Do not stack crates, cases and pallets.

Leave flange protectors on valves until installation

8.3. Slips storage:

Slips and repair kits need to be stored indoors in a clean environment at room temperature and dry conditions. Unpack slips and repair kits only when ready for installation. Once they are unpacked, rubber seals must be protected from dirt, liquids and deformation.

