AVK WATER SUPPLY

WE DELIVER
PURE
QUALITY
JUST LIKE YOU

Expect ... AVK

LET'S ENSURE SAFE AND CLEAN WATER FOR EVERYONE

Reliability and purity are crucial when it comes to water supply. AVK products are renowned for superior quality thanks to our market leading expertise when it comes to rubber compounds. Due to own vulcanisation and coating facilities and worldwide approvals for drinking water we can ensure maximum safety and durability.

AVK has been in the valve business for about 50 years. Today, we are offering solutions for numerous applications, not least valves, hydrants and accessories for water supply. Our wide range includes gate valves, butterfly valves, control valves, check valves, needle valves, air valves, service connection valves and hydrants as well as flange adaptors, couplings, fittings, tapping saddles, repair clamps, surface boxes and valve accessories.

Our quality assurance system is certified according to ISO 9001. Moreover, we are certified to ISO 14001, the international standard for environmental management, and to OHSAS 18001, the international Occupational Health and Safety Standard.

More than 4300+ people in the AVK Group are doing their utmost to ensure that AVK remains one of the world's leading valve manufacturers for water, wastewater, gas, and fire protection applications..

ABOUT
AVK MALAYSIA

AVK GROUP

The AVK Group is a privately owned industrial group that currently comprises 100+ companies. AVK's core business is the production of valves, hydrants and accessories for the industrial, firefighting markets, water and gas distribution networks and sewage treatment.
AVK valves are part of vital infrastructure systems that include potable water distribution, wastewater treatment, distribution of natural gas to be used for heating and electricity and sprinkle systems used for fire protection. AVK hydrants are used for outdoor fire protection systems in industrial areas and around large buildings and by firefighters to extinguish fires in our communities. We aim at developing products which will make a difference now and in future, for instance products that will help solve the crucial problem of water loss, and not least products which offer the most cost-efficient solution for our customers in the long run.

AVK MALAYSIA

AVK Valves Manufacturing Malaysia Sdn Bhd. is a part of the AVK Group. We have the overall responsibility of sales, marketing, and distribution of AVK Valves in Malaysia and numerous countries in Southeast Asia. Established in 2003, today we are employing 35 good employees working across operation, sales and marketing, customer service, supply chain, products, quality control, technical service and finance in Klang, Selangor. It is our purpose to market products of high quality and with a long lifetime that are part of vital infrastructure including water supply, wastewater treatment and energy supply as well as a variety of other industrial applications that all together contribute to sustainable development, the health of people and a better environment. We aim at developing products which will make a difference now and in future, for instance products that will help solve the crucial problem of water loss, and not least products which offer the most cost-efficient solution for our customers in the long run.

AVK Malaysia Factory, Klang, Selangor.

EXPECT US TO EXCEED MARKET STANDARDS

Third party certification
Authorities such as DVGW (Germany), KIWA (Netherlands),UL & FM (the US) and SPAN (Malaysia) offer certification of finished valves, and these are also recognised and accepted by other countries that do not have their own certification schemes.

By obtaining and maintaining the most widely accepted certification, we show our customers that AVK valves always meet the highest quality and safety standards.

HALAL Certificate for Grease

Halal Valves
Certain chemicals used in the production of synthetic rubber and grease can be derived from animal fats.

Since media - especially clean drinking water supplied in the distribution network - comes directly in contact with rubber compounds / elements used in valves, hydrants, and associated accessories, it is important to ensure these components / elements are Halal certified with respect to Malaysia whose official religion is Islam. Halal Certificate assures that the products are thoroughly checked in accordance to the Islamic Shariah Laws by the concerned board. Such importance is also seen in the requirements stated in product registration guidelines of National Water Service Commission (SPAN).

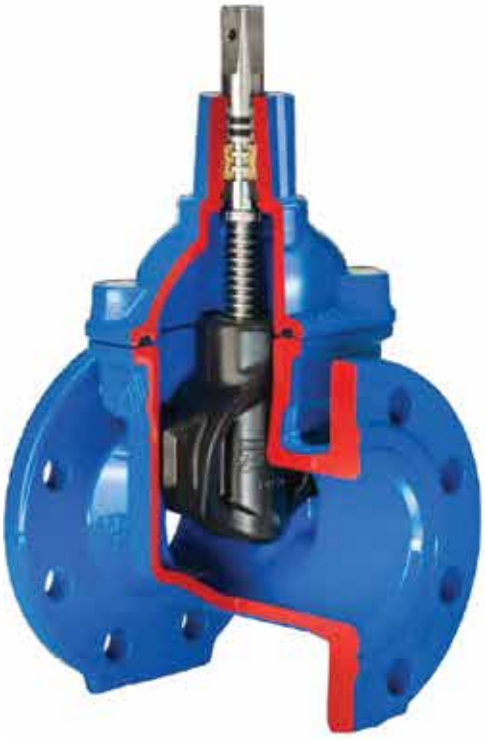
AVK has all its rubber components and grease HALAL certified by authorised body recognized by JAKIM.

AVK Rubber Compound – HALAL Certification
For more than 30 years AVK GUMMI has manufactured components for use in drinking water supplies. Our experience in this field derives from many years of close co-operation with leading manufacturers of fittings, valves and pumps.

The R&D department of AVK GUMMI uses this knowledge to develop rubber compounds with continuously improved properties.

HALAL Certificate for Rubber

AVK GATE VALVES
RENOWNED FOR SUPERIOR QUALITY



The wedge is the heart of a gate valve and the quality of the wedge rubber is crucial for the valve function and durability. AVK wedges are fully vulcanised with AVK's rubber compound offering outstanding characteristics.

The double bonding vulcanisation process ensures maximum adhesion of the rubber and prevents creeping corrosion.

Fixed wedge nut prevents corrosion
AVK's wedge nut design with a fixed, integral wedge nut outperforms the traditional loose wedge nut design as it prevents vibration and thus also corrosion and malfunction. It is made of low-lead brass according to the stringent EU standards.

Wedge shoes for smooth operation
The fixed wedge nut and the vulcanised wedge shoes secure a smooth operation of the valve and low operating torques. The wedge shoes protect the rubber against wear which otherwise would arise from friction during operation.

State-of-the-art rubber technology
AVK GUMMI A/S develops and manufactures the rubber compound for wedges and gaskets using highly advanced technologies.

Data is collected throughout the entire manufacturing process which secures traceability of every single ingredient, compound and final component. AVK performs a number of tests to ensure that the compression set values, the adhesion and the tensile strength of the rubber meet the predefined requirements.

Safe operation
The large stem hole prevents stagnant water and accumulation of impurities. The large rubber volume in the sealing area combined with the excellent compression set provide optimum sealing.

Efficient bonding is the key to durability
The wedge core is immersed in two different baths to provide ultimate bonding between core and rubber. Even if a sharp object penetrates the rubber during closing of the valve, the bonding is so strong that there is no risk of creeping corrosion. As a result, we offer the best possible corrosion protection of the wedge.

No contamination of drinking water
The EPDM rubber recipes are composed with focus on minimising the formation of biofilm. The rubber will therefore not provide breeding ground for bacteria.

High resistance
The drinking water approved EPDM compounds are resistant to ozone and water treatment chemicals, and are of course taste, smell and colour neutral.

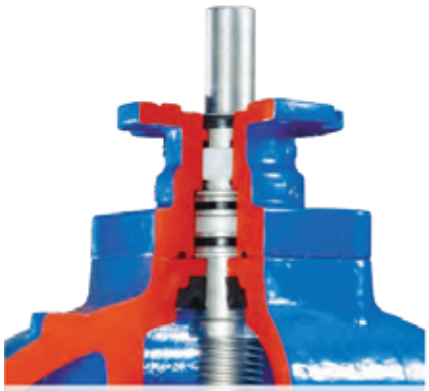
Excellent ability to regain original shape
AVK GUMMI A/S has a profound knowledge of a rubber's compression set, meaning its ability to regain original shape.

Even after many years of service where the wedge rubber has been compressed numerous times, the rubber will regain its original shape and ensure a tight sealing. Impurities will not affect the tightness of the valve, as the impurities will be absorbed in the rubber when the valve is in closed position and will be flushed away when the valve is reopened.

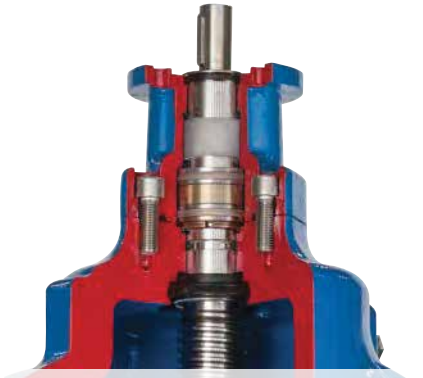
In closed position impurities are absorbed in the rubber

When reopened the rubber will regain its shape

AVK GATE VALVES OFFER UNIQUE FEATURES



Gate valves DN450-600
In DN450-600 the valves are designed with two roller bearings and a thrust collar of stainless steel to ensure low operating torques.



Gate valves DN800-1000
Thrust washers and nylon bearings are used due to the higher axial forces.

Wedge stop and rolled threads
The wedge stop provides a firm stop against the wedge nut when opening the valve. This prevents the wedge from compressing the stem seals and from damaging the coating inside the bonnet. Therefore, the wedge stop gives prolonged durability of the valve.

The stem threads are rolled in a cold pressing process which maintains the steel structure and therefore increases the strength of the stem. This method also ensures a smooth thread surface that gives low operating torques.

Triple safety stem sealing
An NBR wiper ring protects against impurities from the outside. Tightness and low friction are provided by four NBR O-rings in a polyamide bearing, or optionally a replaceable brass stem nut, preventing galvanic corrosion. An EPDM manchette is the main seal to the flow.

The full circle thrust collar of high strength deszincification resistant brass provides fixation of the stem and low free running torques.

The stem is mounted from below, and the thrust collar expands inside the bonnet and fixes the stem, preventing it from being blown out.

Two strong coatings
The standard corrosion protection is an internal and external fusion bonded epoxy coating in compliance with DIN 3476 part 1 and EN 14901, GSK approved. Furthermore, we offer gate valves with a highly wear-resistant internal enamel lining offering excellent protec-tion against creeping corrosion.

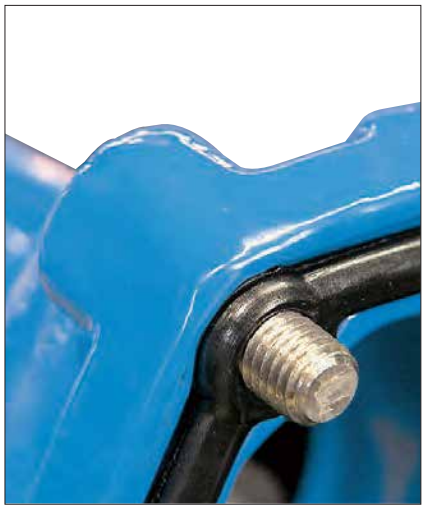
We control each batch of epoxy coated compo-nents to ensure a layer thickness of minimum 250 µ, a pore-free surface, high impact resistance and adequate curing. In addition to our own tests, the independent GSK authorities control the adhesion and cathodic disbonding of the epoxy coating according to their guidelines.

Tight assembly of valve body and bonnet
An EPDM bonnet gasket is fixed in a recess in the bonnet to prevent blow-out. The stainless steel bonnet bolts are encircled by the bonnet gasket, embedded in the casting to ensure that no threads are exposed to the surroundings, and finally sealed with hot melt to prevent corrosion.

Strong PE end connection
The DVGW approved class 1 connection is stronger than the PE pipe itself, and the full and straight bore ensures minimum pressure loss and makes underpressure drilling possible.

A piece of standard PE pipe is pressed directly onto the grooved valve end. The grooves combined with a sleeve around the valve/pipe connection ensure that the PE pipe material is firmly secured and that the connection remains tight and tensile during the entire service life of the pipeline. The connection is sealed with a shrink hose to provide corrosion protection.

Pressure test
Every single valve is pressure tested according to EN 1074-1 and 2 /EN 12266 before leaving the factory.



Feature summary
- Fixed, integral wedge nut prevents corrosion caused by vibration
- Wedge and body guide rails ensure stable operation
- AVK's wedge rubber has an excellent ability to regain its shape
- AVK's wedge rubber features an excellent bonding, minimum formation of biofilm and a high resistance to water treatment chemicals
- Wedge shoes protect the rubber against wear
- Large stem hole in the wedge prevents stagnant water
- Rolled threads increase the stem's strength
- Anti-blowout stem design
- Wedge stop protects seals and coating
- Triple safety stem sealing
- Thrust collar provides fixation of the stem and low free running torques
- Bonnet gasket is fixed in recess and encircles bonnet bolts to prevent blow-out
- Countersunk bonnet bolts sealed with hot melt to protect against corrosion
- Full bore ensures low head loss and enables use of pipe cleaning devices
- Low operating torques ensure easy operation
- Fusion bonded epoxy coating in compliance with DIN 3476 part 1 and EN 14901, GSK approved, optionally internal enamel

AVK GATE VALVES
METAL SEATED

AVK metal seated gate valves are designed with built-in safety and quality in every detail. The metal valve seat is resistant to high temperatures in the medium and will not deform during long periods of compression. This ensures stable and reliable operation over the long life span of the valve.

DN350-600 DN700-1000 and DN1200 DN1100 and DN1400-1800

Features

- High strength alu-bronze valve seat
- Metal faces machined to a high finish for optimum contact and minimum leakage
- Stem in stainless steel
- DN350-600 four separate and independent O-ring stem seals
- DN≥700 stuffing box with ample depth gives long life to the PTFE packing
- Round body-bonnet O-cord gasket fixed in a recess to avoid blow-out
- Full bore
- Lifting eyes for easy handling
- All rubber and coating in contact with the water are drinking water approved
- Guides on the wedge helps provide steady operation
- DN350-600 protected fasteners in galvanized 8.8 steel, exposed fasteners in A4 stainless steel
- DN≥700 fasteners in galvanized 8.8 steel
- DN350-1000 protected by 250µm blue fusion bonded epoxy coating
- DN≥1100 protected by 250µm blue 2-pack epoxy coating
- Prepared for by-pass

The metal seated gate valve is available in sizes up to DN2200. The valves are designed in accordance with the main international standards, e.g. EN, BS, DIN, AS, AWWA, WIMES etc.

The valves are usually constructed in ductile iron with bronze seats and a stainless steel stem. They are protected externally and internally with appropriate coatings.

Each and every valve is thoroughly tested before it leaves our production facilities. Shell (body) and seat tests naturally comply with national and international standards.

AVK offers PN10 and PN16 rated valves as standard – and up to PN50 in certain dimensions/applications. For AWWA we can supply 150 PSI, 250 PSI and up to 300 PSI nominal working pressure.

A gate valve (also applicable for resilient seated executions) has much lower head loss than a butterfly valve and therefore consumes less energy during system operation.

The annual energy savings that result from using this design gate valve over a butterfly valve are therefore considerable. The full open headloss coefficient for large gate valves is in order of 0.05 against 0.18 for butterfly valves. The energy saving is proportional to this.

The gate valves are also suitable for pipe pigging and for higher velocities in full open position compared to most other isolating valves. This valve design is also suitable for other segments/applications.

AVK CENTRIC BUTTERFLY VALVES FIXED OR LOOSE LINER

AVK offers the widest range of butterfly valves at the market. The fixed liner butterfly valves from AVK are among the very few of its kind and offer outstanding advantages. Furthermore, we offer a wide range of loose liner butterfly valves.

Unique fixed liner design
An outstanding seating concept is the heart of the valve. The rubber is injection moulded directly on the valve body forming a permanent bond with an optimal rubber shore hardness. Consequently, there is no risk of deformation or dislocation of the liner and the valves are therefore suitable even under vacuum conditions.

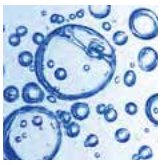
The disc has a profiled sealing edge which requires minimal deformation of the liner to achieve a tight sealing. This gives less wear of the liner and low operating torques.

Feature summary
- Fixed liner with no risk of deformation or dislocation, thus suitable under vacuum conditions
- AVK rubber liner with excellent ability to regain shape after compression
- Disc with profiled sealing edge gives less wear of liner
- Low operating torques due to fixed liner, profiled disc and shaft bearings
- Streamlined disc prevents turbulence, pressure drops and valve vibration
- Available as wafer, semilug, full lug, double flanged short and double flanged long in DN40-2000 with any type of actuation

No turbulence or pressure drops
The streamlined disc gives low flow resistance when the valve is open. Therefore, the valves will not cause any turbulence, pressure drops or valve vibration, and will reduce energy costs for the user.

Profiled disc and unique AVK rubber ensure exceptional durability
The unique AVK rubber compound has an excellent ability to regain shape after compression, and this ability combined with the profiled disc secure tightness even after thousands of operation cycles.

AVK SWING CHECK VALVE
UNIQUE DESIGN



AVK swing check valves are available in DN 50-1000 and feature full bore and low head loss, as well as easy access to maintenance and a great durability. The swing check valves can be installed in both horizontal and vertical positions.

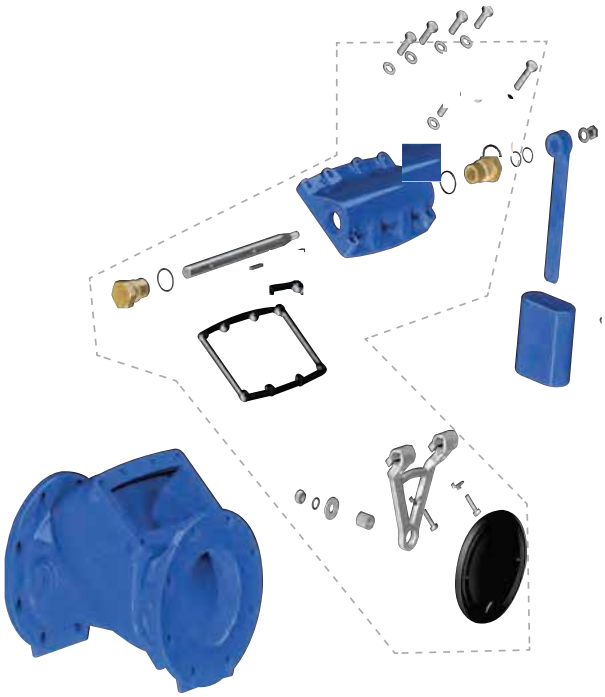
Unique design
By unscrewing a few bolts the bonnet assembly including hinge and disc can be removed from the body. The hinge is tightened around the shaft with bolts to eliminate play and thus ensure durability.

Feature summary

- Full bore ensures low head loss when fully open
- Full bore prevents pressure loss allowing maximum utilization of pump capacity
- Bonnet/disc design gives easy access to maintenance
- Fully rubber coated disc prevents corrosion and ensures drip-tightclosure and long life
- Light-weight disc requires a minimum of force to open and close the valve
- The disc is mounted in a nylon bushing, which allows it to move slightly both horizontally and vertically to close completely tight also in case of minor impurities in the seat
- Hinge tightened around the shaft with bolts to eliminate play and thus ensure durability
- Ductile iron epoxy coated to DIN 30677-2
- Available with or without lever and weight
- Other options available complete with limit switch

Resilient seated disc with Stainless Steel hinge.
The valve is ideal for installation in the horizontal position and used where there is an insignificant risk of water hammer. This design features a distinctly low head loss and is used in installations, where the dry matter percentage is max. 10%. Optimum sealing at not less than 0.5 bar pressure. The valve is suitable for underground installation.

Swing check valve with external lever and weight plus limit switch.
Cam operated IP66 limit switch. Mechanical roller plunger with the ability to easily set the cam at any given position. Maintenance free and vibration resistant cage clamp terminals. key and keyway as back-up.



To achieve the optimum performance from any swing check valve, a velocity of 1.5 to 2m/s is required to fully open the valve, and to reduce turbulence a straight piece of pipe five (5) times

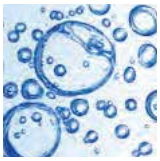
Swing check valve with external lever and weight.
For installations with an insignificant risk of water hammer, but where the minimising of head loss is important. The lever is also useful as an indicator of the valve disc position. The valve is suitable for horizontal and vertical installations.

Large diameter metal seated check valve.
This valve is ideal for potable water and sewerage applications and suitable for temperatures up to 70°C.

The body, bonnet, hinge and metal seated disc are all constructed with high grade Ductile Iron to EN 1563, EN-GJS-500-7. The seat is aluminium bronze.

A guard covering the lever and weight eliminates the risk of injuries. Optionally with proximity switches for remote monitoring.

AVK RECOIL CHECK VALVE
RAPID CLOSING AND NON SLAM



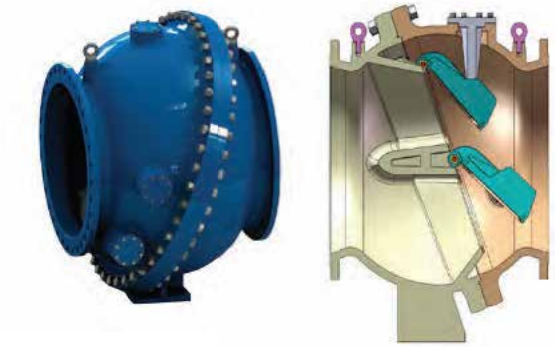
For Water and Sewage Applications

The AVK single and multi door 'Recoil' high performance non-return valve has been designed after extensive practical hydraulic laboratory testing. These in-house tests have led to the development of a superior check valve that will close the instant forward flow ceases.

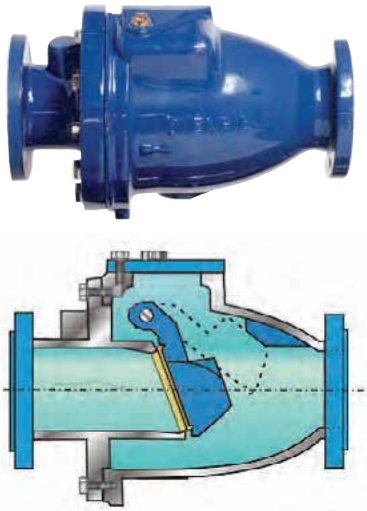
The 'Recoil' valve will close in under one second thus eliminating the opportunity for water hammer.

All of these design features ensure that the Series 641 Recoil Valve is superior to conventional swing check valve designs.

- Slope of the body face, and the door opening arc length.
- Weight of the door, and the manner in which the weight is distributed.
- Location of the hinge pin in relation to the plane of the faces.
- Large volume area around the door to reduce turbulence at the closure point.



2 Door
641/21 DN600-800

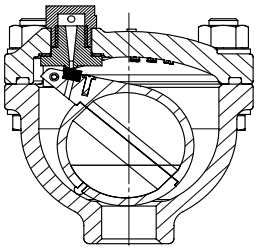


Single Disk
641/11 - DN100-500

AVK AIR RELEASE VALVES
SINGLE OR DOUBLE ORIFICE

Air Release Valves designed for the purpose...

There are two basic air release valve types which are commonly referred to as single small orifice and double orifice air valves. These are illustrated in the following figures respectively.

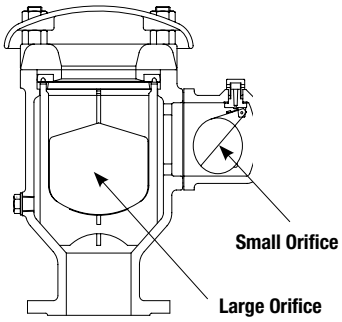


AVK Single Small Orifice Air Release Valves

The small Orifice valve is designed to open and allow the escape of air which has accumulated in the system during the pressurised working conditions.

When air has collected in the valve body, it depresses the water level until a point is reached where the buoyancy is reduced such that the opening force created by the weight of the float isgreater than the closing force generated by the system pressure operating on the unbalanced areaof the Orifice.

With the AVK Series 851 Air Release Valve illustrated, the Orifice size ranges from 3.5mm (PN6) to 1.75mm (PN25) diameter giving optimum performance on varying working pressures from 6 to 25 bar respectively.



AVK Double Orifice Air Valves

In most pipeline systems, the ventilation requirements are such as to warrant the use of both small and large Orifice air valves at the same point.

Hence, it is usual to install a valve of the Double Orifice Air Release Valve type Series 851, which incorporates both of these valve functions in a single unit. The performance of such a valve is namely ventilating the pipeline during filling and emptying sequences together with the ability to release air under pressure working conditions. It also embodies the unique Glenfield designed Aerokinetic Principle which has been incorporated in this valve since 1970.

The purpose of this valve is to permit large volumes of air to exhaust during initial filling of a pipeline and also allow air to enter the pipeline in sufficient quantities during emptying. This air inflow rate must be adequate to enable pipeline dewatering or scouring to be conducted quickly and without endangering the pipeline to high vacuum pressures. It remains in the open position during filling until buoyed on to its rubber seat (EPDM) by the arrival of the water.

In the large Orifice float design it is most important so that the float is not prematurely blown or forced shut. This was a problem experienced in the older rubber covered ball type valves. This difficulty has now been overcome by the 'Glenfield Aerokinetic' feature which will not allow the valve to blow shut while discharging air at any pressure or discharge rate. Essentially, this feature gives a resultant pressure on the float which acts in a downward direction and increases in magnitude as the emergent air velocity increases.

Thus, for a similar sized inlet, the Aerokinetic valve has a much higher discharge capacity than other valve designs. This enables in most instances, the use of an air valve one size smaller than was previously possible, for a given discharge rate with a cost effective outcome.

OPERATION
THE AEROKINETIC PRINCIPLE

AVK's Large Orifice Series 851 Air Release Valves incorporate the exclusive Glenfield Aerokinetic Principle which prevents premature closure while air is being released from a pipeline.

The valve only closes when water reaches and lifts the float into contact with the seal.
It cannot be prematurely shut by discharging air or a mixture of air and water spray irrespective of emitting velocity. The valve float and the valve internal body profiles are specially shaped, and the positioning of the float relative to the valve inlet is critical. Thus, when air is discharging the resultant direction of aerodynamic forces is downward on the float which increases as the emergent air velocity increases.

AVK PLUNGER VALVES
PRECISE REGULATION

Plunger valves are often used for flow control and pressure reducing applications.

AVK series 870 is a plunger valve which in some areas is referred to as needle valve in the industry for inline applications of regulation.

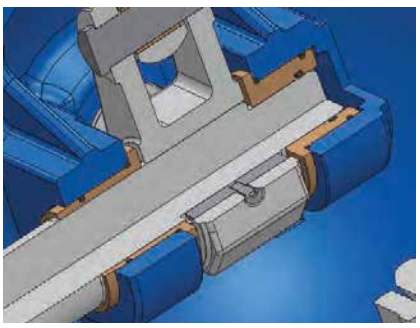
Unlike butterfly or gate valves assuming only fully open or shut off functions, plunger valves are designed to regulate and control flow and pressure in water supply systems. The design holds a single-piece body of fusion bonded epoxy coated ductile iron (above DN150) or stainless steel (up to DN150).

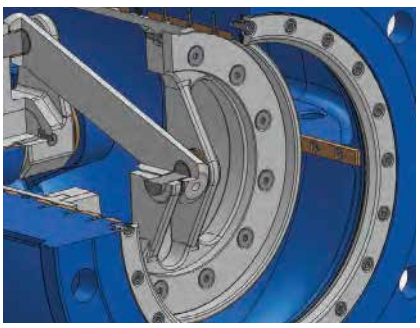
All internal components are made in either stainless steel or bronze; materials that guarantee good anticorrosion properties and a long life time.

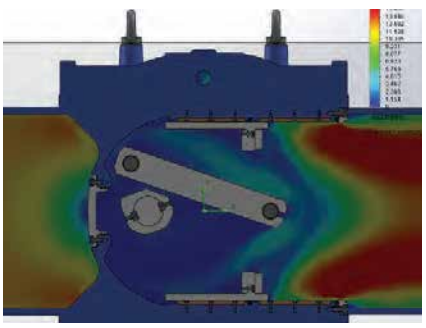
Available in pressure ratings up to 25 Bar, flanged to suit EN 1092-2 PN10/16/25 and sizes DN80-600, Tested acc. to EN1074-1&5 / EN12266. Designed acc. to EN1074-1&5 / EN1349. Face-to-face acc. to EN558 Table 2 Basic Series 15. The valve is equipped with an ISO actuator flange to which can be fitted an electrical actuator or a gearbox with a handwheel. We offer sizing, engineering and technical expertise from supply of the correct plunger valve to the on-site installation.

DESIGN FEATURES AND BENEFITS

- One-piece body construction.
- Low operating torque due to pressure equilibrium between internal chamber and piston.
- Angular shaft rotation from fully open to close → 90degrees.
- Low head loss coefficient in fully open position due to optimized internal body.
- 4 bronze guide rails keep vibration at a minimum and ensure accurate alignment throughout the full valve stroke.
- Guide rails, downstream retaining ring and upstream cover are all installed with bolts to make for easy dismantling for maintenance.
- DN80-150 have uncoated stainless steel bodies.
- DN200-600 are coated with blue RAL 5017 fusionbonded epoxy in a GSK approved process according to DIN3476.
- "T" shape main seal located in safety flow area ensuring minimal wear and long life time.
- Double O-ring sealed drive shaft.
- All other shafts and bearings protected against corrosion with O-ring seals.
- All internal parts in stainless steel or bronze.







AVK FABRICATED CLAMPS
QUICK PIPE REPAIR SOLUTION

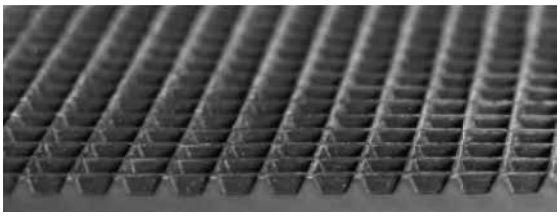
AVK Malaysia offers a wide range of repair clamps and off-take clamps designed for quick pipe repairs and easy installation. The excellent build and rubber quality ensure durable solutions for all sorts of cracks in most common pipe materials.

AVK REPAIR CLAMPS
SINGLE OR MULTI BAND

Series 729 repair clamps ensure a cost effective and reliable solution for quick repairs on steel, copper, asbestos cement, cast iron and plastic pipes. A pipe with a hole or a crack will be repaired permanently. The stainless steel repair clamps are passivated in order to ensure an optimum corrosion resistance. The clamps are provided with a waffle structured rubber gasket and blunt ending to create a fully circumferential seal.

Series 729 repair clamp features:

- Clamp is made out of pre-rolled plate of stainless steel AISI304.
- Design with welded AISI 304 studs and ribs.
- Clamp is completely pickled and passivated after welding.
- Studs are coated with PTFE to prevent cold welding (galling).
- Gasket of EPDM rubber with waffle structure and blunt ending.
- Stainless steel AISI316 is available as an option upon request.



Waffle structured rubber gasket for effective circumferential seal.

Single-band repair clamp
FS10

Double-band repair clamp
FS20

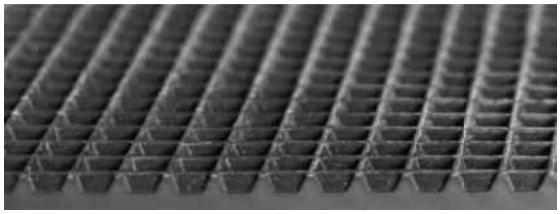
Triple-band repair clamp
FS30

AVK OFF-TAKE CLAMPS
TAPPED OR FLANGED

Series 729 tapped off-take clamps are intended to provide a permanent threaded connection into new and existing pipelines and may be used for replacement of existingdamaged tapped connections. Flanged off-take clamps are intended to provide a permanent means of making a flanged connection to a pipeline. Off-take clamps may also be used for under pressure cut-in connections. The clamps are provided with a waffle structured rubber gasket and blunt ending to create a fully circumferential seal.

Series 729 off-take clamp features:

- Off-takes are available both in BSP threaded tapping (1/2 in to 3 in) or flanged outlet (50 to 300 mm).
- Exclusively used as hot-tapping saddle.
- Clamp is made out of pre-rolled plate of stainless steel AISI304.
- Design with welded AISI 304 studs and ribs.
- Clamp is completely pickled and passivated after welding.
- Studs are coated with PTFE to prevent cold welding (galling).
- Gasket of EPDM rubber with waffle structure and blunt ending.
- Stainless steel AISI316 is available as an option upon request.



Waffle structured rubber gasket for effective circumferential seal.

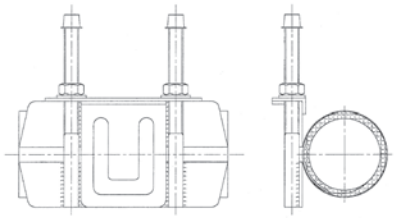
Single band tapped offtake clamps FSA10

Double band tapped offtake clamps FSA20

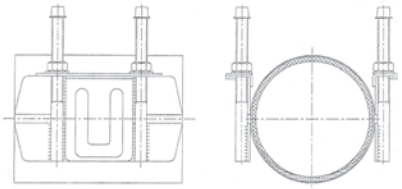
Double band flanged offtake clamps FST20

COMPLETE IN SERVICE REPAIR BOX

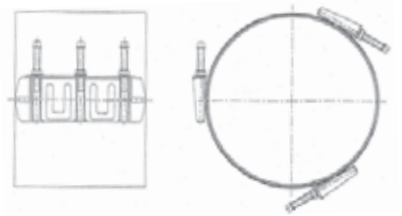
AVK's repair box is an easy, quick and flexible solution for emergency repair of damaged pipes, With the stainless steel repair elements you can create your own repair clamp that can be used for permanent repair of cracks, pinholes or other damages to the pipes. The repair box consist of 6 or 10 stainless steel elements as standard, which can cover a range from diameter 85mm up to diameter 954mm, only by connecting the elements. Available in AISI 304, sealing material can be EPDM or NBR. The elements comes in standard width 300mm.



Single element



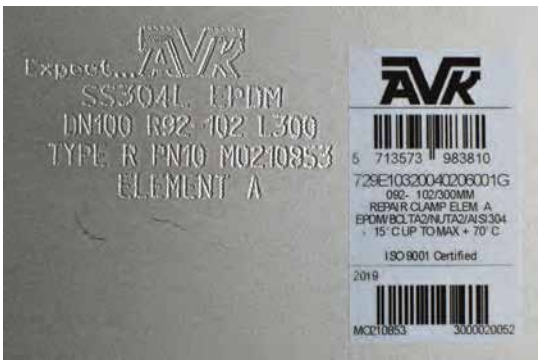
Two elements combined



Three elements combined

Repair box features:

- One repair box with 6 stainless steel AISI304 elements, makes it possible to repair pipes from diameter 86mm up to 732mm.
- Elements are marked with labels from A to F. Use schedule to achieve required range. Elements G to J are optional to increase the repair range up to 954mm.
- Used elements can be re-ordered to complete the repair box for next emergency.
- Made entirely of stainless steel - no corrosion.
- Clamp is completely passivated after welding procedure.
- Lightweight - easy to handle, no loose parts that can be lost during assembly.
- PTFE coating on threads prevents nuts and bolts from cold welding (galling).
- Spanner plate is completely vulcanized into rubber gasket.
- Studs protected with plastic protection caps.



FLANGED GATE VALVES

21/36
Resilient seat gate valve,
Face-to-face dimension
BS EN 558 Table 2
Basic Series 3
Ductile iron
EPDM rubber,
WRAS approved,
Fusion bonded epoxy coated

Options:
• DN050-400

21/38
Resilient seat gate valve,
Face-to-face dimension
BS EN 558 Table 2
Basic Series 3
Ductile iron
EPDM rubber,
WRAS approved,
Fusion bonded epoxy coated

Options:
• DN050-400

21/60
Resilient seat PN25 gate valve to BS standard,
Face-to-face dimension
EN 558 Table 2
Basic Series 3
Ductile iron
EPDM rubber wedge,
WRAS approved,
Fusion bonded epoxy coated
GSK approved

Options:
• DN050-400

21/46
Flanged gate valve with riing stem,
Face-to-face
EN 558 Table 2
Basic Series 3
Ductile iron
EPDM rubber,
WRAS approved,
AVK standard coating

Options:
• DN50-400

02/20
Flanged gate valve
Face-to-face dimension
EN 558 Table 2
Basic Series 3
Ductile iron
EPDM rubber,
WRAS approved
Fusion bonded epoxy coated

Options:
• DN50-400

37/50
Metal seat gate valve
Face-to-face dimension
EN 558 Table 2
Basic Series 3
Ductile iron
EPDM rubber,
WRAS, approved
Blue epoxy RAL 5017
250 microns

Options:
• DN50-300

55/66
Flanged gate valve with bypass
Face-to-face dimension
EN 558 Table 2
Basic Series 3
Ductile iron
EPDM rubber,
WRAS approved
Fusion bonded epoxy coated
GSK approved
F16 ISO top gland flange

Options:
• DN450-600

55/30
Flanged gate valve with bypass
Face-to-face dimension
EN 558 Table 2
Basic Series 3
Ductile iron
EPDM rubber,
WRAS approved
Fusion bonded epoxy coated
GSK approved
F16 ISO top gland flange

Options:
• DN700-800

55/67
Flanged gate valve with bypass
Face-to-face dimension
EN 558 Table 2
Basic Series 3
Ductile iron
EPDM rubber,
WRAS approved
Fusion bonded epoxy coated
GSK approved
F16 ISO top gland flange

Options:
• DN900-1000

54/3334
Metal seat gate valves with bypass
Face-to-face dimension
EN 558 Table 2
Basic Series 3
Ductile iron
Epoxy coated to WRAS
F16 ISO top gland flange

Options:
• DN350-1800

DOUBLE ECCENTRIC AND CENTRIC BUTTERFLY VALVES

756/218
Double ecentric butterfly valve to EN 593, integral seat. Steel seal retainer ring, IP67 gearbox w. handwheel
Face-to-face dimension EN 558 Table 2
Basic Series 13
Ductile iron
EPDM rubber,
WRAS approved
Fusion bonded epoxy coated

Options:
• DN150-600

756/218
Double ecentric butterfly valve to EN 593, integral seat. Steel seal retainer ring, IP67 gearbox w. handwheel
Face-to-face dimension EN 558 Table 2
Basic Series 13
Ductile iron
EPDM rubber,
WRAS approved
Fusion bonded epoxy coated

Options:
• DN700-2200

756/218
Double ecentric butterfly valve to EN 593, stainless steel seat, stainless steel seal retainer ring, IP67 gearbox w. handwheel
Face-to-face dimension EN 558 Table 2
Basic Series 13
Ductile iron
EPDM rubber,
NF approved
Fusion bonded epoxy coated

Options:
• DN150-1200

76/70
Concentric butterfly valve with loose liner
Face-to-face dimension EN 558 Table 2
Basic Series 20
Ductile iron
EPDM rubber,
Blue epoxy coated

Options:
• DN50-300

76/70
Concentric butterfly valve with loose liner
Face-to-face dimension EN 558 Table 2
Basic Series 20
Ductile iron
EPDM rubber,
Blue epoxy coated

Options:
• DN350-400

76/71
Concentric butterfly valve with loose liner
Face-to-face dimension EN 558 Table 2
Basic Series 20
Ductile iron
EPDM rubber,
WRAS approved
Blue epoxy coated

Options:
• DN50-300

76/71
Concentric butterfly valve with loose liner
Face-to-face dimension EN 558 Table 2
Basic Series 20
Ductile iron
EPDM rubber wedge,
WRAS approved
Blue epoxy coated

Options:
• DN350-400

76/74
Centric butterfly valve with loose liner
Face-to-face dimension EN 558 Table 2
Basic Series 13
Ductile iron
EPDM rubber wedge,
WRAS approved
Blue epoxy coated

Options:
• DN50-300

Series 75
Butterfly valve
Centric with fixed liner
Double flange type (long/short)
PN10/16
Ductile iron
EPDM rubber,
WRAS approved
Blue epoxy coated

Options:
• various actuators
• DN50-2000

Series 75/31
Butterfly valve
Centric with fixed liner
Semi-lug type
PN10/16
Ductile iron
EPDM rubber,
WRAS approved
Blue epoxy coated

Options:
• various actuators
• DN50-200

Series 75/41
Butterfly valve
Centric with fixed liner
Full lug type
PN10/16
Ductile iron
EPDM rubber,
WRAS approved
Blue epoxy coated

Options:
• various actuators
• DN50-1200

Series 820/20
Butterfly valve
Centric with loose liner
U-section type
PN10/16
Ductile iron
EPDM rubber,
WRAS approved,
Blue epoxy coated

Options:
• DN150-1600
• various actuators

AIR VALVES AND CHECK VALVES

851/41
Air Venting Valve
Abs float
Ductile iron
EPDM rubber,
WRAS approved
Blue epoxy coated

Options:
• DN25

851/41
Air Relief Valve
Abs float
Ductile iron
EPDM rubber,
WRAS approved
Blue epoxy coated

Options:
• DN50-200

851/42
Air Venting Valve
Stainless steel 316 float
Ductile iron
EPDM rubber,
WRAS approved
Blue epoxy coated

Options:
• DN25

851/42
Air Relief Valve
Stainless steel 316 float
Ductile iron
EPDM rubber,
WRAS approved
Blue epoxy coated

Options:
• DN50-200

851/45
Air Relief Valve
Stainless steel float & guide
Ductile iron
EPDM rubber,
WRAS approved
Blue epoxy coated

Options:
• DN50-200

41/22
Swing check valve lever and weight kit
Face-to-face
EN 558 Table 2
Basic series 10
Ductile iron
EPDM rubber wedge,
WRAS approved
Blue epoxy coated

Options:
• DN50-300

41/36
Metal seated swing check valve with lever and weight
Face-to-face dimension
EN 558 Table 2
Basic Series 48
Ductile iron
EPDM rubber
Fusion bonded epoxy coated
3476-1 and EN 14901

Options:
• DN350-600

641/21
Multi door recoil check valve with bypass
Ductile iron
EPDM rubber,
WRAS approved
Electrostatically applied epoxy coating

Options:
• DN600-1600

903/20
Flanged silent check valve
Face-to-face
MSS SP-125
Short globe
Ductile iron
Blue epoxy coated

Options:
• DN65-400

874/00
Tilting disc resilient seat check valve with lever and weight
Face-to-face dimension
EN 558 Series 14
Ductile iron
EPDM rubber
EN1074-3

Options:
• DN150-1600

875/00
Multi door recoil check valve with bypass
Ductile iron
EPDM rubber,
WRAS approved
Electrostatically applied epoxy coating

Options:
• DN600-1600

CONTROL VALVES AND PLUNGER VALVES

Series 859
Control valve
Pressure reducing
Full bore / Reduced bore
PN10/PN16
Ductile iron/AISI 304

Sizes:
• DN50-600

Series 859
Control valve
Pressure sustaining
Full bore / Reduced bore
PN10/PN16
Ductile iron/AISI 304

Sizes:
• DN50-600

Series 859
Control valve
Constant flow
Full Bore & Reduced Bore
PN10/16
Ductile Iron / AISI 304
Blue epoxy coated

Options:
• DN50-600

Series 859
Control valve
Altitude valve
Full bore / Reduced bore
PN10/PN16
Ductile iron/AISI 304

Sizes:
• DN50-600

Series 859
Control valve
Surge anticipation
Full bore / Reduced bore
PN10/PN16
Ductile iron/AISI 304

Sizes:
• DN50-600

Series 859
Control valve
Float control modulating
Full Bore & Reduced Bore
PN10/16
Ductile Iron / AISI 304
Blue epoxy coated

Options:
• DN50-600

Series 859
Control valve
Float control
nonmodulating
Full bore / Reduced bore
PN10/PN16
Ductile iron/AISI 304

Sizes:
• DN50-600

Hydroflux
Control valve
All variants
Full bore / Reduced bore
PN10/PN16
Ductile iron/AISI 304

Sizes:
• DN50-1000

Series 870
Plunger valve
Flow rate control
PN16/PN25
Stainless steel

Sizes:
• DN80-150

Series 870
Plunger valve
Flow rate control
PN16/PN25
Stainless steel

Sizes:
• DN200-600

Regflux
Needle valve
Flow rate control
PN16/PN25
Ductile iron/AISI 304

Sizes:
• DN80-2000

REPAIR CLAMPS AND TAPPING SADDLES

729/A1 (FS 10)
Single band repair clamp,
EPDM,ribs, stainless steel
304/316
10/16 bars

Options:
• Pipe OD: 48-370mm

729/A2 (FS 20)
Double band repair clamp,
EPDM,ribs, stainless steel
304/316
10/16 bars

Options:
• Pipe OD: 88-650mm

729/A3 (FS 30)
Triple band repair clamp,
EPDM,ribs, stainless steel
304/316
PN10/16

Options:
• Pipe OD: 270-880mm

729/D2 (FST 20)
Double band repair clamp,
EPDM,ribs, stainless steel
304/316 with flanged
outlet
10/16 bars

Options:
• Pipe OD: 48-370mm

729/E1
Stainless steel
Repair elements
EPDM
6/10/16 bars

Options:
• Pipe OD: 85-954mm

Series 10/00
Tapping saddle
for PVC and PE pipes
Ductile iron
Lower part in stainless
steel from DN250

Options:
• DN50-300

Series 730/2
Universal tapping saddle
for ductile iron, steel and
other metal pipes
Ductile iron/steel

Options:
• DN50-300

Series 10/12
Tapping saddle
PN16
Ductile iron
For MS pipes

Options:
• DN80-200

Series 10/32
Tapping saddle
PN16
Ductile iron
For DI pipes

Options:
• DN80-200

Series 10/52
Tapping saddle
PN16
Ductile iron
For MS,AC & DI pipes

Options:
• DN80-200

Series 10/42
Tapping saddle
PN16
Ductile iron
For HDPE pipes

Options:
• DN80-200

Series 10/22
Universal tapping saddle
PN16
Ductile iron
For DUCTILE, STEEL &
AC pipes

Options:
• DN50-300

PENSTOCKS AND KNIFE GATE VALVE

772/61
AVK wall penstock with non-rising stem for water and waste treatment

Options:
• Up to 4000x4000mm

772/64
AVK wall penstock with non-rising stem for water and waste treatment

Options:
• Up to 4000x4000mm

772/71
AVK channel penstock with non-rising stem

Options:
• Up to 4500x4500mm

772/73
AVK channel penstock with rising stem

Options:
• DN200-1200

702/20-103
Knife gate valve with rising stem and handwheel
Face-to-face
DIN/EN 558-1, series 20 (K1), up to and incl.
Ductile iron
NBR rubber
Fusion bonded epoxy coating

Options:
• DN50-1000

702/30-103
Knife gate valve with quick operation lever and replaceable top packing gland
Face-to-face
DIN/EN 558-1, series 20
Ductile iron
NBR rubber
Fusion bonded epoxy coated

Options:
• DN50-150

702/40-103
Knife gate valve with doube acting pneumatic activator, replaceable top gland packing
Face-to-face
DIN/EN 558-1, series 20
Ductile iron
NBR rubber
Fusion bonded epoxy coated

Options:
• DN50-1000

702/50-103
Knife gate valve with ISO top flange for mounting at electric activator, replaceable top packing gland
Face-to-face
DIN/EN 558-1, series 20
Ductile iron
NBR rubber
Fusion bonded epoxy coated

Options:
• DN50-1000

702/70-103
Knife gate valve with rising stem, replaceable top packing gland, AUMA activator IP68
Face-to-face
DIN/EN 558-1, series 20
Ductile iron
NBR rubber
Fusion bonded epoxy coated

Options:
• DN50-1000

GATE VALVES WITH PE ENDS

Series 36/80
Gate valve with PE ends
Ductile iron
PE100/SDR11

Options:
- PE100/ SDR17
- DN65-630

Series 36/00
Gate valve with PE ends and postindicator plates
Ductile iron
PE100/SDR11

Options:
- DN80-300

538/80
Gate valve with Flanged / PE ends
Ductile iron
PE100/SDR11

Options:
- DN50-200

SUPA MAXI™, SUPA PLUS™ AND SUPA® COUPLINGS AND ADADPTORS

Series 601
Supa® straight coupling universal for uPVC, AC, steel, cast iron and ductile iron pipes
Ductile iron
PN16

Options:
- Step coupling
- DN40-400

Series 603
Supa® flange adaptor universal for uPVC, AC, steel, cast iron and ductile iron pipes
Universal drilling
Ductile iron
PN10/16

Options:
- DN40-400

Series 621/61
Supa Plus™ coupling Tensile for PE and PVC pipes
Ductile iron
PN16

Options:
- DN32-300

Series 623/10
Supa Plus™ flange adaptor Tensile for PE and uPVC pipes
Universal drilling
Ductile iron
PN10/16

Options:
- DN40-300

Series 631/100
Supa Maxi™ straight coupling
Universal and Tensile
Ductile iron
PN16

Options:
- DN50-600

Series 632/100
Supa Maxi™ step coupling
Universal and Tensile
Ductile iron
PN16

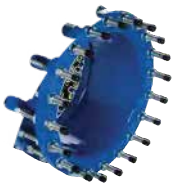
Options:
- DN50-300

SUPPORT BUSH, FABRICATED COUPLINGS & ADAPTORS AND DISMANTLING JOINTS

Series 4258
Fabricated straight coupling for mild steel or ductile iron pipes
Steel
DN80-2000
PN10/16/25

Options:
- Step coupling

Series 4260
Fabricated flange adaptor for mild steel or ductile iron pipes
Steel
DN80-2000
PN10/16/25



Series 4265
Fabricated dismantling joint for all pipe materials
With centre flange
Steel
DN80-2000
PN10/16/25

Options:
- Type A
- Type B

Series 05
Support bush for PE pipes
Suitable for Supa Maxi™, Supa Plus™ and combi-flanges
Stainless steel
DN50-600
PN6.3/10/16

VALVE ACCESSORIES AND Y-STRAINER

Series 04/04
Extension spindle for gate valves
Telescopic
DN40-600

Series 04/F
Extension spindle for double eccentric butterfly valves
Telescopic
DN200-1200

Series 04/15
T-key for gate valves
DN40-400

Series 04/08/55
Stem caps for gate valves and service connection valves
DN25-600

Series 08/00
Handwheel for gate valves
DN50-600
CTC
Grey cast iron

Options:
- CTO

Series 910
Y-strainer
DN50-300
Ductile iron

ABOVE-GROUND FIRE HYDRANTS

Series 27/00
Dry barrel fire hydrant
Modern style
Bury depth 305-2438 mm
17,2 bar (250 PSI)
Ductile iron
UL/ULC listed,
FM approved

Inlet options:
- DN100-150 flanged
- DN100-150 PE end
- monitor fire hydrant

Series 27
Dry barrel monitor fire hydrant
Bury depth 305-2438 mm
17,2 bar (250 PSI)
Ductile iron
UL/ULC listed,
FM approved

Monitor flange options:
- DN80-100

Series 27
Monitor with spray nozzle
Flow rate up to 4732 l/min.
DN80-100 inlet flange
360° continued horizontal travel
-60° to +90° vertical travel
FM approved.
Other spray nozzles available:

Series 24/10
Wet barrel fire hydrant
13,7 bar (200 PSI)
With DN100 monitor flange
2 x 2½" + 1 x 4"/4½" outlets
Ductile iron
UL listed, FM approved

Options:
- ANSI class 150 inlet

Series 24/70
Wet barrel fire hydrant
13,7 bar (200 PSI)
2 x 2½" + 1 x 4"/4½" outlets
Ductile iron
UL listed, FM approved

Series 24/90
Wet barrel fire hydrant
13,7 bar (200 PSI)
2 x 2½" + 1 x 4"/4½" outlets
Ductile iron
UL listed, FM approved
Options:

- DN100 monitor flange and 2 x 2½" + 1 x 4"/4½" outlets

Series 78
Dry barrel fire hydrant
360° orientation 3,7 bar (200 PSI)
Symmetric outlet according to NF S 61-703
Ductile iron
NF S 61-213/CN and NF EN
14384 norms

Options:
- DN80-100

120/11
Dry barrel aboveground
Breakable with a 90° duck foot band
PN16

Options:
- DN100

120/11
Barrel aboveground hydrant according to SYABAS standard
PN16

Options:
- DN100

EXPECT US TO TAKE RESPONSIBILITY

Water is a scarce resource
Access to clean water is often taken for granted, just like the fresh air we breathe. But we are facing an invisible, yet crucial problem of water loss, also referred to as non-revenue water.

Non-revenue water is water that has been produced and cleaned but which is lost somewhere in the water distribution system without being used or paid for, and the levels of non-revenue water range from about 5% to as much as 80% in certain areas.

AVK offers a wide range of reliable and long-lasting valves, including control valves, that can help reduce water losses and contribute to efficient water supply management by maintaining a certain pressure, flow or level, regardless of changes in the supply network.

Pressure management is considered the single most beneficial and cost-effective leakage management activity, but it is also of considerable importance to use valves of a sufficient quality to ensure tightness many years after the valves have been installed, whenever they have been used frequently or not at all.

Supporting world-transforming goals
Our solutions contribute to the UN sustainable development goals by ensuring clean water and sanitation, by reducing water waste, electricity consumption and CO_2 emissions, and by turning wastewater into affordable and clean energy.

Our valve design is not only optimised to ensure long durability and 100% tightness, but also offers low operating torque, which allows for the use of cost-efficient electrical actuators.

AVK has entered into partnerships with other leading Danish companies with the purpose of sharing knowledge within water technology and offering joint solutions for a more sustainable world.

Sustainable production
The AVK Group has outlined strict objectives for activities and processes in its manufacturing companies regarding recycling as well as energy and water consumption.

In addition, our suppliers must comply with our ethical standards to be a certified supplier of the AVK Group, since it is vital for AVK to ensure sustainability throughout the supply chain. Therefore, we choose partners who are strongly committed to complying with international legislation in the field of labour.

TECHNICAL APPENDIX CORROSION PROTECTION

First all cast components are blast cleaned according to ISO 12944-4, SA 2½.

The valve and hydrant bodies and bonnets and other components are fusion bonded epoxy coating in compliance with DIN 3476 part 1 and EN 14901 and GSK guidelines. The high quality epoxy coating is GSK approved and applied manually or using a fluidized bed epoxy coating system. After the valve components have been blast cleaned, the clean and preheated components are submerged in epoxy powder. The powder melts when in contact with the preheated components and cures when the components enter the cooling tunnel shortly after the coating process.

Test procedure

- Coating thickness:
  The coating layer thickness shall be no less than 250 µ.

- Pore-free coating: The coating must be completely free of penetrating pores to avoid subsequent corrosion of the casting underneath. A 3 kv holiday detector with a brush electrode is used to electrically reveal and locate any pores in the coating.

- Impact resistance:
  The impact resistance test is carried out right after the coating process by means of a stainless steel cylinder dropped on the coating surface through a one meter long tube corresponding to an impact energy of 5 Nm.

After each impact the component is electrically tested, and no electrical breakthrough shall occur.

- Cross linkage:
One drop of methyl isobutyl ketone is put on a horizontal epoxy resin coated surface of the test piece at room temperature. After 30 seconds the test area is wiped with a clean white cloth. It is checked that the test surface has not become neither matt nor smeared, and that the cloth remains clean. The test is carried out 24 hours after the coating process.

- Adhesion:
The adhesion of the powder coating on one of each type of component is tested four times a year per coating plant according to GSK guidelines using the punch separation method according to DIN 24624. The coating thickness over a dispersed area of the test item shall be within the range 250 µ to 400 µ.

The test pieces are immersed for seven days in deionised water at 90°C, and then dried in an oven for 3 hours. A conditioning phase of 3 to 5 days in normal atmosphere is then allowed to elapse. No blisters may arise during the period immersed in the water bath.

The surface of the test piece is degreased and then roughened with abrasive paper. The roughened surface is cleaned from dust with oil-free compressed air and recleaned.
The adhesion on both the core and the moulding sand sides is tested with a minimum pulling force of >12 N/mm².

- Cathodic disbonding:
Cathodic disbonding tests are carried out on one of each type of component at least twice a year. No bubbles in the coating may develop during the test for cathodic disbonding. For this test, the coating thickness over a dispersed area of the test item shall be within the range 250 µ to 400 µ.

Approvals:
The coating is approved for use in drinking water systems, meeting all specified toxicological conditions, by the following institutes:
- Hygiene Institute, Germany
- Hydrocheck, Belgium
- CARSO L.S.E.H.L., France

Extra top coating:
All our hydrants and post indicators have an additional layer of UV-resistant polyester coating. The polyester coating will protect the colour of the products from fading, even though the products are installed in places with a strong UV-light exposure.

TECHNICAL APPENDIX
RUBBER TECHNOLOGY

Ability to regain shape:
The high quality rubber used on the wedge has an excellent compression set also called memory (the ability to recover the original shape after being compressed). Even after many years of service where the wedge rubber has been compressed numerous times, the rubber will regain its original shape and ensure a tight sealing.

Impurities will not affect the rubber surface or the tightness of the valve, as they will be absorbed in the rubber when the valve is in closed position. When the valve is reopened, the impurities will be flushed away, and the rubber will regain its shape.

EN 681-1:
A common European standard states the minimum requirements for the compression set (permanent deformation). To test the compression set, the rubber is deformed by 25% of its original thickness at a constant temperature for a specific time. The pressure on the rubber is relieved and the layer thickness is measured after half an hour. The smaller the deformation, the better the memory effect.

Double bonding system:
The wedge core is immersed in two different baths - the first to prepare the ductile iron core and the second to vulcanise the rubber to the core. The rubber is vulcanised to the metal wedge core with a process that fully bonds the two materials. Even if a sharp object penetrates the rubber the bonding is so strong that there is no risk of creeping corrosion underneath the rubber. As a result, we can offer the best rubber adhesion and corrosion protection on the market.

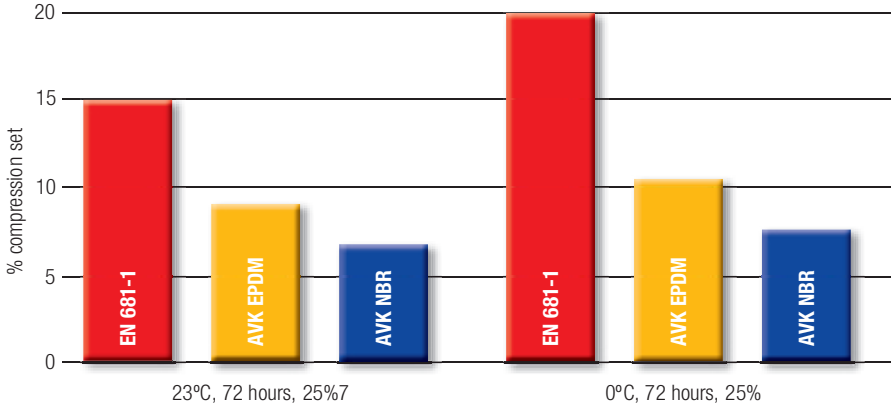
Since no international bonding standard is available, AVK has developed its own harsh test method to ensure that the adhesion also withstands a worst-case scenario. Testing is done both during production and after immersion in 90°C water for 3 weeks. When peeling off rubber from the core, the core must still be covered with rubber.

Protection against wear:
The wedge guide rails and wedge shoes ensure a smooth operation and keep the operating torque to a minimum. The wedge shoes ensure that AVK supersedes the life time requirements stated in EN 1074-2. Even at maximum differential pressures and high flow velocities the friction between the body and wedge is kept to a minimum.

A unique vulcanisation process ensures that the entire wedge core is covered with rubber and that the shoes are attached to the wedge core. This process is one of the secrets keeping the wedge protected from corrosion and thus securing a long service life and smooth operation of the valve.

High quality rubber compounds:
AVK uses rubber compounds durable enough to resist repeated open/close operations. Furthermore, the friction against the valve body's internal epoxy coating is very low with this rubber quality, whereby very low operating torques and closing torques are achieved.

The ductile iron core is fully vulcanised with rubber both inside and outside. A minimum of 1.5 mm rubber is applied on all pressure bearing surfaces and a minimum of 4 mm on all sealing surfaces regardless of the design.



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