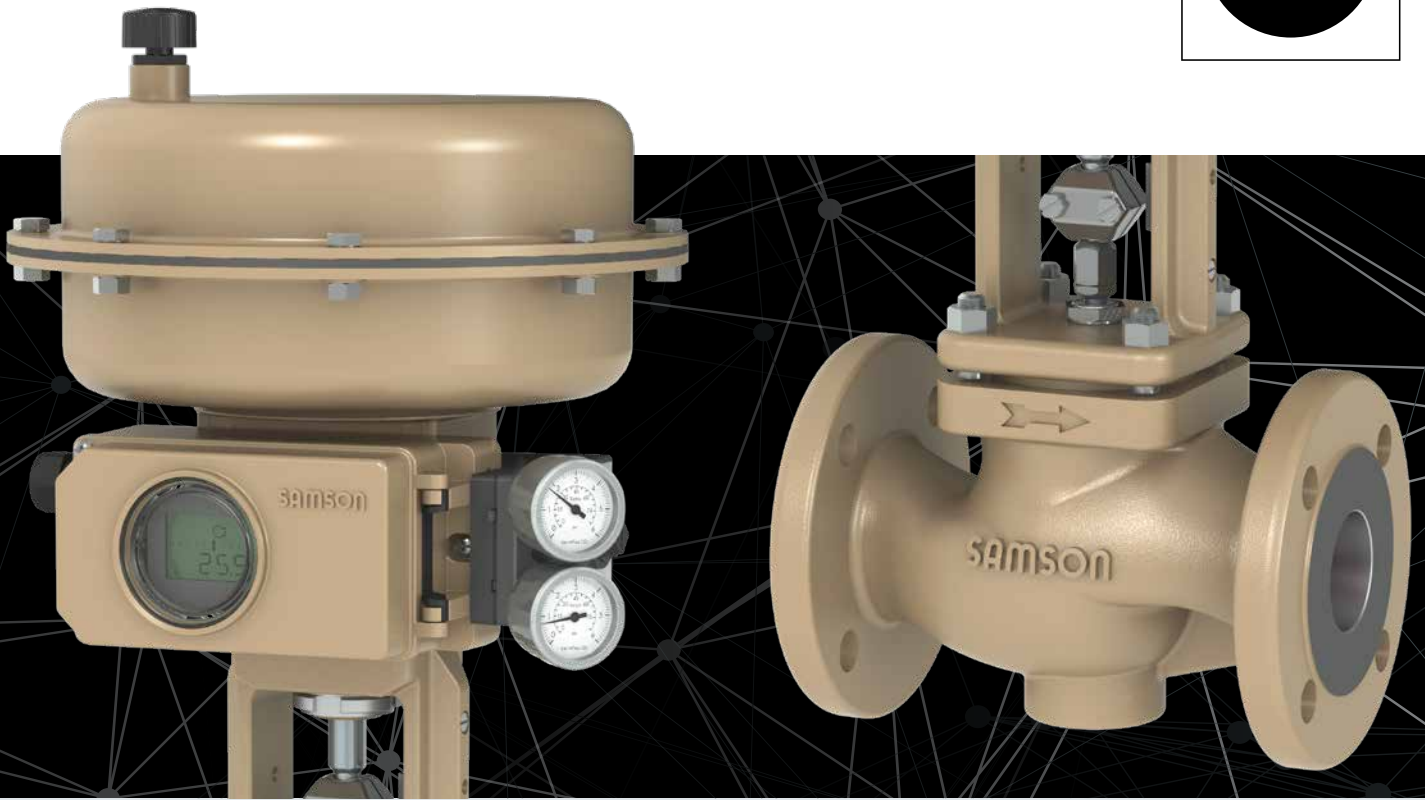


The SAMSON logo consists of the word "SAMSON" in white, uppercase, sans-serif font, centered within a solid black circle. This circle is itself centered within a white square frame.

EXPERTISE

in Control Valve Engineering

SMART IN FLOW CONTROL

GLOBAL PRESENCE

SAMSON

AIR TORQUE · CERA SYSTEM · KT-ELEKTRONIK · LEUSCH · PFEIFFER
PRECOGNIZE · RINGO · SED · STARLINE · UBIX · VDH PRODUCTS · VETEC

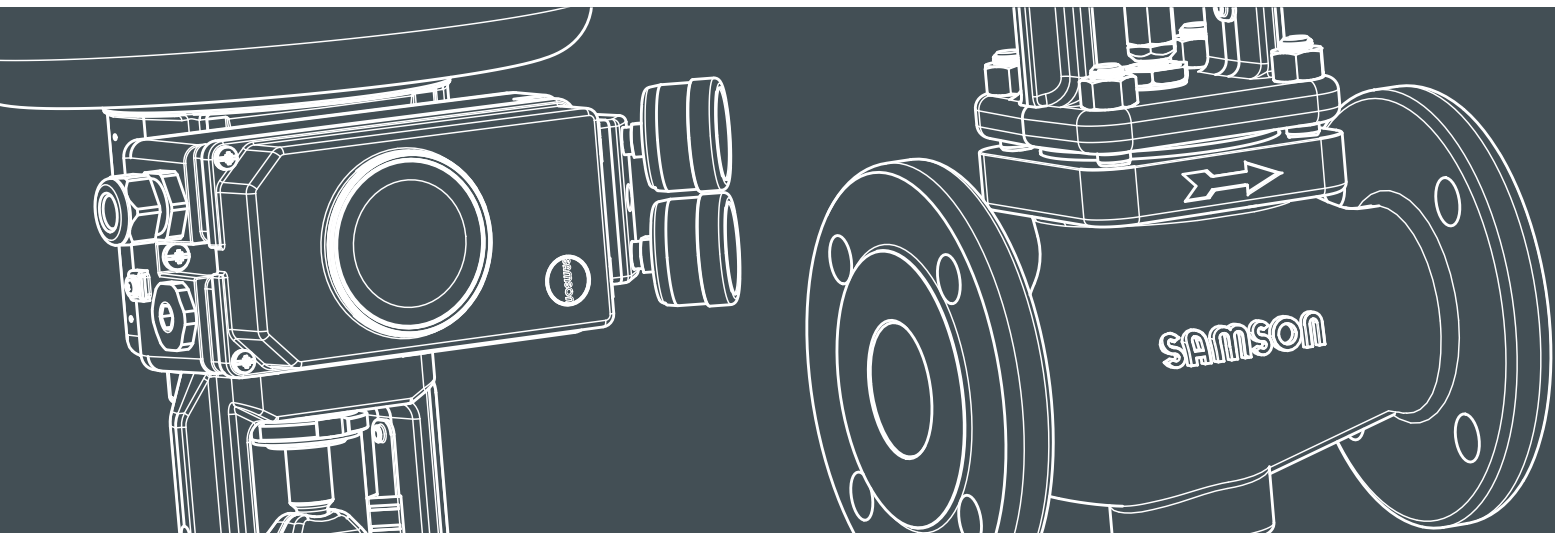


Global presence with a local touch – SAMSON has enjoyed a history of growth for over a century. Shortly after the company was founded in 1907, SAMSON established partnerships with renowned trading houses in several European countries to efficiently market our products abroad. The formation of the Technical Sales Department in 1949 laid the foundations for the expansion of SAMSON’s international sales and service network recognized for its expertise and efficiency.

A strong partner – Today, SAMSON is a worldwide leader in the manufacture of expertly engineered control valves and accessories for all industrial processes. Noted manufacturers of special valves, such as AIR TORQUE, CERA SYSTEM, LEUSCH, PFEIFFER, RINGO VÁLVULAS, STARLINE and VETEC, belong to SAMSON.

Local customer support – With over 50 largely independent subsidiaries and more than 220 representatives or engineering and sales offices, SAMSON is on hand to provide local customer service all over the world. Each year, new offices are established to further strengthen our local presence. Quick service for our SAMSON products anywhere in the world is a matter of course.

CONTROL VALVES IN MODULAR DESIGN



In any case

Efficient solutions – SAMSON's expertise in control valve engineering covers all processes in industrial plants. Our extensive experience gained over the years from the design, development and manufacture of optimally engineered solutions serves as the basis for mastering new challenges. The wide range of products proven in practice can be customized in close cooperation with our customers to provide a commercially acceptable solution that meets the requirements of even the most complex applications.

Modular design – With their flexible, modular design, our SAMSON control valves can be tailored to the specific control task, which allows them to meet even the most challenging requirements under severe operating conditions.

SAMSON can supply modular control valves with globe, angle and three-way bodies in all common pressure ratings and materials at short notice. The valves are designed in accordance with the ANSI, DIN or JIS standards and available with different flange types and welding ends.





The right actuator – Pneumatic actuators with a rolling diaphragm and springs evenly arranged in the actuator case are made to precisely fit on valves over robust yokes, completing the compact design of our SAMSON control valves.

The fail-safe action of SAMSON actuators can be reversed in the field, requiring no additional parts. The connector mechanism that fastens the actuator to the valve stem allows the travel and thrusts to be varied.

Actuators with manual overrides ensure that the process can keep running in emergency mode, even in the event of a control signal or power supply failure.

Innovative valve accessories – Positioners and limit switches by SAMSON ensure the safe operation of our customers' plants.

Small to medium-sized actuators mounted on globe valves are designed for integral positioner attachment, eliminating the need for external piping. In all other cases, the NAMUR rib at the actuator yoke ensures that the valve accessories are mounted safely.

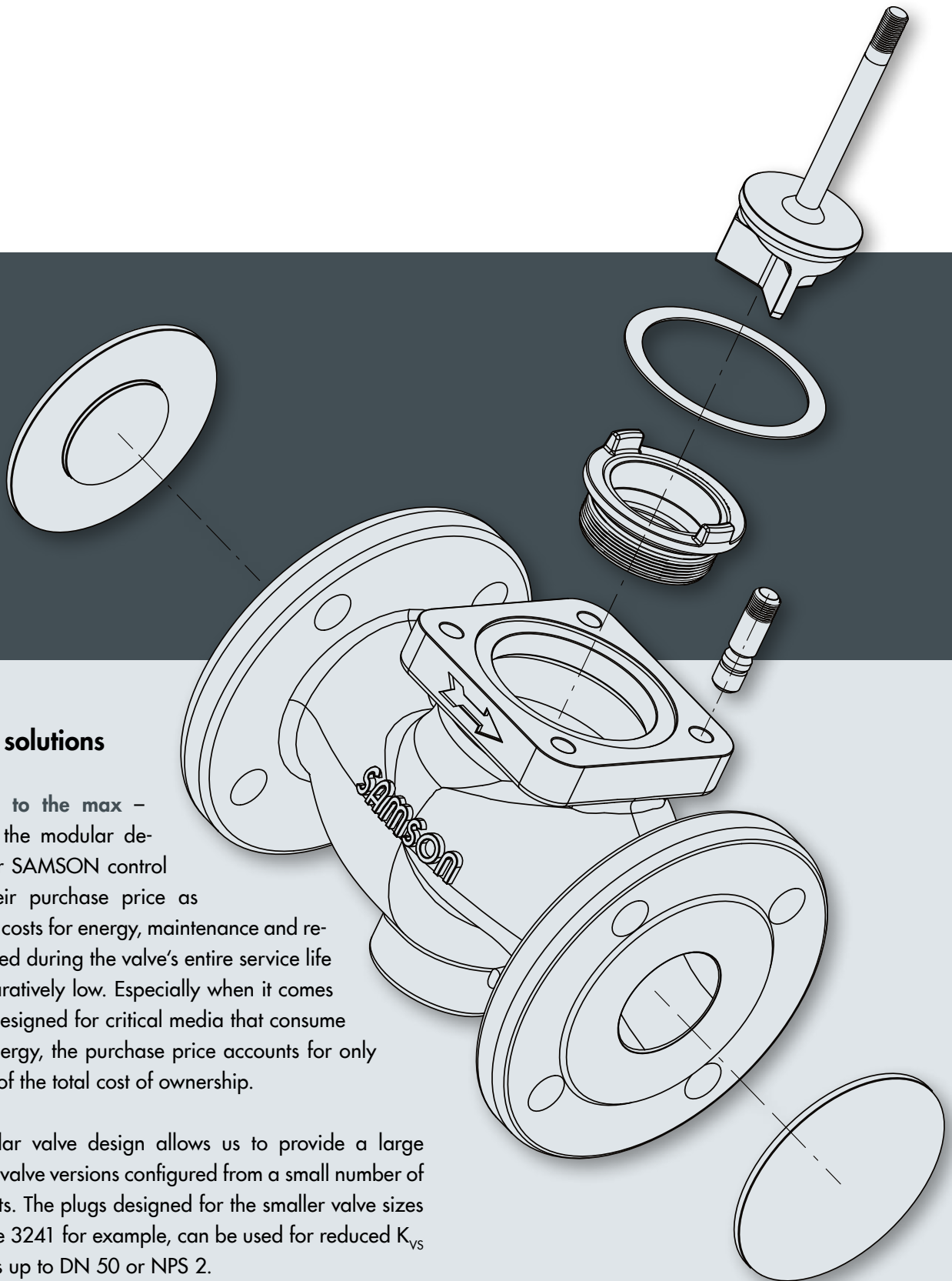
Attachment of our positioners to rotary actuators complies with VDI/VDE 3845 requirements.

Efficient solutions

Optimized to the max –
Thanks to the modular design of our SAMSON control valves, their purchase price as well as the costs for energy, maintenance and repair incurred during the valve's entire service life are comparatively low. Especially when it comes to valves designed for critical media that consume a lot of energy, the purchase price accounts for only a fraction of the total cost of ownership.

The modular valve design allows us to provide a large number of valve versions configured from a small number of components. The plugs designed for the smaller valve sizes of our Type 3241 for example, can be used for reduced K_{vs} coefficients up to DN 50 or NPS 2.

In addition, the seat design allows the valve trims to be adapted easily to changed process data.



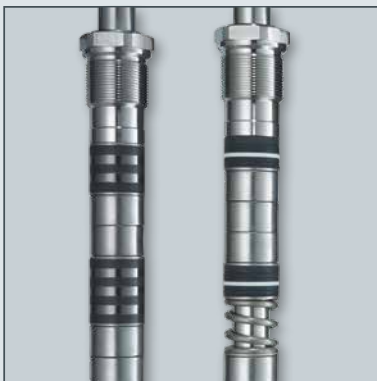


The dimensions of the bellows and packings are identical up to DN 80. As a result, fewer spare parts have to be kept in stock despite the wide variety of K_{vs} coefficients.

True, a metal bellows costs more than a packing. But when the packing needs to be replaced for the first time, these extra costs will soon be forgotten in view of the considerable plant downtime caused.

Often, an actuator with a greater actuating force is more expensive than a pressure-balanced solution. However, the more powerful actuator provides a lower hysteresis and leakage rate, and it may not be necessary to repeatedly replace worn-out gaskets.

The reliable and economically viable solutions by SAMSON ensure the competitiveness of our customers in the international market.



PRESSURE LETDOWN IN GASES



Low-noise operation

Theoretical insights – When reducing the pressure in gases and vapors, the medium expands as it passes through the valve and reaches high flow velocities even at small pressure drops. As a result, a turbulent mixing zone is created downstream of the vena contracta where the pressure and density fluctuate considerably. As the differential pressure increases, the flow velocity may exceed the speed of sound at certain locations. This causes the turbulent mixing zone to be overlapped by shocks. This phenomenon exposes the valve components to extreme mechanical stress and leads to noise emissions exceeding 100 dB(A).

Empirical data applied – SAMSON has carried out extensive tests on in-house test benches operated by steam, water and air to investigate how and why noise develops in control valves as well as to find ways of optimizing the noise behavior patterns. To achieve a low-noise pressure letdown, the outlet velocity must be restricted to Mach 0.3. This helps avoid secondary sources of noise and allows our SAMSON flow dividers to perform to their full potential: they keep the turbulent zone directly downstream of the vena contracta in control and reduce the sound level by as much as 30 dB(A).





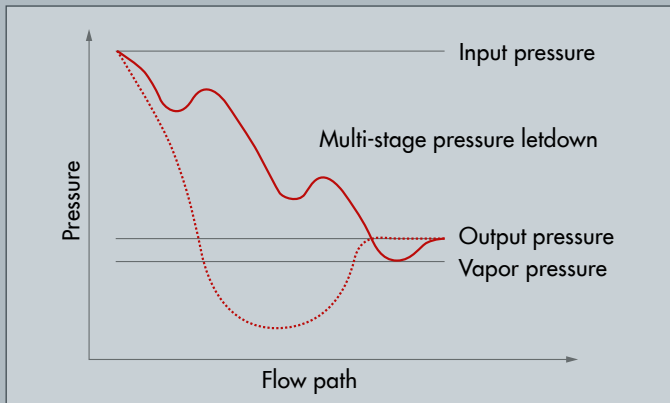
Accurate noise calculations – SAMSON bases noise emission calculations on the internal sound power, which can be calculated using a theoretical formula and acoustical efficiency factors determined empirically. This method is used to precisely calculate noise transmission loss, the effect of insulation, noise emission at a remote location or when venting to the atmosphere.

With the objective of improving existing standards and meeting customer requirements, we at SAMSON are constantly investing in our high-performance test rigs.

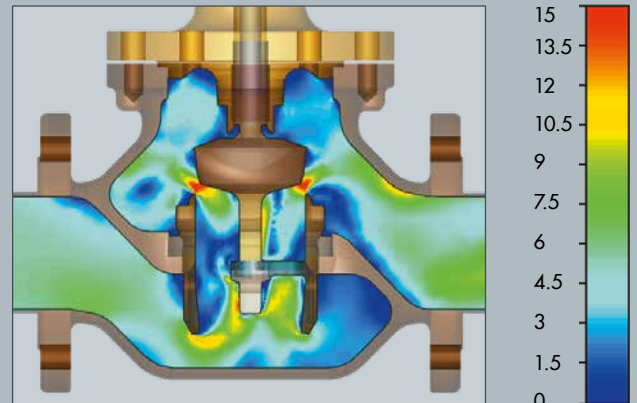
Effective solutions – A control valve can be adapted to an existing pipeline by installing a silencer downstream of the valve. This silencer restricts the pressure drop across the valve at full load and expands the valve outlet to achieve an outlet velocity that does not exceed Mach 0.3. A low-noise momentum exchange with the surrounding medium is made possible by using a perforated plug. A considerable noise reduction is achieved by the design consisting of a silencer, perforated plug and flow divider.



THROTTLING SERVICE WITH LIQUIDS



Pressure graph: — With AC-trim Without AC-trim

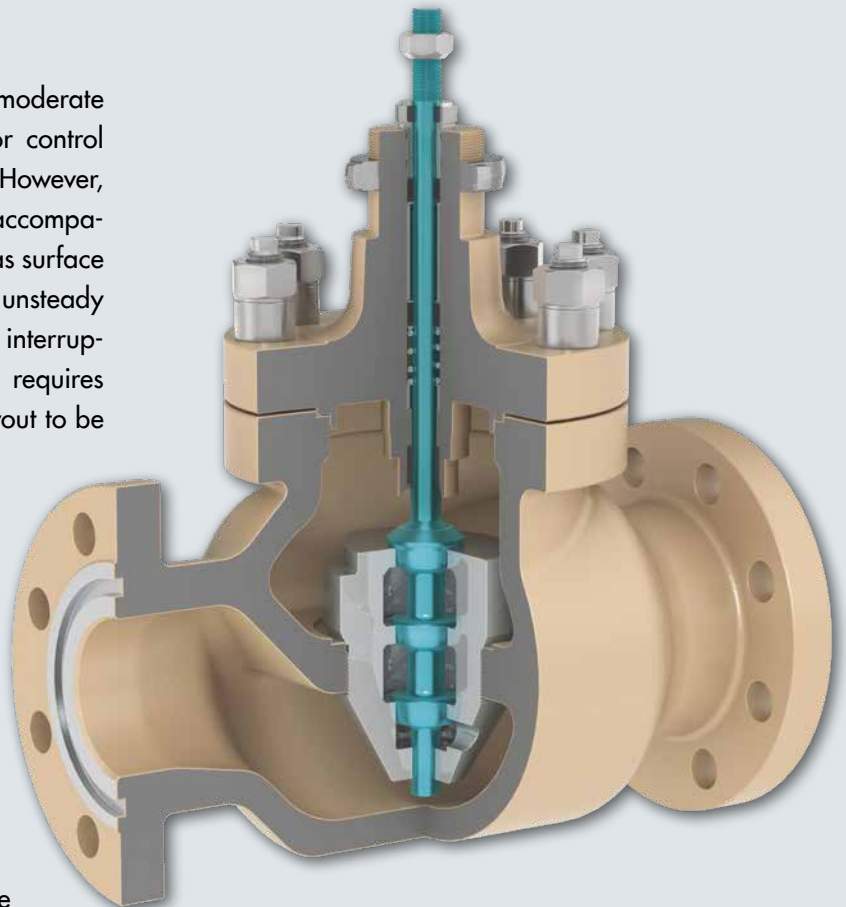


Flow velocity

Mastering cavitation

When bubbles implode – Handling liquids at moderate pressure drops does not pose any difficulties for control valves made of suitable anti-corrosive materials. However, severe problems emerge when cavitation occurs, accompanied by its numerous damaging side effects, such as surface erosion, unacceptably high noise emissions and unsteady flows. Almost always, cavitation results in critical interruptions of plant operation, costly repairs or even requires control valves to be replaced and the pipeline layout to be changed.

Perfect solution – The cavitation factor x_{Fz} introduced by SAMSON in 1973 is the basis for international noise prediction standards and specifies at which pressure ratio cavitation starts. As a result of elaborate tests and calculations performed at SAMSON, the standard valves have been optimized to prevent cavitation by developing special plug designs and anti-cavitation trims with high x_{Fz} coefficients to keep the valves free of vibration and cavitation over the entire load range.





For example, a seat-guided and shape-optimized parabolic plug with special flow contours and a raised seat yields the lowest possible pressure recovery. At high valve loads, the x_{Fz} coefficient can be further increased by using upstream attenuation plates to prevent cavitation.



Multi-stage plugs with double guiding sized to achieve the same differential pressure ratio at every stage across the entire load range are particularly suitable for applications involving high pressure drops.

Cavitation under control – In cases where cavitation cannot be prevented using the primary measures at hand, the control valve needs to be sized to withstand the adverse effects of cavitation. SAMSON can provide the perfect solution in any case, thanks to our modular valve design with flow coefficients determined over the entire travel range on in-house test benches as well as a valve sizing software that takes into account the control loop behavior under all operating conditions.



MULTI-PHASE FLOWS



Rugged and reliable

Flow know-how – As there is no binding calculation standard, a high level of expertise is required when sizing valves intended to control multi-phase flows, e.g. a gas-liquid mixture. Special consideration must be given to the increase in volume and velocity that occurs during the expansion of the mixture as well as to the fact that the mixture has a lower sound velocity than its individual components. Thanks to our expertise, our SAMSON valves are ideally sized and produce non-choked flows, which prevent excessive mechanical stress on the valves.

Eliminating the effects of erosion – Multi-phase flows containing a large amount of gas and solid particles, such as carbon or minerals, have a severely erosive effect even at low flow velocities. The damage becomes visible as destroyed material surfaces on the seat, plug, plug stem and body. Angle valves with flow-to-close design, ceramic or carbide trims and downstream anti-wear sleeves have proven ideal for controlling such flows.





The flashing phenomenon – SAMSON set up a test rig to study flashing and valves under operating conditions. In cooperation with Hamburg University of Technology, SAMSON successfully developed solutions for proper sizing. The optimal valve design – both for two-phase flow and flashing service – proved to be a one-stage valve with a considerably reduced seat bore and a seat-guided plug, which provides sufficient space for the expansion of the gas or vapor and ensures continuous, non-erosive downstream flow. Such valves can easily be configured from SAMSON's modular valve components.

One of the most essential components is the V-port plug. Thanks to its rugged seat guiding and asymmetrical ports, the plug reliably prevents mechanical vibration and resonance oscillations. It ensures safe operation, especially under critical operating conditions such as flashing.

VALVES FOR HIGH FLOW RATES



Sizing matters

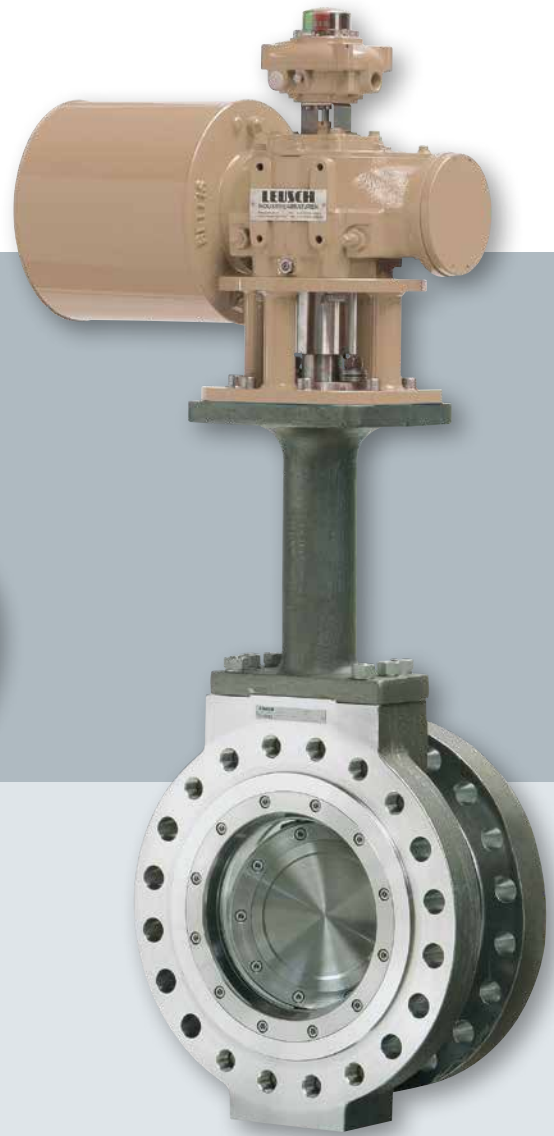
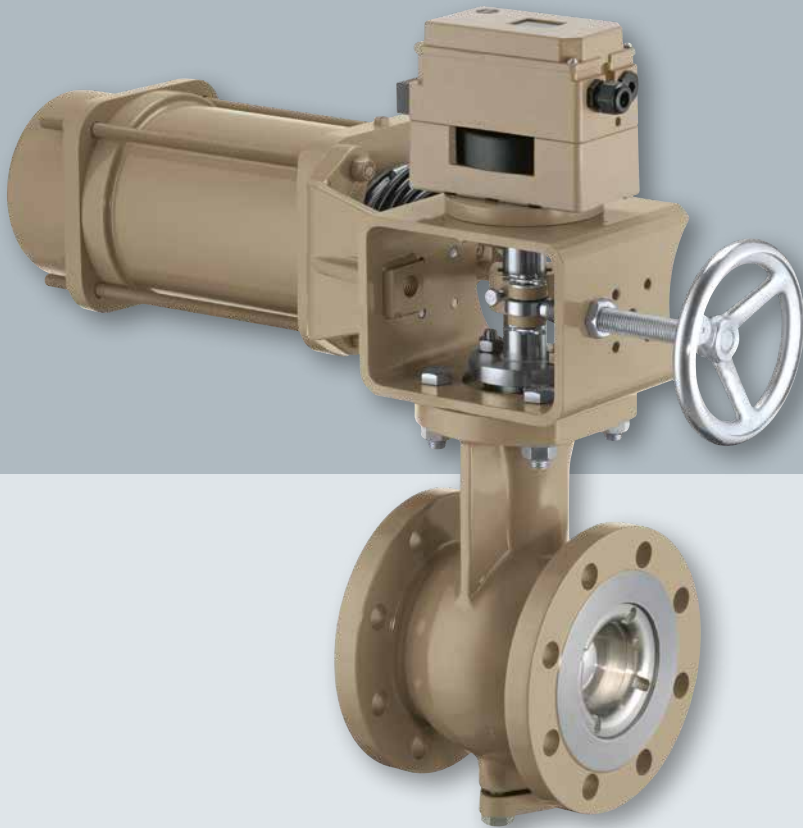
Well sized – A decisive factor for the efficient operation of industrial plants involves handling high flow rates at small pressure drops while consuming little energy. In addition to globe valves in large sizes, valves with a high flow capacity and low friction coefficient are best suited for such tasks, e.g. rotary plug valves, butterfly valves or ball valves with powerful, low-friction rotary actuators.

Tight shut-off – Depending on the task at hand, the valves are expected to provide a high flow capacity as well as ensure tight shut-off and low fugitive emissions, show an excellent control quality or perform reliably in case of fire. Rotary valves meet tight shut-off requirements by using a

multi-eccentric closure member or a floating, flexible or live-loaded seat – or by combining both designs.

For the actuator to be sized effectively, certain factors need to be known, such as the friction, closing and breakaway torques depending on the pressure drop across the valve as well as the dynamic torques that additionally depend on the valve position, process medium and pressure ratio. SAMSON operates high-performance test benches to determine and optimize the valve-specific coefficients. Apart from cost-effective piston actuators, our product line also includes low-friction rotary actuators with rolling diaphragms for an excellent control performance.





Heavy-duty valve series – Our heavy-duty valve series, e.g. SAMSON Series 590, available in sizes up to DN 700 or NPS 20 keeps high flow rates safely under control, even at high pressures and temperatures.

Butterfly valves – In our butterfly valves, the multi-offset disk design guarantees a low initial breakaway torque and accurate control, even at very small opening angles.

Segmented ball valves – An excellent rangeability and fine control characteristic are the main features of our segmented ball valves, which have a V-shaped port incorporated into the ball.

Ball valves – The ball valves feature a floating ball that ensures tightest shut-off while a trunnion-mounted bearing helps achieve better control properties.

MAXIFLUSS rotary plug valves – The MAXIFLUSS rotary plug valves are ideal for controlling high flow rates. The cross-sectional area between the seat and plug is fully released, leaving the flow path unrestricted. At the same time, controllability remains accurate even at small flow rates. The double-eccentric seat-plug geometry allows the valve to open without initial breakaway torque so that it can be operated up to a rangeability of 200:1. Sophisticated details, such as the rugged splined connection between plug and shaft, guarantee safe operation of the valves.

PRODUCTS FOR VALVE COMMUNICATION



Smart data

Stay well informed – Integrating control valves into the process control system has a significant positive effect on control accuracy, product quality and plant efficiency. With the help of smart valve communication, predictive maintenance becomes possible and plant availability is increased. SAMSON's smart valve positioners are the modules used to integrate the field units into the control system. They guarantee a reliable data exchange in the process and quickly detect faults and malfunctions.

Positioner integration – SAMSON offers innovative, self-calibrating positioners with integrated EXPERTplus valve diagnostics for all common communication protocols.

The positioners with HART® communication combine the proven mA technology with digital communication.

The major benefit of PROFIBUS® positioners is their cost-effective wiring: only a single cable is needed for data transmission and the power supply.

FOUNDATION™ fieldbus positioners set the trend towards more distributed networks. They contain function blocks that enable them to act as fully fledged process controllers.

With PROFINET over Ethernet-APL we support the latest communication technology for the process industry. This new technology achieves fast data transmission rates even in hazardous areas (intrinsic safety).





Intuitive operation – Automatic start-up and a proven operating structure in all our digital positioners as well as numerous details, such as initialization at the push of a button, convenient operation using one rotary pushbutton, a display that is easy to read and whose reading direction can be turned by 180°, contribute to making start-up and operation easier for the user.

Our positioners are easily adapted to the control task at hand – either on site or, in Series 3730, 3731, 3793 and 3797 Positioners with diagnostics, on a computer using our TROVIS-VIEW software.

The new positioner generation TROVIS 3793 and TROVIS 3797 leaves nothing to be desired. These positioners have a modular design and generate a high air capacity. Variable outputs, e.g. double-acting control, can be achieved by using exchangeable pneumatic modules that can be retrofitted.

Optional additional functions, such as limit switches, position feedback or binary inputs and outputs, can be added to the positioner on site as option modules. Pressure sensors and the integrated EXPERTplus valve diagnostics provide extensive high-performance diagnostic functions.

We have added the new TROVIS SAFE series to our range of positioners specially for use in safety-instrumented systems. The positioners include partial stroke testing and ready configured for the use on on/off valves.



FOR THE GOOD OF THE ENVIRONMENT



Proven to be reliable

Keeping the air clean – Environmental protection and the sustainable use of natural resources have become key issues in modern society. Laws and regulations, such as the Clean Air Act in the United States or TA Luft in Germany, lay down limits for emissions produced by industrial plants. The comparable evaluation of limits is defined in international standards, such as FCI 91-1 or ISO 15848.

SAMSON valves assist our customers in observing these limits. Depending on the requirements, the plug stem is sealed by a self-adjusting V-ring packing or an adjustable packing. In addition, a bellows seal can be used to prevent leakage at the plug stem.

A matter of packing – We have developed packings for our SAMSON valve series that meet the highest requirements. Temperatures ranging from -50 to $+400$ °C or even temperature ranges between -200 and $+550$ °C, depending on the application, are possible.

For any application – The maintenance-free, spring-loaded V-ring packing made of a PTFE-carbon compound with its special long-life lubricant can be used for most process media. A number of special packings is available for severe-service applications, e.g. involving urea or water that contains calcium carbonate, process media that crystallize out or polymerize, or for molten salt.



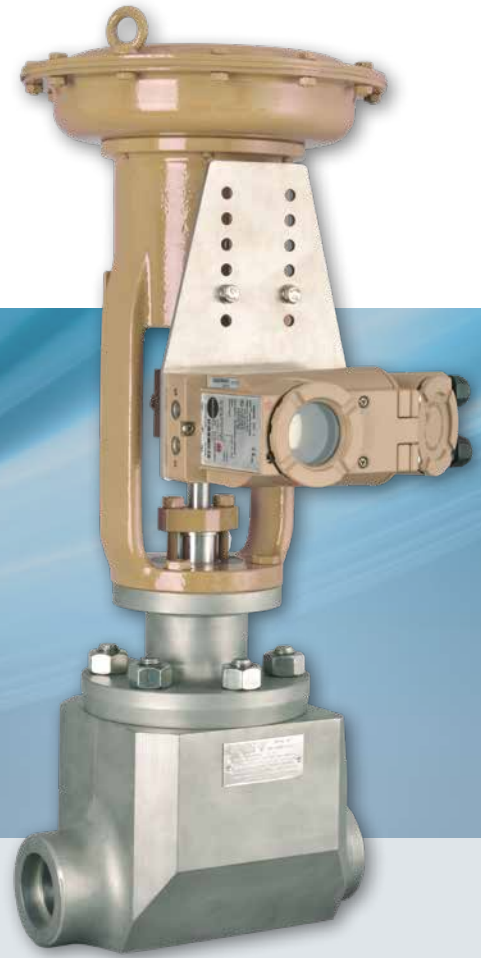


A groundbreaking invention – The most effective sealing solution is the metal bellows, one of the groundbreaking inventions of SAMSON. We still manufacture multi-layer bellows made of stainless steel for toxic or cryogenic media.

Absolutely leak-tight – SAMSON's metal bellows guarantee that valves meet stringent fugitive emissions requirements. If the bellows is heated or flushed to prevent crystallizing media or deposits from clogging it up, the bellows can guarantee zero emissions throughout the valve's entire service life without creating friction or requiring maintenance. This ensures the safety and environmental compatibility of our customers' plants, even in critical applications.



SMART VALVE TECHNOLOGY



Fully flexible

Meeting the challenge – With sophisticated control valves, SAMSON provides the perfect answer to demanding process requirements that cannot be met by standard valve versions.

SAMSON has equipped the control valves with special components and accessories to satisfy even the most demanding requirements. In addition, we have designed highly specialized valve series for high-performance applications.

On top of that, SAMSON develops and manufactures valves made of materials that are difficult to machine, such as duplex or high-alloy steels.

The subsidiaries of SAMSON, such as AIR TORQUE, CERA SYSTEM, LEUSCH, PFEIFFER, RINGO VÁLVULAS, STARLINE and VETEC round off the product line and offer special solutions.

VETEC for example, has specifically developed the VNG valve to let down the pressure in natural gases that have only been purified preliminarily and still contain dirt particles. The valve's throttling system features a patented jet nozzle and can handle abrasive liquids and solid particles, even at differential pressures of more than 400 bar. In addition, it complies with the strict noise emission regulations, leaving nothing to be desired.





Heating jackets – Heating jackets ensure optimal condensate drainage and allow the control valves to be used even for media with a tendency to crystallize or congeal.

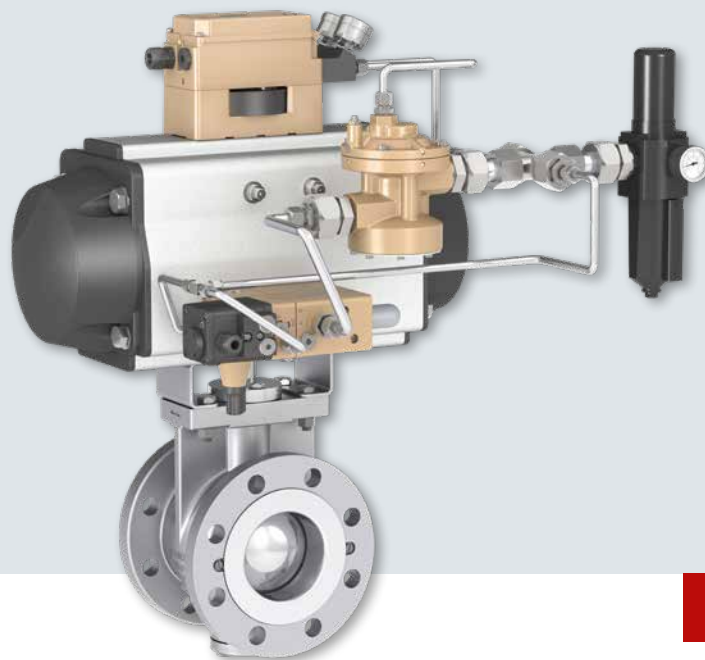
Tandem actuators – SAMSON's tandem actuators ensure tight shut-off even at high differential pressures or low supply air pressures.

Valve accessories – Intricately hooked-up accessories, such as supply air reducing stations, boosters, lock-up valves, solenoid valves and limit switches, enhance the positioners' functions, allow for fast response times and make the control valves fit for all desired fail-safe actions.

Self-operated regulators – Self-operated regulators offer a simple solution for all applications in which the controlled variable is to be maintained at a constant value. If sized properly, they work with low noise emissions and provide stable control even at smallest loads.

Modular micro-flow valves – Our micro-flow valves have been specifically developed to control the lowest flow rates in pilot plants or technical research facilities. They are available in sizes up to DN 25 or NPS 1.

Hygienic and aseptic valves – Our valves for hygienic and aseptic applications are made of stainless steel. Their bodies are suitable for CIP (cleaning-in-place) or SIP (sterilization-in-place). The suitability of materials and designs used is certified by, for example FDA, EHEDG and 3A.



GLOBAL AFTER-SALES SERVICE



Customer proximity

SAMSON has a global service network in over 50 countries for fast support at the customer's, keeping plant downtime to a minimum.

Our experienced SAMSON staff supports customers during plant start-up, maintenance and repair.

All SAMSON sites have their own workshop and storage facilities, which allows us to provide spare parts at short notice.

To make the expertise available where it is needed, SAMSON offers comprehensive service training either at specialized workshops or on the job, including training schemes tailored to our customers' needs.

SAM VALVE MANAGEMENT, a web-based diagnostic tool by SAMSON, can be used for remote monitoring around the clock from anywhere in the world.

Configuration and operation of our controllers and valve accessories is made easy and cost-effective by TROVIS-VIEW, a software solution developed by SAMSON.

EXPERTplus, the SAMSON valve diagnostics integrated into the positioner, allows for predictive maintenance while the process is running. The positioner indicates the maintenance state of the control valve it is mounted on in compliance with NAMUR recommendation NE 107.





Concepts for the future – Due to our long corporate tradition and constant growth, logistics have always been an important issue at SAMSON. Nevertheless, requirements have increased over the past years. Technology is advancing at an increasingly faster pace. Short innovation cycles demand short-term investment. To remain a proficient partner even under these changing conditions, SAMSON continues to invest in its logistics facilities to ensure that we are able to respond quickly, flexibly and in line with demand.

Everything under one roof – The logistics center is the heart of a logistics system that ensures the availability of our SAMSON products. We are able to manufacture 5,000 high-quality control valves at the Frankfurt headquarters each month as semi-finished products and castings are kept in stock to meet unscheduled demands. In addition, foresighted production of components and peripheral devices as well as the quick final assembly according to customer specifications take place on short routes under the watchful eye of an ISO 9001 certified quality assurance system.

The last stage that the control valves pass on their way through the logistics center is the sunlit final assembly hall. At modern workplaces, the painted components are assembled, adjusted and checked to make sure the final products comply with customer specifications. State-of-the-art test equipment, sufficient work space, efficient conveying and stacking systems as well as pleasant offices create a relaxed and friendly environment for the final acceptance test of SAMSON's high-quality control valves performed by the customer.

SAMSON AT A GLANCE



STAFF

- Worldwide 4,500
- Europe 3,600
- Asia 600
- Americas 200
- Frankfurt am Main, Germany 1,900

INDUSTRIES AND APPLICATIONS

- Chemicals and petrochemicals
- Food and beverages
- Pharmaceuticals and biotechnology
- Oil and gas
- Liquefied Natural Gas (LNG)
- Marine equipment
- Power and energy
- Industrial gases
- Cryogenic applications
- District energy and building automation
- Metallurgy and mining
- Pulp and paper
- Water technology
- Other industries

PRODUCTS

- Valves
- Self-operated regulators
- Actuators
- Positioners and valve accessories
- Signal converters
- Controllers and automation systems
- Sensors and thermostats
- Digital solutions

SALES SITES

- More than 50 subsidiaries
in over 40 countries
- More than 200 representatives

PRODUCTION SITES

- SAMSON Germany, Frankfurt, established in 1916
Total plot and production area: 150,000 m²
- SAMSON France, Lyon, established in 1962
Total plot and production area: 23,400 m²
- SAMSON Turkey, Istanbul established in 1984
Total plot and production area: 11,100 m²
- SAMSON USA, Baytown, TX, established in 1992
Total plot and production area: 20,000 m²
- SAMSON China, Beijing, established in 1998
Total plot and production area: 47,000 m²
- SAMSON India, Pune district, established in 1999
Total plot and production area: 28,000 m²
- SAMSON Russia, Rostov-on-Don, established in 2015
Total plot and production area: 24,000 m²
- SAMSON AIR TORQUE, Bergamo, Italy
Total plot and production area: 27,000 m²
- SAMSON CERA SYSTEM, Hermsdorf, Germany
Total plot and production area: 14,700 m²
- SAMSON KT-ELEKTRONIK, Berlin, Germany
Total plot and production area: 1,100 m²
- SAMSON LEUSCH, Neuss, Germany
Total plot and production area: 18,400 m²
- SAMSON PFEIFFER, Kempen, Germany
Total plot and production area: 20,300 m²
- SAMSON RINGO, Zaragoza, Spain
Total plot and production area: 19,000 m²
- SAMSON SED, Bad Rappenau, Germany
Total plot and production area: 10,400 m²
- SAMSON STARLINE, Bergamo, Italy
Total plot and production area: 27,000 m²
- SAMSON VDH PRODUCTS, the Netherlands
Total plot and production area: 12,000 m²
- SAMSON VETEC, Speyer, Germany
Total plot and production area: 27,100 m²

SAMSON AKTIENGESELLSCHAFT

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