

# Mokveld

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## shut-off valves

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# Mokveld shut-off valves axial flow, a unique concept that works

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Mokveld axial flow shut-off valves have been developed over nearly four decades of research and field application. They combine high quality engineering with a thorough understanding of the needs of the oil and gas production, process industries and companies involved with transmission, distribution and storage of fluids.

Axial flow valves were originally designed for hydro power plants, where they have been in use since the beginning of this century. Mokveld adopted the unique advantages of the axial flow principle in 1955 and has taken the lead in development of the axial design for valves used in the oil and gas industries.

Mokveld axial flow shut-off valves have found worldwide acceptance across a large range of gas and liquid applications: production, treatment, transmission, storage and distribution. Fluids handled range from crude oil to refined products, from high GOR multiphase fluids to heavily sand loaded natural gas.

Mokveld has supplied shut-off valves to the world's largest oil and gas production facilities, gas storage facilities, and gas transmission systems.



*HIPPS valve 16" ANSI 1500 lbs  
in German compressor station*



*HIPPS valve 24" ANSI 900 lbs for gas  
landing station at Zeebrugge Belgium*

# the shut-off valve that offers more

The Mokveld axial flow shut-off valve is a rugged, low maintenance, high performance valve, providing efficient service over a long period in a range of many applications.

## **bubble tight shut-off**

Even under the most severe working conditions, Mokveld shut-off valves maintain tight shut-off over the full pressure range. Mokveld's unique sealing system has a proven record for reliability in applications where shut-off valves are required to provide bubble tight shut-off after extended periods of operation. The main seal is protected from the high velocity flow.

## **suitability for throttling applications**

The Mokveld shut-off valve is designed for throttling service. The throttling is controlled by steel parts in the valve separate from the main seal and seat.

## **pressure balanced**

The design of the Mokveld shut-off valve includes a pressure balanced piston eliminating pressure differentials across the piston. This significantly reduces the thrust to be overcome by the actuator and limits wear on the moving parts. Stroke times are subsequently very fast, with smaller actuators and a low mass of moving parts in the valve. Fast stroke times are essential for over pressure protection systems (HIPPS) and emergency shutdown applications.

## **high integrity pressure protection systems**

The fast acting pressure balanced Mokveld shut-off valve, RZD-X-SAV, is ideally suited for over pressure protection systems (HIPPS). Independent of valve size and rating, response times can be 2 seconds or faster. The main sealing integrity is maintained by a design which protects the seal and seat from flow damage.

The valve and actuator and instrument design meet stringent safety requirements for HIPPS applications.

## **bi-directional flow and sealing**

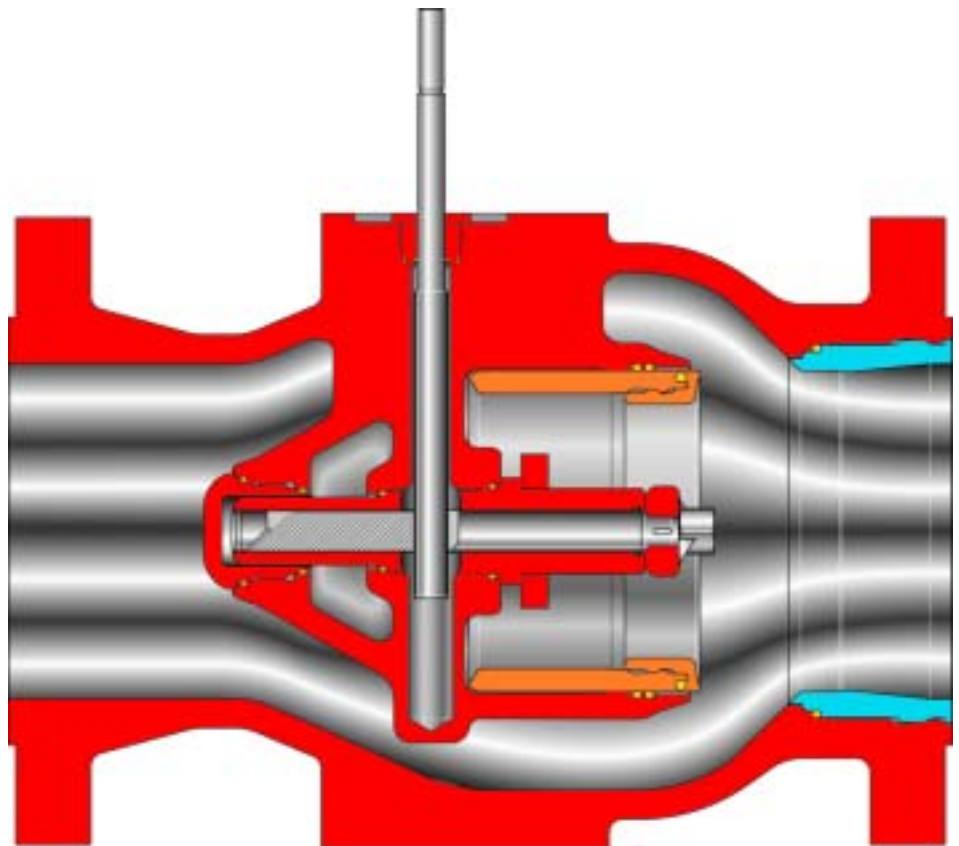
The valve design allows flow in both directions. Bubble tight sealing is provided with pressure up or downstream of the valve.

## **fire safe design**

Mokveld shut-off valves can be certified fire safe according to API 6FA.

## **complete range of sizes and pressure ratings**

Shut-off valves are available in all sizes up to 48" and pressure ratings from ANSI 150 to ANSI 2,500, and up to API 10,000.

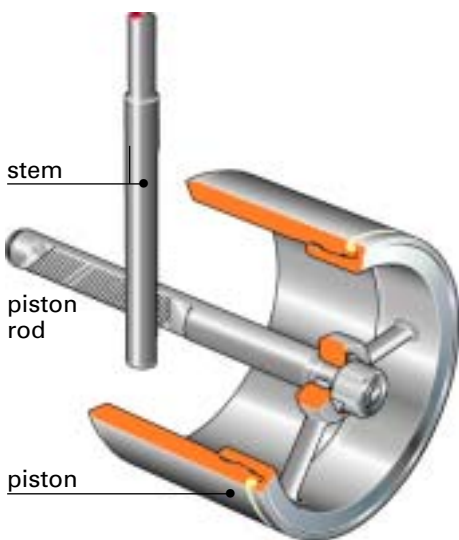
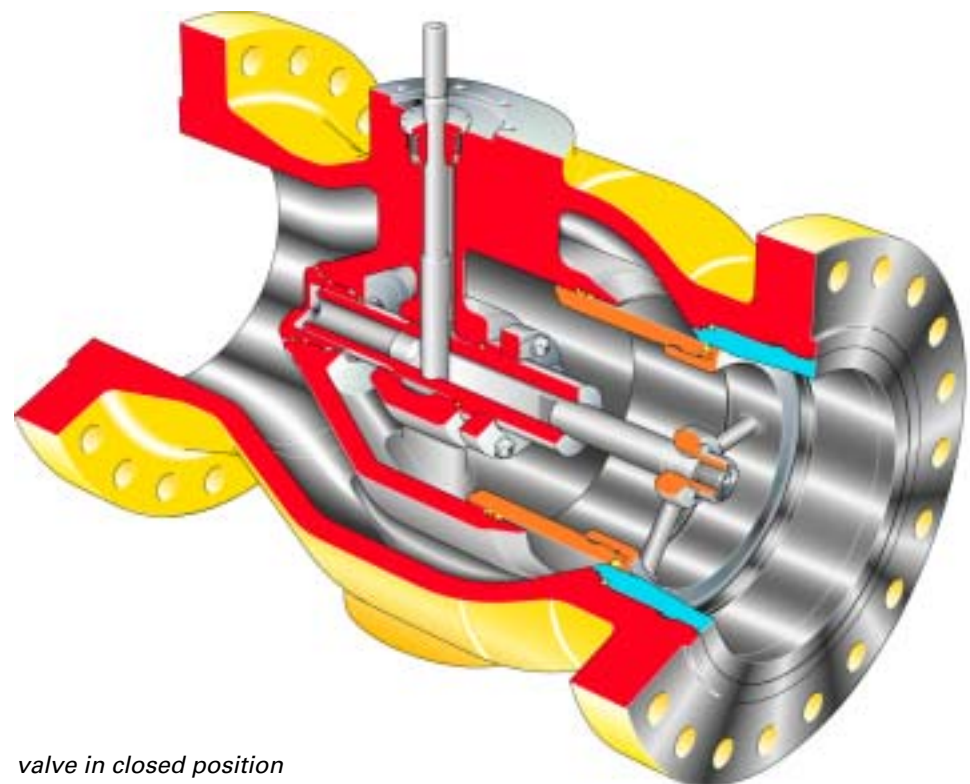
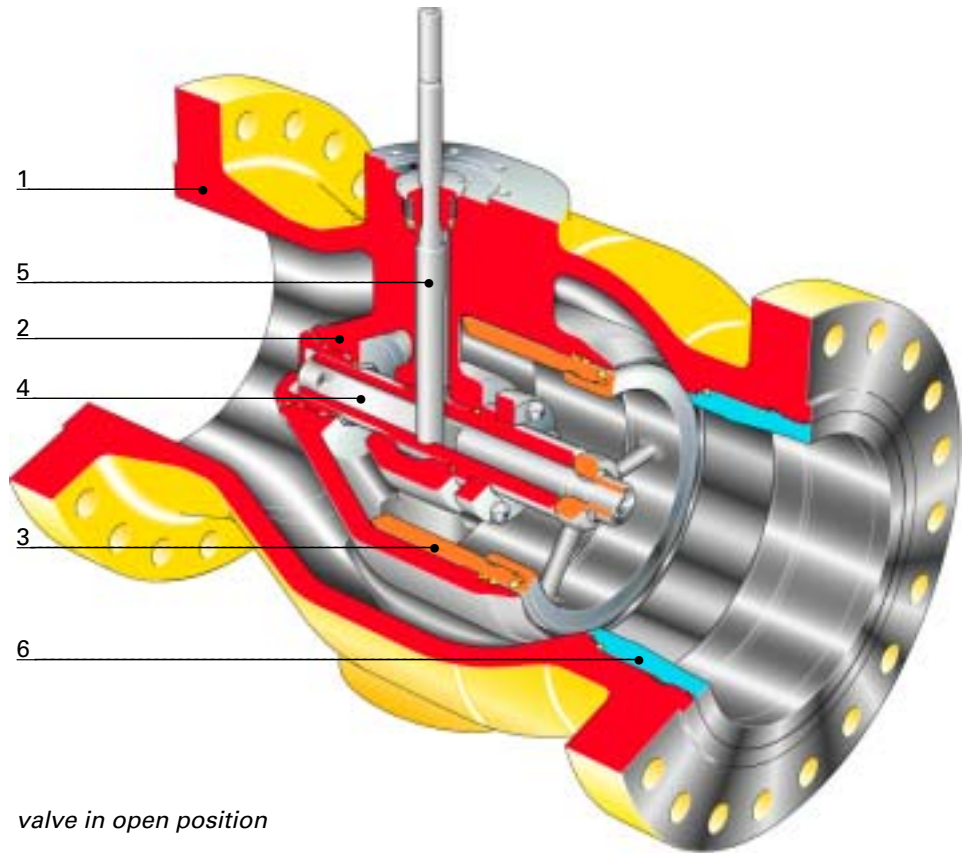


# axial flow

Axial flow refers to the straight line symmetrical and unrestricted flow path between the valve inner and outer bodies. Major components of the Mokveld axial flow shut-off valve are valve outer body (1), inner body (2), piston (3), piston rod (4) and valve stem (5) and seat (6).

The valve body is a single piece steel casting. The wide body concept provides very high capacities with overall pressure losses kept to a minimum.

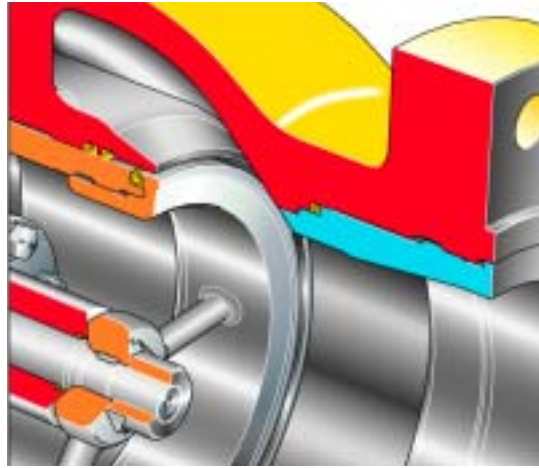
The piston is operated by means of a 90 degree angle transmission consisting of a pair of sliding tooth racks with matching teeth located on both piston rod and stem. Small tolerances on the gear teeth ensure that the Mokveld gearing is hysteresis free with no 'play' between valve stem and piston rod. The flat tooth beds are isolated from the fluid by double primary seals on the piston rod and guide.



# patented sealing system

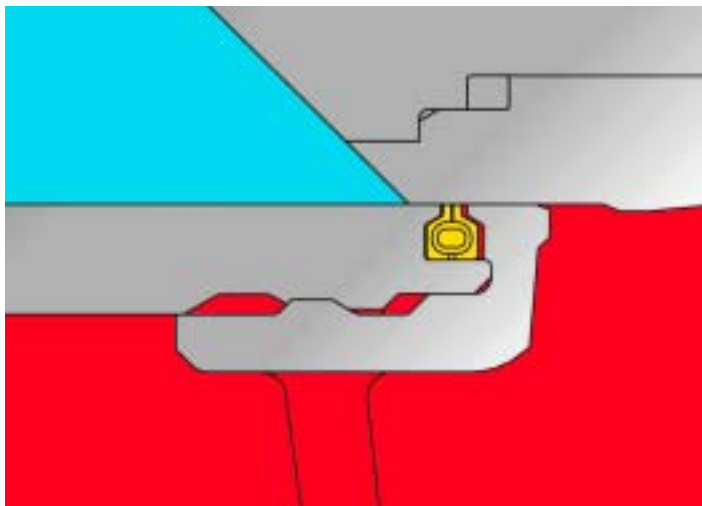
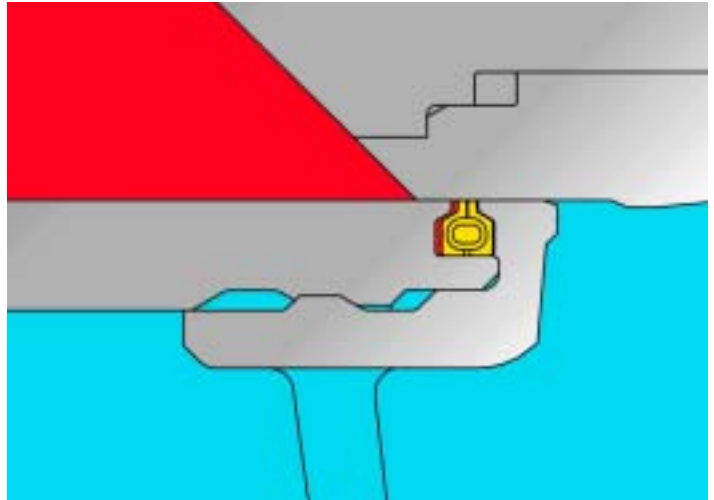
Mokveld shut-off valves assure bubble tight shut-off over the full pressure range, even under the most severe working conditions. These valves have an unsurpassed record for reliability in applications where the shut-off valve must maintain 100% tight shut-off capacity, even after extended periods of use.

The Mokveld Sealing Assembly, a self-energizing pressure design, consists of two high pressure rings and a spring in between, all of which are located within the piston.

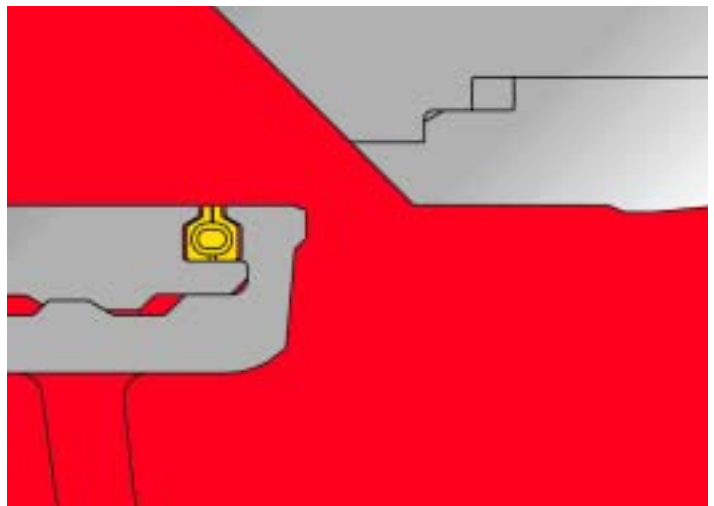


In the closed position pressure is applied to the internal face of the main seal, energizing it and forcing it radially outwards against the piston seat, thereby assuring bubble tight shut off against all pressure differentials.

Note that the clearance between the valve piston and the seat is extremely small so that throttling has taken place between metal faces only and to all intents the valve is closed before the seal is energized. Therefore the seal only completes tight shut-off and is protected from erosion. All shut-off valves maintain bubble tight shutoff to ANSI class VI, independent of actuation method.



Under reversed flow conditions, the system works equally well. The main seal is forced against the piston by the line pressure, effecting tight shutoff.



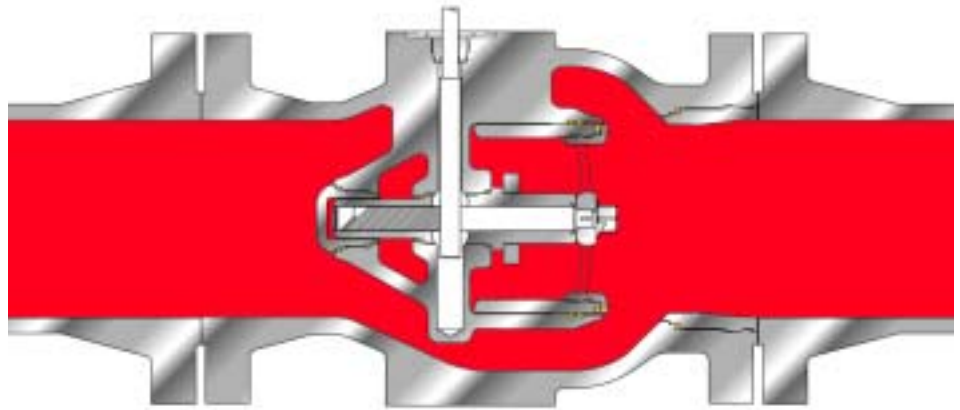
When the valve is open, the main seal, because of the energizing principle, is retracted into the piston head and therefore protected from erosion.

# pressure balancing

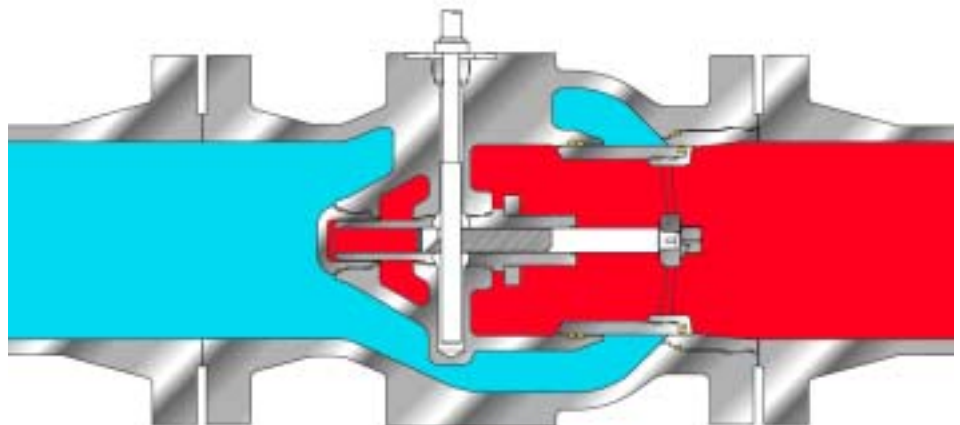
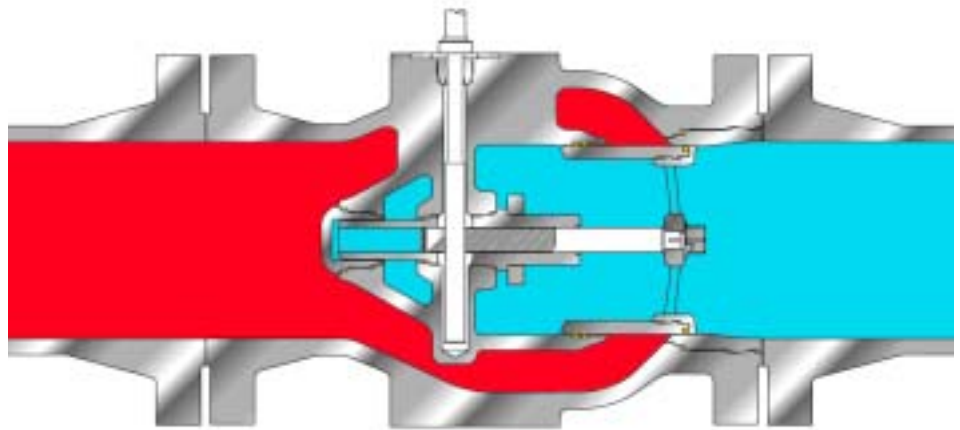
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Mokveld shut-off valves are pressure balanced. This is achieved by placing line pressure both sides of the piston and the piston rod, providing equal forces within the valve and cancelling a pressure differential.

The pressure balancing permits easy operation, and in combination with the low mass of the valve internals, very fast stroking speeds.



With the valve in closed position high pressure can be allowed from both upstream and downstream sides without affecting the stem thrust required to operate the valve.



# special application: pressure protection systems

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## application

Pressure protection systems are required in every situation where risks of the process pressure exceeding the system design pressure may occur.

Depending on the design requirements, systems can provide different levels of protection; for example pressure relief which is limited in practical application and usually not preferred for environmental reasons.

## design

High Integrity Pressure Protection Systems (HIPPS) are used as the highest level of defence in systems handling compressible fluids.

HIPPS are independent systems with a high degree of redundancy, using highly reliable Mokveld type RZD-X-SAV shut-off valves with instruments to interrupt the passage causing overpressure.

Overall response time of the protection system is less than 2 seconds.

## shut-off valve design code

Mokveld safety shut-off valves including associated instrumentation are designed, built and tested according to the DIN 3381 standard, a common and widely used design code for the HIPPS method of pressure protection. DVGW certification is available for the entire range of sizes up to 48" and ratings up to ANSI Class 2,500 lbs.

Among the regulations it is imperative that the safety device is of a proven reliable design. The reliability of the Mokveld safety valve can meet the worlds most stringent safety requirements with references in more than 188 applications since 1974.

## features

The design of the Mokveld shut-off valve provides features ideally suited to the requirements of high safety standards in critical applications.

The pressure balancing system permits simple and compact spring return fail-safe actuators, manufactured and designed by Mokveld. Fast response times are further enhanced by the low mass of the valve moving parts.

The proven and unique sealing system is protected completely from the flow when the valve is full open. During throttling the seal and seat are both away from the high velocity flow, with energising of the seal in the last millimetres of stroke.

## measuring units

Pressure switches or transmitters can be utilised for the measuring unit. The most simple system, without any external source of energy, is based on Mokveld pneumatic pressure switches. Accuracy within the DVGW/DIN standards is AG 1 (1% deviation of the setpoint).



*HIPPS valve 28" ANSI 600 lbs in natural gas booster station, Germany*



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## actuator

The actuator is the most important component between the pressure sensing element and the over pressure control valve. It is specially designed for fast reliable stroking over an extended service life.

Three types of Mokveld actuators are used in HIPPS service:

### 1

Low pressure piston type, instrument air or line gas to open, spring to close.

### 2

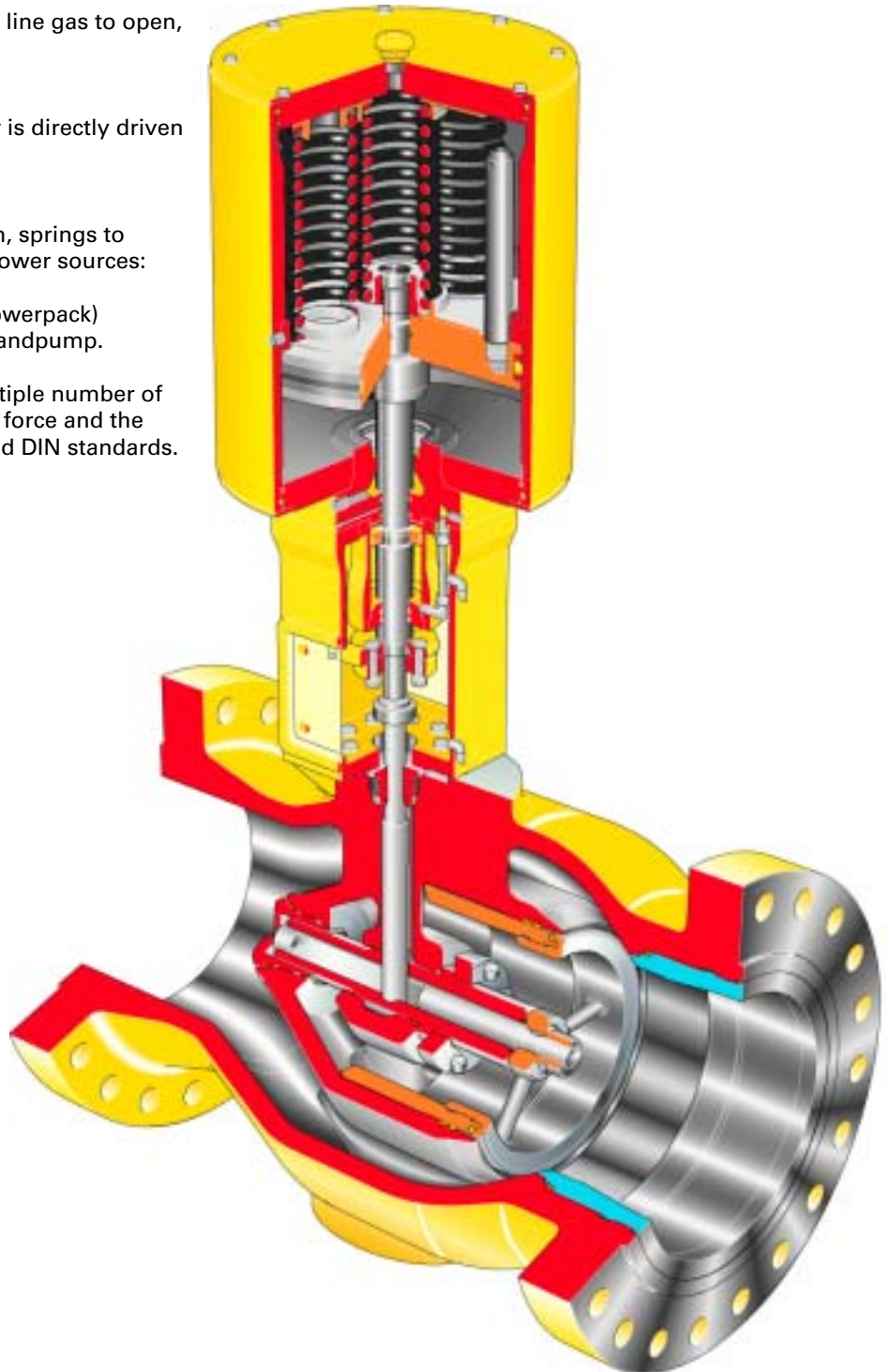
High pressure (line) gas actuators. Actuator is directly driven by the gas from the line.

### 3

Hydraulic piston actuator, hydraulic to open, springs to close. This type can be supplied with two power sources:

- hydraulic supply from external source (powerpack)
- hydraulic supply from a valve mounted handpump.

Mokveld actuators are designed with a multiple number of springs, depending on the required closing force and the necessary over sizing dictated by DVGW and DIN standards.



# general

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## materials

Mokveld has wide experience in material selection for shut-off valves in corrosive and sweet services like crude oil, natural gas, multi-phase fluids, potable water, produced water and sea water. Selection criteria include fluid composition, velocities, operating and design temperatures and pressures. Commonly used body materials include carbon steel, austenitic stainless steels, aluminium bronze, Incoloy 825, duplex alloys, 254 SMO, and many others.

## quality control and quality assurance

Mokveld's policy is that all valves are manufactured within strict quality standards. The Quality Assurance Department takes full responsibility to ensure that all customer requirements are met. Mokveld's quality systems are in full compliance with ISO 9001 and API Q1 and have been audited and approved by all major oil and gas companies, engineering contractors and inspection authorities.

## test and inspection

Mokveld manufactures and tests its products in accordance with standards and codes issued by API, ANSI, BS, CSA, DIN, DVGW, MSS, NACE, NS, TRbF, TRLG, and by others. In-house facilities are available for hydrostatic and gas body and seat tests. The facilities and procedures meet the requirements as outlined in industry standards. Non-destructive testing is performed by certified ASNT-TC-1A level II inspectors.



Registration Number 891209



API Spec 6A-0257, 6D-0270

## Computer Aided Manufacturing at Mokveld factory



# other Mokveld products

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**Mokveld Valves is manufacturer of:**

control valves  
shut-off valves  
surge relief valves  
choke valves  
check valves  
actuators and control systems

Separate brochures are available upon request.

*anti-surge control valve 12" ANSI 600  
compressor station, Russia*

*flowline shut-off valves  
gas production plant  
N/E Netherlands  
(by courtesy of NAM)*



# other Mokveld products

*adjustable choke valves 7<sup>1</sup>/<sub>16</sub>"  
API 10,000 with inconel cladding,  
gas production field UAE*



*adjustable choke valves 8" ANSI 900 lbs  
with pneumatic actuators,  
gas production offshore Malaysia*

*surge control valves 20" and 24"  
ANSI 300 lbs,  
gas compression facility New Mexico*

# other Mokveld products

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*inline production chokes 10" ANSI 1500,  
FPSO Norway*



*pressure control valves 20" ANSI 600 lbs and safety slam shut valves  
16" ANSI 600 lbs, M & R station Germany*

*flow control valves, underground gasstorage field Germany*



*safety shut-off valve 16" ANSI 600,  
underground storage field Germany*



## other Mokveld products

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*shut-off valves and non-slam check valves  
6" ANSI 900 lbs, water injection manifold  
of a crude oil production field, North Africa*



*flow pressure control valves and safety shut-off  
valves, M & R station Germany*



# Mokveld Valves



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Sumy, Ukraine  
Beijing, the People's Republic of China  
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Stavanger, Norway