SAMSON

CATALOG

Products

Products

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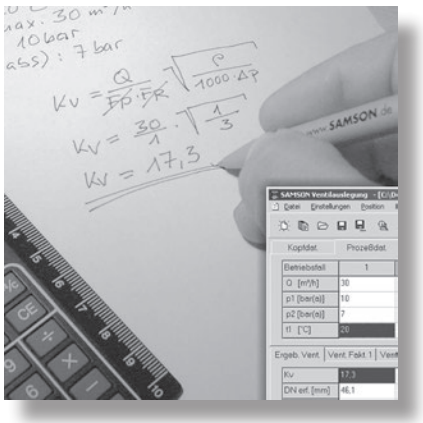
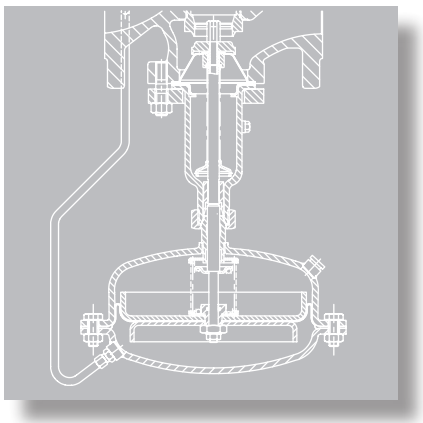
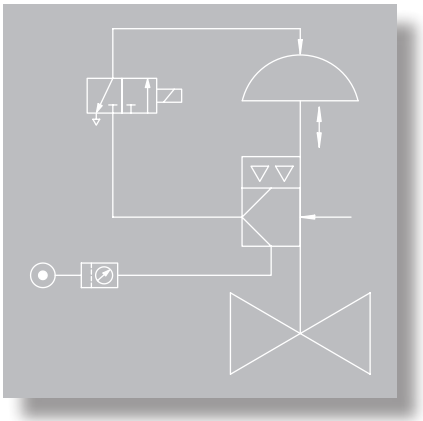
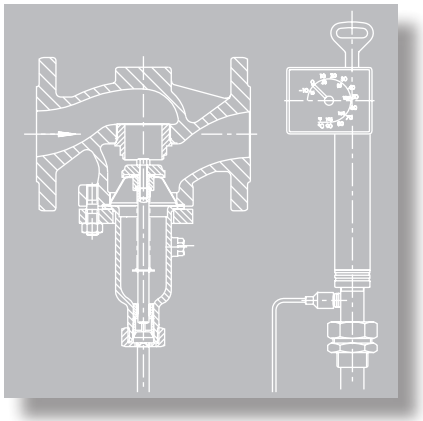
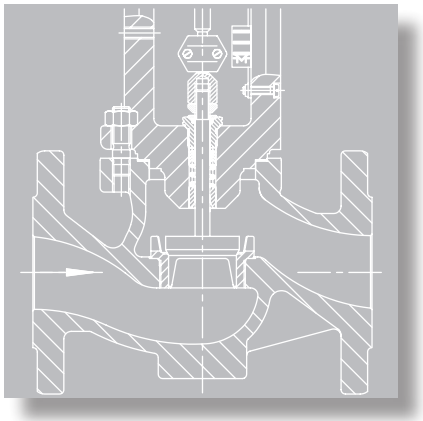
Technical Basics











1 SAMSON control valves

Series 240, 250, 280, and 290 Control Valves include pneumatic and electric globe valves, three-way valves, and angle valves. Their application range covers control tasks in process engineering and industrial applications as well as in supply and power plant engineering.

The modular system allows easy retrofitting and servicing.

The control valves consist of the valve and actuator. They can be equipped either with pneumatic, electric, electrohydraulic or hand-operated actuators.

For controlling purposes and travel indication, accessories, such as positioners, limit switches, and solenoid valves, can either be attached directly or according to IEC 60534-6 (NAMUR rib) (see Information Sheet ▶T 8350).

The valve bodies are available in cast iron, spheroidal graphite iron, cast steel, cast stainless steel, cold-resisting steel, forged steel or forged stainless steel as well as special alloys. All parts of the valve and the pneumatic actuator housing in the completely corrosion-resistant version are made of stainless steel. Refer to the associated data sheets for details.

Series 240

Series 240 Control Valves are primarily used in the chemical industry. The valves are available as globe and three-way valves in valve sizes ranging from DN 15 to 300 (NPS ½ to 12) and up to a pressure rating of PN 40 (Class 300).

Standard versions of the valves are suitable for temperature ranges between −10 and +220 °C (15 and 430 °F). An insulating section allows the temperature range to be extended to −196 and +450 °C (ANSI: −325 and +840 °F).

The plug stem is sealed either by a self-adjusting PTFE V-ring packing or an adjustable packing. To meet stricter emissions control requirements, a stainless steel bellows is used. The Type 3241 Valve can be equipped with a heating jacket that may also include the bellows seal.

Series 250

Series 250 Control Valves are used when large valve sizes and/or high pressures are involved in process engineering, power plant or supply engineering.

They are manufactured in valve sizes DN 15 to 500 (NPS ½ to 20) and pressure ratings of PN 16 to 400 (Class 150 to 2500). In addition to globe, three-way and angle valves, customized valve constructions can be engineered.

Standard versions of the valves are suitable for temperature ranges between −10 and +220 °C (15 and 430 °F). The temperature range can, however, be extended by using an adjustable high-temperature packing to a temperature range between −10 and +350 °C (15 and 660 °F) and by using a bellows seal or an insulating section to a temperature range between −196 and +550 °C (ANSI: −325 and +1022 °F).

Series 250 Valves can be equipped with a heating jacket.

Series 280

Series 280 Steam-converting Valves are used to reduce both the steam pressure and steam temperature to optimize plant operation and heat efficiency in process plants, for example, in refineries, food and beverage, tobacco or pulp and paper industries.

Steam-converting valves are based on Series 250 Valves fitted with a flow divider St III and an additional cooling water connection.

Steam-converting valves are available in valve sizes ranging from DN 50 to 500 (NPS 2 to 20), for pressure ratings of PN 16 to 160 (Class 150 to 900) and for temperatures up to 500 °C (930 °F).

Series 290

Series 290 Control Valves are primarily used in the petrochemical industry and process engineering due to their maintenance-friendly properties. The seat is clamped into the valves to facilitate maintenance.

Series 290 Valves are only available in ANSI versions in valve sizes NPS ½ to 8 and pressure ratings of Class 150 to 900. A bellows seal or insulating section allows the valves to be used in temperature ranges between −196 and +450 °C (−325 and +842 °F) depending on the material used.

Additional equipment includes flow dividers, heating jackets, and balanced plugs. Furthermore, Series 290 Valves can be designed to meet NACE requirements for sour gas.

Series V2001

The Series V2001 Valves are available as globe valves or as three-way valves for mixing or diverting service. They are manufactured in valve sizes DN 15 to 100 (NPS ½ to 4) and pressure ratings of PN 16 to 40 (Class 150 and 300). The standard versions of these valves are suitable for temperature ranges from −10 to +220 °C (14 to 430 °F). The use of an insulating section extends the temperature range to 300 °C (572 °F).

Series V2001 Valves are primarily designed for use in mechanical and plant engineering. A special attribute of the Type 3531 and Type 3535 Valves is their use in heat transfer applications using organic media (e.g. heat transfer oil). The Type 3321 and Type 3323 Valves are suitable for liquids, gases, and steam up to 350 °C (660 °F).

The standard version can also be fitted with additional equipment, such as bellows seals, insulating sections, and flow dividers.

Valves for special applications

These valves are designed for special requirements. Such valves include cryogenic, diaphragm, and micro-flow valves as well as valves for the food and pharmaceutical industries.

1.1 Valves

1.1.1 Valve body styles

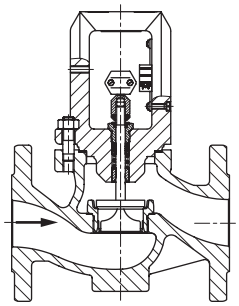
The valve body, valve bonnet and, in some cases, the bottom flange are subject to internal stress caused by the process medium flowing through the valve. Consequently, the valves must be designed to be sufficiently resistant to mechanical and chemical stress.

Under the influence of the operating temperature, the material strength changes. This behavior can be improved by combining certain alloys. For this reason, heat-resisting materials are used at high temperatures (e.g. according to DIN EN 10213) and cold-resisting materials are used for cryogenic service. The materials table on page 22 and the Information Sheet ▶ T 8000-2 provide a summary.

Globe valve

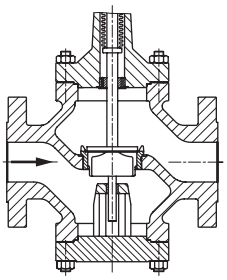
Globe valves allow easy installation in straight pipelines. For nominal pressures up to PN 40 and nominal sizes up to DN 300, three-flanged bodies of the Series 240 are mainly used. The plug stem is guided in the valve bonnet and the V-port plug in the screwed-in seat.

The ports of the V-port plug are asymmetric in order to suppress any oscillations. Unguided parabolic plugs are used for small K_{VS} coefficients.



Type 3241 Globe Valve

To handle higher loads and when larger seat diameters are used, the Type 3254 Globe Valve (Series 250) is provided with an additional plug stem guide in the bottom flange.

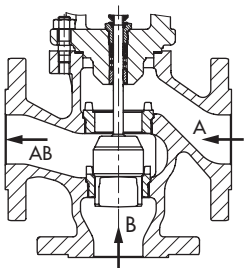


Additional plug stem guide in Type 3254

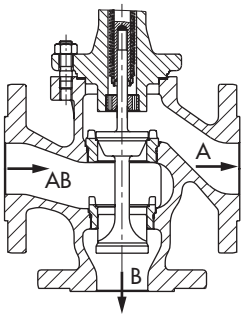
More details on globe valves in Data Sheets ▶ T 8015 and ▶ T 8060

Three-way valve

Three-way valves are used for mixing or flow-diverting service. The mode of operation depends on how the two plugs are arranged. The direction of flow is indicated by arrows.



Mixing service with Type 3244 Three-way Valve



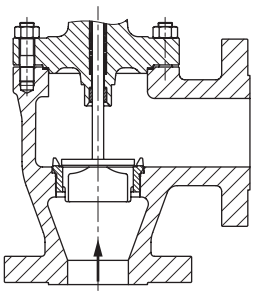
Flow-diverting service with Type 3244 Three-way Valve

More details on three-ways valves in Data Sheet ▶ T 8026.

Angle valve

Angle valves are ideally installed when a vertical pipeline and a horizontal pipeline need to be connected. The process medium is only diverted once. Angle valves allow the condensate to be optimally treated and are practically entirely self draining.

In case the process medium flows in the flow-to-close direction, wear in the valve outlet can be reduced by the use of an anti-wear sleeve.

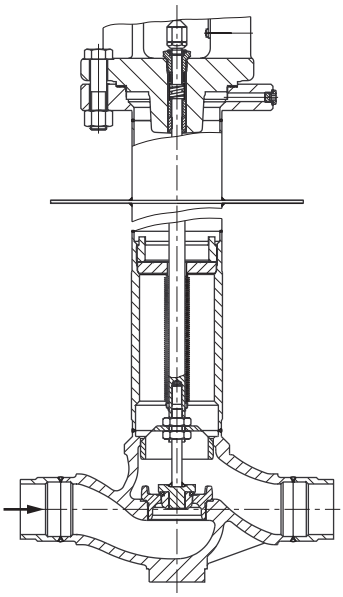


Type 3256 Angle Valve

More details on angle valves in Data Sheet ▶ T 8065

Cryogenic valve

Plants that produce liquefied, cryogenic air separation gases, often use vacuum-insulated pipelines to prevent environmental heat being transferred to the medium. The valves can be integrated into the vacuum jacket using a connecting flange. The valve is designed to widely prevent thermal conduction to the effect that the stem remains free of ice. A bellows seal serves as the primary sealing. The jacketed pipeline is evacuated of air and sealed off after installation of the components. The cryogenic extension bonnet of the valve is often welded to the jacketed pipeline over a flange, meaning considerable work is involved to remove the valve from the pipeline. However, to make maintenance possible, the internal parts can be accessed through the cryogenic extension bonnet without having to remove the valve from the pipeline.

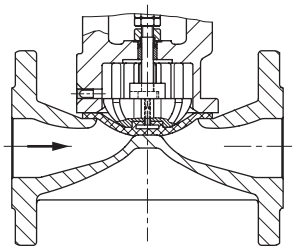


Type 3248 Cryogenic Valve

More details on cryogenic valves in Data Sheet ▶ T 8093

Diaphragm valve

For viscous or corrosive media possibly containing solids, diaphragm valves that are free of dead space and without stuffing boxes are an economical solution. The diaphragm may be made of rubber, nitrile, butyl or PTFE. The valve body may additionally be lined with rubber or ETFE.

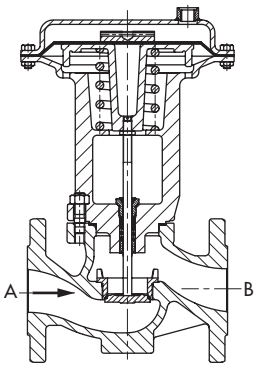


Type 3345 Diaphragm Valve

More details on diaphragm valves in Data Sheet ▶ T 8031

On/off valve

The valve for on/off service is used for tight shut-off of liquids, non-flammable gases and steam. As the valve plug is equipped with both a metal seal and a soft seal, the leakage class VI is achieved.

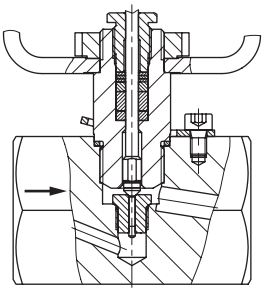


Type 3351 On/off Valve

More details on on/off valves in Data Sheet ▶ T 8039

Micro-flow valve

Micro-flow valves are used for very low flow rates (K_V coefficients <1.6 to 10^{-5} m³/h). The parts exposed to the process medium are made of stainless steel 1.4404. All valve parts are made of semi-finished products. As a result, special materials can be used in a particularly cost-effective manner, and the valve covers a wide range of applications.

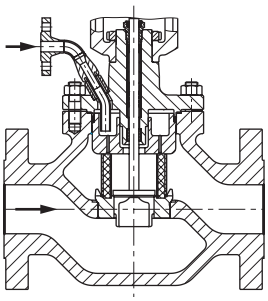


Type 3510 Micro-flow Valve

More details on micro-flow valves in Data Sheet ▶ T 8091

Steam-converting valve

Steam-converting valves are used to reduce the steam pressure and the steam temperature simultaneously. A connecting pipe supplies the cooling water to the flow divider St III. At its inner wall, the cooling water comes into contact with the steam flow. The steam flow and the entrained water are mixed in the narrow wire mesh of the flow divider. As the supplied cooling water does not come into contact with the valve body, neither erosion nor thermal shock occur. The flow divider ensures low-noise and low-vibration operation.



Type 3281 Steam-converting Valve

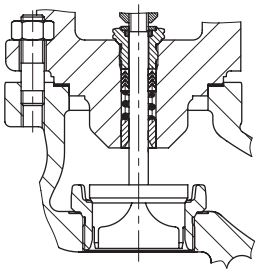
More details on steam-converting valves in Data Sheets ▶ T 8251 and ▶ T 8254

1.1.2 Valve bonnet

The valve bonnet seals off the valve at the top and accommodates the packing and the plug stem guide. The valve bonnet and the yoke of Series 240 Valves are incorporated in one piece. The valve bonnet and the yoke of Series 250 and 280 Valves are bolted together. The NAMUR rib standardized in IEC 60534-6 located on the yoke allows easy, standardized attachment of a positioner or other accessories. The valve bonnet is a pressure-bearing component that is exposed to the process medium, therefore its material is subject to the same design requirements as the valve body.

Packing

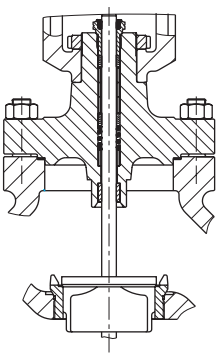
The plug stem is sealed by the packing. The standard packing is used for standard versions, versions with bellows seal or insulating section or when the packing functions as a backup packing.



Valve bonnet of Series 240 Valves

The temperature range of the standard packing is between −10 and +220 °C and can be extended by the use of an insulating section on the valve bonnet.

Other packings can be installed for special applications.



Valve bonnet of Series 250 Valves

The packings meet the fugitive emission requirements according to VDI 2440 and, as a result, fulfill the requirements of TA Luft (German technical instructions on air quality control). SAMSON's ISO packings are tested based on EN ISO 15848 and maintain the external leakage rates depending on the temperature, load, and pressure even in continuous operation.

SAMSON issues corresponding manufacturer's declarations for the valve series and models.

Packing forms

Standard packing

Temperature range: −10 to +220 °C

Self-adjusting, spring-loaded V-ring packing made of PTFE-carbon for nominal sizes DN 15 to 150. Self-adjusting PTFE compound and PTFE-silk packing for nominal sizes DN 200 to 500.
Suitable for all applications that require a high level of sealing performance, yet requiring hardly any maintenance.

Form A

Adjustable, cavity-free PTFE-silk/PTFE-carbon packing. Especially suitable for process media that crystallize out or polymerize.

Form B

Adjustable, cavity-free PTFE-silk/pure PTFE packing. PTFE-silk for nominal sizes DN 200 to 500.
Suitable for process media that crystallize out or polymerize and in cases where the carbon particles would contaminate the process medium.

Form C

Adjustable, cavity-free packing made of woven PTFE-silk. Application for all chemicals including hot acids and alkaline solutions.

Form D

Spring-loaded V-ring packing made of pure PTFE.
Suitable for pure process media where the carbon particles would contaminate the process medium.

Form W

Adjustable, cavity-free packing made of PTFE-graphite thread and carbon for fresh and service water. The carbon bushings serve as wipers.
Especially suitable for hard water and any process media that may cause deposits to form on the plug stem.

NACE standard

Spring-loaded V-ring packing made of PTFE-carbon according to NACE standard.
Suitable for sour gas or sour water.

ADSEAL

Spring-loaded V-ring packing made of PTFE-carbon with ADSEAL emergency adjusting function.

ZELETEC 4.000

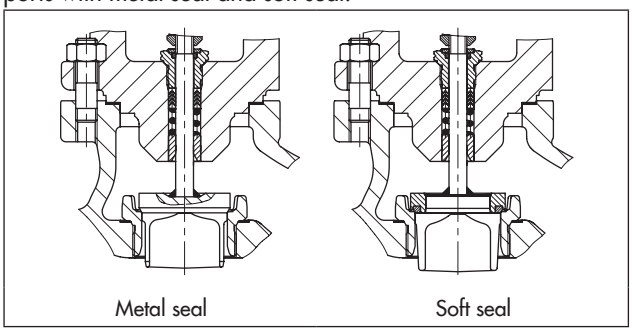
Self-adjusting, spring-loaded packing made of pure PTFE with intermediate FFKM V-rings for nominal sizes DN 200 and larger.
The ZELETEC (**Ze**ro **Le**akage **Tec**hnology) packing is maintenance-free and is especially designed for valves that are difficult to access and must have a high level of sealing performance.

Packing versions for extended operating conditions available on request.

1.1.3 Seat and plug

The design of the seat and the plug determines the K_{VS} (C_V) coefficient, characteristic and, seat leakage of a valve.

The drawings show seat-guided V-port plugs with asymmetric ports with metal seal and soft seal.



The seat, plug, and plug stem are made of stainless steel. In some cases, the trims are subject to high stress due to high differential pressures, cavitation, flashing, or in cases where the process media contains solids. In order to increase the service life, seats and metal-seated plugs can have a Stellite® facing, and plugs up to DN 100 can be made of solid Stellite®.

The seats are screwed into place, allowing them to be easily exchanged. They may also be made of other materials.

Perforated plug

An optimized trim with perforated plug is available for Series 240 and 250 Valves. Perforated plugs are mainly used in severe service, e.g. in steam applications, two-phase medium flows, liquid media which vaporize on the outlet side (flashing valves) or emergency relief valves (blow-off valves) involving gas relief. In these applications, flow velocities lower than 0.3 Mach cannot usually be kept. The medium flows through the perforated plug, splitting up the jet stream into numerous smaller jets to ensure low-noise energy transfer to the surrounding medium.

More details on valves with perforated plugs in Data Sheet ▶ T 8086

Clamped-in seat

Type 3291 Valves are fitted with a clamped-in seat which has two major benefits: in comparison to screwed seats, it cannot become undone. Furthermore, the clamped-in seat can be quickly removed and reinstalled using standard tools. This facilitates maintenance which meets the requirements of the oil and gas industry. Most plants in this industry cannot be shut down for maintenance, meaning maintenance-friendly components are required. Furthermore, these seats are suitable for use in the steam and condensate area.

More details on Type 3291 Valve in Data Sheet ▶ T 8072-1

Seat leakage

The seat leakage is determined according to IEC 60534, which specifies the maximum amount of the test process medium (gas or water) that may flow through the closed control valve under test conditions.

For special applications (e.g. using Type 3241-Gas or Type 3241-Oil) or with shut-off valves (Type 3351), a high leakage class can be achieved by using a high-performance metal seal or a soft seal for seat and plug.

Plug seal and seat leakage rate

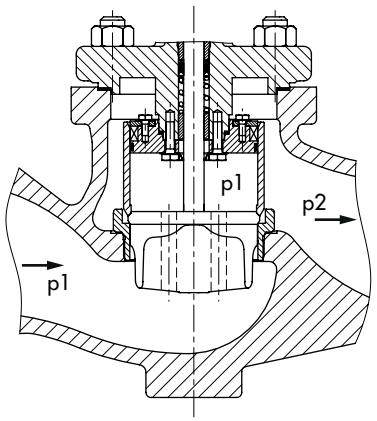
Seat-plug seal	Leakage class IEC 60534-4 ANSI/FCI 70-2	Seat leakage % of K_{VS} (C_V)
Metal seal	IV	≤0.01
High-performance metal seal	V	See IEC 60534-4, table 3
Soft seal	VI	$0.3 \times \Delta p \times f_L$ [1]
Pressure balancing with PTFE ring	V	See IEC 60534-4, table 3
Pressure balancing with graphite ring	IV	≤0.01

[1] Leakage factor IEC 60534-4, section 5.5

Pressure balancing

If the actuator thrust is not sufficient to handle the differential pressure, pressure-balanced plugs are a good solution. The plug is designed to function as a piston. The upstream pressure p_1 is transferred to the back of the plug through a hole in the bottom of the plug. The forces acting on the plug are compensated for, with exception of the area around the plug stem.

Pressure-balanced plugs are additionally sealed with a PTFE ring or a graphite ring. The pressure-balanced components are subject to wear. As a result, the seat leakage rate (see table on page 13) and the amount of maintenance needed for these valves increase. Pressure-balanced plugs should not be used, if at all possible, for high-temperature process media or for media that contain solids or crystallize out. In these cases, we recommend to use a more powerful actuator.



Plug with pressure balancing

Carbide or ceramic trims

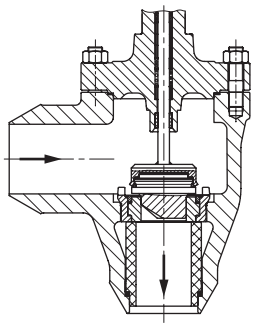
Control valves with extremely resistant carbide or ceramic trims are used when the valve body and trim are subject to considerable erosion and abrasion.

The following valves can be fitted with carbide or ceramic trims:

- Type 3251 Globe Valve
- Type 3256 Angle Valve

The Type 3256 Angle Valve can be fitted with a ceramic wear-resistant pipe. When the process medium flows in the flow-to-close (FTC) direction, this version is suitable for extreme erosive and abrasive conditions caused by process medium containing solids.

Details on ceramic materials and their properties are available on request.



Type 3256 Angle Valve with ceramic trim and ceramic anti-wear pipe

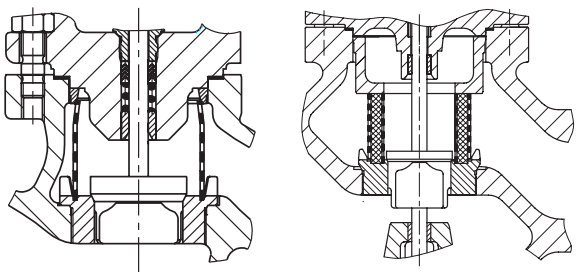
More details on ceramic trims in Data Sheet ▶ T 8071

1.1.4 Low-noise operation

Flow divider

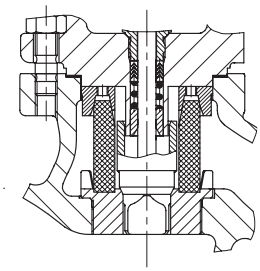
The flow dividers serve to reduce the noise emission of gases and vapors. The process medium reaches its maximum velocity after passing the restriction between seat and plug. Before it starts to create a noise-intensive, turbulent mixing zone, the process medium hits the inner wall of the flow divider. The flow is divided and a low-noise impulse exchange with the surrounding medium takes place.

The flow divider St I has a single-ply perforated sheet steel and flow divider St II a two-ply perforated sheet steel.



Flow divider St I Flow divider St II

The flow divider St III consists of a corrosion-resistant wire mesh, which can be additionally fitted with an internal and external perforated sheet steel for Series 250 Valves.



Flow divider St III

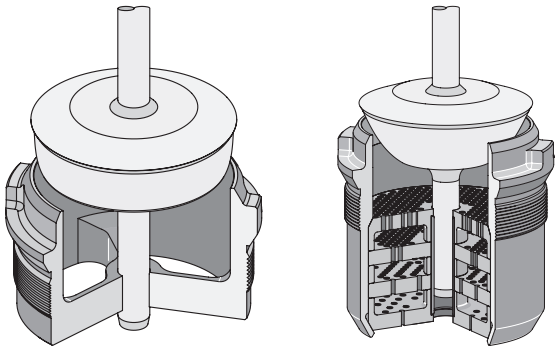
The valve-specific correction values for gases and vapors are required for noise calculation according to VDMA 24422, Edition 1989 and IEC 60534 when flow dividers are used. See the diagrams on page 21 for details.

The K_{VS} (C_V) coefficient of the valve trim is reduced by the flow divider. The K_{VS} (C_V) coefficients for the flow dividers St I, St II and St III are listed in the associated data sheet.

More details on flow dividers in Data Sheet ▶ T 8081

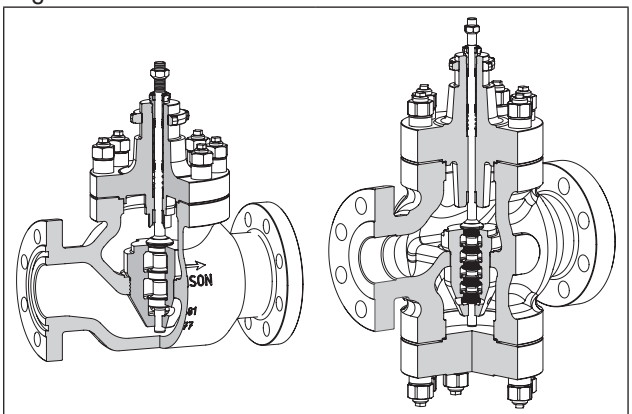
AC trims

AC-1 and AC-2 Trims are optimized trims for low-noise pressure letdown of liquids at differential pressures up to 40 bar. The seat is raised and the parabolic plug is additionally guided in the seat. The AC-2 Trim additionally has up to four attenuation plates.



AC-1 Trim AC-2 Trim

The three-staged AC-3 Trim is used for differential pressures up to 100 bar. Optionally, Stellite facings or hardened trims are available. For differential pressures over 100 bar, the five-staged AC-5 Trim is available.

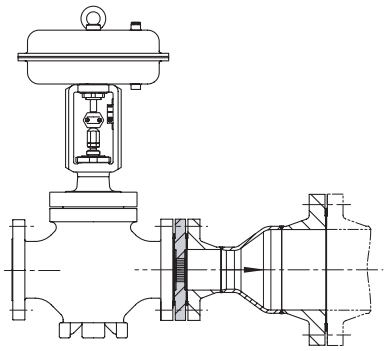


Type 3251 with AC-3 Trim Type 3254 with AC-5 Trim

More details on AC trims in Data Sheets ▶ T 8082 and ▶ T 8083

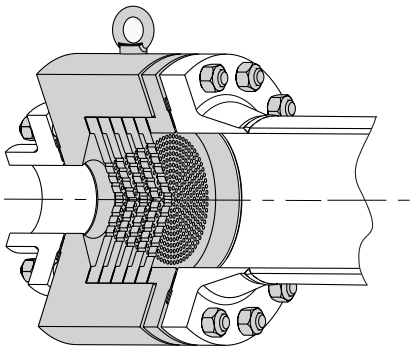
Silencer

The silencer acts as a fixed restrictor package that can be installed downstream of the valve with one to five attenuation plates for applications with gases or vapors. The silencer increases the backpressure downstream of the valve which leads to a reduction in the valve outlet velocity and sound pressure level. Additionally, the nominal outlet size can be extended. A pipe expander may be required depending on the version.

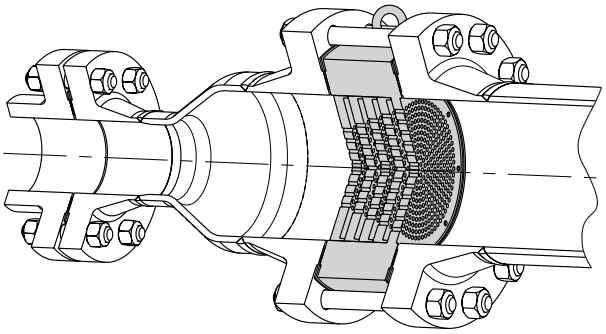


Type 3381-1: Single attenuation plate on the valve upstream of a possible pipe expander

In Type 3381-3-X, two to five attenuation plates can be installed one after the other in a housing integrated into the pipe expander.



Type 3381-3-5: Five attenuation plates in a housing



Type 3381-4-5: Five attenuation plates clamped between the pipe expander and pipeline (wafer-type version)

More details on silencers in Data Sheet ▶ T 8084

1.1.5 Additional components

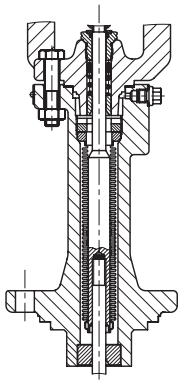
Metal bellows seal

In case, stricter emissions control requirements must be met, e.g. TA Luft or in vacuum applications, a metal bellows is used to seal the plug stem. The plug stem is additionally sealed with a packing at the top flange. This packing serves as a backup packing.

The metal bellows can be monitored for leakage or a sealing medium can be applied by means of a test connection.

The bellows seal can be used for valves of Series 240 and 290 from –196 to +450 °C, and Series 250 and 280 from –196 to +550 °C.

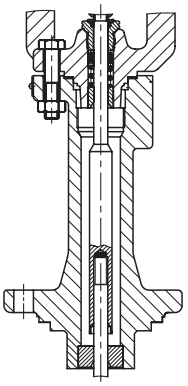
Higher temperatures for Series 250 and 280 on request



Metal bellows seal

Insulating section

The application range of a standard packing can be extended to an operating temperature of less than –10 °C or over +220 °C by using an insulating section.



Insulating section

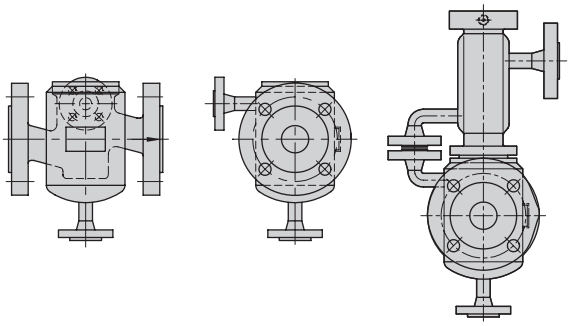
The temperature ranges of the various valves series are:

Series 240:	–196 to +450 °C with long insulating section –50 to +450 °C with short insulating section
Series 250:	–196 to +550 °C
Series 280:	Max. 500 °C
Series 290:	–196 to +450 °C

The specified temperature ranges may be restricted by the materials used as specified in the pressure-temperature diagram (Information Sheet ▶ T 8000-2).

Heating jacket

Some process media only flow easily above a certain temperature. Below this temperature they start to solidify or crystallize out. The valve bodies are fitted with a heating jacket to ensure that the process medium remains at a certain temperature and can flow freely. The valve bonnet may also be equipped with a heating jacket when the plug stem is sealed by a bellows seal.



Type 3241 with heating jacket and with bellows heating

A heat transfer medium flowing between valve body and heating jacket ensures that the process medium is kept at a certain temperature. If steam is used as heating transfer medium, proper condensate discharge must be ensured.

Versions with heating of the connecting flanges or with heating of larger connecting flanges for the body are available on request.

1.1.6 Face-to-face dimensions

SAMSON valves with flanges have the same face-to-face dimensions as valves with welding ends.

Face-to-face dimensions according to DIN EN

PN	Types 3241, 3251, 3254, 3281, and 3284 Globe Valves
10 to 40	DIN EN 558, Series 1
63 to 100	DIN EN 558, Series 2
160	DIN EN 558, Series 2
250	DIN EN 558, Series 2
320	DIN EN 558, Series 2
400	Based on ASME B16.10 Class 2500, column 4
	Types 3256 and 3286 Angle Valves
10 to 40	DIN EN 558, Series 8
63 to 100	DIN EN 558, Series 9
160	DIN EN 558, Series 9
250	DIN EN 558, Series 93
320	DIN EN 558, Series 93
400	Based on ASME B16.10 Class 2500, column 6

Face-to-face dimensions according to ANSI

Class	Types 3241, 3251, 3254, 3281, and 3291 Globe Valves [1]
125/150	ANSI/ISA-75.08.01
250/300	ANSI/ISA-75.08.01
600	ANSI/ISA-75.08.01
900	ASME B16.10 Class 900, column 5
1500	ASME B16.10 Class 1500, column 5
2500	ASME B16.10 Class 2500, column 4
	Types 3256 and 3296 Angle Valves [1]
125/150	0.5 · ANSI/ISA-75.08.01
250/300	0.5 · ANSI/ISA-75.08.01
600	0.5 · ANSI/ISA-75.08.01
900	ASME B16.10 Class 900, column 7
1500	ASME B16.10 Class 1500, column 7
2500	ASME B16.10 Class 2500, column 6

1) Depending on the valve series, the pressure ratings are restricted as follows:
Series 240: only up to Class 300
Series 280 and 290: only up to Class 900

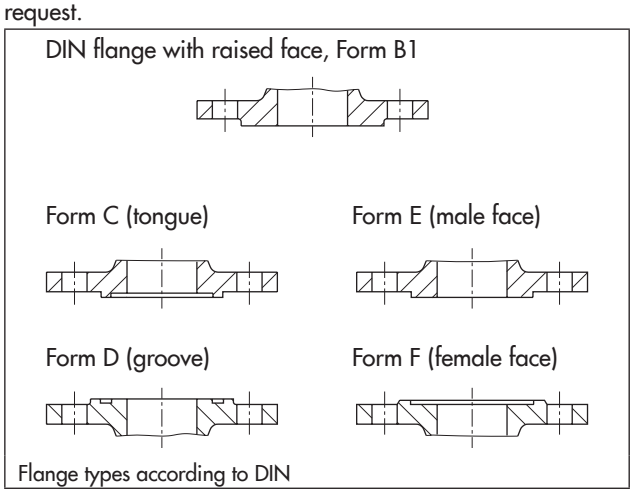
Versions with welding-neck ends are not standardized. Consult SAMSON first concerning their face-to-face dimensions.

1.1.7 Types of pipe connections

Flanged connections are most frequently used in industrial plants as they allow easy mounting and removal of valves and their milled facings provide excellent sealing reliability and quality.

A summary of flanges according to DIN EN standards, their connection dimensions, and types of flange faces is provided in DIN EN 1092-1 for steel flanges and DIN EN 1092-2 for cast iron flanges.

The standard version of SAMSON valves has flanges with raised faces (Form B1). Other flange types are available on request.



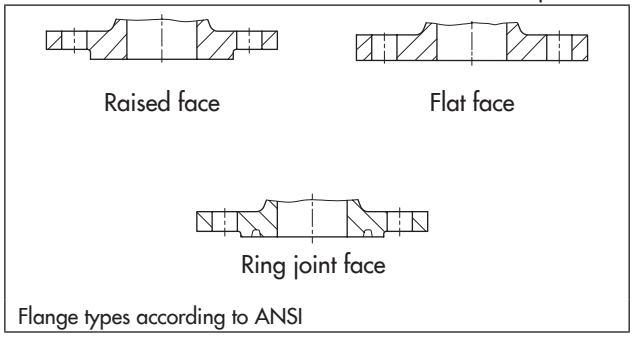
Flange types according to DIN

The US standard for cast iron flanges is ASME B16.1, ASME B16.42 for spheroidal graphite iron flanges and ASME B16.5 for steel flanges.

The standard version of cast iron valves with a pressure rating of Class 125 has flanges with flat faces.

Valves with a pressure rating of Class 300 have flanges with raised faces (0.06″ height), and valves with higher pressure ratings have flanges with raised faces (0.25″ height).

Other versions are available. Details available on request.



Flange types according to ANSI

For critical process media and/or high pressure ratings, the valve bodies can be supplied with welding ends or welding-neck ends. For control valves according to DIN standards, the welding ends conform to DIN EN 12627. For control valves according to US standards, the welding ends are specified in ASME B16.25.

For installation methods according to US standards, valves of the Series 240 are available with NPT female thread in sizes ½″ to 2″.

1.2 Rotary valves

Principle of operation

The actuator opens the closure member of a rotary valve from 0 to 270°. This causes the medium flow through the valve to be either throttled or shut off.

Special features

Rotary valves have a more compact design than globe valves. Consequently, these valves are more cost-efficient in large nominal sizes. Additionally, they have a higher flow capacities. The advantages and disadvantages as well as the fields of application depend on the rotary valve design.

Designs

Butterfly valves

The shaft turns the butterfly disk used to shut off or to control the medium flow by up to 90°. The various butterfly valve designs, in particular the bearing design of the disk, allows the valves to be used for throttling or on/off service.

Butterfly valves in the wafer-type or lug-type design are cost-effective and use less material. They are primarily used for large nominal sizes.

Butterfly valves are only suitable in applications where the pressure drop is relatively low. Higher differential pressures cause higher noise emissions and increase the load on the valve components. Possible countermeasures are restricted by the valve construction and space available in the valve.

Ball valves

Either a ball with a cylindrical passage or a segmented V-notch ball is used in ball valves to control the flow rate or shut off the process medium. The ball is located between two metal or PTFE seat rings. The ball can be rotated by 90° (quarter-turn ball valve). The seat rings press against the ball and the sharp edges of the hole through the ball help wipe off particles that stick to the ball and cut off any long fibers.

When the valve is open, the full pipe cross-section is released, which causes a negligible loss in pressure and allows its use in pigging systems.

Careful machining of valve inside surfaces ensures that a gas-tight shut-off can be achieved even at high pressure drops. Due to the high friction torques and gas-tight shut-off, ball valves are mainly used in on/off service.

There are two types of ball valves: floating and trunnion-mounted ball valves. The ball of the trunnion-mounted ball valve is mounted on both sides, resulting in less friction torque which means smaller actuators can be used. Additionally, higher torques can be transferred which allows higher differential pressures to be controlled. However, mounting the ball on both sides makes the construction more complicated.

Segmented ball valves

The design of the segmented ball valve is based on the trunnion-mounted ball valve. In place of a solid ball, a segmented ball with either a linear or equal percentage characteristic is used. To reduce the wear on the body when controlling abrasive media, the direction of flow can be reversed. Special alloys can also be used on request. The segmented ball is sealed by a spring-loaded seat.

Segmented ball valves are characterized by low friction torque, high flow coefficients, and a closure member with its own characteristic. As a result, they are often used for throttling service where the pressure drop is low in the open position.

Segmented ball valve with rotary actuator

Tank bottom valves

In tank bottom valves, the ball with its cylindrical bore rotates around the center axis. The rotary angle of the ball determines the flow rate across the free area between the body and the ball channel. PTFE-lined tank bottom valves are mainly suited for corrosive media.

In the standard version, these ball valves have a shaft which is located at an angle away from the tank. This allows the optimal position of the actuator to the tank.

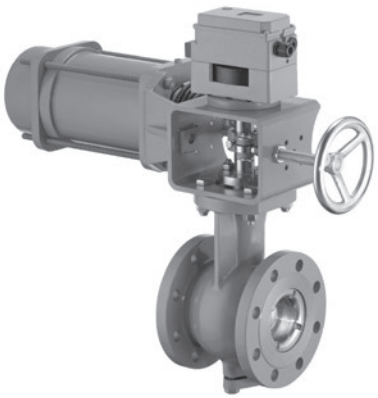
Tank bottom valve

Rotary plug valves

A double offset is created in rotary plug valves: the center line of the shaft and plug (first offset), and the pivot of the plug (second offset). This double offset causes the plug to be immediately lifted out of the seat resulting in no friction or initial breakaway torque when the shaft turns from the closed to open position. The valve shows a stable control response even at small opening angles.

The flow coefficient can be reduced by a smaller seat diameter. As a result, throttling service is possible when the valve is open even with medium differential pressures.

Rotary plug valves are mainly used for throttling service, especially for media containing solids.



Rotary plug valve

1.3 Valve-specific parameters

K_{VS} or C_V coefficient

The K_V (C_V) coefficient is calculated according to IEC 60534 from the specified operating data.

The K_{VS} (C_V) coefficient is specified in the data sheets to identify the valves. It corresponds to the K_V coefficient at the rated travel H_{100}. In order to increase control accuracy and with regard to manufacturing tolerances, the selected K_{VS} (C_V) coefficient must be higher than the K_V coefficient.

Rangeability

The rangeability is the quotient of K_{VS}/K_{VR}. K_{VR} being the smallest K_V where the characteristic still lies within the permissible gradient tolerance of the characteristic (IEC 60534-2-4). See Information Sheet ▶ T 8000-3.

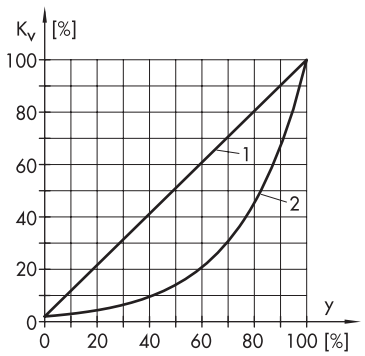
Inherent characteristic

The characteristic shows the relationship between the K_V flow coefficient and the travel (H).

Valves are either designed with an equal percentage or with a linear characteristic.

The equal percentage characteristic can be identified by equal increments of travel that yield equal percentage increments of the K_V flow coefficient.

Whereas, in a linear characteristic, equal increments of travel yield equal increments of the K_V flow coefficient.



Valve characteristic: 1 - linear; 2 - equal percentage

1.3.1 Valve sizing

Calculation of the K_V coefficient

The K_V coefficient is calculated according to IEC 60534. The data sheets contain the necessary device-specific terms.

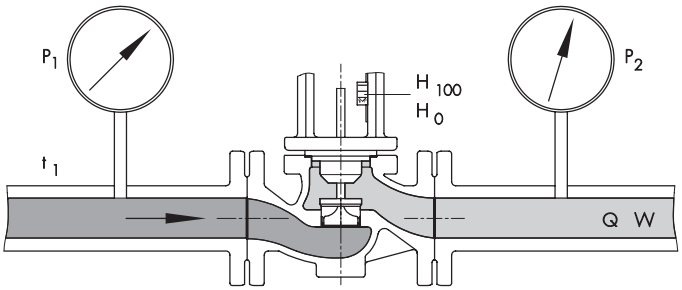
A preliminary, simplified calculation may be made with the help of the working equations listed below. They do not take into account the influence of the connecting fittings or choked flow at critical flow velocities.

Valve selection

After calculating the K_V (C_V) coefficient, the corresponding K_{VS} (C_V) coefficient of the valve model is to be selected from the data sheet.

In case, real operating data are used in the calculation, the following generally applies: (also for C_V): $K_{Vmax} \approx 0.7$ to $0.8 \cdot K_{VS}$.

Further details on calculation of the K_V coefficient are listed in the Application Notes ▶ AB 04.



p_1	Upstream pressure
p_2	Downstream pressure
H	Travel
Q	Flow rate in m³/h
W	Flow rate in kg/h
ρ	Density in kg/m³ (generally also for liquids)
ρ_1	Upstream density in kg/m³ (for gases and vapors)
t_1	Upstream temperature in °C

Medium	Liquids		Gases		Steam
Pressure drops	m³/h	kg/h	m³/h	kg/h	kg/h
$p_2 > \frac{p_1}{2}$	$K_V = Q \cdot \sqrt{\frac{\rho}{1000 \cdot \Delta p}}$	$K_V = \frac{W}{\sqrt{1000 \cdot \rho \cdot \Delta p}}$	$K_V = \frac{Q_G}{519} \cdot \sqrt{\frac{\rho_G \cdot T_1}{\Delta p \cdot p_2}}$	$K_V = \frac{W}{519} \cdot \sqrt{\frac{T_1}{\rho_G \cdot \Delta p \cdot p_2}}$	$K_V = \frac{W}{31.62} \cdot \sqrt{\frac{v_2}{\Delta p}}$
$\Delta p < \frac{p_1}{2}$					
$p_2 < \frac{p_1}{2}$			$K_V = \frac{Q_G}{259.5 \cdot p_1} \cdot \sqrt{\rho_G \cdot T_1}$	$K_V = \frac{W}{259.5 \cdot p_1} \cdot \sqrt{\frac{T_1}{\rho_G}}$	$K_V = \frac{W}{31.62} \cdot \sqrt{\frac{2 \cdot v^*}{p_1}}$
$\Delta p > \frac{p_1}{2}$					

Including:

p_1	[bar]	Absolute pressure p_{abs}		[kg/m³]	Density of liquids
p_2	[bar]	Absolute pressure p_{abs}		[kg/m³]	Density of gases at 0 °C and 1013 mbar
Δp	[bar]	Absolute pressure p_{abs}	v_1	[m³/kg]	Specific volume (v' from steam table) at t_1 and p_1
T_1	[K]	273 + t_1	v_2	[m³/kg]	Specific volume (v' from steam table) at t_1 and p_2
Q_G	[m³/h]	Flow rate of gases based on 0 °C and 1013 mbar	v*	[m³/kg]	Specific volume (v' from steam table) at t_1 and $\frac{p_1}{2}$

1.3.2 Calculation of noise emission

Gases and vapors

The noise emitted by gases in single-stage and multi-stage valves is determined according to IEC 60534-8-3. This calculation method, however, does not apply to valves containing noise-reducing elements, such as flow dividers St I to St III. In this case, calculation is performed according to VDMA 24422, Edition 1989.

The calculation is based upon the jet power reached on expansion. The noise emission is determined by means of an acoustical conversion coefficient η_G.

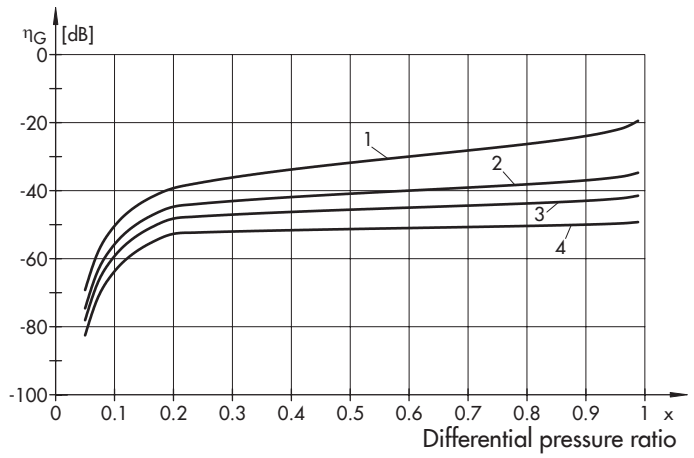
Diagram 1 illustrates the difference between the conversion coefficients η_G depending on the differential pressure ratio. Assuming a differential pressure ratio of x = 0.5, the difference in sound pressure level is –20 dB between a valve without flow divider and a valve with a flow divider St III. The sound pressure level can be reduced considerably by the use of flow dividers.

Liquids

The noise emissions produced by valves used in throttling service of liquids are calculated according to IEC 60534-8-4. This calculation is consistent with the calculation according to VDMA 24422, Edition 1989. It is based on the jet power reached in the valve and also on the valve-specific acoustical conversion coefficient η_F empirically determined according to VDMA 24423 for turbulent flows as well as the valve-specific pressure ratio x_{Fz} for incipient cavitation.

The sound power level and the sound pressure level difference at a distance of 1 m for the valves with different x_{Fz} values can be seen in the diagram 2.

For a pressure ratio of $x_F = 0.5$ and a valve with $x_{Fz} = 0.6$, the sound pressure level is 20 dB less than that of a valve with $x_{Fz} = 0.3$.



1 - without flow divider
2 - with flow divider St I
3 - with flow divider St II
4 - with flow divider St III

Diagram 1: Noise reduction with gases depending on the differential pressure using flow dividers

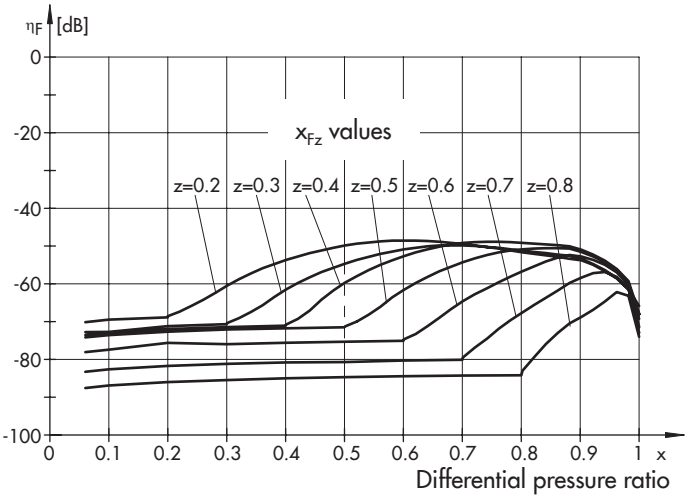
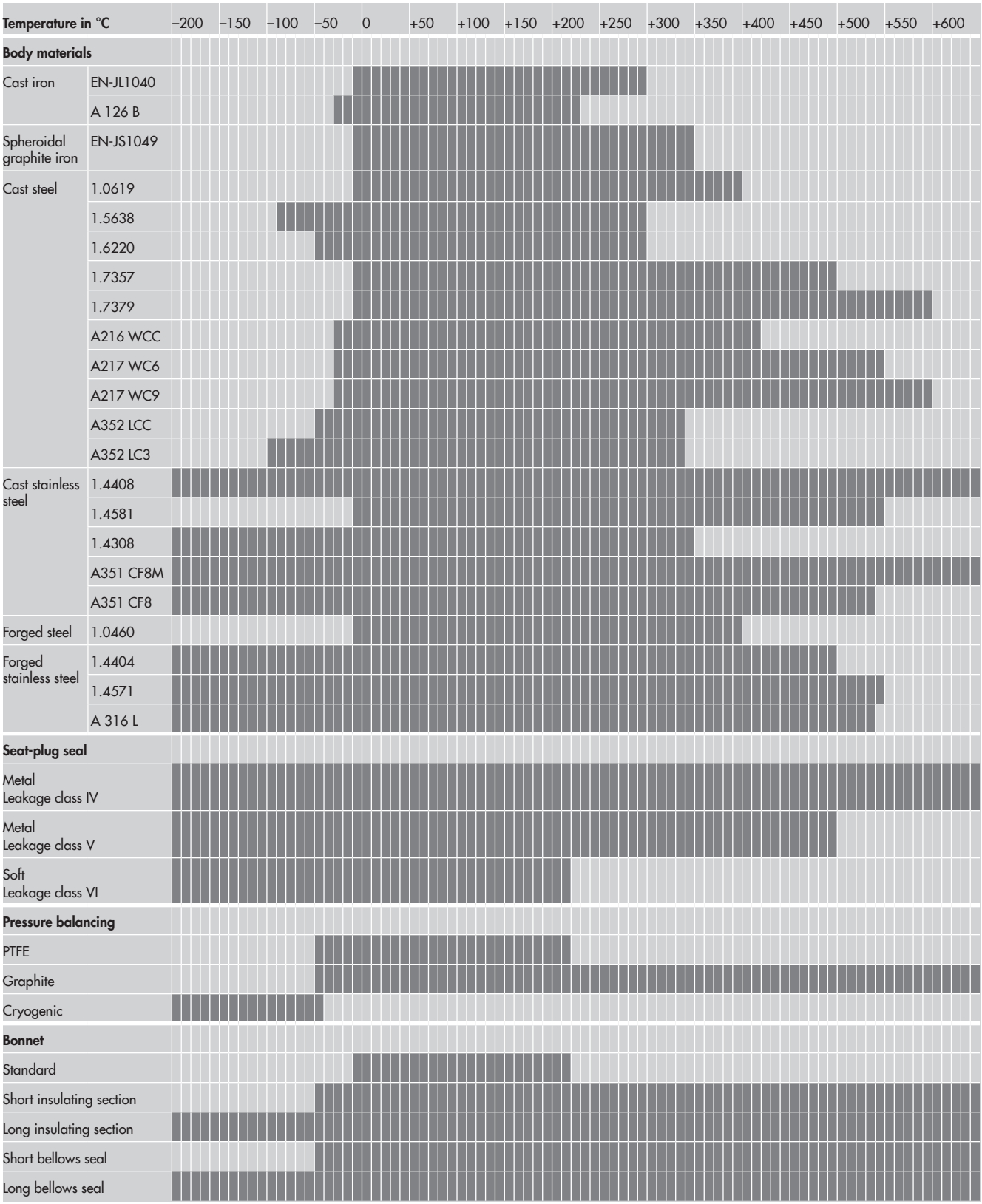


Diagram 2: Noise reduction with liquids depending on the differential pressure using flow dividers

1.3.3 Materials according to DIN and ANSI/ASME

The body materials mainly used and their temperature ranges are listed in the table below.

The associated pressure-temperature diagrams in Part 2 of this Information Sheet (▶ T 8000-2) include the materials' limits of application.



1.3.4 Selection and ordering

Selection and sizing of the control valve

1. Calculate the required K_V (C_V) coefficient according to IEC 60534. You may use, for example, the SAMSON valve sizing software. This sizing usually is carried out by SAMSON. If real operating data are used for the calculation, the following generally applies:
   K_{Vmax} = 0.7 to 0.8 x K_{VS}.
2. Select the K_{VS} coefficient and the nominal size DN according to the table in the corresponding data sheet.
3. Select the appropriate valve characteristic on the basis of the behavior of the controlled system.
4. Determine the permissible differential pressure Δp and select a suitable actuator using the differential pressure tables included in the associated data sheet.
5. Select the materials to be used with regard to corrosion, erosion, pressure and temperature using the materials tables and the associated pressure-temperature diagram.
6. Select the additional equipment, such as positioner and/or limit switch.

Ordering data

Order specifications:

Valve model	… [1]
Nominal size DN	… [1]
Nominal pressure PN	… [1]
Body material	… [1]
Type of connection	Flanges/welding ends/welding-neck ends
Plug [1]	Standard, balanced, metal seal, soft seal, high-performance metal seal Hard facing, if required
Characteristic	Equal percentage or linear
Pneumatic actuator	Version according to ▶ T 8310-1 or ▶ T 8310-2
Fail-safe position	Fail-open or fail-close
Transit time	Specifications only for special stroking speed requirements
Process medium	Density in kg/m³ in standard or operating state
Pressure	p_1 in bar (absolute pressure p_{abs}) p_2 in bar (absolute pressure p_{abs}) with minimum, normal and maximum flow rate
Valve accessories	Positioner and/or limit switch, position transmitter, solenoid valve, lock-up valve, volume booster, supply pressure regulator

[1] When no specifications are made, we provide possible specifications

1.3.5 Specification sheet for control valves

				SAMSON	Specification sheet for control valves according to IEC 60534-7 X · Details that must be specified to select and size the valve					
	1				Installation site					
	2				Control task					
	7	X			Pipeline	DN	PN	NPS	Class	
	8				Pipe material					
	12	X			Process medium					
	13	X			State at the valve inlet	Liquid	Vapor	Gas		
	15					Min.	Usual	Max.	Unit	
	16	X		Operating data	Flow rate					
	17	X			Input pressure p_1					
	18	X			Output pressure p_2					
	19	X			Temperature T_1					
	20	X			Input density ρ_1 or M					
	21	X			Vapor pressure P_V					
	22	X			Critical pressure P_C					
	23	X			Kinematic viscosity v					
	31				Calculation of max. flow coefficient K_V (C_V)					
	32				Calculation of min. flow coefficient K_V (C_V)					
	33				Selected flow coefficient K_{VS} or C_V					
	34				Calculated sound pressure level	dB(A)				
	35			Valve body	Type … Valve					
	36				Style					
	38				Pressure rating	PN	Class			
	39				Valve size	DN	NPS			
	40				Type of end connections	Flanges	Welding ends	Welding-neck ends	DIN/ ANSI	
	43				Type of bonnet	Normal	Insulating section	Bellows seal	Heating jacket	
	45				Body/bonnet material					
	47				Characteristic	Linear	Equal percentage			
	48				Body/bonnet material					
	49				Bushing/seat material					
	52				Hard facing	None	Stellite® facing	Completely of Stellite®	Hardened	
	54				Leakage class	% K_{VS}	Class			
	55				Packing material	Standard	Form			
	57			Actuator	Actuator type	Pneumatic				
	60				Actuator area	cm^2				
	62				Supply pressure	Min.	Max.			
	63				Bench range					
	64				Fail-safe action	Fail-close	Fail-open	Fail in place		
	66				Other actuator types	Electric	Electrohydraulic	Hand-operated		
	67				Fail-safe position for three-way valves					
	68				Additional manual override	No	Yes			
	70			Positioner	Positioner type					
	71				Input signal	Pneumatic	Electric			
	72				Control valve OPEN at	bar	mA			
	73				Control valve CLOSED at	bar	mA			
	76				Air connection, max.	bar				
	78				Explosion protection	Ex i	Ex d			
	80			Limit switch	Type ... Limit Switch					
	81				Limit switches	Electric	Inductive	Pneumatic		
	82				Switching position	Closed	% travel	Open		
	83				Switching function	Closing	Opening			
	84				Explosion protection	Ex i	Ex d			

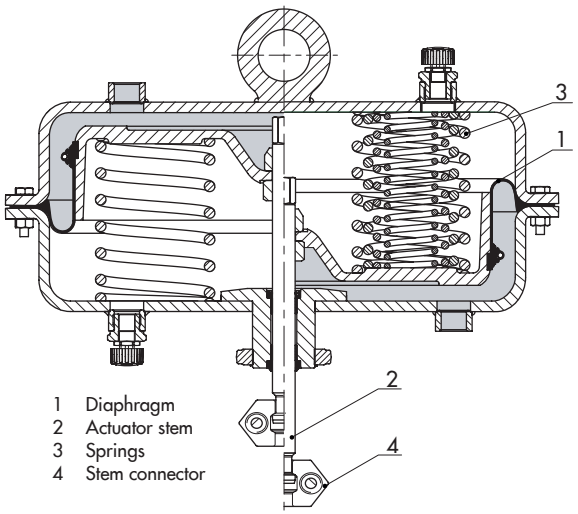
1.4 Actuators

Actuators convert the control signal from, for example, a positioner into a travel motion carried out by the valve (plug stem with valve plug).

Pneumatic, electric and electrohydraulic actuators as well as hand-operated actuators are available (see Information Sheet ▶ T 8300).

Pneumatic actuators

Pneumatic actuators are used for pneumatic or electropneumatic instrumentation. The pneumatic actuators are diaphragm actuators with a rolling diaphragm and internally fitted springs. The benefits of pneumatic actuators include their low overall height, powerful thrust, and stroking speed.



Type 3271 Pneumatic Actuator

Different signal pressure ranges are available. Pneumatic actuators are suitable for use in hazardous areas and feature fail-safe action (upon air supply failure, the control valve is either closed or opened).

The Type 3277 Pneumatic Actuators allow direct attachment of positioners or limit switches. The travel linkage is protected as it is located within the yoke below the diaphragm cases.

Pneumatic actuators can additionally be equipped with a handwheel (▶ T 8310-1 and ▶ T 8310-2).

Electric actuators

The benefits of electric actuators include their powerful thrust and large travel. Furthermore, a series of modules can also be added to these actuators, permitting them to be adapted to the specific control task.

The actuators are available in versions for three-step control, with integrated digital positioner or as electric actuator with process controller. The electric actuators with process controller come with a digital controller and are suitable for diverse control tasks.

Electrohydraulic actuators

Electrohydraulic actuators are connected to an analog signal over three-step controllers or electric positioners. Versions with fail-safe action are available (▶ T 8340).

Hand-operated actuators

These actuators are mounted onto Series 240 and 250 Valves, which are used as hand-operated control valves with 15 or 30 mm rated travels (▶ T 8312). Hand-operated actuators for larger travels are available on request (Type 3273-5/-6).

2 Valve accessories

2.1 Positioners

Principle of operation

Positioners ensure a predetermined assignment of the valve position (controlled variable x) to the input signal (reference variable w). They compare the control signal issued by pneumatic or electric automation equipment (controller, control station, process control system) to the position or opening angle of the control valve and supply a corresponding output signal pressure (p_{st}, output variable y). Positioners are often used as servo-booster as they convert low-energy signals into strong proportional signal pressures up to the maximum supply pressure (6 bar/90 psi). They can be used in standard and split-range operation.

Pneumatic and electropneumatic positioners

Depending on the input signal, a distinction is made between pneumatic (p/p) and electropneumatic (i/p) positioners:

- **Pneumatic (p/p) positioners:**
  Pneumatic positioners accept an input signal of 0.2 to 1 bar (3 to 15 psi) and issue an output signal pressure (p_{st}) of maximum 6 bar (90 psi).
- **Electropneumatic (i/p) positioners:**
  Electropneumatic positioners use an analog DC signal of 0/4 to 20 mA or 1 to 5 mA as the input variable and issue an output signal pressure (p_{st}) up to 6 bar (90 psi).

Digital positioners

SAMSON digital positioners are single-acting or double-acting positioners for attachment to pneumatic linear or rotary actuators.

Due to their digital signal processing technology, these positioners have the following advantages over conventional positioners:

- Simple operation
- LCD with rotatable reading direction
- Automatic zero and span calibration during initialization (except for Type 3730-0)
- Automatic detection of faults in the actuator
- Direction of action independent of mounting position
- Continuous monitoring of zero point
- Low air consumption
- Permanent storage of all parameters in EEPROM (protected against power failure)

Digital positioners can be fitted with additional functions:

- Inductive limit contacts
- Solenoid valve
- Position transmitter
- External position sensor
- Analog input
- Binary input/binary output
- Forced venting
- Leakage sensor

2.2 Limit switches

Limit switches issue a signal when an adjusted limit is exceeded or not reached. This signal is suitable for initiating visual or audible alarms as well as actuating valves or other switching units. Moreover, the limit switches can be connected to central control or alarm systems.

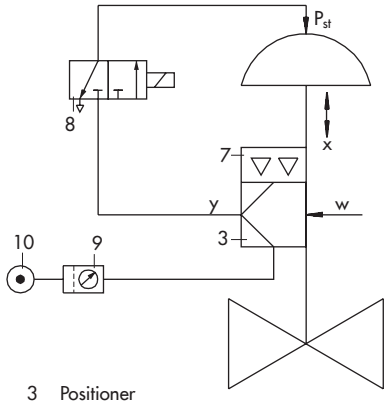
The installed limit contacts are either:

- Inductive
- Electric
- Pneumatic

It is possible to override the limit contacts. They can be adjusted to be either an NC or NO contact. A maximum of three contacts can be used in limit switches.

They can be attached to control valves with linear actuators or directly to rotary actuator as well as pneumatic and electropneumatic positioners. The limit switch is linked axially over the shaft of rotary actuators or linked over a lever to linear actuators.

An optional solenoid valve allows the monitored actuator also to be controlled.



3 Positioner
7 Limit switch
8 Solenoid valve
9 Supply pressure regulator
10 Supply air
w Set point
x Controlled variable
y Manipulated variable

Hook-up of a pneumatic actuator with positioner, limit switch, and solenoid valve

2.3 Solenoid valves

Solenoid valves convert binary signals issued by electric control equipment into binary pneumatic control signals which close or open the control valve.

The principle of operation is similar to an electropneumatic converter unit (e/p converter) and a valve configuration corresponding with the valve's switching function. Intrinsically safe, low-power binary signals issued by automation equipment or fieldbus systems can be used for controlling purposes.

3/2, 5/2, 5/3 or 6/2-way functions can be implemented depending on the solenoid valve version used. Different flow rates and connection types allow the solenoid valve to be tailor-made for the various tasks.

2.4 Pneumatic lock-up valves

Pneumatic lock-up valves shut off the signal pressure line either when the air supply falls below an adjusted value or upon complete air supply failure. As a result, the pressure in the actuator is blocked. The actuator remains in its last position until the defect is eliminated.

2.5 Pneumatic remote adjusters

The remote adjuster is a precision pressure regulator which can be manually adjusted. It is designed for use in pneumatic control loops as either a set point adjuster or manual remote adjuster and can be used as an adjustable precision pressure regulator for measuring, calibration and testing equipment.

2.6 Supply pressure regulators

Supply pressure regulators provide pneumatic control instruments with a constant air supply. The supply pressure regulator reduces and controls the pressure of a compressed air network to the pressure adjusted at the set point adjuster.

Versions are available for installation in pipelines or control panels or for direct attachment to positioners or pneumatic actuators.

The air pressure reducing station consists of a supply pressure regulator and an upstream filter with condensate drain.

2.7 Filter regulators

The filter regulator is used to supply compressed air to pneumatic volume boosters for large actuators. It cleans the compressed air, removing any dirt particles, water, and oil. In addition, it regulates the air pressure to a constant output pressure.

2.8 Service units for purifying and controlling compressed air

The service unit is used to supply compressed air to pneumatic transmitters, controllers, and positioners. It cleans the compressed air, removing any dirt particles, water, and oil. In addition, it regulates the air pressure to a constant output pressure.

2.9 Reversing amplifiers

The reversing amplifier allows double-acting pneumatic actuators to be operated using single-acting pneumatic/electropneumatic positioners or limit switches.

The positioner creates an output signal pressure Y_1, to which the air pressure Y_2 is added.

The reversing amplifier uses the supply pressure Z as auxiliary power. The following rule applies:

$Y_1 + Y_2 = Z$

2.10 Pneumatic volume boosters

Volume boosters are used together with positioners to increase the positioning speeds of pneumatic actuators. The pneumatic booster supplies the actuator with an air flow output whose pressure corresponds exactly to the signal pressure, except that it has a much higher volume output.

2.11 Quick exhaust valves

The quick exhaust valves are mounted between the positioner or solenoid valve and the actuator. They are used to vent the actuator more quickly.

3 Self-operated regulators

General

Self-operated pressure regulators are control devices whose measuring units draw their energy from the process medium which creates sufficient force to move the final control element (plug with plug stem).

3.1 Pressure regulators

Principle of operation

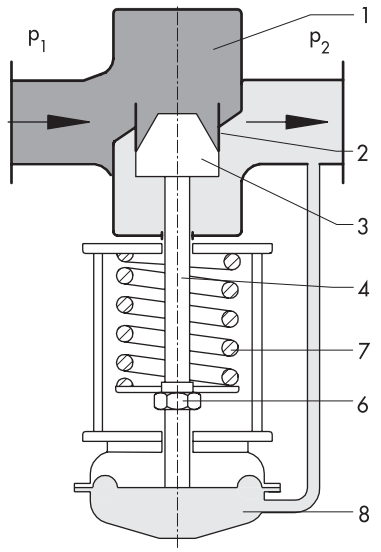
The regulators consist of a valve and an actuator, which either opens or closes the valve when the pressure increases. The regulators are proportional regulators controlled by the process medium. Each deviation from the adjusted set point is assigned a certain valve plug position.

Pressure reducing valves

Pressure reducing valves or pressure reducing stations withdraw as much energy from a pressure vessel with a higher pressure level as needed to maintain a nearly constant pressure level in downstream equipment, although consumption fluctuates.

The pressure p_2 to be controlled (controlled variable x) produces the force $F_m = p_2 \times A$, which is proportional to the controlled variable, on the diaphragm area A. This force corresponds to the actual value and is compared at the plug stem with the spring force F_S= set point w. F_S is adjustable at the set point adjuster. If the pressure p_2 changes, and in this way also the force F_m, the valve plug is being adjusted until $F_m = F_S$.

In the version illustrated, the valve closes when the pressure to be maintained constant rises. The regulator, in this case a pressure reducing valve, regulates the pressure p_2 downstream of the valve to the value adjusted at the set point adjuster.



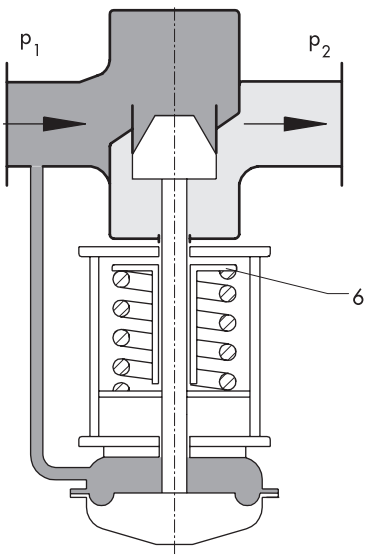
1 Valve body
2 Valve seat
3 Plug
4 Plug stem
6 Set point adjuster
7 Set point spring
8 Actuator

Pressure reducing valve closed ($p_2 > p_1$)

Excess pressure valve

The pressure p_1 to be controlled (controlled variable x) is picked up in the valve body and applied to one side of the actuator diaphragm. The force of the actuator $F_m = p_1 \times A$ is compared over the plug stem to the force F_S = set point w of the set point spring. In steady state (x = w) F_m is equal to F_S. If the pressure p_1 increases, the actuator force increases and the travel of the plug increases against the force of the set point spring. This causes the outlet flow to increase and the pressure p_1 to decrease until a new equilibrium is reached between actuator and spring force.

In the version illustrated, the valve opens when the pressure to be maintained constant rises. The regulator, in this case an excess pressure valve, regulates the pressure p_1 upstream of the valve to the value adjusted at the set point adjuster.



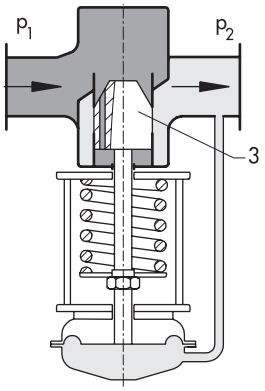
6 Set point adjuster

Excess pressure valve closed ($p_1 < p_2$)

3.1.1 Details concerning pressure regulators

Pressure balancing

The control accuracy (offset) and stability of the control process depend on the disturbances occurring in the loop (for example, changes in upstream pressure and flow rate). The regulators are designed in such a way that the effect of these disturbances is relatively small. The force acting on the valve plug depending on, for example, either the upstream or differential pressure can be eliminated by balancing the plug correspondingly. In unbalanced valves, the effect on the plug is a force resulting from the cross-sectional seat area and the differential pressure ($\Delta p = p_1 - p_2$). In regulators with pressure-balanced plugs, this effect is largely neutralized. This version is, therefore, suitable for handling large pressure drops. The drawing shows a plug balanced by a piston.



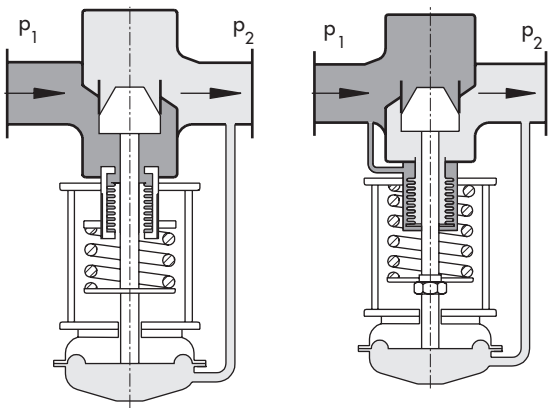
3 Plug balanced by a piston

Pressure balancing

Upstream/downstream pressure balancing

In the regulator (left), the metal bellows balances the upstream pressure and provides an absolutely tight and frictionless plug stem seal.

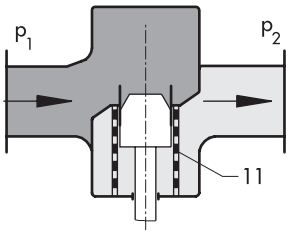
The right drawing shows a bellows arrangement for upstream and downstream pressure balancing.



Left: upstream pressure balancing and plug stem seal by a metal bellows
Right: Upstream/downstream pressure balancing by a metal bellows

Low-noise operation with a flow divider

All regulators come with low-noise valve plugs. The valves used in the Type 39-2, Type 41-23, Type 2422/2424, Type 41-73, and Type 2422/2425 Regulators can be equipped with a flow divider in special versions. Flow dividers are effective and reliable components used to reduce the noise level or to avoid critical conditions inside the valve. The maximum flow rate is restricted on using a flow divider.



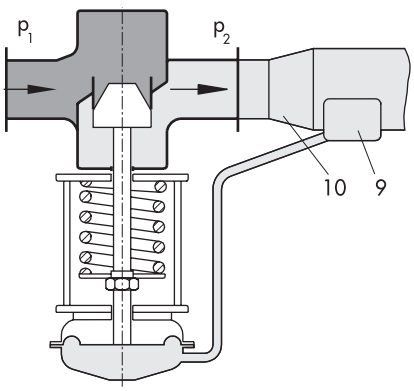
11 Flow divider

Valve with flow divider

For noise calculation according to VDMA 24422, the correction terms ΔL_G for gases and vapors as well as ΔL_F for liquids are required on using flow dividers. Refer to the associated data sheet of the pressure regulator for more details.

Steam pressure control

In a steam pressure control application, a compensation chamber is installed at the point of measurement. It allows steam to condense and protects the connected diaphragm system against high temperatures. Since the steam volume increases as the steam pressure decreases, it is often necessary to enlarge the piping diameter downstream of the regulator by installing a conical expansion piece. This expansion piece (accessories) can double the nominal outlet diameter of the pipeline (e.g. DN 100 to 200).



9 Compensation chamber
10 Conical expansion piece

Steam pressure control

3.1.2 Regulators and equipment for safety requirements

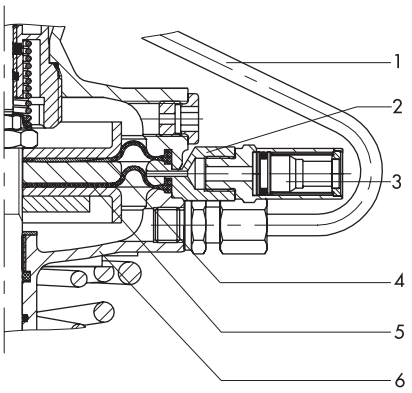
Safety shut-off valves (SSV) and safety excess pressure valves (SEV)

These regulators meet enhanced safety requirements.

- Low-maintenance proportional regulators requiring no auxiliary energy
- Especially suitable for applications in district heating plants designed in accordance with DIN 4747-1. The regulators comply with AGFW (German District Heating Association) regulations for regulators with backup diaphragm.

Backup diaphragm

The regulators are equipped with two operating diaphragms. In case the actual operating diaphragm ruptures, the backup diaphragm ensures emergency operation or the regulator moves to the fail-safe position. To monitor the diaphragm condition, the intermediate ring is equipped with a visual diaphragm rupture indicator, or a pressure switch can be optionally used to indicate the condition.



1 Control line (turned into the plane of projection)
2 Intermediate ring
3 Diaphragm rupture indicator
4 Backup diaphragm
5 Operating diaphragm
6 Actuator (housing)

Version with backup diaphragm

Pressure regulators with pilot valves

Regardless of whether a pressure reducing valve or excess pressure valve is used, the upstream pressure p_1 is transmitted to the pilot valve as auxiliary energy.

The pilot valve regulates the pressure to create a control pressure p_S dependent on the set point adjustment, which is compared to the pressure to be controlled acting from the top of the operating diaphragm.

- Pilot-operated by the process medium
- Convenient set point adjustment at the pilot valve
- High dynamic response and small system deviation, i.e. excellent control accuracy

3.2 Differential pressure and flow regulators (Series 42)

SAMSON differential pressure and flow regulators are suitable for industrial, public, and domestic applications, especially for district heating supply systems, for heating, ventilation and air-conditioning systems, for steam and heat generators, heat exchangers, energy supply units in power plants, and chemical plants as well as for large pipeline systems.

- Low-noise, self-operated proportional regulators requiring little maintenance
- Body optionally available in cast iron, spheroidal graphite iron, cast steel, cast stainless steel or forged steel
- Suitable for water, steam, air, and other liquids or gases, provided they do not influence the properties of the operating diaphragm
- Special version for mineral oils/heat transfer oils
- Flanges

Regulators and their control methods

The Series 42 Self-operated Differential Pressure and Flow Regulators consist of a valve with flanges and an actuator, which closes or opens the valve when the differential pressure/flow rate increases.

The medium flows through the valve in the direction indicated by the arrow. The areas released by the valve plug determine the differential pressure/flow rate.

In pressure-balanced regulators, the plug is largely unaffected by pressure changes in the medium. This is achieved by using either valves balanced by a bellows or a diaphragm. The valves balanced by a diaphragm have a balancing diaphragm instead of a balancing bellows. In both cases, the forces created by the upstream and downstream pressures that act on the plug are balanced out.

The actuators can be equipped with force limiters to limit the force acting on the plug stem and protect the seat and plug against damage.

A similar effect is achieved by an excess pressure limiter integrated into the actuator. A bypass opens, if necessary, and balances the forces which prevents excessive positioning forces.

Flow control

The flow rate is determined according to the differential pressure method. This is achieved by a standard orifice plate in the pipe through which the medium flows or by an adjustable restriction integrated into the valve.

The areas released by the restriction and the valve plug influence the flow rate. In this case, the high pressure upstream of the restriction is transferred through the control line to the high-pressure side of the diaphragm, whereas the low pressure downstream of the restriction is transferred through a bore in the valve plug to the low-pressure side of the diaphragm.

If the pressure difference acting on the operating diaphragm exceeds the differential pressure set point of the set point spring, i.e. the flow rate increases, the diaphragm moves together with the plug stem and the plug. The cross-sectional area of flow is reduced until the pressure drop created above the restriction and the differential pressure created to measure flow are identical.

Combined regulators applicable for differential pressure/pressure and flow control as well as regulators suitable for one or more of these control tasks are commonly used.

Design · Principle of operation and application

Self-operated differential pressure and flow regulators are medium-controlled proportional regulators. Each deviation from the adjusted set point is assigned to a certain valve plug position.

The medium to be controlled delivers the necessary energy to adjust the valve. The released force moves the plug when the set point differs from the actual value.

The differential pressure Δp to be controlled generates a force F_m at the diaphragm surface of the actuator which is proportional to the actual value (controlled variable x). This force is compared to the spring force F_S (set point w) at the plug stem. The spring force corresponds to the set point and can be adjusted at the set point adjuster. When the differential pressure Δp and thus the force F_m change, the plug stem is moved until $F_m = F_S$. With a predetermined diaphragm area A, the spring rate of the set point spring determines the rated travel and thus also the proportional-action coefficient K_p and the proportional band x_p.

The flow rate is controlled according to the differential pressure method.

The control accuracy and stability depend on the disturbances that occur. The regulators are designed in such a way that the effect of these disturbances is relatively small. Amongst other things, this is also achieved by balancing the plug with a metal bellows. As a result, the force acting on the plug, which depends on the upstream or differential pressure, is eliminated by an equal opposing force. In unbalanced versions, the disturbance effect is a force resulting from the cross-section of the seat and the differential pressure.

The regulators can be designed to function as:

- Differential pressure regulators
- Flow regulators
- Differential pressure and flow regulators
- Differential pressure and flow limiters
- Differential pressure, flow, and temperature regulators
- Combined self-operated regulator for flow rate with additional electric actuator

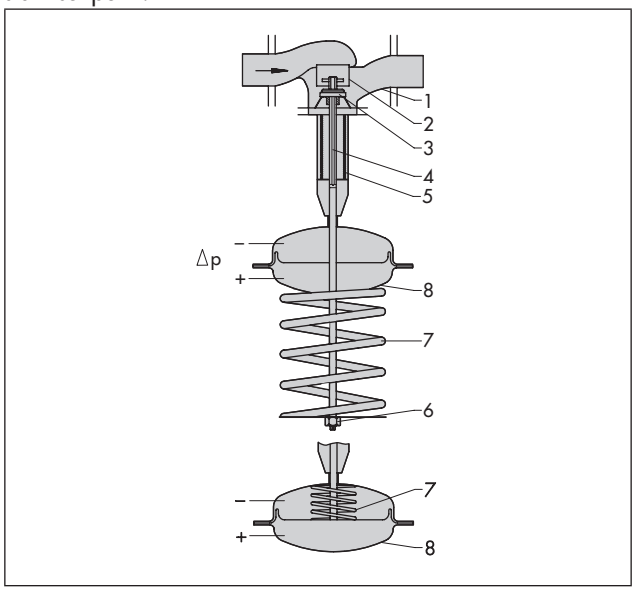
Legend for the following diagrams

1 Valve body
2 Seat
3 Plug
4 Plug stem
5 Balancing bellows
6 Set point adjustment
7 Set point spring
8 Actuator
11 Adjustable orifice

Differential pressure regulators with closing actuator

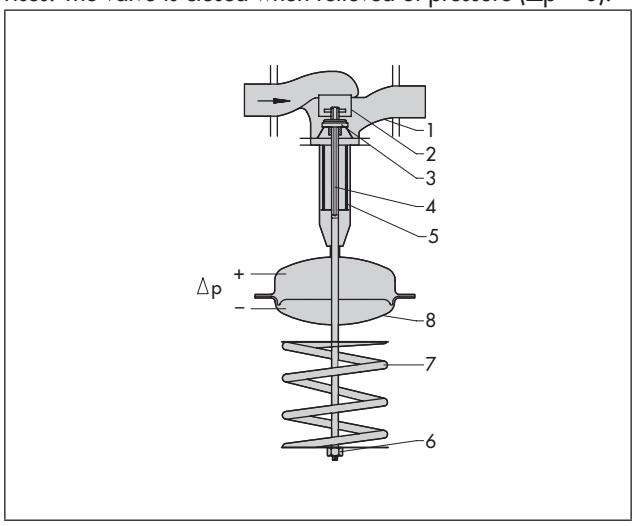
This actuator closes the valve when the adjusted differential pressure set point is exceeded. The top of the diagram shows a closing actuator with an adjustable set point, the bottom an actuator with a fixed set point.

Actuators with a fixed set point determined by the set point spring are appropriately suitable for closed loops with a constant set point.



Differential pressure regulator with opening actuator

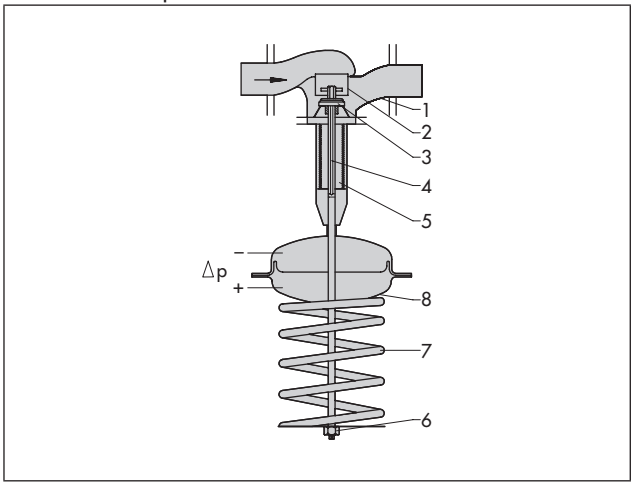
This actuator opens the valve when the differential pressure rises. The valve is closed when relieved of pressure (Δp = 0).



Valve with bellows seal

The downstream pressure acts on the inside bellows surface, while the upstream pressure acts on the outside bellows surface. As a result, the forces acting on the plug are balanced, the plug is fully balanced and not affected by any pressure or flow rate changes in the process medium.

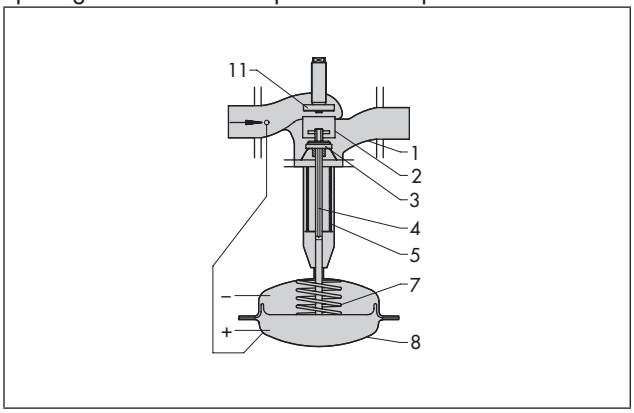
The fully balanced valves in the Series 42 Regulators allow these regulators to be used for nominal sizes up to DN 250 and flow rates up to 520 m³/h.



Flow regulators

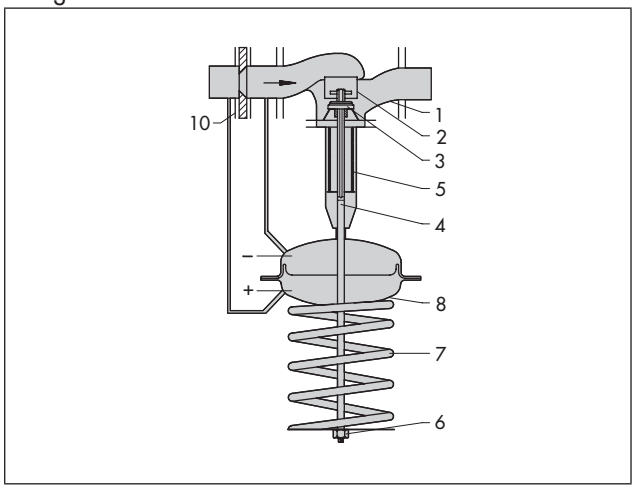
Flow regulators are particularly suitable for district heating supply networks. The measuring system is designed for a fixed differential pressure at the restriction of, for example, 0.2 bar.

The set point is adjusted at the restriction. As a result, the regulator operates with an *adjustable orifice bore*, i.e. with an opening ratio which is adapted to the set point.



Principle of flow control according to the differential pressure method

The differential pressure $\Delta p_{restriction}$ generated at the restriction is transferred to the diaphragm surface of the actuator. The difference between the force at the diaphragm and the spring force of the set point spring causes the plug position to change.



For the flow rate, the differential pressure $\Delta p_{restriction}$ acting on the restriction and the force F_m acting on the diaphragm, the following applies:

$$\dot{V} = K \cdot \sqrt{\Delta p_{restriction}} \triangleq K' \cdot \sqrt{F_m} \quad \text{or } \dot{V}^2 = K' \times \Delta p \triangleq K' \times F_m$$

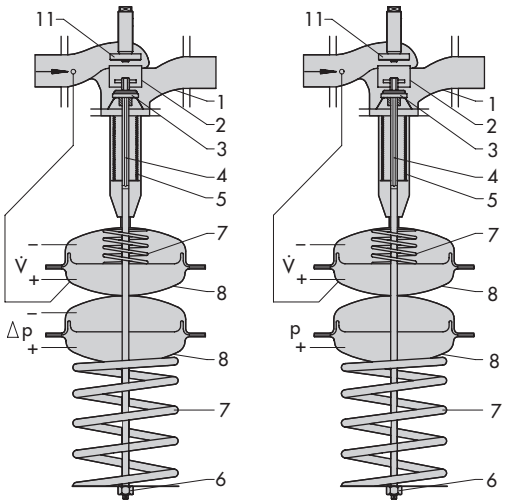
$$\Delta p_{restriction} = \frac{F_m}{A}$$

$\dot{V}$	=	Flow rate
F_m	=	Force acting on the diaphragm surface
$\Delta p_{restriction}$	=	Differential pressure created at the restriction for measuring the flow rate
K, K´	=	Constants
A	=	Diaphragm area

Flow and differential pressure or pressure regulators

These regulators are equipped with two diaphragms. The top diaphragm is used to control the flow rate, the bottom diaphragm is used to control the differential pressure or pressure. The largest signal is always used to control the regulator.

Depending on the intended application, these regulators are equipped with the necessary control lines.



Flow and differential pressure regulator (flow pipe)

Flow and pressure regulator

3.3 Temperature regulators (Type 1 to Type 9)

Principle of operation

The temperature regulators shown in the schematic diagrams operate according to the liquid expansion principle. They consist of a valve and a control thermostat.

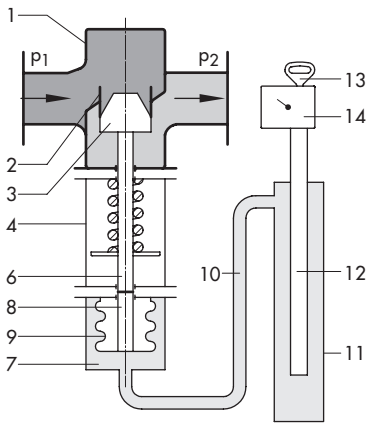
The control thermostat comprises a temperature sensor (11), set point adjuster (13), capillary tube (10), and a hydraulic actuator termed the operating element (7). The sensor is filled with an expansion liquid, which acts over the positioning bellows (9) and the positioning pin (8) upon the valve plug (3) attached to the plug stem (6). The temperature-dependent change in volume of the liquid contained in the sensor and the displacement of the piston (12) located in the set point adjuster cause the bellows and the plug to move.

The hydraulic actuator and the valve, which does not contain a packing, ensure high operating reliability of the regulators. Since the regulators operate on the liquid expansion principle, the temperature sensor and the control thermostat can be adapted to different operating conditions. Therefore, the easy-to-install version (top and middle diagrams) and the version in bottom diagram are used in most cases for temperatures exceeding 150 °C (300 °F) and in applications where separate installation of the sensor and the set point adjuster is appropriate. The selection of a Type 2231, 2232, 2333, 2234 or 2235 Temperature Sensor depends on the medium, required time constant, and installation situation.

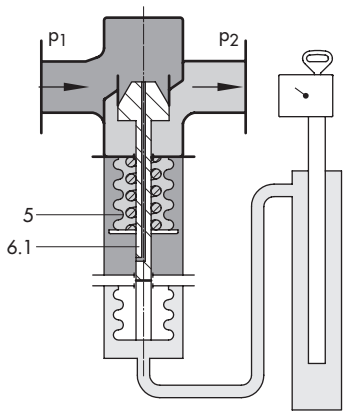
The regulators are proportional regulators controlled by the process medium. Each deviation from the adjusted set point is assigned a certain valve plug position. The control accuracy and stability of the control process depend on the disturbances occurring in the loop (for example, changes in upstream pressure and flow rate). The regulators are designed in such a way that the effect of these disturbances is relatively small. The force acting on the valve plug depending on, for example, either the upstream or differential pressure can be eliminated by balancing the plug correspondingly.

In unbalanced valves (top diagram), the effect on the plug is a force resulting from the cross-sectional seat area and the differential pressure.

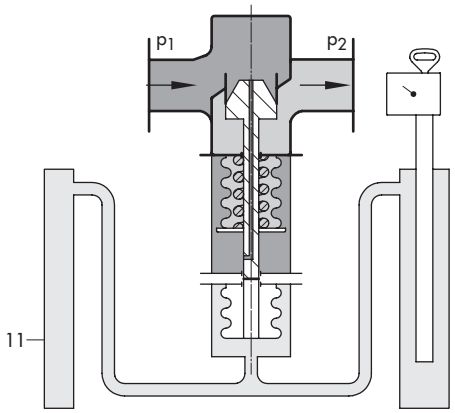
In versions balanced by a bellows, the upstream pressure p_1 is transferred through a hole in the plug stem and acts on the outside of the balancing bellows, whereas the pressure downstream of the plug p_2 acts on the inside of the bellows. As a result, the forces acting on the valve plug are balanced out. The fully balanced valves allow the self-operated regulators to be used for nominal sizes up to DN 250 (valves up to NPS 10 on request).



Temperature regulator with unbalanced valve and compact thermostat



Temperature regulator with balanced valve and compact thermostat



Temperature regulator with balanced valve and a thermostat with separate set point adjustment

Valve

1	Valve body	5	Balancing bellows
2	Seat	6	Plug stem
3	Plug	6.1	Plug stem with hole for pressure balancing
4	Bellows housing		

Control thermostat

7	Operating element	11	Temperature sensor
8	Positioning pin	12	Piston
9	Operating bellows	13	Set point adjustment
10	Capillary tube	14	Set point dial

Dynamic behavior of the thermostats

The dynamics of the regulators are mainly determined by the response of the sensor and its characteristic time constant.

The following table lists the response times of SAMSON sensors operating according to different principles measured in water for Type 1 to Type 9 Temperature Regulators.

Functional principle	Control thermostat	Time constant [s]	
		Without Thermowell	With Thermowell
Liquid expansion	Type 2231	70	120
	Type 2232	65	110
	Type 2233	25	– [1]
	Type 2234	15	– [1]
	Type 2235	10	– [1]
	Type 2213	70	120
Adsorption	Type 2212	– [1]	40

[1] Not permissible

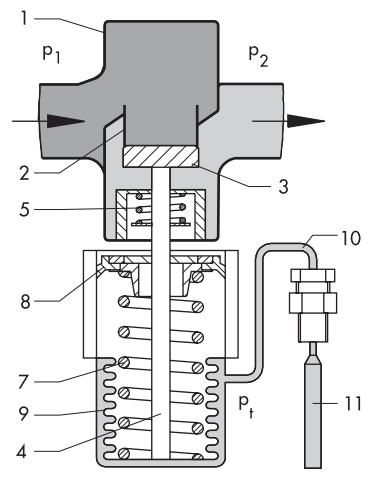
3.4 Temperature regulators (Series 43)

Principle of operation

The regulators illustrated consist of a valve (1) and a control thermostat with set point adjuster (8), capillary tube (10), and temperature sensor (11) operating according to the adsorption principle.

The medium temperature creates the pressure p_t in the sensor (11) that corresponds to the actual value. This pressure is transferred over the capillary tube (10) to the positioning bellows (9) where the force $F_t = p_t \times A$ is created at the effective bellows area A. This force that corresponds to the controlled variable x is compared at the bottom of the bellows with the spring force F_s (= set point w) dependent on the set point adjustment.

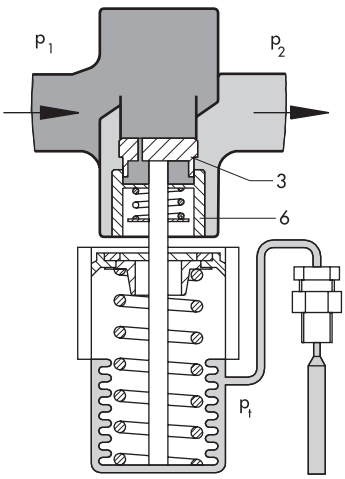
When the temperature changes, the plug (3) moves until $F_t = F_s$.



1 Valve body
2 Valve seat (exchangeable)
3 Plug
4 Plug stem
5 Valve spring
7 Set point spring(s)
8 Set point adjuster
9 Operating bellows
10 Capillary tube
11 Temperature sensor

Pressure balancing

The control accuracy and stability of the control process depend on the disturbances occurring in the loop (for example, changes in upstream pressure and flow rate). The regulators are designed in such a way that the effect of these disturbances is relatively small. The force acting on the valve plug depending on, for example, the upstream pressure, can be eliminated by balancing the plug correspondingly.

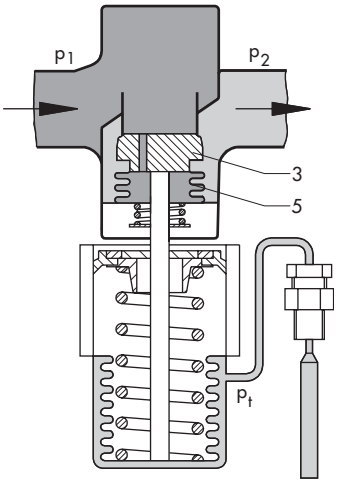


3 Plug balanced by a piston
6 Bushing

The valve plug has a hole through it to allow the upstream pressure to be applied to the front and back of the plug. The downstream pressure is separated from the plug either by the bushing of a piston plug or a metal bellows.

Regulators for plants to be heated

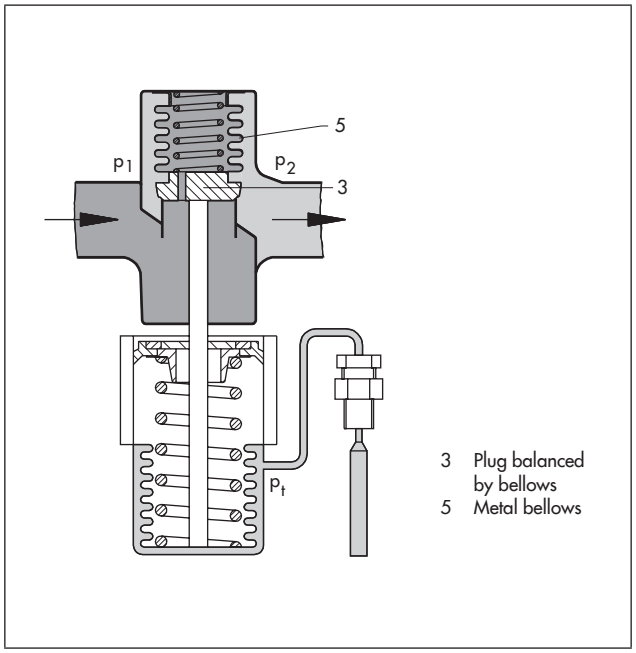
The valve **closes** as soon as the temperature at the sensor rises.



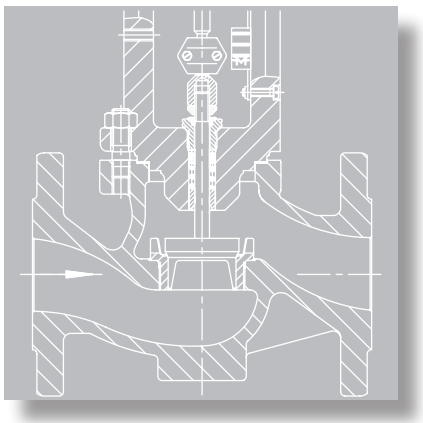
3 Plug balanced by bellows
5 Metal bellows

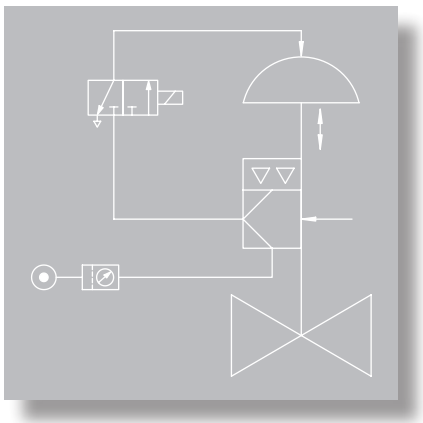
Regulators for plants to be cooled

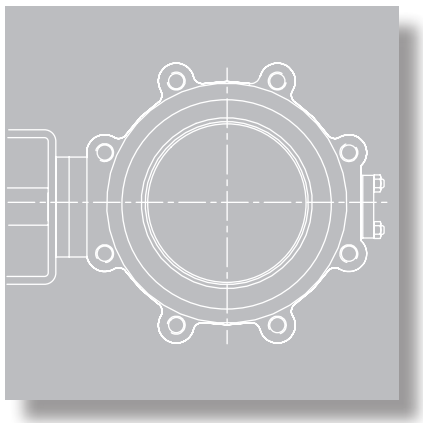
The valve **opens** as soon as the temperature at the sensor rises.

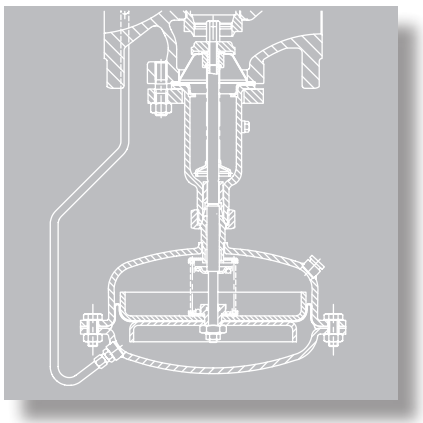


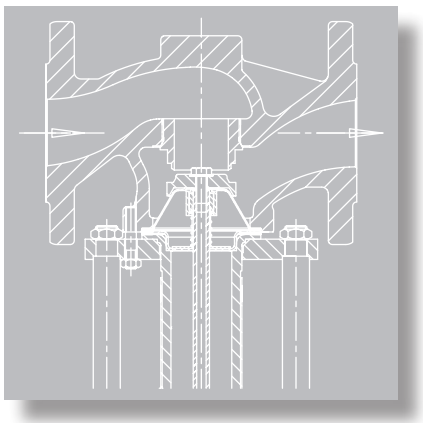
Product Range

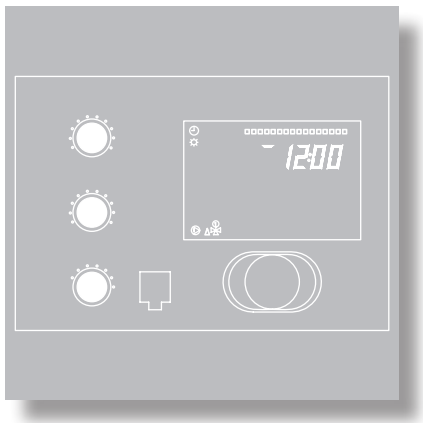


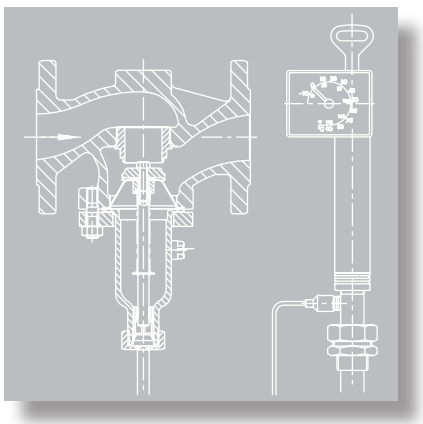


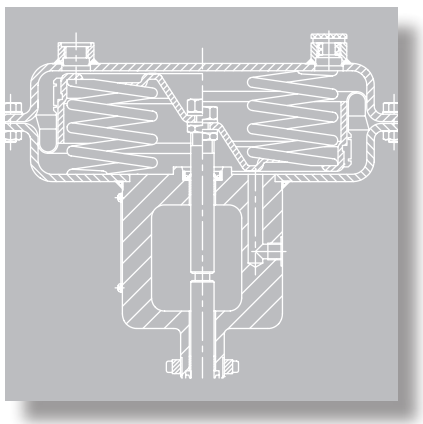


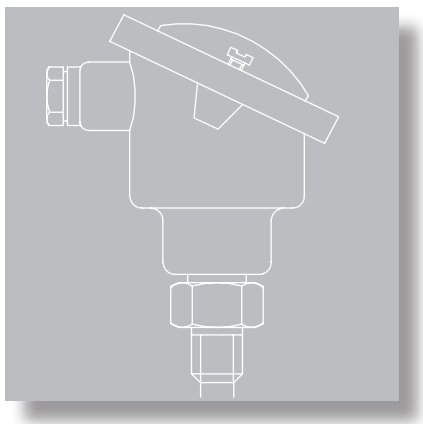












Pneumatic Control Valves · Series 240

Globe valve · Type 3241

Application

Control valves for process engineering and industrial applications according to DIN, ANSI, and JIS standards

- Valve sizes DN 15 to 300 · NPS ½ to 12 · DN 15A to 300A
- Pressure rating PN 10 to 40 · Class 125 to 300 · JIS 10K/20K
- Temperatures from –196 to +450 °C · –320 to +800 °F

Special features

- Globe valve with pneumatic or electric actuator
- Valve body optionally made of cast iron, spheroidal graphite iron, cast steel, forged steel, cold-resisting and high-alloy steels or special materials
- Valve plug with metal seal, soft seal or high-performance metal seal

Versions

– **Type 3241-7:** valve with Type 3277 Pneumatic Actuator (see page 66)

– **Type 3241-1:** valve with Type 3271 Pneumatic Actuator (see page 66)

Accessories · Positioners, limit switches, solenoid valves

Technical data

Valve size		**DN 15 to 300 (NPS ½ to 12)**			
Body material	DIN	Cast iron EN-JL1040	Spheroidal graphite iron EN-JS1049	Cast steel 1.0619 1.0460 [1]	Cast stainless steel 1.4408 1.4571 [1]
	ANSI	A126 B	–	A216 WCC A 105 [1]	A351 CF8M A182 F316 [1]
Pressure rating	PN	10, 16	16, 25	10 to 40	
	Class	125, 250	–	150, 300	
End connections	DIN	Flanges, welding ends according to EN 12627			
	ANSI	ANSI B16.25/flanges FF, RF · NPT thread			
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV Soft seal: VI High-performance metal seal: V			
Characteristic		Equal percentage, linear			
Rangeability		50:1 up to DN 50 (NPS 2) · 30:1 for DN 65 (NPS 2½) and larger 50:1 for DN 200 (NPS 8) and larger			
Temperature range		–10 to +220 °C (14 to 430 °F)			
With insulating section		–196 to +450 °C (–325 to +842 °F)			
Compliance		CE · EAC			
Data sheets		DIN/ANSI: **T 8015/T 8012** · Actuators: **T 8310-1/-2/-3**			

[1] Forged steel version up to DN 80 (ANSI: up to NPS 2 only) in PN 40 (Class 300)

Type 3241-7 up to DN 150
with Type 3277 Actuator

Type 3241-7 up to DN 80
with Type 3277 Actuator

Type 3241-1 with
Type 3271 Actuator

Further versions

- Welding ends for versions according to DIN and ANSI
- Adjustable packing
- Flow divider or AC-trim for noise reduction · See Data Sheets T 8081 and T 8082
- Insulating section or bellows seal · See Data Sheets T 8015 and T 8012
- Heating jacket · On request
- Actuator made of stainless steel · See Data Sheet T 8310-1
- Additional handwheel · See Data Sheets T 8310-1 and T 8312
- Electric actuator for plant engineering and HVAC · See T 5870, T 5871, T 5874

Valves for special applications

Type 3241-1 and Type 3241-7: with safety function for water and steam · Tested according to DIN EN 14597 · See Data Sheet T 8016

Type 3241-4: with safety function to protect heating systems against excess temperatures or pressures · Tested according to DIN EN 14597 · See Data Sheet T 5871

Type 3241-1 Gas and Type 3241-7 Gas: pneumatic control and quick-acting shut-off valves for gases · Typetested according to DIN EN 161 · See Data Sheet T 8020

Valves for higher pressures

Series 250 according to DIN and ANSI · See page 43
Pressure rating up to PN 400 (Class 2500) · Valve size up to DN 500 (NPS 20)
Temperatures up to 550 °C (1022 °F) · See Data Sheet T 8051 ff.

Steam-converting valves

Series 280 according to DIN and ANSI · See page 45
Pressure rating up to PN 160 (Class 600) · Valve size up to DN 500 (NPS 20)
Temperatures up to 500 °C (930 °F) · See Data Sheets T 8251 and T 8254

Type 3241-7 with Type 3277 Actuator and heating jacket including bellows heating

Type 3241-4 with Type 3274 Actuator

CE

Application

Mixing or diverting valve for process engineering and industrial applications according to DIN, ANSI, and JIS standards

- Valve size DN 15 to 150 · NPS ½ to 6
- Pressure rating PN 10 to 40 · Class 150 to 300
- Temperatures from –196 to +450 °C · –321 to +842 °F

Special features

- Three-way valve with pneumatic or electric actuator
- Valve body optionally made of cast iron (DIN version only), cast steel or cast stainless steel
- Metal-seated valve plug

Versions

Standard version for temperatures ranging from –10 to +220 °C

– **Type 3244-7:** valve with Type 3277 Pneumatic Actuator (see page 66)

– **Type 3244-1:** valve with Type 3271 Pneumatic Actuator (see page 66)

Technical data

Valve size		**DN 15 to 150 (NPS ½ to 6)**		
Body material	DIN	Cast iron EN-JL1040	Cast steel 1.0619	Cast steel 1.4408
	ANSI	–	A216 WCC	A351 CF8M
Pressure rating	PN	10 to 40		
	Class	–	150, 300	
End connections	DIN	All flanges according to DIN		
	ANSI	Flanges RF		
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal Class: I 0.05 % K_{VS}		
Characteristic		Linear		
Rangeability		50:1 up to DN 50 (NPS 2) · 30:1 for DN 65 (NPS 2½) and larger		
Temperature range		–10 to +220 °C (14 to 430 °F)		
With insulating section		–196 to +450 °C (–325 to +842 °F)		
Compliance		CE · EAC		
Data sheets		DIN/ANSI valve: **T 8026** · Actuators: **T 8310-1**		

Accessories · Positioners, limit switches, solenoid valves

Further versions

– Insulating section or bellows seal · See Data Sheet T 8026
– Heating jacket · On request
– Additional handwheel · See Data Sheet T 8310-1
– Electric actuator for plant engineering and HVAC

Type 3244-7 with Type 3277 Actuator

Type 3244-1 with Type 3271 Actuator

Pneumatic Control Valves

Micro-flow valve · Type 3510

High-pressure valve · Type 3252

Application
Control valve to control very low flow rates according to DIN and ANSI standards

Special features
- Globe or angle valve with pneumatic actuator
- Valve body and wetted parts made of stainless steel
- Metal-seated valve plug
- Connections: G/NPT thread, welding ends or flanges

Versions
- **Type 3510-7:** micro-flow valve with Type 3277-5 Pneumatic Actuator
- **Type 3510-1:** micro-flow valve with Type 3271-5 Pneumatic Actuator (120 cm²)
- **Type 3252-7:** high-pressure valve with Type 3277-5 Pneumatic Actuator (120 cm²) or Type 3277 Pneumatic Actuator (350 cm²)
- **Type 3252-1:** high-pressure valve with Type 3271-5 Pneumatic Actuator (120 cm²) or Type 3271 Pneumatic Actuator (350 cm²)

See page 66 for more details on Type 3277 and Type 3271 Pneumatic Actuators

Technical data

Type		3510	3252
Valve size	DN	10 to 25	15 to 25
	NPS	½ to 1	½ to 1
Female thread	G/NPT	⅛ to ¾	½ to 1
	Rc	⅛ to ¾	–
Flow coefficients	K_{VS}	0.0001 to 1.6	0.1 to 4.0
	C_V	0.00012 to 2.0	0.12 to 5.0
Body material	DIN	1.4404	1.4404
	ANSI	A 316 L	A 316 L
Pressure rating	PN	40 to 400	40 to 400
	Class	150 to 2500	300 to 2500
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV High-performance metal seal: V	Metal seal: IV High-performance metal seal: V Soft seal: VI
Characteristic		Equal percentage for K_{VS} 0.01 and higher, linear, quick-opening	Equal percentage, linear, quick opening
Rangeability		Max. 50:1	Max. 50:1
Temperature range		−10 to +220 °C 14 to 428 °F	−10 to +220 °C 14 to 428 °F
With insulating section		−200 to +450 °C −328 to +842 °F	−196 to +450 °C −325 to +842 °F
Compliance		EAC	
Data sheets		**T 8091, T 8091-1**	**T 8053**

Accessories · Positioners, limit switches, solenoid valves

Type 3510-7 with
Type 3725 Positioner

Type 3252-7 with
Type 3767 Positioner

Pneumatic Control Valves · Series 250

Globe valve · Type 3251

Angle valve · Type 3256

CE

Application

Control valve for process engineering applications with high industrial requirements according to DIN and ANSI standards

- Valve size DN 15 to 500 · NPS ½ to 20
- Pressure rating PN 16 to 400 · Class 150 to 2500
- Temperatures from –200 to +550 °C · –420 to +958 °F

Special features

- Globe or angle valve with pneumatic actuator

Versions

Standard version for temperatures from –10 to +220 °C (14 to 428 °F), with adjustable high-temperature packing from –10 to +350 °C (15 to 662 °F)

– **Type 3251-1** or **Type 3256-1:** valve with Type 3271 Pneumatic Actuator (page 66)

– **Type 3251-7** or **Type 3256-7:** valve with Type 3277 Pneumatic Actuator (page 66)

Technical data

Valve	Type	3251		3256
Valve size	DN	15 to 500		15 to 500
	NPS	½ to 20		½ to 20
Body material	DIN	Cast steel 1.0619	Cast steel 1.7357	Cast stainless steel 1.4408
	ANSI	A216 WCC	A217 WC6	A351 CF8M
Pressure rating		PN 16 to 400 (Class 150 to 2500) [1]		
End connections	DIN	Flanges, welding ends according to EN 12627		
	ANSI	Flanges RF, RTJ · Welding ends B16.25		
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV Soft seal: VI High-performance metal seal: V		
Characteristic		Equal percentage, linear, quick opening		
Rangeability		50:1		
Temperature range		–10 to +220 °C (14 to 428 °F)		
With high-temperature packing		220 to 350 °C (430 to 662 °F)		
With insulating section		–196 to +550 °C (–325 to +1022 °F)		
Compliance		CE · EAC		
Data sheets		DIN/ANSI: **T 8051/T 8052**		DIN/ANSI: **T 8065/ T 806**

[1] On request

Accessories · Positioners, limit switches, solenoid valves

Further versions with flow divider or special AC-trim

Type 3251-1 with Type 3271 Actuator

Type 3256-1 with Type 3271 Actuator

Pneumatic Control Valves · Series 250

Three-way valve · Type 3253

Globe valve · Type 3254 with additional plug stem guide in the bottom body flange

CE

Application

Control valve for process engineering applications with high industrial requirements according to DIN and ANSI standards

Technical data

Valve Type		3253 [1]		
Valve size		DN 15 to 500 (NPS ½ to 20)		
Body material	DIN	Cast iron EN-JL1040	Cast steel 1.0619	Cast stainless steel 1.4408
	ANSI	–	A216 WCC	A351 CF8M
Pressure rating		PN 16 to 160 (Class 150 to 900) [2]		
End connections		Flanges according to DIN EN · Raised face, ring joint		
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal Class: I 0.05 % K_{VS}		
Characteristic		Linear		
Rangeability		50:1		
Temperature range		–10 to +220 °C (14 to 428 °F)		
With high-temperature packing		220 to 350 °C (428 to 662 °F)		
With insulating section		–196 to +550 °C (–325 to +1022 °F)		
Compliance		CE · EAC		
Data sheets		DIN/ANSI: **T 8055/T 8056**		

1) Depending on plug arrangement as mixing or diverting valve
2) Higher pressures on request

Type 3253-1 with Type 3271 Actuator

Technical data

Valve Type		3254		
Valve size		DN 80 to 500 (NPS 3 to 20)		
Body material	DIN	Cast steel 1.0619	Cast steel 1.7357	Cast stainless steel 1.4408
	ANSI	A216 WCC	A217 WC6	A351 CF8M
Pressure rating		PN 16 to 400 (Class 150 to 2500)		
End connections	DIN	Flanges, welding ends according to EN 12627		
	ANSI	Flanges RF, RTJ · Welding ends B16.25		
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV Soft seal: VI High-performance metal seal: V		
Characteristic		Equal percentage, linear, quick opening		
Rangeability		50:1		
Temperature range		–10 to +220 °C (14 to 428 °F)		
With high-temperature packing		220 to 350 °C (428 to 662 °F)		
With insulating section		–196 to +550 °C (–325 to +1022 °F)		
Compliance		CE · EAC		
Data sheets		DIN/ANSI: **T 8060/T 8061**		

Type 3254-1 with Type 3271 Actuator

CE

Application

Steam converters (globe valve or angle valve) for process engineering applications and thermal plants

Technical data

Steam-converting valve		Type 3281 Globe Valve	Type 3286 Angle Valve
Valve size	DN	50 to 500	50 to 300
	NPS	2 to 20	2 to 12
Body material	DIN	Cast steel: 1.0619/1.7357	
	ANSI	Cast steel: A216 WCC/A217 WC6	
Pressure rating		PN 16 to 160 (Class 150 to 900)	
End connections		Flanges, welding ends	
Seat-plug seal, Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV High-performance metal seal: V Balanced: min. IV (depending on version)	
Characteristic		Equal percentage, linear	
Rangeability		50:1	
Temperature range		–10 to +220 °C (14 to 428 °F)	
With high-temperature packing up to		350 °C (660 °F)	
With insulating section up to		500 °C (932 °F)	500 °C (932 °F)
Compliance		CE · EAC	
Data sheets		**T 8251/T 8252**	**T 8256/T 8257**

Type 3281-1 with Type 3271 Actuator

Type 3286-1 with Type 3271 Actuator

Pneumatic Control Valves

Components to reduce noise and wear

Flow dividers · AC trims · Perforated plug

Silencer · Type 3381

Application

The noise emission of the control valves and the attached pipeline is determined by the free jet exiting the restriction and the jet's turbulent mixing zone in applications with gases and vapors. When cavitation occurs, the noise level is influenced to a large extent by the pressure waves induced by the implosion of the cavitation bubbles.
The following components are used to reduce noise:

Flow dividers St I, St II or St III · Effective and cost-efficient components made of perforated sheet steel or hard-faced wire mesh

- Shorten the free jet in applications with gases and vapors
- Accelerate the exchange of energy in the mixing zone
- Protect the valve body

Flow dividers are suitable for SAMSON Series 240, 250, 280 and 290 Globe Valves as well as for globe valves of self-operated regulators (see Data Sheet T 8081).

AC trims · Optimized trims for SAMSON control valves for low-noise pressure letdown of liquids (see T 8082 and T 8083)

- Double-guided plug stem to prevent vibration
- Additional attenuation plates in the seat with AC-2 Trim
- AC-3 to AC-5 Trims: multi-stage pressure reduction at high differential pressures

Versions

– **AC-1 Trim:** noise-optimized trim, parabolic plug with double plug stem guide. Suitable for DN 50 to 300 and PN 16 to 160 (see T 8082)
– **AC-2 Trim:** trim same as AC-1 Trim, but with fixed attenuation plates integrated into the seat on the upstream side, for DN 80 to 250 and PN 16 to 160 (see T 8082)
– **AC-3 Trim:** multi-stage parabolic plug for DN 15 to 300 and PN 40 to 400 (see T 8083)

Control valves with perforated plug · Mainly used for valves in steam applications, particularly for operation in the wet steam region, the control of two-phase medium flow, liquid media which vaporize on the outlet side (flashing valves) or emergency relief valves (blow-off valves). The perforated plug splits up the jet stream into numerous smaller jets and ensures low-noise energy transfer to the surrounding medium. Suitable for Types 3241, 3246, 3248, 3251, 3254 and 3256 Valves (see T 8086), Type 3291 (see T 8072-1) and Type 3296 (see T 8074-1).

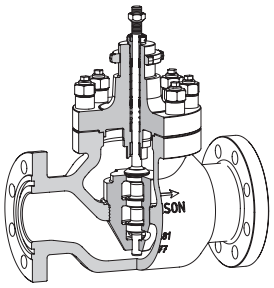
Type 3381 Silencer · Fixed restrictor package that can be installed downstream of the valve with one to five attenuation plates for applications with liquids, gases or vapors. The silencer increases the backpressure downstream of the valve. With gases and vapors this leads to a reduction in the valve outlet velocity and sound pressure level. With liquids this leads to a reduction in the sound pressure level (see T 8084).

- DN 40 to 800 (NPS 1½ to 32) · PN 10 to 400 (Class 150 to 2500)

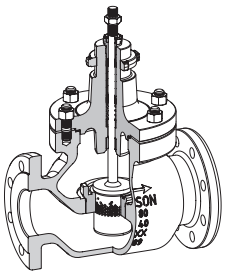
Versions

– Sandwich-style version for clamping between flanges with one attenuation plate · Body for two to five attenuation plates attachable using flanges (see Data Sheet T 8084)

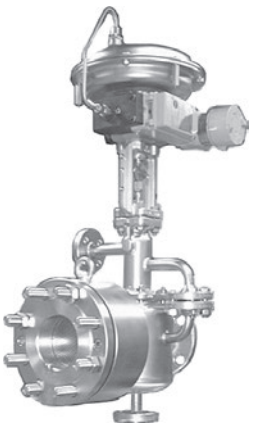
Flow divider St I



Type 3251 with AC-3 Trim



Type 3251 with perforated plug



Type 3381, flanged to control valve with heating jacket

Pneumatic Control Valves · Series 240

Diaphragm valve · Type 3345

On/off valve · Type 3351

Type 3345 Diaphragm Valve

Control valve for viscous, corrosive and abrasive fluids

- According to DIN, ANSI, or BS standards
- FDA-compliant version

Technical data

Version	DIN	ANSI
Valve size	DN 15 to 150	NPS ½ to 6
Body material	EN-JL1040, EN-JS1025 1.4408, 1.4435	A126 B, A 395 A351 CF8M, A316 L
Maximum pressure	16 bar	230 psi
End connections	Flanges, threaded ends Clamps, welding ends	
Diaphragm sealing Leakage class according to IEC 60534-4 or ANSI/FCI 70-2	Butyl, PTFE/EPM, EPDM Class: VI	
Characteristic	Linear	
Rangeability	30:1	
Temperature range	–30 to +160 °C [1]	–22 to +320 °F [1]
Compliance	EAC	
Data sheet	**T 8031**	

[1] Temperature range depending on the diaphragm used

Type 3351 On/off Valve

Pilot valve

- Optionally with bellows seal or insulating section
- With tight shutoff for liquids, non-flammable gases and steam
- According to DIN and ANSI standards

Technical data

Valve size		DN 15 to 100 (NPS ½ to 4)		
Body material	DIN	Cast iron EN-JL1040	Cast steel 1.0619	Cast stainless steel 1.4408
	ANSI	–	A216 WCC	A351 CF8M
Pressure rating	PN	10, 16	10 to 40	
	Class	–	150, 300	
End connections	DIN	Flanges B1 according to EN 1092		
	ANSI	–	Flanges RF	
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal or soft seal Class: VI		
Medium temperatures		–50 to +250 °C (–58 to +482 °F)		
Compliance		EAC		
Data sheet		**T 8039**		

Type 3345-1

Type 3345-1, DN 50
Version for food processing industry

Type 3351-1

Type 3351-1 with insulating section

Pneumatic Control Valves for Hygienic and Aseptic Applications

Angle valves · Type 3347, Type 3249, and Type 3349

Application

Cavity-free angle valves for the food processing and pharmaceutical industries

– **Type 3347:** pneumatic control valve for hygienic service according to DIN, ANSI, or BS standards

Technical data

Body version		Cast	Bar stock	Micro-flow valve
Valve size	DN	25 to 100	15 to 125	6 to 15
	NPS	1 to 4	½ to 5	¼ to ½
Body material		Cast stainless steel, stainless steel		
Maximum pressure		16 bar (230 psi)	16 bar (230 psi) [1]	16 bar (230 psi)
End connections		Welding ends, threaded ends, clamps, flanges		
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV Soft seal: VI		
Characteristic		Equal percentage, linear		
Rangeability		50:1 up to DN 50 (NPS 2) 30:1 for DN 65 (NPS 2½) and larger		15:1 to 50:1
Max. temperature range		0 to 150 °C (32 to 300 °F)		
Compliance		EAC		
Data sheets		DIN/ANSI: **T 8097, T 8097-3**		

[1] 40 bar (580 psi) flanged when made of bar stock

– **Type 3349:** pneumatic control valve for aseptic service according to DIN, ANSI, or BS standards · Stem guide sealed by a diaphragm and with test connection

Technical data

Version	DIN	ANSI
Valve size	DN 15 to 100	NPS ½ to 4
Body material	1.4404	A 316 L
Diaphragm material	EPDM with PTFE facing	
Maximum pressure	10 bar	150 psi
End connections	Welding ends, threaded ends Aseptic pipe fittings, clamps, flanges	
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2	Metal seal: IV Soft seal (does not comply with 3A): VI	
Characteristic	Equal percentage, linear	
Rangeability	50:1: up to DN 50 · 30:1 for DN 65 and larger	
Operating temperature	0 to 160 °C	32 to 320 °F
Compliance	EAC	
Data sheet	**T 8048**	

Refer to our **Components for the Food Processing and Pharmaceutical Industries** catalog

Type 3347-7 with threaded connections

Type 3347 with Type 3379 Actuator

Type 3249-7 with welding ends

– **Type 3349:** aseptic angle valve with USP-VI diaphragm according to DIN or ANSI standards · Stem guide sealed by a diaphragm and with test connection

Technical data

Version	**DIN**	**ANSI**
Valve size	DN 15 to 50 [1]	NPS ½ to 2 [1]
Body material	1.4435	A 316 L
Diaphragm material	PTFE	
Maximum pressure	10 bar	150 psi
End connections	Welding ends, aseptic flanges, connecting thread and clamp connections	
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2	Metal seal: IV Soft seal: VI	
Characteristic	Equal percentage, linear	
Rangeability	50:1 up to DN 50 (NPS 2) · 30:1 for ≤ K_{VS} 0.63 (C_V 0.75)	
Operating temperature	0 to 160 °C	32 to 320 °F
Compliance	EAC	
Data sheets	**T 8048-2/T 8048-3**	

[1] Up to DN 100/NPS 4 in preparation

Type 3349

Pneumatic Control Valves

Cryogenic valves

Type 3248

Type 3246 with long insulating section and circulation inhibitor

CE

Application

Control valve for use in cryogenic applications for liquids and gases

Special features

- Globe or angle valve with pneumatic actuator
- Valve body made of cold-resisting stainless steel with welding ends, angle valve also available made of aluminum
- Insulating section with integrated bellows seal to protect the stem guide from freezing up. As a result, the valve can be mounted in any desired position
- Prepared for installation in cold-box systems
- Valve trim can be exchanged without having to remove the valve

Versions

Globe or angle-style valve body with welding-neck ends and cryogenic extension bonnet, self-adjusting PTFE or PTFE/carbon V-ring packing, metal or soft-seated valve plug

– **Type 3248-7:** cryogenic valve with Type 3277 Pneumatic Actuator (page 66)
– **Type 3248-1:** cryogenic valve with Type 3271 Pneumatic Actuator (page 66)

Technical data

Valve size	**DN 25 to 150 (NPS 1 to 6)**	
Body style	Globe valve	Angle valve
Body material	1.4308 A351 CF8	1.4571 or AlMg4, 5MnF27
Pressure rating	PN 16 to 100 (Class 150 to 600)	
End connections	Welding ends, welding-neck ends	
Seat-plug seal, Leakage class according to IEC 60534-4 or ANSI/FCI 70-2	Metal seal: IV Soft seal: VI High-performance metal seal: V	
Characteristic	Equal percentage, linear	
Rangeability	50:1 up to DN 50 (NPS 2) 30:1 for DN 80 (NPS 3) and larger	
Temperature range	Standard: –196 to +65 °C (–321 to +149 °F) Cryogenic: down to –273 °C, ANSI: down to –254 °C (–425 °F)	
Compliance	CE · EAC	
Data sheets	DIN/ANSI: **T 8093/T 8093-1** · Actuators: **T 8310-1**	

Accessories · Positioners, limit switches, solenoid valves

Type 3248-7, steel globe valve with positioner and supply pressure regulator

Type 3248-1 Cryogenic Valve, aluminum angle valve with positioner, supply pressure regulator, and additional handwheel

Type 3246 Cryogenic Valve with long insulating section and circulation inhibitor, ANSI version

Application

Globe valve for cryogenic applications

Special features

- Globe or three-way valve with pneumatic actuator
- Valve body made of cast stainless steel
- Valve plug with metal seal or high-performance metal seal
- Long insulating section
- Circulation inhibitor to prevent the flow conditions of the process medium having any effect in the insulating section

Versions

Standard version for temperatures from –200 to +65 °C (–328 to +149 °F) with long insulating section, cover plate with collar and circulation inhibitor

– **Type 3246-1:** valve with Type 3271 Pneumatic Actuator (see page 66)

– **Type 3246-7:** valve with Type 3277 Pneumatic Actuator (see page 66)

Technical data

Body style		**Globe valve**		**Three-way valve**
Valve size	NPS	½ to 10	½ to 8	½ to 6
Pressure rating	Class	150/300	600	150/300
Body material		A351 CF8		A351 CF8M
End connections		Welding ends/ANSI flanges RF		ANSI flanges RF
Seat-plug seal		Metal seal		
		High-performance metal seal, Stellite®		–
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV High-performance metal seal: V		0.05 % of C_V
Characteristic		Equal percentage, linear, quick opening		Linear
Rangeability		50:1 30:1 for NPS 3 and larger	50:1	50:1 30:1 for NPS 3 and larger
Temperature range		–196 to +65 °C (–325 to +149 °F)		–196 to +65 °C –325 to +149 °F
Compliance		CE · EAC		
Data sheets		**T 8046-1**	**T 8046-2**	**T 8046-3**

Type 3246-7, Class 150/300

Type 3246-1, Class 600

Type 3246-7, Class 150/300

Pneumatic Butterfly Valves

Butterfly valve · Type 3331

High-pressure butterfly valve · LEUSCH Type LTR 43

Control butterfly valves · PFEIFFER Type 10a, 10e, and 14b/31a

Application

Control valves for process engineering and industrial applications

Versions

- **Type 3331:** swing-through or angle-seated disk for liquids, vapors and gases with Type 31a Pneumatic Actuator
- **LEUSCH Type LTR 43:** triple-eccentric, tight-closing, high-pressure butterfly valve with zero seat leakage in both directions of medium flow at full differential pressure. Optionally TA Luft packing, fire-safe version, extension for cryogenic or high temperatures

Technical data

Type		3331	LTR 43
Valve size	DN	50 to 400	80 to 2500
	NPS	2 to 16	3 to 100
Body material	DIN	1.0425, 1.4404, 1.4408 DN 150 and larger: 1.0619, 1.4581	1.4408 1.0619
	ANSI	A414 Gr D, 316L NPS 6 and larger: A216 WCC	A216 WCC/WCB A351 CF8M
Pressure rating	PN	10 to 40 ISO 20, 50	10 to 420
	Class	150, 300	150 to 2500
Body style		Wafer-type	Between flanges, lug-type, double flange
Butterfly disk material		1.4581	A216 WCC/WCB A351 CF8M
Gasket		Metal to metal	Graphite on metal core Stellite® faced, PTFE
Leakage		≤ 1 %	Class VI DIN EN 1349/ ANSI/FCI 70-2
Opening angle		90°, 70°	80° (90°)
Throttling service up to		70°	70°
Rangeability		50:1	> 50:1
Temperature range	°C	–10 to +400	–196 to +1000
	°F	14 to 752	–320 to +1830
Actuator	Type	Type 31a/Type 3278	On request
Data sheets		**T 8227**	**T 9923**

Accessories · Positioners, limit switches, solenoid valves

Type 3331 with Type 31a Actuator

Type LTR 43, double-flanged body, NPS 10, Class 1500 with pneumatic actuator and positioner

Type LTR 43 lug-type body version with manual gear

– **PFEIFFER Type 10a:** double-eccentric control butterfly valve with min. 8 to 12 mm thick M-PTFE lining
– **PFEIFFER Type 10e:** centric control and shut-off butterfly valve with minimum 3 mm thick isostatic PTFE lining
– **PFEIFFER Type 14b/31a:** double-eccentric butterfly valve with Type 31a Pneumatic Piston Actuator

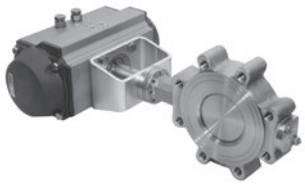
Technical data

Type		**Type 10a**	**Type 10e**	**Type 14b**
Valve size	DN	100 to 800	50 to 400	50 to 800
	NPS	4 to 32	2 to 16	2 to 32
Body material	DIN	EN-JS1049 St 52-3 PTFE lining	EN-JS1049 PTFE lining	1.4408 1.0619
	ANSI	A395		A216 WCB A351 CF8M
Pressure rating	PN	10	10/16	10 to 40
	Class	150		150, 300
Body style		Wafer-type Lug-type	Wafer-type Lug-type	Wafer-type Lug-type
Butterfly disk material		1.4313 coated	1.4313 coated	1.4408
Gasket		PTFE		Metal seal: IV/V IEC 60534-4 Soft seal: A according to DIN EN 12266-1
Leakage		A according to DIN EN 12266-1 IV IEC 60534-4		IV/V IEC 60534-4
Opening angle		90°		
Temperature range	°C	–40 to +200	–35 to +200	–60 to +350
	°F	–40 to 392	–31 to +392	–76 to 482
Actuator	Type	Type 31a/30a	Type 31a/30a	Type 31a/30a
PFEIFFER data sheets		**TB 10a**	**TB 10e**	**TB 14b**

Accessories · Positioners, limit switches, solenoid valves

Type 10a

Type 10e/31a



Type 14b/31a

PTFE or PFA-lined Control Valves

Globe valves · PFEIFFER Types 1a, 1b, and 6a

Angle valve · PFEIFFER Type 8a

Pfeiffer
Chemie-Armaturenbau GmbH

Application

Lined control valves to control corrosive liquids in the chemical industry

Special features

- Globe or angle valves with pneumatic actuator
- PTFE or PFA lining
- PTFE lining with min. 5 mm thickness
- PTFE bellows seal

Versions

– **PFEIFFER Type 1a:** PTFE-lined globe valve
– **PFEIFFER Type 1b:** PFA-lined globe valve
– **PFEIFFER Type 6a:** PTFE-lined micro-flow valve with K_{VS} coefficients between 0.005 and 2.5
– **PFEIFFER Type 8a:** PTFE-lined angle valve

Technical data

Type		Type 1a	Type 1b	Type 6a	Type 8a
Body style		Globe valve			Angle valve
Valve size	DN	25 to 150	25 to 100	6 to 15	15 to 50
	NPS	1 to 6	1 to 4	–	½ to 2
Body material	DIN	EN-JS1049			
	ANSI	A395		–	
Lining		PTFE	PFA	PTFE	PTFE
Pressure rating	PN	10/16	10/16	10	10/16
	Class	150	150	125	150
Connection		For flanges according to DIN EN 1092-1			
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		PTFE, VI	PFA, VI	PTFE, VI	
Characteristic		Equal percentage, linear			
Rangeability		30:1	50:1	30:1	30:1
Temperatures		Up to 200 °C (390 °F)		Up to 150 °C (300 °F)	
PFEIFFER data sheets		**TB 01a**	**TB 01b**	**TB 06a**	**TB 08a**

Accessories · Positioner, limit switch, solenoid valve, resistance transmitter

Further versions with hand-operated actuator

Type 1a

Type 1b

Type 6a

Ball Valves and Pigging Valves

Lined ball valves · PFEIFFER Types 20a and 20b

Stainless steel ball valves · PFEIFFER Types 22a, 26d, and 26s

Pigging valves · PFEIFFER Types 28 and 29

Sampling valve · PFEIFFER Type 27

Pfeiffer
Chemie-Armaturenbau GmbH

Application

Tight-closing lined valves for process engineering and industrial applications, especially for use with corrosive media

- **PFEIFFER Type 20a:** PTFE-lined ball valve
- **PFEIFFER Type 20b:** PFA-lined ball valve

Technical data

Type	Type 20a	Type 20b
Style/end connections	Flanges	Flanges
Valve size DN/NPS	15 to 200/0.5 to 8	15 to 100/0.5 to 4
Body material	EN-JS1049/A395	EN-JS1049/A395
Lining	White PTFE	PFA
Pressure rating PN	16	16
Closure member	PTFE-coated	PFA-coated
Leakage rate	A according to DIN EN 12266-1	
Temperature range	–10 to +200 °C (14 to 392 °F)	
PFEIFFER data sheets	**TB 20a**	**TB 20b**

Application

Tight-closing ball valves for process engineering and industrial applications, especially for use with corrosive media

- **PFEIFFER Type 22a:** Stainless steel tank bottom valve
- **PFEIFFER Type 26d:** Stainless steel ball valve
- **PFEIFFER Type 26s:** Flanged ball valve

Technical data

Type		Type 22a	Type 26d	Type 26s
Valve size	DN	50 to 300	15 to 100	15 to 800
	NPS	2 to 12	½ to 4	½ to 32
Body material	DIN	1.4408, 1.4571, 1.4581	1.4408, 1.4571, 1.0619	1.4408, 1.0619
	ANSI	F316 Ti, A351 CF8M	A351 CF8M, A216 WCB	A351 C8M, A216 WCB/WCC
Pressure rating	PN	16 to 40	16 to 40	16 to 40
	Class	150/300	150/300	150/300
Connecting flanges		According to EN 1092	According to EN 1092	According to EN 1092
Ball seal		1.4571 with PTFE	TFM	PTFE, HSB
Leakage rate		A according to DIN EN 12266-1		A/B according to DIN EN 12266-1
Temperature range		–10 to +200 °C (14 to 392 °F)		–10 to +400 °C (14 to 752 °F)
PFEIFFER data sheets		**TB 22a**	**TB 26d**	**TB 26s**

Accessories · Positioner, limit switch, solenoid valve, resistance transmitter
Further versions with hand-operated actuator, pneumatic, electric or hydraulic actuator

Type 20a

Type 22a

Type 26d/31a

Type 26s/31a

Application

Pigging valves for the chemical industry used to convey gases and liquids as well as to efficiently pig the pipeline using the minimum amount of solvents

Special features

- High surface quality
- Cavity-filled seat rings
- Special precision flanges

Versions

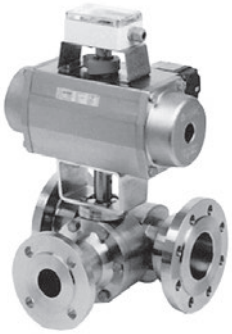
– **PFEIFFER Type 28:** valves designed for use as launch or receiving stations, for dosing, as pig trap or pig rinsing station

– **PFEIFFER Type 29:** multi-way valves, for example, 3/4 or 5/4-way manifolds

Technical data

Type	Series 28	Series 29
Valve size DN	50, 80, 100, 150	
Body material	1.4408, 1.4571	
Pressure rating PN	25/40	
Connection	Flanges	
Ball seal	PTFE	
PFEIFFER data sheets	**TB 28a**	**TB 29a**

Additionally available: turnkey pigging systems including pipework and control engineering



Type 28a

Application

Valves for continuous or intermittent sampling

– **PFEIFFER Type 27:** sampling valve

Special features of intermittent sampling:

- No direct exposure to the environment
- Sealing liners allows for sampling free of dead spaces
- Representative samples due to the direct installation of the valve in the pipeline
- Pressureless sampling of liquids
- Known sample quantity per cycle

Technical data

Type	Type 27a	Type 27c	Type 27d	Type 27e	Type 27f
Valve size DN	25 to 100 (NPS 1 to 4)		25 to 50 (NPS 1 to 2)		25 to 100
Body material	1.4408		EN-JS1049/PFA		1.4571
Sampling element	Ball		Ball		Needle
Sampling principle	Intermittent	Continuous	Intermittent	Continuous	Continuous
PFEIFFER data sheets	**TB 27a**		**TB 27d**		**TB 27f**

Type 27a with Type AT Actuator

Further versions

– Dead man's control
– Protective casing
– Control or automation (except for Type 27f)
– Other nominal sizes and materials on request

Application

Control valves for process engineering and industrial applications

Special features

- Valve body made of cast steel, cast stainless steel or special materials

Versions

– **Type 72.3:** double-eccentric rotary plug valve, flanged version, DN 25 to 500

– **Type 72.4:** double-eccentric rotary plug valve, sandwich-style version, DN 25 to 300

Technical data

Type		**72.3**	**72.4**
Valve size	DN	25 to 500	25 to 300
	NPS	1 to 20	1 to 12
Body material	DIN	1.0619, 1.4408	
	ANSI	A216 WCC, A351 CF8M	
Pressure rating	PN	10 to 40 See Type 73.x for higher pressure ratings	
	Class	150, 300	
Body version		Flange	Wafer-type
Flange		DIN/ANSI	
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV-L1 Soft seal: VI-G1	
Characteristic (cam disk in positioner)		Equal percentage, linear	
Rangeability		≥ 200:1	
Temperature range	Metal	–100 to +400 °C (–148 to +752 °F)	
	Soft	–100 to +220 °C (–148 to +430 °F)	
Actuator		Type AT/R	
VETEC data sheets		**72.3**	**72.4**

Further versions

– With additional handwheel

– TA Luft packing (for VETEC Type 72)

– Noise-reducing measures

– Heating jacket

Type 72.3/AT

Type 72.4/R

Application

Double-eccentric control valves for process engineering and industrial applications

Special features

- Valve body made of cast steel or cast stainless steel
- Seat with metal seal with or without hard facing or seat with soft seal

Versions

– **Type 62.7/AT:** double-eccentric rotary plug valve with Type AT Pneumatic Rotary Actuator

– **Type 82.7/AT or Type 82.7/R:** double-eccentric rotary plug valve with Type R or Type AT Pneumatic Rotary Actuator

Technical data

Type		62.7	82.7
Valve size	DN	25 to 200	25 to 250
	NPS	1 to 8	1 to 10
Body material	DIN	1.0619, 1.4408	
	ANSI	A216 WCC, A351 CF8M	
Pressure rating	PN	10 to 40 See Type 73.x for higher pressure ratings	
	Class	150, 300	
Flanges		DIN EN 1092 B1/ ASME B16.5	DIN EN 1591-1/ ASME B16.5/DIN 2500
Overall length	DIN	EN 558-1, Tab. 16, S 36	
	ANSI	EN 558-2, Tab. 16, S 36	
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV Soft seal: VI	
Characteristic (cam disk in positioner)		Equal percentage, linear	
Rangeability		200:1	
Medium temperature range		–60 to +220 °C (–76 to +428°F)	–100 to +400 °C (–148 to +752°F)
Actuator		Type AT	Type AT/R
Data sheets		**www.vetec.de**	

Further versions (Type 82.7 only)

– TA Luft packing
– Special materials
– Noise-reducing measures
– Flange version with tongue/groove, male face/female face according to DIN EN 1092-1
– Versions for higher and lower temperatures on request

Type 82.7 Rotary Plug Valve with Type R Rotary Actuator and Type 3730 Positioner

Type 82.7 Rotary Plug Valve with Type AT Rotary Actuator and Type 3730 Positioner

Application

Double-eccentric control valves for process engineering, industrial applications, and refineries

Special features

- Valve body made of cast steel, cast stainless steel or special materials
- Sandwich-style or flanged version

Versions

Standard version · Double-eccentric rotary plug valve with single-acting rotary actuator

Nominal size DN 25 to 250

– **Type 73.3/x:** rotary plug valve DN 25 to 250 with Type R or Type M Rotary Actuator, flanged version with flanges with through holes, face-to-face dimensions according to EN 558-1 Series 2

– **Type 73.7/x:** rotary plug valve DN 25 to 400 (NPS 1 to 16) with Type R or Type M Rotary Actuator, flanged version with flanges with through holes, face-to-face dimensions according to EN 558-1 Series 15

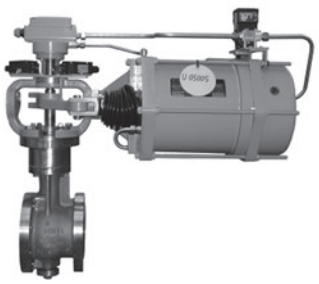
Technical data

Type		73.3	73.7
Valve size	DN	25 to 250	25 to 500
	NPS	–	1 to 20
Body material	DIN	1.0619, 1.4581	
	ANSI	–	A216 WCC, A351 CF8M
Pressure rating	PN	63 to 160	
	Class	–	600, 900
End connections		Flanges with through holes	Flanges with tapped holes
Overall length		EN 558-1, Series 2	EN 558-1, Series 15
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV-L1	
Characteristic (cam disk in positioner)		Equal percentage, linear	
Rangeability		≥ 200:1	
Temperature range		–100 to +400 °C (–148 to +752 °F)	
Actuator		Type R, Type M	
Data sheets		**T 9919**	**T 9920**

Further versions

– Double packing or TA Luft packing
– Flange version with groove or tongue
– Lens gasket according to DIN 2696
– Seat, plug, and lining made of ceramic

Type 73.3/R



Type 73.7/R

Type 73.3/M

Pneumatic Control Valves

Segmented ball valve · Type 3310/31a

Application

Control valves for process engineering and industrial applications

Special features

- Valve body in flanged design made of cast steel, cast stainless steel or special alloys
- Metal or soft-seated segmented ball

Versions

– **Type 3310/31a:** segmented ball valve with single-acting or double-acting Type 31a Pneumatic Piston Actuator

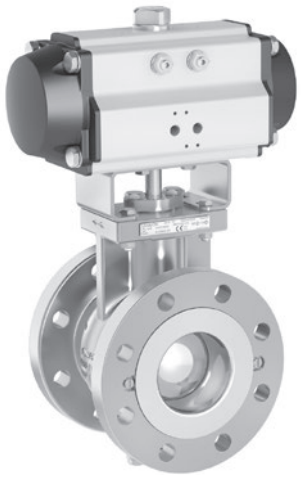
– **Type 3310/3278:** segmented ball valve with single-acting Type 3278 Rotary Actuator

Technical data

Version	DIN	ANSI
Valve size	DN 25 to 300	NPS 1 to 12
Body material	A216 WCC, A351 CF8M	
Pressure rating	PN 40	Class 150/300
End connections	Flanges according to DIN EN 1092	Flanges according to ASME B16.5
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2	Metal: IV, soft: VI	
Characteristic	Equal percentage, linear	
Rangeability	≥ 100:1	
Temperature ranges	–10 to +220 °C (14 to 752 °F)	–20 to +428 °F (–29 to +220 °C)
Compliance	EAC	
Actuator	Type 31a, Type 3278	
Data sheets	**T 8222, T 9929, T 8321**	

Further versions

– Double packing with or without leak monitoring
– Reduced K_{VS} coefficients by installing upstream or downstream reducers
– Manual override or with additional manual override
– Heating jacket
– With insulating section for temperature range from –46 to +450 °C



Type 3310/31a

Series V2001 Valves

Control valves with pneumatic or electric actuator

Globe valve · Type 3321

Three-way valve · Type 3323

CE

Application

Control valves designed for mechanical and plant engineering. Suitable for liquids, gases, and steam
Optionally as globe or three-way valve according to DIN or ANSI standards

Versions

- **Type 3321/3323-IP · Electropneumatic control valve:**
  Electropneumatic positioner integrated in Type 3372 Actuator or Type 3725 Positioner, tight-closing function, 4 to 20 mA reference variable, max. 6 bar supply air, fail-safe action
- **Type 3321/3323-PP · Pneumatic control valves:**
  Pneumatic actuator with fail-safe action
- **Type 3321/3323-E1: · Electric control valves:**
  Type 5824 Electric Actuator for 230 V/50 Hz, 24 V/50 Hz or 120 V/60 Hz, optionally with positioner and resistance transmitter
- **Type 3321/3323-E3 · Electric control valves:**
  Type 3374 Electric Actuator for 230 V/50 or 60 Hz, 24 V/50 or 60 Hz or 120 V/60 Hz, optionally with fail-safe action, resistance transmitter and positioner

Technical data

Body style		**Type 3321 Globe Valve**	**Type 3323 Three-way Valve**
Valve size	DN	15 to 100	15 to 100
	NPS	½ to 4	½ to 4
Body material	DIN	EN-JL1040, 1.0619, 1.4408	
	ANSI	A216 WCC, A351 CF8M, A126 B	
Pressure rating	PN	16 to 40	
	Class	150, 300	
End connections	DIN	Flanges according to EN 1092	
	ANSI	Flanges RF/FF	
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV Soft seal: VI	Metal seal: I (0.05 % K_{VS})
Characteristic		Inherent	Linear
Rangeability		Up to 50:1	
Temperature range		–10 to +300 °C (14 to 572 °F)	
Compliance		CE · EAC	
Actuators		Versions for Types 3321/3323-IP, -PP, -E1, -E3	
Data sheets		**T 8111, T 8112**	**T 8113, T 8114**

Further versions

- Insulating section
- Flow divider St I for noise reduction (on request)

Type 3321-IP with integral positioner

Type 3321-IP with 350 cm² actuator and Type 3725 Positioner

Type 3323-E1 with Type 5824 Actuator

Series V2001 Valves

Control valves with pneumatic or electric actuator

Globe valve for heat transfer oil · Type 3531

Three-way valve for heat transfer oil · Type 3535

CE

Application

Control valves for heat transfer applications using organic media according to DIN 4745
Optionally as globe or three-way valve according to DIN or ANSI standards

Versions

- **Type 3531/3535-IP · Electropneumatic control valves for heat transfer oil:**
  Electropneumatic positioner integrated in Type 3372 Actuator or Type 3725 Positioner, tight-closing function, 4 to 20 mA reference variable, max. 6 bar supply air, fail-safe action
- **Type 3531/3535-PP Pneumatic control valves for heat transfer oil:**
  Pneumatic actuator with fail-safe action
- **Type 3531/3535-E1 · Electric control valves for heat transfer oil:**
  Type 5824 Electric Actuator for 230 and 24 V/50 Hz or 120 V/60 Hz
  Optionally with positioner and resistance transmitters
- **Type 3531/3535-E3 · Electric control valves for heat transfer oil:**
  Type 3374 Electric Actuator for 230 V/50 or 60 Hz, 24 V/50 or 60 Hz, 120 V/60 Hz
  Optionally with fail-safe position, positioner and resistance transmitters

Technical data

Body style		**Type 3531 Globe Valve**	**Type 3535 Three-way Valve**
Valve size	DN	15 to 80	
	NPS	½ to 3	
Body material	DIN	EN-JS1049, 1.0619, 1.4408	
	ANSI	A395, A216 WCC, A351 CF8M	
Pressure rating	PN	16, 25	
	Class	125,150	
End connections	DIN	Flanges according to EN 1092	
	ANSI	Flanges RF	
Leakage class according to IEC 60534-4 or ANSI/FCI 70-2		Metal seal: IV	Metal seal: I (0.05 % K_{VS})
Characteristic		Equal percentage	Linear
Rangeability		50:1	Up to 50:1
Temperature range		–10 to +350 °C (14 to 660 °F), on request: up to –70 °C (–94 °F)	
Compliance		CE · EAC	
Recommended actuators		Versions for Types 3531/3535-IP, -PP, -E1, -E3	
Data sheets		**T 8131, T 8132**	**T 8135, T 8136**

Further versions

- Explosion-protected version with electric actuators (on request)

Type 3531-PP with actuator and Type 4744-2 Limit Switch

Type 3535-E3 with Type 3374 Actuator

Electric and Pneumatic Control Valves

Globe valves · Types 3213, 3214, 3222, 3222 N, and 3260

Three-way valves · Type 3260 and Type 3226

Application

Globe and three-way valves for heating, ventilation and air-conditioning
Electric or pneumatic control valves with:

- Electric actuators
- Electric actuators with process controllers
- Pneumatic actuators

The electric actuators with process controllers have integrated digital controller. The controlled variable is measured by a directly connected Pt 1000 sensor and the output signal is transferred to the actuator stem as the positioning force.

Recommended valve/electric actuator combinations

Actuator type	5824	5825 [1]	5857	3374 [1]	3375	3274 [1]
Globe valve in nominal size DN						
Type 3213	15 to 50 [2]	15 to 50 [2]	15 to 25	–	–	–
Type 3214	15 to 50	15 to 50	–	65 to 250	300 to 400	125 to 250
Type 3222	15 to 50	15 to 50	15 to 25	–	–	–
Type 3222 N	–	–	15	–	–	–
Type 3260	–	–	–	65 to 150	–	65 to 150
Three-way valve in nominal size DN						
Type 3226	15 to 50	15 to 50	15 to 25	–	–	–
Type 3260	15 to 80	15 to 50	15 to 25	65 to 150	200 to 300	65 to 150

[1] Electric globe valves tested according to DIN EN 14597 with Type 5825, Type 3374 or Type 3274 Actuator (with fail-safe action "actuator stem extends"). See Data Sheet T 5869 (electric control valves with Type 5825, Type 3374 or Type 3274 Actuators with fail-safe action)
[2] DN 15 to 25 with PN 25 nominal pressure, DN 32 to 50 with PN 16 nominal pressure

Recommended valve/electric actuator with process controller combinations

TROVIS ... Actuator	5724-3	5725-3 [1]	5725-7 [1]	5757-3	5757-7	5724-8	5725-8
Globe valve in nominal size DN							
Type 3213	15 to 50 [2]	15 to 50 [2]	15 to 50 [2]	15 to 25	–	15 to 50 [2]	15 to 50 [2]
Type 3214	15 to 50	15 to 50	15 to 50	–	–	15 to 50	15 to 50
Type 3222	15 to 50	15 to 50	15 to 50	15 to 25	15 to 25	15 to 50	15 to 50
Type 3222 N	–	–	–	15	15	–	–
Three-way valve in nominal size DN							
Type 3226	–	–	15 to 50	–	15 to 25	15 to 50	15 to 50
Type 3260	–	–	15 to 50	–	15 to 25	15 to 50	15 to 50

[1] The TROVIS 5725-3 and TROVIS 5725-7 Actuators combined with the listed valves are tested according to DIN EN 14597 (for fail-safe action "actuator stem extends"). See Data Sheet T 5869
[2] DN 15 to 25 with PN 25 nominal pressure, DN 32 to 50 with PN 16 nominal pressure

Type 3213 with
Type 5825 Actuator

Type 3214 with
Type 3374 Actuator

Type 3260 with
Type 5824 Actuator

Recommended valve/pneumatic actuator combinations

Actuator type	2780-1	2780-2	3271	3277	3372
Globe valve in nominal size DN					
Type 3213	15 to 50 [1]	15 to 50 [1]	–	–	–
Type 3214	–	65 to 100	–	–	–
Type 3222	15 to 50	15 to 50	–	–	–
Type 3222 N	–	–	–	–	–
Type 3260	–	–	65 to 150	65 to 150	65, 80
Three-way valve in nominal size DN					
Type 3226	15 to 50	15 to 50	–	–	–
Type 3260	15 to 50	15 to 50	65 to 300	65 to 150	–

[1] DN 15 to 25 with PN 25 nominal pressure, DN 32 to 50 with PN 16 nominal pressure

Type 3213 and Type 3214 Globe Valves

Technical data

Globe valve	Type	3213	3214
Valve size	DN	15 to 50	15 to 400
Pressure rating	PN	16, 25	16 to 40
Body material		EN-JL1040 EN-JS1049	EN-JL1040 EN-JS1049 1.0619
End connections	DIN	Flanges	
Seat-plug seal, leakage class according to IEC 60534-4		I	I
Temperature range		Up to 200 °C	Up to 220 °C
Compliance		CE · EAC	
Data sheets		**T 5868, T 5869**	

Type 3222 and Type 3222 N Globe Valves

Technical data

Globe valve	Type	3222	3222 N
Valve size	DN	15 to 50	15
Pressure rating	PN	25	16
Body material		Red brass CC491K, EN-JS1049	Brass, CW602N
End connections	DIN	Welding ends, threaded ends, flanges, female thread	ISO 228/1-G ¾ B, welding ends, threaded ends, soldering ends
Leakage class according to IEC 60534-4		I	
Temperature range		Up to 200 °C	Up to 120 °C
Compliance		CE · EAC	
Data sheets		**T 5866**	**T 5867**

Further versions

– **Type 3222**: globe valve with balanced plug

Type 3222 with
Type 2780-2 Actuator

Type 3222/5825
Version with flanged body

Type 3226 with
Type 5824 Actuator

Type 3214 with
Type 5725 Actuator

Type 3260 Three-way Valve

Type 3226 Three-way Valve

Technical data

Type		3260 Globe valve	3260 Three-way valve	3226 Three-way valve
Valve size	DN	65 to 150	15 to 300	15 to 50
Pressure rating	PN	16		25
Body material		EN-JL1040		Red brass CC491K
End connections	DIN	Flanges		Welding ends, threaded ends, flanges, female thread
Leakage class according to IEC 60534-4		IV		
Temperature range		Up to 150 °C		Up to 150 °C
Compliance		EAC		
Data sheets		**T 5862**	**T 5861**	**T 5863**

Further versions

– **Type 3226** also available as DVGW version in PN 10

Type 3222/5757
with welding ends

Type 3222/5725
with flanged body

Type 3222 N/5757

Type 3226/5757
with female thread

Type 3226/5724
with female thread

Application

Single-acting linear actuators for control valves used in process engineering and industrial applications as well as in heating, ventilation and air-conditioning systems, especially for attachment to SAMSON Types 3213, 3222, 3321, 3531, 3226, 3260, 3323, 3535 Valves and valves of the Series 240, 250, 280, 290 and 590.

Special features

- Diaphragm actuators with internal compression springs
- Fail-safe action "actuator stem extends" or "actuator stem retracts"
- Easily reversible direction of action of the actuator
- Low friction due to rolling diaphragm
- Direct attachment to Type 3277 guarantees accurate attachment of accessories as well as concealed linkage

Versions

– **Type 3277:** pneumatic actuator for direct attachment of a positioner, limit switch or position transmitter

– **Type 3271:** pneumatic actuator with diaphragm areas from 120 cm² used for the micro-flow valve up to 2 x 2800 cm² with tandem actuators

Technical data

Type		**3277 · 3271**		
Diaphragm area	**cm²**	**120**	**175, 355, 750**	**240, 350, 700**
Max. supply pressure	bar	6 [1]		
Rated travel	mm	7.5 to 30		
Fail-safe action		Reversible		
Temperature range with diaphragm material	NBR	–35 to +90 °C [2], [4]	–35 to +90 °C [2], [4]	–35 to +90 °C [2], [4]
	EPDM	–	–50 to +120 °C [3], [4]	–50 to +120 °C [3], [4]
	PVMQ	–	–60 to +90 °C	–
Compliance		EAC		
Materials				
Actuator stem		1.4305	1.4404	1.4404
Actuator stem sealing		NBR	NBR	NBR
			EPDM	EPDM
Painted diaphragm cases		Die-cast aluminum	Sheet steel	
Data sheet		**T 8310-1**		

1) Observe supply pressure restrictions. See Data Sheet T 8310-1.
2) In on/off service, lowest temperature restricted to –20 °C
3) In on/off service, lowest temperature restricted to –40 °C
4) Install vent plug for temperatures below –20 °C. See Application Notes AB 07.

Type 3277 for direct attachment

Type 3271 Actuator

Type 3277-5 Actuator (120 cm²) with Type 3510 Valve and Type 3725 Positioner

Type		3271			
Diaphragm area	**cm²**	**1000**	**1400-120**	**2800**	**2x 2800**
Max. supply pressure	bar	6			
Rated travel	mm	Up to 120 mm			
Fail-safe action		Reversible			
Temperature range with diaphragm material	NBR	–35 to +90 °C			
	PVMQ	–60 to +90 °C			
Compliance		EAC			
Materials					
Actuator stem		1.4548.4	1.4404	1.4548.4	1.4548.4
Actuator stem sealing		NBR	NBR	NBR	NBR
		EPDM	PVMQ	PVMQ	PVMQ
Housing		Sheet steel, sheet stainless steel	Painted cast steel		
Data sheet		**T 8310-2**			

Type		3271
Diaphragm area	**cm²**	**1400-60**
Max. supply pressure	bar	6
Rated travel	mm	Up to 60 mm
Fail-safe action		Reversible
Temperature range with diaphragm material	NBR	–35 to +90 °C
	EPDM	–50 to +120 °C
Compliance		EAC
Materials		
Actuator stem		1.4404
Actuator stem sealing		NBR
		EPDM
Housing		Sheet steel, plastic-coated
Data sheet		**T 8310-3**

Further versions with additional handwheel for Types 3277 and 3271 Actuators

Type 3271 (1000 cm²)

Type 3271 (1400-60 cm²) on Type 3251 Valve

Pneumatic Actuators for the Food and Pharmaceutical Industries

Pneumatic actuator · Type 3379

Application

The Type 3379 Pneumatic Actuator (with spring-return mechanism) is used in conjunction with a valve suitable for the food and pharmaceutical industries.

Special features

- Can be combined with Type 3347 Hygienic Valve or Type 3349 Aseptic Valve
- Smooth stainless steel surfaces for easy cleaning
- All moving parts located inside the housing to improve safety
- Visual indicator for the valve position
- Internal air routing to prevent air or water from entering the device

Versions

– **Type 3379-00:** combined with Type 3724 Electropneumatic Positioner
– **Type 3379-01:** actuator for on/off service
– **Type 3379-02:** combined with Type 4740 Electric Limit Switch

Technical data

Type	**3379**	**63 mm piston diameter · 31 cm² diaphragm area**			
Rated travel	mm	15			
Permissible ambient temperature	°C	0 to 60			
Max. supply pressure	bar	8			
Hysteresis	bar	0.4			
Fail-safe position		**Stem extends (FA)**		**Stem retracts (FE)**	
Number of springs		1		1	
Travel	mm	15	7.5	15	7.5
Thrust	N	720	930	720	930
Data sheets/EB		**T 8097-3, T 8395, EB 8315**			

Type	**3379**	**90 mm piston diameter · 63 cm² diaphragm area**							
Rated travel	mm	15							
Permissible ambient temperature	°C	0 to 60							
Max. supply pressure	bar	8							
Hysteresis	bar	0.3, 0.5, 0.6							
Fail-safe position		**Stem extends (FA)**				**Stem retracts (FE)**			
Number of springs		2		1		1		1	
Travel	mm	15	7.5	15	7.5	15	7.5	15	7.5
Thrust	N	2090	2670	1590	2030	2580	2830	1320	1570
Data sheets/EB		**T 8097-3, T 8395, EB 8315**							

Type 3379

Type 3379 with
Type 3724 Positioner

Pneumatic Actuators

Pneumatic rotary actuators · Type 3278 and PFEIFFER Type 31a

Application

Pneumatic actuators for butterfly valves and other final control elements with rotating closure member. Suitable for throttling or on/off service.

Special features

- Various signal pressure ranges
- Attachment of positioners, limit switches or solenoid valves and other accessories according to VDI/VDE 3845
- Travel stops externally adjustable to limit the opening angle
- No special tools required for mounting and conversion

Versions

– **Type 3278:** single-acting pneumatic rotary actuator with rolling diaphragm and internal compression springs, operating direction (fail-open or fail-close) as required

– **PFEIFFER Type 31a:** pneumatic piston actuator with clearance-free power transmission achieved by using involute gearing and special surface finish
SRP - single acting with fail-safe action
DAP - double acting without fail-safe action

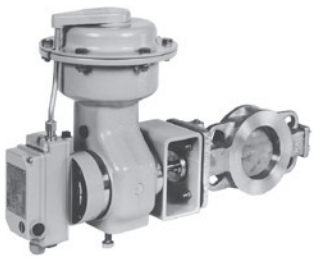
Technical data

Type	3278	Type 31a	
Version and principle of operation	Single-acting	SRP Single-acting	DAP Double-acting
Connection	Key drive	Square drive	
Diaphragm area/size	Diaphragm area 160 cm², 320 cm²	Size 15 to 10000	
Max. supply pressure bar	6	10	
Opening angle	90°	90°/120°/180°	
Fail-safe action	Reversible	Reversible	Without
Temperature range	–35 to +90 °C	–40 to +80 °C	
With special material		–20 to +150 °C, –50 to +80 °C	
Compliance	EAC		
Materials			
Housing	EN-JS1049	AlMgSi0.5 F25	
Diaphragm/piston	NBR	GD AlSi8Cu3	
Data sheets	**T 8321**	**T 9929**	

Accessories

The pneumatic actuators can be equipped with positioners, limit switches, resistance transmitters, and solenoid valves.

Further versions with additional handwheel



Type 3278 with butterfly valve and positioner

Type 31a

Electric Actuators

Electric actuators · Types 5824, 5825, 5857, 3374 and 3375

Electrohydraulic actuator · Type 3274

CE

Application

Electric actuators designed for attachment to valves used in HVAC, process engineering, and industrial energy transfer systems.

Versions

- **Type 5824:** Electric actuator
- **Type 5825:** Electric actuator with fail-safe action
- **Type 5857:** Electric actuator
- **Type 3374:** Electric actuator optionally with fail-safe action
- **Type 3375:** Electric actuator with manual override (handwheel)
- **Type 3274:** Electrohydraulic actuator, optionally with fail-safe action

Technical data for Types 5824, 5825 and 5857

Type	5824	5825	5857
Rated travel mm	6, 12, 15		6
Max. thrust N	700	280, 500	300
Fail-safe action	–	•	–
Handwheel	•	• [1]	•
Power supply	230 V, 50 Hz 24 V, 50 Hz 120 V, 60 Hz		230 V, 50 Hz 24 V, 50 Hz
Permissible ambient temperature	0 to 50 °C		
Compliance	CE · EAC		
Additional electrical equipment			
Positioner	Digital		Digital
Limit contacts	2		–
Resistance transmitters	1		–
Data sheets	**T 5824**		**T 5857**

[1] With an Allen key after removing the cover

Type 5824/5825

Type 5857

Technical data for Types 3374, 3375, and 3274

Type	3374	3375	3274
Rated travel mm	15, 30	30, 60	15, 30
Max. thrust N	2500	12500	7700
Fail-safe action	•	– [1]	•
Handwheel	•	•	•
Power supply	230 V/50 or 60 Hz 24 V/50 or 60 Hz 120 V/60 Hz	230 V/50 or 60 Hz	230 V/50 or 60 Hz 24 V/50 or 60 Hz 120 V/50 or 60 Hz
Permissible ambient temperature	5 to 60 °C	5 to 60 °C	–10 to +60 °C
Compliance	CE · EAC		
Additional electrical equipment			
Positioner	Digital	Digital	Analog
Limit contacts	2	2	Max. 3
Resistance transmitters	2	2	Max. 2
Data sheets	**T 8331**	**T 8332**	**T 8340**

[1] Version with fail-safe action in preparation

Further versions

The Types 5825, 3274 and 3374 Actuators with fail-safe action "actuator stem extends" are tested by the German technical surveillance association (TÜV) according to DIN EN 14597 in combination with various SAMSON valves.

Type 3374

Type 3375

Type 3274

Electric Actuators with Process Controllers

Domestic hot water heating
TROVIS 5724-3 · TROVIS 5725-3 with fail-safe action · TROVIS 5757-3

Heating and cooling applications
TROVIS 5757-7 · TROVIS 5725-7 with fail-safe action
TROVIS 5724-8 · TROVIS 5725-8 with fail-safe action

CE

Application

Electric actuators with integrated digital controller for heating, ventilation and air-conditioning systems · TROVIS 5724-8 and TROVIS 5725-8 also suitable for light industrial applications

Special features

- Linear actuator with integrated digital controller
- Easy installation
- Torque-dependent limit contacts
- Temperature measured by Pt 1000 sensor
- Configuration, parameterization, diagnostic function and direct connection for monitoring using the TROVIS-VIEW software
- Data transmission using a memory pen

Versions for domestic hot water heating

– **TROVIS 5724-3 and TROVIS 5725-3:** designed for DHW heating in instantaneous heating systems for small to medium-sized buildings connected to local supply or district heating networks.
Suitable for Types 3213, 3214, and 3222 Valves in DN 15 to 50.
TROVIS 5725 with fail-safe action
Details in Data Sheet T 5724

– **TROVIS 5757-3: s**uitable for Types 3222, 3222 N, 2488, and 3267 Valves in DN 15 to 25.
Details in Data Sheet T 5757

Version for heating and cooling applications

– **TROVIS 5757-7:** designed for installations in small to medium-sized buildings for outdoor-temperature-compensated control, fixed set point control or fixed set point control with room temperature sensors.
Suitable for Types 3222, 3222 N, 2488, 3267, 3266 and 3260 Valves in DN 15 to 25.
Details in Data Sheet T 5757-7

– **TROVIS 5725-7:** with fail-safe action "actuator stem extends" or "actuator stem retracts"
Suitable for Types 3213, 3214, 3260, 3222 and 3226 Valves in DN 15 to 50.
Details in Data Sheet T 5725-7

– **TROVIS 5724-8 and TROVIS 5725-8:** universal process control unit with two PID control modules for fixed set point, follow-up, override and cascade control · Fast start-up using system code numbers · Ready-wired sensors and control line · Communication over Bluetooth® · Suitable for Types 3213, 3214, 3260, 3222, and 3226 Valves in DN 15 to 50
Details in Data Sheet T 5724-8

TROVIS 5724

TROVIS 5757-3

TROVIS 5757-7

TROVIS 5724-8

Accessories for communication

- TROVIS-VIEW software
- Memory pen-64 (order no. 1400-9753)
- Connecting cable (order no. 1400-7699)
- Modular adapter (order no. 1400-7698)
- USB to RS-232 adapter (order no. 8812-2001)

Accessories for domestic hot water heating
(ready-wired in TROVIS 5724-8 and TROVIS 5725-8)

- Type 5207-0060 Pt 1000 Sensor (fast response)
- Sensor pocket (order no. 1400-9249)
- Water flow sensor (1400-9246)

Accessories for heating and cooling applications

- Type 5267-2 Contact Sensor (Pt 1000)
- Type 5257-2 Room Sensor (Pt 1000) with potentiometer
- Type 5257-7 Room Panel (Pt 1000) with potentiometer and mode selector switch
- Type 5227-2 Outdoor Sensor (Pt 1000)
- Mounting kit for a Pt 1000 cable sensor (contact sensor), order no. 8524-0020
- Brass thermowell, G ½, immersion length 80 mm, PN 16, order no. 1099-0807
- CrNiMo steel thermowell, G ½, immersion length 80 mm, PN 40, order no. 1099-0805
- CrNiMo steel thermowell, G ½, immersion length 250 mm, PN 40, order no. 1099-0806
- Brass thermowell, G ½, immersion length 160 mm, PN 16, order no. 8525-5005
- CrNiMo steel thermowell, G ½, immersion length 160 mm, PN 40, order no. 8525-5011

Accessories for binary control (TROVIS 5724-8 and TROVIS 5725-8)

- Single-channel digital time switch with weekly program, Theben TR610 top2 G, order no. 1402-1017

Pneumatic and Electropneumatic Positioners

Positioners · Types 4765/4763 and Types 3766/3767

CE Ex certified

Application

Positioners for attachment to pneumatic control valves

Versions

- **Type 4765/4763:** positioners for attachment according to IEC 60534
- **Type 3766/3767:** positioners for direct attachment to Type 3277 Actuators as well as for attachment according to IEC 60534 or for attachment to rotary actuators according to VDI/VDE 3845

Technical data

Type	4765	4763	3766	3767
Principle of operation				
Pneumatic	•	–	•	–
Electropneumatic	–	•	–	•
Rated travel mm	7.5 to 90		7.5 to 120	
Opening angles	–		Up to 90°	
Reference variable				
0.2 to 1 bar	•	–	•	–
0/4 to 20 mA	–	•	–	•
1 to 5 mA	–	•	–	•
Supply air	1.4 to 6 bar (20 to 90 psi)			
Output Signal pressure	0 to 6 bar (0 to 90 psi)			
Characteristic	Linear			
Permissible ambient temperature	–20 to +80 °C	–20 to +70 °C [2]	–20 to +80 °C	
	Extended temperature range down to –40 °C on request			
Degree of protection	IP 54/IP 65		IP 54/IP 65/NEMA 4X	
Compliance	CE · EAC			
Explosion protection				
Ex ia IIC T6	–	•	•	•
FM/CSA	–	•	•	•
Ex d [1]	•	–	•	–
Additional electrical equipment				
Limit contact	–	–	2 (inductive)	
Solenoid valve	–	–	•	
Position transmitter	–	–	• [3]	
Options				
Pressure gauge	•	•	–	–
Data sheets	**T 8359**		**T 8355**	

[1] **Ex d** · Used in combination with a Type 6116 i/p Converter, the pneumatic positioners are flameproof i/p positioners.

[2] Maximum temperature range depending on which i/p converter is used. See Data Sheet T 8359.

[3] Available until March 2011

Type 4763

Type 3766 with
Type 6116 i/p Converter (Ex d)

Electronic and Digital Positioners

Electropneumatic positioners · Types 3725, 3730-0, 3730-1 and 3730-2

Electropneumatic positioners (HART®) · Types 3730-3, 3731-3, 3730-6

Electropneumatic positioner (PROFIBUS®-PA) · Type 3730-4

Electropneumatic positioners (FOUNDATION™ fieldbus) · Types 3730-5 and 3731-5

EXPERTplus valve diagnostics · Type 3770 Field Barrier

CE Ex certified

Application

Single-acting or double-acting positioners for attachment to pneumatic linear or rotary actuators. Self-calibrating, automatic adaptation to the control valve (except for Type 3730-0).

Versions

Electropneumatic positioners for SAMSON direct attachment, attachment to NAMUR rib or attachment to rod-type yoke according to IEC 60534 as well as attachment to rotary actuators according to VDI/VDE.

- **Type 3725:** positioner for attachment to pneumatic globe and rotary valves
- **Type 3730-0:** low-priced positioner version for all globe valves. Travel range setting over DIP switches
- **Type 3730-1:** universal positioner with LCD and on-site operation over rotary pushbutton for globe valves and rotary valves. Start-up with automatic initialization procedure.
- **Type 3730-2:** positioner same as Type 3730-1, but additionally with integrated EXPERTplus valve diagnostics, configuration options over serial interface and the TROVIS-VIEW software
- **Type 3730-3:** positioner same as Type 3730-2, but additionally with communication using HART® protocol

Technical data

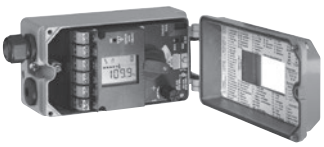
Type	3725	3730-0	3730-1	3730-2	3730-3
Rated travel mm	3.75 to 50	5.3 to 200	3.75 to 200	3.6 to 300	
Opening angles	24 to 100°	–	24 to 100°	24 to 100°	
Reference variable	4 to 20 mA				
Communication	–				HART®
Supply air	1.4 to 7 bar (20 to 105 psi)				
Output Signal pressure	0 to 7 bar (0 to 105 psi)				
Characteristic	Adjustable	Linear	Adjustable	Adjustable	
Perm. ambient temp.	–25 to +80 °C	–45 to +80 °C			
Degree of protection	IP 66	IP 66/NEMA 4X			
Compliance	CE · EAC				
Explosion protection *(further approvals acc. to national and international guidelines in data sheet)*					
ATEX Ex i or Ex nA/nL	•	•	•	•	•
FM/CSA	•	•	•	•	•
ATEX Ex d	–	With Type 3770 Field Barrier			
Additional electrical equipment					
Limit contact	–	–	•	•	•
Position transmitter	–	–	–	•	•
Solenoid valve	–	–	–	•	•
External position sensor	–	–	–	•	•
Analog input	–	–	–	–	•
Binary input	–	–	–	•	•
Leakage sensor	–	–	–	•	•
Data sheets	**T 8394**	**T 8384-0**	**T 8384-1**	**T 8384-2**	**T 8384-3**

Type 3725

Type 3730-0

Type 3730-1

Type 3730-2



Type 3730-3

– **Type 3731-3:** flameproof i/p positioner with HART® communication, local communication with SSP interface, operable on site with LCD, integrated EXPERTplus valve diagnostics
– **Type 3730-4:** positioner same as Type 3730-2, but additionally PROFIBUS®-PA communication, IEC 61158-2 transmission technology, profile class B version 3.0
– **Type 3730-5:** positioner same as Type 3730-2, but additionally with FOUNDATION™ fieldbus communication, IEC 61158-2 transmission technology
Integrated function blocks: PID Process Controller, Analog Output (AO), two Discrete Inputs (DI) and Link Master Capability
– **Type 3731-5:** flameproof, bus-powered positioner with communication according to FOUNDATION™ fieldbus specification, integrated EXPERT+ valve diagnostics
– **Type 3730-6:** positioner same as Type 3730-2, but additionally with pressure sensors, communication using HART® protocol

Technical data

Type	3731-3	3730-4	3730-5	3731-5	3730-6
Rated travel mm	3.6 to 200	3.6 to 300	3.6 to 300	3.6 to 200	3.6 to 300
Opening angles	24 to 100°				
Reference variable	4 to 20 mA	–			4 to 20 mA
Communication	HART®	PROFIBUS®	FOUNDATION™ fieldbus		HART®
Max. operating current	–	15 mA	15 mA		–
Supply air	1.4 to 6 bar 20 to 90 psi	1.4 to 7 bar 20 to 105 psi	1.4 to 7 bar 20 to 105 psi	1.4 to 6 bar 20 to 90 psi	1.4 to 7 bar 20 to 105 psi
Signal pressure output (max.)	0 to 6 bar 0 to 90 psi	0 to 7 bar 0 to 105 psi	0 to 7 bar 0 to 105 psi	0 to 6 bar 0 to 90 psi	0 to 7 bar 0 to 105 psi
Characteristic	Adjustable				
Permissible ambient temperature	–40 to +80 °C	–45 to +80 °C	–45 to +80 °C	–40 to +80 °C	–45 to +80 °C
Degree of protection	IP 66/NEMA 4X				
Compliance	CE · EAC				
Explosion protection *(further approvals according to national and international guidelines listed in data sheet)*					
ATEX Ex i or Ex nA/nL	–	•	•	–	•
ATEX Ex d/Ex de	•	–	–	•	–
FM	•	•	•	•	•
CSA	•	•	•	•	•
Additional electrical equipment					
Limit contact	–	•	•	–	•
Position transmitter	•	–	–	–	•
Solenoid valve	–	•	•	–	•
Forced venting	•	–	•	•	•
External position sensor	–	•	•	–	•
Binary input	•	•	•	•	•
Leakage sensor	–	–	•	–	•
Data sheets	**T 8387-3**	**T 8384-4**	**T 8384-5**	**T 8387-5**	**T 8384-6**

TROVIS-VIEW · See T 6661

TROVIS-VIEW software for configuration and operation of smart positioners

Positioner type	3730-0	3730-1	3730-2	3730-3 3731-3	3730-4	3730-5 3731-5	3730-6
Operation using TROVIS-VIEW	–	–	•	•	•	•	•

Type 3731-3

Type 3730-4, attachment according to VDI/VDE 3845

Type 3730-5, attachment according to NAMUR

EXPERTplus valve diagnostics

Firmware for Series 3730 and 3731 Positioners for early recognition of valve faults, issuing recommended action for predictive maintenance. The diagnostic functions are completely integrated into the positioner (see T 8389 and T 8389-1).
The TROVIS-VIEW software (see T 6661) and FDT/DTM engineering tools allow operation and compiled data to be viewed.

Type 3770 Field Barrier with explosion protection Ex d/Ex i

Field barrier with flameproof enclosure serving as an interface between intrinsically safe and non-intrinsically safe circuits in hazardous areas. The field barrier is suitable for operating positioners, smart positioners with HART® communication, i/p converters, solenoid valves or limit switches (see Data Sheet T 8379).

Type 3770

Digital Positioners for Safety-instrumented Systems

Electropneumatic positioners (HART®) · TROVIS SAFE 3730-6 and TROVIS SAFE 3731-3

CE Ex certified

Application

Single-acting or double-acting positioners for attachment to pneumatic linear or rotary actuators. Self-calibrating, automatic adaptation to the control valve). Discrete analysis of the set point with automated partial stroke testing. Use in safety-instrumented systems according to IEC 61511 up to SIL 2 (single device/HFT = 0) and SIL 3 (redundant configuration/ HFT = 1)

– **TROVIS SAFE 3730-6:** positioner same as Type 3730-6 with special use for control of on/off valves in safety-instrumented systems
– **TROVIS SAFE 3731-3:** flameproof positioner same as Type 3731-3 with special use for control of on/off valves in safety-instrumented systems

Technical data

Type	TROVIS SAFE 3730-6	TROVIS SAFE 3731-3
Rated travel	3.6 to 200 mm	3.6 to 200 mm
Opening angles	24 to 100°	24 to 100°
Reference variable	4 to 20 mA	4 to 20 mA
Communication	HART®	HART®
Max. operating current	–	–
Supply air	1.4 to 7 bar (20 to 105 psi)	6 bar/105 psi
Signal pressure output (max.)	7 bar/105 psi	6 bar/105 psi
Characteristic	Adjustable	Adjustable
Ambient temperature	–45 to +80 °C	–45 to +80 °C
Degree of protection	IP 66	IP 66
Explosion protection (further approvals according to national and international guidelines listed in data sheet)		
ATEX Ex i/Ex nA/nL	•	–
ATEX Ex d/Ex de	–	•
FM	•	•
CSA	–	•
Additional electrical equipment		
Limit contact	•	–
Position transmitter	•	•
Solenoid valve	•	–
Forced venting	•	•
External position sensor	•	–
Binary input	•	•
Leakage sensor	•	–
Data sheets	**T 8384-6S**	**T 8387-3S**

TROVIS SAFE

TROVIS SAFE 3730-6

TROVIS SAFE 3731-3

Electronic Positioners for the Food and Pharmaceutical Industries

Electropneumatic positioner · Type 3724 combined with Type 3379 Pneumatic Actuator

CE

Application

Single-acting positioner combined with Type 3379 Pneumatic Actuator. Self-calibrating, automatic adaptation to valve and actuator.

Special features

- Compact unit by combining it with Type 3379 Pneumatic Actuator
- Can be combined with Type 3347 Hygienic Valve or Type 3349 Aseptic Valve
- Smooth, robust stainless steel surfaces
- Valve position reading easy to read
- Internal air routing with automatic purging of the spring chamber
- Modified PID controller for high control accuracy
- Easy, intuitive operation using keys and an LCD
- Two software limit contacts

Version

– **Type 3724:** electropneumatic positioner with on-site operation and LCD

Technical data

Type	**3724**
Rated travel	4 to 16 mm, adjustable in steps of 0.5 mm
Reference variable	4 to 20 mA
Supply air Air quality according to ISO 8573-1	1.4 to 7 bar (20 to 105 psi) Maximum particle size and density: Class 4, oil content: Class 3 Pressure dew point: Class 3 or at least 10 K below the lowest ambient temperature to be expected
Signal pressure (output)	0 bar up to the capacity of the supply pressure minus 0.4 bar Can be limited to approx. 2.3 bar by software
Characteristic	Adjustable
Permissible ambient temperature	–20 to +80 °C
Degree of protection	IP 65 [1], only applies in combination with Type 3379 Pneumatic Actuator
Compliance	CE
Additional electrical equipment	
Limit contact	Two software limit contacts (min., max.), reverse polarity protection, galvanic isolation
Data sheet	**T 8395**

[1] In preparation

Type 3724 (cover removed)

Type 3724 with
Type 3379 Actuator

Software

TROVIS-VIEW 6661 Software

Calculation and sizing of valves
Valve sizing

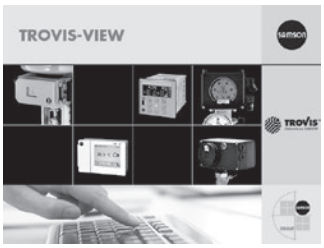
TROVIS-VIEW

Universal configuration and operator interface for various smart SAMSON instruments, such as positioners, industrial and heating controllers, electric actuators, electric actuators with process controllers and differential pressure meters.

- Simple operation
- Selectable language
- Modular structure with operator interface, communications server and device-specific database modules containing characteristic properties, e.g. parameters, data points, user levels, etc.
- This means that data can be changed in the device immediately, or they can be saved on the computer first and downloaded to the device on site.
- Direct operation and monitoring in online operation · In addition to cyclical refreshment of data points, freely definable data points can also be logged. Data can be viewed both as a graph and in tables. Data can be imported and exported.
- Communication can be operated over a network

See Data Sheet T 6661 for more details.

The TROVIS-VIEW software is available for downloading free of charge from our website (www.samson.de) at Services > Software > TROVIS-VIEW.



Operating and monitoring using TROVIS-VIEW

Valve sizing

The SAMSON Valve Sizing Program is a software for calculating and sizing control valves. This program calculates the valve-specific data (Kvs coefficients, required nominal valve size, etc.) for up to three cases using the process and medium data entered by the user. Afterwards, these data are used to determine a valve which is then suggested by the program. Finally, the sound emission and other operating data are calculated for the selected valve. The software includes many additional user-friendly functions for valve sizing.

New features included in version 4.7 of the SAMSON Valve Sizing:

- Medium database with over 1000 process media including functions to calculate the process media in relation to pressure and temperature.
- Automatic assignment of media properties, such as density, viscosity, vapor pressure.
- Automatic assignment of enthalpy, flashing data, isentropic exponents and phases
- Missing data are estimated using approximation equations
- Graphs for valve sizing analysis:
  - Valve characteristics measured on the SAMSON test bench can be used
  - Pressure-temperature graphs for the selected valve body material and pressure rating
  - Medium data with isobars for the maximum temperature range are displayed for all media in the media explorer.
- New units for conversion as well as new noise prediction standards (IEC 60534 8-3 and 8-4) have been added.

Calculation and sizing using valve sizing program

Valve Accessories

Limit switches · Type 4746, Type 4747, Type 3776, Ex d Type 4744, Type 3738-20/-50, Type 3768
Supply pressure regulator · Type 4708
Solenoid valves · Type 3701, Type 3963, Type 3966, and Type 3967
Solenoid valve island · Type 3965
Pneumatic lock-up valve · Type 3709
Reversing amplifier · Type 3710
Pneumatic volume booster · Type 3755
Quick exhaust valve · Type 3711

CE Ex certified

Limit switch

Limit switches issue an electric or pneumatic signal when an adjusted limit value is exceeded or not reached.

Versions

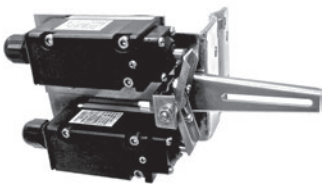
- **Type 4746-x2:** Inductive limit switch
- **Type 4746-x3:** Electric limit switch
- **Type 4746-x4:** Pneumatic limit switch
- **Type 4747:** Inductive or mechanical limit switch with explosion protection
- **Type 4744:** Electric limit switch with explosion protection

Technical data

Type	**4746**			**4747**		**4744**	
Version	**-x2**	**-x3**	**-x4**	**-1**	**-2**	**–**	**-2**
Rated travel mm	7.5 to 180			0 to 30/200		7.5 to 150	15
Opening angles	–			0 to 100		–	
Max. permissible ambient temperature							
°C	–50 to +100	–40 to +85	–20 to +60	–40 to +80	–40 to +80	–55 to +70	–20 to +75
Compliance	CE · EAC						
Switching element							
Inductive	•			•	•		
Electric		•				•	•
Pneumatic			•				
Mechanical				•	•		
Explosion protection							
ATEX	•	•		Ex ia	Ex d	Ex ed	Ex d
FM/CSA	•	•			•		
GOST				•	•		
NEPSI					•		
Data sheets	**T 8365**			**T 4747**		**T 8367**	

Type 4746

Type 4747



Type 4744 (cover removed)

Versions

- **Type 3776-0:** Inductive or electric limit switch
- **Type 3776-1:** Limit switch with explosion protection
- **Type 3738-20:** Electronic limit switch for valves used in on/off applications
- **Type 3738-50:** Electronic limit switch for valves used in on/off applications with FOUNDATION™ fieldbus communication
- **Type 3768:** Inductive limit switch

Technical data

Type	3776	3738		3768
Version	-x	-20	-50	-x
Rated travel mm	7.5 to 120	7.5 to 200		7.5 to 120
Opening angles	0 to 180°	0 to 30/170°		
Max. permissible ambient temperature	–45 to +80 °C	–40 to +80 °C		–45 to +80 °C
Compliance	CE · EAC			
Optional internal solenoid valve	•	•		•
Switching element				
Inductive	•			•
Mechanical	•			
Electronic		•	•	
Explosion protection				
II 2G Ex ia IIC T6	• [1]	•	•	•
FM	• [1]			•
Data sheets	**T 3776**	**T 8390**	**T 8390-5**	**T 8356**

[1] Depending on version

Type 4708 Supply Pressure Regulator

The supply pressure regulator reduces and controls the maximum pressure of 12 bar (180 psi) in a compressed air network to the pressure adjusted at the set point adjuster. The supply pressure regulators can be directly attached to pneumatic and electropneumatic devices. The regulator includes a filter (20 or 15 µm) with drain plug. The air pressure reducing station consists of a supply pressure regulator and an upstream filter with condensate drain.

- **Type 4708-45 Supply Pressure Regulator:** for increased air capacity

Technical data

Type	4708	4708-45
Input pressure	1.6 to 12 bar (24 to 180 psi)	0 to 12 bar (15 to 180 psi) [1]
Set point range	0.2 to 1.6 bar (3 to 24 psi), 0.5 to 6 bar (8 to 90 psi)	
G or NPT connections	¼	½
Compliance	EAC	
Data sheet	**T 8546**	

[1] Recommendation: min. 1.0 bar (15 psi) above the adjusted set point

Type 3776

Type 3738-20/-50

Type 3768

Type 4708-11

Type 4708-45

Solenoid valves · Type 3701, Type 3963, Type 3966, and Type 3967

Solenoid valves for high operational reliability and short actuating times for controlling pneumatic actuators also in hazardous areas.
A variety of device versions to suit individual applications are available due to the various switching functions, flow rates and different connections.

Technical data

Type		3701		3963	
		No explosion protection	With explosion protection	No explosion protection	With explosion protection
Nominal signal	V DC	6/12/24	6/12/24	6/12/24	6/12/24
	V AC	24/48/115/230	–	24/48/115/230	–
Power consumption [1]		6 to 27 mW		6 to 27 mW	
		0.04 to 0.46 VA		0.04 to 0.46 VA	
Power supply		1.4 to 6 bar		1.4 to 6 bar	
Output signal		Max. 6 bar		Max. 10 bar	
Service life		Up to 2 x 10^7 switching cycles		Up to 2 x 10^7 switching cycles	
Max. permissible ambient temperature		–45 to +80 °C		–45 to +80 °C	
Compliance		CE · EAC			
Explosion protection					
ATEX		–	•	–	•
GOST			•		•
CSA			•		•
FM			•		•
INMETRO					•
NEPSI					•
STCC					•
Data sheets		**T 3701**		**T 3963**	

[1] Depending on nominal signal

Type		3966		3967	
		No explosion protection	With explosion protection	No explosion protection	With explosion protection
Nominal signal	V DC	6/12/24/120	6/12/24	6/12/24	6/12/24
	V AC	120/240	–	–	–
Power consumption [1]		6 to 460 mW		6 to 27 mW	
Power supply		1.4 to 6 bar		1.4 to 10 bar	
Output signal		Max. 10 bar		Max. 10 bar	
Service life		Up to 2 x 10^7 switching cycles		Up to 2 x 10^7 switching cycles	
Max. permissible ambient temperature		–45 to +80 °C		–45 to +80 °C	
Compliance		CE · EAC			
Explosion protection					
ATEX		–	•	–	•
Flameproof enclosure			✓		
Intrinsic safety			✓		✓
GOST			•		•
IECEx					•
FM			•		
Data sheets		**T 3966**		**T 3967**	

[1] Depending on nominal signal

Type 3701

Type 3963

Type 3966

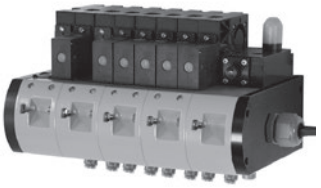
Type 3967

Type 3965 Solenoid Valve Island

The Type 3965 Solenoid Valve Island is a compact solution for the centralized control of pneumatic actuators in chemical and pharmaceutical plants. The modular design with various switching functions and connection options allows the solenoid valves to be configured to meet the individual requirements of a control task. The solenoid valve island provides a high level of operating safety in hazardous areas. Due to the low power input, low-power binary signals over fieldbus or remote I/Os can be used for controlling.

Special features

- Compact modular design with up to 16 switching functions
- Less wiring required thanks to common cable, multipole connector or bus connection for PROFIBUS®-DP (Ex ia)
- Corrosion-resistant housing
- Manual override
- Electric status indicator
- 2/2, 3/2 or 5/2-way function
- K_{VS} 0.13
- Threaded connections G (NPT) ⅛ and ¼



Type 3965

Technical data

Type		3965	
		No explosion protection	With explosion protection
Nominal signal	V DC	6/12/24	6/12/24
	V AC	24	–
Power consumption [1]		6 to 27 mW	
Power supply		2.2 to 6.0 bar	
Output signal		Max. 6 bar	
Service life		Up to 2 x 10^7 switching cycles	
Max. permissible ambient temperature		–25 to +80 °C	
Degree of protection		IP 54 [2]	
Compliance		CE · EAC	
Explosion protection			
ATEX		–	•
IECEx			• [3]
Data sheet		**T 3965**	

1) Depending on nominal signal
2) IP 40 for PROFIBUS®-DP version
3) Not for PROFIBUS®-DP version

Type 3709 Pneumatic Lock-Up Valve

The pneumatic lock-up valve shuts off the signal pressure line either when the air supply falls below an adjusted value or upon complete air supply failure. This causes the actuator to remain in its last position.

Versions

- **Type 3709-1:** lock-up valve for direct attachment to a positioner
- Type 3709-2: lock-up valve for installation in the signal pressure line in any position as required
- **Type 3709-4:** lock-up valve with booster for installation in the signal pressure line as required with connecting thread
- **Type 3709-5 and Type 3709-6:** lock-up valve with booster for attachment to single-acting rotary actuators according to VDI/VDE 3848, input hook-up as required
- **Type 3709-7 and Type 3709-8:** lock-up valve with booster for attachment to single-acting rotary actuators according to VDI/VDE 3848, sandwich style

Technical data

Type		3709-1	3709-2
Attachment		Positioner	Hooked up as required
Supply air	Max.	12 bar	12 bar
Signal pressure	Max.	6 bar	6 bar
K_{VS} coefficient	Approx.	0.2	0.2
Set point range (adjustable)		0.5 to 6 bar	0.5 to 6 bar
Permissible ambient temperature		–25 to +80 °C	
Compliance		EAC	
Data sheet		**T 8391**	

Type		Lock-up valve with booster				
		3709-4	3709-5	3709-6 [1]	3709-7	3709-8 [1]
Attachment		Hooked up as required	VDI/VDE 3845 Input hooked-up as required		VDI/VDE 3845 Sandwich style	
Supply air	Max.	6 bar	6 bar	6 bar	6 bar	6 bar
Signal pressure	Max.	6 bar	6 bar	6 bar	6 bar	6 bar
K_{VS} coefficient	Approx.	4.3	2.0	4.3	2.0	4.3
Set point range (adjustable)		1.5 to 6 bar				
Permissible ambient temperature		–40 to +80 °C				
Compliance		EAC				
Data sheet		**T 8391**				

[1] On request

Type 3709-1

Type 3709-4

Type 3709-7

Type 3710 Reversing Amplifier

Reversing amplifier to operate a double-acting pneumatic actuator using a single-acting pneumatic or electropneumatic positioner (e.g. Series 3730 and 3731 Positioners). The positioner is mounted either with or without pressure gauge.

Type		3710
Permissible supply pressure		6 bar
K_V coefficient	Supply	0.11
	Exhaust	0.12
Connections		¼-18 NPT, ISO 228/1-G ¼
Degree of protection		IP 65
Permissible ambient temperature		–25 to +80 °C (–13 to +176 °F)
Low-temperature version		–50 to +80 °C (–58 to +176 °F)
Compliance		EAC
Options		
Pressure gauge Ø 40 mm		0 to 6 bar (0 to 90 psi)
Data sheet		**T 8392**

Type 3710

Type 3755 Pneumatic Volume Booster

The pneumatic volume booster is mounted between the positioner and actuator. It supplies the actuator with an air flow output whose pressure corresponds exactly to the signal pressure, except that it has a much higher volume output.

- Compact body made of cast aluminum
- Fast dynamic response due to low hysteresis
- Bypass restriction with linear characteristic
- Sintered polyethylene filter disk ensures low noise emissions
- Constant reversing pressure
- Exhaust air feedback possible

Versions

– **Type 3755-1:** pneumatic volume booster with low-noise sintered polyethylene filter disk
– **Type 3755-2:** pneumatic volume booster with flanged-on threaded exhaust port (ISO 228 G 1 or 1-11½ NPT)

Type 3755-1

Technical data

Type	3755-1	3755-2
K_{VS} Supply	2.5	2.5
K_{VS} Exhaust	2.5	2.5
K_{VS} Bypass	0.8	0.8
Pressure ratio	Signal:output = 1:1	
Response pressure	Standard temperature range: 80 mbar Low temperature range: 100 mbar	
Supply pressure	Max. 10 bar (145 psi)	
Actuator pressure	Max. 7 bar (101.5 psi)	
Signal pressure	Max. 7 bar (101.5 psi)	
Permissible ambient temperature	Standard temperature range: –40 to +80 °C Low temperature range: –55 to +60 °C	
Degree of protection	IP 44 [1]	IP 66
Compliance	EAC	
Service life	≥1 x 10^7 full strokes	
Data sheet	**T 8393**	

[1] Exhaust side facing downward or to the side

Type 3755-2

Type 3711 Quick Exhaust Valve

The Type 3711 Quick Exhaust Valve is mounted between the positioner or solenoid valve and the actuator. It is used to vent the actuator more quickly.

- Compact design
- Flow coefficient: K_V 10.0
- Closing hysteresis of check valve < 0.02 bar
- Integrated restriction to adjust the dynamic response

Type 3711

Technical data

Type	3711
Operating pressure	0 to 7 bar
Differential pressure between air supply and exhaust	55 % of control pressure
K_{VS} Exhaust	10.0 [1]
K_{VS} Supply	1.3 (restriction screw closed)
	1.9 (restriction screw open)
K_{VS} Bypass	Max. 0.75
Permissible leakage at 6 bar	≤ 25 l_n/h
Permissible ambient temperature	–40 to +80 °C
Closing hysteresis of check valve	< 0.02 bar
Weight	Approx. 0.5 kg [1]
Compliance	EAC
Data sheet	**T 8547**

[1] Without silencer

Converters

i/p converters · Type 6111, Type 6116, and Type 6126

p/i converters · Type 6132 and Type 6134

CE Ex certified

Application

Used to convert direct current signals or pneumatic signals

Versions

Electropneumatic converters accept a current signal from electric control equipment and convert it into a pneumatic signal for measuring or control tasks.

- **Type 6111:** i/p converter, rail-mounting unit for supply air manifold or stainless steel field unit
- **Type 6116:** i/p converter, field unit
- **Type 6126:** i/p converter, industrial unit

Technical data

Type	6111	6116	6126
Input	0/4 to 20 mA	0/4 to 20 mA	0/4 to 20 mA, 0/2 to 10 V
Output	0.2 to 1 bar [1]		
Output signal	Max. 8 bar		Max. 5 bar
Power supply	0.4 bar above upper range value [2]		
	Max. 10 bar		Max. 5.4 bar
Permissible ambient temperature	–20 to +70 °C	–30 to +60°C, –40 to +70 °C Special version: –45 °C	–25 to +70 °C
Degree of protection	IP 20, IP 65	IP 54, IP 65	IP 54, IP 65
Compliance	CE · EAC		
Explosion protection			
ATEX	–	•	–	•	–
Ex ia		✓		✓	
Ex d				✓	
GOST				•	
CSA				•	
FM				•	
IECEx				•	
KCS				•	
JIS				•	
STCC				•	
Data sheets	**T 6111**		**T 6116**		**T 6126**

[1] Further ranges in data sheet
[2] Restricted pressure ranges for explosion-protected devices (see data sheet)

Type 6111, rail-mounting unit

Type 6111, stainless steel enclosure

Type 6116, field unit

Type 6126 with pressure gauge

p/i converters accept a pneumatic signal from control equipment and convert it into an electric signal.

- **Type 6132:** p/i converter for four-wire connection, available as rail-mounting unit
- **Type 6134:** p/i converter for two-wire connection, available as either a rail-mounting or field unit

Technical data

Type	**6132** (four-wire)	**6134** (two-wire)	
Explosion-protected version	–	–	Ex ia/Ex d
Input	0.2 to 1 bar		
Output	0/4 to 20 mA 0/2 to 10 V	4 to 20 mA	
Voltage supply	230, 115, 24 V AC 24 V DC	12 to 30 V DC	
Permissible ambient temperature	–20 to +70 °C	–20 to +70 °C	
Degree of protection	IP 20		IP 54 IP 65
Compliance	CE · EAC		
Data sheets	**T 6132**	**T 6134**	

Type 6132-04, rail-mounting unit

Type 6134-03, field unit

Type 6134-04, rail-mounting unit

Media Series

Differential pressure, flow and liquid level meters

Media 5 · Media 05

Application

Instruments designed to measure differential pressure and measured variables derived from it. Suitable for liquids, gases, and vapors.

- Liquid level meters for cryogenic service
- Liquid level measurement in pressure vessels, especially for cryogenic gases
- Differential pressure measurement between flow and return flow pipe
- Pressure drop measurement across valves and filters
- Flow rate measurement according to the differential pressure method

Special features

- Suitable for field installation and panel mounting
- Directly connected valve block
- Zero adjustment from the front
- Limit switch easily retrofitted

Versions with

– Differential pressure cell made of brass (CW617N) or CrNi steel
– Scales: linear, square, according to DIN 19204, detachable, special
– Inductive limit switch with up to three alarm contacts

Technical data

Type	Media 5	Media 05
Pressure rating	PN 50, overloadable on one side up to 50 bar	
Measuring range	0 to 3600 mbar	
Degree of protection	IP 54	
Permissible ambient temperature	–40 to +80 °C	
Characteristic	Reading linear to the differential pressure	
Indicator Ø	160 mm	100 mm
Compliance	CE · EAC	
Data sheets	**T 9519**	**T 9520**

Materials

dp cell	CW617N (brass) or CrNi steel
Indicator housing unit	Polycarbonate
Springs, diaphragm plates and functional parts	CrNi steel
Measuring diaphragm and seals	ECO, NBR, FPM, EPDM

Special versions on request

Media 5 with limit switches, valve block and pressure gauge for operating pressure

Media 05 with limit switches, valve block and pressure gauge for operating pressure

Media Series

Indicating digital transmitters for differential pressure

Media 6 · Media 6 Z

Application

Microprocessor-controlled transmitters for measuring and indicating the differential pressure or measured variables derived from it. Suitable for liquids, gases and vapors

Special features

- Liquid level meters for cryogenic service
- Transmitter with digital display in two-wire connection
- Gas selection by switch
- Proportional 4 to 20 mA current signal
- LCD with 100 % bar graph, blinking alarm and warning markers
- Zero and span adjustment activated by key without influencing each other
- On-site configuration and programming over the RS-232 interface using a memory pen or the TROVIS-VIEW software
- Optional explosion protection ATEX Ex ia

Versions

– **Media 6:** transmitter with digital display, measuring range between 100 and 3600 mbar, two software limit contacts according to NAMUR

– **Media 6 Z:** same as above, but additionally with a pulse output proportional to quantity for controlling an external counter, one software limit contact

Media 6 with limit switches, valve block and pressure gauge for operating pressure

Technical data

Type	Media 6	Media 6 Z
Pressure rating	PN 50, overloadable on one side up to 50 bar	
Measuring range	0 to 3600 mbar	
Characteristic	Output and reading proportional to the tank content, linear or square root extraction depending on operating mode	
Limit contacts	Two software limit contacts or one software limit contact according to pulse output	
Display	Display Ø 90 mm	
Degree of protection	IP 65	
Permissible ambient temperature	–40 to +70 °C	
Two-wire system	4 to 20 mA output	
Power supply (battery operation)	12 to 36 V DC (9 V DC)	
Compliance	CE · EAC	
Data sheet	**T 9527**	

Materials

dp cell	CW617N (brass) or CrNi steel
Indicator housing unit	Polycarbonate
Springs, diaphragm plates and functional parts	CrNi steel
Measuring diaphragm and seals	ECO, NBR, FPM, EPDM

Special versions on request

Differential Pressure and Flow Meters

Orifice flange · Type 90

Application

Orifice plate assemblies for flow measurement · Generation of a defined differential pressure

In combination with a differential pressure meter, for example, Media 5, the orifice plates measure the flow rates of liquids, gases, and vapors.

Versions

– **Type 90:** orifice flange with standard orifice plate and annular chamber · DN 32 to 400 (NPS 1¼ to 16) · PN 6 to 40 (Class 150 to 300)

  Differential pressure connections: compression fittings for 12 x 1 mm or 12 x 1.5 mm pipes

Technical data

Type 90 Orifice Flange	
Valve size	DN 32 to 500 (NPS 1¼ to 20)
Pressure rating	PN 6, 10, 16, 25, 40 (Class 150 to 300)
Data sheet	**T 9550**

Materials

Standard orifice plate		1.4404
Annular chamber	Max. 300 °C	1.0566/SA 516-70
	Max. 400 °C	1.4404/316L, 1.5415
Pipe		Chromated steel or 1.4404/316L
Differential pressure connections		
Gasket		Fiber gasket (max. 300 °C) Graphite on metal core (max. 550 °C)

Accessories

– The **restriction orifice plate** is used to limit the mass flow in process engineering plants.

Special version

– Free of oil and grease for oxygen
– Form D grooved flanges, DIN EN 1092-1
– Other materials
– Other sizes

Type 90

Restriction orifice plate

Electronic Process Controllers

Compact controller · TROVIS 6493

Industrial controller · TROVIS 6495-2

Application

Digital controllers to automate industrial and process plants for general and more complex control tasks. The controllers are suitable for control of continuous-action, on/off or pulsing final control elements (e.g pneumatic actuators with electropneumatic positioners, motorized actuators, electric heating systems, refrigerating machines, etc.).

Versions

– **TROVIS 6493:** compact controller for panel mounting

Special features

- Configuration and parameterization using keys or the TROVIS-VIEW software
- Permanently stored function blocks
- One control circuit

– **TROVIS 6495-2:** industrial controller for panel mounting

Special features

- Configuration using keys with plain text display or the TROVIS-VIEW software
- Standard control circuits with permanently stored function blocks
- Two control circuits, operated separately or combined
- Split-range control
- Output tracking (DDC backup)
- Optional RS-232/USB and RS-485/USB interface boards for SSP and Modbus RTU

TROVIS 6493 Compact Controller

TROVIS 6495-2 Industrial Controller

Technical data

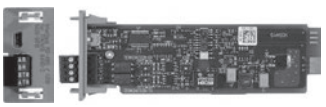
TROVIS			6493	6495-2
Design	Panel-mounting unit		•	•
	Front frame W x H (mm)		48 x 96	96 x 96
	Degree of protection (front)		IP 65	IP 65
	Display		LCD	Graphics
	Keys		6	9
Functions	Control circuits		1	2
	P, PI, PD, PID control		•	•
	Fixed set point and follow-up control		•	•
	Ratio control			•
	Cascade control			•
	Override control			•
	Linking of input variables		•	•
Input	Analog inputs		2	4
	0/4 to 20 mA		•	•
	0/2 to 10 V		•	•
	Pt 100 resistance thermometer		•	•
	Pt 1000 resistance thermometer		•	•
	Resistance transmitters		•	•
	Transmitter supply		•	•
	Binary inputs		1	4
Output	Analog outputs		1	3
	0/4 to 20 mA		•	•
	0/2 to 10 V		•	•
	Relay		2	4
	Transistor outputs		1	3
	On/off, three-step		1	2
	Limit		2	4
Communication	Interface	Infrared	•	•
		USB		• [1]
		RS-232		• [1]
		RS-485		• [1]
	Protocol	SSP (TROVIS-VIEW)	•	•
		Modbus RTU		• [1]
Power supply	85 to 264 V AC, 50/60 Hz			•
	90 to 250 V AC, 50/60 Hz		•	
	24 V AC/DC, 50/60 Hz		•	•
Compliance			CE · EAC	
Data sheets			**T 6493**	**T 6495-2**

[1] Optional

TROVIS 6493 Compact Controller with infrared adapter and bracket

TROVIS 6495-2 Industrial Controller with infrared adapter and bracket

Optional RS-232/USB interface board



Optional RS-485/USB interface board

Optional memory pen-64 for TROVIS 6495-2 Controller

Control Valves for Cryogenic Service

Pressure build-up regulator · Type 2357-1

Excess pressure valve · Type 2357-2

CE

Application

Pressure regulators for cryogenic gases and liquids as well as other liquids, gases, and vapors

Special features

The regulators consist of a valve, operating diaphragm, and set point adjuster.

- Low-maintenance proportional regulators requiring no auxiliary energy
- Wide set point range and convenient set point adjustment
- Rugged design and low overall height
- Cleaned and packed for oxygen service

Versions

Type 2357-1 · Pressure build-up regulator or pressure reducing valve

Principle of operation as pressure build-up regulator: the valve opens when the upstream pressure drops (direction of flow from port B to port A).

Principle of operation as pressure reducing valve: the valve closes when the downstream pressure rises (direction of flow from port A to port B).

Type	**2357-1**	
K_{VS} coefficient	0.25	0.8
Set point range	1 to 25 bar 10 to 36 bar	1 to 8 bar 5 to 25 bar 8 to 40 bar
Permissible operating pressure	40 bar	50 bar
Max. permissible differential pressure Δp	Gases: 30 bar · Liquids: 6 bar	
Connections	G ¾ A conical joint	
Temperature range	–196 to +200 °C	
Compliance	CE · EAC	
Data sheet	**T 2557**	

Type 2357-2 · Excess pressure valve

The valve opens when the upstream pressure rises.

Type	**2357-2**	
K_{VS} coefficient	1.25	0.4
Set point range	1 to 8 bar 5 to 25 bar 8 to 40 bar	1 to 25 bar 10 to 36 bar
Permissible operating pressure	50 bar	40 bar
Max. permissible differential pressure Δp	3 bar [1]	
Connections	Inlet: G ¾ A conical joint Outlet: G ¾ female thread	
Temperature range	–196 to +200 °C	
Compliance	CE · EAC	
Data sheet	**T 2557**	

[1] >3 bar only with special accessories

Type 2357-1

Type 2357-2

Control Valves for Cryogenic Service

Pressure build-up regulator · Type 2357-11

Excess pressure valve · Type 2357-21

CE

Application
Pressure regulators for cryogenic gases and liquids as well as other liquids, gases, and vapors

Special features
- Low-maintenance proportional regulators requiring no auxiliary energy
- Wide set point range and convenient set point adjustment
- Rugged design and low overall height
- Suitable for oxygen service
- Wetted parts free of non-ferrous metal

Versions
The regulators consist of a valve, operating diaphragm, and set point adjuster.

Type 2357-11 Pressure Build-up Regulator with safety function
Pressure regulator with globe valve · Direction of flow from port B to port A · The upstream pressure is transmitted to the operating diaphragm. The valve opens when the upstream pressure falls below the adjusted set point.
Safety function: the plug in the pressure build-up regulator operates like a safety valve and relieves the pressure chamber. The pressure acts from below against the plug surface. The valve opens to equalize the pressures.

Type 2357-11 Pressure Reducing Valve
Pressure regulator with globe valve · Direction of flow from port A to port B · The valve regulates the downstream pressure to the adjusted set point. The valve closes when the downstream pressure rises above the adjusted set point.

Type 2357-21 Excess Pressure Valve
Pressure regulator with globe valve · Direction of flow from port B to port A · The valve regulates the upstream pressure to the pressure adjusted at the set point adjuster. The valve opens when the pressure increases until the set point is reached. The regulator is additionally equipped with an integrated non-return unit that prevents the medium from flowing back.

Technical data

Type	2357-11	2357-21
K_{VS} coefficient	0.8	1.25
Set point ranges in bar	1 to 8, 5 to 25, 8 to 40	
Permissible operating pressure	63 bar	
Temperature range	–200 to +200 °C	
Compliance	CE · EAC	
Data sheet	**T 2560**	

[1] For oxygen max. 40 bar

Special versions
Version for liquid hydrogen · With welding ends · Suitable for flammable gases

Accessories
Coupling nut with ball-type bushing and welding nipple for 21.3 x 1.6 mm pipe diameter
Coupling nut with ball-type bushing and flanges

Type 2357-11/Type 2357-21

Control Valves for Cryogenic Service

Pressure build-up regulators · Type 2357-3 and Type 2357-31
with safety function and integrated excess pressure valve

CE

Application
- **Type 2357-3:** pressure regulator for cryogenic gases as well as liquids, gases, and vapors
- **Type 2357-31:** pressure regulator for cryogenic gases and liquids

Special features
- Low-maintenance proportional regulators requiring no auxiliary energy
- Wide set point range and convenient set point adjustment
- Rugged design and low overall height
- Cleaned and packed for oxygen service

Versions
The pressure regulators consist of a valve with three ports (A, B, C), a spring-loaded operating bellows (Type 2357-3) or a operating diaphragm (Type 2357-31) and a set point adjuster.

Pressure build-up regulator with safety function
Operating direction from port A to port B (closing)
The tubular plug in the pressure build-up regulator operates like a safety valve and relieves the pressure chamber at port A when the pressure exceeds the set point by 5 bar. The difference in pressure at the bellows between the inside pressure at port C and outside pressure at port A creates a positioning force. This force opens the plug, opposing the force of the closing spring. As a result, the pressures are equalized and the pressure chamber upstream of port A is relieved of pressure.

Direction of flow from port B to port C (opening)
When no pressure is applied, the passage from port B to C is closed. The tubular plug does not open the valve until the pressure becomes 0.5 bar higher than the set point (pressure build-up). Port C can be additionally equipped with a non-return unit.

Technical data

Type	**2357-3** Process medium in the gas phase	**2357-31** Process medium in the liquid phase
K_{VS} coefficient	Pressure build-up: 3.2 Pressure reduction: 0.8	Pressure build-up: 0.8 Pressure reduction: 0.2
Set point range bar	2 to 10, 8 to 26, 25 to 40	1 to 8, 5 to 25, 8 to 40
Perm. operating pressure	40 bar	50 bar
Temperature range	–196 to +200 °C	
Compliance	CE · EAC	
Data sheets	**T 2559**	**T 2558**

Accessories
Soldering nipple with ball-type bushing: port A and B for connection to Ø 28 mm pipes
Port C for Ø 18 mm pipes: optionally non-return unit

Special versions
- All wetted parts made of CrNiMo steel
- Type 2357-3: for use with process medium in the liquid phase
- Type 2357-31: for use with process medium in the gas phase

Type 2357-3

Type 2357-31

Self-operated Temperature Regulators

for cryogenic applications

Safety temperature monitor (STM) · Type 2040

CE

Application

Pressure regulator for cryogenic gases and liquids as well as other liquids, gases and vapors

Special features

- Self-operated regulator with integrated temperature sensor
- Convenient set point adjustment
- Free of oil and grease for oxygen
- Rugged, compact design featuring small dimensions

Versions

The Type 2040 Safety Temperature Monitor consists of a body, an integrated temperature sensor with a set point adjuster and the connecting body with G 1¼ A conical joints at both the inlet and outlet.

Connection parts: soldering nipples and welding ends including connection nuts

Technical data

Type	2040
Body connection	G 1¼
K_{VS} coefficient	5
Set point ranges	–30 to +10 °C –45 to –10 °C
Permissible operating pressure	40 bar
Permissible differential pressure	25 bar
Leakage class according to IEC 60534-4	≤0.05 % of K_{VS} at –10 °C ≤0.1 % of K_{VS} at –45 °C
Hysteresis	2 K
Accuracy	±1 °C
Permissible ambient temperature	–60 to +60 °C [1]
Temperature open/closed differential	17 K
Compliance	CE · EAC
Data sheet	**T 2090**

[1] To adjust the set point properly, the ambient temperature must be at least 15 K above the target temperature to be adjusted.

Special version

Set point adjuster with set point indication · Reading in steps of 10 °C indicated by ring marks on the set point adjuster

Accessories

Connecting parts: connection nut with soldering nipple/welding ends with either a spherical liner or gasket. See T 2090 for details.

Type 2040

Electronic Controllers for Heating, District Heating and Ventilation

Heating and district heating controllers
TROVIS 5573 · TROVIS 5575 · TROVIS 5576 · TROVIS 5578 · TROVIS 5579

Programmable logic controller · TROVIS 5571
TROVIS 5488 Meter Bus Gateway · TROVIS 5590 Web Module
Modbus I/O module for TROVIS 5571 · Converter or repeater CoRe02
Meter bus/Modbus gateway · Modbus/TCP gateway

CE

Application
Outdoor-temperature-compensated flow temperature control in hot water heating systems and domestic hot water heating systems

Special features

- Easy start-up using default settings
- Connection to room panels for single heating circuits
- Heating characteristics optionally based on the gradient or based on four points
- Calculation of the best possible activation and deactivation times for the heating (optimization)
- Automatic adaptation of the heating characteristic (adaptation)
- Delayed outdoor temperature adaptation
- Demand-driven control using the set points of downstream control circuits demanded by device bus or a 0 to 10 V signal
- Annual clock for maximum four time schedules and three time-of-use periods
- TROVIS-VIEW software for configuration and parameterization of controllers

TROVIS 557x: heating and district heating controllers for wall, panel or top-hat rail mounting
Two control circuits (three with TROVIS 5579) for controlling a primary heat exchanger or boiler and a supplementary heating circuit plus a DHW heating circuit, a heating circuit and a DHW circuit or two heating circuits (three with TROVIS 5579)
Configuration of solar/buffer storage tank systems.
Historical data storage and graphics analysis on a computer using data logging viewer software

– **TROVIS 5573-000x:** display with icon readings, interface for optional external communications module or meter bus/Modbus gateway
– **TROVIS 5573-100x:** graphic display with plain-text readings, interface for optional external communications module or meter bus/Modbus gateway
– **TROVIS 5573-110x:** graphic display with plain-text readings, M-bus interface for three M-bus units
– **TROVIS 5575:** display with icon readings · Multi-circuit systems possible by interconnecting controllers over device bus

TROVIS 5573-11

TROVIS 5576: display with icon readings

- Multi-circuit systems possible by interconnecting controllers over device bus
- RS-232 Modbus interface for modem operation or for connection to RS-232/RS-485 cable converter for bus operation
- Alarm notification by text message (modem required)
- Prepared for meter bus plug-in module for communication with a maximum of six heat meters

TROVIS 5578: graphic display with plain-text readings

- Three control circuits
- Control of a primary heat exchanger or boiler. Max. two mixing and one non-mixing heating circuit. Control of DHW heating in the secondary circuit.
- Outdoor-temperature-compensated buffer storage tank control with solid-fuel boiler and solar circuit control and max. two mixing heating circuits
- Control of two outdoor-temperature-compensated heating circuits and a DHW heating with three valves in the primary circuit
- Control of three outdoor-temperature-compensated heating circuits with three valves in the primary circuit

TROVIS 5579: display with icon readings

- Three control circuits for controlling a primary heat exchanger or boiler and two supplementary heating circuits plus DHW heating, two heating circuits and one DHW circuit or three heating circuits
- Multi-circuit systems possible by interconnecting controllers over device bus
- RS-232 Modbus interface for modem operation or for connection to RS-232/RS-485 cable converter for bus operation
- Alarm notification by text message (modem required)
- Prepared for meter bus plug-in module for communication with a maximum of six heat meters

TROVIS 5571 Programmable Logic Controller: for freely programmable HVAC plants and applications · Modbus and meter bus interface

- Freely programmable according to IEC 61131 using ISaGRAF®
- Fully graphic, illuminated display plain text display
- Convenient data input
- 17 universal inputs individually configurable
- Modbus communication over Modbus master and slave function
- Alarm notification by fax or text message
- Other inputs and outputs available by connecting an expansion module
- Standard applications:
  - WTF71: heat exchanger sequence control
  - Luft71: ventilation control
  - KES71: boiler control

TROVIS 5571

TROVIS 5575

TROVIS 5576

TROVIS 5579

Technical data (excerpt)

TROVIS	5573	5575	5576	5579	5571	5578
Control circuits, max.	2	2	2	3	Free [1]	3
Heating, max.	2	2	2	3	Free [1]	3
DHW, max.	1	1	1	1	Free [1]	1
Inputs						
Sensors	8	8	15	17	17	17
Alternatively binary	1	1	14	14	•	•
Alternatively 0 to 10 V	–	1 [2]	1	1	•	1 [2]
Alternatively 0/4 to 20 mA	–	1 [2]	14	15	•	1 [2]
Additionally binary	2	2	–	–	–	–
Additionally 0 to 10 V	1	–	–	–	–	–
Usable sensor types	Pt 1000	Pt 100/500/1000, Ni 1000, PTC, NTC				Pt 1000

[1] Freely programmable
[2] V and mA input cannot be used at the same time

TROVIS *5578*

TROVIS	5573	5575	5576	5579	5578	5571
Outputs						
Control signal						
Three-point/on-off, max.	2	2	2	3	3	Free [1]
Binary	3	3	4	5	5	12
0 to 10 V	1	–	2	3	1	4
Interfaces · Partly optional						
Device bus	–	•	•	•	•	–
Meter bus	•	–	•	•	•	•
Modbus slave						
RS-232	•	–	•	•	•	•
RS-485	•	–	•	•	•	•
Modbus master						
RS-485	–	–	–	–	–	•
Ethernet	•	–	•	•	•	•
Data transmission and data logging						
TROVIS-VIEW software module	•	•	•	•	•	–
Data transmission						
With memory pen	–	–	–	–	–	–
With memory module	•	•	•	•	–	–
Direct	Using USB converter 3					–
Data logging viewer/module	•	•	•	•	•	•
Voltage supply	165 to 250 V~					
Compliance	CE · EAC					
Data sheets	**T 5573**	**T 5575**	**T 5576**	**T 5579**	**T 5578**	**T 5571**

[1] Freely programmable

TROVIS 5488

TROVIS 5590

TROVIS 5488 Meter Bus Gateway

Used in HVAC networks to integrate M-bus meters and pulse counters into a control system. See Data Sheet T 5488 for further details.

- 16 floating contacts (pulse counters)
- 32 meter bus meters complying with EN 1434-3
- Communication over Modbus interface

TROVIS 5590 Web Module

To connect smart heating, district heating, or industrial controllers (Modbus RTU) and/or maximum six meter bus participants over intranet/Internet

- Visualization and operation using a web browser
- Historical data logging
- Alarm management including e-mail notification
- Four configurable user levels
- Ethernet interface 10/100 Mbit
- Connection to controller over RS-232 and RS-485, Modbus RTU, or TTL
- Processing of max. six meter bus participants
- LED for 10 Mbit, 100 Mbit, power, RxD, and TxD

See Data Sheet T 5590 for further details.

Modbus I/O module for TROVIS 5571

Extension of inputs and outputs at the TROVIS 5571 Programmable Logic Controller (PLC)

- Maximum six inputs can optionally be used as counter input, Pt 1000, 0 to 1000 Ω or 0 to 10 V
- Four binary outputs and a maximum of two 0 to 10 V outputs
- Wall, panel, or top-hat rail mounting

Converter or repeater CoRe02

Converter (RS-232/RS-485) or repeater for RS-485 bus networks (two-wire/four-wire)

- RS-485 interfaces optionally connected over RJ-11/RJ-45 jacks or over plug-in screw terminals
- Slide switches to select the operating mode, transmission rate, termination and bus bias voltage
- LED to monitor communication
- Wall, panel, or top-hat rail mounting

See Data Sheet T 5409 for further details

Modbus/meter bus gateway

Used in HVAC networks to integrate M-bus meters into a control system.

- Maximum six heat, electricity or water meters according to EN 1434-3
- Conversion of input data into Modbus data

See Data Sheet T 5409 for further details

Modbus/TCP gateway

Integration of Modbus-capable controllers, such as TROVIS 5573, 5576, 5578, and 5579 Controllers as well as TROVIS 5571 PLC into Ethernet (LAN) structures.

- Connection to controller optionally using RS-485, TTL or RS-232 jacks
- Simultaneous access to several Modbus-TCP masters in LAN possible
- Firmware updates of connected controllers
- Wall, panel, or top-hat rail mounting

See Data Sheet T 5409 for further details

Modbus-GPRS gateway

Polling of heat meters as well as heating and district heating controllers over mobile networks or local area networks.

- Connection to controller over RS-485, RS-232 or TTL
- Max. three M-bus loads
- Simultaneous polling of controller and meter data possible
- Alarm notification by text message or e-mail
- Wall, panel, or top-hat rail mounting

Modbus I/O module for TROVIS 5571

Universal bus unit CoRe02

Modbus/meter bus gateway

Modbus/TCP gateway

Modbus-GPRS gateway

Solar Controllers and Heat Pump Controllers

Solar controllers · ZPR · ZPR-D · SOL3-1 · SOL3-7 · SOL71

Heat pump controllers · WPR3 · WPR71

KT Elektronik

Versions and special features

Solar controllers

The solar controllers are used in solar thermal systems to monitor the collector and storage tank temperatures. The applications covered by the controllers range from simple to complex solar systems.

– **ZPR:** on/off controller for simple heating and water control systems
- Microprocessor-controlled controller for simple solar thermal systems
- Differential temperature control for for solar heating systems, solar-heated swimming pools, boiler thermostats, fan control, and solid fuel boilers
- Two sensor inputs, one relay contact

– **ZPR-D:** on/off controller for simple heating and water control systems
- LED temperature display
- Microprocessor-controlled controller for simple solar thermal systems
- Differential temperature control for for solar heating systems, solar-heated swimming pools, boiler thermostats, fan control, and solid fuel boilers
- Two sensor inputs, one relay contact

ZPR and ZPR-D On/off Controllers

– **SOL3-1:** solar heating controller for simple systems
- Convenient operation with rotary pushbutton
- Graphical selection of the plant schemes
- Logging of all measured data and switching states
- Interface for remote polling, configuration and visualization
- Two sensor inputs, two relay contacts

– **SOL3-7:** solar heating controller for complex systems
- Controller for solar thermal systems with maximum two collector arrays, two storage tanks, a heat exchanger, additional heating system, and a heating circuit
- 117 hydraulic plant schemes
- Operation using rotary pushbutton
- Large display for operating states
- Logging of all measured data and switching states
- Interface for remote polling, configuration and visualization
- Nine sensor inputs, seven relay contacts, and one analog output

SOL3-x Solar Controller

– **SOL71:** freely programmable solar heating controller for complex systems
- The SOL71 solar heating control is an application used to control complex solar heating systems based on TROVIS 5571 Programmable Logic Controller.
- 104 hydraulic plant schemes
- Graphic display for settings and displaying current operating parameters
- Icons used on the display to represent the plant
- Inputs and outputs extendable for subsequent addition of control tasks
- Interfaces for communication with other field devices
- 17 universal inputs, 12 binary outputs, and four analog outputs

Heat pump controllers

The heat pump controllers are used to control heating systems with heat pumps.

– **WPR3:** controller for complex heat pump systems
- 9 hydraulic plant schemes
- Operation using rotary pushbutton
- Large LCD for plant settings and information
- Logging of all measured data and switching states
- Interface for remote polling, configuration and visualization
- Nine sensor inputs, one pulse input, one output, seven relay outputs

– **WPR71:** freely programmable controller for complex heat pump systems
- Application used to control complex heat pump systems based on TROVIS 5571 Programmable Logic Controller
- Convenient and simple plain-text operation
- Various applications for hydraulic plant schemes
- Inputs and outputs extendable for subsequent addition of control tasks
- Data logger function and communication interfaces
- Freely programmable using IsaGRAF® software
- 17 universal inputs, 12 relay outputs, two pulse outputs for flow rate measurement, four outputs 0 to 10 V for pump speed control

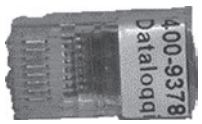
TROVIS 5571 with SOL71 Solar Controller

WPR3 Heat Pump Controller

TROVIS 5571 with WPR71 Heat Pump Controller

Overview · (o = optional)

	ZPR	ZPR-D	SOL3-1	SOL3-7	SOL71	WPR3	WPR71
On/off controllers	•	•					
Solar controllers			•	•	•		
Heat pump controllers						•	•
Operation							
Rotary switch	•	•					
Menu-driven Turn and push			•	•		•	
Freely programmable					•		•
Display							
Status LEDs	•	•					
Temperature		•					
Plain text/graphics			•	•	•	•	•
Inputs							
Pt 1000	2	2	2	9		9	
Universal (Pt, Ni, PTC, NTC, mA, V, binary)					17		17
Pulse input				1	2	1	2
0 to 10 V					4		4
Outputs							
Relay (250 V AC, 2 A)	•	•	2	7	10	7	10
Low voltage (50 V DC, 100 mA)					2		2
0 to 10 V				1	4	1	4
Interfaces							
Jack for memory module			•	•	•	•	•
Data logger			o	o	o	o	o
Communication interface			o	o	•	o	•
Optional extension							
Universal inputs					6		6
Relay outputs					4		4
Mounting							
Wall mounting			•	•	•	•	•
Rail mounting	•	•	•	•	•	•	•
Panel mounting			•	•	•	•	•
Voltage supply							
85 to 250 V AC	•	•	•	•	•	•	•
Power consumption, max.	0.7 W		3 VA	3 VA	8 W	3 W	8 W



Data logging module

TROVIS 6600 Automation System

CPU module · TROVIS 6610
I/O module · TROVIS 6620
Input module · TROVIS 6625
Web terminal · TROVIS 6616
AO module · TROVIS 6630
AI module · TROVIS 6640

CE

Application

Control and monitoring of autonomous automation stations in building automation applications

Versions and special features

– **TROVIS 6610 CPU Module**

- Freely configurable automation station with 40 physical channels suitable for connection of up to 32 TROVIS 6620 I/O Modules and TROVIS 6625 Input Modules.
- Communication according to DIN EN ISO 16484-5, certification according to DIN EN ISO 16484-6
- Processing of over 20,000 physical data points
- BACnet profile B-BC and additional BIBBs (BACnet Interoperability Building Blocks)
- Modbus master or slave functions
- Integrated web server for optional graphical plant visualization, including historical data, access protection, alarm management and service
- E-mail and/or text message notification of event-triggered alarms
- Two full-speed USB 2.0 ports (12 Mbit/s) to connect memory pen, wireless modem etc.

Common features of the modules

- Connection to TROVIS 6610 CPU Module over RS-485
- Power supply and I/O bus galvanically isolated from the module
- Inputs and outputs can be connected directly to the module's terminals
- LEDs for binary inputs and outputs
- Status LEDs for module operation or malfunction

– **TROVIS 6620 I/O Module**

- Analog inputs as Pt 1000 (two-wire), 0 to 10 V DC, 0 to 2000 Ω
- Binary inputs optionally as normally closed or normally open contacts, status indicated by LEDs, binary inputs 1 and 2 as counter inputs (1 kHz)
- Six binary outputs including 250 V AC/3 A coupling relay, status indicated by LEDs
- Four analog 0 to 10 V DC outputs

– **TROVIS 6625 Input Module**

- Binary inputs optionally as normally closed or normally open contacts, status indicated by LEDs
- Use with internal or external power supply
  - Internal power supply: 18 to 33 V DC
  - External power supply: max. 24 V DC (+15 %)

– **TROVIS 6616 Web Terminal**

- Indication and operation of all relevant operating data in conjunction with TROVIS 6610 CPU Module
- Fully graphical display
- Operation, e.g. setting parameters or changing set points, on a touch screen
- Android operating system
- 7" widescreen LED-TFT monitor, projected capacitive touch screen, 800 x 480 pixels
- Two USB 2.0 A ports, one mini USB port
- Ethernet 10/100 with 802.3af PoE

TROVIS 6610

TROVIS 6620

TROVIS 6625

TROVIS 6616

– **TROVIS 6630 AO Module**

- Eight analog outputs
  - 0/4 to 20 mA or
  - 0/2 to 10 V

– **TROVIS 6640 AI Module**

- Eight analog inputs
  - 0/4 to 20 mA or
  - Two-wire transmitter supply or
  - 0/2 to 10 V or
  - Pt 100, two/three-wire (–50 to 250 °C) or
  - Pt 1000, two/three-wire (–50 to 250 °C) or
  - 0 to 2000 Ω

TROVIS 6630

TROVIS 6640

Temperature Sensors

Resistors with Pt 100 · Pt 1000

Application

Sensors for measuring temperatures in heating, ventilation and air-conditioning systems as well as thermal plants

Types 5204 to 5256 · Temperature sensors with Pt 100 resistor

Type	5204/5205/5206	5215/5216	5225/5226	5255
Screw-in sensor	•			
Duct sensor		•		
Outdoor sensor			•	
Room sensor				•
Operating temp. range	–20 to +150 °C –60 to +400 °C	–35 to +200 °C	–20 to +50 °C	–35 to +85 °C
Compliance	CE			
Data sheet	**T 5203**			

Types 5207 to 5277 · Temperature sensors with Pt 1000 resistor

Type	5207-xx	5217	5227-2	5257-x
Screw-in sensor	•			
Duct sensor		•		
Immersion sensor				
Contact sensor				
Outdoor sensor			•	
Room sensor				•
Operating temperature range	–20 to +150 °C –60 to +400 °C –50 to +180 °C –5 to +90 °C	–20 to +150 °C	–35 to +85 °C	–20 to +60 °C –35 to +70 °C
Compliance	CE · EAC			
Data sheets	**T 5220, T 5221, T 5222**			

Type	5267-2	5277-2	5277-3/-5
Screw-in sensor			
Duct sensor			
Immersion sensor		•	•
Contact sensor	•		
Outdoor sensor			
Room sensor			
Operating temp. range	–20 to +120 °C	–10 to +105 °C	–50 to +180 °C
Compliance	CE · EAC		
Data sheet	**T 5220**		

Types 5207-60, 5207-61, 5207-64 and 5207-65 also available as fast-response versions with Pt 1000 resistor (see T 5221 and T 5222)

Type 5207-64 (top),
Type 5207-61 (bottom)

Type 5206/5207

Type 5267-2

Thermostats

Safety temperature monitor · Type 5343
Temperature regulator · Type 5344
Safety temperature limiter · Type 5345
Double thermostats · Type 5347, Type 5348 and Type 5349
Frost protection thermostat · Type 5312-2

Types 5343, 5344, 5345, 5347, 5348, 5349

- Can be mounted either as a contact thermostat or as a thermostat with thermowell
- Easy to wire using spring-clamp terminals
- Switching capacity 16 A, 230 V
- Stable switching point thanks to ambient temperature compensation
- Degree of protection IP 54

Application

The thermostats are tested by the German technical surveillance association (TÜV) according to DIN EN 14597 for temperature control in heat-generating plants and for use in HVAC applications as:

– Safety temperature monitor (STM)
– Temperature regulator (TR)
– Safety temperature limiter (STL)
– Temperature regulator with safety temperature limiter (TR/STL) or
– Temperature regulator with safety temperature monitor (TR/STM)

Type 5312-2 Frost Protection Thermostat

The frost protection thermostat is used to monitor the temperature in air ducts containing non-corrosive gases.

Single thermostats

Type	5312-2	5343	5344	5345
Function	TM	STM	TR	STL
Set point range [°C]	–10 to +12	0 to 60 40 to 100 70 to 130 35 to 95	0 to 120 20 to 150	70 to 130 30 to 90
Sensor length [mm]	6000	2000		
Max. medium temperature [°C]	200	85, 125, 155, 120	145, 175	155, 115
Compliance	CE	CE · EAC		
Data sheets	**T 5207**	**T 5206**		

Double thermostats

Type		5347	5348	5349
Function		TR/STL	TR/STM	STM/STL
Set point range [°C]	TR	0 to 120	0 to 120	–
	STL	70 to 130 30 to 90	–	70 to 130
	STM	–	70 to 130/40 to 100	70 to 130
Sensor length [mm]		2000		
Max. medium temp. [°C]		145 or 115	145 or 125	145
Compliance		CE · EAC		CE
Data sheet		**T 5206**		

Type 5312-2

Types 5343, 5344 and 5345

Type 5347

Type 5348

Type 5349

Self-operated Temperature Regulators

Temperature regulators with
Globe valves · Types 1/4 · Types 1u/4u
Three-way valves · Types 8/9

Application

Temperature regulators with globe or three-way valves and Types 2231 to 2235 Control Thermostats, tested according to DIN EN 14597. Suitable for liquids, gases and vapors, especially for heat transfer media, such as water, oil and steam, or for coolants, such as cooling water.

Special features

The regulators consist of a:

- Type 2111, Type 2114, Type 2118 or Type 2119 Valve and
- either a Type 2231, 2232, 2233, 2234 or 2235 Control Thermostat

Versions

– **Type 1 · Flanges**
Unbalanced globe valve
The valve **closes** when the temperature rises
Body materials according to DIN and ANSI: cast iron (EN-JL1040), spheroidal graphite iron (EN-JS1049), cast steel (1.0619), cast stainless steel (1.4408) or A126 Class B, A216 WCC, A351 CF8M

– **Type 1 · Body with screwed ends**
Unbalanced globe valve
The valve **closes** when the temperature rises
Red brass body

– **Type 1u** · Same as Type 1
The valve **opens** when the temperature rises. Body materials according to DIN and ANSI: red brass, spheroidal graphite iron or A126 B, A216 WCC

– **Type 4 · Flanges**
Balanced globe valve
The valve **closes** when the temperature rises
Body materials according to DIN and ANSI: cast iron (EN-JL1040), spheroidal graphite iron (EN-JS1049), cast steel (1.0619), cast stainless steel (1.4408) or A126 Class B, A216 WCC, A351 CF8M

– **Type 4u** · Same as Type 4
The valve **opens** when the temperature rises.

– **Type 8 · Flanges**
Unbalanced three-way valve
Mixing or diverting service for liquids
Cast iron body

– **Type 9 · Flanges**
Balanced three-way valve
Mixing or diverting service for liquids
Body materials according to DIN and ANSI: cast iron (EN-JL1040), spheroidal graphite iron (EN-JS1049), cast steel (1.0619), cast stainless steel (1.4408) or A126 Class B, A216 WCC, A351 CF8M

Type 4 with
Type 2231 Control Thermostat

Type 1 with
Type 2231 Control Thermostat

Type 1 with
Type 2231 Control Thermostat

Technical data

Valve Type		2111, 2121				2114	
Pressure balancing		Without [1]				With	
Connection	DN/G	DN 15 to 50	G ½ to G 1	DN 15 to 50	G ½ to G 1	DN 15 to 150	
	NPS	½ to 2	– [2]	½ to 2 [2]		½ to 10	
Pressure rating	PN	16 to 40	25	25		16 to 40	
	Class	125 to 300	250	125 to 300		125 to 300	
Max. permissible temperature		350 °C	220 °C	150 °C		350 °C	
		660 °F	–	300 °F		660 °F	
Compliance		CE · EAC					
Data sheets		**T 2111 T 2115**	**T 2112**	**T 2113**		**T 2121 T 2025**	**T 2123**

[1] Type 2121 in DN 32, 40 and 50 also available with balanced valve
[2] Versions also available with NPT female thread

Materials

Body according to			
DIN	EN-JL1040, 1.0619, cast stainless steel (1.4408)	CC491K, EN-JL1040, 1.0619, cast stainless steel	EN-JL1040, 1.0619, cast stainless steel (1.4408)
ANSI	A126 Class B A216 A351 CF8M	B 62	A126 Class B, A216, A351 CF8M

Technical data

Valve Type	2118	2119
Pressure balancing	Without	DN 32 and higher
Valve size	DN 15 to 50	DN 15 to 150 (NPS ½ to 6)
Pressure rating	PN 16	PN 16 to 40 (Class 125 and 300)
Max. permissible temperature	150 °C	350 °C (660 °F)
Compliance	CE · EAC	
Data sheets	**T 2131**	**T 2133, T 2134**

Materials

Body according to		
DIN	EN-JL1040	EN-JL1040, 1.0619, 1.4581
ANSI	–	A216, A351 CF8M

Special versions

- Valve entirely of stainless steel
- Reduced K_{VS} coefficient
- Valve with flow divider I for noise reduction with steam and non-flammable gases
- Version free of non-ferrous metal

Type 4u with
Type 2231 Control Thermostat

Type 8 with Type 2118 Valve and
Type 2232 Control Thermostat with
separate set point adjustment

Type 9 with
Type 2231 Control Thermostat

Application

Temperature regulation for heating or cooling installations

Special features

- The control thermostats consist of a temperature sensor, a set point adjuster with temperature scale and excess temperature safety device, a capillary tube and an operating element.
- They regulate the medium temperature by causing the connected valve to open or close.
- The thermostats operate according to the liquid expansion principle.

Versions

– **Type 2231:** set points from –10 to 150 °C (15 to 300 °F), set point adjustment at the sensor, suitable for liquids and steam · Installation in pipelines, vessels, heating or cooling systems

– **Type 2232:** set points from –10 to 250 °C (15 to 480 °F), separate set point adjustment, application same as Type 2231

– **Type 2233:** set points from –10 to 150 °C (15 to 300 °F), set point adjustment at the sensor, suitable for liquids, air and gases, liquid regulation with quick response times, installation in air ducts, vessels, pipelines, heating or cooling systems

– **Type 2234:** set points from –10 to 250 °C (15 to 480 °F), separate set point adjustment, suitable for liquids, air and gases, application same as Type 2233

– **Type 2235:** set points from –10 to 250 °C (15 to 480 °F), separate set point adjustment, capillary tube can be installed as required by the user to measure different temperature layers, installation in air-heated storerooms as well as drying, climatic and heating cabinets

Technical data

Type	2231	2232	2233	2234	2235
Set point span	–10 to +90, 20 to 120 or 50 to 150 °C For Types 2232, 2234, 2235 also 100 to 200, 150 to 250 °C				
	15 to 195, 70 to 250 or 120 to 300 °F For Types 2232, 2234, 2235 also 210 to 390, 300 to 480 °F				
Permissible ambient temperature	–40 to +80 °C (–40 to +175 °F) at the set point adjuster				
Permissible temperature at the sensor	100 K above the adjusted set point				
Capillary tube length	3 m (10 ft)				
Compliance	EAC				
Data sheets	**T 2111/2115, T 2112, T 2113, T 2121/2025, T 2123/2131, T 2133/2134**				

Materials

Type	2231	2232	2233	2234	2235
Sensor	Bronze	Bronze	Copper	Copper	Copper
Capillary tube	Nickel-plated copper [1]				

[1] Special version: plastic-coated copper or 1.4571

Special versions

– Sensor of CrNiMo steel
– Capillary tube made of CrNiMo steel or plastic-coated copper
– Capillary tube length: 5, 10 or 15 m (16, 33 or 50 ft)

Type 2233

Type 2232

Type 2231

Self-operated Temperature Regulators

Typetested safety devices

Type 1/... , Type 4/..., Type 8/..., Type 9/...

Safety temperature limiter (STL) · Type 2212

Application

Temperature limitation in heating and water heating installations according to DIN 4753 and DIN 4747-1 · Tested according to DIN EN 14597

Special features

- Interrupts and locks the energy supply when an adjusted limit value is reached, when the capillary tube breaks or when leakage occurs in the sensor system
- Can only be reset or started-up with a tool, provided the defect has been eliminated and the temperature has fallen below the limit value

Versions: safety temperature limiter (STL) consisting of:

– Type 2111/Type 2114 Globe Valve or Type 2118/Type 2119 Three-way Valve and
– **Type 2212** Safety Thermostat with temperature sensor, limit value adjuster, capillary tube and connecting element with spring mechanism

Safety temperature limiters (STL), consisting of a valve and safety thermostat, operate without auxiliary energy and are designed for extended safety acc. to DIN EN 14597. Devices tested according to DIN EN 14597 are available for installations according to DIN 4753.

Technical data

Safety thermostat	**Type 2212 STL** (size 50 [1], size 150 [2])
Adjustable limit value range	10 to 95, 20 to 120 or 40 to 170 °C
Max. perm. ambient temperature	80 °C (60 °C with electromagnetic release)
Min. permissible sensor temperature [3] at 0 °C ambient temperature	Smallest adjustable limit temperature of the selected limit range
Min. permissible temperature of the STL including sensor during plant shutdown [3]	10 to 95 °C limit range : –10 °C 20 to 120 °C limit range : 0 °C 40 to 170 °C limit range : +10 °C
Permissible temperature at sensor	Max. 50 K above the adjusted set point
Capillary tube length	5 m
Compliance	CE · EAC
Data sheet	**T 2046**

1) For valves up to DN 50
2) For valves larger than DN 50
3) The STL is triggered when the temperature falls below the specified temperature

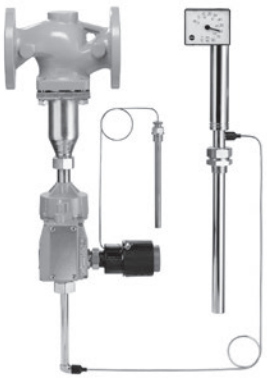
Materials

Connecting element with spring mechanism	GD AlSi12 (230), connecting piece 1.4104
Sensor	Copper
Thermowell	Copper or CrNiMo
Capillary tube	Copper

Special versions

– Electric signal transmitter for remote transmission of the plant status
– With Type 2401 Pressure Element
– 10 m capillary tube length (**not** tested according to DIN EN)

Type 2212



STL with Type 2114 Valve, Type 2231 Thermostat and Type 2212 Safety Thermostat

Self-operated Temperature Regulators

Typetested safety devices

Type 1/... , Type 4/... , Type 8/... , Type 9/...

Safety temperature monitor (STM) · Type 2213

Application

Temperature monitoring in heating and water heating installations according to DIN 4747-1 and DIN EN 12828 · Tested according to DIN EN 14597

Special features

- Interrupts and locks the energy supply when an adjusted limit value is reached, when the capillary tube breaks or when leakage occurs in the sensor system
- Automatic reset or start-up, provided the defect has been eliminated and the temperature has fallen below the limit value

Versions: Safety temperature monitor (STM) consists of:

– Type 2111/Type 2114 Globe Valve or Type 2118/Type 2119 Three-way Valve and
– **Type 2213** Safety Thermostat with
temperature sensor, limit value adjuster, capillary tube, and connecting element with spring mechanism

Safety temperature monitors (STM), consisting of a valve and safety thermostat, operate without auxiliary energy and are designed for extended safety acc. to DIN EN 14597. Devices tested according to DIN EN 14597 are available for installations according to DIN 4747 or DIN EN 12828.

Technical data

Safety thermostat	**Type 2213 Safety Temperature Monitor**
Limit value range	–10 to 90 °C or 20 to 120 °C
Permissible ambient temperature at the limit value adjuster	–40 to +80 °C
Permissible temperature at sensor	Max. 100 K above the adjusted set point
Capillary tube length	5 m
Compliance	CE · EAC
Data sheet	**T 2043**

Materials

Connecting element with spring mechanism	Nickel-plated brass
Sensor	Bronze
Thermowell with conductive plate	Bronze, copper or CrNiMo steel
Capillary tube	Nickel-plated copper

Special versions

– Electric signal transmitter for remote transmission of the plant status
– Capillary tube 10 or 15 m, made of copper and 5, 10 or 15 m made of plastic-coated copper (10 and 15 m **not** tested according to DIN EN)

Type 2213

STM with Type 2114 Valve, Type 2213 Safety Thermostat and Type 2232 Control Thermostat

Self-operated Temperature Regulators

Temperature regulators · Type 43-1 to Type 43-7

Valve closes when the temperature rises · Type 43-1 · Type 43-2 · Type 43-5 · Type 43-7
Valve opens when the temperature rises · Type 43-6
Three-way valve for mixing and diverting service · Type 43-3

Application

Regulators for district heating systems, heat generators, heat exchangers and other HVAC and industrial applications. Suitable for liquids, gases, and vapors at operating pressures up to 25 bar.

For heating service: Types 43-1, 43-2, 43-5, 43-7
For cooling service: Type 43-6
For mixing or diverting service, **heating or cooling service:** Type 43-3

Special features

- Low-maintenance proportional regulators requiring no auxiliary energy
- Temperature sensors suitable for any desired mounting position and high permissible ambient temperatures, especially suitable for district heating networks

Versions

The regulators consist of a valve, a Type 2430 K Control Thermostat with set point adjuster, a capillary tube, and temperature sensor operating according to the adsorption principle.

Technical data

Type	43-1	43-2	43-3
Valve	2431 K	2432 K	2433 K
Pressure balancing	Plug balanced by a piston		–
Flanged body	–	DN 15 to 50	–
Set point range	0 to 35, 25 to 70, 40 to 100, 50 to 120, 70 to 150 °C		
	30 to 95, 75 to 160, 105 to 210, 160 to 300 °F		
Max. permissible temperature [°C/°F]	Liquids: 150/300, non-flammable gases: 80/175		Water: 150/300
Compliance	CE · EAC		
Data sheets	**T 2171, T 2175**		**T 2173, T 2177**

Type	43-5	43-7	43-6
Valve	2435 K	2437 K	2436 K
Pressure balancing	Plug balanced by bellows		
Flanged body	–	DN 15 to 50	
Set point range	0 to 35, 25 to 70, 40 to 100, 50 to 120, 70 to 150 °C		
	30 to 95, 75 to 160, 105 to 210, 160 to 300 °F		
Max. permissible temperature [°C/°F]	Liquids, steam: 200/390		Liquids: 150/300 Non-flammable gases: 80/175
Compliance	CE · EAC		
Data sheets	**T 2172, T 2174**		

Type 43-1

Type 43-2

Type 43-3

Connections

	DIN									ANSI								
	G			DN						NPT			NPS					
	½	¾	1	15	20	25	32	40	50	½	¾	1	½	¾	1	1¼	1½	2
Type 43-1	•	•	•							•	•	•						
Type 43-2				•	•	•	•	•	•				•	•	•	•	•	•
Type 43-3	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Type 43-5	•	•	•							•	•	•						
Type 43-6	•	•	•				•	•	•	•	•	•				•	•	•
Type 43-7				•	•	•	•	•	•				•	•	•	•	•	•

Materials

Body	Red brass · 1.4408 [2] (Types 2431 and 2436 only) · EN-JS1049 [1]
Sensor	
Thermowell	Copper or 1.4310
Capillary tube	Copper or 1.4310

[1] Flanged body
[2] Special version of Type 43-1 (G ½, G ¾, G 1 and DN 15, DN 25)

Special versions

- Versions tested according to DIN EN 14597 (see T 2181)
- Capillary tube
- Internal parts resistant to mineral oils
- Fast-responding thermostats (vapor pressure principle)
- Small K_{VS} in DN 15 or G ½
- Stainless steel body for Type 43-1
- Flanged valve body of EN-JS1049 for Type 43-2

Type 43-5

Self-operated Temperature Regulators

Temperature regulators with hydraulic controllers · Type 43-8 and Type 43-8 N

Application

Temperature regulation of instantaneous water heaters in small district heating units, particularly in single or multiple-family dwellings

Special features

- Low-maintenance proportional regulators requiring no auxiliary energy
- Tested according to DIN EN 14597
- Regulation of small instantaneous water heaters
- Idle temperature regulation
- Fast-responding vapor pressure thermostats

Versions

Type 43-8 and **Type 43-8 N** for local heat supply networks with

– Type 2430 K Thermostat with Type 2438 K Hydraulic Controller and
– Type 2432 K Valve

Technical data

Type 2432 K Valve	**Type 43-8**	**Type 43-8 N**
Valve size	DN 15	
K_{VS} coefficient	2.5	
Permissible temperature (valve)	Max. 130 °C	Max. 120 °C
Compliance	EAC	
Control thermostat	**Type 2430 K (vapor pressure)**	
Set point range	45 to 65 °C	
Permissible temperature at sensor	Max. 30 K above the adjusted set point	
Capillary tube length	2 m	
Hydraulic controller	**Type 2438 K**	
Required differential pressure	0.4 bar with a tapping rate up to 10 l/minute 0.5 bar with a tapping rate up to 20 l/minute	
Pressure rating	PN 16	
Max. flow rate	20 l/min	
Min. tapping rate	2 l/min	
Data sheet	**T 2178**	

Materials

Type	**43-8**	**43-8 N**
Body	CC491K (red brass, Rg 5)	CW602N (hot-pressed brass)
Valve seat	1.4305	
Plug	1.4104 and brass (resistant to dezincification) with EPDM soft seal	
Temperature sensor		
Capillary tube	Copper	
Sensor	CrNiMo steel	

Special version with Type 2439 K Safety Temperature Limiter

Type 43-8

Self-operated Temperature Regulators

Typetested safety devices

Safety temperature limiter with safety thermostat · Type 2439 K

Application

Temperature limitation in heating and water heating installations according to DIN 4747-1, DIN EN 12828, DIN EN 12953-6, and DIN 4753 · Tested according to DIN EN 14597

Special features

- Safety temperature limitation of the energy supply by closing and locking a valve using a spring mechanism
- The valve closes when the adjusted set point is reached, when the capillary tube breaks or when leakage occurs in the system
- Reset or start-up using a screwdriver, provided the defect has been eliminated and the temperature has fallen below the limit value

Versions

Safety temperature limiter (STL) consisting of:

– Types 2431 K/2432 K/2433 K/2435 K/2436 K/2437 K Valve and

– **Type 2439 K** Safety Thermostat with temperature sensor and thermowell, limit value adjuster, capillary tube, and connecting element with spring mechanism

Technical data

Safety thermostat	**Type 2439 K Safety Temperature Limiter (STL)**
Limit value range	10 to 95 °C or 20 to 120 °C
Permissible ambient temperature	80 °C
Permissible temperature at sensor	Max. 20 K above the adjusted set point
Capillary tube length	2 m
Compliance	CE · EAC
Data sheet	**T 2185**

Materials

Connecting element with spring mechanism	PTFE, glass fiber reinforced
Sensor	Copper
Thermowell	Copper or CrNiMo steel
Capillary tube	Copper

Special versions with

– G ½ thermowell of CrNiMo steel
– 5 m capillary tube
– Electric signal transmitter
– Reduced K_{VS} coefficient in DN 15 or G ½

Combinations

– The safety temperature limiter can be combined with a Type 2430 K Thermostat (TR/STL).
– Safety temperature monitor with differential pressure/flow rate regulation

Type 2439 K

Type 2432 K Valve with Type 2439 K Safety Temperature Limiter and Do3 K double adapter with two Type 2430 K Thermostats

Self-operated Temperature Regulators

Typetested safety devices

Safety temperature monitor with safety thermostat · Type 2403 K

Application

Temperature monitoring in heating and water heating installations according to DIN 4747-1, DIN EN 12828, and DIN 4735 · Tested according to DIN EN 14597

Special features

- The valve closes when the adjusted set point is reached, when the capillary tube breaks or when leakage occurs in the system
- Automatic reset or start-up, provided the defect has been eliminated and the temperature has fallen below the limit value

Versions

Safety temperature monitor (STM) consists of:

– Types 2431 K/2432 K/2433 K/2435 K/2436 K/2437 K Valve and

– **Type 2403 K** Safety Thermostat with temperature sensor, limit value adjuster, capillary tube, and connecting element with spring mechanism

Technical data

Safety thermostat	**Type 2403 K Safety Temperature Monitor**
Limit value range	60 to 75 °C, 75 to 100 °C, 100 to 120 °C
Permissible ambient temperature	Max. 50 °C
Permissible temperature at sensor	Max. 25 K above the adjusted set point
Capillary tube length	5 m
Compliance	CE · EAC
Data sheet	**T 2183**

Materials

Connecting element	PPO with brass connection nut
Set point adjuster	PTFE, glass fiber reinforced
Sensor	1.4571
Capillary tube	Copper

Combinations

– The safety temperature monitor can be combined with a Type 2430 K Thermostat (TR/STM).

– Safety temperature monitor with differential pressure/flow rate regulation

Further self-operated temperature regulators:

– **Type 2040** · Safety temperature monitor for cryogenic applications, see page 98

Type 2432 K Valve and
Type 2403 K Safety Temperature Monitor with
Type 2430 K Thermostat

Self-operated Pressure Regulators

Pressure reducing valve · Type 2405

Excess pressure valve · Type 2406

CE

Application

Pressure regulation of flammable gases used as a source of energy or to control compressed air supply in process engineering applications

Special features

- Low-maintenance proportional regulators
- Compact regulator design providing excellent control accuracy
- Internal set point springs with set point adjustment using a nut on the actuator
- Fulfills stricter fugitive emission requirements (TA Luft)
- Minimum leakage class IV
- Suitable for vacuum

Versions

– **Pressure reducing valve** or **excess pressure valve** with flange or threaded connections
Soft-seated plug · DIN and ANSI versions

Technical data

Type	**2405**	**2406**
Pressure reducing valve	•	
Excess pressure valve		•
Set point range	5 mbar to 10 bar	
K_{VS} coefficient	0.016 to 32	
Valve size	DN 15 to 50	
Pressure rating	PN 16 to 40	
Medium temperature range	–20 to +60 °C [1]	
Compliance	CE · EAC	
Data sheets	**T 2520**	**T 2522**

[1] 0 to 150 °C: for unbalanced version with FPM diaphragm/soft seal

Materials

Body	EN-JL1040, EN-JS1049 · 1.0619, 1.4571, 1.4408
Seat	1.4112, 1.4404
Plug	1.4305
Plug seal, diaphragm	EPDM, FPM, NBR
Springs	1.4310
Actuator housing	1.0332, 1.4301

Special versions

– FDA-compliant materials for the food processing and pharmaceutical industries
– Version according to NACE (sour gas)
– With seal and leakage line connection
– With directly connected control line

Type 2405 or Type 2406
with flanges

Self-operated Pressure Regulators

Pressure reducing valve · Type 41-23

Excess pressure valve · Type 41-73

Application

Pressure set points from 0.05 to 28 bar (0.75 to 400 psi) · Suitable for liquids, gases, and vapors up to 350 °C (600 °F)

Special features

- Low-maintenance, medium-controlled proportional regulators requiring no auxiliary energy
- Frictionless plug stem seal with stainless steel bellows
- Exchangeable positioning springs and actuator
- Single-seated valve with upstream and downstream pressure balancing

Versions

– **Type 41-23 Pressure Reducing Valve:** Type 2412 Valve and Type 2413 Actuator with EPDM rolling diaphragm

– **Type 41-73 Excess Pressure Valve:** Type 2417 Valve and Type 2413 Actuator with EPDM rolling diaphragm

Technical data

Valve	**Type**	**2412, 2417**		
Valve size	DN	15 to 50	65 to 80	100
	NPS	½ to 2	2½ and 3	4
Max. Δp		25 bar (360 psi)	20 bar (290 psi)	16 bar (230 psi)
Actuator	Type	**2413**		
Set point range		0.05 to 0.25 bar, 0,1 to 0.6 bar, 0,2 to 1.2 bar, 0.8 to 2.5 bar, 2 to 5 bar, 4.5 to 10 bar, 8 to 16 bar		
		0.75 to 3.5 psi, 1.5 to 8.5 psi, 3 to 17 psi, 10 to 35 psi, 30 to 75 psi, 65 to 145 psi, 115 to 230 psi		
Max. permissible temperature		Gases 350 °C (660 °F), at the actuator max. 80 °C (175 °F) Liquids 150 °C (300 °F), with compensation chamber 350 °C (660 °F) Steam with compensation chamber 350 °C (660 °F)		
Compliance		CE · EAC		
Data sheets		**T 2512/T 2513, T 2517/T 2518**		

Type 41-23

Type 41-23, stainless steel version

Materials

Valve	Type	2412, 2417			
Pressure rating	PN	16	25	40	40
	Class	125	150	300	300
Max. permissible temperature	°C	300	350	350	350
	°F	570	660	660	660
Body	DIN	EN-JL1040	EN-JS1049	1.0619	1.4408
	ANSI	A126 B	A216 WCC		A351 CF8M
Seat/plug		CrNiMo steel/CrNiMo steel			CrNiMo steel
Actuator	**Type**	**2413**			
Diaphragm cases		Sheet steel DD11 [1]			
Diaphragm		EPDM with fabric reinforcement, FPM for mineral oils NBR, EPDM with PTFE foil			

[1] In corrosion-resistant version (CrNi steel)

Special versions

- Control line kit for tapping the pressure directly at the valve body (accessories)
- With internal parts made of FPM (FKM), e.g. for use with mineral oils
- Free of oil and grease for oxygen with FPM (FKM) diaphragm
- EPDM diaphragm with PTFE protective facing
- Actuator for remote set point adjustment (autoclave control)
- Bellows actuator for valves DN 15 to 100, set point ranges 2 to 6, 5 to 10, 10 to 22 or 20 to 28 bar
- Valve with flow divider St I or St III (DN 65 to 100) for particularly low-noise operation with gases and vapors
- Seat and plug with Stellite® facing · Plug with PTFE/EPDM/FPM/NBR soft seal
- Wetted plastic parts conforming to FDA regulations (max. 60 °C)
- Lubricants for ultrapure water or gas

Type 41-73

Self-operated Pressure Regulators

Pressure reducing valves · Type 44-0 B and Type 44-1 B

Excess pressure valve · Type 44-6 B

CE

Application

Pressure set points from 0.2 to 20 bar (3 to 290 psi), suitable for non-flammable gases, liquids, and steam

Special features

- Low-maintenance proportional regulators requiring no auxiliary energy
- Stainless steel operating bellows as operating element
- Compact design with particularly low overall height
- Spring-loaded, single-seated valve with balanced plug

Versions

– **Type 44-0 B Pressure Reducing Valve:** valve PN 25 (Class 250), for steam up to 200 °C (390 °F) · Unbalanced or balanced

– **Type 44-1 B Pressure Reducing Valve:** valve PN 25 (Class 250) for air up to 150 °C (300 °F) · Nitrogen up to 200 °C (390 °F), other gases up to 80 °C (175 °F) · Liquids up to 150 °C (300 °F) · Unbalanced or balanced

– **Type 44-6 B Excess Pressure Valve:** valve PN 25 (Class 250) for air up to 150 °C (300 °F) · Nitrogen up to 200 °C (390 °F), other gases up to 80 °C (175 °F) · Liquids up to 150 °C (300 °F) and steam up to 200 °C (390 °F) · Unbalanced or balanced (standard)

Technical data

Regulator		Pressure reducing valve		Excess pressure valve
		Type 44-0 B	Type 44-1 B	Type 44-6 B
Connection (female thread or flanges)		G ½, G ¾, G 1, DN 15 to 50 (NPS ½ to 2), ½ NPT, ¾ NPT, 1 NPT		
Pressure rating		PN 25 (Class 250)		
Set point range	bar	0.2 to 2, 1 to 4, 2 to 6, 4 to 10, 8 to 20 (PN 16)		
	psi	3 to 30/15 to 60/30 to 90/60 to 150/120 to 290		
Compliance		CE · EAC		
Data sheets		**T 2626, T 2627, T 2628**		

K_{VS} or C_V coefficients

Body with screwed ends: Type 44-1 B, Type 44-6 B, Type 44-0 B			
Connection	G ½ (½ NPT)	G ¾ (¾ NPT)	G 1 (1 NPT)
K_{VS} [1]	3.2	4	5
C_V	4	5	6

Flanges: Type 44-1 B, Type 44-6 B, Type 44-0 B				
Connection	DN 15 (NPS ½)	DN 25 (NPS 1)	DN 40 (NPS 1½)	DN 50 (NPS 2)
K_{VS} [1]	3.2	5	16	20
C_V	4	6	–	–

[1] Special K_{VS} coefficients on request

Type 44-0 B,
body with screwed ends

Type 44-1 B,
body with screwed ends

Type 44-1 B, flanged body

Type 44-6 B, flanged body

Materials

Body	Red brass CC491K CC499K C 83600	Spheroidal graphite iron EN-JS1049	Stainless steel 1.4408
Seat	Stainless steel 1.4305		1.4404
Plug			
Type 44-1 B	Brass (free of dezincification), soft seal		1.4404, metal or soft seal
Type 44-6 B	Brass (free of dezincification), soft seal		1.4404, metal or soft seal
Type 44-6 B (steam regulator)	Brass (resistant to dezincification) with PTFE soft seal or metal seal		1.4404, with PTFE soft seal or metal seal
Type 44-0 B	Brass (resistant to dezincification) with PTFE soft seal Balanced: 1.4404, metal seal		1.4404, with PTFE soft seal
Operating/ balancing bellows	Steel: 1.4571		1.4571

Connections: Type 44-0 B, Type 44-1 B, and Type 44-6 B

		DIN							ANSI				
		G			DN				NPT			NPS	
Body material	Connection	½	¾	1	15	25	40	50	½	¾	1	½	1
Stainless steel/red brass	Female thread	•	•	•									
Stainless steel	Flange				•	•							
Spheroidal graphite iron	Flange				•	•	•	•					
A351 CF8M, C83600	Female thread								•	•	•		
A351 CF8M	Flange											•	•

Self-operated Pressure Regulators

Pressure reducing valve with pilot valve · Type 2333

Excess pressure valve with pilot valve · Type 2335

CE

Application

Pressure set points from 2 to 28 bar, suitable for liquids, gases and vapors up to 350 °C
The attached pilot valve (either a pressure reducing valve or excess pressure valve) determines the function of the regulator.

Special features

- Pressure regulator, pilot-operated by the process medium with excellent control properties
- High control accuracy
- Set point adjustment at the pilot valve

Versions

– **Type 2422 Valve:** modified, with suitable pilot valve with set point adjuster, valve conforming with DIN, ANSI, or JIS standards
– **Type 2333 Pressure Reducing Valve:** to regulate the downstream pressure p_2 to the adjusted set point. Suitable pilot valves: Type 44-1 B or Type 44-0 B, Type 44-2, Type 41-23, Type 2405
– **Type 2335 Excess Pressure Valve:** to regulate the upstream pressure p_1 to the adjusted set point. Suitable pilot valves: Type 44-6 B, Type 44-7, Type 41-73, Type 2406

Technical data

Valve	**Type**	**2422**					
Valve size	DN	125	150	200	250	300	400
K_{VS} coefficient	Balanced by a bellows	200	360	520	620	–	–
K_{VS} I [1]		150	270	400	500	–	–
K_{VS} III [2]		100	180	260	310	–	–
K_{VS} coefficient	Balanced by a diaphragm	250	380	650	800	1250	2000
Set point range		Depending on the pilot valve used					
Compliance		CE · EAC					
Data sheets		**T 2552, T 2554**					

[1] With flow divider I [2] With flow divider III

Materials

Valve	**Type**	**Type 2422** · Balanced by a bellows · Balanced by a diaphragm			
Pressure rating	PN	16	16/25	16/25/40	
Body	DIN	EN-JL1040	EN-JS1049	1.0619	CrNiMo steel
	ANSI	A126 B	–	A216 WCC	A351 CF8M
Valve seat		1.4006			1.4404
Plug (standard)		1.4301 with PTFE soft seal			

Special versions

With flow divider for noise reduction · Version resistant to mineral oils · Version for flammable gases · Free of non-ferrous metal · Lower minimum differential pressure · Larger nominal sizes · Reduced K_{VS} · Version for deionized water · Version for oxygen · With solenoid valve for emergency function

Type 2333 (DN 150)
with Type 50 ES Pilot Valve

Type 2335 (DN 150)
with Type 44-7 Pilot Valve

Self-operated Pressure Regulators

Pressure reducing valve · Type 44-2

Safety shut-off valves (SSV) · Type 44-3 and Type 44-9

Excess pressure valve · Type 44-7

Safety excess pressure valves (SEV) · Type 44-8 and Type 44-4

CE

Application

Pressure set points from 0.2 to 11 bar, suitable for liquids, air, and nitrogen · SSV and SEV to protect district heating systems

Special features

- Low-maintenance proportional regulators requiring no auxiliary energy
- Tight-closing single-seated valve with balanced plug
- SEV and SSV: typetested for water by the German technical surveillance association (TÜV)

Versions

Series 44 Pressure Regulators with set point ranges from 0.2 to 11 bar
Nominal sizes DN 15 to 50 · With welding ends and flanged valve body

– **Type 44-2 Pressure Reducing Valve:** with one operating diaphragm
– **Type 44-3 Safety Shut-off Valve (SSV):** with pressure reducing valve and two operating diaphragms · Typetested for water by TÜV · In the event of a diaphragm rupture, the valve continues to function.
– **Type 44-9 Safety Shut-off Valve (SSV):** with pressure reducing valve and two operating diaphragms · Typetested for water by TÜV · In the event of a diaphragm rupture, the valve closes.
– **Type 44-7 Excess Pressure Valve:** with one operating diaphragm
– **Type 44-8 Safety Excess Pressure Valve (SEV):** with two operating diaphragms · Typetested for water by TÜV· In the event of a diaphragm rupture, the valve continues to function.
– **Type 44-4 Safety Excess Pressure Valve (SEV):** with two operating diaphragms · Typetested for water by TÜV· In the event of a diaphragm rupture, the valve opens.

Technical data

Valve size	**DN**	**15**	**20**	**25**	**32**	**40**	**50**
K_{VS} coefficient		1/2.5/4	6.3	8	12.5	16	20
Max. permissible temperature		150 °C					
Set point range							
Type 44-2	bar	0.5 to 2, 1 to 4, 2 to 4.2, 2.4 to 6.3, 6 to 10.5					
Type 44-3 (SSV)	bar	2 to 4.2, 2.4 to 6.3, 6 to 10.5 (without typetesting: 1 to 4)					
Type 44-9 (SSV)	bar	1 to 4, 2 to 4.2, 2.4 to 6.3, 6 to 10.5					
Type 44-7	bar	0.1 to 1, 0.5 to 2, 1 to 4, 2 to 4.4, 2.4 to 6.6, 6 to 11					
Type 44-8 (SEV)	bar	2 to 4.4, 2.4 to 6.6, 6 to 11					
Type 44-4 (SEV)	bar	2 to 4.4, 2.4 to 6.6, 6 to 11					
Compliance		CE · EAC					
Data sheets		**T 2623, T 2723, T 2630, T 2632**					

Types 44-3/-9

Types 44-8/-4 (SEV)

Materials

Body	Red brass CC491K/CC499K, EN-JS1049 [1)]
Seat	Stainless steel 1.4305
Plug	Brass 2.0402 and 1.4305 with EPDM soft seal

[1)] Additional version for Type 44-3, DN 32 to 50: valve with flanged body

Special version

- Internal parts resistant to mineral oils
- Special K_{VS} coefficients for DN 15

Type 44-6 B,
body with screwed ends

Series 2371 Pressure Regulators for the Food and Pharmaceutical Industries

Pressure reducing valves · Type 2371-10 and Type 2371-11

Excess pressure valves · Type 2371-00 and Type 2371-01

Application

Pressure reducing valves or excess pressure valves for the food and pharmaceutical industries for liquids and gases

Special features

- Proportional pressure regulators
- Wetted inside surfaces with a surface roughness $R_a \leq 0.8$ µm; outside surface glass bead blasted
- Stainless steel 1.4404 (316L) or 1.4409 (CF3M)
- FDA-approved materials
- Cavity-free angle-style body
- Test bore to monitor the diaphragm for leakage
- Optional stem locking facility to keep valve open during CIP or SIP

Versions

– **Type 2371-11 and Type 2371-11:** pressure reducing valves with diaphragm to regulate the outlet pressure · Set point of Type 2371-10 adjusted pneumatically, Type 2371-11 adjusted by the set point spring

– **Type 2371-00 and Type 2371-01:** excess pressure valves with diaphragm to regulate the inlet pressure · Set point of Type 2371-00 adjusted pneumatically, Type 2371-01 adjusted by the set point spring

Technical data

Regulator		Type 2371 Pressure Reducing Valve		Type 2371 Excess Pressure Valve	
		-10	-11	-00	-01
Valve size		DN 15 to 50 (NPS ½ to 2)			
Connection		Clamps, threaded connections, flanges		Clamps, threaded connections, flanges, welding ends	
Set point range	bar	0.3 to 1.2, 1 to 3, 2.5 to 4.5, 4 to 6			
	psi	5 to 18, 15 to 45, 35 to 65, 60 to 90			
Maximum pressure		10 bar (150 psi)			
Permissible temperature		–10 to +160 °C (14 to 320 °F)			
Leakage class acc. to DIN EN/ANSI		Metal seal: ≤0.05 % of K_{VS}/C_V			
		Soft seal: ≤0.01 % of K_{VS}/C_V			
Compliance		EAC			
Data sheets		**T 2640**		**T 2642**	

Special versions

– Body made of 1.4435, others on request
– DN 50 body with DN 65 connections

Type 2371-11

Type 2371-00

Type 2371-01 with manual stem locking

Self-operated Pressure Regulators

Pressure reducing valve · Type 2422/2424

Excess pressure valve · Type 2422/2425

Application

Pressure regulators for set points from 0.05 to 2.5 bar · Valve nominal sizes DN 125 to 250
Nominal pressure PN 16 to 40 · Suitable for liquids, gases, and vapors up to 350 °C

Special features

- Low-maintenance, medium-controlled proportional regulators requiring no auxiliary energy
- Wide set point range and convenient set point adjustment using a nut
- Exchangeable set point springs and actuator
- Spring-loaded, single-seated valve with upstream and downstream pressures balanced by a stainless steel bellows or by a balancing diaphragm
- Standard low-noise plug · Special version with flow divider St I or St III for further noise level reduction
- Reduced K_{VS} coefficients to adapt the regulator to the operating conditions

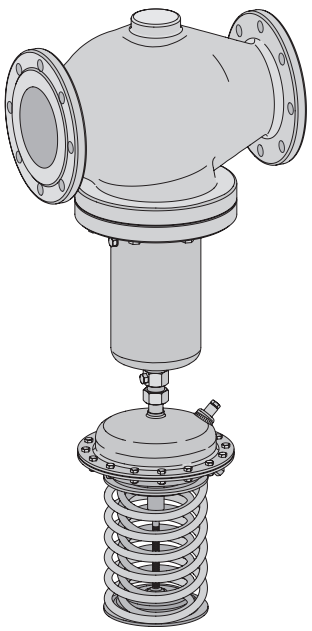
Versions

– **Type 2422/2424 Pressure Reducing Valve:** Type 2422 Valve balanced by a bellows or a diaphragm with soft-seated plug · Body of cast iron, spheroidal graphite iron, cast steel, or cast stainless steel · Type 2424 Actuator with EPDM rolling diaphragm

– **Type 2422/2425 Excess Pressure Valve:** Type 2422 Valve balanced by a bellows or a diaphragm with soft-seated plug · Body of cast iron, spheroidal graphite iron, cast steel, or cast stainless steel · Type 2425 Actuator with EPDM rolling diaphragm

Technical data

Type 2422 Valve		
Valve size		DN 125, 150, 250 (NPS 6, 8, 10)
Nominal pressure		PN 16, 25, 40 (Class 125, 150, 300)
Max. permissible temperature	Valve body	Up to 350 °C
	Valve plug balanced by a bellows	Metal seal: 350 °C, PTFE soft seal: 220 °C, EPDM or FPM (FKM) soft seal: 150 °C, NBR soft seal: 80 °C
	Valve plug balanced by a diaphragm	150 °C
K_{VS} coefficient		40 to 800
Max. Δp		10 to 20 bar
Leakage class acc. to IEC 60534-4		≤0.05 % of K_{VS} coefficient
Compliance		CE · EAC
Type 2424/Type 2425 Actuator		
Set point ranges		0.05 to 0.25 bar, 0.1 to 0.6 bar, 0.2 to 1 bar, 0.5 to 1.5 bar, 1 to 2.5 bar
Max. permissible pressure		320 cm² actuator area: 3 bar, 640 cm² actuator area: 1.5 bar
Max. permissible temperature		Gases at the actuator 80 °C · Liquids 150 °C, with compensation chamber 350 °C · Steam with compensation chamber 350 °C
Data sheets		**T 2547/T 2548, T 2549/T 2550**



Type 2422/2424

Special versions

- With flow divider St I or St III for particularly low-noise operation
- With metal-seated plug
- With FPM (FKM) rolling diaphragm, e.g. for mineral oils or flammable gases
- With NBR rolling diaphragm for flammable gases
- Version completely in stainless steel for nominal pressure PN 16 to 40
- Versions for oxygen service
- Actuator with two diaphragms
- With metal cover to protect the set point springs

Type 2422/2425

Materials

Type 2422 Valve, balanced by a bellows				
Nominal pressure	PN 16	PN 25	PN 16, 25 and 40	
Valve body	Cast iron EN-JL1040	Spheroidal graphite iron EN-JS1049	Cast steel 1.0619	Stainless steel 1.4408
Seat	1.4006			1.4404
Plug	1.4404			1.4404 with PTFE seal
Seal for soft-seated plug	PTFE · EPDM/FPM (FKM) · NBR			
Plug stem	1.4301			
Metal bellows	1.4571			
Bottom section	1.0305			1.4571
Body gasket	Graphite on metal core			
Type 2422 Valve, balanced by a diaphragm				
Nominal pressure	PN 16	PN 16/25	PN 16, 25 and 40	
Valve body	Cast iron EN-JL1040	Spheroidal graphite iron EN-JS1049	Cast steel 1.0619	Stainless steel 1.4408
Valve seat	Red brass [1]			
Plug	Red brass [1] · With EPDM soft seal or with PTFE soft seal			
Pressure balancing	Balancing cases made of sheet steel DD11 · EPDM balancing diaphragm for liquids and non-flammable gases or NBR diaphragm for flammable gases			
Gasket	Graphite on metal core			
Type 2424/Type 2425 Actuator				
Diaphragm cases	DD 11			1.4301
Diaphragm	EPDM with fabric reinforcement · FPM (FKM) · NBR			
Guide bushing	DU bushing			PTFE
Seals	EPDM · FPM (FKM) · NBR			

[1] Special version 1.4409

Self-operated Pressure Regulators

Type 2404-1 Pressure Reducing Valve with Pilot Valve for small set point ranges

CE

Application

Pressure reducing valve for set points from 3 to 100 mbar (0.045 to 1.5 psi) · Valve size DN 25 to 150 (NPS 1 to 6) · Suitable for gases at temperatures from –20 to +90 °C (–5 to 195 °F)

Special features

- Pilot control provides excellent control accuracy
- Soft-seat plug provides bubble-tight shut-off performance
- Meets strict emission requirements (TA Luft)
- Suitable for sour gas service (NACE)

Versions

– **Type 2404-1**, pilot-operated pressure reducing valve consisting of: Type 2406 Main Valve, Type 2405 Pilot Valve, Type 2441 Input Pressure Regulator, M2404-1 mounting kit

Type 2404-1

Technical data

Valve size	DN 25 to 150 (NPS 1 to 6)
Nominal pressure	PN 16 to 40 (Class 125, 150, 300)
K_{VS} coefficient	8 to 380 (C_V 9.4 to 450)
Permissible ambient temperature	–20 to +90 °C (–5 to +195 °F) [1]
Set point ranges	3 to 10 mbar, 5 to 30 mbar, 25 to 100 mbar 0.045 to 0.15 psi, 0.075 to 0.45 psi, 0.35 to 1.5 psi
Leakage class according to ANSI/ FCI 70-2 or IEC 60534-4	Soft-seated, minimum Class IV
Max. input pressure	12 bar (175 psi) [1]
Differential pressure Δp_{min}	1 bar (15 psi)
Compliance	CE · EAC
Data sheet	**T 2538**

[1] Higher values on request

Materials

Body	A126B, A216 WCC, A351 CF8M · EN-JL1040, 1.0619, 1.4408
Seat	316L [1]
Plug	316L [1]

[1] NPS 6 (DN 150): CF3M (1.4409)

Special version

– With FDA-compliant materials
– For sour gas service (NACE)
– Actuator of pilot valve with seal and leakage line connection

Self-operated Pressure Regulators

Type 2404-2 Excess Pressure Valve with Pilot Valve for small set point ranges

CE

Application

Excess pressure valve for set points from 5 to 200 mbar (0.075 to 3 psi) · Valve size DN 65 to 400 (NPS 2½ to 16) · Suitable for gases at temperatures from –20 to +90 °C (–5 to +195 °F)

Special features

- Pilot control provides excellent control accuracy
- Soft-seat plug provides bubble-tight shut-off performance
- Meets strict emission requirements (TA Luft)
- Suitable for sour gas service (NACE)

Versions

– **Type 2404-2**, pilot-operated excess pressure valve consisting of: Type 2406 or Type 2422 Main Valve, Type 2406 Pilot Valve, Type 2441 Input Pressure Regulator, M2404-2 mounting kit

Type 2404-2

Technical data

Valve size	**DN 65 to 150 (NPS 2½ to 6)**
Pressure rating	PN 16, 40 (Class 150, 300)
K_{VS} coefficient	50 to 380 (C_V 60 to 450)
Permissible ambient temperature	–20 to +90 °C (–5 to +195 °F) [1]
Set point ranges	5 to 15 mbar, 10 to 30 mbar, 25 to 60 mbar, 50 to 200 mbar 0.07 to 0.2 psi, 0.15 to 0.4 psi, 0.3 to 0.9 psi, 0.7 to 3 psi
Leakage class according to ANSI/ FCI 70-2 or IEC 60534-4	Soft-seated, minimum Class IV
Differential pressure Δp_{min}	12 bar (175 psi)
Compliance	CE · EAC
Data sheet	**T 2540**

[1] Higher values on request

Materials

Body	A126B, A216 WCC, A351 CF8M · EN-JL1040, 1.0619, 1.4408
Seat	316L
Plug	316L

Special version

– Version with FDA-compliant materials
– Versions for sour gas service (NACE)
– Actuator of pilot valve with seal and leakage line connection

Type 42-10 RS Check Valve (backflow protection)

Application

For safeguarding nitrogen and compressed air networks against backflow from directly connected systems. The regulator is open, provided the upstream pressure is at least 0.2 bar greater than the downstream pressure. It closes automatically when the downstream pressure rises to or above the value of the upstream pressure.

Special features

- Low-maintenance, medium-controlled proportional regulators requiring no auxiliary energy
- Fixed set point, external adjustment not possible
- Regulators delivered ready-to-install without supplementary devices, meaning no additional installations or start-ups are necessary
- Reliable functioning even in the event of a power failure or when other instruments in the control circuit malfunction
- Diaphragm rupture indication, in the event of a diaphragm ruptures, the undamaged operating diaphragm takes over the function of the damaged diaphragm
- Backflow only leads to a minimum amount of leakage due to the soft-seated plug
- An increasing backpressure supports tight shut-off of the valve
- Valve body optionally available in cast steel, cast stainless steel or forged stainless steel
- Wetted parts free of non-ferrous metal

Versions

Check valve in supply pipelines

– **Type 42-10 RS:** Type 2421 RS Valve and Type 2420 RS Actuator with two diaphragms Fixed set point at 0.2 bar

Technical data

Valve **Type**	**2421 RS**	
Valve size	DN 15 to 250 (NPS ½ to 10)	
K_{VS} coefficient (C_V coefficient)	4 to 500 (4.5 to 585)	
Pressure rating	PN 25/40 (Class 150/300)	
Max. constant operating pressure	25 bar	
Max. perm. pressure acting on one side	45 bar	
Actuator **Type**	**2420 RS**	
Diaphragm area	320 cm²	640 cm²
Δp set point, fixed	DN 15 to 150: 0.2 bar, DN 200 to 250: 0.3 bar	
Max. permissible temperature	Air and gases: 80 °C Water: 150 °C Steam with compensation chamber: 220 °C	
Compliance	EAC	
Data sheets	**T 3009/T 3010**	

Further versions

– Diaphragm rupture indication with pressure switch (optional)
– Stainless steel version (optional)
– Version for steam (on request)

Type 42-10 RS

Self-operated Flow Regulators

Flow regulator · Type 42-36

Application

For district heating supply networks and large heating systems. The devices regulate the flow rate of liquids to the adjusted set point.

Special features

- The valve closes when the flow rate rises
- Medium-controlled proportional regulators requiring no auxiliary energy
- Single-seated valve with a plug balanced by a stainless steel bellows or a balancing diaphragm (DN 65 to 250)

Versions

– **Type 42-36:** Type 2423 Valve with Type 2426 Actuator, integrated restriction for adjusting the flow rate set point

Technical data

Type	42-36
Valve size	DN 15 to 250 (NPS ½ to 10)
Pressure rating	PN 16, 25, 40 (Class 125, 250, 150, 300)
Flow rate set point ranges	
Differential pressure at restriction: 0.2 bar	0.05 to 220 m³/h (0.2 to 970 US gal/min), balanced by a bellows: max. 350 m³/h (1540 US gal/min)
Differential pressure at restriction: 0.5 bar	0.15 to 300 m³/h (0.7 to 1300 US gal/min), balanced by a bellows: max. 520 m³/h (2290 US gal/min)
Max. permissible medium temperature	Steam and liquids with compensation chamber: 220 °C (430 °F), without compensation chamber: 150 °C (300 °F), air [1]: 80 °C (175 °F)
K_{VS} coefficient	4 [2] to 800
Data sheets	**T 3015, T 3016**

1) Special restriction for air and nitrogen up to 150 °C (300 °F) on request
2) Special restriction for very low flow rates on request

Special version for mineral oils

Type 42-36

Materials

Valve	Type	2423			
Body material	DIN	EN-JL1040	EN-JL1049	1.0619	1.4408
	ANSI	A126 B	–	A216 WCC	A351 CF8M
Pressure rating	PN	16	25	16/25/40	
	Class	125/250	–	150/300	
Seat					
Balanced by a bellows		1.4104, 1.4006			1.4404
Balanced by a diaphragm (max. 150 °C)		Red brass, 1.4006 (DN 65 to 100)			1.4409
Plug					
Balanced by a bellows		Up to DN 100: 1.4112, 1.4104, 1.4006 DN 125 and larger: 1.4404 with EPDM soft seal			1.4404
Balanced by a diaphragm (max. 150 °C)		Red brass, 1.4104 and 1.4006 (DN 65 to 100)			1.4409 [1]
Balancing bellows		DN 15 to 100: 1.4571, DN 125 and larger: 1.4404			
Balancing diaphragm		EPDM with fabric reinforcement			
Actuator	**Type**	**2426**			
Diaphragm cases		DD11			1.4301
Diaphragm		EPDM with fabric reinforcement			

[1] DN 65 to 100: 1.4404

Self-operated Flow and Differential Pressure Regulators

Flow and differential pressure regulators · Type 42-37 and Type 42-39

Application

Flow and differential pressure regulators or flow and pressure regulators for district heating and extended heating systems

Special features

- The valve closes when the differential pressure or flow rate rises
- Low-noise, self-operated proportional regulators requiring little maintenance
- Single-seated valve with a plug balanced by a stainless steel bellows or a balancing diaphragm (DN 65 to 250)

Versions

– **Type 42-37:** flow and differential pressure regulator consisting of a Type 2423 Valve (DN 15 to 250) with integrated restriction and a Type 2427 Actuator. Flow rate set point adjustable at the restriction; differential pressure set point adjustable at the actuator

– **Type 42-39:** flow and differential pressure or pressure regulator consisting of a Type 2423 Valve (DN 15 to 250) with integrated restriction and a Type 2429 Actuator. Flow rate set point adjustable at the restriction; differential pressure or pressure set point adjustable at the actuator

Technical data

Type	**42-37, 42-39**
Valve size	DN 15 to 250
Pressure rating	PN 16, 25, 40
Flow rate set point ranges	
Differential pressure at restriction: 0.2 bar	0.05 to 220 m³/h, balanced by a diaphragm up to 350 m³/h
Differential pressure at restriction: 0.5 bar	0.15 to 300 m³/h, balanced by a diaphragm up to 520 m³/h
Differential pressure or differential pressure set point ranges	0.1 to 2.5 bar [1]
Permissible medium temperature	Steam and liquids with compensation chamber: 220 °C, without compensation chamber: 150 °C
K_{VS} coefficient	4 [2] to 800
Data sheet	**T 3017**

1) Set point ranges up to 10 bar on request
2) Special restriction for very low flow rates on request

Special ANSI and JIS versions (on request)

Type 42-37

Materials

Valve	Type	2423			
Body material	DIN	EN-JL1040	EN-JL1049	1.0619	1.4408
Pressure rating	PN	16	25	16/25/40	
Seat					
Balanced by a bellows		1.4104, 1.4006			1.4404
Balanced by a diaphragm (max. 150 °C)		Red brass, DN 65 to 100: 1.4006			1.4409
Plug					
Balanced by a bellows		Up to DN 100: 1.4112, 1.4104, 1.4006 DN 125 and larger: 1.4404 with EPDM soft seal			1.4404
Balanced by a diaphragm (max. 150 °C)		Red brass, 1.4104 and 1.4006 (DN 65 to 100)			1.4409 [1]
Balancing bellows		DN 15 to 100: 1.4571, DN 125 and larger: 1.4404			
Balancing diaphragm		EPDM with fabric reinforcement			
Actuator	**Type**	**2427, 2429**			
Diaphragm cases		DD11			1.4301
Diaphragm		EPDM with fabric reinforcement			

[1] DN 65 to 100: 1.4404

Type 42-39

Self-operated Flow and Differential Pressure Regulators

Differential pressure regulator with balanced valve · Type 2422

– With closing actuator · Type 42-24 and Type 42-28
– With opening actuator · Type 42-20 and Type 42-25

Application

For district heating systems, extended heating systems and industrial applications. To regulate differential pressures from 0.05 to 10 bar (0.75 to 145 psi). Suitable for liquids and vapors as well as air and other non-flammable gases

Special features

- Proportional regulators for district heating supply networks. Single-seated valve balanced by a stainless steel bellows or a balancing diaphragm. Low-noise and low-maintenance
- Types 42-24 and 42-28 · Valve closes when the differential pressure rises
- Types 42-20 and 42-25 · Valve opens when the differential pressure rises

Versions

– **Type 42-20/Type 42-28:** Type 2422 Valve, DN 15 to 100 (NPS ½ to 4), Type 2420/Type 2428 Actuator, fixed set point
– **Type 42-25/Type 42-24:** Type 2422 Valve, DN 15 to 250 (NPS ½ to 10), Type 2425/Type 2424 Actuator, adjustable set point

Technical data

Type		**42-24**	**42-25**	**42-28**	**42-20**
Valve size		DN 15 to 250 (NPS ½ to 10)		DN 15 to 100 (NPS ½ to 4)	
Set point range Δp	bar	0.05 to 10		0.1, 0.2, 0.3, 0.4 or 0.5 fixed	
	psi	0.75 to 145		3, 4, 6 or 7 fixed	
Data sheets		**T 3003, T 3004, T 3007, T 3008**			

Materials

Valve [1]	**Type**	**2422**				
Valve body [2]	DIN	EN-JL1040	EN-JS1049	1.0619	1.4571	1.4408
	ANSI	A126 B	–	A216 WCC	A351 CF8M	
Pressure rating	PN	16	25	16/25/40		
	Class	125/250	–	125/150/300		
Actuator	**Type**	**2420, 2424, 2425, and 2428**				
Diaphragm cases		DD11			1.4301	
Diaphragm		EPDM [3], NBR [4] or FPM [3]				

1) Balanced by a bellows/diaphragm
2) Also in forged stainless steel 1.4571 for DN 15, 25, 40 and 50
3) Max. 150 °C
4) Max. 80 °C

Type 42-24

Type 42-25

Type 42-28

Self-operated Flow and Differential Pressure Regulators

Differential pressure regulators with closing actuator · Types 45-1, 45-2, 45-3, and 45-4

Flow regulator · Type 45-9

CE

Application

Differential pressure and flow regulators for district heating supply networks, large pipeline systems and industrial plants for liquids and gases

Special features

- The valve closes when the differential pressure or flow rate rises
- Low-maintenance, medium-controlled proportional regulators requiring no auxiliary energy
- Only one control line due to fixed connection to the actuator; Type 45-9 requires no external control line

Versions

The regulators consist of a valve with integrated (closing) actuator. Valve in DN 15 to 50 with welding ends, DN 32, 40 and 50 also available with flanged valve body
The valve of Type 45-9 is fitted with an adjustable restriction.

– **Type 45-1:** differential pressure regulator with fixed set point
  Installation in the high-pressure pipe
– **Type 45-2:** differential pressure regulator with adjustable set point
  Installation in the high-pressure pipe
– **Type 45-3:** differential pressure regulator with fixed set point
  For installation in the low-pressure line
– **Type 45-4:** differential pressure regulator with adjustable set point
  For installation in the low-pressure line
– **Type 45-9:** flow regulator with restriction to adjust the flow rate set point for differential pressure at the restriction of either 0.2 or 0.3 bar

Technical data

Valve size **DN**	**15**	**20**	**25**	**32**	**40**	**50**
K_{VS} coefficient	2.5	6.3	8	12.5	16	20
Flanged body	–			12.5	20	25
Differential pressure set point range						
Types 45-1 and 45-3 bar	0.1, 0.2, 0.3, 0.4 or 0.5 fixed					
Types 45-2 and 45-4 bar	0.1 to 4				0.2 to 1	
Data sheet	**T 3124**					
Adjustable flow rate set points (for differential pressure at restriction of 0.2 bar)						
Type 45-9	0.01 to 15 m³/h					
Permissible temperature	Liquids: 130 °C, nitrogen and air: 150 °C [1]					
Compliance	CE · EAC					
Data sheet	**T 3128**					

[1] Diaphragm and seals made of FPM (FKM), PN 25 version only

Materials

Body		Red brass CC491K/CC499K	EN-JS1049 [1]
Seat		Stainless steel 1.4305	
Plug	PN 16	Brass (resistant to dezincification) and plastic with EPDM [2] soft seal	
	PN 25	Brass (resistant to dezincification) with EPDM [2] soft seal	
Operating diaphragm		EPDM [2] with fabric reinforcement	

[1] For flanged valve body DN 32 to 50
[2] FPM (FKM) in special version for mineral oils

Type 45-3

Type 45-4

Type 45-9

Self-operated Flow and Differential Pressure Regulators

For installation in the return flow pipe · Type 46-7 and Type 47-5

For installation in the flow pipe · Type 47-1 and Type 47-4

CE

Application

Flow rate and differential pressure regulation or flow rate and pressure regulation in district heating supply networks and industrial plants

Special features

- Flow rate regulation, adjustable at the restriction in the valve
- Differential pressure or downstream pressure adjustable at the set point adjuster on the actuator
- Low-maintenance, medium-controlled proportional regulators requiring no auxiliary energy

The largest signal closes the valve. The valve closes when the differential pressure or flow rate rises.

Versions

Flow and differential pressure regulators with valves (DN 15 to 50) with integrated restriction to adjust the flow rate set point

Flow and differential pressure regulators for installation in the return flow pipe
- **Type 46-7:** adjustable differential pressure set point
- **Type 47-5:** fixed differential pressure set point

Flow and differential pressure regulators for installation in the flow pipe
- **Type 47-1:** adjustable differential pressure or pressure set point
- **Type 47-4:** fixed differential pressure set point

Technical data

Valve size	**DN**	**15**	**20**	**25**	**32**	**40**	**50**
K_{VS} coefficient		2.5	6.3	8	12.5	16	20
Flanged body		–			12.5	20	25
Differential pressure set point range							
Types 47-4 and 47-5	bar	0.1, 0.2, 0.3, 0.4 or 0.5 fixed					
Types 46-7 and 47-1	bar	0.2 to 0.6, 0.2 to 1 or 0.5 to 2, continuously adjustable					
Flow rate set point for differential pressure at restriction of 0.2 bar		0.01 to 15 m³/h					
Max. permissible temperature		Liquids: 150 °C, nitrogen and air: 150 °C [1]					
Compliance		CE · EAC					
Data sheet		**T 3131**					

[1] Diaphragm and seals made of FPM (FKM), PN 25 version only

Materials

Body		Red brass CC491K/CC499K	EN-JS1049/395 [1]
Seat		Stainless steel 1.4305	
Plug	PN 16	Brass (resistant to dezincification) and plastic with EPDM [2] soft seal	
	PN 25	Brass (resistant to dezincification) with EPDM [2] soft seal	
Operating diaphragm		EPDM [2] with fabric reinforcement	

[1] For flanged valve body DN 32 to 50

[2] FPM (FKM) in special version for mineral oils

Type 46-7

Type 47-5

Type 46-7 with flanged valve body (DN 32 to 50)

Pilot-operated Universal Regulators

Pressure, differential pressure, flow rate, temperature or combined regulators, optionally with additional electric actuator

Type 2334

Application

Pilot-operated pressure, differential pressure, flow rate, temperature or combined regulators, optionally with additional electric actuator
For heating and cooling plants, suitable for liquids from 5 to 150 °C and non-flammable gases up to 80 °C

Special features

- Main valve with flanges in DN 65 to 400
- Low-maintenance proportional regulators requiring no auxiliary energy
- Suitable for district heating plants conforming to DIN 4747-1
- Wide control range and high rangeability at low pressure loss
- Pilot-operated by the medium, with a maximum of three pilot valves
- Excellent stability and control accuracy even when the pressures fluctuate considerably
- Smooth opening and closing of the main valve
- Wide set point range and convenient set point adjustment at the pilot valve
- Numerous control functions and the possibility to combine several functions

Versions

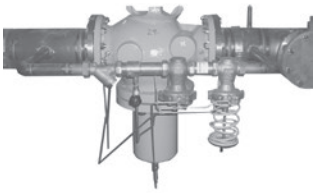
Type 2423 Valve with integrated restriction or Type 2422 Valve without restriction (DN 65 to 100) with balancing bellows and external Type 2420 Actuator (closing) with integrated diaphragm actuator with internal closing spring (DN 125 to 250)
Pilot valve depending on the application

– **Basic version:** main valve (DN 65 to 250) and bypass line with strainer, Venturi nozzle and pilot valve (ready-to-install assembly), bypass line (DN 15) made of stainless steel, strainer and pilot valve depending on the application
– **Version with bypass:** main valve DN 65 to 400
Bypass line DN 25 or 40 with strainer, Venturi nozzle and pilot valve (assembly on site)

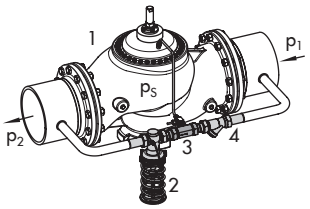
See associated Information Sheet T 3000, Data Sheet T 3210

Special versions, DN 65 to 250

– Reduced K_{VS} coefficient
– Version for higher temperatures (steam)
– ANSI and JIS versions
– Flow divider for noise reduction (only valves balanced by a bellows)
– Oil-resistant
– Free of non-ferrous metal
– Pilot valves connected in parallel (instead of in series)
– Balanced by a metal bellows
– Free of graphite for deionized water
– External restriction
– With downstream attenuation plate for noise reduction



Type 2334 with Type 2422 Valve, DN 200 with operating bellows



Type 2334 with bypass

1 Main valve
2 Pilot valve
3 Venturi nozzle
4 Strainer
p_s Control pressure
p_1 Upstream pressure
p_2 Downstream pressure

Pressure-independent Control Valves (PICV)

Flow regulator · Type 42-36 E

Application

Self-operated regulators combined with an electric actuator used to transmit the control signal of an electric controller

Sample application

Flow rate and temperature regulation e.g. in district heating systems or extended heating or cooling networks

Special features

The valve closes when the flow rate rises. In addition, the control signal of an electric controller can be applied to influence the flow rate over the actuator.

- The combined regulators consist of:
  - Valve with flanged body
  - Diaphragm actuator
  - Adapter to adjust the flow rate set point and to attach the electric actuator
- Control equipment tested according to DIN EN 14597 available

Versions

Valves DN 15 to 250, nominal pressure PN 16 to 40, suitable for liquids from 5 to 150 °C, electric actuators with or without fail-safe action to change the flow rate set point depending on the control signal issued by an electric controller

– **Type 42-36 E:** pressure-independent control valve with restriction to adjust the flow rate set point, installation in the flow or return flow pipe

Technical data

Type	**42-36 E**
Valve size	DN 15 to 250 (NPS ½ to 10)
Pressure rating	PN 16, 25, 40 (Class 125, 150, 300)
Flow rate set point ranges	
Differential pressure at restriction: 0.2 bar	0.5 to 220 m³/h (2.2 to 970 US gal/min), balanced by a diaphragm: max. 260 m³/h (1140 US gal/min)
Differential pressure at restriction: 0.5 bar	0.8 to 300 m³/h (3.5 to 1300 US gal/min), balanced by a diaphragm: max. 360 m³/h (1580 US gal/min)
Permissible medium temperature	Max. 150 °C
Permissible ambient temperature	Max. 50 °C
K_{VS} coefficient	4 [1] to 800
Data sheet	**T 3018**

[1] Special restriction for very low flow rates on request

Type 42-36 E
with Type 5825 Actuator

Materials

Valve	Type	2423			
Body material	DIN	EN-JL1040	EN-JL1049	1.0619	1.4408
Pressure rating	PN	16	25	16/25/40	
Seat					
Balanced by a bellows		1.4104, 1.4006			1.4404
Balanced by a diaphragm (max. 150 °C)		Red brass, DN 65 to 100: 1.4006			1.4409
Plug					
Balanced by a bellows		Up to DN 100: 1.4112, 1.4104, 1.4006 DN 125 and larger: 1.4404 with EPDM soft seal			1.4404
Balanced by a diaphragm (max. 150 °C)		Red brass, 1.4104 and 1.4006 (DN 65 to 100)			1.4409 [1]
Balancing bellows		DN 15 to 100: 1.4571, DN 125 and larger: 1.4404			
Balancing diaphragm		EPDM with fabric reinforcement			
Actuator	**Type**	**2426**			
Diaphragm cases		DD11			1.4301
Diaphragm		EPDM with fabric reinforcement			

[1] DN 65 to 100: 1.4404

Type 42-36 E
with TROVIS 5724-8 Actuator

Pressure-independent Control Valves (PICV)

Flow regulators · Type 2488/58.. and Type 2489/58..

Application

Flow regulation in district heating supply networks and industrial plants, combined with an electric actuator. A further operating parameter (e.g. temperature) can be regulated when combined with a district heating controller and electric actuator.

Special features

The valve closes when the flow rate rises. In addition, the control signal of an electric controller can be applied to influence the flow rate over the actuator.

- Low-maintenance, medium-controlled flow regulators requiring no auxiliary energy
- Single-seated valve with balanced plug
- Adapter to attach the electric actuator and to adjust the flow rate
- Control equipment tested according to DIN EN 14597 available

Versions

The combined regulators consist of valve, diaphragm actuator and Type 5824 or Type 5825 Electric Actuator with fail-safe action, or optionally Type 5857 or Type 5757 Electric Actuator without fail-safe action for DN 15 to 25.

For indirectly connected systems (with heat transfer medium) for installation in low-pressure pipes

– **Type 2488/58.. Pressure-independent Control Valve**
with Types 5824, 5825 or 5857 Electric Actuator
– **Type 2489/58.. Pressure-independent Control Valve**
with Types 5824, 5825 or 5857 Electric Actuator and additional Type 2430 K Control Thermostat for temperature regulation

Type 2488 with
Type 5824 Actuator

Technical data

Valve size	**DN**	**15**	**20**	**25**	**32**	**40**	**50**
K_{VS} coefficient	Body with screwed ends	2.5	6.3	8	12.5	16	20
	Flanged body	–			12.5	20	25
Flow rate set point for differential pressure at restriction of 0.2 bar		0.03 to 15 m³/h					
Max. perm. temperature		150 °C					
Connections		Welding ends, threaded ends, flanges					
Compliance		CE · EAC					
Data sheet		**T 3135**					

Materials

Body		Red brass CC491K/CC499K	EN-JS1049 [1]
Seat		Stainless steel 1.4305	
Plug	PN 16	Brass (resistant to dezincification) and plastic with EPDM [2] soft seal	
	PN 25	Brass (resistant to dezincification) with EPDM [2] soft seal	
Operating diaphragm		EPDM [2] with fabric reinforcement	

1) Version in spheroidal graphite iron for flanged valve bodies (DN 32, 40 and 50)
2) FPM (FKM) in special version for mineral oils

Application

Used to discharge condensate from steam-heated systems

Special features

- The liquid evaporation and temperature changes cause a change in the plug travel. When the valve is open, any air and condensate captured in the valve can escape.
- Operating range 0.01 to 10 bar
- Maximum temperature 200 °C

Versions

– **Type 13 E:** combination optionally as angle or globe valve with threaded connections

Technical data

Connection	**G ½, G ¾, G 1**
Operating range	0.01 to 10 bar
Max. permissible temperature	200 °C
Compliance	EAC
Data sheet	**T 0500**

Materials

Body, screw plug	Malleable iron GTW-35-04
Seat	Stainless steel 1.4104
Plug	Stainless steel 1.4301
Operating element	Stainless steel 1.4541

Type 13 E

Pipeline Fittings

Strainers · Types 1 N and Type 1 NI
Type 2 N and Type 2 NI

Application

For protecting downstream plants, aggregates and measuring and control devices against impurities. Straining and collecting dirt particles carried along by the medium

Special features

- Compact design
- Easy removal of the collected dirt particles
- Easy replacement of the strainer insert

Versions

Y-shaped body with flanges or threaded end connections and wide-meshed strainer insert with an additional fine-meshed internal strainer

Types 1 N, 1 NI	**Types 2 N, 2 NI**
Threaded connection	Flanges
Type 1 N Standard strainer insert	Type 2 N Standard strainer insert
Type 1 N Dual strainer insert	Type 2 NI Dual strainer insert

Technical data

Type	**1 N**		**1 NI**	**2 N**				**2 NI**
Pressure rating	PN 25			PN 10, 16, 25, 40				
Connection	Thread, G...			Flange, DN...				
	½ to 1	1¼ to 2	½ to 2	15 to 25	32 to 65	80 to 150	200 to 250	15 to 250
Mesh size	0.5 mm	0.75 mm	0.25 mm	0.5 mm	0.8 mm	1.25 mm	2 mm	0.25 mm
Data sheets	**T 1010**			**T 1015**				

Materials

Body	Red brass, brass	EN-JL1040, EN-JS1049, 1.0619, Cast stainless steel 1.4408
Filter	Stainless steel 1.4401	

Additional accessories for self-operated regulators (see Data Sheets T 3095 and T 2595)

- Compression-type fittings
- Needle valve
- Compensation chamber
- Orifice plate
- Welding neck flange
- Control lines etc.

Type 1 N/1 NI

Type 2 N/2 NI

Appendix

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