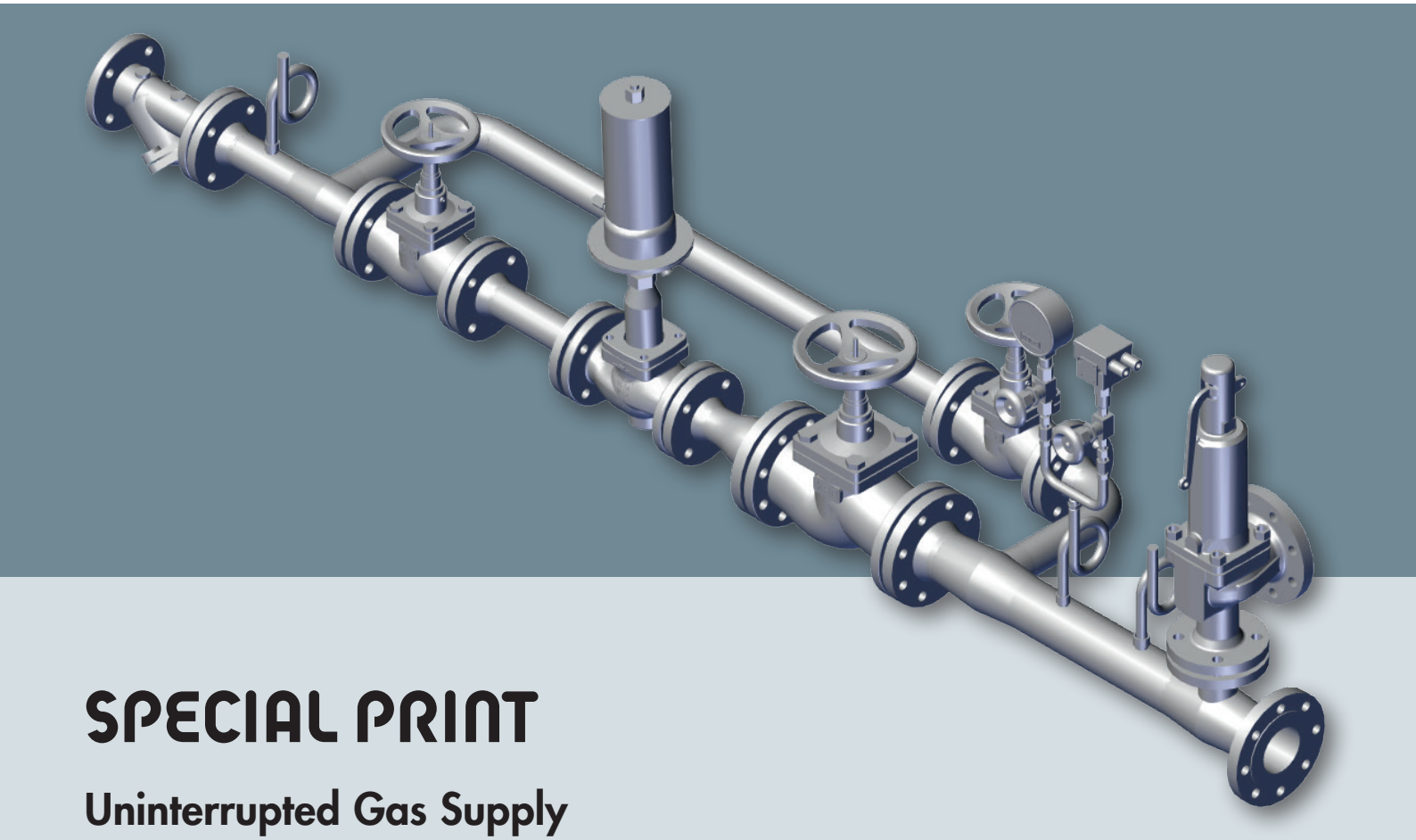

SPECIAL PRINT

Uninterrupted Gas Supply

Pressure Control Valves to Ensure Emergency Supply with Industrial Gases

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Author:
Frank-Detlef Karolius, Application Support

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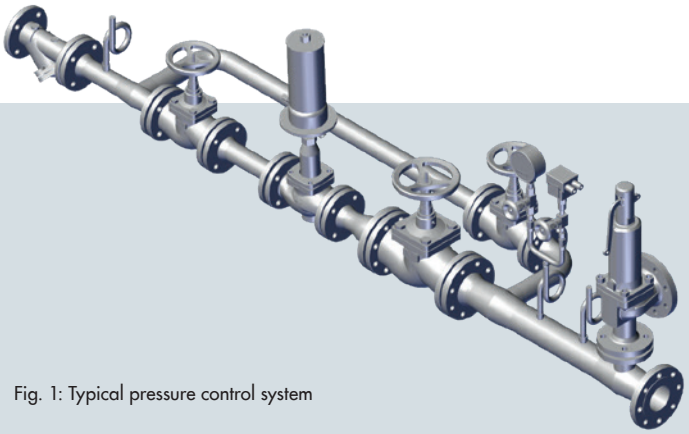

Fig. 1: Typical pressure control system

Industrial gases, such as acetylene, argon, carbon dioxide, nitrogen and hydrogen, can be found in a wide variety of technical applications. As simple as their supply may seem: consumers soon enough face technical and logistical challenges, which call for innovative, reliable solutions. One solution are pressure control valves, which – thanks to their mechanical control – ensure the proper supply with the right amount of technical gases even when the power and instrument air supplies fail.

In many cases, industrial gases are liquefied by cooling them down at high pressure; storage and transport take place at low temperatures. Liquefied gases have a considerably lower volume than in the gaseous state. At ambient pressure for example, 1 l of liquid nitrogen becomes approximately 800 l of gas. Liquefied industrial gases are stored in upright tanks. Fig. 2 shows the schematic drawing of an upright tank.

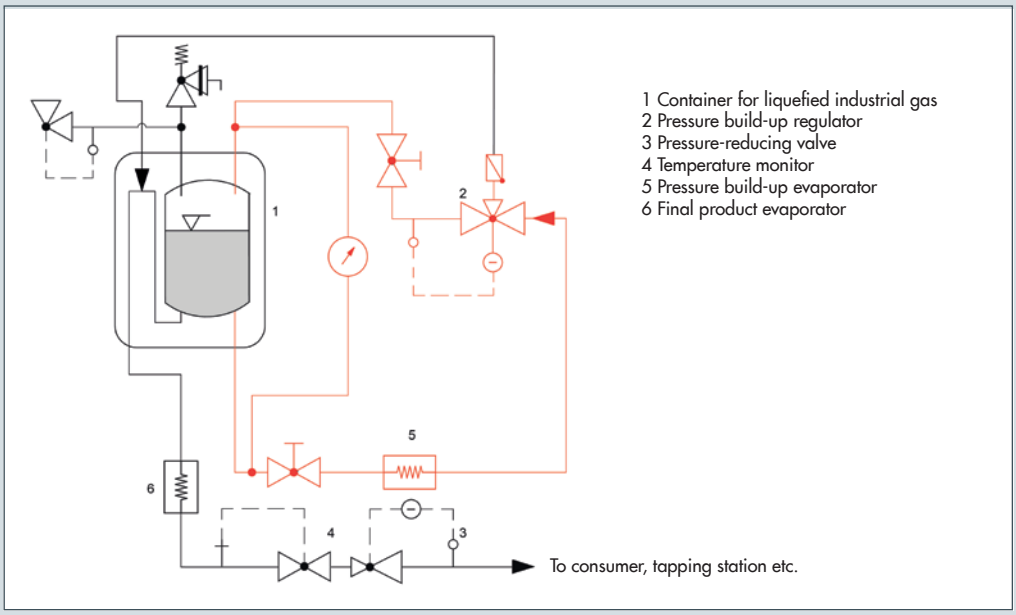

Fig. 2: Upright tank with pressure build-up circuit

Solutions from low to high gas demand

The pressure in the tank decreases when the medium is tapped through the consumer pipeline. To counteract this pressure drop, part of the stored medium is evaporated in the pressure build-up circuit (red control loop in Fig. 2) to keep the pressure constant. During this process, the valves installed in the tanks need to handle challenging operating conditions. They have to withstand numerous extreme temperature changes and, in some cases, be suitable for oxygen service at the same time. Materials compliant with these requirements include stainless, steel, special alloys, brass as well as bronze. There are different ways to supply industrial gases to consumers. Small amounts are stored and transported at ambient temperature in pressurized cylinders. For medium demand, the gas is liquefied and transported by road. When a high gas demand exists (for example when several consumers are clustered together on the same site), it may be more cost effective to supply the gases by pipeline. To secure the gas supply even when transportation issues or other emergencies arise, backup tanks are integrated into the gas supply system. The emergency supply must be guaranteed also when the instrument air or power supplies fail. Traditional cryogenic valves are not fit for this purpose. Consequently, SAMSON has developed a purely mechanical solution for large tapping demands.

The mechanics of pressure control valves

The pressure control valves mainly consist of a valve body and diaphragm actuator. The actuators are fitted with a rolling diaphragm made of a gas-resistant material. In general, rolling diaphragms provide a better control accuracy than comparable flat diaphragms because no additional forces arise due to material expansion. In conventional actuators, diaphragm

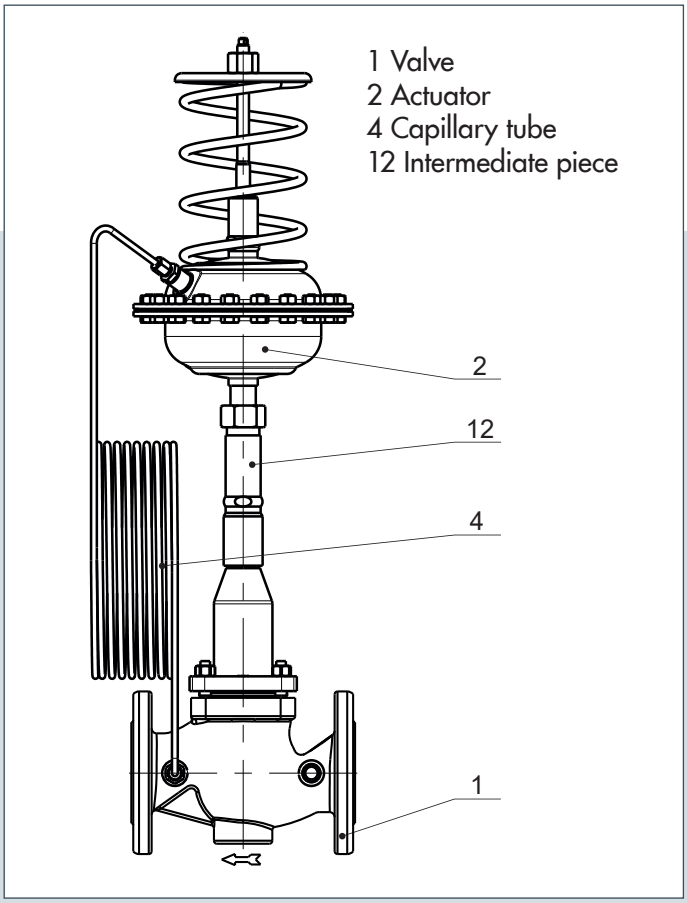

Fig. 3: Pressure reducing valve by SAMSON

hardening could occur at severe temperature drops (glass transition temperature). In pressure control valves, a cryogenic extension bonnet (12, Fig. 3) with an internal metal bellows seal separates the thermal conduction of the valves from the actuator diaphragms. As a result, the medium temperature has hardly any effect on the actuator temperature, which means that the diaphragms stay above the critical temperature range.

When the actuators perform one travel cycle, the cold medium from the valves is heated up in a several-meter-long capillary tube before it reaches the actuators. Additional protection can be achieved by selecting a diaphragm material to match the process conditions. When combining both design features – cryogenic extension bonnet with bellows seal and suitable diaphragm material –, the actuators can be used in cryogenic gas service without additional heating.

These special pressure control valves by SAMSON are available in various configurations. The standard series comprises numerous nominal valve sizes and flow capacity ratings. Based on which diaphragm actuator is selected, either pressure reducing valves (to protect downstream installations) or excess pressure valves (pressure maintaining valves to protect upstream installations) can be configured. Carefully matched combinations of diaphragm areas and spring packages cater to a wide selection of set point ranges.

Valve solutions for high flow rates

Even extreme flow rates for high consumer demands (to supply entire sites) are possible. In such cases, it would be possible to use pilot-operated valves in even larger nominal sizes, with the valve described above serving as the pilot valve. Such a combination would have an added benefit: Occasionally, a low base load with peak tapping demand occurs in real-life plant operation, for example during tank rinsing or inerting. These peaks in consumption (partly 100 times higher than the base load) can basically not be handled by a single pressure control valve. A combination comprising a small pilot valve and a large main valve, however, offers a viable, self-operated solution also for such applications.

As a one-stop-shop for control valve solutions, SAMSON does not only supply stand-alone valves but turnkey pressure control stations as well. To facilitate service work on pressure control valves used in emergency supply applications, SAMSON recommends to install a shut-off valve upstream of the pressure reducing valve to prevent problems, which always seem to occur at the worst possible time. A bypass line (or even a stand-by valve) guarantees a reliable supply. In addition to the pressure reducing valves, stilling pipes, pressure gauges, shut-off valves, bypass lines and skids are available as ready-to-install options. SAMSON offers support at the planning stage as well as during start-up.

Industrial gases are used in many different applications. An uninterrupted supply – even in the event of power or instrument air failures – can be ensured by using mechanical pressure control valves. Different sample applications with increasing complexity were presented. As a welcome side effect, there is no need to invest in wiring, cabling and a compressed air supply.

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- Asia 700
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- Frankfurt am Main, Germany 1,800

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- More than 200 representatives

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  Total plot and production area: 47,000 m²
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SAMSON AKTIENGESELLSCHAFT

Weismuellerstrasse 3 · 60314 Frankfurt am Main, Germany
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507
E-mail: samson@samsongroup.com
Internet: www.samsongroup.com

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