

ADAMS

ARMATUREN

**Persistent
valves**
for hydrogen
production and
transportation



Made in Germany

The company

The plant in Herne was acquired in 1972. The company management already planned a long way ahead. The land provided sufficient space to expand and thereby accommodate the fourteen production buildings erected so far, as well as the administration building. Today, more than 250 employees work in the main administration building and at the plant.

Our plant in Herne / Germany covers 70,000 square meters and currently performs practically all production steps required for the manufacture of valves, including welding, mechanical processing, assembling and approval. Only the making of cast parts is outsourced to certified foundries. We also operate a specially designed large-parts production area for manufacturing oversized valves. The broad scope of production that can be provided by the main plant in Herne is in keeping with the high degree of flexibility and quality that we offer our customers.



Commitment from all employees

Product development at Adams has always comprised two main areas: the general development of valves and details and the development of products specially designed for individual customers. In our view, we can only make real progress if research and development are solidly embedded as integrated corporate tasks. This also includes close interaction with other departments of the company, for example exchanging views with those of the sales department who pose questions straight from the market, or cooperation with the production department regarding the latest technologies, e.g. finishing processes, which enable the engineers' ideas to be implemented in the first place.

What we provide

We often receive enquiries including exhaustive specifications that clearly define the valve and its design within a certain framework. In these cases, we can quickly and precisely supply the valve to suit the desired requirements. However, just as often we receive enquiries that our wide range of experience enables us to offer solutions for, using various of types of valves that had not previously been thought of. In several cases, customers ask us to develop valves together with them for special applications. We are able to provide all of these services because of the great scope we have in both development and production.



Our values and principles

For over 60 years, ADAMS is leading in the development of triple eccentric butterfly valves and has constantly focused on innovation, reliability and high quality. During the last decades, we have developed different types of valves with numerous features and for various applications. With our expertise, we were - and still are - able to design the valves according to our customers' requirements. We have delivered large quantities of valves that are in operation since decades.

ADAMS did not only enhance the valves but also itself. Today's success has been achieved by sticking to five principles: Availability, Design for environment, Adaptability, Made in Germany and Satisfied customers. At ADAMS, there is no one person more important than the other, at ADAMS we view all employees as a team. Without our team, we would not have been able to achieve such a success with high quality valves made in Germany. We would not have been able to design reliable and safe valves for critical application that last for years. We would not have been able to become world market leader in 2021.



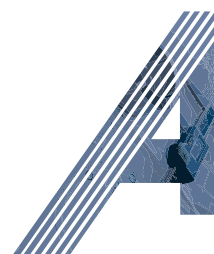
Availability

With our headquarter and main workshop located in Herne, Germany, we are taking advantage of the optimal distribution possibilities to deliver our valves worldwide. Airports, harbors and railway stations are nearby which enables us to deliver our valves by any means of transportation.

But ADAMS did not stay in Germany, in 1969 we have established our first foreign distribution office: The "Benelux" office in Breda, the Netherlands. Only a few years later, in 1972, the ADAMS Schweiz AG has been founded. In 1988 ADAMS Valves Inc. was incorporated in Houston, Texas. Today, we have 350 employees worldwide.

Design for environment

Sustainability is one of the main values for ADAMS and we strive to implement it both in our work environment and in our valves. At our workshops, we have implemented an environmental management system according to DIN EN ISO 14001 and have set objectives for our company. We aim to reduce the energy consumption, production-related emissions, water and waste in our workshops and by doing so we reduce our impact on the environment.



Adaptability

High functional reliability under difficult operating conditions is one of the most important requirements for nearly all of our customers. As operating conditions can be highly individual, the majority of our valves are tailor-made to ensure they ideally meet our customer's needs.

When ADAMS was founded by Karl Adams, he has conquered the market not only with his patent for the triple eccentric sealing system but also with his idea of specially designed valves for the use in versatile and critical applications. During the years, our innovative spirit has stayed and many patents like the metallic sealing system have been registered.

Made in Germany

Since our foundation in 1960 we have expanded our production facility and our list of suppliers and partners. We have gained extensive experience and are able to manufacture our valves on our own in our plant in Herne, Germany. Due to this, we have complete control over all processes and are able to deliver high quality valves – made in Germany.



Satisfied customers

It has always been important to develop valves according to our customers requirements. This value has not changed during the last 60 years, as we still focus on long-term relationships both to our customers and suppliers. By keeping this focus, we were able to enhance our technologies and knowledge and are able to develop special valves for critical applications. Many of our customers have kept on re-ordering valves for other projects. The trust and loyalty of our customers has only intensified our will to maintain the course and keep on enhancing our product portfolio.

Valves for green energy production, storage and transport

Since ADAMS has patented the triple offset butterfly valves back in 1960, the triple offset valve concept found its way into more than hundred thousand high end applications in power generation, gas and petrochemical plants, providing reliable and safe operations. In recent years, the call for the decarbonization of these industries and the demand for renewable energy to bring climate change to a hold dominate the news every single day. At ADAMS we are well-prepared for this energy transition with a large installed base in solar, hydro- and pump storage installed valves globally.



Hydrogen & energy transition

In order to decarbonize the power and petrochemical industries, the utilization of hydrogen produced from renewables such as solar and wind energy will rise exponentially on mid long term. With its potential as energy carrier green hydrogen usage will increase drastically in petrochemical and power industries. One example of the application is that green hydrogen is used in refineries and as feedstock for gas turbines. This generates decarbonized electricity in existing power plants globally. It is ADAMS mission to continue to contribute to these sustainable transitions with proven, safe and reliable triple offset technology. With experienced partners and stakeholders for the production of valves in the energy supply chain, ADAMS design specialists are contributing to international standardization committees defining new international standards for the increased use of hydrogen in the industry.

Hydrogen is an energy carrier like electricity is. It can be used as a fuel and energy carrier and has the advantage, that it has no environmental impact, as long as it is produced with renewable energies. Another benefit of it is that the handling of hydrogen does not have to be completely reinvented. Its means of transportation are similar to the transportation of natural gas. This is why natural gas supply lines can be adjusted or new lines, based on these adjustments, can be made for it.

Other than electricity, it is also possible to use hydrogen as feedstock for industrial processes and, if needed, to reconvert it into electricity. It can be used to decarbonize power generation as well as petrochemical-, steel and cement industries. Beneficial is, that it is storable and can hence be used even when it is not possible to generate energy through wind and solar plants due to the weather conditions. With the decommissioning of nuclear and coal fired power stations stored hydrogen, amongst other technologies, has big potential to fill the gap between the future demand and supply.

ADAMS supports the production of green hydrogen for sustainable energy and heat supply for industrial plants and households as well as for climate-neutral transportation. We strive for a green future.



Special designed valves for hydrogen



Over the last decades, ADAMS triple offset valves were installed for hydrogen applications, in petrochemical and industrial applications for many global customers. Our product range includes tight shut-off, throttle and control valves, check valves and combined tight shut-off valves. Our triple offset valves are manufactured for various processes, starting with hydrogen production, storage and transportation up to the consumption of hydrogen in various industries. The ADAMS engineers follow a noncompromising design philosophy.

This leads to a reliable and long-lasting valve of high quality – providing safety and reliability for generations to come and made in Germany.

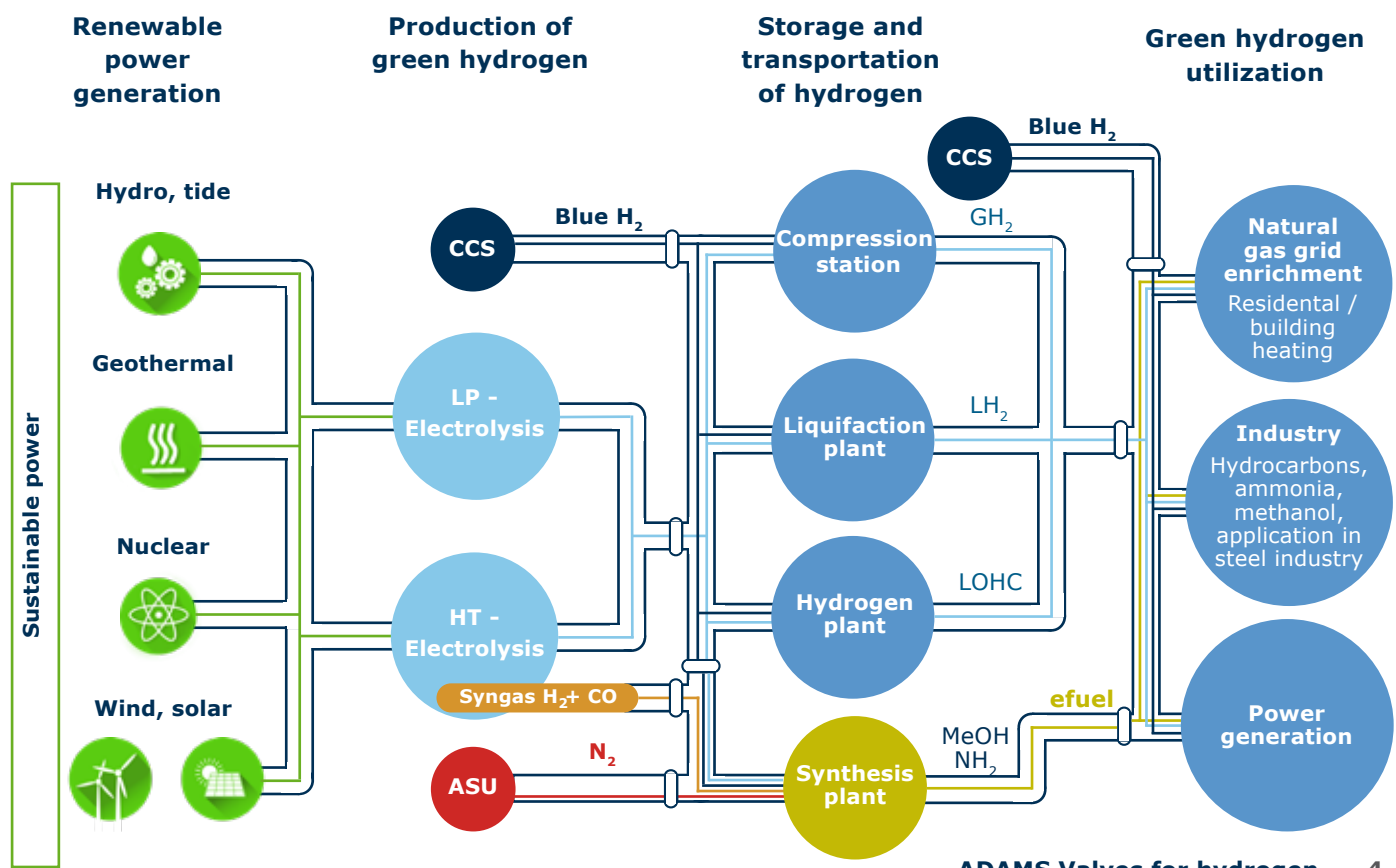
ADAMS Triple offset technology, performance made for hydrogen applications

The ADAMS triple offset valves can be found in hydrogen applications at chemical and petrochemical applications.

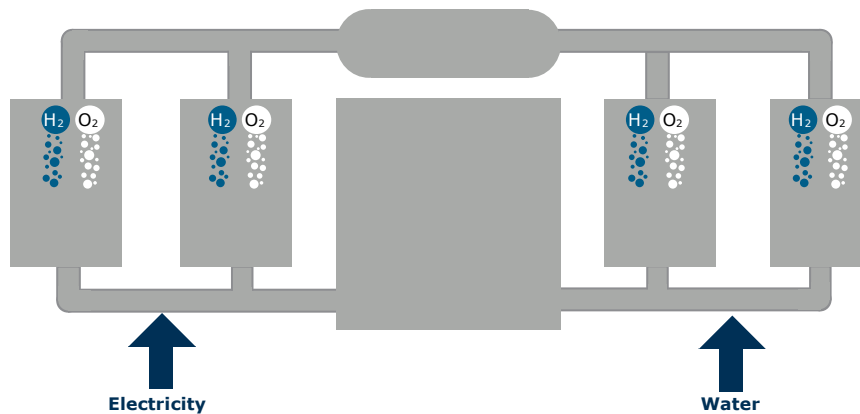
As hydrogen is the lightest element, it is difficult to seal and highly flammable. The ADAMS triple eccentric valve technology provides zero leakage seat arrangement since decades. Due to its conical seat arrangement the disc rotates and closes without friction assuring safe and reliable operation. Furthermore, our well-proven valves used in hydrogen application are qualified acc. to ISO 15848-1 to limit fugitive emissions as much as possible.

The ADAMS valves for hydrogen application are available in different dimensions and pressure classes:

- PN2,5 - PN150
- ASME 150 - 2500
- DN80 / 3" - DN5000 / 200"



Hydrogen supply chain and ADAMS triple offset



The electrolyzers split the water into oxygen and hydrogen

Production of hydrogen includes various processes, each of them dealing with its own difficulties. At the heart of the hydrogen supply chain electrolysis or steam reforming are the primary processes. Pressure and temperature ratings vary from, -253°C with Liquid hydrogen to +400°C in high temperature hydrogen applications. Pressures vary from vacuum to 160barg.

- Green Hydrogen Electrolysis Produce Hydrogen and Oxygen
- Blue Hydrogen is produced by methane steam reforming combined with Carbon Capture

The requirements of the flow controls and circuits at Electrolysis vary with the different technologies and manufacturer. Current best praxis is the application of ADAMS MAK triple offset butterfly valves, they are the most economical choice at DN150 and larger. Due to its triple offset design, valves are one hundred percent tight.

ADAMS Design features Hydrogen applications

Depending on the individual processes, different design features are needed. Throughout the years, ADAMS has found reliable and safe solutions for these processes, based on our experience and sophisticated engineers.

Main pressure bearing parts

For cryogenic applications austenitic stainless steels are used by ADAMS, especially in case of liquid Hydrogen. Pressure containing parts need to fulfil the most extreme tightness requirements to avoid diffusion of hydrogen molecules through the valve body and disc. One hundred percent nondestructive examination is performed against the most stringent standards.

Fugitive emissions

ADAMS complies with ISO FE 14484-1 standards to prevent leakage to the atmosphere. In case of liquid hydrogen service a valve can be installed in a vacuum-insulated line or valve jacket („vacuum insulation”) or in a vacuum space („cold box”).

Hydrogen embrittlement

Hydrogen-induced stress corrosion (HIC) is to be mitigated to avoid cracking for highly stressed pressure-bearing components. This requires the design of additional valve internals and surface hardness such as stellite followed with heat treatments.

Safety integrity level (SIL)

ADAMS valves and control systems comply to the Safety Integrity Level 3, abbreviated SIL 3. SIL is a normative method for assessing electrical, electronic and programmable electronic (E/E/PE) systems with regard to the reliability and safety of processes The IEC 61508 standard defines SIL into two broad categories: hardware safety integrity and systematic safety integrity. All ADAMS valve assemblies meet the requirements for both categories to achieve the most reliable valve-actuator systems.

ADAMS Product range for hydrogen

Hydrogen definitions and applications			
Application	Typical process temperature	State of aggregation	ADAMS Valve type
sLH ₂ / L ₂	20K (-253°C)	Fluid	MAK, MAKO, HTK
GH ₂ - Green H ₂	243 to 323 K (-30°C to -50°C)	Gas	MAK, MAKO, HTK, WAK
"H ₂ ready"	273 K (0°C to ambient temperature)	Gas	MAK, MAKO, HTK, WAK
Methanol (CH ₃ OH)	338 K (65°C)	Fluid	MAK, MAKO, HTK, WAK, RZN, GBZ
Ammonia (NH ₃)	240K (-33°C)	Gas	MAK, MAKO, HTK, WAK, GMZ

References ADAMS valves in Hydrogen

ADAMS manufactures valves for the utilization in hydrogen applications since decades and has gathered widespread experience. One of our most manufactured valves in Germany for this area of application is the tight shut-off, throttle and control valve type MAK. We have produced them for various customers, amongst others for:

AIR LIQUIDE, ARAMCO, NASA, NOBIAN, SASOL

ADAMS Valves for oxygen

Next to hydrogen, electrolysis produces another element: Oxygen. It is as well needed in refineries, chemical industry, metallurgy and power generation. The handling of oxygen is even more critical as hydrogen. This is why ADAMS has developed reliable valve designs for this medium. Oxygen valves are needed to comply with high safety and cleanliness standards, as the smallest impurities and damages can lead to catastrophes.

Design features ADAMS Oxygen service

Risks in the Oxygen service are flammable materials, including some materials that are normally relatively non-flammable in air, but burn very rapidly in high oxygen concentrations.

As well as in hydrogen processes, the oxygen application includes processes with stringent requirements and conditions. The ADAMS valves for the service in oxygen application are available in different materials, in accordance with the conditions in the process. This leads to the best performance and utmost reliability of the valves. Material selection as per EIGA Doc 13/20 Appendix A, Nickel alloys such as Hastelloy, Inconel and Monel. Stem packing material is BAM certified.

All ADAMS valves in oxygen service are designed to operate without lubrication. They are needed to be assembled in clean rooms.

References ADAMS in Oxygen

We have enhanced our valves for the use in Oxygen applications as well. Several of our valve types have been ordered by numerous customers like:

CELANESE, DEGUSSA HULS, LINDE, MAN, HYDRO RAFNES, SEW Zürich

Type MAK



ADAMS tight shut-off valve type MAK

Mature technology for a broad range of applications

Based on the original patented triple eccentric valve technology, the MAK is a valve which can be universally modified to suit extreme operating conditions and high actuation torques. During the last 50 years, we have enhanced the design and applied it to a wide range of applications.

Many of the tight shut-off, throttle and control valves type MAK are already in operation for decades, without any sign of malfunctions, proving the high reliability and quality. We achieve such a quality due to the fact that our valves are tailor-made constructions according to the special requirements of each of our customers.

The MAK is especially designed to handle temperatures of -253°C / -423°F , which makes it optimally suitable for the use in hydrogen application. It is furthermore capable of dealing with extreme pressures up to Cl. 2500.

Nominal diameters

80 mm to 2400 mm
3 inches to 96 inches

Temperature range

-253°C up to 600°C
 -423°F up to 1112°F

Pressure class

PN10/16/25/40/64/100
ANSI 150/300/600/900/1500/2500



Features

- triple-eccentric design
- Seal in the valve body for protection of medium
- Fireproof design
- Compact, robust design#
- Low-friction function

Advantages

- Tightness on both sides
- High resilience to temperatures
- Low actuation torques
- Excellent control characteristics
- Minimal pressure losses
- Simple to maintain, even on site /replaceable interior parts
- Protection against emission
- ISO FE 14484-1 stem seals

Options

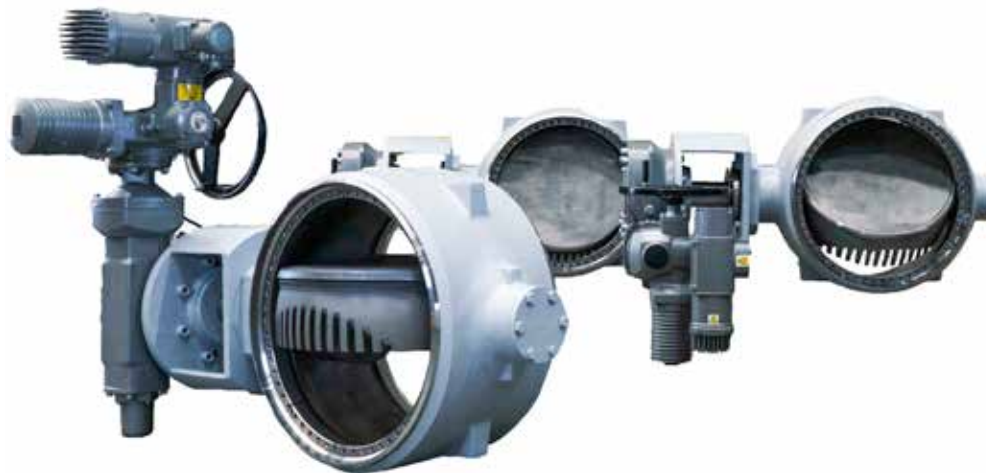
- Flange or butt-welded ends
- Double disc for achieving pressurisation
- Various types of packings
- Different sealing systems
- Blocking system
- Optional installation length

Type MAKO

The MAKO is based on our well-proven triple offset valve type MAK and offers the same outstanding reliability all ADAMS valves have. The disc design with its special shape and flow channels make it special and each of the discs are customized designs based on customer requirements.

The control valve ideally prevents cavitation while regulating the flow and minimizing noises. The enhanced regulation is rendered possible because of the flow channels on the disc. Another improvement of the MAKO is, that the special form of the back of the disc has been adjusted, so that it creates a change of the flow chart within the first 20 degree and the last ten degree. This leads to a nearly perfect, even percentage characteristic curve during the whole flow area.

The MAKO is able to cope with extreme conditions, due to the solid seal located in the body. It offers highest reliability and long-term performance at extreme conditions. The control valve is the ideal solution if a high-pressure drop is requested.



Nominal diameters

80 mm to 2400 mm
3 inches to 96 inches

Temperature range

-253°C up to 600°C
-423°F up to 1112°F

Pressure class

PN10/16/25/40/64/100
ANSI 150/300/600/900/1500

Features

- Triple-eccentric design
- Solid seal located in body
- Compact, robust design#
- Special shape of the disc
- Flow channels on the disc

Advantages

- Tightness on both sides
- High resilience to temperatures
- Excellent control characteristics
- Minimal pressure losses
- Creates a change of the flow chart
- Even percentage characteristic curve during whole flow area

Options

- Additional orifice plate downstream

Type HTK



ADAMS tight shut-off valve type HTK

Reliability at large nominal widths

The strength of HTK valves is their absolute tightness at temperatures up to 950 °C. The triple eccentricity combined with the special metallic sealing system in the valve ensures easy opening and closing, even at extreme temperatures.

Our state-of-the-art welding technology makes it possible to work with large nominal widths and enables us a great deal of flexibility with which we manufacture special lengths and custom-made valves in accordance to the requirements of our customers.

ADAMS has developed a special HTK for the use in severe hydrogen service. This special design features a purge system and inspection ports as well as adjusted material selection to provide highest reliability. The ports make easy inspection on site possible, while the purge systems prevent slurry particles from reaching the bushing area. This leads to an improved lifecycle of the valve.

Nominal diameters

500 mm to 4000 mm
20 inches to 160 inches

Temperature range

-20°C up to 150°C
-4°F up to 302°F

Pressure class

PN2.5/10/16/25/40/64
ANSI 150/300/600/900/1500/2500



Features

- Small shaft eccentricity
- Positively operated valve
- Fully open position regardless of the flow rates
- Counterweight and hydraulic servomotor controlled pump protection valve

Advantages

- Optimal tightness
- Progressive sealing
- Reliable functioning in any position installed
- Capable of combining various operating tasks: flow regulation, shut-off function
- Great resilience, even at high switching frequency

Options

- Block & bleed

Type WAK

Quality utilization in vacuum-insulated lines

The WAK has a wide range of uses due to its economical construction as a lug and wafer design.

Its sealing system is incorporated in the body and guarantees low-friction opening and closing without jamming. The metal seal ensures tightness on one side and is designed to withstand high temperatures. The WAK features first-class control characteristics and very low pressure losses. It is a hydrodynamically optimized and economical valve which is used in a great many applications, particularly in compressor and pump lines.

The WAK is additionally usable as a vacuum-breaking valve type and can be installed between the turbine and the condensate pipeline and must eliminate any possible vacuum. Due to this feature it is a great choice for liquid hydrogen service in a vacuum-insulated line, valve jacket or in a vacuum space. The valve is electrically actuated and has a resilient seat.



ADAMS tight shut-off valve type WAK



Nominal diameters

80 mm to 1200 mm
3 inches to 48 inches

Temperature range

-20°C up to 150°C
-4°F up to 302°F

Pressure class

ANSI 150/300

Features

- Metal-to-Metal torque seating
- Seal ring in body
- Wafer or Lug-type construction
- Inherently fire-safe
- Low fugitive emissions
- Compact size / low weight
- Stable control characteristics

Advantages

- Replaceable internal parts
- Low torques
- Compact design
- Low weight
- Any installation positions
- Good control characteristics
- Wide range of applications

Options

- Fire-safe model
- Single flange model
- With tapped and through-holes (lug type)

Type RZN and RZI

Complete pump protection in sophisticated areas

Our RZN check valve offers proven pump protection for applications with liquid media, more reliable than any other check valve in the market. The individually adjustable damping system enables the butterfly valve to perform shock-free checking, even in critical areas.

The high-quality check valve features first-class hydrodynamic characteristics, low pressure losses and the individually adaptable damping system. This inimitable damping system ideally adjusts the closing characteristics of the butterfly and enables it to suit the needs of each system. It is possible to simply readjust the RZN and the RZI to adapt to new requirements if changes are made to the system at any point in the future. This makes them the most economical solution in changing conditions.

The compact design of the RZN check valve even makes it possible to operate in very limited spaces. The valve is robust and long lasting and can additionally be equipped with soft seals in a metallic seat or strip-metal seals for use at higher temperatures.

The RZN is the most-suitable valve for the protection of pumps for liquid media. The high flexibility of material and seal models enables the valve to be used in a wide variety of applications.



ADAMS Check valve type RZN

Nominal diameters RZN

150 mm to 1000 mm
 6 inches to 40 inches

Temperature range

-50°C up to 200°C
 -58°F up to 392°F

Pressure class

PN10/16/25/40/64
 ANSI 150/300/600



Features

- Individually adjustable damping system
- Compact design
- Automatically closing

Advantages

- Long service life
- Shock-free checking even in critical areas
- Great hydrodynamic characteristics
- Low pressure loss
- Simple readjustment
- Operation in limited spaces

Options

- Disc blocking mechanism
- Soft seals in a metallic seat or strip-metal seal

Type GMZ



ADAMS check valve type GMZ

Safety when flows reverse

Our GMZ check valve protects important continuous flow machines from the dangers of backflows. An extremely low degree of internal friction and a finely responsive adjustable counterweight enable the valve to react sensitively. The GMZ is additionally equipped with a pneumatic, spring-controlled drive, enabling controlled and rapid closing behavior. It is also fitted with a hydraulic damping system to avoid any tendencies of the valve disc to vibrate during flow changes.

As automatically closing check valve the GMZ is used in exhaust steam pipes in steam turbines as well as in pressure lines of compressors in air and gas systems.

The valves can be fitted with either a hydraulic or pneumatic auxiliary drive with spring loading as additional closing support.



Nominal diameters GMZ

150 mm to 2000 mm
6 inches to 80 inches

Temperature range

-50°C up to 250°C
-58°F up to 482°F

Pressure class

PN2.5/6/10/16/25/40
ANSI 150/300

Features

- Individually adjustable damping system
- Positive closing behavior via spring-loaded pneumatic operation
- Adjustable counterweight

Advantages

- Adjustable hydraulic damping facility
- Avoidance of tendencies of the valve disc to vibrate during operation
- Adjustability of slight pressure losses via the closure weight
- Additional screw retention
- High availability and long service life

Options

- Hydraulic or pneumatic auxiliary drive
- Additional spring loading

Quality surveillance



At ADAMS, we focus on high quality to guarantee long-lasting and sustainable valves for our customers. For more than 60 years, our valves are made according to the highest standards and regulations or by the specifications of our customers - all made in Germany. We work daily to retain this level of quality – systematically and with great attention.

Since 1960, we have expanded our buildings and halls, invested in state-of-the-art equipment and have constantly enhanced our valves with it.

Next to the equipment, we have invested as much in our employees. Many of them have started their apprenticeship at ADAMS and are still working for us. This guarantees the flow of information from our experienced employees to the next generation.

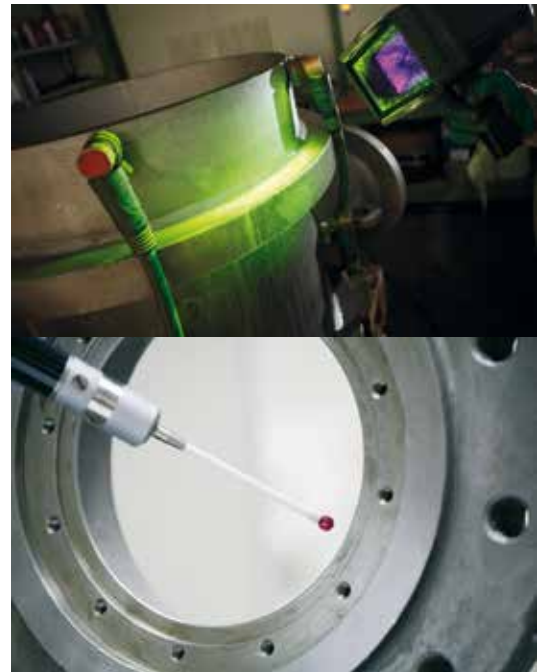
Our employees take great care in everything they do. They have a positive attitude towards their work that cannot be prescribed. It is part of a working culture that has come into being through many years of working together. It is all about the understanding of each individual employee for the quality requirements of our customers, but also as a reflection of the appreciation of their achievements by the executives and management.

Certification in accordance with DIN EN ISO 9001

The ADAMS quality management system in accordance with DIN EN ISO 9001 was certified for the first time in 1993. We have regularly obtained recertification ever since. Our quality management includes two points of central importance that we would additionally like to mention. Firstly, the particularly extensive training and further education of the company’s employees and secondly, the maintaining of the company’s own test stands for valves with state-of-the-art testing equipment that we use for scrutinizing our finished products and prototypes. That typifies our systematic approach.

National standards and guidelines by which ADAMS is authorized to develop, produce and test:

- AD information sheets
- ANSI
- API
- ASME
- ATEX
- BS
- PED
- DIN EN ISO
- GOST
- KTA
- MSS
- NACE
- RCC-M



Environmental management system certified according to ISO 14001

Next to the ISO 9001 certification, ADAMS has received certification for the environmental management system according to DIN EN ISO 14001. It is one of our aims to fulfil both national and international environmental standards. We have implemented diverse production changes to be able to produce sustainable valves in an environment-friendly manner.

By testing our valves in our own in-house testing facility, we are able to guarantee their performance, high quality and longevity. This leads to long operation times and less leakage.

Quality tests



Our tests comply with the above-mentioned standards. We perform the testing processes with our own state-of-the-art equipment either personally in-house or in cooperation with well-known testing institutions.

Destruction-free testing procedures:

- Dye penetrant test (PT)
- Magnetic particle test (MT)
- Ultrasound test (UT)
- Visual test (VT)
- Leak test (LT)
- Positive Material Identification (PMI)
- X-ray test (RT)





Contact information

ADAMS Armaturen GmbH
Baukauer Str. 55
44653 Herne / Germany
Tel +49 (0)2323 209 0
www.adams-armaturen.de
info@adams-armaturen.de

ADAMS Valves Inc.
12303 Cutton Road
Houston, Texas 77066
Tel +1 (281) 453 3750
www.adamsvalves-usa.com
sales@adamsvalves-usa.com

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ADAMS Armaturen GmbH

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