

# Specialty Gas Equipment

Cylinder pressure regulators and gas supply systems for specialty gases



Gases are usually stored compressed, liquefied or dissolved in suitable cylinders. In order to withdraw the gases from their containers the use of appropriate equipment plays a crucial role to ensure safety and preserve the quality of gases.

In general, there are two types of gas supply: individual cylinders with pressure regulators at the point of use or a central gas supply system.

Cylinder pressure regulators can be used if only one application has to be supplied with gas and the cylinder can be placed right next to the point of use.

The cylinder pressure regulator is directly connected to the gas cylinder and reduces the pressure to the required level.

With a central gas supply system, consisting of pressure control panels, pipelines and tapping points at the various points of use, the gas cylinders are safely stored outside of workplaces.

Messer offers the full range of components for any application. We will be glad to support you in finding the optimal form of supply.

## Selection of equipment

The specific requirements of the individual application are decisive for choosing the optimal equipment. The key factors are the type of gas (inert, corrosive or liquefied), type of gas supply (single cylinder or central gas supply) and the requirements on stability of outlet pressure.

### Type of gas

The type and quality of gas basically determine the selection of materials for the supply equipment. We recommend the use of (chrome plated) brass equipment with metal diaphragms and corresponding sealing materials for non-corrosive, high purity gases up to 6.0 purity and gas mixtures. The Messer Spectrolab product line meets these requirements and can, therefore, be used for all non-corrosive, high purity gases and gas mixtures.

For corrosive gases and sensitive, low-concentration gas mixtures we recommend stainless steel components. On the one hand, it is necessary to protect the equip-

ment against corrosion, and on the other hand, especially in case of low concentration gas mixtures (low ppm or ppb-range), it prevents the trace compounds from being adsorbed by the surface, and significantly, affecting the composition of the gas mixtures. Sealing materials need to be adapted according to the type of gas. The Messer Spectrocem product line covers all the components for these types of applications.

Liquefied gases under pressure with a boiling pressure below 40 bar can also be withdrawn without reduction of pressure by using a valve (e.g. Spectrocem V6E).

### Type of gas supply (cylinder pressure regulator/central gas supply)

Single cylinders equipped with a cylinder pressure regulator are often used for low gas consumptions. A central gas supply, consisting of pressure control panels, pipelines and tapping points, meets greater demand of gases, including also different consumers.

Type of gas	Formula	Pressure (bar) 20 °C	Property	spectrolab	spectrocem
Acetylene	C <sub>2</sub> H <sub>2</sub>	18	F	x	
Ammonia	NH <sub>3</sub>	8,6	FTC		x
Argon	Ar	200/300	I	x	
Butane	C <sub>4</sub> H <sub>10</sub>	2,1	F	x	
Chlorine	Cl <sub>2</sub>	6,8	TC		x
Hydrogen chloride	HCl	42,6	TC		x
Nitrous oxide	N <sub>2</sub> O	50,6	O	x	
Ethane	C <sub>2</sub> H <sub>6</sub>	37,6	F	x	
Ethylene	C <sub>2</sub> H <sub>4</sub>	-	F	x	
Ethylene oxide	C <sub>2</sub> H <sub>4</sub> O	1,5	FT		x
Fluorine (< 10% in gas mixture)	F <sub>2</sub>	-	TC		x
Helium	He	200/300	I	x	
Carbon dioxide	CO <sub>2</sub>	57,3	I	x	
Carbon monoxide	CO	200	FT	x	
Krypton	Kr	approx. 150	I	x	
Methane	CH <sub>4</sub>	200	F	x	
Propane	C <sub>3</sub> H <sub>8</sub>	8,4	F	x	
Test gas without corrosive component	-	max. 200		x	
Test gas with corrosive component	-	max. 200	C(T)		x
Oxygen	O <sub>2</sub>	200/300	O	x	
Sulfur dioxide	SO <sub>2</sub>	3,3	TC		x
Nitrogen	N <sub>2</sub>	200/300	I	x	
Nitrogen dioxide	NO <sub>2</sub>	0,96	TC		x
Nitrogen monoxide	NO	50,5	TC		x
Synthetic air	-	200/300	O	x	
Hydrogen	H <sub>2</sub>	200/300	F	x	
Xenon	Xe	approx. 60	I	x	

Selection of materials (C=corrosive, F=flammable, I=inert, O=oxidizing, T=toxic)

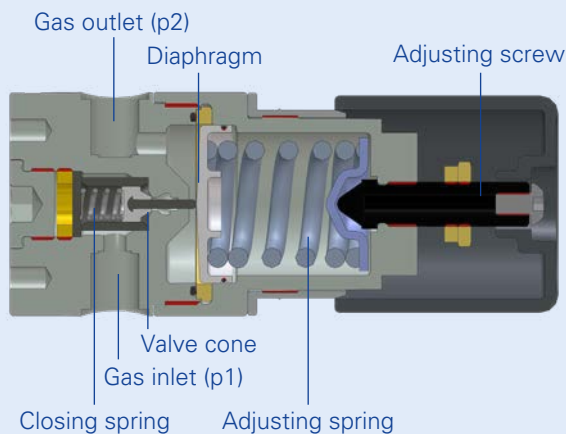


Individual cylinder at the point of use with cylinder pressure regulator

## Cylinder pressure regulator

The most important function of the gas supply equipment is to reduce the cylinder pressure to the appropriate level of the individual application. For this, pressure regulators are used. In the simplest case of a single cylinder supply the pressure regulator can be directly connected to the cylinder valve.

The principle of a pressure regulator is based on the balance of the forces acting on the valve cone. These are, on the one side, the forces of the closing spring and the gas inlet pressure  $p_1$  and on the other side, the forces of the adjusting spring and the gas outlet pressure  $p_2$ . The adjusting spring force, and therefore, the resulting outlet pressure, can be adjusted by means of the adjusting screw. The diaphragm ensures that the gas filled compartment is sealed from the atmosphere.



## Stability of outlet pressure

The requirements for the working pressure and its constancy determine which type of pressure regulator should be selected.

The withdrawal of gas from the cylinder leads to a reduction of the cylinder pressure. This changes the force balance in the pressure regulator. If the adjusting screw is not readjusted manually, the reduction of the inlet pressure leads to an increase of the outlet pressure. Single stage regulators with „compensated main valve“ or the new exact-technology can be used to improve the stability of the outlet pressure during gas withdrawal.

However, the use of a two-stage regulator is recommended for high pressure stability requirements and low outlet pressures. The first stage reduces the inlet pressure to a factory set intermediate pressure (i.e. 20 bar) and the desired outlet pressure is adjusted via the second stage. Two-stage pressure regulators guarantee a very constant outlet pressure, practically independent from the decreasing cylinder pressure.

All pressure regulators are equipped with relief valves to protect the connected equipment and two pressure gauges indicating the cylinder and outlet pressure. The display range of the pressure gauges depends on the relevant pressure levels.





Central gas supply system

## Central gas supply

In general, pressurized gas cylinders should be positioned outside of work areas. With a central gas supply, the gas cylinders are placed in a separate room or even outside the building. The cylinders are connected to a pressure control panel, consisting of a pressure regulator, which reduces the cylinder pressure to the line pressure, e.g. to 10 bar; pressure gauges for indication of cylinder and line pressure as well as purge and shut off valves. Fixed pipelines supply the gas to individual points of use, where the gas consumers are connected via tapping points. At the tapping point the line pressure is reduced to the required working pressure. A pressure gauge indicates the current working pressure.

The parallel connection of two cylinders or bundles is recommended for continuous gas supply. In this case, gas is always withdrawn from one container, while the other is connected on standby. In the simplest case, changeover from one cylinder to the other is done manually. However, there are also pressure control panels available which provide automatic changeover between the containers. Pressure control panels are equipped with pressure gauges for indication of the cylinder and outlet pressures. The panels can be supplied with contact pressure gauges, which notify if the cylinder pressure drops below a certain preset level. This signal can be passed to a low-pressure alarm panel.

It is also possible to connect and empty several cylinders at the same time using extension modules.

### Key advantages of a central gas supply are:

- **Safety:** No gas cylinder in the working area, reduced handling of gas cylinders
- **Quality:** Integrated purging valves, pressure control panels and tapping point always form a two-stage gas supply
- **Efficiency:** Supply of several gas consumers from one common source, uninterrupted gas supply with automatic changeover



**Equipment for non-corrosive gases and gas mixtures up to 6.0 grade****spectrolab**

<b>Product line</b>	<b>Inlet pressure (bar)</b>	<b>Outlet pressure (bar)</b>	<b>Product</b>
<b>Cylinder pressure regulator</b>			
single-stage	max. 300	1,5/4/10/20/50/100/150/200	Spectrolab FM 51
single-stage with balanced main valve	max. 230	0,1 - 10	Spectrolab FM 45
single-stage with exact-technology	max. 300	1,5/4/10/20	Spectrolab FM 52exact
two-stage	max. 300	1,5/4/10/20	Spectrolab FM 53
<b>Gas supply systems</b>			
<b>pressure control panel</b>			
for one cylinder	max. 300	10/20/50/100 /200	Spectrolab BM 55-1
for one cylinder, two-stage	max. 300	1,5/4/10	Spectrolab BM 56-1
for two cylinders, manual	max. 300	10/20/50/100/200	Spectrolab BM 55-2
with automatic change-over	max. 300	10/20/50/100/200	Spectrolab BM 55-2U
with automatic change-over	max. 300	10/20/50/100/200	Spectrolab BM 55-2A
for two cylinder, two-stage	max. 300	1,5/4/10	Spectrolab BM 56-2
with automatic change-over	max. 300	1,5/4/10	Spectrolab BM 56-2U
extensions	max. 300		Spectrolab BM 55-E
tapping point	max. 300	1,5/4/10/20/50	Spectrolab EM 55
<b>Accessories</b>			
control valve	max. 50	without regulator	Spectrolab V6M
blocking valve	max. 300		Spectrolab MV 3
flowmeter	1,4/4		Spectrolab FLM 32

**Equipment for corrosive and/or toxic gases and gas mixtures up to 6.0 grade****spectrocem**

<b>Product line</b>	<b>Inlet pressure (bar)</b>	<b>Outlet pressure (bar)</b>	<b>Product</b>
<b>Cylinder pressure regulator</b>			
single-stage	max. 25	0,05 - 1,5	Spectrocem FE 121
with purge valves	max. 25	0,05 - 1,5	Spectrocem FE 121 SP
single-stage	max. 300	1,5/4/10/20/50/100/150/200	Spectrocem FE 51
single-stage with balanced main valve	max. 230	0,1 - 10	Spectrocem FE 45
single-stage with exact-technology	max. 300	1,5/4/10/20	Spectrocem FE 52exact
two-stage	max. 300	1,5/4/10	Spectrocem FE 53
<b>Gas supply systems</b>			
<b>pressure control panel</b>			
for one cylinder	max. 300	10/20/50/100/200	Spectrocem BE 55-1
for one cylinder, double stage	max. 300	1,5/4/10	Spectrocem BE 56-1
for two cylinders, manual	max. 300	10/20/50/100/200	Spectrocem BE 55-2
with automatic change-over	max. 300	10/20/50/100/200	Spectrocem BE 55-2U
for two cylinders, double stage	max. 300	1,5/4/10	Spectrocem BE 56-2
with automatic change-over	max. 300	1,5/4/10	Spectrocem BE 56-2U
extension	max. 300		Spectrocem BE 55-E
tapping point	max. 200	1,5/4/10/20/50	Spectrocem EE 55
<b>Accessories</b>			
control valve	40	without regulator	Spectrocem V6E
blocking valve	max. 300		Spectrocem MV 3-E
flowmeter	1,4/4		Spectrocem FLE 32
purge- and connection-block	max. 200		Spectrocem SBE3

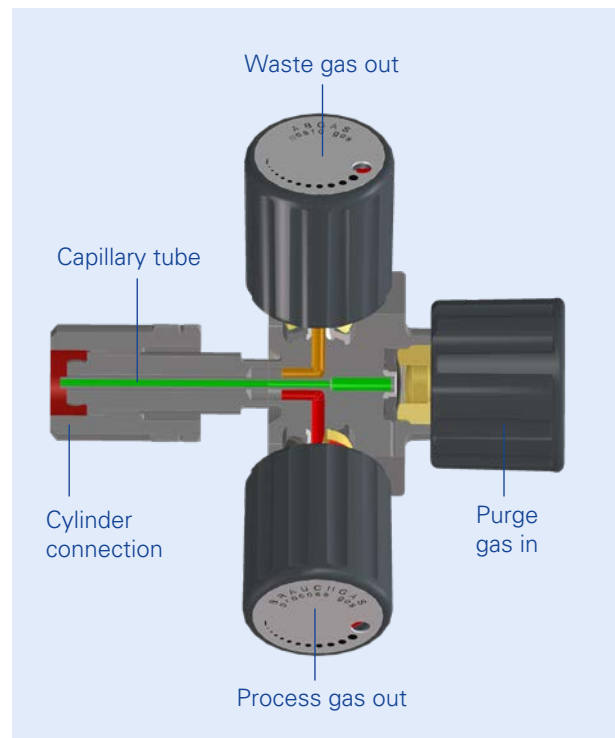
## Additional accessories

With each exchange of a cylinder, a certain volume of ambient air is introduced into the system. In order to prevent contamination of the gas and the entire system the connection has to be purged before using the new cylinder. With non-corrosive gases, this can be done by means of multiple pressure build-up purging using the gas from the gas cylinder. With corrosive and toxic gases or sensitive gas mixtures, a special purging device with a separate purge gas is required. All our pressure control panels for specialty gases are equipped with



integrated purge valves in order to ensure safe exchange of the cylinder. Spectrochem cylinder pressure regulators can be supplied with optional purge valves. The best results are achieved with the SBE/3 purge block, as it uses a separate purge gas and a capillary to purge right into the cylinder valve area.

Our specialty gas equipment product line comprises additional accessories such as flow meter, control and blocking valves.



## Service and support

Details of all equipment can be found in our specialty gases equipment app „specgas“. The app also provides the datasheets for the individual products. If you wish a personal consulting, we will be glad to support you in planning your gas supply system. We also ensure that any installation is carried out professionally and meets the relevant standards and regulations.



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