

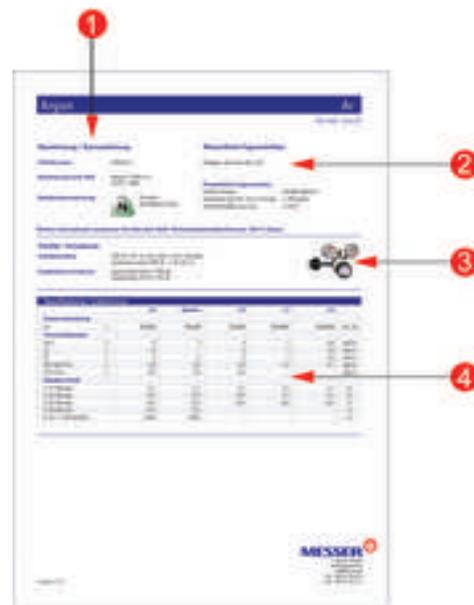


High-purity gases

Messer offers a wide range of high-purity gases. This ranges from the “air gases” (nitrogen, oxygen and argon), carbon dioxide, carbon monoxide, hydrogen and the noble gases (helium, neon, krypton and xenon) through to the most important organic (e.g. methane, ethane, ethylene, acetylene, ...) and inorganic gases (e.g. ammonia, chlorine, sulfur dioxide, refrigerants, ...).

All the gases are available in a variety of qualities and cylinders – depending on the different applications. All the necessary information is listed in the relevant data sheets for the various products. Please note the information provided below on this subject. We will be happy to help you choose the “right” product.

If you cannot find a product in the quality or delivery form you require, please contact us for more information.



- 1) Information on the description of the gas and the cylinder identification
- 2) Main properties of the gas
- 3) Valve connection and recommended manifolds
- 4) Product specifications and standard delivery forms available

Explanations

The gas quality specifications are determined by the particular application. Since these cover such a wide range, Messer offers most high-purity gases in several, graduated qualities. The quality in this regard is determined by the type and maximum content of impurities. Which impurities are contained in a particular pure gas largely depends on the production and purification process used for the gas. For the user, however, the specification of the components interfering in their process is much more important. The selection of specified impurities is therefore based on the impurities interfering in the typical applications of the gases – for example, these are mostly moisture, air components (oxygen and/or nitrogen), hydrocarbons or carbon monoxide and carbon dioxide.

The content of impurities can be expressed in different units, depending on whether it refers to the amount of substance, the volume or the mass. For example, the following units are used:

ppm; ppmv; wt. ppm: 1 part per million
(mol/mol; m³/m³; kg/kg)

ppb; ppbv; wt. ppb: 1 part per billion
(mol/mol; m³/m³; kg/kg)

For the simple description of **product quality**, a short form for purity levels has become generally established (“point notation”), which indicates the number of “nines” of the gas purity expressed in percentage terms and the first decimal place other than “nine”. For example:

Helium 6.0:
Purity > 99,9999% Sum of specified impurities < 1 ppm

Nitrogen 5.5:
Purity > 99,9995% Sum of specified impurities < 5 ppm

Argon 4.8:
Purity > 99,998 Vol% Sum of specified impurities < 20 ppm

The specifications of the high-purity gases are clearly indicated on the relevant data sheets. Please contact us if your application requires a different specification.

Filling of cylinders with high-purity gases

When filling cylinders with high-purity gases, special measures have to be taken. The first of these is a thorough cylinder pre-treatment. Compliance with the strict specifications for high-purity gases is only possible in cylinders with immaculate internal surfaces.



Filling station for high-purity gases

Steel cylinders therefore have their internal surfaces blasted prior to initial filling or after retesting. This process produces a corrosion-free, smooth surface. The cylinders are then conditioned before use. This involves heating them to approx. 80°C in a special oven and purging them several times with pure nitrogen. This removes any impurities, in particular moisture, from the internal surface.

Prior to filling, the cylinders can be evacuated with a vacuum pump directly at the filling stand. Strict quality management monitors all the production stages and checks compliance with the specifications. Depending on the filling process and quality specifications, the measures range from batch analysis to individual cylinder analysis. This is the only way of ensuring the continuous compliance with all specifications.

Forms of delivery

Depending on the type of gas, the quality specifications and the quantity required, Messer offers a range of cylinders for high-purity gases. These range from 1l pressure cans (see separate information "CANgas") to cylinder bundles.

The standard forms of delivery are listed on the relevant data sheets. For information purposes, the quantity of gas is indicated in m³ (at 15 °C and 1 bar) or kg.



Line-up of different-sized cylinders – from pressure can to bundle

The table below contains some typical values for dimensions and contents of some standard cylinders. The short form provided to denote the form of delivery describes the cylinders in accordance with the following terms:

- Type (F: cylinder, B12: bundle of 12 cylinders)
- Geometric volume (in liters)
- Material (no indication: steel, Alu: aluminum)
- Filling pressure (e.g. 200 bar)

In addition, depending on the type of gas, there are numerous special containers, e.g. cylinders with filling material (for acetylene) or drums for some organic and inorganic gases.

Cylinder	max. filling pressure (bar)	Gas contents (Nm ³)	External diameter (mm)	Length (mm)	Empty weight (kg)
F 2 200 bar	200	0,4	100	350	2,5
F 5 200 bar	200	1,0	140	440	5,5
F 10 200 bar	200	2	140	810	12
F 20 200 bar	200	4	204	790	25
F 20 300 bar	300	6	204	815	39
F 50 200 bar	200	10	229	1500	57
F 50 300 bar	300	15	229	1488	71

F 2 Alu 200 bar	200	0,4	102	390	2,6
F 5 Alu 200 bar	200	1,0	140	525	6,5
F 10 Alu 200 bar	200	2	140	995	11
F 20 Alu 200 bar	200	4	204	940	23,4
F 40 Alu 200 bar	200	8	229	1455	46
F 50 Alu 200 bar	200	10	250	1530	57,5

B 12 x F 50 200 bar	200	128	L 990 / B 750 / H 1838		920
B 12 x F 50 300 bar	300	182	L 990 / B 750 / H 1838		1100

Identification

The cylinders are identified by a combination of imprints, hazardous goods labels (product labels) and hazard or gas type specific color coding of the cylinder shoulder.

The most important identification, and the one that is definitive for transport and application purposes, is the hazardous goods label, which contains the mandatory information about the contents of the cylinder.



Further safety information is contained in the safety data sheet provided by Messer

In addition to the precise identification of the gas, the label also provides safety information for transportation and advice on the safe handling of the gas (hazards and safety recommendations).

The color coding of the cylinder shoulders is based on the EN 1089-3 standard. This standard defines the color of the cylinder shoulder. In general, this is based on the primary hazard.

For some gases the color coding of the shoulder has been explicitly defined:

Properties	Shoulder color	Examples
Toxic and/or corrosive (1)	Yellow 	Ammonia, arsine, chlorine, fluorine, carbon monoxide, nitric oxide, sulfur dioxide
Flammable (2)	Red 	Hydrogen, methane, ethylene, forming gas, (nitrogen/hydrogen mixture)
Oxidizing (3)	Light blue 	Oxygen mixtures, nitrous oxide mixtures
Inert	Bright green 	Krypton, xenon, neon, shielding gas mixtures, compressed air

1) See ADR/RID for definition of toxic/non-toxic and corrosive/non-corrosive
In this case, corrosive means causing burns to human tissue
2) See ADR/RID for definition of flammable/non-flammable
3) See ADR/RID for definition of oxidizing/non-oxidizing

Gas	Shoulder color
Acetylene	Maroon 
Oxygen	White 
Nitrous oxide	Blue 
Argon	Darkgreen 
Nitrogen	Black 
Carbon dioxide	Gray 
Helium	Brown 

Cylinder connections

The valve connections comply with the relevant national standard, e.g.:

- German DIN 477
- French AFNOR
- British Standard BS341
- Dutch NEN 3268

These standards define the valve connections for the different types of gas. The connections for 300 bar cylinders are defined EU-wide in the ISO 5145:2004 standard. The appropriate connection is specified on the product data sheet. Please do not hesitate to ask us if you have any questions on this subject.



Physikalische Eigenschaften	
Relative Dichte	1,33
Schmelztemperatur	18,9 K (-273,15 °C)
Siedetemperatur	87,3 K (-185,85 °C)
Kritische Temperatur	150,6 K (-172,55 °C)
Kritische Dichte	4,807 kg/m³
Kritischer Druck	48,3 bar
Kritische Masse	352,9 kg
Kritische Volumen	0,00221 m³/kg
Kritische Enthalpie	10,5 kJ/kg
Kritische Entropie	0,101 kJ/kg·K
Kritische Wärmekapazität	1,67 kJ/kg·K
Kritische Viskosität	1,91 x 10 ⁻⁴ Pa·s
Kritische Diffusionskoeffizient	0,16 cm²/s
Kritische Leitfähigkeit	0,017 W/m·K
Kritische Viskosität	1,91 x 10 ⁻⁴ Pa·s
Kritische Diffusionskoeffizient	0,16 cm²/s
Kritische Leitfähigkeit	0,017 W/m·K

Example for a technical gas data sheet

Further information on the gases can be found in the "technical data sheets" which contain tables listing the main properties, the compatibility of materials (as per EN ISO 11114), important safety parameters and the physical data of each gas. All the data were compiled with great care. Nevertheless, we cannot accept any liability for it. If you have any doubts, please get in touch with us!

In order to withdraw the gas safely, you will need the appropriate withdrawal equipment – in the simplest case a cylinder pressure regulator, for example. Advice on selecting the appropriate components can be found in the separate information "Gas supply systems and components for specialty gases".

The product data sheets list the recommended manifolds from the extensive range of Messer equipment for each type of gas. Detailed information can be found in the data sheets for each component.



Messer Group GmbH
Gahlingspfad 31
47803 Krefeld
Tel. +49 2151 7811-0
Fax +49 2151 7811-501
info@messergroup.com
www.messergroup.com