

# VAAS

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## OPTIONS FOR UNI-DIRECTIONAL KNIFE GATE VALVES

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- Deflection Cones
- Seats
- V-Notch
- Gates
- Flush / Purge Ports
- Extensions
- Chainwheel & Chain
- Stem Boot
- Stem Guard
- Locking Devices
- Gland Packings
- Operators
- Actuators
- Modulating Control
- Actuator Accessories
- Fail-Safe Systems

**VAAS UNI-DIRECTIONAL KNIFE GATE VALVES ARE AVAILABLE WITH SEVERAL OPTIONS AND CUSTOMISED SOLUTIONS – IDEALLY SUITED TO MINING, PULP & PAPER, CORROSIVE ENVIRONMENTS, CEMENT, THERMAL POWER, BULK CONVEYING, WATER & SEWAGE.**

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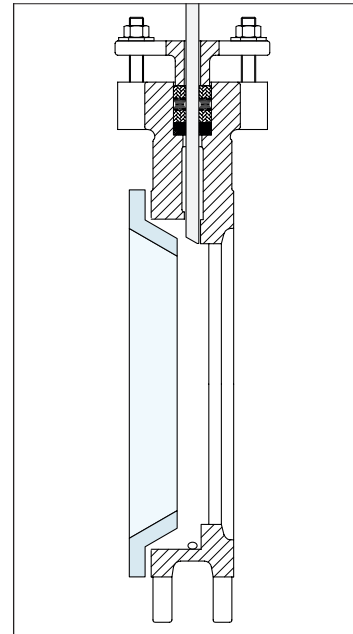
## DEFLECTION CONES

### DEFLECTION CONES

Even though VAAS uni-directional knife-gate valves are designed for tough, abrasive and/or corrosive services, they have a raised seat that faces the flow when the valve is open. As such, deflection cones are recommended to prolong valve life in these demanding situations. The components of a knife-gate valve that are subject to the most abuse and wear in abrasive services are the seat and the gate.

A deflection cone is a contoured cone that is clamped between the upstream flange-face of a valve and the adjacent piping flange. Its purpose is to redirect flow away from the seat and towards the centre of the bore. It is easily replaceable. Though reducing the port area slightly, they can increase the life of the seat and gate and are less expensive to replace than the entire valve.

VAAS supplies deflection cones in cast Ni-Hard, generally for high-abrasion services, and Polyurethane for the less demanding applications.



VAAS code DC1 cones are Ni-Hard cast chrome-iron (type 2) with a hardness of 450-600BHN. Ni-Hard's unique properties make it ideal for use in the mining industry. These Ni-Hard cones are supplied with a gasket that fits between the deflection cone and the valve body. A gasket is also required to be fitted between the deflection cone and the mating flange.

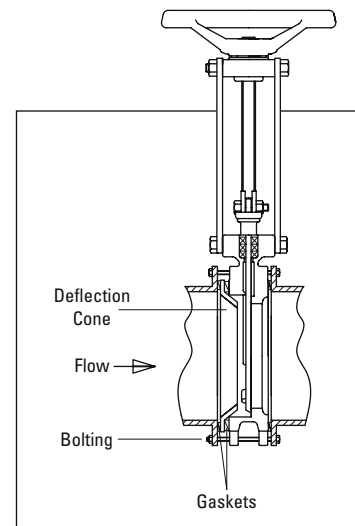
VAAS code DC2 cones are moulded Polyurethane with a durometer shore hardness of 90A and suitable for temperatures up to 80°C / 176°F. Polyurethane offers the elasticity of rubber combined with the toughness and durability of metal with excellent wear properties.

### TYPICAL MOUNTING ORIENTATIONS

#### Pump Flow Applications

##### *Flow against the seat*

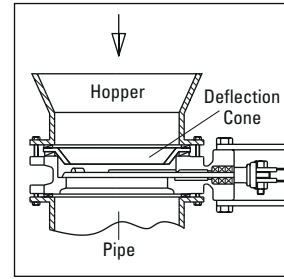
Deflection cone fitted to the upstream side of the valve – flow indicator arrow / tag on the side of the valve body showing flow direction.



### Pressurised Flow Below Hopper / Silo Application

#### **Seat facing up, towards flow**

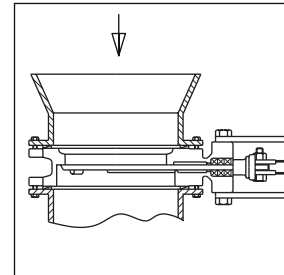
Deflection cone may be used if media is abrasive - flow indicator arrow / tag on the side of the valve body showing flow direction



### Gravity Flow Below Hopper / Silo Application

#### **Seat facing down, away from flow**

Deflection cone not used / not required – flow indicator arrow / tag on the side of the valve body points upward against flow.



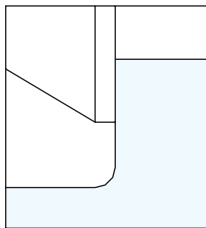
## TYPICAL APPLICATIONS

Typical applications for deflection cones include slurry and dry solids service, mining slurries, storage bin and thickener underflow, hopper / fly-ash hopper outlets, ore handling, pump suction, cyclone isolation, slurry tanks and pneumatic conveying.

## SEATING

VAAS offers two types of seating for uni-directional knife-gate valves - **metal-to-metal** and **resilient**.

### METAL-TO-METAL SEATING



#### **Integral Seat**

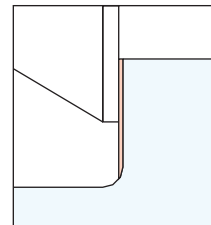
Seat facing is machined in the valve body and, being integral, is of the same material as the body casting. This feature, being standard in a metal seated valve, has no order-coding. Standard integral, metal seated knife-gate valves can not be fitted with other replaceable seat options.

#### **Integral Stellite Seat**

Stellite seat is a weld deposit process using Stellite 6 welding rod to a depth of approximately 1mm and with a typical hardness of 300-350 BHN / 40 HRC.

#### **Integral Nitride Seat**

This process produces a thin surface layer of typically 20 microns of nitride (600-1250 HV1 surface hardness) on the stainless steel base metal of the seat. Nitriding is generally suitable for services involving sliding-ware as experienced in dry powder handling.



Stellite and Nitriding options increase the service life of the valve in handling abrasive media. However, as these processes generally involve treatment of the metal at high temperatures, warping may occur. This will result in lower than MSS SP-81 seat leakage acceptance criteria.

### Low Leakage Lapped Seating

Certain metal seat applications require leakage rates lower than that specified in MSS SP-81. In such applications, VAAS offers lapped seating for low leakage of 100cc per minute, irrespective of valve size.

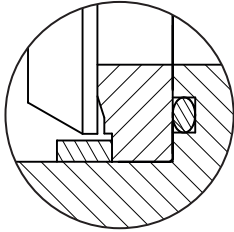
## SEATING (Continued)

### Replaceable Seat

Available with or without elastomer body seal, depending on temperature and medium.

RS-S2-E / RS-S1-E is supplied with elastomer body O-Ring seal suitable for temperatures up to 250° C / 482° F.

S2-ST / S1-ST is supplied without body O-Ring seal for higher temperatures (not leak-tested). These are available in stainless steel materials with option for stellite facing.

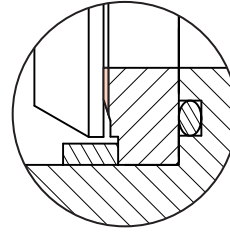


#### Metal Seat

Size 2" to 24" / 50mm to 600mm

Material: SS / Alloy Cast Iron

◀ shows elastomer body O-Ring



#### Stellite Seat

Size 2" to 24" / 50mm to 600mm

Material: SS

◀ shows elastomer body O-Ring

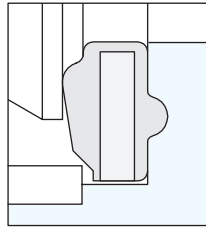
Metal seated valves ordered with replaceable metal seat options will have body machined to accept optional replaceable soft seat or replaceable v-notch seat.

### RESILIENT SEATING

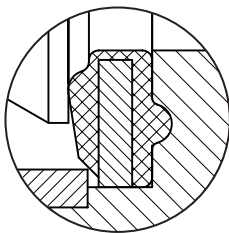
A range of replaceable seats is available in different materials:

#### Elastomer

Seats are available in a variety of rubbers including EPDM, Viton, Nitrile, etc. and are rubber vulcanised on to stainless steel rings. The front of the seat has a rubber flat face for gate sealing and the back has a simulated O-Ring to prevent leakage past the body-seat interface.

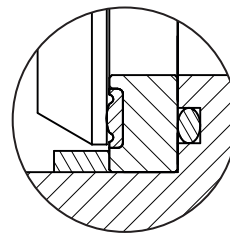


Material	Max. Temp.	Code
EPDM	120° C / 248° F	RS 66
Viton	200° C / 392° F	RS 48
Nitrile	90° C / 194° F	RS 26
Chloroprene	85° C / 185° F	RS16



Size 2" to 12" / 50mm to 300mm

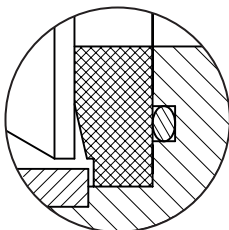
Material: EPDM / Nitrile /  
Viton / Chloroprene



Size 14" to 24" / 350mm to 600mm

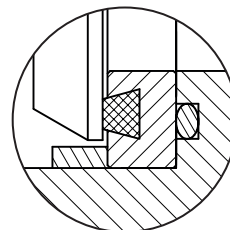
Material: SS Backup Ring with  
EPDM / Nitrile / Viton / Chloroprene

**PTFE** - Replaceable seats correspond to valve sizes.



PTFE solid seat - for sizes up to  
200mm / 8" (RS 76).

Size 2" to 8" / 50mm to 200mm  
Material: Solid PTFE



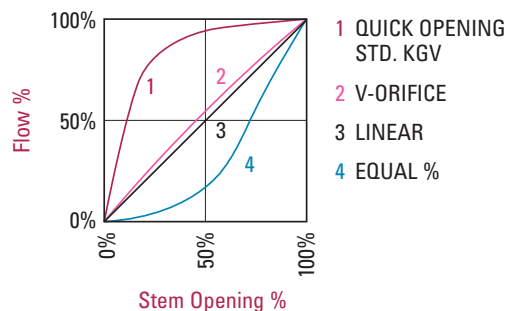
PTFE seat with 316SS backup ring -  
for sizes 250mm / 10" and above (RS 75).

Size 10" to 24" / 250mm to 600mm  
Material: SS Backup Ring  
with PTFE

## V-NOTCH SEATING / V-PORT

Standard round-port knife gate valves are only used for on/off applications and not suitable for throttling services. However, uni-directional valves such as VAAS Fig 940 & 950, can be supplied with V-Orifice seat options suitable for throttling/control applications in metering services on suspended solids with little chance of the valve plugging. Also suitable for pulp stock and similar viscous media.

The V-Orifice seat provides “modified linear control characteristics.”

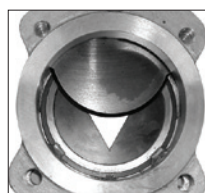


Valve Flow Characteristics

VAAS offers two types of V-Notch Seats:

### Welded-In

- V-Orifice (Code V)
- V-Orifice with stellite bore face (Code V-ST)  
Available in 316, 304, 317L, tool steel materials.



Welded-In V-Orifice in special tool steel material for abrasive coal slurry service.

### Replaceable

- Stainless Steel V-Orifice (Code RS-S1-V)
- Stainless Steel with hard facing (Stellite) (RS-S1-ST-V)
- Stainless Steel with stellite bore (RS-S1-STB-V)  
Available in 316, 304, 317L, Tool Steel materials.



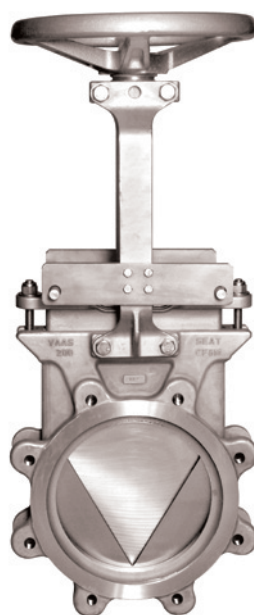
Replaceable V-Orifice in special tool steel material for abrasive coal slurry service.



Pneumatically Operated

These valves are generally supplied with VAAS Fig CCGC double-acting pneumatic actuators and pneumatic/electro-pneumatic positioners for operation from a control signal.

Valves for manual hand-wheel operation are also available.

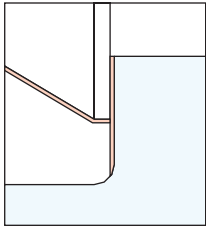


Manual



## GATE

### Stellite-Faced Gate Edge



Stelliteing of gate edge extends service-life of the valve in severe applications.

**Stellite 6®** is an alloy of cobalt-chromium and tungsten, which is overlaid on the leading edge of the gate and machined to finish. It is effective in erosive mining applications and when the gate must cut through fibers in paper & pulp applications. It provides a durable, sharp cutting edge.

Hardness 300-350 BHN / 40 HRc.

### Hard-Chrome Plating

This is a hot-dip process that produces a uniform, hard layer on steel and stainless steel gates (5550-600 BHN).

**Hard-Chrome** is a thin layer (approx. 0.07mm / 0.003 inch) of industrial hard-chrome coating. It provides good resistance to abrasion, corrosion and impact.

### Nitriding

**Nitriding** is a process of surface/case hardening. The hardened layer (600-1250 HV1 surface hardness) is very thin but the process reduces corrosion resistance. It is generally suitable for services involving sliding wear.

### Hard or Tool Steel Gate Material

**Tool Steel** is a very hard alloy steel with approx. 450 Brinell Hardness. Abrasion and impact-resistant properties are excellent.

### Other Alloy Materials

These include:

**17-4pH Stainless Steel** - Also known as Type 630, is a chromium-copper precipitation hardening stainless steel used for applications requiring high strength and a moderate level of corrosion resistance.

**SAF2205 Duplex** - This is a medium-alloy duplex stainless steel with high corrosion resistance.

**SAF2507 Super Duplex** - This is a high-alloy stainless steel for service under extremely corrosive conditions, developed mainly for chloride containing environments like seawater. It contains high amounts of chromium, molybdenum and nitrogen.

### PTFE Coated

**PTFE** coated gates are generally fitted in valves with polyurethane body lining.

PTFE coated gates provide excellent lubricity with low coefficient of friction, thereby lowering operating torques.

PTFE coating, with excellent stick-slip properties, also provides a non-stick surface that minimises adhesion of sticky media to gate surface.



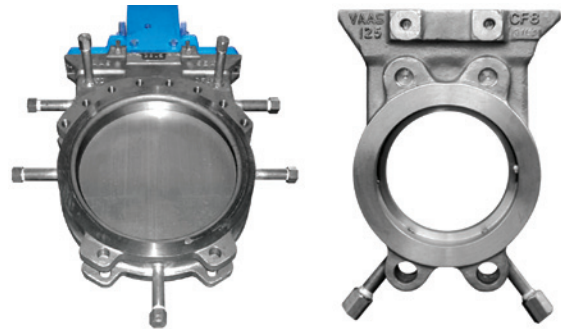
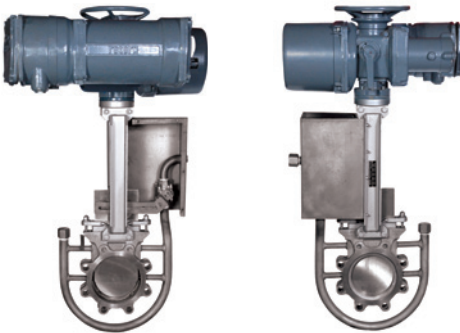
## FLUSH PORTS

Knife-gate valves generally operate in difficult conditions which could involve suspended solids/materials that collect in the bottom of the valve or in the chest area. For these applications, where entrapped media causes problems in operation, valves can be provided with purge connections at various locations of the body.

Flush-ports are used to clean the seating areas and/or chest area, below the packing, where media could settle by injecting fluid to flush the valve. Flushing medium could include water, inert gas or even steam, depending on compatibility with process media, and should be a minimum of 15psi greater than line pressure.

Flushing is usually carried out during stroking of the valve. Constant flushing is not normally required, however, a slight trickle is often adequate for applications such as de-watering.

Purge connections are usually positioned on the sides of the chest and in the bottom seating area of the valve. Some severe services may require additional flush ports.



Flush ports are also available fully piped for ease of operation minimising the need for multiple piping connections. They can be supplied in either stainless or carbon steel piping depending on material construction of the body.

Flush ports are shipped hydro-tested and capped with a pipe plug.

## SPECIAL PACKING / LIVE LOADING

Standard gland packing is square-braided PTFE impregnated syntex fibre with a maximum temperature limitation of 232°C / 450°F.

For tough slurry applications and to increase packing life, wiper-seal options are available such as copper-braided packing. This is fitted as the bottom layer of the packing chamber and wipes the gate clean during its travel. It also provides longer life for the upper sealing layers of PTFE packing. Other wiper packing materials are available, e.g. inconel.

In high-temperature applications, special graphite-braided packing is available such as Inmarco Style 108 with a temperature limitation of 650°C / 1202°F. Also available is Inmarco Style 126S with a maximum temperature limit of 1000°C / 1832°F.



*PTFE  
Syntex*

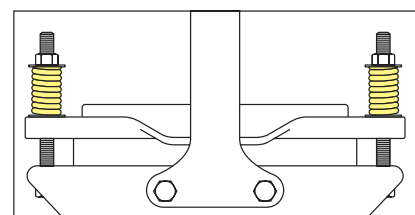
*Copper  
Braid*

*Graphite  
Braid*

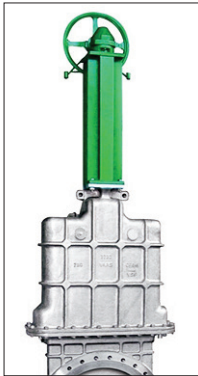
### LIVE LOADING

There are certain applications, such as thermal cycling or high-cycle conditions, where gland bolts could loosen. In these situations, the use of springs in the gland bolts provides downward force and maintains gland pressure on the packing.

Springs can not be used on standard-length bolts - extended gland bolts are required.



## BONNET



VAAS uni-directional valve models, Fig 940 and Fig 950 can be supplied with bonnets – Fig 980 and Fig 985.

The bonnet is cast or fabricated, depending on valve size, and bolts on to the valve body. Material and pressure rating is as per the valve's. Sealing to atmosphere is achieved using a round gland-sealing arrangement on top of the bonnet. This assures very tight sealing, not normally feasible on standard knife-gate valves which have a large rectangular packing area.

Bonneted valves are generally used for buried services where backfill covers the valve. Also suitable for applications requiring a higher level of gland tightness such as dangerous and toxic gasses. The bonnet also prevents internal corrosion from corrosive environments.

## LOCKING DEVICES

All VAAS knife-gate valves are available with a locking option.

### Chain Locking Device

A chain that passes through the handwheel spoke and valve yoke and secured with a padlock. Used to lock manual handwheel operated valves in the open or closed position.

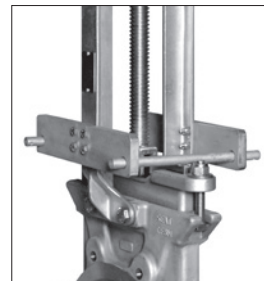
### Lock-Out Device

Fabricated and bolted on to the valve yoke with pins that prevent the gate and valve from opening. Used to lock valves in the closed position only.

### Locking Pin Device

A simple and effective locking device consisting of a removable, high-tensile locking pin and a specially made yoke. In this design, the pin, which is connected to the valve with a stainless steel cable, passes through the lugs that are drilled in the top and bottom of the yoke. The locking pin also has provision for a padlock and is designed to withstand the full thrust-load capacity of the pneumatic actuator. Used to lock valves both in the open as well as closed positions.

*Note:* In this design, the yoke and stem are longer and can not be interchanged with standard length valve and actuators as the valve will not fully close.



*Lock-Out Device*

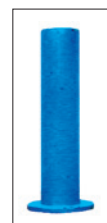
*Locking Pin Device*

## GATE GUARD & STEM GUARD



Safety Guards / Gate shrouds are also an OH&S option which is fitted to the yoke around the gate area as a precautionary measure to avoid chances of injury to hands and fingers.

Stem guards are offered as a plant-safety OH&S requirement and, additionally, protects the stem from external damage and possible corrosion.





## STEM BOOT



Stem boot / bellow is a convoluted leather / rubber / cloth cover that is clamped over the valve stem. It is generally used in pneumatically actuated valves to protect the piston rod and seal from dirt and debris that could cause premature actuator failure under extreme conditions.

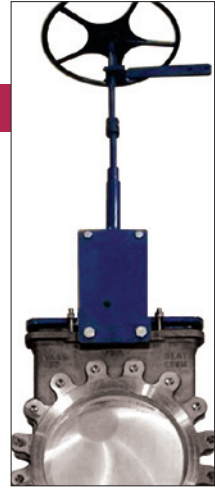
*Note:* Stem boots are factory-fitted and may require a longer actuator stroke and yoke.

## EXTENSIONS & FLOORSTANDS

For remote-mounted knife-gate valve operators and in applications where operation is required from an elevated location, VAAS offers stem extensions / extension hand-wheels, floor-mounted pedestals / floor stands and stem guides. These can be offered for both rising stem and non-rising stem valves.

Stem extensions can be supplied in kit form for site installation and, depending on requirements, could include stem guides and universal joints.

Floor stands can be fabricated to customer mounting requirements for handwheel and gear-operator mounting.



## OPERATORS



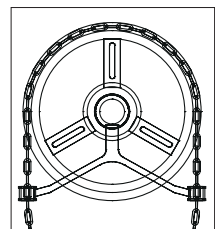
### GEAR

Weather-proof, totally enclosed bevel gear or open bevel gear operators with handwheel can be fitted to all larger diameter knife-gate valves, making them easier to operator.

### CHAINWHEEL

When valves are installed in overhead and inaccessible areas, chainwheel and chain-drive options can be supplied for easy operation.

Chainwheels can replace the handwheel of the knife-gate valve and can also be used in conjunction with bevel-gear actuators. Galvanised chain can also be supplied with the chainwheel when the chain-drop is specified.

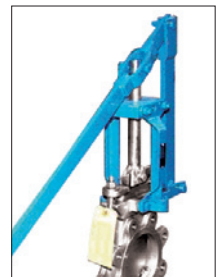


### LEVER

For quick opening applications, lever operated valves can be supplied. They are not recommended for sizes above 200mm / 8 inch as the weight of the gate could shut the valve. Valve thrust requirement is another consideration.

### RATCHET

In applications where space is limited, e.g. closely mounted to tanks and other structures, and where handwheels or gear operators can not be used, valves can be supplied with a ratchet operator fitted to allow operation at the unobstructed side. Use of ratchets are limited by valve size and torque requirements.



## ACTUATORS & CONTROLS

All VAAS knife-gate valves can be supplied with pneumatically or hydraulically actuated cylinders. Refer to VAAS for sizing options.

### PNEUMATIC ACTUATORS

VAAS pneumatic actuator model CCGC is designed for easy mounting or retrofit on all VAAS knife-gate valves. They offer easy interchangeability with manual handwheel operated valves and no additional mounting or adaptation is required. These actuators have a proven piston-seal design that uses a PTFE seal backed with a nitrile O-Ring to ensure continuous sealing between the piston and cylinder. The cylinder tube is constructed from a non-corrosive FRP material (fibreglass reinforced plastic). The internal cylinder is coated with MoS<sub>2</sub> and offers very low friction and long seal life. The piston rod is of stainless steel material providing good corrosion resistance and long, trouble-free operation.

VAAS CCGC pneumatic actuators are double-acting linear design and are offered in cylinder diameters ranging from 80mm / 3 inch to 500mm / 20 inch.

Standard actuators with FRP cylinder can be used up to a maximum temperature of 100°C / 212°F. Actuators with metallic cylinders, e.g. steel, aluminium, can be supplied with viton seals and a temperature limitation to 220°C / 428°F.

Pressure rating of actuators is 10 bar / 150 psi. Recommended air pressure to actuators is between 5 bar / 72 psi to 7 bar / 101 psi.

All CCGC pneumatic actuators are supplied with a stroke adjustment bolt located in the top cover of the actuator.



### HYDRAULIC ACTUATORS

All VAAS knife-gate valves can be supplied fitted with hydraulic double-acting linear actuators for operation by either hand pumps or hydraulic power packs.



### ELECTRIC ACTUATORS

All VAAS knife-gate valves are available with the option for electric actuation. They can be supplied with brands according to customer preference and are available in general purpose, weather-proof or explosion-proof enclosures and various operating currents.

Consult VAAS for details.



### MODULATING CONTROLS

VAAS uni-directional knife-gate valves can be supplied with V-Notch orifice plates and double-acting pneumatic actuators, fitted with pneumatic / electro-pneumatic positioners and instrumentation for modulating control applications.

See section on V-Notch for valve details.

## ACCESSORIES



All actuated valves can be complimented with a range of accessories:

- Limit Switches - Mechanical or Proximity Type
- Positioners - Pneumatic or Electro-Pneumatic
- Position Transmitters
- Filter Regulators and Gauge
- Speed Controllers
- Control Boxes including Instrumentation
- Fail-Safe Systems
- Gate / Travel Position Indicators
- Manual Handwheel Override
- Gate Guard
- Actuator Cushioning Closure



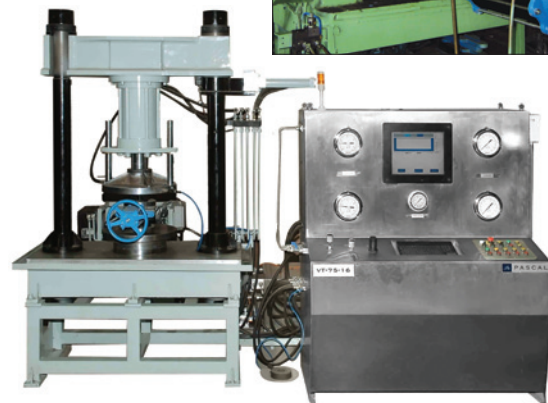
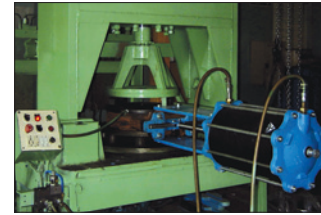
## APPLICABLE STANDARDS / SEAT LEAKAGE

VAAS carbon steel, stainless steel and alloy steel uni-directional knife-gate valves are tested and supplied in accordance with applicable international standard for bonnetless knife-gate valves MSS SP-81-2006a. This standard covers knife-gate valves in sizes 50mm / 2" to 900mm / 36".

### Pressure Testing

Seat leakage is carried out in the valve's normal flow direction (uni-directional / pressure-assisted sealing). VAAS uni-directional knife-gate valves comply with MSS SP-81 leakage standards which stipulate:

- Metal-seated valves - 40cc / minute / inch valve size, maximum, when tested with water @ 40psi in normal flow direction.
- VAAS soft-seated valves are supplied with zero-visible leakage when tested with water at 40psi in normal flow direction.
- All shell tests are hydrostatically pressure-tested at 1.5 times the rated working pressure with no visible leakage and seat-tested at 40psi differential pressure in the direction of closure.
- The MSS SP-81 standard stipulates seat-leak test at a low pressure of 40psi as knife-gate valves seal better when pressures increase.



*Computerised / Integrated Test Station*

VAAS also supplies metal-seated valves with a lower leakage rate (100cc / minute irrespective of valve size up to 400mm / 16") by lapping the gate / seat interface.

VAAS cast-iron, uni-directional valves are rated 10bar / 150psi up to 300mm / 12" and 5bar / 75psi up to 800mm / 32".

### Pressure Rating

Size mm	Size Inch	Pressure Psi	Pressure Bar
50 - 600	2 - 24	150	10
750 & 900	30 & 36	100	7

### Face-to-Face Dimensions

VAAS uni-directional valves comply with face-to-face dimensions as stipulated in the MSS SP-81 standard.

## OPTIONS COMMONLY AVAILABLE

OPTION	FIG 940	FIG 950	FIG 960	FIG 930	FIG 931	FIG 970	FIG 980	FIG 985
Deflection Cones (Ni-Hard / Polyurethane)	•	•					•	•
Metal Seat - Integral / Integral + Stellite	•	•	•	•	•	•	•	•
Metal Seat - Replaceable w EPDM Backup O-Ring (RS-S1 / S2-E)	•	•					•	•
Metal Seat - Replaceable (RS-S1 / S2)	•	•				•	•	•
Metal Seat - Replaceable + Stellite (RS-S1 / S2-ST)	•	•				•	•	•
Soft Seat - EPDM (RS66)	•	•		•	•		•	•
Soft Seat - Viton (RS48)	•	•		•	•		•	•
Soft Seat - Off-White Viton (RS58)	•	•					•	•
Soft Seat - Nitrile (RS26)	•	•		•	•		•	•
Soft Seat - Chloroprene (RS16)	•	•		•	•		•	•
Soft Seat - Neoprene (RS36)	•	•		•	•		•	•
Soft Seat - White Neoprene (RS70)	•	•					•	•
Soft Seat - PTFE w SS Backup Ring (RS75)	•	•					•	•
Soft Seat - PTFE (RS76)	•	•		•	•		•	•
V-Port	•	•					•	•
Stellite Edge Gate	•	•	•			•	•	•
PTFE Coated Gate	•	•						
Flush / Purge Ports	•	•						
Extensions & Floorstands	•	•					•	•
Chainwheel & Chain	•	•				•	•	•
Stem Boot	•	•						
Stem / Gate Guard	•	•						
Bonnet							•	•
Locking	•	•						
Packing - New Design PTFE + Quad Seal	•							
Live Load Packing	•							
Handwheel	•	•	•	•	•	•	•	•
Ratchet	•	•						
Lever	•	•						
Gear Operator	•	•	•	•	•	•	•	•
Pneumatic Actuator	•	•	•	•	•	•	•	•
Electric Actuator	•	•	•	•	•	•	•	•
Hydraulic Actuator	•	•						
Actuation Instrumentation	•	•	•	•	•	•	•	•

Note: For options not indicated in this chart, contact a VAAS representative nearest you.

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