APPLICATION INFORMATION

Installation
The Series 764 eccentric plug valve is suitable for isolation and throttling applications in both directions. It is recommended the valve should generally be installed with the flow acting on the direct pressure side of the valve, Please see images at the bottom of the page which highlight these recommendations. Any installation of this valve type should be done in accordance with the Series 764 Installation, operation and maintenance instructions. Any necessary fittings such as dismantling joints, flange adaptors etc are available from the AVK product offer. Please contact AVK to discuss your exact requirements.

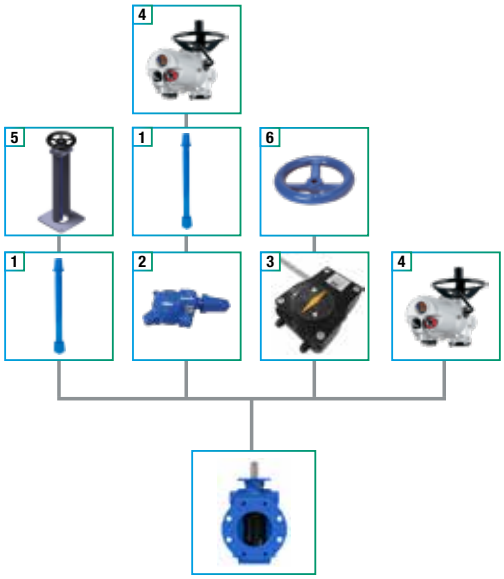
Note: Reverse flow conditions should be stated at the time of order.

Maintenance
The Series 764 eccentric plug valve has been developed to ensure that it provides the optimum performance throughout the duration of its service life. These valves have very low maintenance requirements, details of which are shown in the Series 764 Installation, operation and maintenance instructions.

Design and Construction
The design and construction of the Series 764 eccentric plug valve has been made in full accordance with AWWA C517. There are a number of design features, all of which are shown on page 4. These features have been included to provide maximum operational performance and flexibility.

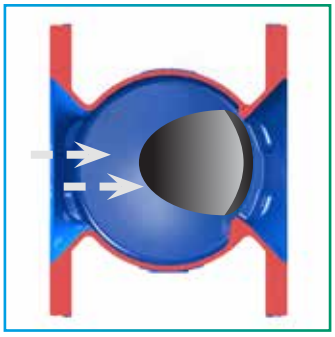
Operation
Manual gearboxes and electrical actuation are available to install directly onto each valve using the multi-flexible ISO mounting flange. No additional adaptor pieces or other equipment is required, providing easy and standard fitting of the operator. All accessories such as extension spindles, floor pedestals are available from the AVK product offer allowing the complete operation package to be supplied. Buried service duty is also available and AVK surface boxes can be supplied for these particular applications.

Options
Buried duty and coastal application / aggressive environment / friction collar is available upon request to suit application. Contact AVK to discuss exact requirements.

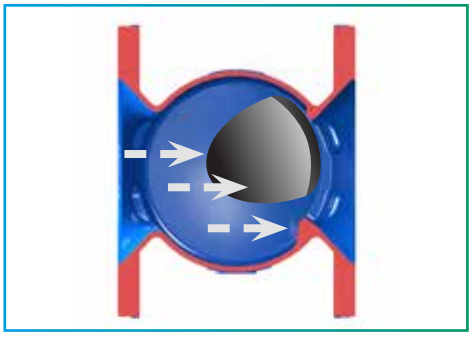


1. Extension spindle
2. Gearbox
3. Worm gearbox
4. Electrical actuator
5. Floor pedestal
6. Hand wheel

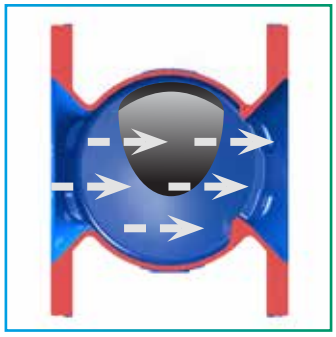
Seat Positions
Due to the design of the valve and the rotary action of the obturator, the Series 764 eccentric plug has many positions giving a range of flow control depending on the system parameters.



Closed valve position
- Higher differential pressure (direct pressure) forces the plug onto the seat, assisting with drop tight closure.



Partially open position
- From fully closed position, the plug rotates in an anti-clockwise direction away from the seat for instant opening.
- The eccentric (or offset) design helps reduce contact and friction between the plug and seat while opening which increases the longevity of the valve whilst also minimising the operating torque requirements.
- The valve can be used to regulate the flow rate by positioning the plug to the desired opening. For continuous flow control applications, the plug should be a minimum of 20 degrees open.



Fully open position
- When the valve is fully open, it acts as a full bore valve. This ensures minimal headloss occurs across the valve therefore increasing the overall flow efficiency of the system.

Installation, Operation and Maintenance Manual

AVK SERIES 764 ECCENTRIC PLUG VALVE

Table of Contents

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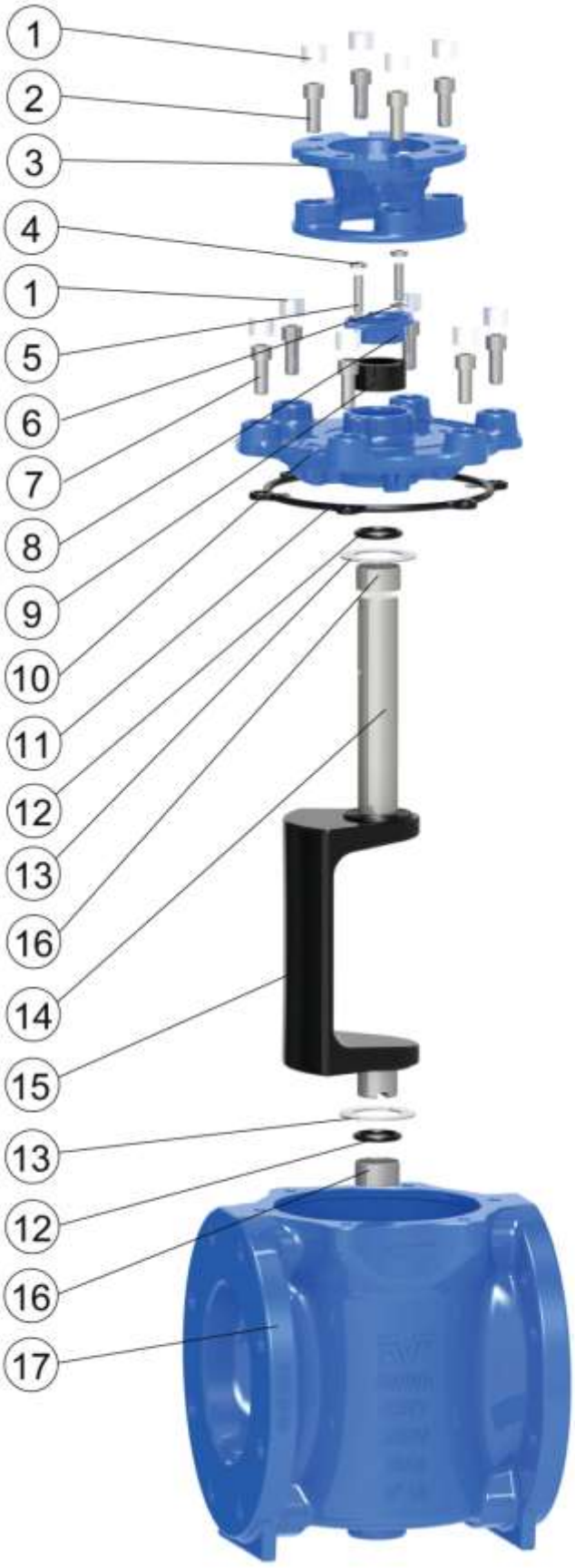
AVK Series 764 Eccentric Plug Valve Exploded View



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1. Parts List

No.	Description	Material
1	Hot melt	\
2	Bolt	Stainless steel
3	ISO Flange	Ductile iron
4	Hexagon nut	Stainless steel
5	Threaded rod	Stainless steel
6	Washer	Stainless steel
7	Bolt	Stainless steel
8	Gland	Ductile Iron
9	Packing	NBR / EPDM
10	Bonnet	Ductile iron
11	Bonnet gasket	NBR / EPDM
12	O-ring	NBR / EPDM
13	Thrust washer	Bronze / PTFE
14	Plug core	Ductile iron
15	Plug rubber	NBR / EPDM
16	Bearing	Self-lubricating, stainless steel backed, PTFE coated, bronze bearing
17	Body	Ductile Iron

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2. Health & Safety at work

Make sure all relevant health and safety issues and regulations are adhered to prior to and during installation or maintenance work carried out on this product. It is the end users responsibility to ensure that safe working practices are followed at all times.

Whenever AVK's products are installed, operated or maintained the inherent dangers of pressurized liquids and gasses must be addressed. Before work on a valve or other piping component is undertaken, that may involve the release of internal pressure, the valve or line must be fully isolated, depressurized and drained prior to commencing the work.

All workers handling the product must be aware of the weight of the components or assemblies to be handled and manipulated during installation and maintenance. It is essential that staff undertaking these operations are adequately trained and it is the responsibility of the end user that only trained and competent staff undertake these duties.

This manual has been designed to assist, but it cannot replace quality training in the workplace. However, AVK's technical staff are always available to answer questions relating to specific problems that may not be covered by this manual.

AVK's products are designed to be fit for purpose and to a high reliability standard. This provides a safe, low risk product when used correctly for the purpose for which it was designed. However, this assumes that the equipment is used and maintained in accordance with this manual, and the user is advised to study it and to make it available to all staff that may need to refer to it.

AVK Valves cannot be held responsible for incidents arising from incorrect installation, operation or maintenance. The responsibility for this rests wholly with the end user.

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3. Introduction

AVK eccentric plug valves are designed with built-in safety in every detail. Plug valves are used for isolation purposes in water and wastewater installations, for pump control shut-off and flow control applications. The Series 764 eccentric plug valve is fully bi-directional as standard. The plug is fully vulcanized with AVK's own rubber compound (either EPDM or NBR) which, due to its sturdy design and double bonding vulcanization, features an outstanding durability with the plugs rubber ability to regain its original shape. The valve has a welded nickel seat and a full port design allowing high flow capability with minimal head loss when in the fully open position. The valve body, bonnet and ISO mounting flange are all epoxy coated internally and externally for optimal corrosion resistance. The valve design incorporates a unique integral ISO operator mounting which provides increased flexibility when selecting gearbox or electrical actuator units.

4. Receiving and Storage

4.1 Unloading

All valves should be carefully unloaded. Each valve should be carefully lowered from the truck to the ground; it should not be dropped. Do not lift valves with slings or chain around actuator or through waterway. Lift valves with eyebolts or rods through flange holes or chain hook at the ends of valve parts. Failure to carefully follow these recommendations is likely to result in damage to the valve as well as risk of personal injury.

4.2 Inspection after unloading

AVK eccentric plug valves should be inspected for damage at the time of receipt. The initial inspection should verify compliance with specifications, direction of opening, size and flange details. A visual inspection of the seating surfaces should be performed to detect any damage in shipment or scoring of the seating surfaces. Inspection personnel should look for any other evidence of mishandling during shipment. Each valve should be operated through one complete opening-and-closing cycle in the position in which it is to be installed.

4.3 Storage

1. The plug valves should be stored in a manner that protects them from the environment, preferably indoors.
2. The valves should be stored with the plug in the open position to prevent unnecessary compression of the rubber compound.
3. The plug should also be protected from sunlight, ozone and chemical exposure.
4. In colder climates, valves should be drained and left slightly open before storage. Failure to do so may result in damage to the valve castings from water freezing.
5. Valves stored outside should be stored with the plug core in the vertical position. If the valves are stored in the horizontal or flat position, rainwater may accumulate in the valve cavity, potentially causing damage due to water freezing.

5. Installation and Testing

5.1 Inspection prior to installation:

1. Visually inspect each valve for any foreign material in the interior of the valve and remove it if present.

2. Inspect each valve in a similar manner as described in the "INSPECTION AFTER" section of this manual.

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5.2 Installation:

1. Valves in water distribution lines should, where practical, be located in easily accessible areas.
2. During installation there is the possibility of foreign materials inadvertently entering the valve. Foreign material can damage the internal working parts during operation of the eccentric plug valves. For this reason, eccentric plug valves should be installed in the closed position. Each valve should be placed on firm footing in the trench to prevent settling and excessive strain on the connection to the pipe. Piping systems should be supported and aligned to avoid damage to the valve.
3. A valve box or vault should be provided for each valve in a buried-service application. The valve box should be designed and installed so as to not transmit shock loads or stress to the valve.
4. Valves buried in unusually deep trenches should have special provisions for operating the valve. Gear actuators are recommended for buried valves to hold the valve in position and provide multi-turn closure. The valve should be installed with the shaft horizontal and the actuator nut directed upwards. Either a riser on the stem to permit use of a normal key or a notation on the valve records that a long key will be required.
5. Valves installed above ground or in a plant piping system should be supported and aligned to avoid damage to the valves.
6. Tighten the flange connection bolts and nuts in the crossover method shown in Figure 2 to load the pipe and valve evenly and prevent stress on the joints.

Fig.1

Fig.2

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Liquids without suspended solids

1. Before installation, remove foreign material such as weld spatter, oil, grease, and dirt from the valve and pipeline.
2. Install the valve as shown in Figures 3 & 4.
3. Ensure the valve and flanges are concentric to effect proper flange sealing.
4. Tighten the flange bolts or studs in a sequence according to Figure 2

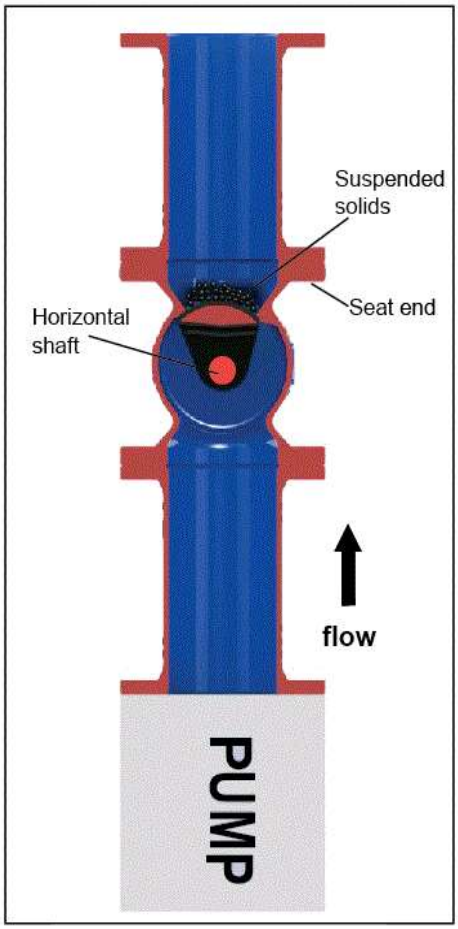

Fig.3 Vertical installation

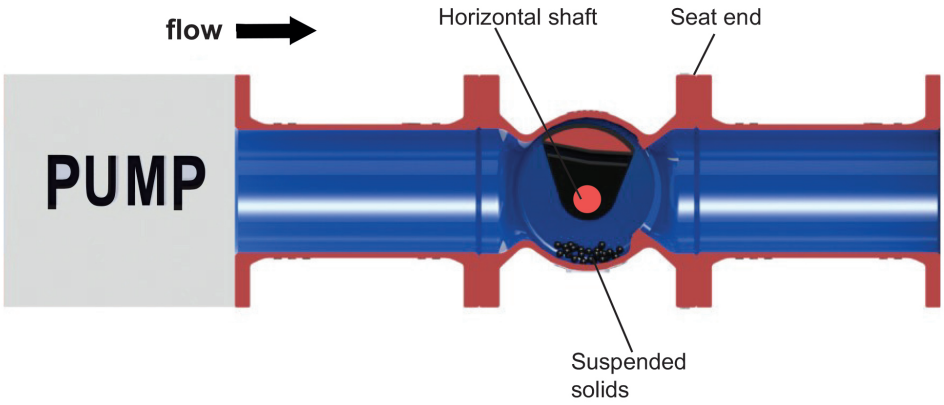

Fig.4 Horizontal installation

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Liquids with suspended Solids

1. Before installation, remove foreign material such as weld spatter, oil, grease, and dirt from the valve and pipeline.
2. Install the valve as shown in Figures 3 & 4.

A. In horizontal pipelines install valve so plug is horizontal and rotates upward as valve opens.
B. For vertical pipelines, install valve with the end marked “Seat” at top of valve.

3. Tighten the flange bolts or studs in a sequence according to Figure 2.
4. Ensure the valve and flanges are concentric to effect proper flange sealing.

GEARBOX / ACTUATOR OPERATED VALVES: Actuators (gear and electric actuators) are designed for flow velocities according to EN1074-1 Table 2 (valves for water supply). Any deviation in these operating conditions must be specified prior to order placement. Adjustment of the limit stops (open / close) must not be changed without the manufacturer’s approval. If the valve is installed without gear units, it must be ensured that the valve is not pressurized.

- Pressure rating PN 6: 2.5 m/s
- Pressure rating PN 10: 3 m/s
- Pressure rating PN 16: 4 m/s

For detailed information on gears and actuators, please see the operation manuals issued by the manufacturer of these components.

The AVK eccentric plug valve has an adjustment angle of 90°. The valve itself is not equipped with position limiters. For position indication, this is shown on the gearbox / electrical actuator.

The operating gearbox / electrical actuator is mounted on the unique integral ISO flange.

Flow coefficients and head loss characteristics for each DN size are shown in Figures 8 – 13.
Red lines defining cavitation limits depending on installation conditions.

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DN80								
POSITION	20°	30°	40°	50°	60°	70°	80°	90°
Kv [m3/h] Excluding pipe head loss	76	108	144	228	279	332	384	459

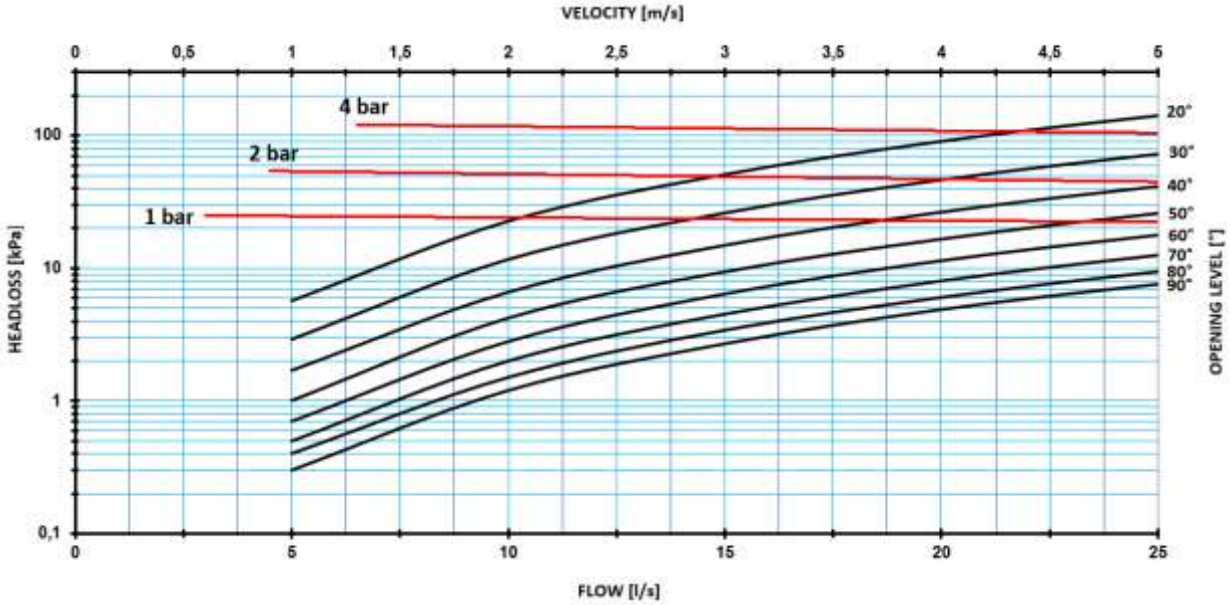

Fig.8 DN80

DN100								
POSITION	20°	30°	40°	50°	60°	70°	80°	90°
Kv [m3/h] Excluding pipe head loss	137	198	261	346	451	578	675	760

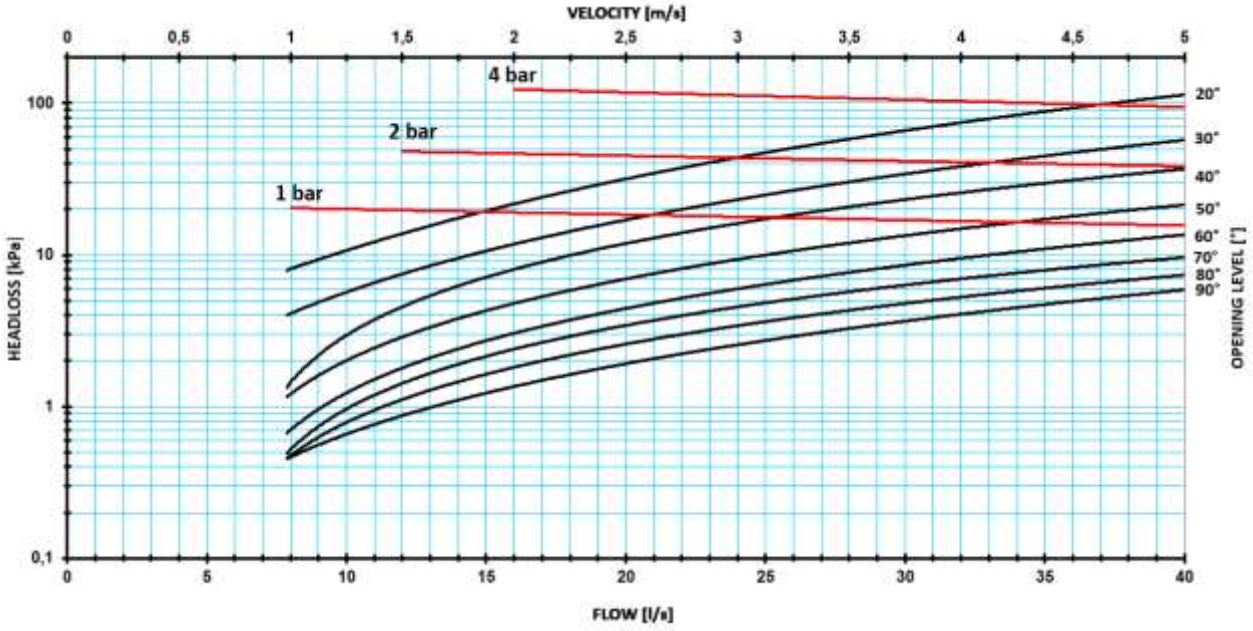

Fig.9 DN100

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DN150								
POSITION	20°	30°	40°	50°	60°	70°	80°	90°
Kv [m3/h] Excluding pipe head loss	285	399	528	833	1007	1245	1468	1548

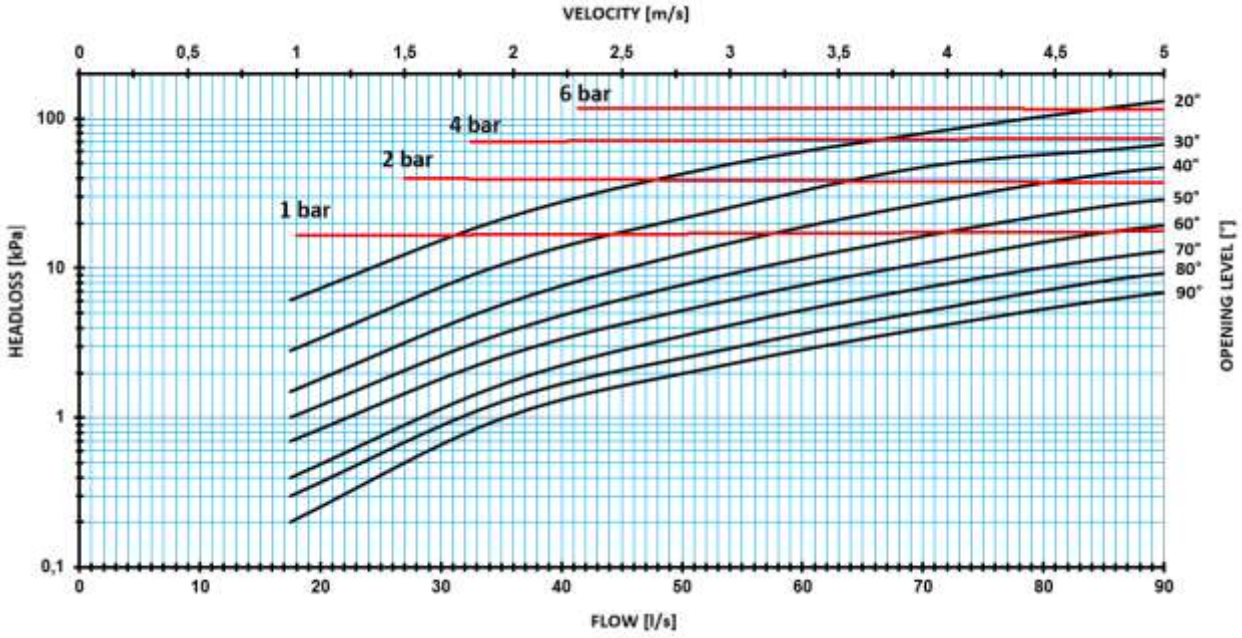

Fig.10 DN150

DN200								
POSITION	20°	30°	40°	50°	60°	70°	80°	90°
Kv [m3/h] Excluding pipe head loss	321	485	675	1112	1337	1592	1832	1844

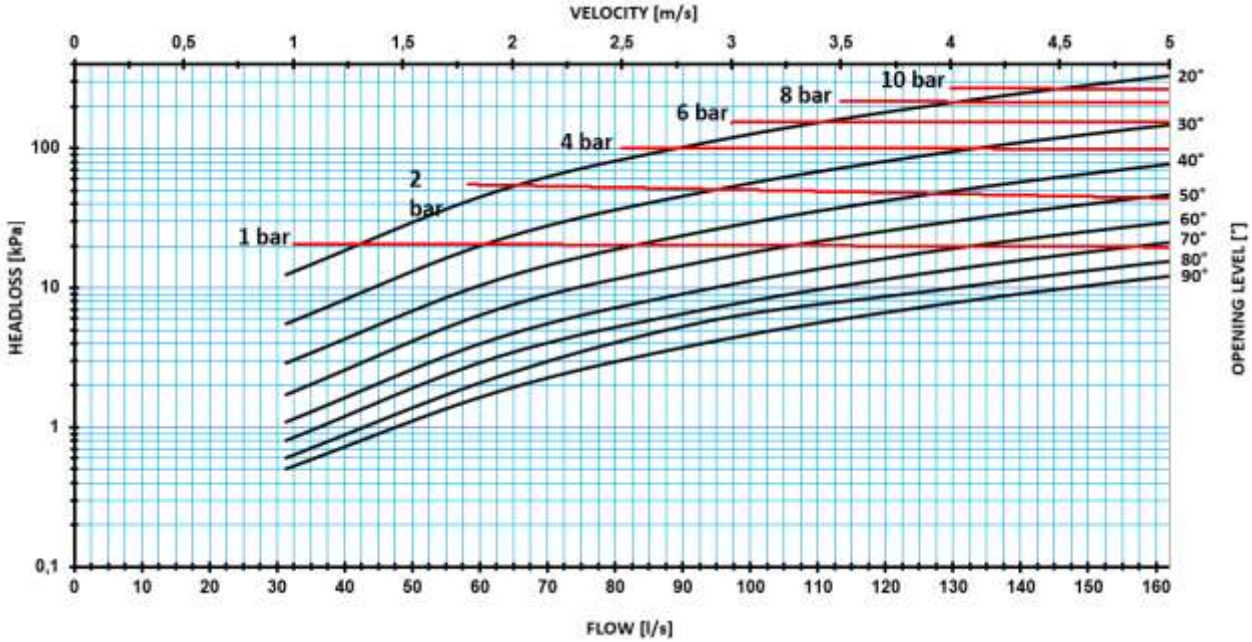

Fig.11 DN200

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DN250								
POSITION	20°	30°	40°	50°	60°	70°	80°	90°
Kv [m3/h] Excluding pipe head loss	713	1004	1334	2006	2436	2738	2773	2848

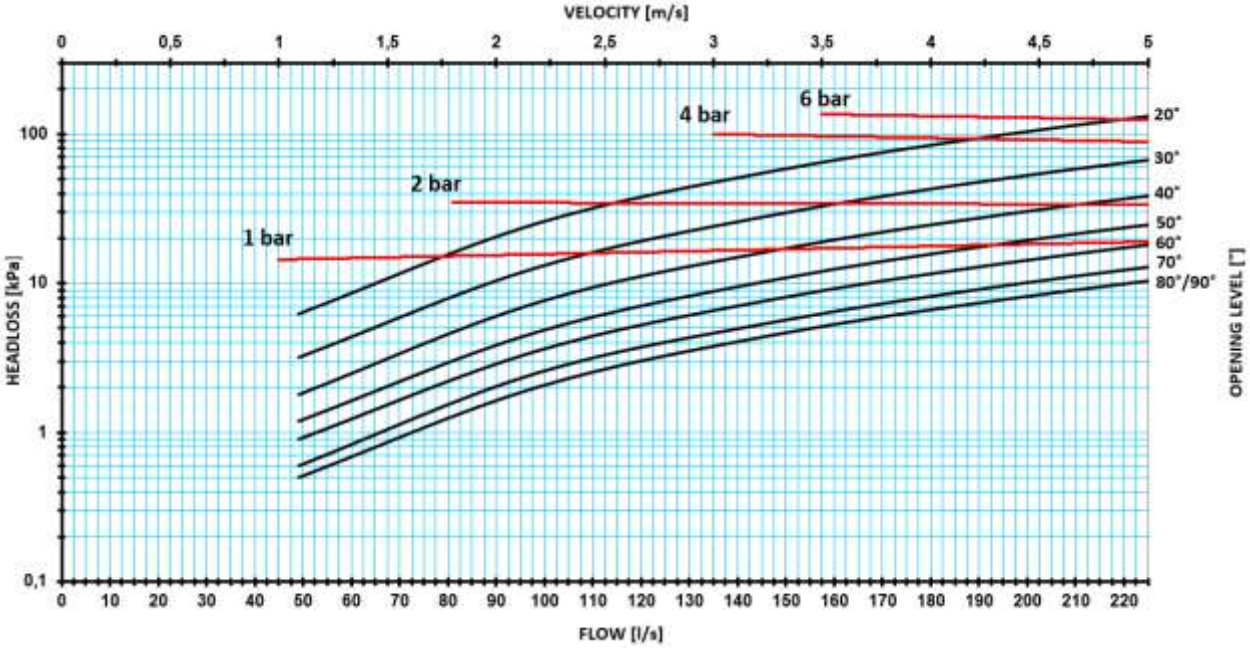

Fig.12 250

DN300								
POSITION	20°	30°	40°	50°	60°	70°	80°	90°
Kv [m3/h] Excluding pipe head loss	929	1360	1749	2391	2670	2895	3075	3081

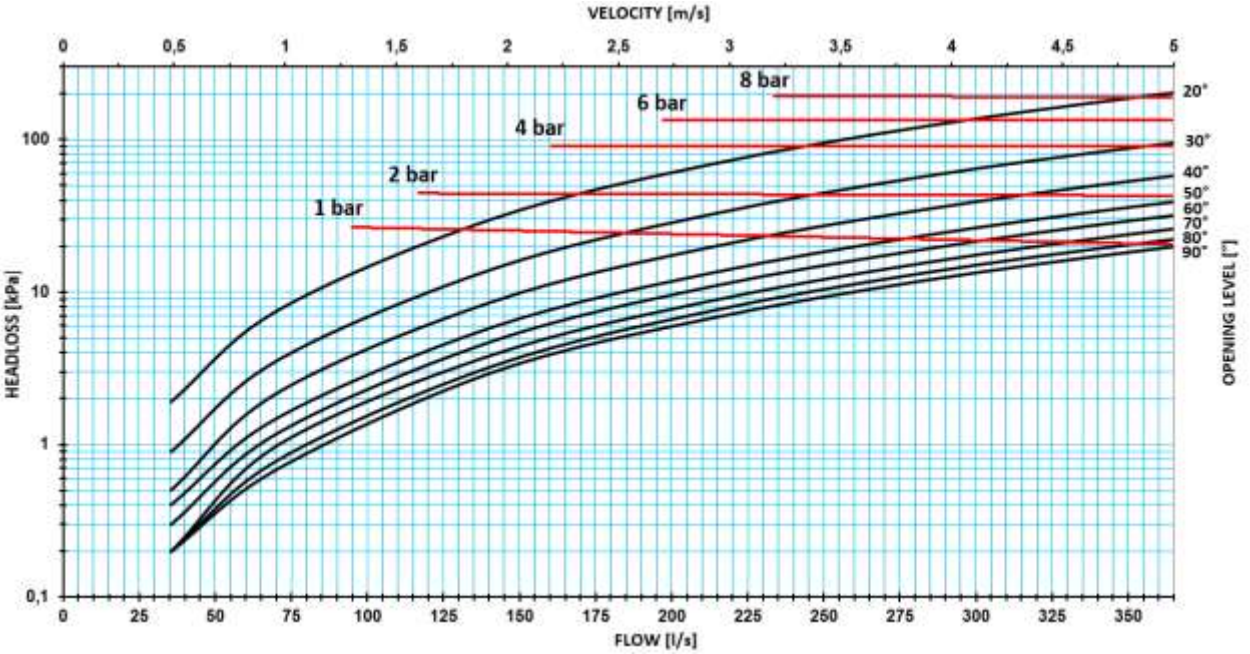

Fig.13 DN300

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5.3 Testing after installation:

In order to prevent time searching for potential leaks, it is recommended that excavations should not be backfilled until after pressure tests of the pipeline system have been made. After installation, it is desirable to test newly installed piping sections, including valves, at some pressure above the system designed pressure. The test pressure should not exceed the rated working pressure of the valve. After the test, steps should be taken to relieve any trapped pressure in the body of the valve. The valve should not be operated in either the opening or closing direction at differential pressures above the rated working pressure. It is also recognized that wear or foreign material may damage valve seating surfaces and may cause leakage.

On completion of the installation, valve location, size, make, type, date of installation, angle to open, direction of opening, and other information deemed pertinent should be entered on permanent records.

5.4 Application hazards:

1. AVK eccentric plug valves should not be installed in lines where service pressure will exceed the rated working pressure of the valve.

2. The valve should not be used in applications that are exposed to freezing temperatures unless sufficient flow is maintained through the valve or other protection is provided to prevent freezing.

3. Pipe, fittings, and valves installed in underground pipelines are generally joined with mechanical joints. These joints are considered unrestrained-type joints since no considerable restraint against longitudinal separation is provided.

4. Plug valves should not be installed in a dead end or near a bend in a pipeline without proper and adequate restraint to support the valve and prevent it from damage.

5. It is good engineering practice to consider during the design whether or not thrust blocks, restrained joints, or other means of restraint are needed on or adjacent to valves on pipelines and/or where unusual conditions exist, such as high internal pressures, adjacent fittings, or unsuitable soils.

6. The valve should not be used as a lifting device for pipes (or equal) mounted on the valve

6. Operation and Maintenance

6.1 Operation:

As shown in Figure14, the valve consists of a body and a quarter turn plug that is offset from the seat centerline. The eccentric offset causes the plug to lift and rotate off the seat simultaneously to reduce seat friction and wear during operation. Direct pressure pushes the plug onto the seat and reverse pressure pushes the plug away from the seat. The valve is operated by rotating 90 degrees. The valve can be adjusted to a maximum of 5 degrees over travel. The valves can be used to regulate flow rate by positioning the plug between 20 and 90 degrees open. A clockwise rotation will close the valve.

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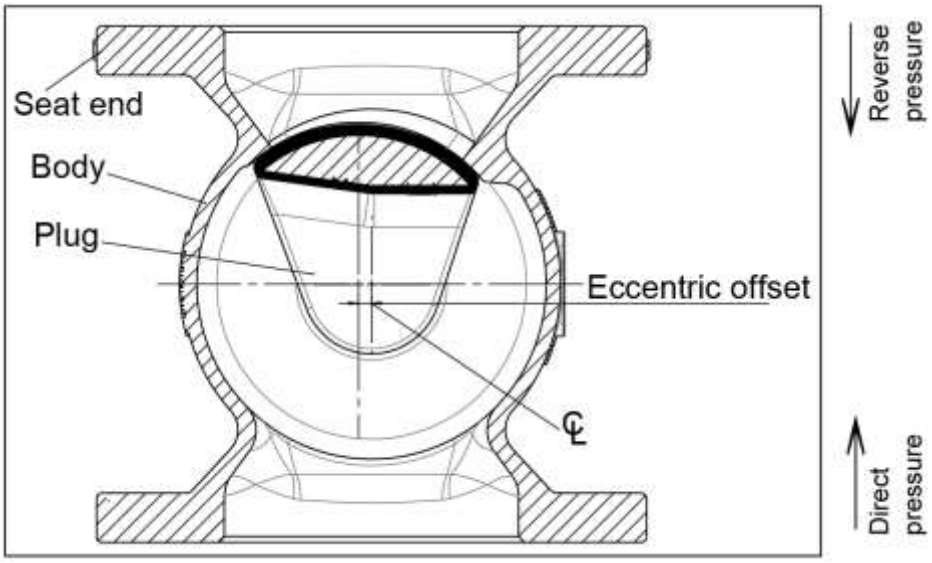

Fig.14

6.2 Maintenance procedures:

6.2.1 Inspection:

Each valve should be operated through one complete cycle. With the plug in the partially open position, a visual inspection should be performed, where practical, to check for leakage at all joints, connections, and areas of packing or seals. If leakage is observed, all defective O-rings, seals, gaskets, or end connection sealing members should be replaced. If the leakage cannot be corrected immediately, the nature of the leakage should be reported promptly to those who are responsible for repairs. If the valve is inoperable or irreparable, its location should be clearly established to save time for repair crews. The condition of the valve, and if possible, the plug position, should be reported to personnel responsible for repairs. In addition, fire departments and other municipal departments should be informed that the valve is out of service.

The recommended interval for exercising is every six months or annually if the valve is regularly operated. Over the life of the valve, inspection and some regular adjustments may be needed.

6.2.2 Record keeping:

In order to carry out a meaningful inspection and maintenance program, it is essential that the location, make, type, size, and date of installation of each valve be recorded. Depending on the type of record system used, other information may be entered in the permanent record. When an eccentric plug valve is inspected, an entry should be entered in the permanent record indicating the date of inspection and condition of the valve. If repair work is necessary, it should be indicated. On completion of the work, the nature of the repairs and date completed should be recorded.

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7. Repair procedures

Leakage, broken parts, difficult operation, and other major defects should be corrected by a repair crew as soon as possible after the defect has been reported. If repairs are to be performed in the field, the repair crews should take a full complement of spare parts to the jobsite. Provisions should be made to isolate the defective valve from water pressure and relieve internal trapped pressure prior to performing any corrective maintenance. Disassembly of the valve should be accomplished in accordance with the procedure supplied in the following sections. After repairing the valve, the operating mechanism should be cycled through one complete operating cycle. With full line pressure applied to the valve in the open position, an inspection should be made to detect leakage in the areas around the seat, bonnet, packing/stem, and body-end connections. A record should be made to indicate that the valve has been repaired and is in working condition. Any marking that the valve is inoperable should be removed. In addition, fire department and other appropriate municipal departments should be informed of satisfactory repair of the valve.

7.1 Packing adjustment (Figure 15)

1. This can be carried out with the valve under pressure in the pipeline.
2. Tighten the two gland nuts (4) on gland (8) to stop the leakage.
3. If the leakage continues, the packing should be replaced.

7.2 Packing replacement (Figure 15)

1. Isolate the valve and depressurize the line.
2. Remove hot melt (1) to expose ISO flange bolts. (2)
3. Remove actuator. See actuator instruction.
4. Remove ISO flange (3) with bolts (2).
5. Remove gland (8) & gland nuts(4) & washers(6).
6. Replace packing (9) from bonnet cavity , and slightly grease them with a drinking water approved lubricant.
7. Replace gland (8) and ensure it makes contact with the packing (9). Tighten gland nuts (4) to compress the packing (9) until there is no leakage.
8. Replace ISO flange (3) and tighten the ISO flange bolts (2) (See table 1)
9. Install actuator. See actuator instruction.

Size	Tighten bolt torque (N m)
DN65, 80	40
DN100, 150	48
DN200	64
DN250, 300	80

Table 1 - recommended bolt torques

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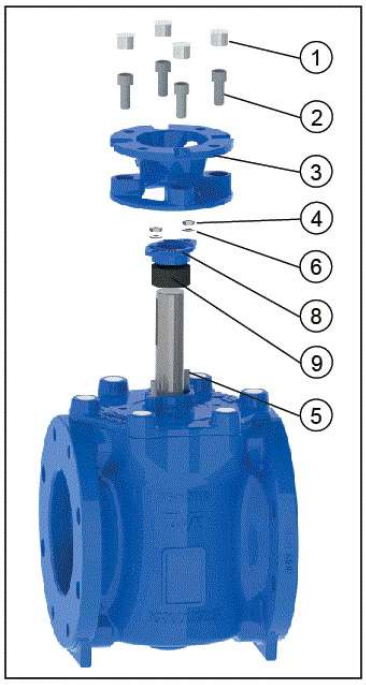

Fig.15

7.3 Replace bonnet gasket: (Figure 16)

1. Isolate valve and depressurize the line.
2. Remove hot melt (1) to expose bonnet bolts (2).
3. Remove actuator. See actuator instruction.
4. Disassemble ISO flange (3) , gland (8), gland nuts (4) and packing (9).
5. Remove bonnet bolts (2) and lift bonnet (10).
6. Replace bonnet gasket (11) then reassemble bonnet (10) and tighten bonnet bolts (2) (see table 1).
7. Replace packing (9) , gland (8), washers (6) and tighten the gland nuts (4) to compress packing (9) until no leakage.
8. Replace ISO flange (3) and tighten the ISO flange bolts (2) (see table 1)
9. Install actuator. See actuator instruction.

Fig.16

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Fig.17

7.4 Replace other components: (Figure 17)

1. Isolate valve and depressurize the line.
2. Remove hot melt (1) to expose bonnet bolts (2).
3. Remove actuator. See actuator instruction.
4. Disassemble and remove ISO flange (3) , gland nuts (4), gland (8) and packing (9).
5. Remove bonnet bolts (2) and lift bonnet (10) .
6. Push plug (15) out of body (17), replace needed components then reassemble
7. Replace assembly of plug with thrust washers (13) and o-rings (12) , bonnet gasket (11) , bonnet (10) and tighten bonnet bolts (2) (see table 1)
8. Replace packing (9) , gland (8), washers (6) and tighten the gland nuts (4) to compress packing (9) until no leakage
9. Replace ISO flange (3) and tighten the ISO flange bolts (2) (see table 1)
10. Install actuator**.** See actuator instruction.

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8. Trouble shooting guide

WARNING: The valve must be isolated before performing most maintenance. Failure to do so may cause pressure to be released resulting in severe injury or death.

Problem	Cause	Remedial actions
Valve leaking around stem/ ISO flange	1. Damaged or worn packing	1. Refer to the REPAIR PROCEDURES sections of this manual and tighten or replace the packing.
Valve leaking around Bonnet and Body	1. Bonnet bolts loose 2. Damaged Bonnet Gasket	1. Tighten Bonnet Bolts 2. Replace Bonnet Gasket
Valve leaking around pipe connections	/	1. Tighten flange hardware 2. Verify gasket is not damaged. Replace if necessary
Valve cannot be operated	1. Foreign matter jammed in the seat area 2. Gear blocked 3. No electrical connection of the electric actuator 4. Unfavourable flow and impairment of movement	1. Flush valve, dismantle if necessary, and remove foreign matter 2. Undo blocking 3. Establish the electrical connection 4. Change installation position
Leaks in the body seat	1. The valve is not completely closed 2. Valve plug damaged or worn, when fully closed.	1. Close the valve completely 2. Replace plug
Noisy operation- Cavitation in valve	1. Valve operating beyond its design limits 2. Operational data changed	1. Check operating conditions, design limits, flow velocity. Provide inspection of installation for e.g. daily or weekly.
High operating forces	1. Valve seat polluted by deposits 2. The valve is dry in pipeline, no medium present	1. Flush the valve, dismantle it if necessary, and clean the seat area 2. The valve is operated more easily when it is wet

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