

INSTRUM

Pressure regulators
Flow restrictors
Safety elements

For protecting
explosive, corrosive
and sterile processes
with inert gases



INSTRUM
BINDERGROUP



We apply pressure

in tanks, reactors, centrifuges and continuous agitated tank reactors in the process engineering industry. We offer suitable fittings made of corrosion-resistant materials for blanketing of liquids with an inert gas atmosphere.

We design and build systems for tank blanketing, inerting, product transfer and sterilisation, with particular focus on automatic mechanical regulators that operate without auxiliary power, including pressure regulators for reduction, relief, negative and differential pressure,

check valves for positive and negative pressure. The **INSTRUM** approach enables you to significantly reduce your installation and running costs while increasing operational reliability. Please contact us. We will be glad to give you good advice.

Tank blanketing and inerting with INSTRUM

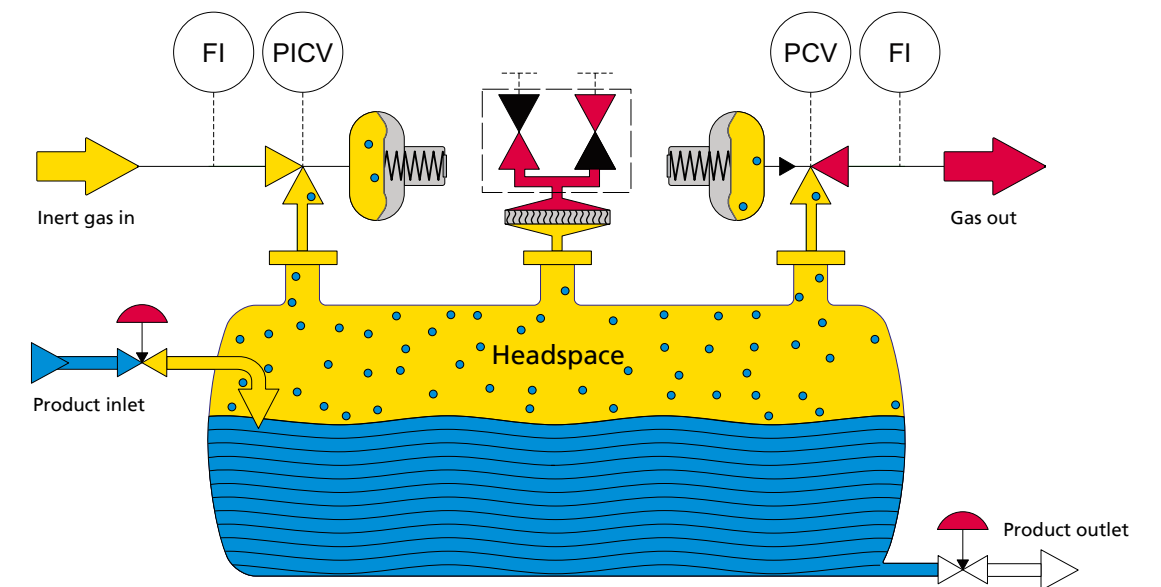
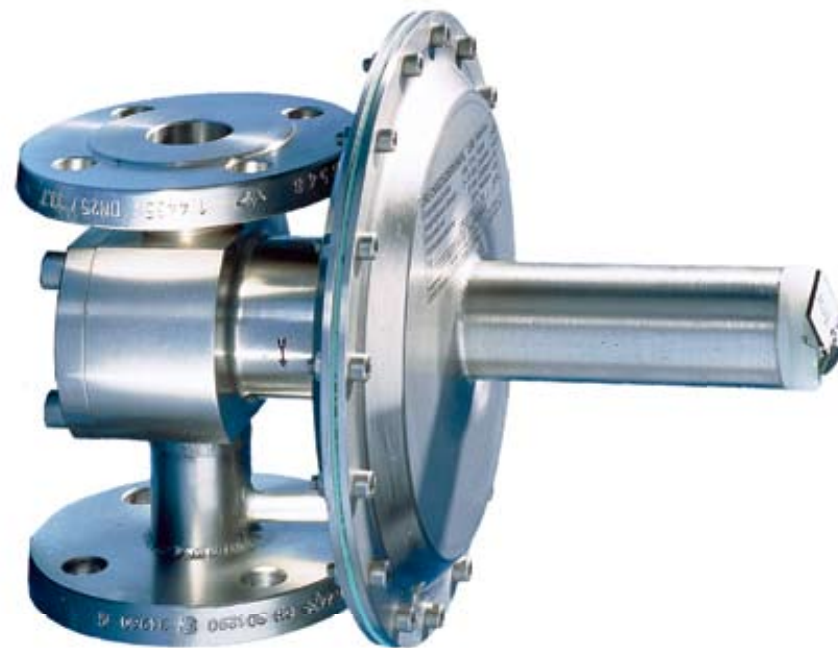
In many fields of modern process engineering, where products or liquids are taken from reservoirs and tanks for processing, it makes sense to protect these with an inert gas atmosphere. It prevents oxidation, contamination or serves as explosion protection. The aim is to ensure operational safety through controlled ventilation, while minimising the effect on the environment and the costs for the inert gases.

INSTRUM units are used for:

- Product protection and product quality
- Explosion protection
- Process optimisation
- Environmental protection
- Health protection
- Odour prevention
- Compliance with statutory regulations

INSTRUM products can be supplied in conformity with:

- Pressure Equipment Directive - PED (97/23/EC)
- Explosive atmospheres - Explosion prevention and protection acc. DIN EN 1127-1
- Non-electrical equipment intended for use in potentially explosive atmospheres - Protection by constructional safety "c" acc. DIN EN 13463-5
- Rules for Pressure Equipment acc. AD 2000 Code
- CE marking
- ATEX 95 (EX II 3G / 3GD c IIA T4 X)



Blanketing, conveying and sterilisation

The independent tank blanketing systems from **INSTRUM** can be used to protect media in storage tanks, mixing vessels and other containers with nitrogen, carbon dioxide or other inert gases.

For reasons of environmental protection tank safety has become a main concern for operators. Blanketing with inert nitrogen gas is the preferred method for explosion and oxidation protection. Exact regulation in the low-pressure range saves significant costs and achieves maximum safety.

For preventing oxidation of medium and the inner tank walls

⇒ **Ensuring product quality and corrosion protection**

For avoiding ignitable vapour / air / gas mixtures

⇒ **Explosion protection**

For avoiding health risk and odour nuisance in the workplace

⇒ **Environmental and health protection**

Pressure regulation system for different process steps: blanketing, conveying and sterilisation

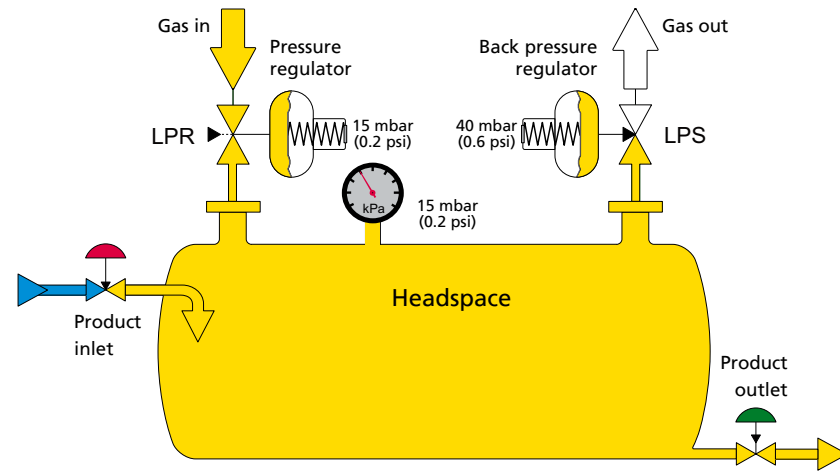
⇒ **Process optimisation and cost-saving**

Blanketing in the low psi range and expansion of the operating point help system operators to minimise the inert gas consumption and the costs for waste air treatment

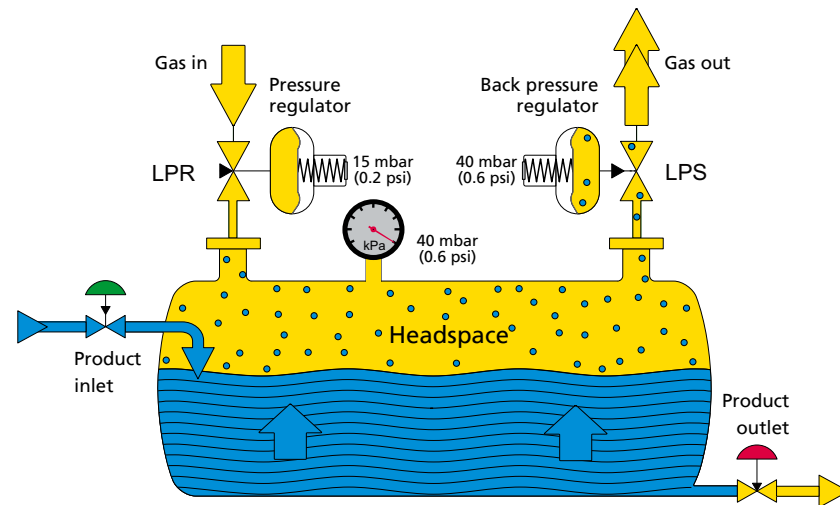
⇒ **Cost-saving**



Blanketing

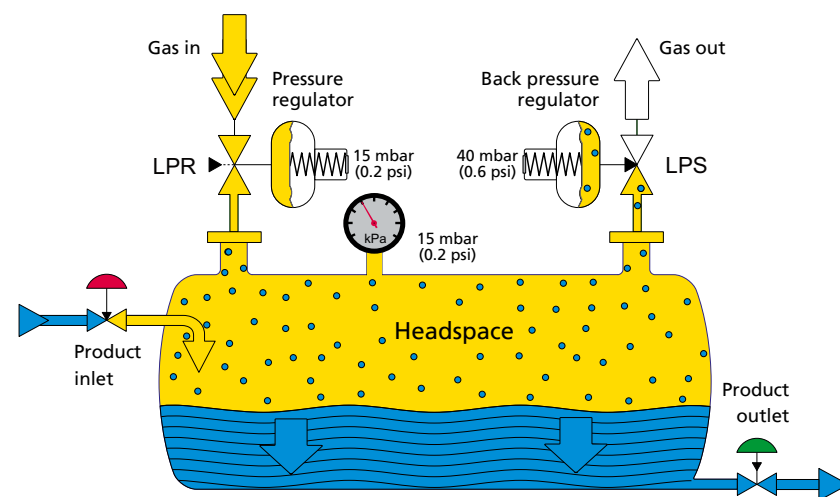


For optimum blanketing two pressure regulators are required, one pressure regulator for reduction of the incoming nitrogen (intake / LPR = low-pressure regulating valve) and one back pressure regulator as discharge valve for the waste gas (expiration / LPS = low pressure relief valve). The aim of ventilation is to maintain an inert state in the tank or equipment in all operating stages of a production process. Blanketing can take place with positive or negative pressure. Positive pressure is used to prevent oxygen from entering the process. Negative pressure is used to prevent process gas, e.g. toxic media, from escaping.



Typical basic settings for tank or reservoir inertising are 15 mbar (0.2 psi) for the pressure regulator (LPR) and 40 mbar (0.6 psi) for the back pressure regulator (LPS). Before a tank is filled with product the empty tank is purged with nitrogen in order to drive out the air. Typically 3 to 5 times the tank volume is used. Once the discharge valve is closed the gas pressure increases to the set value of 15 mbar (0.2 psi).

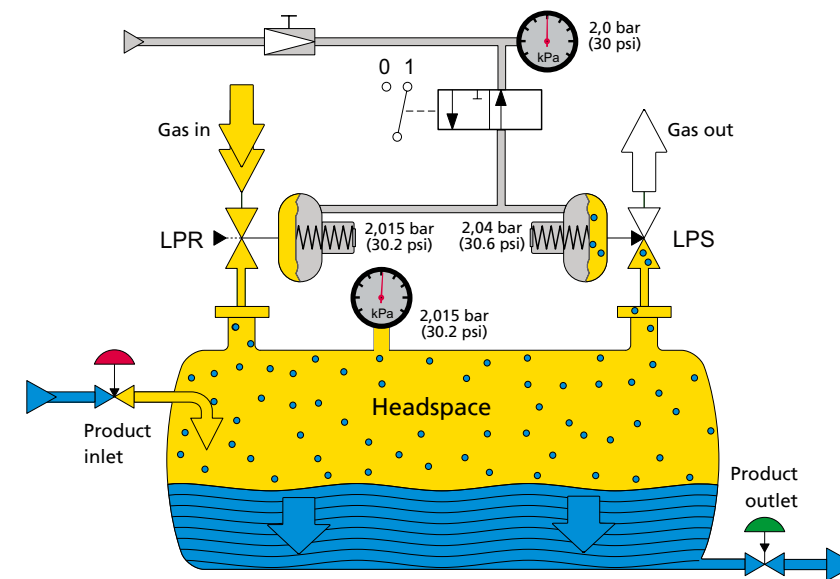
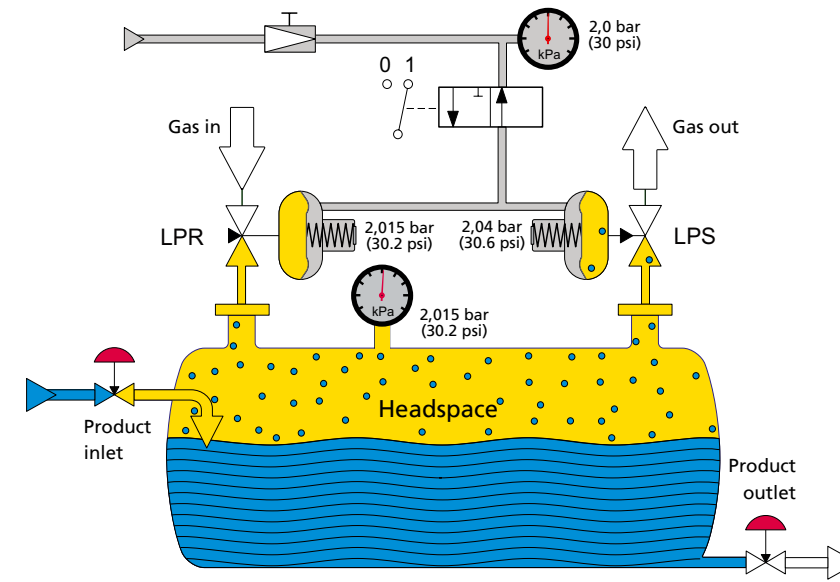
After purging the tank is filled with product. For this the product outlet valve closes and the inlet valve is opened. With increasing product level in the tank the pressure in the headspace increases until the set value of 40 mbar (0.6 psi) is reached. Nitrogen is then discharged via the back pressure regulator into the gas processing unit or atmosphere.



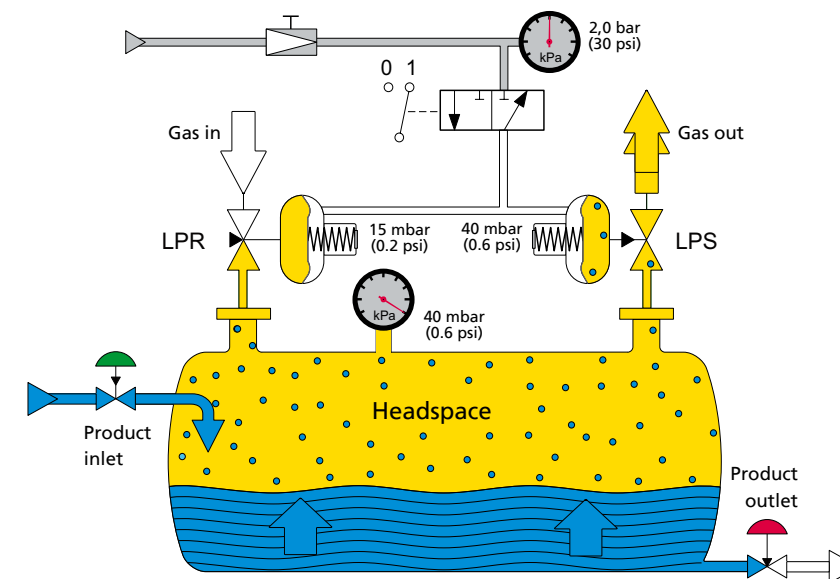
If product is discharged, the pressure in the headspace decreases. At 15 mbar (0.2 psi) the pressure regulator (LPR) opens to allow nitrogen to flow in, in order to prevent the pressure from decreasing further. The pressure regulator (LPR) and the back pressure regulator (LPS) ensure that the pressure range for nitrogen blanketing is between 15 mbar (0.2 psi) and 40 mbar (0.6 psi) under all operating conditions. To reduce the costs for inert gas the operating points should be as far apart as possible, in order to achieve a maximum pressure range without gas consumption. This reduces nitrogen costs, product losses in the waste gas system and waste gas treatment costs.

Conveying

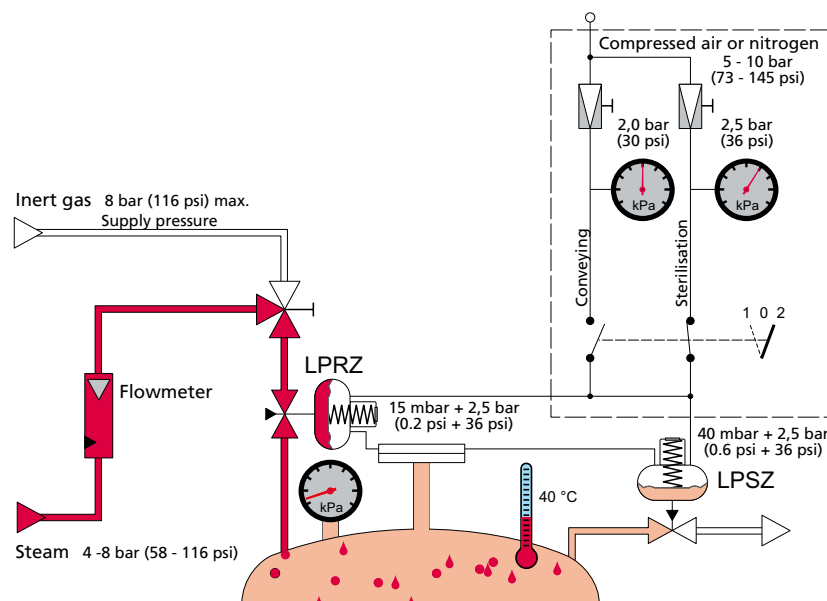
In addition to ventilation, blanketing with variable pressure (up to 4 bar / 58 psi) enables to press out the product from the tank, instead of using a pump. The pressure build-up takes place via same regulators that are used for tank blanketing.



The required servo pressure is applied to the pressure regulator (LPR) and back pressure regulator (LPS) through manual or electro-pneumatic switching (I/P converter). The new set value for the pressure regulator (LPR) causes it to open, so that nitrogen flows into the tank. The new set value for the back pressure regulator (LPS) causes the increased pressure to be maintained in the tank, according to the specified pressure ratio. This pressure can be used to transfer the product by opening the discharge valve. The discharged product is replaced by nitrogen, in order to ensure a constant conveying pressure, irrespective of the product level in the tank.



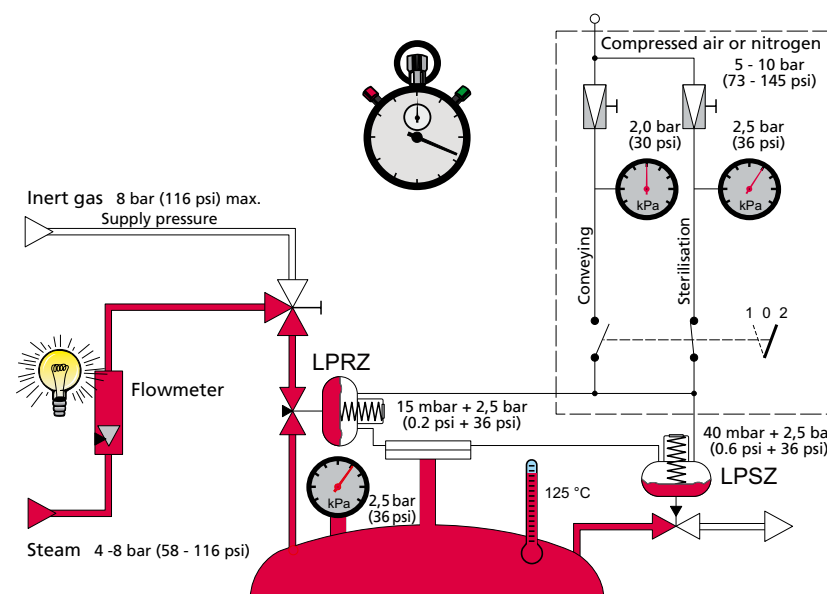
Product transfer is terminated by closing the product outlet valve and setting the servo pressure at the pressure regulator (LPR) and the back pressure regulator (LPS) to zero. This causes the headspace pressure to decrease to the ventilation pressure of 40 mbar (0.6 psi). The normal tank ventilation state has thus been restored.



Sterilisation

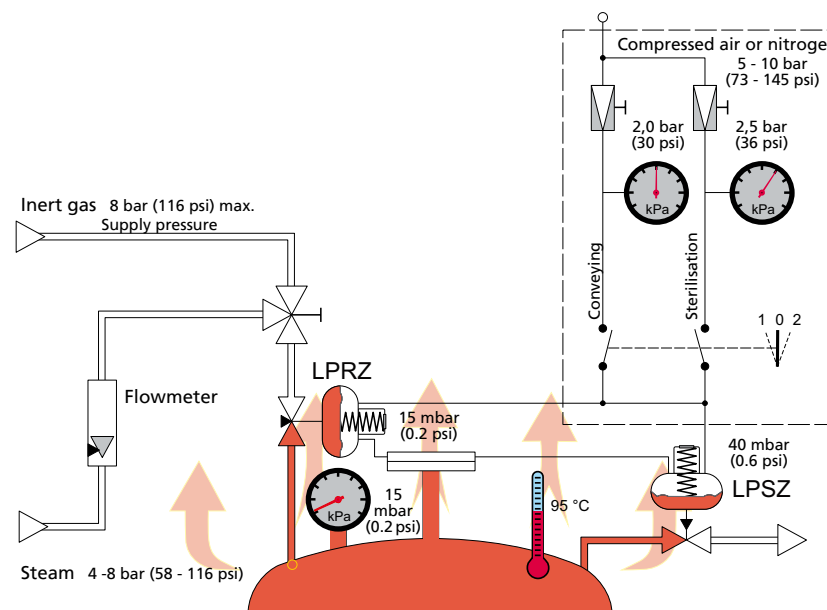
For tank sterilisation, a diaphragm seal, a steam flowmeter and an associated controller are required in addition to the pressure regulator (LPR) and back pressure regulator (LPS) in sterile design. Steam is used for sterilisation.

A servo pressure of 2,5 bar (36 psi) is applied to the pressure regulator (e.g. set to 15 mbar / 0.2 psi) and back pressure regulator (e.g. set to 40 mbar / 0.6 psi). This servo pressure corresponds to the required sterilisation temperature.



Initially the steam condenses at the cold container wall. The pressure increases slowly. The pressure and the corresponding temperature are constant at any point in the sterile zone. The steam flow rate falls to the quantity required for compensating the temperature loss through convection.

The temperature and flowmetering system reports the start of the sterilisation time to the control system. After the sterilisation the servo pressure and the sterile steam supply are switched off, and the system switches to inert gas ventilation mode. The back pressure regulator reduces the steam pressure in the tank to 40 mbar (0.6 psi).



The sterilisation technique with low-pressure regulators avoids cold spots, is particularly reliable and requires only little additional equipment, resulting in a significant reduction of investment costs.

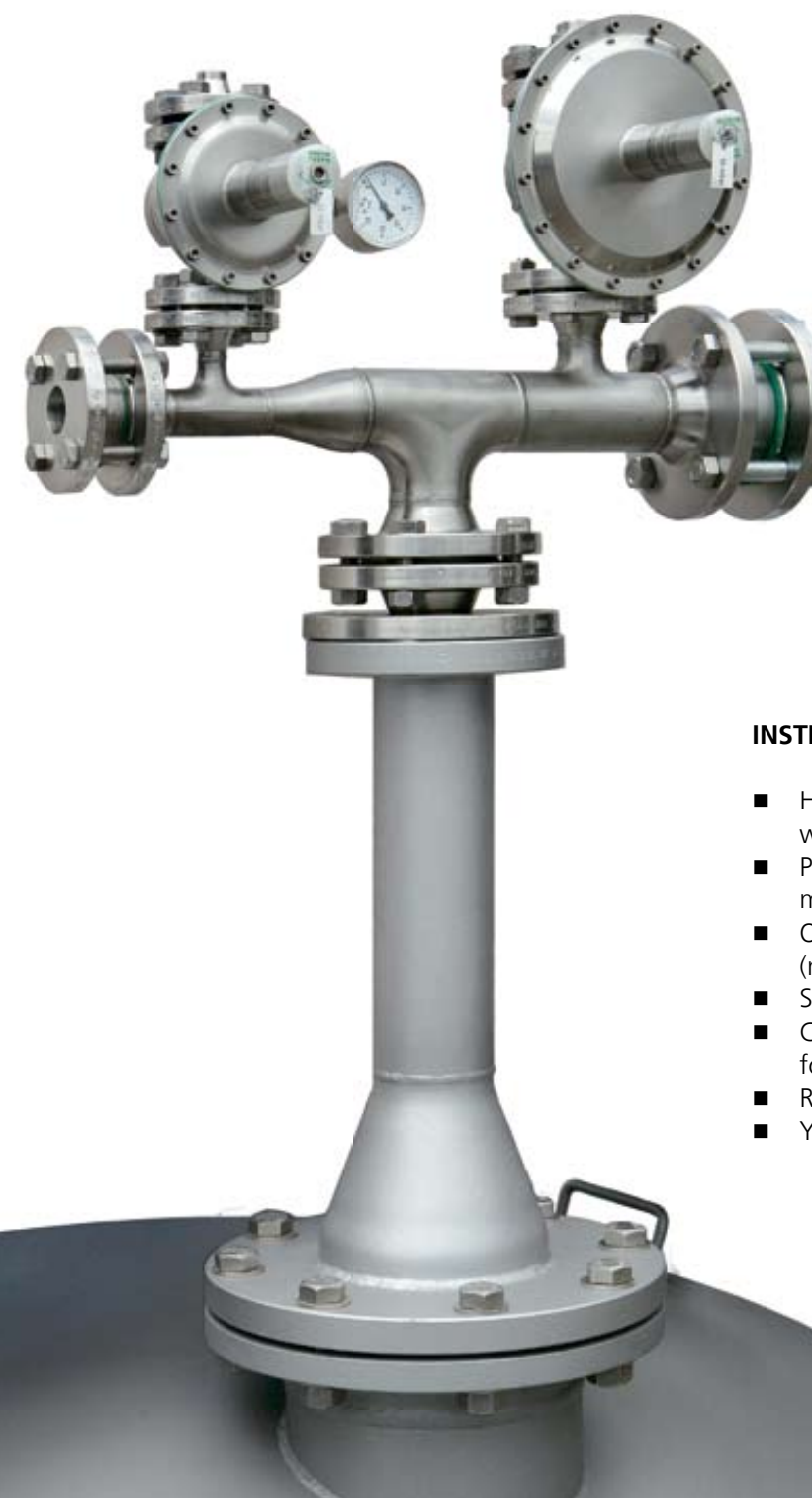
A computer animation explaining the process is available on our website: www.instrum.ch

INSTRUM High-quality materials

High-quality materials and precision finish ensure corrosion resistance and excellent leak-tightness at zero flow.

We use the following materials as standard:

- Stainless steel (1.4435 / 1.4404 / 1.4408) for all parts in contact with the product
- Hastelloy (C22, C276), PP, PVDF and PFA lined for highly corrosive applications
- PTFE membranes and seals (e.g. Teflon®)
- FFKM (e.g. Kalrez®), FKM (e.g. Viton®) for the control seat
- Other special materials (e.g. titanium, tantalum) are available on request

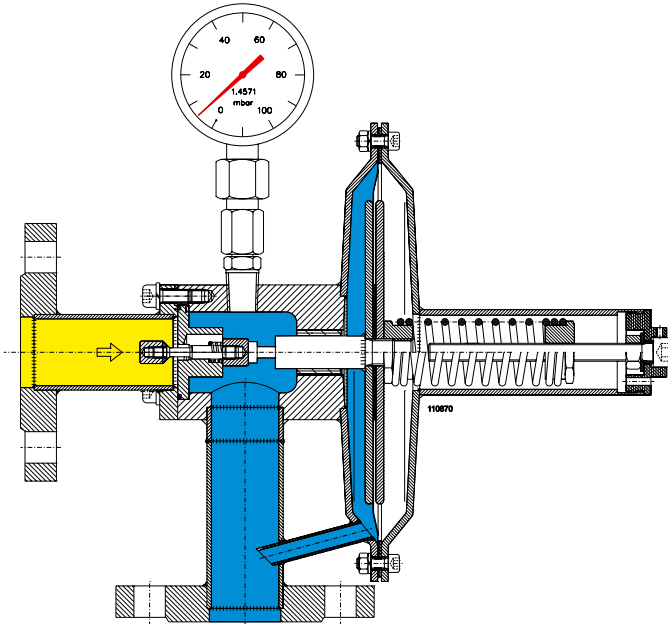


INSTRUM inert gas control systems ensure

- High control precision for small blanketing pressures with minimum hysteresis
- Precise pressure regulation at minimum and maximum flow rate with gas-tight seal
- Operational safety through independent system (no auxiliary power required for operation)
- Simple installation, commissioning and maintenance
- Corrosion- and temperature-resistant finish, suitable for outdoor installation
- Rugged design and high-quality materials
- Years of maintenance-free operation

Low-pressure regulators and back pressure regulators

Regulating range -0,8 to 5 bar (-11.6 psi to 72.5 psi), ½" to 4"



Extended application options

The spring-loaded design with large diaphragm results in high-precision regulation.

A robust, supported mechanism with guided valve seat allows operating pressures from vacuum up to 5 bar (72.5 psi) with additional functions such as

- Tank blanketing with variable pressure, e.g. for pneumatic product conveying
- Sterilisation, conveying and ventilation
- Pneumatic pressure control for complex processes in continuous agitated tank reactors.

INSTRUM regulators for sterile applications

Our sterile regulators with reduced dead space and self-draining design enable you to meet quality requirements for CIP or SIP applications.

We use certified materials for all our seals. The units enable sterilisation and maintenance of a sterile atmosphere without the need for a sterile filter.



INSTRUM modular design

The modular design enables our regulators to be used for a wide range of applications and offers flexibility through three different types (inline, wafer and angle), with special versions for CIP and SIP applications.

High surface quality and materials with corresponding certifications ensure perfect adaptation for different applications such as:

- Food
- Pharmaceutical
- Biotech
- Cosmetics
- Chemicals and fine chemicals
- General process engineering



Pressure regulators, differential pressure regulators, back pressure regulators

**Regulating range between 0,5 and 200 bar
(7.2 and 2900 psi), ½" to 2"**

For pressure reduction, differential pressure regulation and pressure control for gases, liquids and hazardous media in process engineering applications.

The units are specially designed for chemical system engineering and offer maximum reliability under difficult operating conditions. The pressure regulators are available in a wide range of materials for optimum adaptation to the process requirements. The same high-quality materials are available as for our low-pressure regulators. Various elastomer and metallic membranes and bellows made from stainless steel and hastelloy are available as separating elements between the medium.

The regulator operates on the principle of force balance. Fail-safe characteristics and additional protection against gas leakage into the atmosphere in the event of a diaphragm failure are achieved by a gas spring (dome) instead of a mechanical spring. The output pressure follows the dome set pressure without delay. The ideal characteristic curve enables high-precision operation up to the maximum flow rate without pressure drop.

Pressure reducers for gas modules

INSTRUM offers pressure regulators for pressure reduction of hazardous, aggressive or toxic gases such as HCl, BF₃, Cl₂ etc. from high pressure in transport containers to a few bar (psi). For monogas modules the regulator is equipped with a pressure-compensated seat. For multigas modules a direct-acting seat with no dead space is used, in order to facilitate purging during gas changeover.



INSTRUM regulators, check valves and special units

**Explosion and environmental protection, product
purity and cost-saving**

Backflow preventers

These system separators reliably prevent backflow of gases and liquids and serve to separate different system components. Irrespective of the system pressure, flow is only possible with positive pressure gradient between inlet and outlet. The separator remains closed until pressure equalisation is achieved.

Pneumatic pressure transducers 1:1

Isolating transducers for pressures between 0 and 4 bar (0 and 58 psi) for application in highly corrosive or high-purity systems.

FLOFIX flow regulator

These automatic flow regulators are used for achieving constant flow under varying pressure, as flow regulators for dosing, distribution, cooling circuits etc., or as flow limiting devices for protection against overload in excess flow conditions or against water shock etc.



The FLOFIX regulator is primarily designed for liquids, although it can also be used for gases. Different cartridges can be combined, depending on the application.



Check valves for positive and negative pressure

Check valves allow flow in one direction while automatically preventing backflow. Depending on the application they may be named as safety elements or vacuum breakers, for example.

INSTRUM intermediate flange-type valves are suitable for position-independent installation between piping flanges for gases and steam. The special shape of the guide, spring cap and valve disc can enable opening pressures between as little as 2 mbar (0.03 psi) and a maximum of 100 mbar (1.45 psi) to be achieved for nominal widths between ½" and 4".

Non-corroding materials are used for the housings, internals and springs (stainless steel, hastelloy, tantalum and PTFE), making the unit suitable for application in aggressive environments.

They are used in a wide range of industries, particularly in the chemical and pharmaceutical industry.



Plastic regulators for highly corrosive applications

Plastic regulators and back pressure regulators are used in exceptionally corrosive applications due to hydrocarbons, acids or caustic. The units are made from PP, PP_{el} or PVDF in a wide range of combinations of casings and internals. Springs in contact with the product are made from hastelloy, tantalum or plastic.

Our pressure regulators are available as special versions made from highly corrosion-resistant materials (such as tantalum, for example) in combination with plastic-lined metal housings, offering scope on application for virtually any tasks in aggressive environments.

The performance data are similar to those of metallic pressure regulators. The light-weight regulators and back pressure regulators are self-draining and offer convenient and cost-effective installation. They are exclusively used for blanketing applications.





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