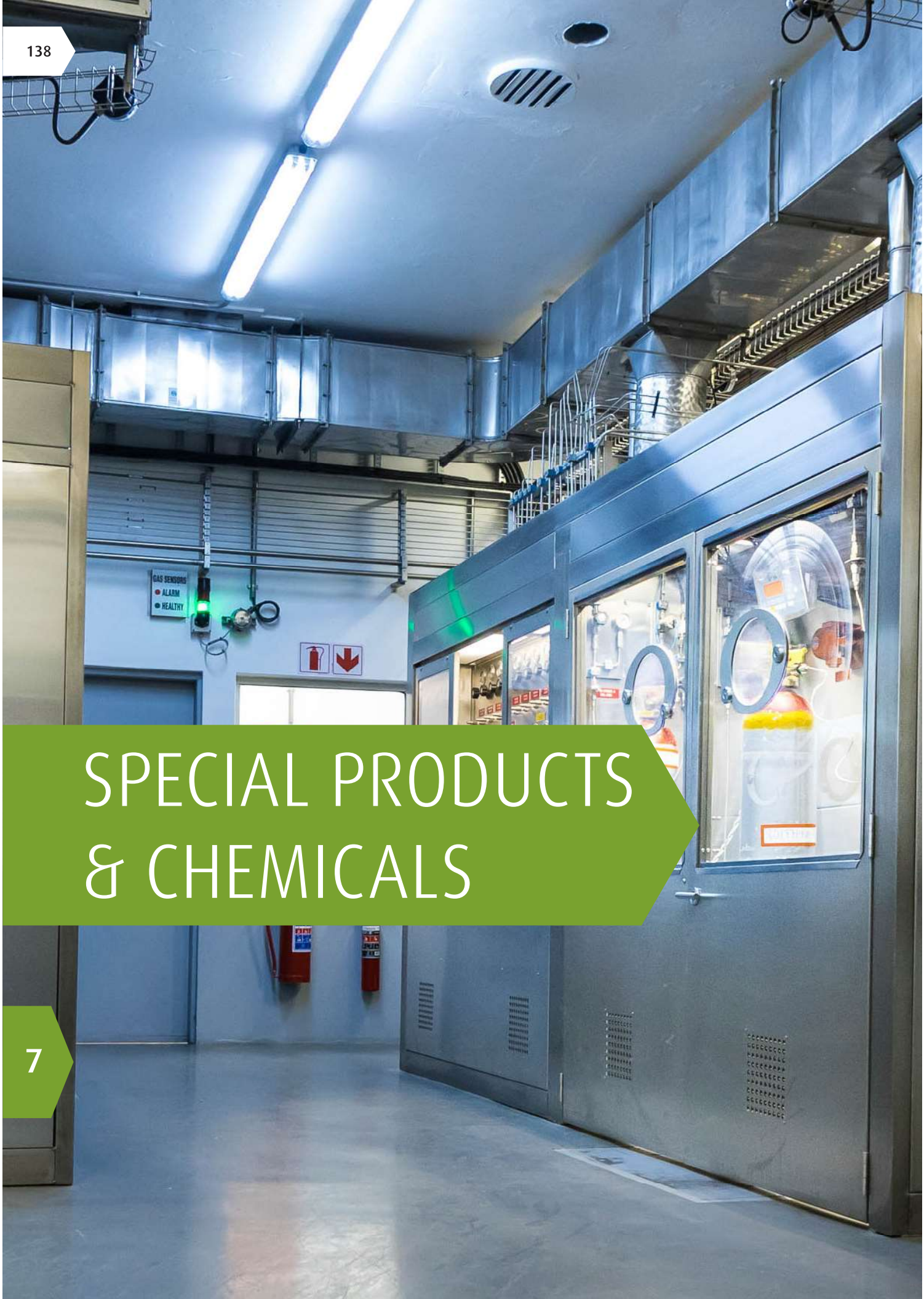


SPECIAL PRODUCTS & CHEMICALS

Chemicals

Ammonia (NH_3, R-717)

CAS: 7664-41-7 UN: 1005

Characteristics

- Colourless liquefied gas with a penetrating and suffocating odour
- Combustible but hard to ignite.

Health Risks

- Toxic
- Irritates mucous membranes and eyes. High concentrations give rise to cramp in the windpipe and pulmonary oedema
- Good odour warning.

Transport

ADR Class 2, 2TC 

DOT Class 2,3 

Product Description	Size (kg)	Material Number	Recommended Regulator
Ammonia N3.5	68,0	540201-LH-N	W020120
Ammonia N3.5	1 400,0	540201-TE-C	Recommendation on Request
Ammonia N2.5	Bulk	5374	Recommendation on Request

Standard Specifications		
Ammonia RG (N3.5)	**Refrigerant Grade**	
Purity (%)	>99,95	
Maximum Impurities (ppm)	Moisture Oil	<100 <100
Stability Period (years)	3	
Material Code	540201-LH-N	
Valve	CGA240	
Pressure @ 20°C	8,56 bar	
Cylinder	Low pressure steel	
Mass of Gas in Cylinder	68 kg	
Volume of Gas @ 101,3 kPa (absolute)	93,4 m^3	
Flammability in Air	15 - 27%	
Applications	Refrigeration	
Precautions	Toxic corrosive gas	

Material Compatibility

Legend: ● Good ▲ Fair ■ Avoid

Source

- Ammonia is manufactured using the Haber-Bosch process, consisting of a direct reaction between hydrogen and nitrogen, in the molar proportions 3:1.

Applications

- Anhydrous ammonia, with the ASHRAE number R-717, is one of the oldest commercial refrigerants known. It is used in both absorption and compression type systems as well as being used in soil fertilisation. In soil fertilisation, it is used in the form of ammonia, ammonia salts, nitrates and urea. It is also added to fertilisers containing superphosphates and in making nitrogen containing solutions which consist of ammonia and ammonium nitrate or urea, or both in water. Anhydrous ammonia is also used in combination with chlorine to purify municipal and industrial water supplies.
- Ammonia, or rather dissociated ammonia, is used in such metal treating operations as nitriding, carbo-nitriding, bright annealing, furnace brazing, sintering, sodium hydride descaling, atomic hydrogen welding and other applications where protective atmospheres are required. It is used in extracting such metals as copper, nickel and molybdenum from their ores. It is also used to reduce atmosphere in heat treatment of metals and for the fabrication of silicium nitride.
- Dissociated ammonia is also used as a convenient source of hydrogen for the hydrogenation of fats and oils. Through the controlled combustion of dissociated ammonia in air, a source of pure nitrogen is achieved.
- The petroleum industry utilises anhydrous ammonia in neutralising the acid constituents of crude oil and in protecting equipment such as bubble plate towers, heat exchangers, condensers, and storage tanks from corrosion.
- High purity ammonia can be oxidising to nitric oxide which is converted to nitrogen dioxide to ultimately furnish nitric acid (Ostwald process); in the lead chamber process for manufacturing sulphuric acid, ammonia is oxidised to nitrogen oxides which are needed to convert sulphur dioxide to sulphuric acid. Most industrial and military explosives of the conventional types contain nitrogen and ammonia is the basic source of nitrogen in their manufacturing. Ammonia is used in the production of hydrogen cyanide.
- As a processing agent, ammonia is used in the manufacturing of alkalis, ammonium salts, dyes, pharmaceuticals, cuprammonium rayon, and nylon.
- A diluted solution of ammonia in water is used as a common household cleansing agent. More concentrated forms are used extensively as chemical reagents.
- A recent development is the substitution of ammonia for calcium in the bisulphite pulping of wood. This improves the yield and quality of the pulp. Ammonia is also used as a solvent for casein in the coating of paper.
- Ammonia is used in the rubber industry for stabilisation of raw latex to prevent coagulation during transportation and storage.
- Ammonia is used as a catalyst in the phenol-formaldehyde condensation and also in the urea-formaldehyde condensation to make synthetic resin.
- Ammonia is a reagent in copying machines (blue print and micro film).
- Ammonia is also used to produce proteins and can be used to improve the protein content of low quality hay.
- Ammonia is used as a component in calibration gas mixtures for gas detection systems as well as environmental emission monitoring.
- Ammonia is widely used in the semiconductor industry.
- Ammonia is used in the production of blue and white LEDs (Light Emitting Diodes).
- Ammonia can be used to neutralise nitric oxides emitted by diesel engines by selective catalytic reduction.

Carbon Monoxide (CO)

CAS: 630-08-0 UN: 1016

Characteristics

- Flammable
- Odourless and colourless gas.

Health Risks

- Toxic. Binds itself to the haemoglobin in the blood
- A headache is usually the first shown symptom.

Transport

ADR Class 2, 2A 

DOT Class 2,2 

Product Description	Size (kg)	Material Number	Recommended Regulator
Carbon Monoxide (Non-petrochemical)	9,0	540303-NE-C	W019120 or W019220

Other purities available to N5.5 on request

Standard Specifications		
Non-petrochemical source		
Purity (N2.5) (%)	≥99,5	
Maximum Impurities (ppm)	Oxygen and argon Hydrogen Water Nitrogen Other impurities	≤30 VPM ≤10 VPM ≤5 VPM ≤4 000 VPM ≤5 VPM
Stability Period (years)	5	
Material Code	540303-NE-C	
Valve	5/8" BSP LH female	
Pressure	150 bar	
Cylinder	40 ℓ aluminium	
Mass of Gas in Cylinder	9 kg	
Volume of Gas @ 101,3 kPa (absolute)	7,56 m^3	
Flammability in Air	12,5 - 74%	

Physical Data	
Molecular Weight	28,01
Boiling Point at 1,013 bar [°C]	-191,45
Boiling Point at 14,5 psi [°F]	-312,59
Density at 1,013 bar, 20°C [kg/m³]	1,165
Density at 1 atm, 70°F [lb/ft³]	0,072
Vapour Pressure at 0°C [bar]	-
Vapour Pressure at 20°C [bar]	-
Vapour Pressure at 32°F [psi]	-
Vapour Pressure at 70°F [psi]	-
Flammability Range in Air [% volume]	12,5 - 74,0
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,859
Specific Volume at 1 atm, 70°F [ft³/lb]	13,9

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	▲	●	■	▲	●	●	●	▲	●	▲	▲	●	●	■

Legend: ● Good ▲ Fair ■ Avoid

Source

The most common carbon monoxide production plants are 'reformers' in which natural gas and steam react together to produce CO together with hydrogen. However, there are also many other production techniques such as incomplete combustion of natural gas and, for smaller quantities, the dehydration of formic acid using either sulphuric or phosphoric acids.

Applications

- The largest use of carbon monoxide is in the chemical industry where it is used in the synthesis of a wide variety of chemicals such as esters, ketones, aldehydes and glycols as well as for the production of phosgene, a common chemical intermediate.
- Some types of electronic components, such as reed relay switches, are encapsulated in a glass enclosure which is sealed by direct heating with a flame. In these cases, it is important that no water is produced in the flame as this would be sealed in the enclosure and lead to failure of the component. Hydrogen and hydrocarbon fuels are therefore not suitable and carbon monoxide is used.
- Atmospheres containing carbon monoxide are used to preserve fruit and vegetables during storage and shipment. The carbon monoxide provides a reducing atmosphere which inhibits the growth of organisms and the action of enzymes.
- Carbon monoxide is used in relatively large quantities and in a variety of ways in the primary metals industry: as a chemical reducing agent for the recovery of metals from ores; in the purification of aluminium waste; and in the

manufacture of metal carbonyls for conversion by thermal decomposition into high purity powdered metals.

- Carbon monoxide also serves for the production and regeneration of catalysts such as nickel carbonyl.
- Carbon monoxide is also used in both organic and inorganic chemical synthesis.
- Carbon monoxide is a component in gas mixtures for lung diffusion.
- Carbon monoxide is a component in laser gas mixtures.
- Carbon monoxide is a component in calibration gas mixtures.
- A necessity in the production of solar cells is super clean silicium, that is produced with the aid of carbon monoxide.
- Carbon monoxide is used as fuel in fuel cells.

Ethylene (C_2H_4, Ethene, R-1150)

CAS: 74-85-1 UN: 1962

Characteristics

- Flammable
- Colourless gas with slight odour.

Health Risks

- Asphyxiant at high concentrations.

Transport

ADR Class 2, 2F 

DOT Class 2,1 

Product Description	Size (kg)	Material Number	Recommended Regulator
Ethylene N2.5	16,7	804450-SO-A	W019120 or W019220

Other purities available to N5.5 on request

Standard Specifications		
Ethylene (N2.5)		
Purity (%)	>99,5	
Maximum Impurities (ppm)	Other Hydrocarbons CO CO_2 O_2 H_2O Nitrogen	<4 000 <5 <15 <25 <5 <100
Stability Period (years)	5	
Material Code	804450-SO-A	
Valve	5/8" BSP LH female	
Pressure	91,1 bar	
Cylinder	50 ℓ WC CrMo steel cylinder	
Mass of Gas in Cylinder	16,7 kg	
Volume of Gas @ 101,3 kPa (absolute)	14,0 m^3	
Flammability in Air	3,1 - 32%	
Applications	Polymer manufacture	
Precautions	Flammable gas under pressure	

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	●	●	▲	●	●	●	●	●	●	▲	●	●	●	●

Legend: ● Good ▲ Fair ■ Avoid

Source

- Ethylene is produced by passing ethyl alcohol vapours over dehydrating catalysts at 360 - 470°C.
- It may also be produced by the pyrolysis of ethane.
- Cracking of petroleum is another source.

Applications

- Ethylene is the starting material for several industrial syntheses. It is employed as an intermediate in the chemical industry and for the production of plastics.
- Ethylene is employed for the production of:
  - Acetaldehyde
  - Acetic acid
  - Chloroethane
  - Chloroethene (vinyl chloride)
  - Dichloroethane
  - 1,1-dichloroethene (vinylidene chloride)
  - Epoxyethane (ethylene oxide)
  - Ethanediol (ethylene glycol)
  - Ethanol
  - Ethoxyethane
  - Ethyl benzene
  - Phenylethene (styrene)
  - Polychloroethene (polyvinyl chloride)
  - Polythene
  - Propanoic acid
  - Tetraethyl lead
  - Trichloroethane.
- Ethylene is used as a component in calibration gases for the automotive, gas, oil as well as the chemical industries.
- Ethylene supplied in cylinders is used for controlled ripening of fruit, especially bananas. A concentration of a few ppm in the warehouse atmosphere is used. Because of flammability considerations, it is strongly recommended to use a mixture of ethene in nitrogen in this application. (see 'Ripegas')
- Ethylene has also been used in agriculture to promote crop growth. In this case the gas is injected directly into the soil.
- It is used as a refrigerant especially in the petrochemical industry. It has the ASHRAE number R-1150.

Hydrogen Chloride (HCl)

CAS: 7647-01-0 UN: 1050

Characteristics

- Colourless, liquefied gas with pungent odour
- Forms white fumes in humid air
- Corrosive in humid conditions.

Health Risks

- Highly corrosive
- Attacks the eyes and the mucous membranes
- Causes lung damage
- Good odour warning.

Transport

ADR Class 2, 2TC 

DOT Class 2,3 

Product Description	Size (kg)	Material Number	Recommended Regulator
Hydrogen Chloride N2.5	50,0	541801-SO-C	Recommendation on Request

Standard Specifications		
Hydrogen Chloride N2.5		
Purity (%)	>99,5 (weight)	
Impurities (ppm)	Inert gases*	<2 000
	Chlorine	<10
	Chlorinated hydrocarbons	<10
	Water	<10
	* H_2, N_2, O_2, Ar, CO_2, CO, CH_4	

The specifications refer to the liquid phase.

Physical Data	
Molecular Weight	36,461
Boiling Point at 1,013 bar [°C]	-85,1
Boiling Point at 14,5psi [°F]	-120,98
Density at 1,013 bar, 20°C [kg/m³]	1,526
Density at 1 atm, 70°F [lb/ft³]	0,095
Vapour Pressure at 0°C [bar]	25,6
Vapour Pressure at 20°C [bar]	42,02
Vapour Pressure at 32°F [psi]	371,1
Vapour Pressure at 70°F [psi]	625,37
Flammability Range in Air [% volume]	Non-combustible
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,655
Specific Volume at 1 atm, 70°F [ft³/lb]	10,5

Valve outlet size will be specified on quote and is not standard but dependant on Linde country of origin

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
■	■	■	■	▲	■	▲	▲	■	■	●	▲	●	▲	▲

Legend: ● Good ▲ Fair ■ Avoid

Source

- Hydrogen chloride is normally prepared in commercial quantities by the direct combination of chlorine and hydrogen. This is achieved by 'burning' chlorine in an atmosphere of hydrogen. Most of the hydrogen chloride produced in this way is normally dissolved directly in water to produce hydrochloric acid, but some companies collect the anhydrous hydrogen chloride.

Applications

- Hydrogen chloride is used to remove the remaining fibres from cotton seeds after the cotton wool has been separated and before the seed is stored for resowing the following season.
- Hydrogen chloride is used to separate cotton from wool.
- Hydrogen chloride is used in the manufacture of inorganic chlorides.
- Hydrogen chloride is used as the chlorine donor in excimer lasers.
- Hydrogen chloride is used to promote and regenerate catalysts in the petrochemical industry, and to add viscosity to oils.
- Hydrogen chloride is used for hydrochlorinations (e.g. production of chloromethane) and oxychlorinations (e.g. production of chloroethene). It is also used to produce chlorosulphonic acid and synthetic rubbers.
- Hydrogen chloride is used as a thermal etchant to remove material from unmasked areas and to prepare wafer surfaces for epitaxial deposition.
- High purity hydrogen chloride gas is widely used in the electronics industry. It is a chlorine carrier produced by high temperature cracking. It is used in the following applications:
  - Scouring furnaces (quartz chambers)
  - Dissolved in water as aqueous cleaning agent to prepare metal surfaces for electro-plating
  - Selective etching of windows in electronic microcircuits
  - Carrier for non-volatile elements in the form of gaseous chloride.
- Hydrogen chloride is used in pharmaceutical synthesis.
- Hydrogen chloride is also used for production of hard metals.

Hydrogen Sulphide (H_2S)

CAS: 7783-06-4 UN: 1053

Characteristics

- Flammable
- Extremely offensive odour, liquefied gas.

Health Risks

- Highly toxic
- Causes headaches, nausea, diarrhoea, and respiratory paralysis
- Warning! The sense of smell is fatigued quickly.

ADR Class 2, 2TF 

DOT Class 2,3 

Product Description	Size (kg)	Material Number	Recommended Regulator
Hydrogen Sulphide N2.5	63,0	542601-LF-C	Recommendation on Request

Not a stock item. Various purities available on request.

Standard Specifications		
Hydrogen Sulphide		
Purity (%)	>99,5 (vol)	
Impurities (ppm)	Carbon oxide sulphide Methane	<3 000 (vol.) <500 (vol.)

The specifications refer to the liquid phase.

Physical Data	
Molecular Weight	34,082
Boiling Point at 1,013 bar [°C]	-60,35
Boiling Point at 14,5psi [°F]	-76,61
Density at 1,013 bar, 20°C [kg/m³]	1,426
Density at 1 atm, 70°F [lb/ft³]	0,089
Vapour Pressure at 0°C [bar]	10,64
Vapour Pressure at 20°C [bar]	18,40
Vapour Pressure at 32°F [psi]	154,40
Vapour Pressure at 70°F [psi]	274,52
Flammability Range in Air [% volume]	4,0 - 44,0
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,701
Specific Volume at 1 atm, 70°F [ft³/lb]	11,2
Valve Connection	G5/8" LH-F BS341 No. 4

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
▲	■	▲	▲	▲	▲	●	●	■	●	▲	▲	▲	●	■

Legend: ● Good ▲ Fair ■ Avoid

Source

- Hydrogen sulphide occurs as a by-product from many chemical processes. It is an off-gas in the production of viscose rayon, synthetic rubber, various petroleum products, dyes and leather processing.
- It can also be manufactured by treatment of many metallic sulphides with a mineral acid such as hydrochloric or sulphuric acid.

Applications

- Small quantities of hydrogen sulphide are used as a dopant for indium phosphide and gallium arsenide semiconductors, and as a precursor for the growth of zinc sulphide semiconductors.
- Hydrogen sulphide is used for metal separation, removal of metallic sulphides. In hot wire galvanising it is used in conjunction with natural gas to speed up the galvanising process.
- Hydrogen sulphide is used to regenerate certain types of catalyst used in the petrochemical industry.
- Hydrogen sulphide is used in calibration mixtures for the petrochemical industry.
- Hydrogen sulphide is used in mixtures for emission control applications.
- Hydrogen sulphide is used as an analytical reagent in chemical analysis.
- Hydrogen sulphide is used for preparation of phosphors, oil additives and for production of additives for high pressure lubricants and cutting oils.
- Hydrogen sulphide is used in the chemical industry for production of sulphurated compounds, as mercaptans, sulphides, etc.
- Hydrogen sulphide is also used as a solvent and as an odorant in town gas.
- Hydrogen sulphide is used in the separation of heavy water, from normal water with some nuclear power stations.
- Hydrogen sulphide is used for surface treatment of metals.

Methane (CH_4, R-50)

CAS: 74-82-8 UN: 1971

Characteristics

- Flammable
- Colourless and odourless gas.

Health Risks

- Asphyxiant at high concentrations.

Transport

ADR Class 2,1F 

DOT Class 2,1 

Product Description	Size (kg)	Material Number	Recommended Regulator
Methane N3.5	8,1	541403-SE-C	W019120 or W019220

Other purities available to N5.5 on request

Standard Specifications		
Methane (N3.5)		
Purity (%)	>99,95	
Maximum Impurities (ppm)	Nitrogen Oxygen Ethane Ethylene Other HC Water Carbon dioxide	<100 <20 <300 <10 <20 <20 <50
Material Code	541403-SE-C	
Valve	G5/8" LH-F BS341 No. 4	
Pressure	200 bar	
Cylinder	50 ℓ WC CrMo steel cylinder	
Mass of Gas in Cylinder	8,1 kg	
Volume of Gas @ 101,3 kPa (absolute)	12,94 m^3	
Flammability in Air	5 - 15%	
Applications	Laboratory synthesis of chemicals	
Precautions	Flammable	

Physical Data	
Molecular Weight	16,043
Boiling Point at 1,013 bar [°C]	-161,49
Boiling Point at 14,5psi [°F]	-258,66
Density at 1,013 bar, 20°C [kg/m³]	0,668
Density at 1 atm, 70°F [lb/ft³]	0,042
Vapour Pressure at 0°C [bar]	-
Vapour Pressure at 20°C [bar]	-
Vapour Pressure at 32°F [psi]	-
Vapour Pressure at 70°F [psi]	-
Flammability Range in Air [% volume]	5,0 - 15,0
Specific Volume at 1,013 bar, 20°C [m³/kg]	1,496
Specific Volume at 1 atm, 70°F [ft³/lb]	23,8

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	●	●	■	●	●	●	●	●	●	▲	●	●	●	●

Legend: ● Good ▲ Fair ■ Avoid

Source

- Methane is the principal constituent of natural gas (typically natural gas is 87% methane). It is therefore commonly produced by purifying gas.
- Pure methane may also be obtained from the cracking of petroleum fractions.

Applications

- Methane is used as a heating fuel for domestic purposes and above all for industrial heating:
  - In the steel industry, with open hearth furnaces, in the presence of fuel oil, and in reheating furnaces for semi-products prior to rolling or forging, oxy-cutting of metal, for heat treatment of non-ferrous metals and supply to infrared heating elements used for surface treatment
  - In thermal power plants
  - In glass making, annealing kilns for pharmaceutical ampoules, ceramic kilns
  - In the textile industry
  - In the chemical industry, petrochemical furnaces, heating of tanks containing resins for paints, vulcanisation of plastics
  - In food and farm industries, coffee roasting ovens, malt drying in breweries, dehydration of plant fodder, powdered milk production
  - In cement plants
  - In paper mills.
- Methane was employed in the gas batteries used by the Apollo space missions.
- High purity methane is used as a fuel gas in flame photometers.
- When mixed with argon or xenon, methane is used as a gas filling for proportional counters and other types of radiation detectors.
- As natural gas, it is also used as fuel for vehicles.
- In the chemical field, methane serves as a raw material for the production of methanol, synthetic ammonia, acetylene, carbon black, carbon disulphide, hydrocyanic acid, chloromethane, methylene chloride, carbon tetrachloride and chloroform.
- In the steel industry, natural gas is used for direct reduction of powdered minerals, and to produce hard metal.
- Methane finds extensive use in various mixtures for quality control laboratories in the petrochemical and fuel gas industries.
- Methane is used in gas cooled nuclear reactors. The methane is used to dope the carbon dioxide coolant in order to prevent erosion of the carbon control rods in the nuclear core.
- Methane is used for efficiency testing of gas burners and engines.
- Methane is also used in synthetic town gas mixtures.
- Methane mixtures are commonly used for calibrations in the automotive industry and in the environmental field.
- Methane mixed with argon is used as make-up gas in electro-chemical detectors (EC detectors).

Note:

Methane is controlled under the Kyoto Protocol, an international Framework Convention with the objective of reducing greenhouse gases.

Sulphur Dioxide (SO_2)

CAS: 7446-09-5 UN: 1079

Characteristics

- Colourless, liquefied gas with pungent odour
- Dry gas is not corrosive.

Health Risks

- Toxic
- Irritates the eyes and respiratory passages
- 50 - 100 ppm is considered to be the maximum permissible concentration for exposures of 30 - 60 min
- Normally the odour is detected at 3 ppm, by taste at 0,7 ppm.

Transport

ADR Class 2, 2TC 

DOT Class 2,3 

Product Description	Size (kg)	Material Number	Recommended Regulator
Sulphur Dioxide N3.0	78,0	540901-LJ-N	W020121
Sulphur Dioxide N3.0	1 000,0	540901-TB-N	Recommendation on Request
Sulphur Dioxide (Afrox owned)	75,0	540902-LJ-N	Recommendation on Request
ISO Container		5409	

Standard Specifications		
Sulphur Dioxide (78 kg) 540901-LJ-N		
Purity (%)	>99,9	
Maximum Impurities (ppm) Mass/mass	Specification. Oil Residue Sulphuric acid Arsenic Lead Zinc Copper and zinc Selenium	<100 <100 <100 <3 <10 <25 <50 <10
Material Code	540901-LJ-N	
Valve	CGA240 modified	
Pressure	3,36 bar @ 20°C	
Cylinder	Low pressure steel	
Mass of Gas in Cylinder	78 kg	
Volume of Gas @ 101,3 kPa (absolute)	28,3 m^3	
Flammability in Air	Not flammable	
Applications	Wine and juice preservative	
Precautions	Toxic and corrosive gas	

Standard Specifications		
Sulphur Dioxide (75 kg Afrox owned) 540902-LJ-C		
Purity (%)	>99,9	
Maximum Impurities (ppm) Mass/mass	Specification. Oil Residue Sulphuric acid Arsenic Lead Zinc Copper and zinc Selenium	<100 <100 <100 <3 <10 <25 <50 <10
Material Code	540902-LJ-C	
Valve	Liquid: CGA 240 Vapour: BS 341 No.10 ($G^1/_2$")	
Pressure	3,36 bar @ 20°C	
Cylinder	Low pressure steel	
Mass of Gas in Cylinder	75 kg	
Volume of Gas @ 101,3 kPa (absolute)	27,2 m^3	
Flammability in Air	Not flammable	
Applications	Wine and juice preservative	
Precautions	Toxic and corrosive gas	

Physical Data	
Molecular Weight	64,065
Boiling Point at 1,013 bar [°C]	-10,02
Boiling Point at 14,5 psi [°F]	13,98
Density at 1,013 bar, 20°C [kg/m^3]	2,712
Density at 1 atm, 70°F [lb/ft^3]	0,169
Vapour Pressure at 0°C [bar]	1,55
Vapour Pressure at 20°C [bar]	3,36
Vapour Pressure at 32°F [psi]	22,51
Vapour Pressure at 70°F [psi]	50,67
Flammability Range in Air [% volume]	Non-combustible
Specific Volume at 1,013 bar, 20°C [m^3/kg]	0,368
Specific Volume at 1 atm, 70°F [ft^3/lb]	5,92

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
▲	■	▲		▲	▲	●	▲	■	■	●	▲	●	●	■

Legend: ● Good ▲ Fair ■ Avoid

Source

- Sulphur dioxide may be produced by a variety of routes, such as the combustion of sulphur or pyrites; alternatively, as a by-product of smelter operations.
- It can also be prepared by the reaction of an acid on a metallic sulphide, or by the action of sulphuric acid directly on a metal such as copper.

Applications

- Sulphur dioxide is used in the manufacture of sulphite, hydrogen sulphites and sulphuric acid.
- Sulphur dioxide is used in magnesium foundries as protection gas (an alternative to SF_6).
- Sulphur dioxide is used as a bleaching agent particularly for certain types of dried food, and also to bleach glue, elation, sugar, textiles, fats and oils.
- Sulphur dioxide is used to sterilise wine and beer making equipment in order to inhibit the growth of moulds and bacteria, and control wine fermentation. Sulphur dioxide may be used in a variety of disinfecting and fumigation applications.

- Sulphur dioxide is used as a component in environmental calibration gases.
- Sulphur dioxide is used in gas mixtures for car emission monitoring.
- Sulphur dioxide is also used in the float glass manufacturing process.
- Sulphur dioxide may be used:
  - As a refrigerant
  - In laboratory research on corrosion problems
  - To remove excess chlorine in textile bleaching and water treatment
  - In preparation of chrome leather tanning
  - As solvent.

Sulphur Hexafluoride (SF_6)

CAS: 2551-62-4 UN: 1080

Characteristics

- Colourless and odourless gas.

Health Risks

- Asphyxiant at high concentrations.

Transport

ADR Class 2, 2A 

DOT Class 2,2 

Product Description	Size (kg)	Material Number	Recommended Regulator
Sulphur Hexafluoride N3.0	9,0	541601-IE-C	W019141 or W019241
Sulphur Hexafluoride N3.0	20,0	541602-SE-C	W019141 or W019241
Sulphur Hexafluoride N3.0	50,0	541601-SE-C	W019141 or W019241

Standard Specifications		
Sulphur Hexafluoride		
Purity (%)	>99,9	
Maximum Impurities (ppm)	Air Carbon tetrafluoride Moisture Mineral oil Acidity, in terms of HF Hydrolysable fluorides in terms of HF	<2500 <1000 <120 <10 <0.3 <1
Stability Period (years)	5	
Material Code	541601-SE-C	
Valve	5,8" RH male BS 341-6	
Pressure	21,61 bar	
Cylinder	50 ℓ WC CrMo steel 230 mm x 1 665 mm 70 kg empty	
Mass of Gas in Cylinder	50 kg	
Volume of Gas @ 101,3 kPa (absolute)	7,99 m^3	
Flammability in Air	Not flammable	
Applications	Electrical insulating gas in high voltage switchgear	
Precautions	Asphyxiant	

Physical Data	
Molecular Weight	146,06
Boiling Point at 1,013 bar [°C]	-63,9
Boiling Point at 14,5 psi [°F]	-83,0
Density at 1,013 bar, 20°C [kg/m³]	6,154
Density at 1 atm, 70°F [lb/ft³]	0,382
Vapour Pressure at 0°C [bar]	12,90
Vapour Pressure at 20°C [bar]	21,60
Vapour Pressure at 32°F [psi]	187,2
Vapour Pressure at 70°F [psi]	321,70
Flammability Range in Air [% volume]	Non-combustible
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,543
Specific Volume at 1 atm, 70°F [ft³/lb]	8,772

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Legend: ● Good ▲ Fair ■ Avoid

Source

- Sulphur hexafluoride is manufactured by direct fluorination of pure (elemental) sulphur, generally by companies who produce fluorine for other purposes such as the production of fluorocarbons.

Applications

- One of the principal uses of sulphur hexafluoride is as an insulating medium in circuit breakers, switch gear, power substations and gas insulated transmission lines. For these applications, the gas used must meet or exceed ASTM D2472 and IEC specifications.
- Sulphur hexafluoride is used as a plasma etching gas.
- Sulphur hexafluoride is often used as a filling gas in double glazing as it reduces the sound transmission and the heat transfer.
- Certain HF/DF chemical lasers use sulphur hexafluoride as the fluorine source. This type of laser is used mainly in R&D applications.
- As sulphur hexafluoride is both inert and considerably denser than air, it is suitable for blanketing open baths of certain molten metals, particularly magnesium.
- Sulphur hexafluoride is used in laboratories as a carrier gas media in supercritical fluid chromatography (SFC), and as media in supercritical fluid extraction (SFE) for sample preparation.
- Sulphur hexafluoride is being used for medical purposes such as a contrasting agent for ultrasound examinations, and in retinal surgery.
- Sulphur hexafluoride is used in a wide variety of applications as a leak detection gas. Examples of this application are aluminium beer barrels, water supply pipelines, and various aircraft and automobile parts.
- Sulphur hexafluoride is also used:
  - As filling in loudspeakers
  - In eye surgery
  - As tyre filling gas.

Note:

Sulphur hexafluoride is controlled under the Kyoto Protocol, an international Framework Convention with the objective of reducing greenhouse gases.

FoodFresh™

All food is subject to deterioration. This means loss of flavour, loss of colour and microbial spoilage. These effects can be retarded and shelf-life extended dramatically, by use of Modified Atmosphere Packaging (MAP). No artificial preservatives or freezing is neccesary.

Food spoilage is usually the result of bacterial action, oxidation, enzyme action, mould growth or the accumulation of metabolic by-products. MAP employs the properties of specific gases or gas mixtures to slow down those decay mechanisms that have the dominant effect on packaged food products.

Customers prefer natural products and quality appearance, where juices and aromas have been sealed in. The benefits of extended shelf-life and cost saving make MAP a very economical option giving you a competitive advantage.

Afrox has developed an extensive range of MAP gases, called FoodFresh™. FoodFresh™ fulfils the requirements of quality assurance, hygiene and freshness demanded by the food industry. It is supplied in dedicated high capacity, high pressure steel cylinders, and the certificate of compliance is your guarantee of quality.

All FoodFresh™ items are also FSSC 22000 certified which deems it safe for human consumption.

Product Description	Product Mass (kg)	Filling Pressure (bar)	Use For	Material Number	Valve Connection	Recommended Regulator	O_2	CO_2	N_2
FoodFresh™ 1	31,3	-	Sparkling Water Poultry (Raw)	518701-SE-C	5/8" BSP RH Ext	W019140 or W019240	-	100	-
FoodFresh™ 1 PCC	175	-	Sparkling Water	518701-PA-C	5/8" BSP RH Ext	W019140 or W019240	-	100	-
FoodFresh™ 2	11,0	200	Fats and Oils Pasta (Dry) Dried Products (Milk powder & snacks)	518702-SE-C	3/4" BSP RH Int	W019130 or W019230	-	-	100
FoodFresh™ 2 PCC	120	-	Fats and Oils Pasta (Dry)	518702-PA-C	3/4" BSP RH Int	W019130 or W019230	-	-	100
FoodFresh™ 4	12,69	200	Blanched Vegetables Fresh Fruit & Vegetables Salads (Non-meat containing)	518704-SE-C	5/8" BSP RH Int	W019110 or W019210	-	15	85
FoodFresh™ 5	13,37	200	Cheese (Soft) Meat (Cured, cooked, uncooked & smoked meat. Pork - fresh) Confectionary (Bread-type)	518705-SE-C	5/8" BSP RH Int	W019110 or W019210	-	20	80
FoodFresh™ 7	14,9	200	Cheese (Soft) Meat (Loaf-type speciality meat) Meat (Cooked) Biltong Poultry (Cured/ smoked, cooked) Fish (Cooked) Shellfish (Cooked) Cooked-chilled or Ready Meals Confectionary (Meat filled) Salads (Meat containing) Salami	518707-SE-C	5/8" BSP RH Int	W019110 or W019210	-	30	70

Product Description	Product Mass (kg)	Filling Pressure (bar)	Use For	Material Number	Valve Connection	Recommended Regulator	O_2	CO_2	N_2
FoodFresh™ 9	9,1	100	Cheese (Hard) Fish (Oily) Pasta Pizza Ready Meals Cakes Smoked Fish	518709-SE-C	5/8" BSP RH Int	W019110 or W019210	-	50	50
FoodFresh™ 22	15,0	200	Red Meat Fresh Sausage Mutton (Raw)	518722-SE-C	5/8" BSP RH Int	W019110 or W019210	80	20	-
FoodFresh™ 24	12,8	200	Fresh Fruit & Vegetable Salads (Non-meat containing) Lettuce	518724-SE-C	5/8" BSP RH Int	W019110 or W019210	5	15	80

HiQ Life Science Range

Afrox has introduced further analytical criteria and all HiQ Life Science gases are not only analysed for accuracy of composition but from now on also for harmful impurities such as sulphur dioxide, nitric oxide and volatile organic compounds. HiQ Life Science gases are exclusively available from Afrox and are several custom blended (made to order) specialty gas mixtures that assist in fertility treatment, clinical blood and pulmonary function testing, and anaerobic and aerobic specialty gas mixtures used to maintain biological atmospheres in incubators for cell culture growth.

A Certificate of Analysis is provided for each mixture which provides details on the analysis results, adding additional certainty that the mixture will not be harmful to life in its required application.

Material Number	Product Description	Size (kg)	Recommended Regulator	Valve Connection	O_2	CO_2	N_2	CH_4	CO
590001-RC-A	HiQ LS 1	8,563	W019210	RH INT 5/8″ BSP	5%	6%	89%		
590002-NE-A	HiQ LS 2	7,118	W019220	LH INT 5/8″ BSP	21%		78,40%	0,30%	0,30%
590003-RC-A	HiQ LS 3	8,676	W019210	RH INT 5/8″ BSP	5%	7,44%	87,56%		
590004-RC-A	HiQ LS 4	8,657	W019211	RH INT 5/8″ BSP	5%	7,20%	87,80%		
590005-RC-A	HiQ LS 5	8,485	W019212	RH INT 5/8″ BSP	5%	5%	90%		

Helium

Helium (He, R-704)

CAS: 7440-59-7 EC: 231-168-5 UN: 1046 (Compressed); 1963 (Refrigerated liquid)

Helium Baseline 5.0				
Purity (%)	≥ 99,999			
Impurities (ppm)	0_2 ≤ 2	N_2 ≤ 5	C_nH_m ≤ 0,5	H_20 ≤ 3
Typical Filling Pressure	20°C: 200 bar(a)			

Helium NF3				
Purity (%)	≥ 99,999			
Impurities (ppm)	0_2 ≤ 3	N_2 ≤ 5	C_nH_m ≤ 0,5	H_20 ≤ 0,5
Typical Filling Pressure	20°C: 200 bar(a)			

Helium is a unique product with many applications in various sectors. The unique cryogenic properties (boiling point -269°C), small molecules and inert nature, lends it to very specific uses. Afrox supplies various grades of helium, from ultra-high purity liquid helium for medical use, to technical grade and Partigas.

Characteristics

- Colourless and odourless gas
- Non-reactive.

Health Risks

- Asphyxiant at high concentrations.

Transport

ADR Class 2, 1 A 

DOT Class 2,2 

Product Description	Size (kg)	Grade	Material Number	Valve Connection	Recommended Regulator
Helium Baseline 5.0	0,30	Instrument Grade	524103-IE-C	5/8″ BSP RH Int	W019110 or W019210
Helium Baseline 5.0	1,51	Instrument Grade	524203-SE-C	5/8″ BSP RH Int	W019110 or W019210
Helium NF3	1,51	NF3 Grade	524206-SE-A	5/8″ BSP RH Int	W019110 or W019210
Helium HP N4.5	1,51	High Purity	524102-SE-C	5/8″ BSP RH Int	W019110 or W019210
Helium Tech N2.7	1,51	Technical	524101-SE-C	5/8″ BSP RH Int	W019110 or W019210
Helium Tech MCP N2.7	22,65	Technical	524101-ME-C	5/8″ BSP RH Int	W019110 or W019210
Liquid Helium	Bulk	Ultra-high Purity	5222-PC	5/8″ BSP RH Int	No Regulator Required

Physical Data	
Molecular Weight	4,003
Boiling Point at 1,013 bar [°C]	-268,93
Density at 1,013 bar, 20°C [kg/m³]	0,166
Vapour Pressure at 0°C [bar]	-
Vapour Pressure at 20°C [bar]	-
Flammability Range in Air [% volume]	Non-combustible
Specific Volume at 1,013 bar, 20°C [m³/kg]	6,024

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Legend: ● Good ▲ Fair ■ Avoid

Source

- The primary source of helium is from natural gas wells. It is obtained by a liquefaction and stripping operation.

Applications

- Helium is inert and the least soluble of all gases in liquids and is therefore used as a pressurisation gas for:
  - Cryogenic rocket propellants in space/missile applications
  - Heavy water in nuclear reactors
  - For all liquids at room or low temperatures.
- Being inert, helium is used as a constituent in neutral atmospheres, e.g. in heat treatment applications requiring a protective atmosphere.
- Helium is used extensively in the welding industry as an inert shielding gas for arc welding. It is also used in conjunction with helium ('leak') detectors to test the integrity of fabricated components and systems.
- Helium is used as a combined cooling and shielding medium for the pulling of optical fibres.
- Helium is used for cooling of uranium rods in nuclear reactors.
- Helium is used in various types of gas lasers as a buffer or carrier gas.
- Gas mixtures of helium and hydrocarbons are also used as fill gases for nuclear counters.
- Helium is used in mixtures with neon and argon for filling electronic tubes such as the familiar neon sign.
- Various mixtures of helium and oxygen are used as breathing gases for divers who must work at great depths and therefore high pressures. The use of helium to dilute the oxygen instead of nitrogen, as in air, prevents nitrogen being dissolved in the blood, which is the cause of nitrogen narcosis (also known as 'bends').
- Helium is used to fill large balloons for upper atmosphere and cosmic ray studies. Small helium balloons are used by weather forecasters to carry meteorological instruments.
- Due to non-flammability and low density, it is ideal for filling toy balloons (in mixtures with nitrogen), airplane tyres, advertising blimps and geostationary balloons (certain projects are under way for the realisation of balloons designed to serve as television transmission and observation relays).
- Helium mixtures with hydrocarbons are used in flushing Geiger counters used for the detection of α, β, γ and X-rays.
- Helium is used as a propellant in the 'helium cannon' used in model firing tunnels. It also finds use as a working gas in some hypersonic wind tunnels.
- Helium is used as a carrier gas or as a purge gas for a variety of semiconductor processes.
- Helium is used as a calibration gas and a balance gas in calibration mixtures. It is also used as carrier gas in gas chromatography. It is used as a purge gas and a zero (span) gas for analytical instruments.
- Helium is used for epitaxial crystal growth (inert atmosphere).
- Helium is also used for vacuum breaking in heat treatment furnaces.
- Helium is also used as airbag inflating gas in high pressure capsules.
- Helium is used to create inert furnace atmospheres in special glass processing, and processing of valuable metals.
- Helium is used for degassing in high performance liquid chromatography (HPLC).
- Liquid helium is used to cool the superconductive magnets in NMR (Nuclear Magnetic Resonance) for analytical or medical purposes and in the R&D to study processes around Absolute Zero.
- Liquid helium is used in MRI (Magnetic Resonance Imagery) in hospitals all over Africa.

Laser Gases

Afrox offers a complete range of products and services specifically tailored to the laser market, ensuring that you get maximum productivity and return on your investment. Afrox has worked closely with laser manufacturers to ensure that laser gases meet their requirements for purity. Laser gases can either be supplied as pure gases or as premixed gases, depending on your laser machine.

Pures

Product Description	Material Number	Purity (%)	Impurities (ppm)	Product Content	Filling Pressure
Helium Baseline 5.0	524203-SE-C	MIN 99,999	Moisture<=3 N_2<=5 O_2<=2 CnHm<=0,5	1,51 kg	200 bar
Argon Baseline 5.0	512203-SE-C	MIN 99,999	Moisture<=3 N_2<=5 O_2<=2 CnHm<=0,5	17,4 kg	200 bar
Nitrogen Baseline 5.0	511203-SE-C	MIN 99,999	Moisture<=3 O_2<=2 CnHm<=0,5	11,0 kg	200 bar
Carbon Dioxide CP	514202-SE-C	MIN 99,995	Moisture<= 5 O_2<=5 N_2<= 10 CnHm<=2	37,5 kg	200 bar

Mixtures

Description	Material Number	Composition	Impurities (ppm)	Valve Connection	Product Content	Filling Pressure
Rofin Lasermix	521100-SE-A	O_2 2,85 - 3,15%; Xe 2,85 - 3,15%; CO_2 3,8 - 4,2%; CO 5,7 - 6,3%; N_2 18,05 - 19,95%; Balance He	-	5/8" BSP RH Int	1,35 m^3	150 bar
Lasermix 312	521110-SE-A	CO_2 2,983 - 3,297%; N_2 29,83 - 32,97%; Balance He	-	5/8" BSP RH Int	10 m^3	200 bar
Lasermix 321	521140-SE-A	CO_2 4,75 - 5,25%; N_2 52,25 - 57,75%; Balance He	H_2O<5 CnHm<1	5/8" BSP RH Int	7,4 kg	200 bar
Lasermix 331	521150-SE-A	CO_2 4,75 - 5,25%; N_2 33,25 - 36,75%; Balance He	-	5/8" BSP RH Int	3,8 kg	200 bar
Lasermix 362 (old 402)	521130-SE-A	CO_2 5,4%; N_2 27%; Balance He		5/8" BSP RH Int	4,8 kg	200 bar
Ammada 2 Lasermix	521120-SE-A	CO_2 5%; N_2 34; Balance He	-	5/8" BSP RH Int	4,13 kg	150 bar
Lasermix 322	521160-SE-C	CO_2 4,5%; N_2 13,5%; Balance He	-	5/8" BSP RH Int	2,4 kg	150 bar

Mining Calibration Mixtures

Carbon monoxide is formed whenever carbonaceous material combusts incompletely, and is a very common pollutant in occupational and non-occupational environments. It is toxic, as it binds with haemoglobin in place of oxygen, and reduces the oxygen available to human tissue, with the most serious effect on the brain. In order to calibrate and check CO measuring and warning devices, Afrox has developed a number of calibration standards. Because methane (CH_4) does not interfere chemically with CO, it is possible to combine these two components with air to produce unique calibration standards for the calibration of dual CH_4/CO measuring devises. Each cylinder is supplied with a certificate of analysis, on which the actual concentrations are clearly stated.

Product Description	Size (kg)	Volume (m^3)	Filling Pressure (bar)	Composition	Material Number	Recommended Regulator
COCal 400	6,2	5,1	130	410 - 450 ppm CO; Balance Air	519123-NE-A	W019120 or W019220
COCal 450	6,2	5,1	130	450 - 480 ppm CO; Balance Air	519124-NE-A	W019120 or W019220
CO-MethCal 100/14	6,1	5,1	130	105 - 120 ppm CO; 1,30 - 1,49% CH_4; Balance Air	519130-NE-A	W019120 or W019220
CO-MethCal 130/15	6,1	5,1	130	120 - 140 ppm CO; 1,40 - 1,59% CH_4; Balance Air	519131-NE-A	W019120 or W019220
CO-MethCal 150/14	6,1	5,1	130	149 - 180 ppm CO; 1,30 - 1,49% CH_4; Balance Air	519135-NE-A	W019120 or W019220
CO-MethCal 200/14	6,1	5,1	130	160 - 240 ppm CO; 1,30 - 1,49% CH_4; Balance Air	519136-NE-A	W019120 or W019220
CO-MethCal 400/24	6,1	5,2	130	400 - 480 ppm CO; 2,30 - 2,45% CH_4; Balance Air	519134-NE-A	W019120 or W019220
CO-MethCal 400/24/17	6,1	5,2	130	400 - 480 ppm CO; 2,30 - 2,45% CH_4; 16 - 18% O_2; Balance Air	519129-NE-A	W019120 or W019220
CO-MethCal 400/14/17	6,1	5,2	130	400 - 480 ppm CO; 1,30 - 1,45% CH_4; 16 - 18% O_2; Balance Air	519138-NE-A	W019120 or W019220
CO-MethCal 450/14	6,1	5,1	130	360 - 540 ppm CO; 1,30 - 1,49% CH_4; Balance Air	519133-NE-A	W019120 or W019220
MethCal 14	7,7	6,4	130	1,30 - 1,50% CH_4; Balance Air	519114-SH-A	W109120
MethCal 14	1,5	1,3	130	1,30 - 1,50% CH_4; Balance Air	519114-IH-A	W109220
MethCal 14 (Lecture bottle)	38,6 g	0,03	80	1,30 - 1,49% CH_4; Balance Air	519114-SO-C	W101535*
MethCal 25	7,7	6,5	130	2,40 - 2,54% CH_4; Balance Air	519115-SH-A	W019120 or W019220

Valve connection 5/8" BSP LH Int

*CGA170

Cylinder Code	Cylinder Description	Water Capacity (ℓ)	Height (m)	Diameter (m)	Empty Mass (kg)	Max Fill Pressure (bar)
NE	Large Aluminium Cylinder	40	1,51	0,23	52	20 000
IJ	Small Aluminium Cylinder	10	0,68	0,18	16	20 000
SH	Large Steel Cylinder - Flammable	50	1,54	0,23	70	20 000
IH	Small Steel Cylinder - Flammable	10	0,60	0,18	18	20 000
SO	Lecture Bottle	0,4	-	-	-	-

Process Gases

Process gas mixtures are used for process applications, such as blanketing, instrument support gases and leak detection. These are specialised mixtures for process specific applications where the high accuracy and thetraceability of gases are not required. They are not suitable for calibration purposes. Cylinders can be supplied with a batch certificate of conformance (COC).

The process gases that have been in demand, have been identified, and we keep them in stock for your convenience. Please contact us for any mixtures that you may need large volume of in future, to work out a supply plan to suit your needs.

Product Description	Mass of Product (kg)	Volume (m^3)	Fill Pressure (bar)	Material Code	Stock Category
10% H_2; Balance N_2	7,6	7,2	150	519201-SH-C	STO/LASS
12% H_2; Balance N_2	7,4	7,1	150	519202-SH-C	STO/LASS
25% H_2; Balance N_2	6,3	7,1	150	519204-SH-C	MTO
4% H_2; Balance Ar	12,4	7,8	150	519212-SH-C	MTO
4% H_2; Balance N_2 MCP	122	108	150	519205-MH-C	LASS
5% H_2; Balance Ar	12,3	7,7	150	519211-SH-C	STO/LASS
5% H_2; Balance N_2	8,0	7,2	150	519207-SH-C	STO/LASS
8% H_2; Balance Ar	11,8	7,7	150	519208-SH-C	STO/LASS
4% H_2; Balance N_2	13,4	8,0	150	519205-SH-C	STO/LASS
5% CO_2; 5% H_2; Balance N_2	13,4	8,0	150	519206-SH-C	STO
35% H2; Balance Ar	7,515	7,2	150	519209-SH-C	

Valve connection 5/8" BSP LH Int

Recommended regulator for mixtures containing hydrogen: W019120 or W019220

Product Description	Mass of Product (kg)	Volume (m^3)	Fill Pressure (bar)	Material Code	Stock Category
5% CO_2; Balance Ar	13,4	8,0	150	519216-SE-C	STO/LASS

Valve connection 5/8" BSP RH Int

Recommended regulator for mixtures not containing hydrogen: W019110 or W019210

Cylinder Code	Cylinder Description	Water Capacity (ℓ)	Height (m)	Diameter (m)	Empty Mass (kg)	Max Fill Pressure (kPa)
SH	Large Steel Cylinder - Flammable	50	1,54	0,23	70	20 000
SE	Large Steel Cylinder	50	1,54	0,23	70	20 000
MH	15 x SH in a frame	15 x 50	2,10	1,2 x 1,5	1 650	20 000

Propellants

Propellants are mixtures of propane and butane to match a required vapour pressure. The product is purified to remove any smell and discoloration.

Hazards

- Propellants are flammable and can form explosive mixtures with air
- At high concentrations, it can act as an asphyxiant with possible anaesthetic effects after prolonged inhalation.

Uses and Features

- Used to expand polystyrene and polyethylene in foam blowing applications
- Used as a propellant in aerosol applications.

Precautions in Use

- Since the product is unstenched, leaks are difficult to detect. All connections should be tested for leaks with a soapy water solution after installation.

Material Compatibility

- Any common, commercially available metals may be used because it is non-corrosive.

Physical Data

- Appearance/odour colourless with slightly ethereal smell
- These values will differ depending on the composition of the blend. Please contact your Special Products representative.

Cosmetic Butane

A number of blends can be mixed to various vapour pressures. Various blends include:

- CB31
- CB36
- CB40
- CB44
- CB48
- CB56
- CB62

Afrox Standard Propellant Blend ordering information and Package size

Product Description	Cylinder Net Mass	Product Code
Butane	48 kg	544128-LF-C
CB-31	48 kg	544131-LF-C
CB-36	48 kg	544136-LF-C
CB-40	48 kg	544140-LF-C
CB-44	48 kg	544144-LF-C
CB-45	48 kg	544145-LF-C
CB-46	48 kg	544146-LF-C
CB-48	48 kg	544148-LF-C
CB-50	48 kg	544150-LF-C
CB-56	48 kg	544156-LF-C
CB-62	48 kg	544162-LF-C
CB-66	48 kg	544166-LF-C
CB-74	48 kg	544174-LF-C
Propane IG-Wet	45 kg	508413-LF-C
Propane IG	45 kg	508403-LF-C
Propane IG	9 kg	508403-LC-C
Bulk Cosmetic Propellant	BULK	580099

Propane (C_3H_8, R-290)

CAS: 74-98-6 UN: 1978

Propane Instrument Grade N1.7					
Purity (%)	≥ 97				
Impurities (ppm)	S ≤ 1	C_nH_m ≤ 3%	H_2O ≤ 50	Unsaturates ≤ 0,1%	1,3 Butadiene ≤ 1 400
Typical Filling Pressure	15°C: 7,3 bar(a)				

Characteristics

- Flammable
- Colourless, liquefied gas.

Health Risks

- Asphyxiant at high concentrations.

Transport

ADR Class 2,2F 

DOT Class 2,1 

Product Description	Size (kg)	Grade	Material Number	Valve Connection	Recommended Regulator
Propane Pure	Bulk	N1.7	580099	5/8" BSP LH Int	Recommendation on Request
Propane IG	45,0	N1.7	508403-LF-C	5/8" BSP LH Int	W019120 or W019220
Propane IG	9,0	N1.7	508403-LC-C	5/8" BSP LH Int	W019120 or W019220
Propane IG	45,0	Wet N1.7	508413-LF-C	5/8" BSP LH Int	No Regulator Required

Physical Data	
Molecular Weight	44,097
Boiling Point at 1,013 bar [°C]	-42,04
Density at 1,013 bar, 20°C [kg/m³]	1,868
Vapour Pressure at 0°C [bar]	4,76
Vapour Pressure at 20°C [bar]	8,39
Flammability Range in Air [% volume]	2,1 - 9,5
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,535

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	●	●	■	●	●	●	●	■	●	■	●	●	●	▲

Legend: ● Good ▲ Fair ■ Avoid

Source

- Propane is a constituent of crude petroleum and natural gas from which it is obtained by refining and processing operations.

Applications

- Propane is of interest as a specialty gas mainly in mixtures used to calibrate process control analysers in the petro-chemical industry. It is also used in its pure form as the fuel gas in flame photometers.
- Propane is used:
  - For heating of industrial premises and apartments
  - As fuel supply to hot air generators used in farming for drying harvests
  - For heating animal breeding areas
  - In hotels and restaurants
  - In portable heating units at work sites, markets, etc.
  - In the iron and steel industry: burners for heat treatment furnaces, radiation panels for surface treatment, metal oxy-cutting
  - In the chemical industry: burners for ceramic kilns, in paintwork finishing installations, incinerators in petro-chemical furnaces
  - As a clean fuel for intra-plant vehicles, such as fork-lift trucks, where petrol fumes or soot would be considered unpleasant
  - Extensively as a refrigerant in chemical, petroleum refining and gas processing operations
  - As a refrigerant in high/medium/low temperature; commercial and industrial refrigeration and A/C
  - In heat pumps, and mixed with iso-butane it is used in high/medium temperature refrigeration; commercial and domestic refrigeration
  - In metallurgy to create controlled atmospheres. It is employed in gaseous cementation processes
  - As an aerosol propellant mixed with iso-butane.
- Propane is one of the main components in liquid petroleum gas (LPG).
- As a refrigerant it has the ASHRAE number R-290.
- Propane is used for efficiency testing of gas burners and engines.
- Propane is used in emission calibration mixtures for the automotive industry.
- Propane is used as a component in calibration gases for the gas, oil and chemical industry.

Afrox Standard Propellant Blend Vapour Pressure

Product Description	Product Code	Blending Tolerance	Absolute Vapour Pressure			Vapour Pressure Gauteng and Inland			Vapour Pressure Sea Level		
			kPa (absolute) @ 25°C			kPa (gauge) for altitude 85 kPa @ 25°C			kPa (gauge) for sea level 101.325 kPa @ 25°C		
		+/- kPa	Target	Min	Max	Target	Min	Max	Target	Min	Max
Butane	544128-LF-C	20	275	255	295	190	170	210	175	155	195
CB-31	544131-LF-C	10	325	315	335	240	230	250	225	215	235
CB-36	544136-LF-C	10	375	365	385	290	280	300	275	265	285
CB-40	544140-LF-C	10	415	405	425	330	320	340	315	305	325
CB-44	544144-LF-C	10	425	415	435	340	330	350	325	315	335
CB-45	544145-LF-C	10	435	425	445	350	340	360	335	325	345
CB-46	544146-LF-C	10	445	435	455	360	350	370	345	335	355
CB-48	544148-LF-C	10	465	455	475	380	370	390	365	355	375
CB-50	544150-LF-C	10	485	475	495	400	390	410	385	375	395
CB-56	544156-LF-C	10	515	505	525	430	420	440	415	405	425
CB-62	544162-LF-C	10	555	545	565	470	460	480	455	445	465
CB-66	544166-LF-C	10	585	575	595	500	490	510	485	475	495
CB-74	544174-LF-C	10	635	625	645	550	540	560	535	525	545
Propane - Wet	508413-LF-C	20	835	815	855	750	730	770	735	715	755
Propane N-1	508403-LF-C	20	835	815	855	750	730	770	735	715	755
Propane N-1	508403-LC-C	20	835	815	855	750	730	770	735	715	755

Afrox Standard Propellant Blend Technical Data

Product Description	Product Code	Absolute Vapour Pressure	Calculated Density 25°C in kg/l	Component % by Volume			Component % by Mass		
				n-Butane as 90% of total Butanes	Iso-Butane as 10% of total Butanes	Propane	n-Butane as 90% of total Butanes	Iso-Butane as 10% of total Butanes	Propane
Butane	544128-LF-C	275	0,568	87,3%	9,7%	3,0%	88,0%	9,4%	2,6%
CB-31	544131-LF-C	325	0,563	80,9%	9,0%	10,1%	82,4%	8,8%	8,8%
CB-36	544136-LF-C	375	0,557	74,5%	8,3%	17,2%	76,6%	8,2%	15,2%
CB-40	544140-LF-C	415	0,553	69,4%	7,7%	23,0%	71,9%	7,7%	20,5%
CB-44	544144-LF-C	425	0,551	68,0%	7,6%	24,4%	70,7%	7,5%	21,8%
CB-45	544145-LF-C	435	0,550	66,7%	7,4%	25,9%	69,4%	7,4%	23,2%
CB-46	544146-LF-C	445	0,549	65,4%	7,3%	27,3%	68,3%	7,3%	24,5%
CB-48	544148-LF-C	465	0,547	62,9%	7,0%	30,1%	65,9%	7,0%	27,1%
CB-50	544150-LF-C	485	0,545	60,3%	6,7%	33,0%	63,4%	6,8%	29,8%
CB-56	544156-LF-C	515	0,541	56,4%	6,3%	37,3%	59,7%	6,4%	33,9%
CB-62	544162-LF-C	555	0,537	51,3%	5,7%	43,0%	54,8%	5,8%	39,4%
CB-66	544166-LF-C	585	0,533	47,4%	5,3%	47,3%	50,9%	5,4%	43,6%
CB-74	544174-LF-C	635	0,528	41,0%	4,6%	54,4%	44,5%	4,8%	50,7%
Propane - Wet	508413-LF-C	835	0,493	0,9%	0,1%	99,0%	1,0%	0,1%	98,8%
Propane N-1	508403-LF-C	835	0,493	0,9%	0,1%	99,0%	1,0%	0,1%	98,8%
Propane N-1	508403-LC-C	835	0,493	0,9%	0,1%	99,0%	1,0%	0,1%	98,8%

The above percentages are dependent on impurities in the raw material and may vary slightly.

Butane Specifications

Composition	Units	Limits	Spec
Total Aromatics	Mole %	max	N/A
Total Unsaturates	Mole %	max	1,0
Methane C_1	Mole %	max	0,1
Ethane C_2	Mole %	max	0,1
Ethene C_2	Mole %	max	0,1
Acetylene C_2	Mole %	max	0,1
Propane C_3	Mole %	max	0,1
Propene C_3	Mole %	max	0,1
iso-Butane i-C_4	Mole %	max	30
Butane n-C_4	Mole %	max	70 - 99,9
iso-Butene	Mole %	max	0,2
1 Butene	Mole %	max	0,2
Trans-2-Butene	Mole %	max	0,2
iso-Pentane	Mole %	max	0,2
Pentene	Mole %	max	0,2
n-Pantane	Mole %	max	0,2
C_5 Plus	Mole %	max	2
1.3 Butadiene	ppm	max	1
Total Mercaptan	ppm	max	0,05
Olefins	ppm	max	N/A
Water	ppm	max	10
Free Water	ppm		None
Oil Stain on Evap.	1 min		None
Residue	ml	max	0,05
Comb. Fluoride	ppm		10
Copper Corrosion	rating		1
Total Sulphur	ppm	max	1,0
Odour			Pleasant non-sulphurous odour

Pure Propane Specifications

Composition	Units	Limits	Spec
Total Aromatics	Mole %	max	0,1
Total Unsaturates	Mole %	max	0,1
Methane C_1	Mole %	max	0,1
Ethane C_2	Mole %	max	0,1
Ethene C_2	Mole %	max	0,05
Acetylene C_2	Mole %	max	0,1
Propane C_3	Mole %	max	98,5 min
Propene C_3	Mole %	max	0,1
iso-Butane i-C_4	Mole %	max	2
Butane n-C_4	Mole %	max	0,1
iso-Butene	Mole %	max	0,1
1 Butene	Mole %	max	0,1
Trans-2-Butene	Mole %	max	0,1
iso-Pentane	Mole %	max	0,1
Pentene	Mole %	max	0,1
n-Pantane	Mole %	max	0,1
C_5 Plus	Mole %	max	2
1.3 Butadiene	ppm	max	1
Total Mercaptan	ppm	max	0,05
Olefins	ppm	max	ND
Water	ppm	max	10
Free Water	ppm		None
Oil Stain on Evap.	1 min		None
Residue	ml	max	0,05
Comb. Fluoride	ppm		ND
Copper Corrosion	rating		1
Total Sulphur	ppm	max	1,0
Odour			Pleasant non-sulphurous odour

Pures

Afrox stocks a wide range of scientific pures, with your laboratory needs in mind. The material codes and descriptions listed will guide you to make the right choice.

Acetylene (C_2H_2, Ethyne)

CAS: 74-86-2 EC: 200-816-9 UN: 1001

Acetylene Instrument Grade	
Purity (%)	≥ 99,0
Impurities	PH_3 ≤ 0,1%
Typical Filling Pressure	15°C:15 bar(a)

Characteristics

- Flammable
- Colourless gas with ether-like odour when very pure, otherwise garlic-like
- Supplied dissolved in acetone or DMF (N,N-dimethylmethanamide)
- Can decompose instantaneously at pressures higher than 1 bar
- Acetylene can be delivered as a non-dissolved gas for specific R&D applications.

Health Risks

- Asphyxiant, anaesthetic.

Transport

ADR Class 2, 4F 

DOT Class 2,1 

Product Description	Size (kg)	Grade	Material Number	Valve Connection	Recommended Regulator
Acetylene IG N2.0	8,0	Instrument Grade	508103-DC-C	5/8" BSP LH Int	W019220 or W019120

Physical Data	
Molecular Weight	26,038
Boiling Point at 1,013 bar [°C]	-84,15
Density at 1,013 bar, 20°C [kg/m³]	1,090
Vapour Pressure at 0°C [bar]	26,4
Vapour Pressure at 20°C [bar]	43,41
Flammability Range in Air [% volume]	2,2 - 85,0
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,917

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	■	▲	●	●	■	▲	■	▲	▲	■	●	●	▲	●

Legend: ● Good ▲ Fair ■ Avoid

Source

- Acetylene is manufactured commercially by reaction between calcium carbide and water, and as a by-product of ethylene production.

Applications

- Acetylene is used as a raw material for the production of electrically conducting plastics, such as polyacetylene.
- Acetylene is used with high purity synthetic air or nitrous oxide as a fuel for the flame in atomic absorption flame spectroscopy. This is used in water, soil, food and biological research laboratories where sensitivity and accuracy of results are important.
- Acetylene is most commonly used in combination with oxygen for cutting or welding materials such as mild steel, where the standard industrial grade is sufficient.
- Acetylene with low phosphine levels is required for lead brazing or welding.
- Acetylene is used in organic synthesis (laboratory work) as well as in chemical synthesis.
- Acetylene is used as carbon source in the production of molecular manufacturing like fullerenes; well known examples are bucky balls or carbon nanotubes.
- Acetylene is used in the cultivation of plants; it improves the forming of new flowers.
- Acetylene is used as a component in calibration gases for the gas, oil as well as chemical industry.
- This unsaturated hydrocarbon exhibits high chemical reactivity, and is an important intermediate in the chemical industry. It is employed for the production of:
  - Acetaldehyde
  - Acrylic acids
  - Acrylic ethers
  - Acrylonitride
  - Carbazole
  - Butenyne (vinyl acetylene)
  - Chloroethene (vinyl chloride)
  - Diols
  - Ethene
  - Ethenoxyethenes (vinyl ethers)
  - Ethenyl acetate (vinyl acetate)
  - Ethenyl amides (vinyl amides)
  - Ethenyl sulphides (vinyl sulphides)
  - Neoprene
  - Phenylethene (styrene)
  - Polyoxymethylene
  - Pyrrolidine
  - Trichloroethene
  - Very fine carbon black, called 'acetylene black'.

Air, Synthetic (80% N_2 + 20% O_2)

CAS: 132259-10-0 EC: Not Available UN: 1002

Air IG Zero				
Impurities (ppm)	CO ≤ 0,5	CO_2 ≤ 0,5	C_nH_m ≤ 5	H_20 ≤ 3
Typical Filling Pressure	20°C: 200 bar(a)			

Transport

ADR Class 2, 1 A 

DOT Class 2,2 

Product Description	Size (kg)	Grade	Material Number	Valve Connection	Recommended Regulator
Air IG Zero	2,3	Instrument Grade	513207-IE-C	5/8″ BSP RH Int	W019110 or W019210
Air IG Zero	11,6	Instrument Grade	513207-SE-C	5/8″ BSP RH Int	W019110 or W019210

Physical Data	
Molecular Weight	28,975
Boiling Point at 1,013 bar [°C]	-194,3
Density at 1,013 bar, 20°C [kg/m³]	1,205
Vapour Pressure at 0°C [bar]	-
Vapour Pressure at 20°C [bar]	-
Flammability Range in Air [% volume]	Non-combustible
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,830

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Legend: ● Good ▲ Fair ■ Avoid

Source

- Synthetic air is produced by mixing pure oxygen (20%) and pure nitrogen (80%). This eliminates all kinds of impurities present in normal ambient air.

Applications

- Air is a source of oxygen and nitrogen.
- Air is the source of oxygen for burning, respiration of plants and animals, decay and industrial oxidations.
- Synthetic air is used as zero gas in the running and calibration of environmental monitoring and test measurements where levels of sulphur and nitric oxides can affect the measurement equipment.
- Synthetic air is used in medical gas mixtures.
- Synthetic air is regularly used as the oxidiser for flame ionisation detectors in chromatography and total hydrocarbon analysers.
- Synthetic air is used together with acetylene in atomic absorption flame spectrometry.
- Synthetic air is used as a balance gas for many calibration gases.

Argon (Ar, R-740)

CAS: 7440-37-1 UN: 1006

Argon Baseline 5.0				
Purity (%)	≥ 99,999			
Impurities (ppm)	0_2 ≤ 2	N_2 ≤ 5	C_nH_m ≤ 0,5	H_20 ≤ 3
Typical Filling Pressure	20°C: 200 bar(a)			

Characteristics

- Colourless and odourless gas
- Non-reactive
- Inert.

Health Risks

- Asphyxiant at high concentrations.

Transport

ADR Class 2, 1 A 

DOT Class 2.2 

Product Description	Size (kg)	Grade	Material Number	Valve Connection	Recommended Regulator
Argon Baseline 5.0	17,4	Instrument Grade	512203-SE-C	5/8" BSP RH Int	W019110 or W019210
Argon Baseline 5.0	3,5	Instrument Grade	512203-IE-C	5/8" BSP RH Int	W019110 or W019210
Argon Baseline MCP	15 x 17,4	Instrument Grade	512203-ME-C	5/8" BSP RH Int	W019110 or W019210
Argon Baseline PCC	200	Instrument Grade	512203-PA-C	5/8" BSP RH Int	W019110 or W019210
Argon HP PCC	200	High Purity	512102-PA-N	5/8" BSP RH Int	W019110 or W019210
Argon PCC Uncertified	200	High Purity	512101-PA-N	5/8" BSP RH Int	W019110 or W019210

Physical Data	
Molecular Weight	39,948
Boiling Point at 1,013 bar [°C]	-185,87
Density at 1,013 bar, 20°C [kg/m³]	1,662
Vapour Pressure at 0°C [bar]	-
Vapour Pressure at 20°C [bar]	-
Flammability Range in Air [% volume]	Non-combustible
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,602

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Legend: ● Good ▲ Fair ■ Avoid

Source

- The most common source of argon is an air separation plant. Air contains approx. 0,93% (vol.) argon. A crude argon stream containing up to 5% oxygen is removed from the main air separation column via a secondary ('side-arm') column. The crude argon is then further purified to produce the various commercial grades required.

Applications

- Argon is one of the most common carrier gases in gas chromatography. Argon is used as a carrier gas in sputtering, plasma etching and ion implantations, and as a blanket atmosphere in crystal growth.
- Argon is also the choice gas for ICP spectroscopy (Inductively Coupled Plasma spectroscopy).
- Argon is used in atomic absorption spectrometry as a blanket gas in the graphite furnace.
- One of the most common applications of argon, either pure or in various mixtures, is as a shielding gas for arc welding.
- Many Geiger-counting tubes contain argon or argon mixed with organic vapours or other gases, for example 10% methane in argon.
- Argon is used in blends with, for example, fluorine and helium in excimer lasers.
- Argon is one of the principal gases used for filling incandescent (filament) lamps, generally in a mixture with nitrogen, krypton or neon, for phosphorescent tubes in mixtures with neon.
- Argon is used as an insulation gas in high-efficiency multi-pane windows to improve thermal insulation.
- The argon-oxygen decarburising (AOD) process is the most common method of refining stainless steel and uses large quantities of both gases supplied either in liquid form or via pipeline from an on-site plant.
- Argon is used in the iron and steel industry to prevent oxidation of molten metals and alloys as well as for degassing and desulphurisation of molten steel and iron baths.
- The pharmaceutical industry uses argon to displace oxygen in the top of intravenous drug containers, extending product shelf-life.
- Argon is used, often in a mixture with hydrogen, as a protective atmosphere for the heat treatment of certain metals, particularly those which are susceptible to nitriding when treated in a nitrogen-based atmosphere. This includes stainless steels and many different specialised and therefore small-scale applications.
- Argon is used for wine preservation to eliminate air by the heavier argon, to prevent oxidation and extend the product quality for opened bottles and barrels.
- Liquid argon is used in cryosurgery, e.g. cryoablation to destroy cancer cells.
- Argon, R-740, is used in gas mixtures for non-CFC ultra-low temperature refrigeration applications.
- Argon is, sometimes in combination with nitrogen, used to inflate airbags.
- Argon is used, often in combination with nitrogen and/or carbon dioxide, as a clean fire extinguishing gas, since the inert properties do not damage any materials extinguished.

Carbon Dioxide

CAS: 124-38-9 EC: 204-696-9 UN: 1013; 2187 (Refrigerated liquid)

Carbon Dioxide IG 3.0	
Purity (%)	≥ 99,9
Impurities	Permanent gases + H_2O ≤ 0,1%

Carbon Dioxide CP Grade 4.5					
Purity (%)	≥ 99,995				
Impurities (ppm)	O_2 ≤ 5	N_2 ≤ 10	C_nH_m ≤ 2	H_2O ≤ 5	CO ≤ 2
Typical Filling Pressure	15°C: 51 bar(a)				

Characteristics

- Liquefied, colourless gas.

Health Risks

- Asphyxiant at high concentrations
- Increases the breathing rate.

Transport

ADR Class 2, 2A 

DOT Class 2,2 

Product Description	Size (kg)	Grade	Material Number	Valve Connection	Recommended Regulator
Carbon Dioxide IG N3.0	31,3	Instrument Grade	514103-RC-C	5/8" BSP RH Ext	W019140 or W019240
Carbon Dioxide IG N3.0	5,6	Instrument Grade	514203-RC-C	5/8" BSP RH Ext	W019140 or W019240
Carbon Dioxide PCC	175	Uncertified	514101-PA-N	5/8" BSP RH Ext	W019140 or W019240
Carbon Dioxide CP Grade N4,5	31,3	Chemically Pure	514202-SE-C	5/8" BSP RH Ext	W019140 or W019240
Carbon Dioxide EP N2.5	31,3	Pharmaceutical	514106-RC-C	5/8" BSP RH Ext	W019140 or W019240

Physical Data	
Molecular Weight	44,01
Boiling Point at 1,013 bar [°C]	-56,56
Density at 1,013 bar, 20°C [kg/m³]	1,839
Vapour Pressure at 0°C [bar]	34,5
Vapour Pressure at 20°C [bar]	57,3
Flammability Range in Air [% volume]	Non-combustible
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,544

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	■	●	▲	●	●	●	●	■	●	▲	●	●	●	■

Legend: ● Good ▲ Fair ■ Avoid

Source

- Carbon dioxide is recovered from many different sources. It is obtained as an off-gas from fermentation processes, lime-stone kilns, natural CO_2 springs as well as gas streams from chemical and petrochemical operations. Recently, CO_2 is also recaptured from the off-gas from power plants.

Applications

- Carbon dioxide is used extensively as a neutralising agent for pH control, for example, in cement curing water treatment and in many other commercially important chemical applications.
- Carbon dioxide is used in many consumer products ranging from aerosol packaging to air guns that require pressurised gas because it is inexpensive and non-flammable; in the operation of pneumatic equipment where other power sources are not available or suitable, and for the transfer of hazardous and flammable liquids.
- Owing to its stimulating effect on the nerve centres, carbon dioxide is employed in medicine in mixtures with oxygen, for reanimating victims of asphyxiation (drowning, electrocution, carbon monoxide poisoning, diphtheritic toxin morphine or scopolamine). It also serves in the treatment of certain skin affections.
- Carbon dioxide is used for the chemical vapour deposition of silicon dioxide.
- Mixed with ethylene oxide, it is employed as a fumigant in the destruction of insects in grain silos, as well as in leguminous plants, dates and dried figs.
- A substantial volume of carbon dioxide is used for carbonating beverages such as beer and many soft drinks and conservation of wine, unfermented grape juice and various fruit juices.
- Carbon dioxide is used to modify atmospheres, for example in green houses where it increases plant growth rates or combined with nitrogen to prolong quality in food packaging applications (MAP). (See FoodFresh™)
- Carbon dioxide, when mixed with helium and nitrogen, is used as the active medium in carbon dioxide lasers. Such lasers have a variety of applications, for instance piercing small holes into cigarette papers and the marking of food and drink packages, cutting metals, welding, engraving, etc.
- Carbon dioxide is used as an inerting agent for various mild steel welding operations, often in combination with argon.
- Carbon dioxide is used for foam blowing.
- Carbon dioxide is used in Coleman nitrogen analysers.
- Carbon dioxide is used as media for supercritical fluid extraction (SFE) in sample preparation and as a carrier gas for analytical and preparative supercritical fluid chromatography (SFC).
- Compressed carbon dioxide is used as a replacement for blasting powder in quarrying and mining operations.
- Solid carbon dioxide is used as blasting agent.
- Liquid carbon dioxide is becoming increasingly used as a refrigerant in mechanical refrigerating systems due to its environmental credentials. It has the ASHRAE number R-744. It can be used in direct expansion systems or as a secondary refrigerant with ammonia. 'Dry ice', or solid CO_2, is commonly used as a refrigerant.
- Liquid/solid carbon dioxide is used for cooling gas chromatography ovens.
- Possible refrigerant for MAC (mobile air-conditioning) due to European phase-out of tetrafluoroethane (R-134a).
- Carbon dioxide is used in mixtures for car emission monitoring and environmental monitoring.
- Carbon dioxide is used for fire extinguishing.
- Carbon dioxide is often used in combination with ethylene oxide for sterilising purposes.
- Carbon dioxide is also used for blood analysis and dehydration of penicillin.
- Carbon dioxide is used for production of paints and varnishes.

Hydrogen (H_2, R-702)

CAS: 1333-74-0 EC: 215-605-7 UN: 1049 (Compressed); 1966 (Refrigerated liquid)

Hydrogen Baseline 5.0				
Purity (%)	≥ 99,999			
Impurities (ppm)	O_2 ≤ 2	N_2 ≤ 5	C_nH_m ≤ 0,5	H_20 ≤ 3
Typical Filling Pressure	20°C: 200 bar(a)			

Characteristics

- Flammable
- Odourless and colourless gas.

Health Risks

- Asphyxiant at high concentrations. Binds itself to the haemoglobin in the blood. A headache is usually the first shown symptom.

Transport

ADR Class 2, 1 F 

DOT Class 2,1 

Product Description	Size (kg)	Grade	Material Number	Valve Connection	Recommended Regulator
Hydrogen Baseline 5.0	0,74	Instrument Grade	510203-SH-C	5/8" BSP LH Int	W019120 or W019220
Hydrogen Baseline MCP	11,1	Instrument Grade	510203-MH-C	5/8" BSP LH Int	W019120 or W019220

Physical Data	
Molecular Weight	2,016
Boiling Point at 1,013 bar [°C]	-252,76
Density at 1,013 bar, 20°C [kg/m³]	0,084
Vapour Pressure at 0°C [bar]	-
Vapour Pressure at 20°C [bar]	-
Flammability Range in Air [% volume]	4,0 - 74,5
Specific Volume at 1,013 bar, 20°C [m³/kg]	11,90

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Legend: ● Good ▲ Fair ■ Avoid

Source

- Hydrogen is most frequently produced for on-site usage by steam reforming of natural gas. Such plants may also be used as sources of hydrogen for the merchant market. Other sources are electrolysis plants, where the hydrogen is a by-product of chlorine production, and various waste gas recovery plants, such as at oil refineries or steel plants (coke oven gas). Hydrogen is also produced by electrolysis of water.

Applications

- High purity hydrogen finds widespread usage in the electronics industry as a reducing agent and as a carrier gas.
- High purity hydrogen is used as a carrier gas in gas chromatography.
- Hydrogen finds some usage in the welding and cutting of metals.
- Hydrogen is used in large quantities, (bulk supply or on-site generation) for the hydrogenation of vegetable and animal oils to produce margarine and other fats, hydrotreatment of petroleum products and hydrosulphuration of fuels in order to eliminate sulphur.
- Hydrogen in large quantities is used in petrochemical processes that include hydrodealkylation, hydro-desulphurisation and hydrotreatment.
- Hydrogen is used in leak testing applications.
- Hydrogen is used extensively in the metals industries because of its ability to reduce metal oxides and prevent oxidation of metals during heat treatment. It may be used either pure, as is often the case when heat treating stainless steel, or in a mixture with inert gases, argon or nitrogen. It is used in the production of carbon steels, special metals and semiconductors.
- Hydrogen is used for combustion;
  - In industry, it is used to supply oxygen-hydrogen torches for glass working (quartz, Pyrex®, etc.), in the fabrication of artificial precious stones (ruby, etc.) and for underwater oxy-cutting
  - In the laboratory, it is used in analyser flames, reducing flame photometry detection instruments, flame ionisation detection instruments and fuel cells.
- Extremely pure hydrogen is used in the chemical industry for fine reduction processes.
- Liquefied hydrogen is used as a rocket fuel. In the laboratory, liquid hydrogen is employed for solid physics research.
- In the nuclear industry, para-hydrogen is employed to fill bubble chambers.
- In electrical power plants, hydrogen is used as a coolant gas in turbogenerators.
- Hydrogen is used for synthesis of ammonia.
- Hydrogen is used as a reagent to produce high purity water.
- Hydrogen is used as fuel in fuel cell applications.

Nitrogen (N_2, R-728)

CAS: 7727-37-9 EC: 231-783-9 UN: 1066 (Compressed); 1977 (Refrigerated liquid)

Nitrogen Baseline 5.0			
Purity (%)	≥ 99,999		
Impurities (ppm)	O_2 ≤ 2	C_nH_m ≤ 0,5	H_2O ≤ 3
Typical Filling Pressure	20°C: 200 bar(a)		

Characteristics

- Colourless and odourless gas.

Health Risks

- Asphyxiant at high concentrations.

ADR Class 2, 1 A 

DOT Class 2,2 

Product Description	Size (kg)	Grade	Material Number	Valve Connection	Recommended Regulator
Nitrogen Baseline 5.0	11,0	Instrument Grade	511203-SE-C	3/4" BSP RH Int	W019130 or W019230
Nitrogen Baseline MCP	165,0	Instrument Grade	511203-ME-C	3/4" BSP RH Int	W019130 or W019230
Nitrogen Baseline 5.0	2,2	Instrument Grade	511203-IE-C	3/4" BSP RH Int	W019130 or W019230
Nitrogen Baseline PCC	120	Ultra-high Purity	511204-PA-C	3/4" BSP RH Int	W019130 or W019230
Nitrogen PCC	120	Uncertified	511201-PA-N	3/4" BSP RH Int	W019130 or W019230
Nitrogen Pharma Grade 5.6	11,0	Pharmaceutical Grade	511206-SE-A	3/4" BSP RH Int	W019130 or W019230

Physical Data	
Molecular Weight	28,014
Boiling Point at 1,013 bar [°C]	-195,8
Density at 1,013 bar, 20°C [kg/m³]	1,165
Vapour Pressure at 0°C [bar]	-
Vapour Pressure at 20°C [bar]	-
Flammability Range in Air [% volume]	Non-combustible
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,858

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Legend: ● Good ▲ Fair ■ Avoid

Source

- Nitrogen is produced in large quantities at air separation plants which liquefy and subsequently distil air into nitrogen, oxygen and usually argon. If very high purity nitrogen is required, the nitrogen produced may need to go through a secondary purification process. The lower range of nitrogen purities can also be produced with membrane techniques, and medium to high purities with pressure swing adsorption (PSA) techniques.

Applications

- Nitrogen is used in large quantities in the chemical industry for blanketing, purging and pressure transfer of flammable chemicals.
- High purity nitrogen is used in large quantities by the semiconductor industry as a purge or carrier gas as well as for blanketing equipment such as furnaces when not in production.
- Nitrogen is used as a purge gas.
- Nitrogen is commonly used as carrier gas in gas chromatography.
- Nitrogen is used as zero gas for analytical instruments.
- Nitrogen is commonly used as a balance gas in mixtures.
- Nitrogen is used in the electronic industry for inerting of epitaxial reactors.
- Nitrogen is used in mixtures with carbon dioxide for modified atmosphere packaging (MAP) of food stuffs. (See FoodFresh™)
- Nitrogen is used extensively, either pure or, more commonly, in a mixture with a reducing gas such as hydrogen or natural gas, to provide an oxygen-free atmosphere during heat treatment of various metals.
- Nitrogen is used in the Haber-Bosch process for production of ammonia.
- Nitrogen is used as a fire extinguishing gas in mines.
- Nitrogen is used to fill tyres to lower wear and limit the risks of blow-outs.
- Liquid nitrogen is used in cold traps to improve the efficiency of vacuum pumps by condensing or solidifying residual gases in the vacuum.
- Liquid nitrogen may be used for shrink fitting of close tolerance components.
- Liquid nitrogen is used to freeze a wide variety of delicate food, such as hamburgers, strawberries, shrimps, etc.
- Liquid nitrogen may also be used for cryogenic grinding of plastics, rubbers and some other chemicals products.
- Liquid nitrogen is used in the nuclear industry, for scientific research.
- Liquid nitrogen is used to store biological materials like tissue, cells, etc.
- Liquid nitrogen is also used for cryosurgery.
- Liquid nitrogen is used in the area of superconductivity.

Nitrous Oxide ($N_2$0, R-744A)

CAS: 10024-97-2 EC: 233-032-0 UN: 1070; 2201 (Refrigerated liquid)

Nitrous Oxide IG N2.0				
Purity (%)	≥ 99			
Impurities (ppm)	CO ≤ 10	NO ≤ 3	H_2O ≤ 50	CO_2 ≤ 100
Typical Filling Pressure	15°C: 46 bar(a)			

Characteristics

- Colourless and odourless gas.

Health Risks

- Asphyxiant at high concentrations.

Transport

ADR Class 2, 20 

DOT Class 2,2 

Product Description	Size (kg)	Grade	Material Number	Valve Connection	Recommended Regulator
Nitrous Oxide IG N2.0	31,3	Instrument Grade	508503-RC-C	BS 341 No. 13 11/16" x 20 tpi RH Ext	W019150 or W019250

Physical Data	
Molecular Weight	44,013
Boiling Point at 1,013 bar [°C]	-88,48
Density at 1,013 bar, 20°C [kg/m³]	1,843
Vapour Pressure at 0°C [bar]	-
Vapour Pressure at 20°C [bar]	-
Flammability Range in Air [% volume]	Non-combustible
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,543

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
▲	▲	●	■	▲	●	▲	●	■	▲	●	●	●	●	▲

Legend: ● Good ▲ Fair ■ Avoid

Source

- Nitrous oxide is obtained most commonly by the thermal decomposition of ammonium nitrate. It may also be obtained by controlled reduction of nitrites or nitrates, by the slow decomposition of hyponitrites or by the thermal decomposition of hydroxylamine.

Applications

- Nitrous oxide (often called 'laughing gas') is commonly used as a general anaesthetic in both medical and dental surgeries. To be effective as an anaesthetic, nitrous oxide must be inhaled in relatively high concentrations mixed with air or oxygen.
- Nitrous oxide serves in industry as a leak detector for vacuum and pressurised enclosures, buried piping, etc.
- Nitrous oxide is used as an oxygen source in the chemical vapour deposition of silicon oxynitride layers.
- Nitrous oxide is used in calibration mixtures for environmental control.
- The nitrous oxide-acetylene flame is employed in the laboratory for the analysis of refractory elements such as aluminium, vanadium, titanium and calcium oxides, by flame emission spectrometry. The use of this flame also permits determination of a certain number of trace metals by atomic absorption spectrometry.

- Nitrous oxide is used as an oxidiser in some types of analytical instruments.
- Nitrous oxide may be used as an aerosol propellant in various fields:
  - For whipped cream (because it improves the foaming characteristics of the cream), syrups, concentrates of coffee, chocolate and various flavours, sauces for grilled meats, vinaigrette, etc.
  - Pharmaceutical field
  - Cosmetics (perfumes, eau de cologne, hair spray, etc.)
  - Household products, paints, varnishes and insecticides
  - Aerosols for use at low temperature, such as de-icers, engine boosters, etc.
- Nitrous oxide is used as an oxygen enrichment medium for high performance internal combustion engines (drag racing).
- Nitrous oxide is used as raw material for the production of rocket fuel.

Note:

Nitrous oxide is controlled under the Kyoto Protocol, an international Framework Convention with the objective of reducing greenhouse gases.

Oxygen (O_2, R-732)

CAS: 7782-44-7 EC: 231-956-9 UN: 1072 (Compressed); 1073 (Refrigerated liquid)

Oxygen HiQ 5,0				
Purity (%)	≥ 99,999			
Impurities (ppm)	N_2 ≤ 3	C_nH_m ≤ 0,5	H_20 ≤ 3	H_2 ≤ 3
Typical Filling Pressure	20°C: 200 bar(a)			

Characteristics

- Colourless and odourless gas
- Many materials burn in oxygen that do not normally burn in air
- Reduces the flash-point temperature and increases the combustion speed.

Health Risks

- Continuous inhalation of concentrations higher than 75% may cause nausea, dizziness, respiratory difficulty and convulsions.

Transport

ADR Class 2, 20

DOT Class 2,2

Product Description	Size (kg)	Grade	Material Number	Valve Connection	Recommended Regulator
Oxygen HiQ 5.0	14	Ultra-high Purity	509304-SE-C	5/8" BSP RH Int	W019110 or W019210
Oxygen PCC	168	Uncertified	509101-PA-N	5/8" BSP RH Int	W019110 or W019210
Oxygen IG N2,5	12,3	Instrument	509203-SE-C	5/8" BSP RH Int	W019110 or W019210

Physical Data	
Molecular Weight	31,999
Boiling Point at 1,013 bar [°C]	-182,98
Density at 1,013 bar, 20°C [kg/m³]	1,332
Vapour Pressure at 0°C [bar]	-
Vapour Pressure at 20°C [bar]	-
Flammability Range in Air [% volume]	Non-combustible
Specific Volume at 1,013 bar, 20°C [m³/kg]	0,751

Material Compatibility

Aluminium	Buna® N	Brass	Butyl rubber	Carbon steel	Copper	Kel-F®	Monel®	Neoprene®	Nylon®	Polythene	PVC	Stainless steel	Teflon®	Viton®
●	▲	●	▲	●	●	●	●	▲	●	●	●	●	●	▲

Legend: ● Good ▲ Fair ■ Avoid

Source

- Oxygen is obtained on a commercial scale by the liquefaction and subsequent distillation of air. For very high purity oxygen, it is normally necessary to take the product from an air separation plant through a secondary purification and distillation stage. Alternatively, high purity oxygen may be produced by the electrolysis of water. Lower purities of oxygen can also be produced with membrane technique.

Applications

- Many oxidation reactions in the chemical industry use pure oxygen rather than air in order to benefit from higher reaction rates, easier product separation, higher yields or smaller equipment size.
- High purity oxygen is used for the formation of silicon dioxide and metal oxide, as an etchant for photoresist and in mixtures with halocarbons for etching silicon. Oxygen is also used in conjunction with hydrogen to fuel torches for welding, brazing, glass blowing and tube sealing a variety of electronic components such as reed relay switches.
- High purity oxygen is used in conjunction with high purity methane in Advanced Gas Cooled (AGR) nuclear reactors to maintain an appropriate carbon balance in the CO_2.
- Gas coolant in the nuclear core.
- High purity oxygen is used in the optical fibre production process.
- Injecting oxygen into sewage treatment plants accelerates the decomposition of sewage.
- Oxygen is used for chemical synthesis.
- Oxygen is used to supplement or replace air in burners used in many different industries in order to obtain increased temperatures. Typical applications are found in the steel, non-ferrous, glass and concrete industries, amongst many others.
- Oxygen is used for flame sealing of glass ampuls for finished products for the pharmaceutical industry and the chemical industry.
- Oxygen is used for enrichment of air during fermentation.
- Mixed with other gases, oxygen serves in the production of breathable atmospheres (O_2 + CO_2: reanimation; O_2 + He or O_2 + N_2: underwater diving).
- Oxygen is used in some cases for modified atmosphere packaging (MAP) of food stuffs. It is used in mixtures with carbon dioxide and/or nitrogen.

Refrigerants

The Afrox Refrigerants Range

Afrox Refrigerants supplies the complete range of refrigerant gases.

Our product range includes:

- HFC gases such as R134A, R404A, R410A and R507A
- HFO refrigerant including 1234YF
- HCFC replacement gas such as R427a
- Natural refrigerants including R744 (refrigerant-grade CO_2), ammonia (R717), and hydrocarbons (R600a and R290).

We also provide technical support and advice relating to legislation and HCFC alternatives. Whatever your application, wherever your location, Afrox will have the right refrigerant for you.

Quality Guarantee

Afrox guarantees that products are of the highest quality and will meet customer requirements. All disposable cylinders are dot 39 Cylinders.

Sales and Technical Advice

Afrox has a team of knowledgeable & experienced people to assist with queries.

Placing Orders

Orders for Afrox refrigerants may be placed directly with our national call centre on 0860 020202. Orders may also be collected from Afrox Gas & Gear retail centres and branches around the country.

Description

All fluorocarbon refrigerant gases contain one or more carbon and fluorine atoms and are organic compounds. Atoms of chlorine, hydrogen and bromine may also be present.

Characteristics

Some characteristics of these gases include:

- High density
- Low boiling point
- Low viscosity and surface tension
- Excellent chemical and thermal stability
- Capacity to be supplied in liquefied gas form, using low pressure cylinders.

Applications

Many of the current refrigeration and HVAC applications would not be possible without the use of fluorocarbon refrigerants. Different refrigerants due to their properties allow for their conditions of cooling.

Classification	High Temp.	Medium Temp.	Low Temp.	Very Low Temp.
Evaporator Temperature	Above 0°C	0°C to -25°C	-25°C to -50°C	Below -50°C

The table below provides a quick summary of the four main refrigeration process segments and the relevant process temperatures for each.

	High Temp.	Medium Temp.	Low Temp.	Very Low Temp.
Domestic Refrigeration	✓	✓		
Commercial Refrigeration		✓	✓	
Industrial Refrigeration	✓	✓	✓	✓
Transport Refrigeration		✓	✓	

ASHRAE Designations

ASHRAE designates a number which identifies different refrigerants based on the chemical makeup and stability of each product.

The designations are:

R10 to R50	Methane series refrigerants
R10 to R170	Ethane series refrigerants
R216ca to R290	Propane series refrigerants
RC316 to RC318	Cyclic organic compound refrigerants
R400 to R411B	Zeotropic blend refrigerants
R500 to R509	Azeotropic blend refrigerants
R600 to R620	Miscellaneous organic compound refrigerants
R630 to R631	Nitrogen compounds
R702 to R764	Inorganic compounds
R1112A to R1270	Unsaturated organic compounds

Ozone Depletion

Traditional fluorocarbon refrigerants, such as R12, R22, and R502, have been identified as contributing to ozone depletion and the greenhouse effect.

The reason for this is that these refrigerants contain chlorine molecules. Once released, the chlorine molecules are held within the polar stratospheric clouds.

These compounds, which include hydrochloric acid and hydrogen chloride, are not reactive to ozone in their compound state and remain inactive during winter.

During spring, however, ultraviolet radiation penetrates the atmosphere and encounters these stratospheric ice clouds.

The radiation acts as a catalyst, resulting in reactions on the surface of the clouds which release reactive chlorine monoxide. It is this chlorine monoxide which destroys the ozone.

The effect halons, CFCs and HCFCs have had on the ozone layer are internationally recognised by the Montreal Protocol of which South Africa is a signatory.

Global Warming

Greenhouse gases can potentially alter these favourable conditions on earth by trapping the heat that earth radiates

back to space. Thus the potential for global warming increases with the concentration of these greenhouse gases.

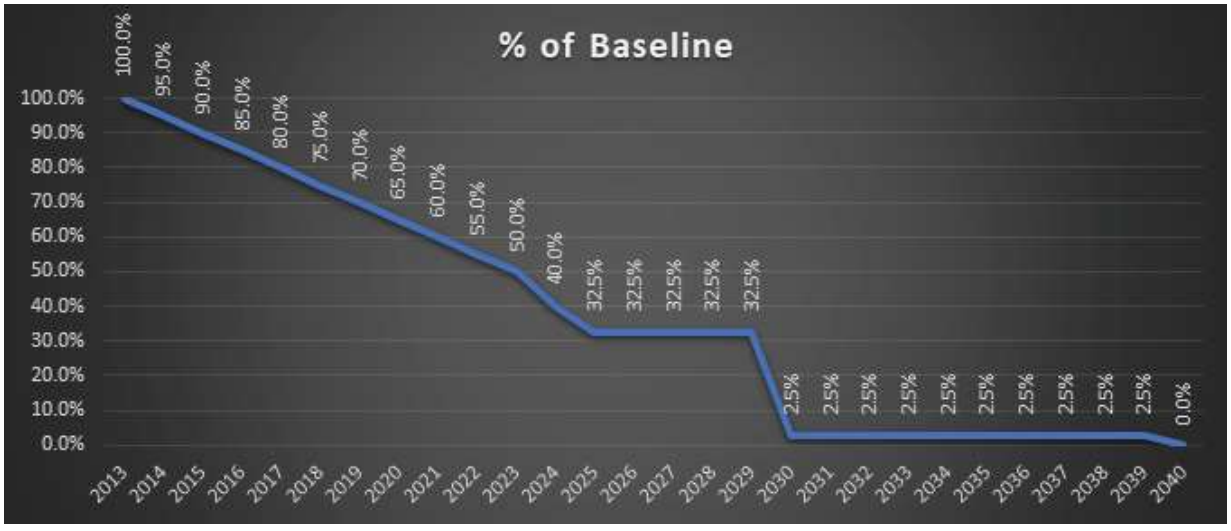
HFC refrigerants, as fluorinated compounds, contribute to the greenhouse effect due to the longevity of their atmospheric life.

To counteract these problems, the control on emissions of greenhouse generating gases was ratified within the Kyoto Protocol in 1997.

Phasing Out of HCFCs Timeframe

- Freeze consumption in 2013 at the baseline consumption (2009-2010)
- 2014 to 2023 is 5% reduction year on year off the baseline
- 2024 a further 10% reduction to a level of 50% off baseline
- 2025 to 2029 reduction to a level of 32,5% of baseline
- 2030 to 2039 reduction to 2,5% of baseline
- 2040 is a total phase out of HCFC use.

Action	Date
Quota system for the assignment of import licenses for all HCFC	1 January 2013
Ban on import of HCFC-141b either in pure form or as a component of blended chemicals; for the purpose of placing on the market or use in the production of polyurethane foams or as solvents or any other application	1 January 2016
Ban of import of any new or used air-conditioning systems or equipment fitted with a compressor and pre-charged or partially charged with HCFC-22 or any refrigerant or refrigerant blend containing any HCFC	1 July 2014
Ban on the use of HCFC-22 (or any other refrigerant containing HCFCs), either in pure form or as a component of blended refrigerants; in the construction, assembly or installation of any new refrigeration or air-conditioning system or equipment which requires a compressor to be fitted in South Africa	1 January 2015
Mandatory recovery and recycling of HCFCs and other ODS refrigerant	1 September 2014
License/certification required for anyone purchasing refrigerant	1 January 2015



Refrigerants R134A

R134A is an HFC, it is a colourless, non-flammable gas at atmospheric pressure with a slight odour. Supplied at low pressure in welded metal cylinders.

Precautions in Use

- Wear safety goggles, use leather/plastic protective gloves, wear overall and safety shoes when handling cylinders.

Hazards

- Asphyxiant in high concentrations
- Sudden expansion will produce low temperatures.

Gas	Purity
HFC-134A, 1, 1, 1, 2 Tetrafluoroethane $C_2H_2F_4$	>99,7 (%)

Physical Data	
Reference: Pabs = 101,325 kPa T = 20°C	**R134A**
Boiling Point	-26,3°C
Bubble Pressure (absolute)	572,1 kPa
Relative Density Air = 1	3,601
Molecular Weight	102 kg/kmol
Critical Temperature	101°C
Critical Pressure	4 059 kPa
Liquid Density	1 225 kg/m^3
ODP R11 = 1	0
GWP CO_2 = 1	1 300

Item Number	Cylinder Size	Contents (kg)	Valve Outlet Connection
W341045	Disposable	13,6	1/4" flare
578013-LG-N	Cylinder	60,0	5/8" BSPF right hand male
578013-TC-N	Drum	850,0	
578013-LC-N	Cylinder	22,0	

Retrofit Information

Replacement for:	R12	With the phasing out of CFCs, R134a was introduced as a replacement for R12 systems in flooded evaporators and shell and tube systems chillers, white goods and automotive
Other alternatives/replacements:	R1234yf	Due to the high GWP of R134a, this gas is being replaced by HFO R1234yf in automotive and other applications using R134a. White goods is moving across to the hydrocarbon refrigerants R600, R600a and R290
Compatible lubricants:	PAG-Auto, POE	

Environmental Impact

Ozone Depletion Potential (ODP)	0
Ozone Depletion Potential (Rating)	
Global Warming Potential (GWP)	1 300
Global Warming Potential (Rating)	

Safety Information

ASHRAE Safety Group (2013)	A1
ASHRAE Flammability	No
ASHRAE Toxicity	No

Common Refrigerant Applications

- Domestic Refrigeration
- Commercial Refrigeration
- Transport/Refrigeration
- Commercial Refrigeration: Plug-ins & Vending Machines
- Industrial Refrigeration
- Residential & Light Air-conditioning
- Industrial/Commercial Air-conditioning DX Chillers
- Industrial/Commercial Centrifugal Compressors
- Mobile Air-conditioning

Temperature Range

Med High

Refrigerants R427A

R427A, also known as Forane® 427A, is an HFC blend. It is a non-toxic, non-flammable, zero-ODP (Ozone Depletion Potential) refrigerant. R427A has the lowest GWP of R22 retrofit replacement refrigerants.

Gas	%
Forane® – 134a (1,1,1,2-Tetrafluororethane)	50
Forane® – 125 (Pentafluoroethane)	25
Forane® – 32 (Difluoromethane)	15
Forane® – 143a (1,1,1-Trifluoroethane)	10
Purity of each component (%)	≥99,5 wt

Physical Data	
Reference: Pabs = 101,325 kPa T = 20°C	**R427A**
Moisture	≤10 ppm
Chlorine Ion Test	Negative
Air Vapour Phase	≤1,5%
Total Acidity	≤ 1 ppm
Boiling Point	-42,7°C
Temperature Glide	7 K
Latent Heat of Vaporisation at n.b.p.	223,3 kJ/K
Critical Temperature	85,3°C
Critical Pressure	4,39 MPa
Liquid Density at 20°C	1,172 kg/m^3
Vapour Pressure at 20°C	0,97 MPa
ODP R11 = 1	0
GWP CO_2 = 1	2 138

Item Number	Cylinder Size	Contents (kg)	Valve Outlet Connection
578042-LA-N	Cylinder	10,0	5/8" BSPF right hand female
578042-LG-N	Cylinder	59,0	5/8" BSPF right hand female
578042-TA-N	Drum	800,00	5/8" BSPF right hand female

Retrofit Information:

Replacement for:	R22
Retrofit gas or design for new equipment?	R427A is suitable as a retrofit gas for R22
Other alternatives/replacements:	R417A, R422A, R422D, R424A, R434A, R437A, R438A
Compatible lubricants:	POE

Environmental Impact

Ozone Depletion Potential (ODP)	0
Ozone Depletion Potential (Rating)	
Global Warming Potential (GWP)	2 138
Global Warming Potential (Rating)	

Safety Information

ASHRAE Safety Group (2013)	A1
ASHRAE Flammability	No
ASHRAE Toxicity	No

Common Refrigerant Applications

Commercial Refrigeration

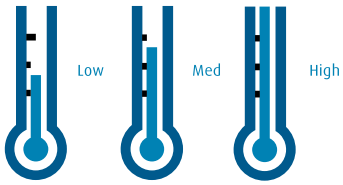
Commercial Refrigeration:
Plug-ins & Vending Machines

Industrial/Commercial Air-conditioning
DX Chillers

Industrial Refrigeration

Residential & Light Air-conditioning

Temperature Range



Refrigerants R22

R22 is an HCFC. It is a colourless, non-flammable, non-toxic gas. In low concentrations, it is odourless. In higher concentrations, its odour is mild. It is shipped in steel cylinders as a liquefied gas.

QUOTA RESTRICTION
- due to HCFC phase out

Precautions in Use

- Wear safety goggles, use leather/plastic protective gloves, wear overall and safety shoes when handling cylinders.

Hazards

- Dangerous for the ozone layer - part of phase-out schedule
- Asphyxiant in high concentrations
- Sudden expansion will produce low temperatures.

Gas	Purity
HCFC-22 Chlorodifluoromethane $CHClF_2$	>99,5 (%) wt

Physical Data	
Reference: Pabs = 101,325 kPa T = 20°C	**R22**
Boiling Point	-40,8°C
Bubble Pressure (absolute)	910,3 kPa
Relative Density Air = 1	3,032
Molecular Weight	86,47 kg/kmol
Critical Temperature	96,13°C
Critical Pressure	4 989 kPa
Liquid Density	1 210 kg/m³
ODP R11 = 1	0,055
GWP CO_2 = 1	1 760

Item Number	Cylinder Size	Contents (kg)	Valve Outlet Connection
W341078	Disposable	13,6	1/4" flare
577022-LG-N	Cylinder	59,0	5/8" BSPF right hand male
577022-TA-N	Drum	785,0	

Retrofit Information:

Replacement for:	R12	Designed as a safer, less toxic alternative to replace NH3 systems Operates at similar pressure to temperature parameters
Other alternatives/replacements:	R404a, R417A, R422A, R422D, R424A, R427A, R428A, R434A, R438A	
Compatible lubricants:	MO, AB	

All virgin HCFCs, including R22, are being phased out as of 1 January 2013.

Environmental Impact

Ozone Depletion Potential (ODP)	0,055
Ozone Depletion Potential (Rating)	
Global Warming Potential (GWP)	1 760
Global Warming Potential (Rating)	

HCFCs contribute both to ozone depletion and global warming. Therefore the use of HCFCs including R22 is being phased out according to the schedule detailed set by the Montreal Protocol due to its ozone depleting potential. Afrox recommends considering alternative solutions.

Safety Information

ASHRAE Safety Group (2013)	A1
ASHRAE Flammability	No
ASHRAE Toxicity	No

Common Refrigerant Applications

- Commercial Refrigeration
- Commercial Refrigeration: Plug-ins & Vending Machines
- Industrial/Commercial Air-conditioning DX Chillers
- Industrial Refrigeration
- Residential & Light Air-conditioning
- Industrial/Commercial Centrifugal Compressors
- Transport/Refrigeration

Temperature Range

Low Med High

Refrigerants R404A

R404A is an HFC blend. It is a colourless, non-flammable gas mixture at atmospheric pressure with a slight odour. Supplied in low pressure cylinders. R404a is a near azeotropic blend of refrigerant and may be used as an alternative gas for R22 systems with an oil change.

Precautions in Use

- Wear safety goggles, use leather/plastic protective gloves, wear overall and safety shoes when handling cylinders.

Hazards

- Asphyxiant in high concentrations
- Sudden expansion will produce low temperatures.

Gas	%
HFC-143a Trifluoroethane	52
HFC-125 Pentafluoroethane	44
HFC-134a Tetrafluoroethane	4
Purity (%)	>99,7

Physical Data	
Reference: Pabs = 101,325 kPa T = 20°C	**R404A**
Boiling Point	-46,6°C/-45,8°C
Bubble Pressure (absolute)	1 088 kPa
Relative Density Air = 1	3,429
Molecular Weight	97,6 kg/kmol
Critical Temperature	72,15°C
Critical Pressure	3 735 kPa
Liquid Density	1 066 kg/m^3
ODP R11 = 1	0
GWP CO_2 = 1	3 922

Item Number	Cylinder Size	Contents (kg)	Valve Outlet Connection
W341079	Disposable cylinder	10,9	1/4" flare
578040-LG-C	Cylinder	44,0	5/8" BSPF right hand male

Retrofit Information:

Replacement for:	R502, R22
Retrofit gas or design for new equipment?	R404A is suitable for use in new equipment as a replacement for older R502 applications. It can also be used to retrofit some old systems with an oil change
Other alternatives/replacements:	R407A, R407F, R442A
Compatible lubricants:	POE

Environmental Impact

Ozone Depletion Potential (ODP)	0
Ozone Depletion Potential (Rating)	
Global Warming Potential (GWP)	3 922
Global Warming Potential (Rating)	

Safety Information

ASHRAE Safety Group (2013)	A1
ASHRAE Flammability	No
ASHRAE Toxicity	No

Common Refrigerant Applications

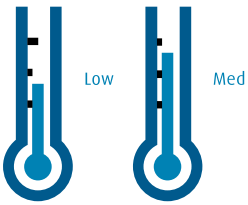
Commercial Refrigeration

Commercial Refrigeration : Plug-ins & Vending Machines

Industrial Refrigeration

Transport/Refrigeration

Temperature Range



Refrigerants R152A

R152A is most commonly used as a component within other refrigerant blends, as a propellant, and in some XPS foams. Its relatively low global warming potential when compared to other HFCs is desirable; however, its flammability creates challenges, thus limiting its use.

Precautions in Use

- Wear safety goggles, use leather/plastic protective gloves, wear overall and safety shoes when handling cylinders.

Hazards

- Extremely flammable gas
- Contact with liquid may cause frostbite and injury
- Inhalation of high concentration of vapour is harmful to health
- Material can be decomposed by high temperatures forming hydrofluoric acid, and possibly carbonyl fluoride

Gas	%
1,1-Difluoroethane $C_2H_4F_2$	100

Physical Data	
Reference: Pabs = 101,325 kPa T = 20°C	**R152A**
Chemical Symbol	CH2H4F2
Molecular weight	66,05 kg/kmol
Critical temperature	113,26 °C
Critical Pressure	47,6 bar
Specific Gravity	2.36
Boiling point @ 101,325 kPa	-24,70C
ODP	0
GWP	138

Item Number	Cylinder Size	Contents (kg)	Valve Outlet Connection
578015-LG-N	Cylinder	47,0	G5/8" LH-F
578015-TB-N	Drum	658	5/8" BSPF right hand male

Retrofit Information:

Replacement for:	R134a
Retrofit gas or design for new equipment?	R152a is suitable for use in new equipment
Other alternatives/replacements:	R134a, R227ea, R245fa, R600a, Pentanes
Compatible lubricants:	-

Environmental Impact

Ozone Depletion Potential (ODP)	0
Ozone Depletion Potential (Rating)	
Global Warming Potential (GWP)	138
Global Warming Potential (Rating)	

Safety Information

ASHRAE Safety Group (2013)	A2
ASHRAE Flammability	Yes
ASHRAE Toxicity	No

Common Refrigerant Applications

Propellant Foam Blowing Agent

Temperature Range

High

Refrigerants R407C

R407C is an HFC blend. It is a colourless and non-flammable gas mixture at atmospheric pressure with a slight odour. Supplied in low pressure cylinders.

Precautions in Use

- Wear safety goggles, use leather/plastic protective gloves, wear overall and safety shoes when handling cylinders.

Hazards

- Asphyxiant in high concentrations
- Sudden expansion will produce low temperatures.

Gas	%
HFC-32 Difluoromethane	23
HFC-125 Pentafluoroethane	25
HFC-134a Tetrafluoroethane	52
Purity (%)	>99,7

Physical Data	
Reference: Pabs = 101,325 kPa T = 20°C	**R407C**
Boiling Point	-43,8°C/-36,7°C
Bubble Pressure (absolute)	864,8 kPa
Relative Density Air = 1	3,022
Molecular Weight	86,2 kg/kmol
Critical Temperature	86,79°C
Critical Pressure	4 597 kPa
Liquid Density	1 157 kg/m^3
ODP R11 = 1	0
GWP CO_2 = 1	1 774

Item Number	Cylinder Size	Contents (kg)	Valve Outlet Connection
W341107	Disposable Cylinder	11,3	1/4" flare

Retrofit Information:

Replacement for:	R22
Retrofit gas or design for new equipment?	R407C is suitable for use in new equipment. It can also be used to retrofit some old R22 systems with an oil change
Other alternatives/replacements:	R407A, R407F
Compatible lubricants:	POE

Environmental Impact

Ozone Depletion Potential (ODP)	0
Ozone Depletion Potential (Rating)	
Global Warming Potential (GWP)	1 774
Global Warming Potential (Rating)	

Safety Information

ASHRAE Safety Group (2013)	A1
ASHRAE Flammability	No
ASHRAE Toxicity	No

Common Refrigerant Applications

Industrial/Commercial Air-conditioning
DX Chillers

Industrial Refrigeration

Residential & Light Air-conditioning

Temperature Range

Med

All virgin HCFCs, including R22, are being phased out as of 1 January 2013.

Refrigerants R417A

R417A (ISCEON® 59) has been primarily developed to replace R22 in air-conditioning applications but has also been successfully utilised in refrigeration applications such as commercial refrigeration.

Precautions in Use

- Wear safety goggles, use leather/plastic protective gloves, wear overall and safety shoes when handling cylinders.

Hazards

- Asphyxiant in high concentrations
- Sudden expansion will produce low temperatures.

Gas	%
HFC - 1,1,1,2-Tetrafluoroethane - R134a	50
HFC -Pentafluoroethane - R125	46,6
HC - N-butane - R600	3,4
Purity (%)	>99,8

Physical Data	
Reference: Pabs = 101,325 kPa T = 25°C	**R417A**
Boiling Point	-41,2°C/-40,1°C
Bubble Pressure (absolute)	8,57 bar
Relative Density Air = 1	1 172,20 kg/m³
Molecular Weight	109 kg/kmol
Critical Temperature	89,89°C
Critical Pressure	4 102 kPa
Liquid Density	41,07 kg/m³
ODP R11 = 1	0
GWP CO_2 = 1	2 346

Item Number	Cylinder Size	Contents (kg)	Valve Outlet Connection
W341083	Disposable Cylinder	13,0	1/4" flare

Retrofit Information:

Replacement for:	R22
Retrofit gas or design for new equipment?	R407C is suitable for use in new equipment. It can also be used to retrofit some old R22 systems with an oil change
Other alternatives/replacements:	R407A, R407F
Compatible lubricants:	POE

Environmental Impact

Ozone Depletion Potential (ODP)	0
Ozone Depletion Potential (Rating)	
Global Warming Potential (GWP)	2 346
Global Warming Potential (Rating)	

Safety Information

ASHRAE Safety Group (2013)	A1
ASHRAE Flammability	No
ASHRAE Toxicity	No

Common Refrigerant Applications

Industrial/Commercial Air-conditioning
DX Chillers

Industrial Refrigeration

Residential & Light Air-conditioning

Temperature Range

Med

Refrigerants R410A

R410A is an HFC blend. It is non-flammable and non-toxic. It operates at high pressures and cannot be used as a retrofit for R22 systems. Systems designed for R410A can take advantage of its ability to use smaller components.

Precautions in Use

- Wear safety goggles, use leather/plastic protective gloves, wear overall and safety shoes when handling cylinders.

Hazards

- Asphyxiant in high concentrations
- Sudden expansion will produce low temperatures.

Gas	%
HFC-32 Difluoromethane	50
HFC-125 Pentafluoroethane	50
Purity (%)	>99,7 wt

Physical Data	
Reference: Pabs = 101,325 kPa T = 20°C	**R410A**
Boiling Point	-51,6°C/-51,5°C
Bubble Pressure (absolute)	1 437 kPa
Relative Density Air = 1	2,543
Molecular Weight	72,58 kg/kmol
Critical Temperature	72,13°C
Critical Pressure	4 770 kPa
Liquid Density	1 087 kg/m^3
ODP R11 = 1	0
GWP CO_2 = 1	2 088

Item Number	Cylinder Size	Contents (kg)	Valve Outlet Connection
W341134	Disposable cylinder	11,3	1/4" flare

Retrofit Information:

Replacement for:	R22, R13B1
Retrofit gas or design for new equipment?	R410A is suitable for new equipment designed to operate with the higher pressure necessary for this gas
Other alternatives/replacements:	R32, MO89, R23, R508B
Compatible lubricants:	POE

All virgin HCFCs, including R22, are being phased out as of 1 January 2013.

Environmental Impact

Ozone Depletion Potential (ODP)	0
Ozone Depletion Potential (Rating)	
Global Warming Potential (GWP)	2 088
Global Warming Potential (Rating)	

Safety Information:

ASHRAE Safety Group (2013)	A1
ASHRAE Flammability	No
ASHRAE Toxicity	No

Common Refrigerant Applications

Industrial Refrigeration

Industrial/Commercial
Centrifugal Compressors

Industrial/Commercial Air-conditioning
DX Chillers

Residential & Light Air-conditioning

Temperature Range

Ultra Low

Low

Med

Refrigerants R507A

R507A is an HFC blend. It is a colourless, non-flammable gas mixture at atmospheric pressure with a slight odour. Supplied in low pressure cylinders.

Precautions in Use

- Wear safety goggles, use leather/plastic protective gloves, wear overall and safety shoes when handling cylinders.

Hazards

- Asphyxiant in high concentrations
- Sudden expansion will produce low temperatures.

Gas	%
HFC-125 Pentafluoroethane	50
HFC-143a Trifluoroethane	50
Purity (%)	>99,7 wt

Physical Data	
Reference: Pabs = 101,325 kPa T = 20°C	**R507A**
Boiling Point	-46,7°C/-40°C
Bubble Pressure (absolute)	1 126 kPa
Relative Density Air = 1	3,471
Molecular Weight	98,86 kg/kmol
Critical Temperature	70,74 °C
Critical Pressure	3 714 kPa
Liquid Density	1 070 kg/m^3
ODP R11 = 1	0
GWP CO_2 = 1	3 985

Item Number	Cylinder Size	Contents (kg)	Charging Pressure kPa at 20°C	Valve Outlet Connection
W341080	Disposable	11,3	Vapour Pressure	1/4" flare

Retrofit Information:

Replacement for:	R502, R22
Retrofit gas or design for new equipment?	R507A is suitable for use with new equipment in applications that used to use R502
Other alternatives/replacements:	R404A, R407A, R407F
Compatible lubricants:	POE

Environmental Impact

Ozone Depletion Potential (ODP)	0
Ozone Depletion Potential (Rating)	
Global Warming Potential (GWP)	3 985
Global Warming Potential (Rating)	

Safety Information:

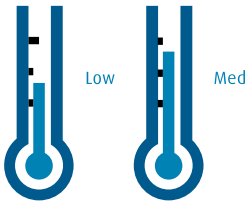
ASHRAE Safety Group (2013)	A1
ASHRAE Flammability	No
ASHRAE Toxicity	No

Common Refrigerant Applications

Industrial Refrigeration

Industrial/Commercial
Centrifugal Compressors

Temperature Range



HFOs

Refrigerant solutions with zero ODP and very low GWP.

HFOs (hydrofluoro-olefins) are the fourth generation of fluorine based gases. HFC refrigerants are composed of hydrogen, fluorine and carbon atoms connected by single bonds between the atoms.

HFO 1234yf, which is sold under the brand names Opteon™ YF, is produced by Du Pont. This is a low GWP (Global Warming Potential) replacement for R134a for use in mobile air-conditioning (MAC) systems in the automotive sector.

HFO refrigerants are categorised as having zero ODP (Ozone Depletion Potential) and low GWP and so offer a more environmentally friendly alternative to CFCs, HCFCs and HFCs.

Opteon™ YF (R1234yf)

R1234yf is a next generation refrigerant gas.

It combines environmental benefits with excellent cooling performance. Consequently, Opteon® YF has been chosen by many automotive OEMs as the low GWP refrigerant of choice.

Afrox offers this refrigerant in a range of package sizes to suit all applications.

Please contact the special gases division at the Afrox Customer Service Centre on 0860 020202.

Retrofit Information:

Replacement for:	R134a
Retrofit gas or design for new equipment?	R1234yf is designed for new systems. It is slightly flammable and therefore is not suitable for retrofitting existing R134a systems
Other alternatives/replacements:	SOLSTICE yf
Compatible lubricants:	PAG-Auto, POE

Environmental Impact

Ozone Depletion Potential (ODP)	0
Ozone Depletion Potential (Rating)	
Global Warming Potential (GWP)	4
Global Warming Potential (Rating)	

Safety Information:

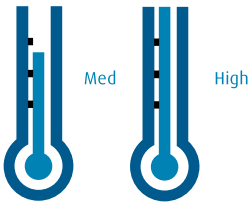
ASHRAE Safety Group (2013)	A2L
ASHRAE Flammability	Yes (Low)
ASHRAE Toxicity	No

Common Refrigerant Applications

Domestic Refrigeration

Mobile Air-conditioning

Temperature Range



Natural Refrigerants

Much of the refrigeration and air-conditioning equipment today uses flourocarbon refrigerants to facilitate the heat transfer process. These refrigerants are synthetic chemicals that have an impact on the environment and lead to global warming.

Alternatives to these chemicals do exist.

Natural refrigerants have zero-ozone depleting potential and very low global warming potential. These products were used before the 1950s prior to fluorocarbon production and are now being used more extensively due to their low impact on the environment.

Natural refrigerants are chemicals which occur in nature's bio-chemical processes. They do not deplete the ozone layer and make a negligible (or zero in the case of R-717 ammonia) contribution to global warming. Their high efficiency means they make a much lower, indirect contribution to global warming than many synthetic refrigerants.

Afrox has a wealth of experience and expertise in environmentally friendly refrigerants. We offer a wide selection of products including:

- R717 (Ammonia)
- R744 (Carbon dioxide)

Ammonia R717

Ammonia has been used in industrial applications since the 1930s and is generally acknowledged as the most efficient refrigerant. It has a low boiling point and is favoured because it is a highly energy efficient refrigerant.

Afrox offers the highest industry specification for refrigerant ammonia, meeting both the IIAR and ASHRAE specifications.

Afrox refrigerant grade ammonia is 99,98% pure with minimal levels of moisture and other impurities (<200 ppm and <10 ppm oil) making it ideal for usage in all types of refrigeration systems.

Product Description	Size (kg)	Material Number	Recommended Regulator
Ammonia N3.5	68,0	540201-LH-N	W020120
Ammonia N3.5	1 400,0	540201-TE-C	Recommendation on Request
Ammonia N2.5	Bulk	5374	Recommendation on Request

Contact the Afrox Customer Service Centre on 0860 020202.

Retrofit Information:

Replacement for:	R22, R134a
Retrofit gas or design for new equipment?	R717 is suitable for new R717 systems. It is a toxic and slightly flammable refrigerant and therefore not suitable for retrofitting existing fluorocarbon refrigerant systems
Other alternatives/replacements:	R134a
Compatible lubricants:	Consult OEM

Environmental Impact

Ozone Depletion Potential (ODP)	0
Ozone Depletion Potential (Rating)	
Global Warming Potential (GWP)	0
Global Warming Potential (Rating)	

Common Refrigerant Applications

Industrial Refrigeration

Transport/Refrigeration

Industrial/Commercial Air-conditioning
DX Chillers

Industrial/Commercial
Centrifugal Compressors

Safety Information:

ASHRAE Safety Group (2013)	**B2L**
ASHRAE Flammability	**Yes (Low)**
ASHRAE Toxicity	**No**

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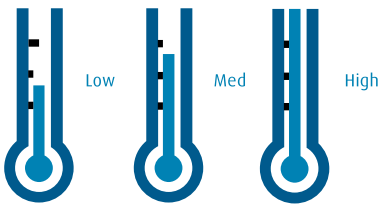
Temperature Range



R744 (Refrigerant Grade Carbon Dioxide)

R744 is an environmentally friendly product. It has excellent thermodynamic properties and low energy usage, making it suitable for a range of applications. Refrigeration CO_2 systems require tight controls on moisture, oil and other impurities. Industrial grade CO_2 does not meet this requirement.

Carbon dioxide is a traditional refrigerant which dates back to 1850. R744 is now regaining popularity due to its low environmental impact.

One major difference between R744 and other refrigerants is its pressure/temperature characteristic. Due to its high pressure and low critical temperature refrigeration systems require special equipment.

R744 is often used as a secondary refrigerant along with ammonia, thereby opening up applications where ammonia as a single-stage refrigerant would not be applicable.

Refrigerant grade CO_2 is available in a variety of cylinder sizes and drums.

Product Description	Size (kg)	Material Number	Recommended Regulator
R744 (Carbon Dioxide) (Dry)	31,3	502922-RC-C	Recommendation on Request
R744 (Carbon Dioxide) (Wet)	31,3	503169-RC-C	Recommendation on Request
R744 (Carbon Dioxide) (Dry)	5,6	502922-HB-C	Recommendation on Request

Contact the Afrox Customer Service Centre on 0860 020202.

Retrofit Information:

Replacement for: R134a, R404A, R22 systems

Retrofit gas or design for new equipment? R744 is suitable for new R744 systems. It has high pressure and a low critical temperature, therefore it is not suitable for retrofitting existing fluorocarbon refrigerant systems

Other alternatives/replacements: R290

Compatible lubricants: Consult OEM

Environmental Impact

Ozone Depletion Potential (ODP) 0

Ozone Depletion Potential (Rating)

Global Warming Potential (GWP) 1

Global Warming Potential (Rating)

Safety Information:

ASHRAE Safety Group (2013)	A1
ASHRAE Flammability	No
ASHRAE Toxicity	No

Common Refrigerant Applications

Commercial Refrigeration

Commercial Refrigeration:
Plug-ins & Vending Machines

Industrial/Commercial Air-conditioning
DX Chillers

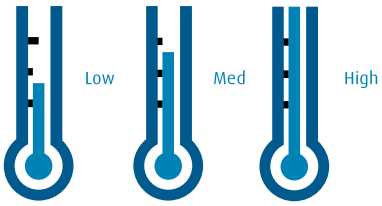
Industrial Refrigeration

Transport/Refrigeration

Industrial/Commercial
Centrifugal Compressors

Mobile Air-conditioning

Temperature Range



Refrigerant Recovery

Afrox, in conjunction with Hudson Technologies (a leading US refrigeration technology company), has developed a set of exclusive services for the refrigeration industry to keep your business running at the right temperature. Our technology is designed to help contractors and plant owners to ensure their refrigeration plant operates as close as possible to its design parameters and minimise running costs per unit output.

Service	Summary
Recovery	Removal of refrigerant from equipment and collection in an appropriate vessel and may include return of the refrigerant to the plant.
Reclamation	This is the recovery of refrigerant from systems being decommissioned or converted. The refrigerant can be resold. This includes the analytical testing of the refrigerant.
Recycling	Reduce the contaminant levels in used refrigerant by passing product through Hudson equipment (the ZugiBeast). Recycle includes no analytical testing of the refrigerant.

Please contact the special gases cell at CSC on 0860 020202

Whether your application is air-conditioning, commercial refrigeration, process chilling or heat extraction, we can help you satisfy regulatory compliance when your refrigerant gases approach the end of their life cycle.

Our recovery and reclamation solutions minimise the impact of used refrigerants upon the environment. They ensure that used gas is safely removed from a cooling system and on collection reclaimed or destroyed in a way that avoids its release into the atmosphere.

Why the need for refrigerant recovery?

It is well understood that many fluorocarbon refrigerant gases contribute to ozone depletion and global warming.

The Montreal and Kyoto Protocols called for countries around the world to help the environment and phase out harmful refrigerants, replacing them with next-generation fluorocarbon and natural refrigerants. Legislation is also driving the need to reduce emissions via reduced charge sizes within refrigeration systems, improved equipment design, better maintenance and inspection procedures. Companies have also come to recognise their ethical obligation to protect the environment.

Even with these changes, any refrigerant will, however, end up as waste when it comes to the end of its life within the refrigeration/cooling system. It is therefore a business imperative to responsibly dispose of used refrigerants.

At Afrox we have the expertise to help you reclaim and reuse refrigerants wherever possible. Refrigerant reclamation delivers measurable business benefits. Enabling you to meet environmental obligations through best-practice. It:

- Avoids the release of ozone depleting and global warming gases
- Eliminates the need to produce new refrigerants

We provide comprehensive, cost-effective services tailored to the needs of refrigeration systems large or small through the:

- Supply of recovery cylinders that enable on-site collection (small volumes)
- Direct collection of larger volumes in drums
- On-site recovery and system rectification service (selected areas)
- Refrigerant reclamation
- Environmentally friendly waste destruction services
- Expert advice regarding legal requirements including waste gas management regulations certification and environmental reporting
- Certification of treatment - legal proof of responsible refrigerant care.

At Afrox we guarantee the quality of our reclaimed refrigerants - unlike recycled products, they meet Air-conditioning, Heating and Refrigeration Institute (AHRI) 700 specification. This ensures:

- Reduced risk of hydrolysis, corrosion or compressor failure
- Reduced risk of rogue thermodynamic properties in the fluid
- Optimal equipment operation and energy efficiency
- Compliance with consumer and legislative demand
- Delivery of the corporate sustainability agenda.

Key Business Benefits

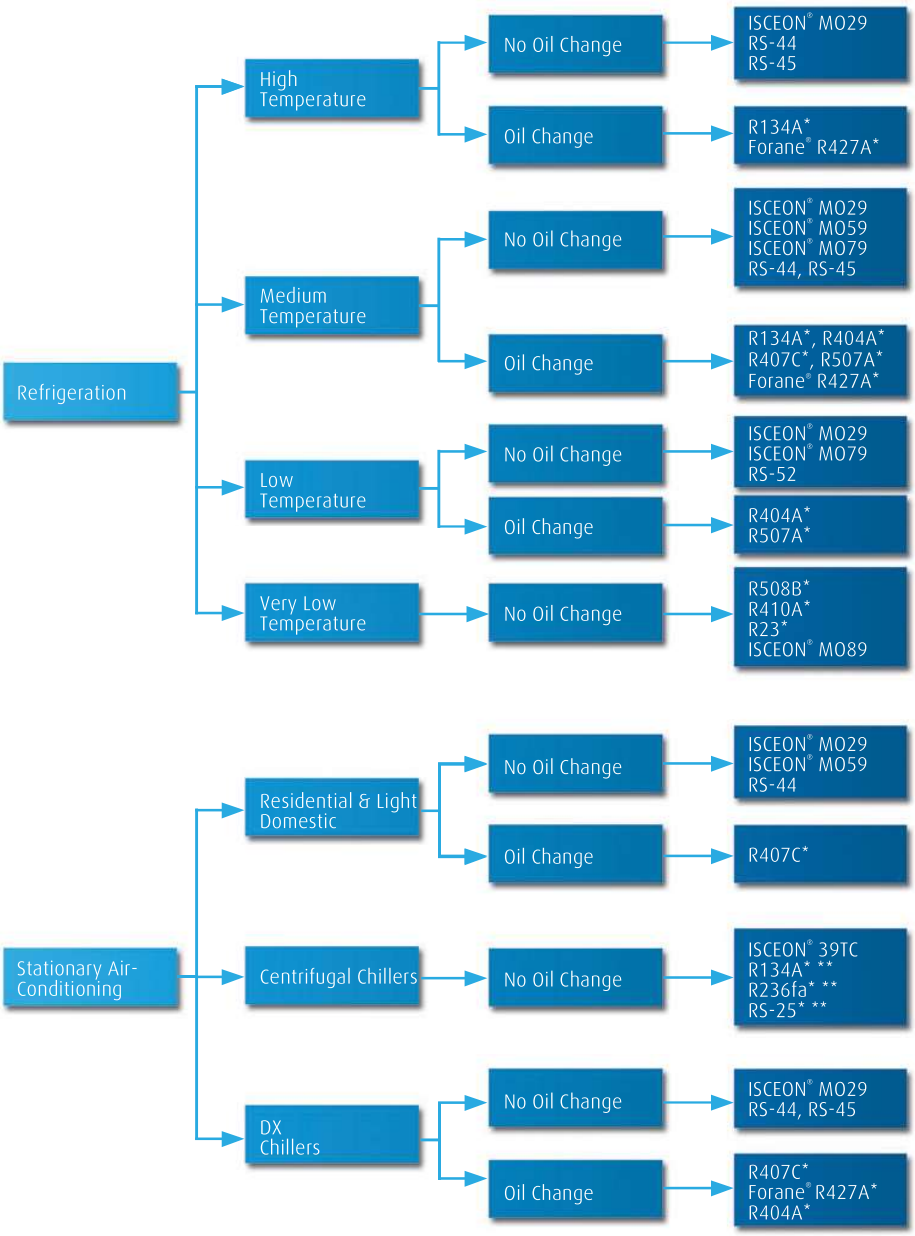
The benefits for your company are universal:

- Minimise risk associated with used refrigerants - avoid harmful ozone depletion and global warming
- Eliminate unnecessary production of new refrigerants - reuse/reclaim to maintain current volumes
- Satisfy consumer and legislative demand
- Deliver on the corporate sustainablity agenda
- Outsource specialist expertise and focus on what you do best.

Afrox - your coolest refrigerant partner

HFC Guide

Guide to the HFC Retrofit Gases into Existing HCFC Systems



* Polyolester oil (POE) must be used

** Possible replacement products in centrifugal chillers. Consult compressor manufacturer first

Note: ISCEON® MO79 and RS-52 are retrofit gases for R502 and will require systems to be suitable for R502 pressures, and an expansion device suitable for R404A.

For all other applications, refer to Afrox.

Contact the refrigerants team on 0860 020202.

Dew Point Pressure Chart (Gauge Pressure) @ Altitude 85 kPa

Replace	R11	R12			R22			R502			Replace
with	R123	R134a	R406A	R409A	R22	R407C	R410A	R507A	R404A	R408A	with
°C	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	°C
-50	-83,227	-55,52	-58,973	-53,5	-20,48	-34,93	24,5	1,08	-2,73	-7,56	-50
-48	-82,946	-51,92	-55,816	-49,78	-13,56	-28,94	35,8	10,16	5,89	0,39	-48
-46	-82,628	-47,97		-45,705	-6,06	-22,39	48,1	19,97	15,2	8,98	-46
-44	-82,27	-43,64	-48,57	-41,28	2,04	-15,27	61,3	30,54	25,2	18,24	-44
-42	-81,867	-38,91	-44,437	-36,42	10,8	-7,53	75,6	41,92	36,1	28,2	-42
-40	-81,414	-33,75	-39,934	-31,15	20,2	0,87	90,9	54,15	47,7	38,91	-40
-38	-80,907	-28,14	-35,037	-25,43	30,4	9,96	107,3	67,26	60,2	50,41	-38
-36	-80,341	-22,05	-29,722	-19,23	41,3	19,8	124,9	81,29	73,6	62,73	-36
-34	-79,71	-15,44	-23,964	-12,53	53	30,4	143,7	96,3	87,9	75,92	-34
-32	-79,009	-8,29	-17,736	-5,29	65,5	41,8	163,8	112,3	103,2	90,01	-32
-30	-78,232	-0,57	-11,012	2,52	78,9	54	185,2	129,37	119,5	105,04	-30
-28	-77,373	7,76	-3,765	10,93	93,2	67,1	208,1	147,53	136,9	121,07	-28
-26	-76,424	16,7	4,033	19,97	108,5	81,2	232,4	166,83	155,4	138,13	-26
-24	-75,38	26,4	12,412	29,67	124,7	96,2	258,2	187,32	175	156,27	-24
-22	-74,23	36,7	21,4	40,07	142	112,3	285,6	209,04	195,9	175,53	-22
-20	-72,97	47,8	31,03	51,19	160,4	129,4	314,7	232,03	218	195,97	-20
-18	-71,59	59,7	41,33	63,09	179,8	147,7	345,5	256,36	241,4	217,62	-18
-16	-70,09	72,4	52,34	75,79	200,5	167,1	378,1	282,06	266,2	240,53	-16
-14	-68,44	85,9	64,08	89,33	222,4	187,7	412,5	309,18	292,4	264,76	-14
-12	-66,65	100,4	76,58	103,75	245,5	209,6	448,8	337,77	320	290,36	-12
-10	-64,71	115,7	89,9	119,09	269,9	232,8	487,1	367,88	349,1	317,36	-10
-8	-62,6	132,1	104,04	135,39	295,6	257,4	527,5	399,57	379,8	345,83	-8
-6	-60,31	149,4	119,06	152,68	322,8	283,4	570	432,89	412,1	375,82	-6
-4	-57,84	167,9	134,99	171,01	351,4	310,8	614,8	467,89	446	407,38	-4
-2	-55,17	187,4	151,86	190,43	381,5	339,9	661,8	504,63	481,6	440,56	-2
0	-52,29	208	169,71	210,96	413,1	370,5	711,1	543,17	519	475,41	0
2	-49,2	229,8	188,57	232,67	446,4	402,8	762,9	583,55	558,3	511,99	2
4	-45,87	252,9	208,49	255,59	481,2	436,8	817,2	625,85	599,4	550,36	4
6	-42,29	277,2	229,51	279,77	517,8	472,6	874,1	670,12	642,4	590,57	6
8	-38,46	302,9	251,66	305,25	556,1	510,3	934	716,43	687,5	632,68	8
10	-34,35	329,9	274,97	332,08	596,2	549,9	996	764,84	734,6	676,75	10
12	-29,97	358,3	299,51	360,31	638,1	591,6	1 061	815,42	783,8	722,82	12
14	-25,28	388,2	325,29	389,98	681,9	635,3	1 129	868,23	835,2	770,97	14
16	-20,28	419,6	352,37	421,15	727,7	681,2	1 200	923,35	888,8	821,26	16
18	-14,95	452,5	380,78	453,87	775,5	729,3	1 275	980,86	945	873,73	18
20	-9,29	487,1	410,57	488,18	825,3	779,8	1 352	1 040,82	1 003	928,46	20
22	-3,26	523,3	441,78	524,14	877,3	832,7	1 433	1 103,31	1 064	985,5	22
24	3,13	561,2	474,45	561,8	931	888,1	1 517	1 168,43	1 127	1 044,92	24
26	9,92	600,8	508,64	601,2	988	946	1 605	1 236,25	1 193	1 106,79	26
28	17,1	642,3	544,37	642,41	1 046	1 007	1 696	1 306,86	1 261	1 171,15	28
30	24,7	685,6	581,71	685,49	1 107	1 070	1 791	1 380,34	1 333	1 238,09	30
32	32,8	730,9	620,68	730,48	1 171	1 137	1 889	1 456,81	1 407	1 307,66	32
34	41,3	778,1	661,35	777,45	1 236	1 206	1 992	1 536,35	1 483	1 379,94	34
36	50,2	827,4	703,76	826,45	1 305	1 279	2 099	1 619,06	1 563	1 454,998	36
38	59,7	878,7	747,95	877,53	1 376	1 354	2 210	1 705,06	1 646	1 532,87	38
40	69,7	932	793,97	930,77	1 449	1 434	2 325	1 794,45	1 732	1 613,66	40
42	80,1	988	841,88	986,21	1 525	1 516	2 444	1 887,36	1 822	1 697,42	42
44	91,2	1 046	891,72	1 043,91	1 604	1 602	2 568	1 983,9	1 914	1 784,23	44
46	102,8	1 106	943,5	1 103,95	1 686	1 692	2 697	2 084,2	2 010	1 874,16	46
48	115	1 169	997,4	1 166,38	1 771	1 785	2 830	2 188,38	2 110	1 967,29	48
50	127,7	1 234	1 053,4	1 231,27	1 858	1 883	2 968	2 296,6	2 213	2 063,67	50
52	141,1	1 301	1 111,5	1 298,69	1 949	1 984	3 112	2 408,99	2 320	2 163,4	52
54	155,1	1 371	1 171,8	1 368,69	2 043	2 090	3 260	2 525,71	2 430	2 266,54	54
56	169,8	1 444	1 234,3	1 441,35	2 140	2 200	3 414	2 646,9	2 545	2 373,18	56
58	185,2	1 520	1 299,2	1 516,73	2 240	2 314	3 573	2 772,75	2 664	2 483,37	58
60	201,3	1 598	1 366,5	1 594,92	2 343	2 433	3 738	2 903,41	2 787	2 597,23	60
62	218	1 679	1 436,1	1 675,97	2 450	2 556	3 908	3 039,08	2 914	2 714,81	62
64	235,5	1 763	1 508,3	1 759,97	2 560	2 684	4 085	3 179,93	3 046	2 836,2	64
66	253,8	1 850	1 583,1	1 846,99	2 674	2 817	4 267	3 326,17	3 182	2 961,48	66
°C	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	°C
with	R123	R134a	R406A	R409A	R22	R407C	R410A	R507A	R404A	R408A	with
Replace	R11	R12			R22			R502			Replace

Bubble Point Pressure Chart (Gauge Pressure) @ Altitude 85 kPa

Replace	R11	R12			R22			R502			Replace
with	R123	R134a	R406A	R409A	R22	R407C	R410A	R507A	R404A	R408A	with
°C	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	°C
-50	-83,227	-55,52	-41,51	-35,08	-20,48	-9,93	24,8	2,96	0,68	-7,56	-50
-48	-82,946	-51,92	-36,77	-29,71	-13,56	-2,00	36,1	12,02	9,51	0,39	-48
-46	-82,628	-47,97	-31,63	-23,89	-6,06	6,58	48,4	21,8	19,0	8,98	-46
-44	-82,270	-43,64	-26,05	-17,59	2,04	15,8	61,7	32,3	29,3	18,2	-44
-42	-81,867	-38,91	-20,03	-10,78	10,80	25,8	76,0	43,7	40,4	28,2	-42
-40	-81,414	-33,75	-13,53	-3,44	20,2	36,6	91,3	55,8	52,2	38,9	-40
-38	-80,907	-28,14	-6,52	4,47	30,4	48,2	107,8	68,9	65,0	50,4	-38
-36	-80,341	-22,05	1,02	12,97	41,3	60,6	125,4	82,8	78,6	62,7	-36
-34	-79,710	-15,44	9,12	22,1	53,0	73,9	144,3	97,8	93,2	75,9	-34
-32	-79,009	-8,29	17,8	31,9	65,5	88,2	164,4	113,7	108,7	90,0	-32
-30	-78,232	-0,57	27,1	42,4	78,9	103,4	185,9	130,7	125,3	105,0	-30
-28	-77,373	7,76	37,1	53,6	93,2	119,6	208,8	148,8	143,0	121,1	-28
-26	-76,424	16,7	47,7	65,5	108,5	137,0	233,2	168,0	161,8	138,1	-26
-24	-75,380	26,4	59,0	78,2	124,7	155,4	259,1	188,4	181,7	156,3	-24
-22	-74,23	36,7	71,1	91,8	142,0	175,0	286,6	210,0	202,9	175,5	-22
-20	-72,97	47,8	83,9	106,2	160,4	195,8	315,8	233,0	225,3	196,0	-20
-18	-71,59	59,7	97,5	121,6	179,8	217,9	346,7	257,2	249,0	217,6	-18
-16	-70,09	72,4	112,0	137,8	200,5	241,3	379,4	282,8	274,1	240,5	-16
-14	-68,44	85,9	127,3	155,0	222,4	266,0	413,9	309,9	300,6	264,8	-14
-12	-66,65	100,4	143,5	173,2	245,5	292,2	450,3	338,4	328,5	290,4	-12
-10	-64,71	115,7	160,7	192,5	269,9	319,8	488,8	368,5	358,0	317,4	-10
-8	-62,60	132,1	178,8	212,8	295,6	348,9	529,3	400,2	389,0	345,8	-8
-6	-60,31	149,4	197,9	234,3	322,8	379,6	572,0	433,5	421,6	375,8	-6
-4	-57,84	167,9	218,0	256,9	351,4	411,9	616,8	468,5	455,8	407,4	-4
-2	-55,17	187,4	239,2	280,7	381,5	446,0	664,0	505,2	491,8	440,6	-2
0	-52,29	208,0	261,6	305,8	413,1	481,7	713,5	543,8	529,5	475,4	0
2	-49,20	229,8	285,0	332,2	446,4	519,2	765,5	584,2	569,1	512,0	2
4	-45,87	252,9	309,6	359,8	481,2	558,6	820,0	626,5	610,5	550,4	4
6	-42,29	277,2	335,5	388,9	517,8	599,9	877,0	670,8	653,9	590,6	6
8	-38,46	302,9	362,6	419,3	556,1	643,2	937	717,1	699,3	632,7	8
10	-34,35	329,9	390,9	451,2	596,2	688,4	999	765,5	746,7	676,8	10
12	-29,97	358,3	420,6	484,6	638,1	735,8	1 065	816,1	796,2	722,8	12
14	-25,28	388,2	451,7	519,6	681,9	785,3	1 133	868,9	847,9	771,0	14
16	-20,28	419,6	484,1	556,1	727,7	837,0	1 204	924	901,8	821,3	16
18	-14,95	452,5	518,0	594,2	775,5	891,0	1 279	981	958	873,7	18
20	-9,29	487,1	553,3	634,0	825,3	947	1 357	1 041	1 017	928	20
22	-3,26	523,3	590,2	675,5	877,3	1 006	1 437	1 104	1 078	986	22
24	3,13	561,2	628,6	718,8	931	1 067	1 522	1 168	1 141	1 045	24
26	9,92	600,8	668,5	763,8	988	1 131	1 610	1 236	1 207	1 107	26
28	17,1	642,3	710,1	810,7	1 046	1 197	1 701	1 306	1 276	1 171	28
30	24,7	685,6	753,4	859,5	1 107	1 266	1 796	1 379	1 347	1 239	30
32	32,8	730,9	798,4	910,2	1 171	1 337	1 895	1 455	1 422	1 308	32
34	41,3	778,1	845,1	963	1 236	1 412	1 998	1 534	1 499	1 380	34
36	50,2	827,4	893,6	1 018	1 305	1 489	2 105	1 616	1 579	1 455	36
38	59,7	878,7	944	1 074	1 376	1 569	2 216	1 700	1 662	1 533	38
40	69,7	932	996	1 133	1 449	1 652	2 331	1 788	1 748	1 614	40
42	80,1	988	1 050	1 194	1 525	1 738	2 451	1 880	1 837	1 697	42
44	91,2	1 046	1 106	1 258	1 604	1 828	2 575	1 975	1 930	1 784	44
46	102,8	1 106	1 164	1 323	1 686	1 920	2 704	2 073	2 026	1 874	46
48	115,0	1 169	1 224	1 391	1 771	2 016	2 838	2 174	2 125	1 967	48
50	127,7	1 234	1 286	1 461	1 858	2 114	2 976	2 280	2 228	2 064	50
52	141,1	1 301	1 350	1 534	1 949	2 217	3 119	2 389	2 335	2 163	52
54	155,1	1 371	1 417	1 609	2 043	2 322	3 268	2 502	2 446	2 267	54
56	169,8	1 444	1 485	1 686	2 140	2 431	3 421	2 619	2 560	2 373	56
58	185,2	1 520	1 556	1 766	2 240	2 544	3 580	2 739	2 679	2 483	58
60	201,3	1 598	1 629	1 849	2 343	2 660	3 745	2 865	2 801	2 597	60
62	218,0	1 679	1 704	1 933	2 450	2 780	3 915	2 994	2 928	2 715	62
64	235,5	1 763	1 782	2 021	2 560	2 904	4 091	3 128	3 059	2 836	64
66	253,8	1 850	1 862	2 112	2 674	3 031	4 273	3 266	3 195	2 961	66
°C	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	°C
with	R123	R134a	R406A	R409A	R22	R407C	R410A	R507A	R404A	R408A	with
Replace	R11	R12			R22			R502			Replace

Dew Point Pressure Chart (Gauge Pressure) @ Sea Level 101,3 kPa

Replace	R11	R12			R22			R502			Replace
with	R123	R134a	R406A	R409A	R22	R407C	R410A	R507A	R404A	R408A	with
°C	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	°C
-50	-99,527	-71,82	-75,27	-69,8	-36,78	-51,23	8,2	-15,22	-19,03	-23,86	-50
-48	-99,246	-68,22	-72,12	-66,08	-29,86	-45,24	19,5	-6,14	-10,41	-15,91	-48
-46	-98,928	-64,27	-68,66	-62,005	-22,36	-38,69	31,8	3,7	-1,1	-7,32	-46
-44	-98,57	-59,94	-64,87	-57,58	-14,26	-31,57	45	14,2	8,9	1,9	-44
-42	-98,167	-55,21	-60,74	-52,72	-5,5	-23,83	59,3	25,6	19,8	11,9	-42
-40	-97,714	-50,05	-56,23	-47,45	3,9	-15,43	74,6	37,9	31,4	22,6	-40
-38	-97,207	-44,44	-51,34	-41,73	14,1	-6,34	91	51,0	43,9	34,1	-38
-36	-96,641	-38,35	-46,02	-35,53	25	3,5	108,6	65,0	57,3	46,4	-36
-34	-96,01	-31,74	-40,26	-28,83	36,7	14,1	127,4	80,0	71,6	59,6	-34
-32	-95,309	-24,59	-34,04	-21,59	49,2	25,5	147,5	96,0	86,9	73,7	-32
-30	-94,532	-16,87	-27,31	-13,78	62,6	37,7	168,9	113,1	103,2	88,7	-30
-28	-93,673	-8,54	-20,07	-5,37	76,9	50,8	191,8	131,2	120,6	104,8	-28
-26	-92,724	0,4	-12,27	3,7	92,2	64,9	216,1	150,5	139,1	121,8	-26
-24	-91,68	10,1	-3,89	13,4	108,4	79,9	241,9	171,0	158,7	140,0	-24
-22	-90,53	20,4	5,1	23,8	125,7	96	269,3	192,7	179,6	159,2	-22
-20	-89,27	31,5	14,7	34,9	144,1	113,1	298,4	215,7	201,7	179,7	-20
-18	-87,89	43,4	25,0	46,8	163,5	131,4	329,2	240,1	225,1	201,3	-18
-16	-86,39	56,1	36,0	59,5	184,2	150,8	361,8	265,8	249,9	224,2	-16
-14	-84,74	69,6	47,8	73,0	206,1	171,4	396,2	292,9	276,1	248,5	-14
-12	-82,95	84,1	60,3	87,5	229,2	193,3	432,5	321,5	303,7	274,1	-12
-10	-81,01	99,4	73,6	102,8	253,6	216,5	470,8	351,6	332,8	301,1	-10
-8	-78,9	115,8	87,7	119,1	279,3	241,1	511,2	383,3	363,5	329,5	-8
-6	-76,61	133,1	102,8	136,4	306,5	267,1	553,7	416,6	395,8	359,5	-6
-4	-74,14	151,6	118,7	154,7	335,1	294,5	598,5	451,6	429,7	391,1	-4
-2	-71,47	171,1	135,6	174,1	365,2	323,6	645,5	488,3	465,3	424,3	-2
0	-68,59	191,7	153,4	194,7	396,8	354,2	694,8	526,9	502,7	459,1	0
2	-65,5	213,5	172,3	216,4	430,1	386,5	746,6	567,3	542	495,7	2
4	-62,17	236,6	192,2	239,3	464,9	420,5	800,9	609,6	583,1	534,1	4
6	-58,59	260,9	213,2	263,5	501,5	456,3	857,8	653,8	626,1	574,3	6
8	-54,76	286,6	235,4	289,0	539,8	494	918	700,1	671,2	616,4	8
10	-50,65	313,6	258,7	315,8	579,9	533,6	980	748,5	718,3	660,5	10
12	-46,27	342	283,2	344,0	621,8	575,3	1 045	799,1	767,5	706,5	12
14	-41,58	371,9	309,0	373,7	665,6	619	1 113	851,9	818,9	754,7	14
16	-36,58	403,3	336,1	404,9	711,4	664,9	1 184	907	872,5	805,0	16
18	-31,25	436,2	364,5	437,6	759,2	713	1 259	965	929	857,4	18
20	-25,59	470,8	394,3	471,9	809	763,5	1 336	1 025	987	912	20
22	-19,56	507	425,5	507,8	861	816,4	1 417	1 087	1 048	969	22
24	-13,17	544,9	458,2	545,5	915	871,8	1 501	1 152	1 111	1 029	24
26	-6,38	584,5	492,3	584,9	972	930	1 589	1 220	1 177	1 090	26
28	0,8	626	528,1	626,1	1 030	991	1 680	1 291	1 245	1 155	28
30	8,4	669,3	565,4	669,2	1 091	1 054	1 775	1 364	1 317	1 222	30
32	16,5	714,6	604,4	714,2	1 155	1 121	1 873	1 441	1 391	1 291	32
34	25	761,8	645,1	761,2	1 220	1 190	1 976	1 520	1 467	1 364	34
36	33,9	811,1	687,5	810,2	1289	1 263	2 083	1 603	1 547	1 439	36
38	43,4	862,4	731,7	861,2	1 360	1 338	2 194	1 689	1 630	1 517	38
40	53,4	916	777,67	914	1 433	1 418	2 309	1 778	1 716	1 597	40
42	63,8	972	825,58	970	1 509	1 500	2 428	1 871	1 806	1 681	42
44	74,9	1 030	875,42	1 028	1 588	1 586	2 552	1 968	1 898	1 768	44
46	86,5	1 090	927	1 088	1 670	1 676	2 681	2 068	1 994	1 858	46
48	98,7	1 153	981	1 150	1 755	1 769	2 814	2 172	2 094	1 951	48
50	111,4	1 218	1 037	1 215	1 842	1 867	2 952	2 280	2 197	2 047	50
52	124,8	1 285	1 095	1 282	1 933	1 968	3 096	2 393	2 304	2 147	52
54	138,8	1 355	1 156	1 352	2 027	2 074	3 244	2 509	2 414	2 250	54
56	153,5	1 428	1 218	1 425	2 124	2 184	3 398	2 631	2 529	2 357	56
58	168,9	1 504	1 283	1 500	2 224	2 298	3 557	2 756	2 648	2 467	58
60	185	1 582	1 350	1 579	2 327	2 417	3 722	2 887	2 771	2 581	60
62	201,7	1 663	1 420	1 660	2 434	2 540	3 892	3 023	2 898	2 699	62
64	219,2	1 747	1 492	1 744	2 544	2 668	4 069	3 164	3 030	2 820	64
66	237,5	1 834	1 567	1 831	2 658	2 801	4 251	3 310	3 166	2 945	66
°C	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	°C
with	R123	R134a	R406A	R409A	R22	R407C	R410A	R507A	R404A	R408A	with
Replace	R11	R12			R22			R502			Replace

Bubble Point Pressure Chart (Gauge Pressure) @ Sea Level 101,3 kPa

Replace	R11	R12			R22			R502			Replace
with	R123	R134a	R406A	R409A	R22	R407C	R410A	R507A	R404A	R408A	with
°C	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	°C
-50	-99,527	-71,82	-57,81	-51,38	-36,78	-26,23	8,5	-13,34	-15,62	-23,86	-50
-48	-99,246	-68,22	-53,07	-46,01	-29,86	-18,30	19,8	-4,28	-6,79	-15,91	-48
-46	-98,928	-64,27	-47,93	-40,19	-22,36	-9,72	32,1	5,5	2,7	-7,32	-46
-44	-98,570	-59,94	-42,35	-33,89	-14,26	-0,5	45,4	16,0	13,0	1,9	-44
-42	-98,167	-55,21	-36,33	-27,08	-5,50	9,5	59,7	27,4	24,1	11,9	-42
-40	-97,714	-50,05	-29,83	-19,74	3,9	20,3	75,0	39,5	35,9	22,6	-40
-38	-97,207	-44,44	-22,82	-11,83	14,1	31,9	91,5	52,6	48,7	34,1	-38
-36	-96,641	-38,35	-15,28	-3,33	25,0	44,3	109,1	66,5	62,3	46,4	-36
-34	-96,010	-31,74	-7,18	5,8	36,7	57,6	128,0	81,5	76,9	59,6	-34
-32	-95,309	-24,59	1,5	15,6	49,2	71,9	148,1	97,4	92,4	73,7	-32
-30	-94,532	-16,87	10,8	26,1	62,6	87,1	169,6	114,4	109,0	88,7	-30
-28	-93,673	-8,54	20,8	37,3	76,9	103,3	192,5	132,5	126,7	104,8	-28
-26	-92,724	0,4	31,4	49,2	92,2	120,7	216,9	151,7	145,5	121,8	-26
-24	-91,680	10,1	42,7	61,9	108,4	139,1	242,8	172,1	165,4	140,0	-24
-22	-90,53	20,4	54,8	75,5	125,7	158,7	270,3	193,7	186,6	159,2	-22
-20	-89,27	31,5	67,6	89,9	144,1	179,5	299,5	216,7	209,0	179,7	-20
-18	-87,89	43,4	81,2	105,3	163,5	201,6	330,4	240,9	232,7	201,3	-18
-16	-86,39	56,1	95,7	121,5	184,2	225,0	363,1	266,5	257,8	224,2	-16
-14	-84,74	69,6	111,0	138,7	206,1	249,7	397,6	293,6	284,3	248,5	-14
-12	-82,95	84,1	127,2	156,9	229,2	275,9	434,0	322,1	312,2	274,1	-12
-10	-81,01	99,4	144,4	176,2	253,6	303,5	472,5	352,2	341,7	301,1	-10
-8	-78,90	115,8	162,5	196,5	279,3	332,6	513,0	383,9	372,7	329,5	-8
-6	-76,61	133,1	181,6	218,0	306,5	363,3	555,7	417,2	405,3	359,5	-6
-4	-74,14	151,6	201,7	240,6	335,1	395,6	600,5	452,2	439,5	391,1	-4
-2	-71,47	171,1	222,9	264,4	365,2	429,7	647,7	488,9	475,5	424,3	-2
0	-68,59	191,7	245,3	289,5	396,8	465,4	697,2	527,5	513,2	459,1	0
2	-65,50	213,5	268,7	315,9	430,1	502,9	749,2	567,9	552,8	495,7	2
4	-62,17	236,6	293,3	343,5	464,9	542,3	803,7	610,2	594,2	534,1	4
6	-58,59	260,9	319,2	372,6	501,5	583,6	860,7	654,5	637,6	574,3	6
8	-54,76	286,6	346,3	403,0	539,8	626,9	921	700,8	683,0	616,4	8
10	-50,65	313,6	374,6	434,9	579,9	672,1	983	749,2	730,4	660,5	10
12	-46,27	342,0	404,3	468,3	621,8	719,5	1 049	799,8	779,9	706,5	12
14	-41,58	371,9	435,4	503,3	665,6	769,0	1 117	852,6	831,6	754,7	14
16	-36,58	403,3	467,8	539,8	711,4	820,7	1 188	908	885,5	805,0	16
18	-31,25	436,2	501,7	577,9	759,2	874,7	1 263	965	942	857,4	18
20	-25,59	470,8	537,0	617,7	809,0	931	1 341	1 025	1 001	912	20
22	-19,56	507,0	573,9	659,2	861,0	990	1 421	1 088	1 062	969	22
24	-13,17	544,9	612,3	702,5	915	1 051	1 506	1 152	1 125	1 029	24
26	-6,38	584,5	652,2	747,5	972	1 115	1 594	1 220	1 191	1 090	26
28	0,8	626,0	693,8	794,4	1 030	1 181	1 685	1 290	1 260	1 155	28
30	8,4	669,3	737,1	843,2	1 091	1 250	1 780	1 363	1 331	1 223	30
32	16,5	714,6	782,1	893,9	1 155	1 321	1 879	1 439	1 406	1 291	32
34	25,0	761,8	828,8	947	1 220	1 396	1 982	1 518	1 483	1 364	34
36	33,9	811,1	877,3	1 001	1 289	1 473	2 089	1 600	1 563	1 439	36
38	43,4	862,4	928	1 058	1 360	1 553	2 200	1 684	1 646	1 517	38
40	53,4	916	980	1 117	1 433	1 636	2 315	1 772	1 732	1 597	40
42	63,8	972	1 034	1 178	1 509	1 722	2 435	1 864	1 821	1 681	42
44	74,9	1 030	1 090	1 241	1 588	1 812	2 559	1 959	1 914	1 768	44
46	86,5	1 090	1 148	1 307	1 670	1 904	2 688	2 057	2 010	1 858	46
48	98,7	1 153	1 208	1 375	1 755	2 000	2 822	2 158	2 109	1 951	48
50	111,4	1 218	1 270	1 445	1 842	2 098	2 960	2 264	2 212	2 047	50
52	124,8	1 285	1 334	1 517	1 933	2 201	3 103	2 373	2 319	2 147	52
54	138,8	1 355	1 400	1 592	2 027	2 306	3 252	2 486	2 430	2 250	54
56	153,5	1 428	1 469	1 670	2 124	2 415	3 405	2 603	2 544	2 357	56
58	168,9	1 504	1 539	1 750	2 224	2 528	3 564	2 723	2 663	2 467	58
60	185,0	1 582	1 612	1 832	2 327	2 644	3 729	2 849	2 785	2 581	60
62	201,7	1 663	1 688	1 917	2 434	2 764	3 899	2 978	2 912	2 699	62
64	219,2	1 747	1 765	2 005	2 544	2 888	4 075	3 112	3 043	2 820	64
66	237,5	1 834	1 845	2 095	2 658	3 015	4 257	3 250	3 179	2 945	66
°C	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	kPa	°C
with	R123	R134a	R406A	R409A	R22	R407C	R410A	R507A	R404A	R408A	with
Replace	R11	R12			R22			R502			Replace

Regulators & Dewars

The scientific range of regulators caters for most applications. Should you require a more specialised regulator, we can source it for you.

The scientific range of gas pressure regulators and inlet stems are designed to relevant standards for a variety of special gas mixtures and applications. The regulators are assembled and tested within the requirements of ISO 9001: 2008 Quality Management Standard (certification number 581951/15 from Pricewaterhouse Coopers Inc.).

Due to the safety risks associated with the connection of incompatible components or incorrect customer assembly, the interchanging or replacement of connections and gauges for these regulators is not supported by Afrox.

In the event of a failure of a scientific regulator, customers are urged to return the product to their local Gas & Gear, where the warranty conditions will be honoured provided that the term has not lapsed and there is no evidence of tampering or abuse.

Scientific Regulators & Equipment

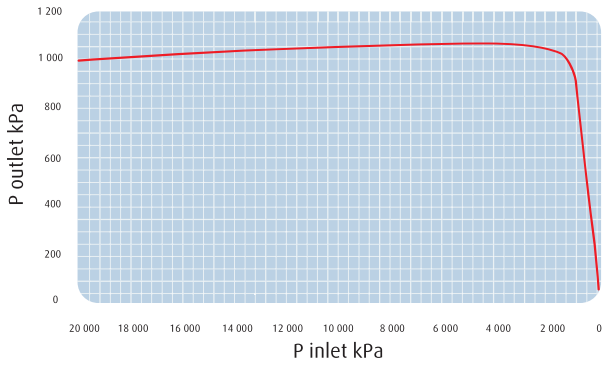
Regulators suitable for: Oxygen, Air, Argon, Helium and Non-Flammable Non-Toxic Mixtures

Item Number		W019110	W019210
		Single-Stage	Multi-Stage
Primary Pressure (bar)		230	230
Outlet Pressure (barg)		0 - 10	0 - 10
Connections:	Inlet	5/8″ RH male	5/8″ RH male
	Outlet	3/8″ RH*	3/8″ RH*
Operating Temperature (°C)		-20 - +65	-20 - +65
Body		Chrome plated brass	Chrome plated brass
Diaphragm		Stainless steel	Stainless steel
Seat		PTFE	PTFE
Seal		Metal to metal	Metal to metal
Encapsulated Valve		Quad-flow stainless steel valve	2 x quad-flow stainless steel valves
Filtration		316 stainless steel	2 x 316 stainless steel
He Leak Certified		<1 x 10^{-8}scc/sec	<1 x 10^{-8}scc/sec

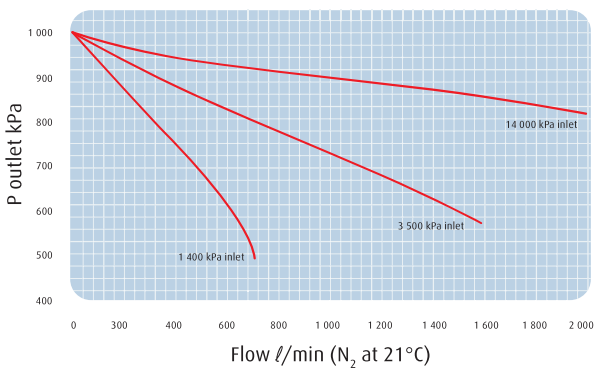
*Connection for nipple and nut

W019110 (Single-Stage)

Output pressure versus cylinder pressure for brass single-stage

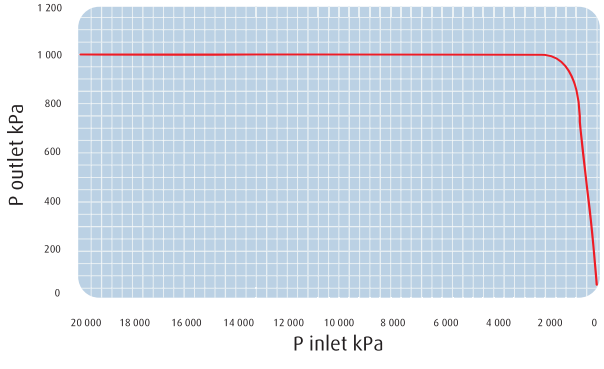


Pressure/flow relationship for brass single-stage

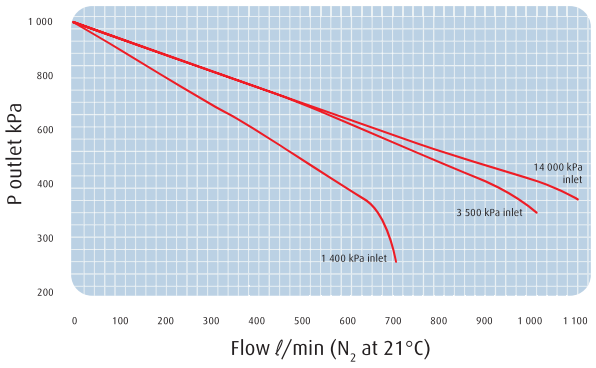


W019210 (Multi-Stage)

Output pressure versus cylinder pressure for brass multi-stage



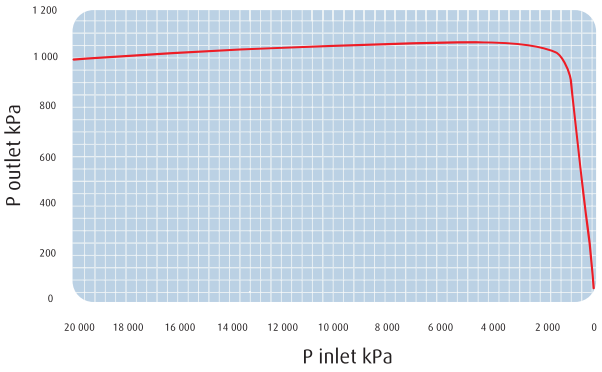
Pressure/flow relationship for brass multi-stage



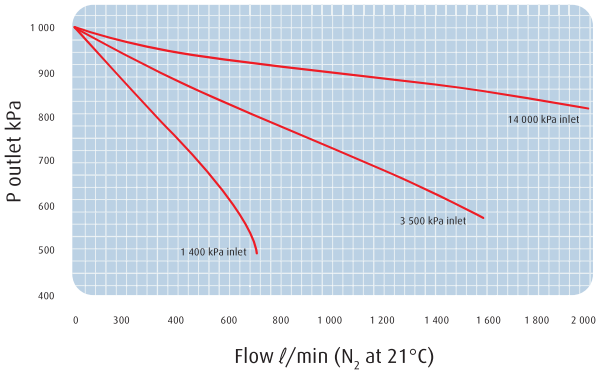
Regulators suitable for: Hydrogen, Carbon Monoxide, P10, Ethylene, Methane and Flammable Toxic Mixtures			
Item Number		**W019120**	**W019220**
		Single-Stage	**Multi-Stage**
Primary Pressure (bar)		230	230
Outlet Pressure (barg)		0 - 10	0 - 10
Connections:	**Inlet**	5/8″ LH male	5/8″ LH male
	Outlet	3/8″ LH*	3/8″ LH*
Operating Temperature (°C)		-20 - +65	-20 - +65
Body		Chrome plated brass	Chrome plated brass
Diaphragm		Stainless steel	Stainless steel
Seat		PTFE	PTFE
Seal		Metal to metal	Metal to metal
Encapsulated Valve		Quad-flow stainless steel	2 x quad-flow stainless steel valves
Filtration		316 stainless steel	2 x 316 stainless steel
He Leak Certified		<1 x 10^{-8}scc/sec	<1 x 10^{-8}scc/sec

W019120 (Single-Stage)

Output pressure versus cylinder pressure for brass single-stage

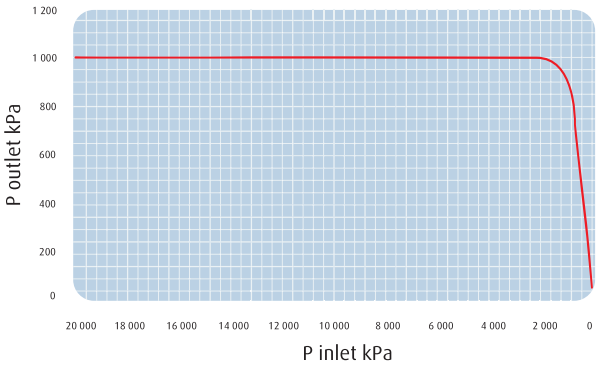


Pressure/flow relationship for brass single-stage

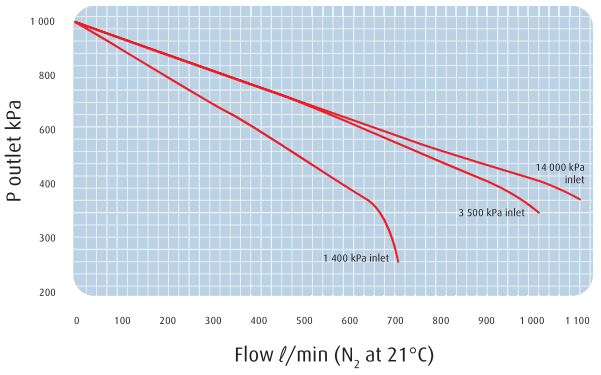


W019220 (Multi-Stage)

Output pressure versus cylinder pressure for brass multi-stage



Pressure/flow relationship for brass multi-stage

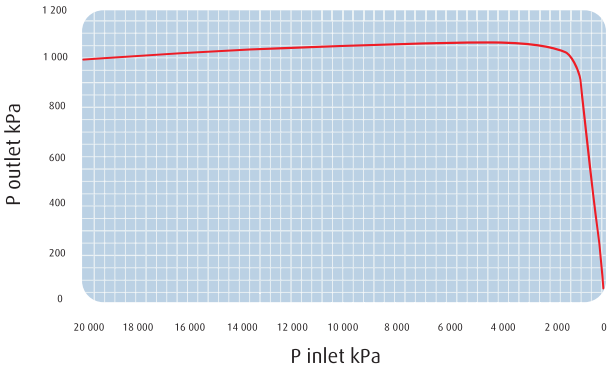


Regulators suitable for: Sulphur Hexafluoride (SF_6)			
Item Number		**W019141**	**W019241**
		Single-Stage	**Multi-Stage**
Primary Pressure (bar)		230	230
Outlet Pressure (barg)		0 - 10	0 - 10
Connections:	**Inlet**	5/8" RH female	5/8" RH female
	Outlet	3/8" RH*	3/8" RH*
Operating Temperature (°C)		-20 - +65	-20 - +65
Body		Chrome plated brass	Chrome plated brass
Diaphragm		Stainless steel	Stainless steel
Seat		PTFE	PTFE
Seal		Metal to metal	Metal to metal
Encapsulated Valve		Quad-flow stainless steel	2 x quad-flow stainless steel valves
Filtration		316 stainless steel	2 x 316 stainless steel
He Leak Certified		<1 x 10^{-8}scc/sec	<1 x 10^{-8}scc/sec

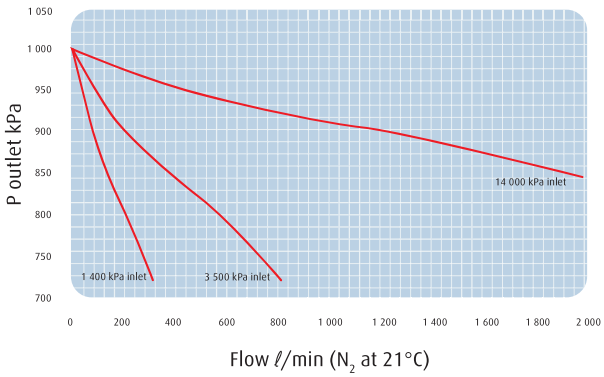
*Connection for nipple and nut

W019141 (Single-Stage)

Output pressure versus cylinder pressure for brass single-stage

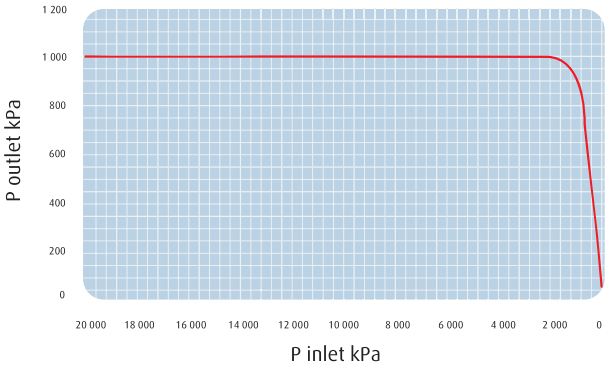


Pressure/flow relationship for brass single-stage

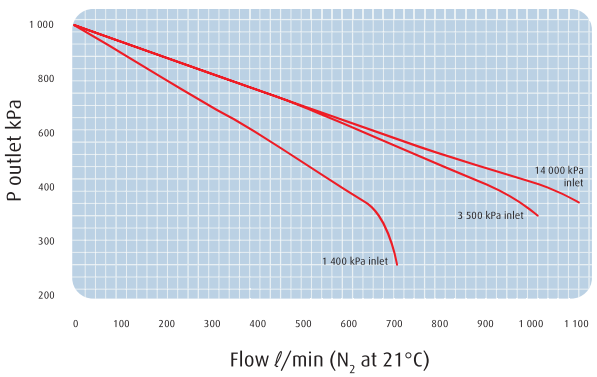


W019241 (Multi-Stage)

Output pressure versus cylinder pressure for brass multi-stage



Pressure/flow relationship for brass multi-stage

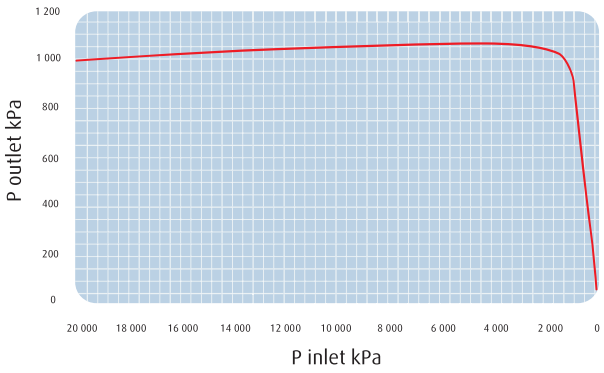


Regulators suitable for: Nitrogen			
Item Number	**W019130**	**W019230**	**W019999**
	Single-Stage	**Multi-Stage**	**Single-Stage**
Primary Pressure (bar)	230	230	230
Outlet Pressure (barg)	0 - 10	0 - 10	35
Connections: Inlet	3/4″ RH male	3/4″ RH male	3/4″ RH male
Outlet	3/8″ RH*	3/8″ RH*	3/8″ RH*
Operating Temperature (°C)	-20 - +65	-20 - +65	-20 - +65
Body	Chrome plated brass	Chrome plated brass	Chrome plated brass
Diaphragm	Stainless steel	Stainless steel	Stainless steel
Seat	PTFE	PTFE	PTFE
Seal	Metal to metal	Metal to metal	Metal to metal
Encapsulated Valve	Quad-flow	2 x quad-flow stainless steel valves	Quad-flow
Filtration	316 stainless steel	2 x 316 stainless steel	316 stainless steel
He Leak Certified	<1 x 10^{-8}scc/sec	<1 x 10^{-8}scc/sec	<1 x 10^{-8}scc/sec

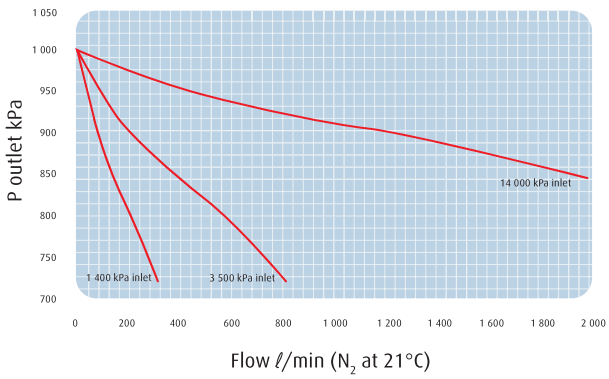
*Connection for nipple and nut

W019130 (Single-Stage)

Output pressure versus cylinder pressure for brass single-stage

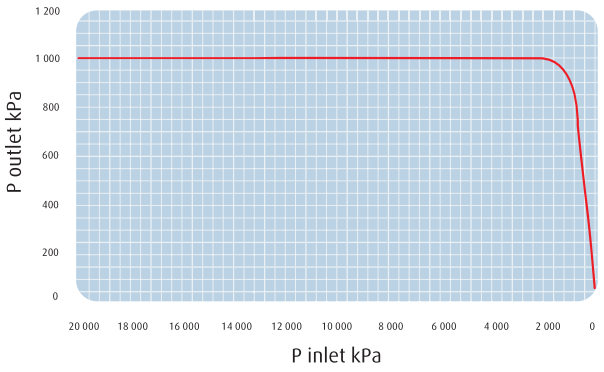


Pressure/flow relationship for brass single-stage

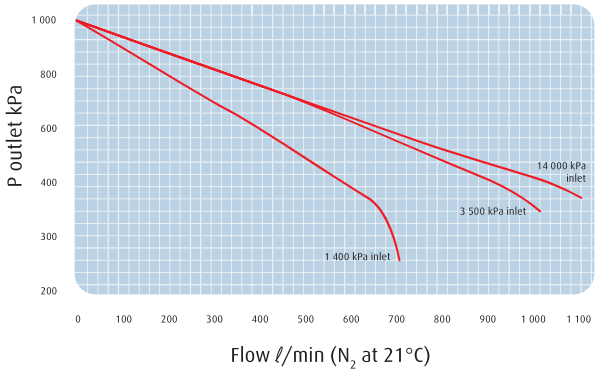


W019230 (Multi-Stage)

Output pressure versus cylinder pressure for brass multi-stage



Pressure/flow relationship for brass multi-stage

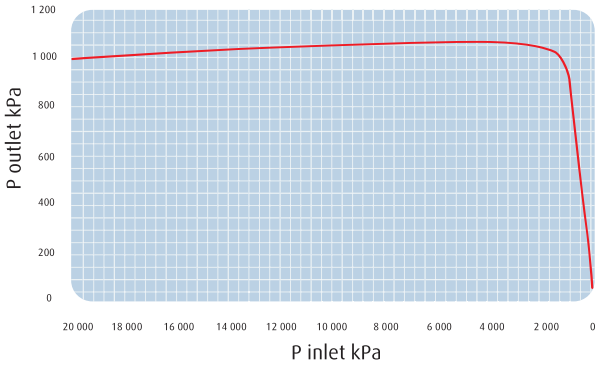


Regulators suitable for: Carbon Dioxide			
Item Number		**W019140**	**W019240**
		Single-Stage	**Multi-Stage**
Primary Pressure (bar)		230	230
Outlet Pressure (barg)		0 - 10	0 - 10
Connections:	**Inlet**	5/8" RH female	5/8" RH female
	Outlet	3/8" RH*	3/8" RH*
Operating Temperature (°C)		-20 - +65	-20 - +65
Body		Chrome plated brass	Chrome plated brass
Diaphragm		Stainless steel	Stainless steel
Seat		PTFE	PTFE
Seal		Metal to metal	Metal to metal
Encapsulated Valve		Quad-flow stainless steel	2 x quad-flow stainless steel valves
Filtration		316 stainless steel	2 x 316 stainless steel
He Leak Certified		<1 x 10^{-8}scc/sec	<1 x 10^{-8}scc/sec

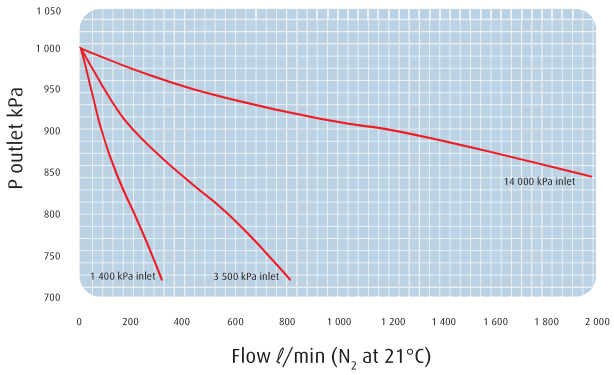
*Connection for nipple and nut

W019140 (Single-Stage)

Output pressure versus cylinder pressure for brass single-stage

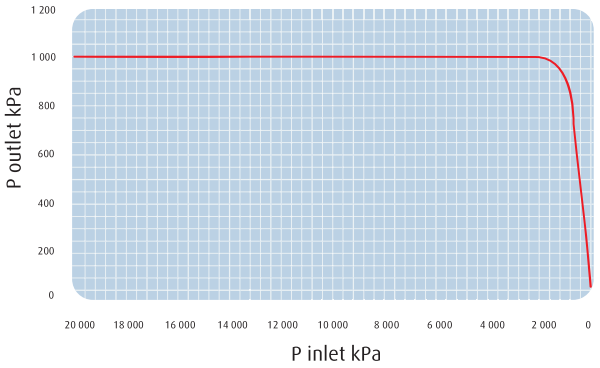


Pressure/flow relationship for brass single-stage

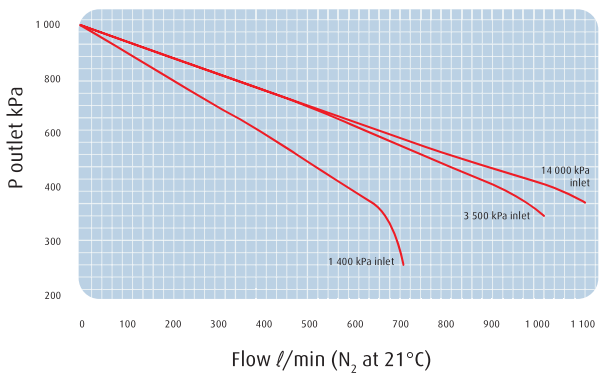


W019240 (Multi-Stage)

Output pressure versus cylinder pressure for brass multi-stage



Pressure/flow relationship for brass multi-stage

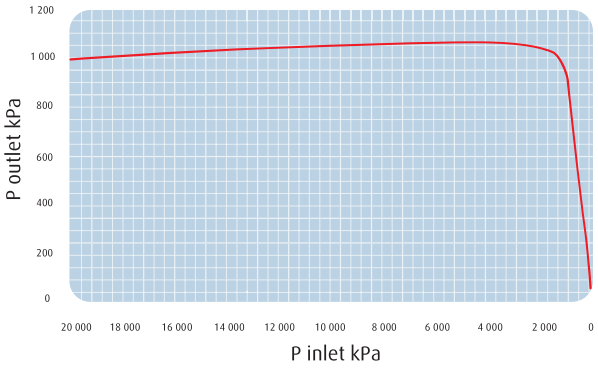


Regulators suitable for: Nitrous Oxide (Non-Medical N_2O)			
Item Number		**W019150**	**W019250**
		Single-Stage	**Multi-Stage**
Primary Pressure (bar)		230	230
Outlet Pressure (barg)		0 - 10	0 - 10
Connections:	**Inlet**	11/16″ x 20 tpi RH female	11/16″ x 20 tpi RH female
	Outlet	3/8″ RH*	3/8″ RH*
Operating Temperature (°C)		-20 - +65	-20 - +65
Body		Chrome plated brass	Chrome plated brass
Diaphragm		Stainless steel	Stainless steel
Seat		PTFE	PTFE
Seal		Metal to metal	Metal to metal
Encapsulated Valve		Quad-flow stainless steel	2 x quad-flow stainless steel valves
Filtration		316 stainless steel	2 x 316 stainless steel
He Leak Certified		<1 x 10^{-8}scc/sec	<1 x 10^{-8}scc/sec

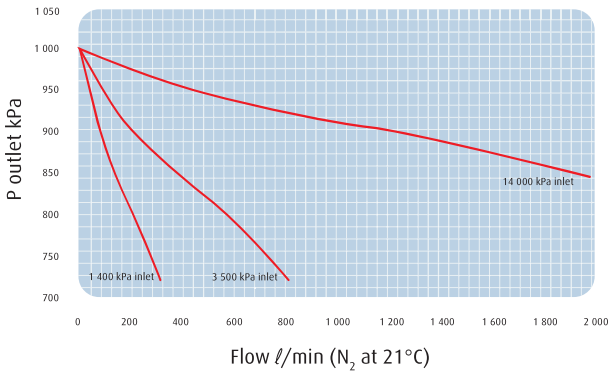
*Connection for nipple and nut

W019140 (Single-Stage)

Output pressure versus cylinder pressure for brass single-stage

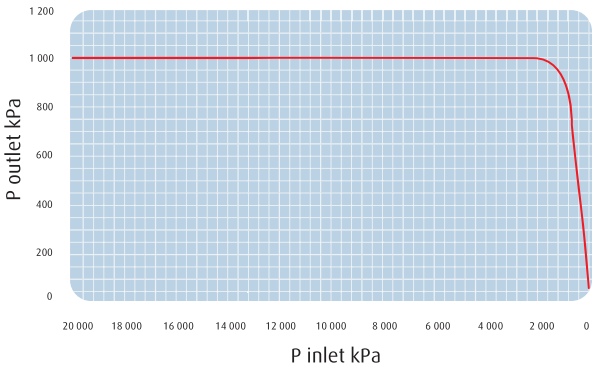


Pressure/flow relationship for brass single-stage

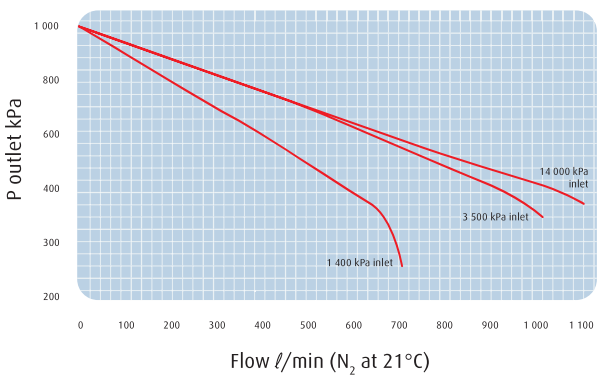


W019240 (Multi-Stage)

Output pressure versus cylinder pressure for brass multi-stage



Pressure/flow relationship for brass multi-stage

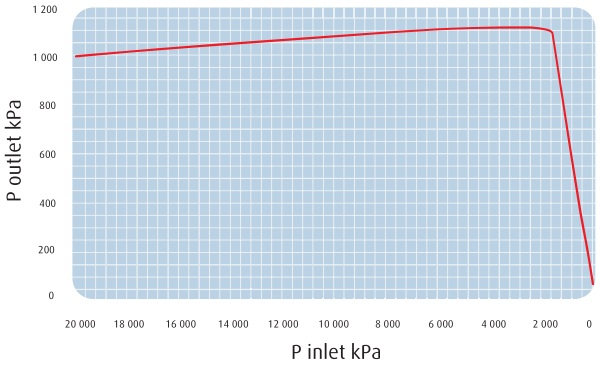


Regulators suitable for: Corrosive Non-Flammable Mixtures			
Item Number		**W020160**	**W020260**
		Single-Stage	**Multi-Stage**
Primary Pressure (bar)		230	230
Outlet Pressure (barg)		0 - 10	0 - 10
Connections:	**Inlet**	3/8" RH female	3/8" RH female
	Outlet	3/8" RH*	3/8" RH*
Operating Temperature (°C)		-20 - +65	-20 - +65
Body		316 stainless steel	316 stainless steel
Diaphragm		Stainless steel	Stainless steel
Seat		PTFE	PTFE
Seal		Metal to metal	Metal to metal
Encapsulated Valve		Quad-flow stainless steel	2 x quad-flow stainless steel valves
Filtration		316 stainless steel	2 x 316 stainless steel
He Leak Certified		<1 x 10^{-8}scc/sec	<1 x 10^{-8}scc/sec

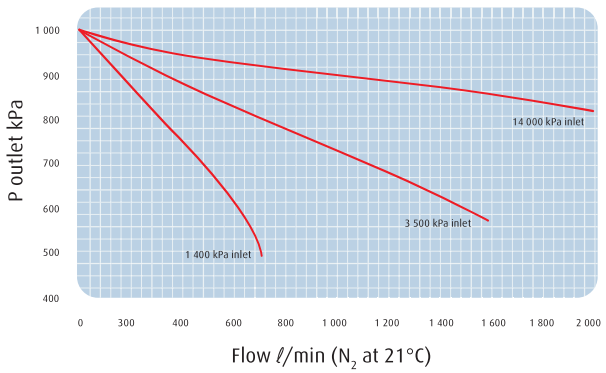
*Connection for nipple and nut

W020160 (Single-Stage)

Output pressure versus cylinder pressure for stainless single-stage

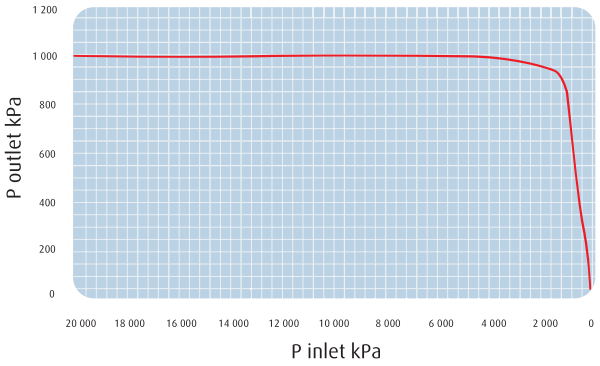


Pressure/flow relationship for stainless single-stage

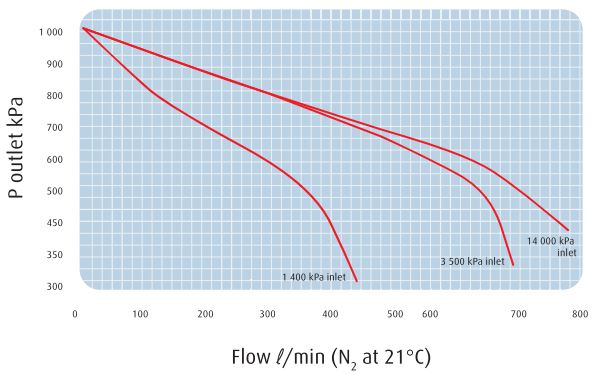


W020260 (Multi-Stage)

Output pressure versus cylinder pressure for stainless multi-stage



Pressure/flow relationship for stainless multi-stage



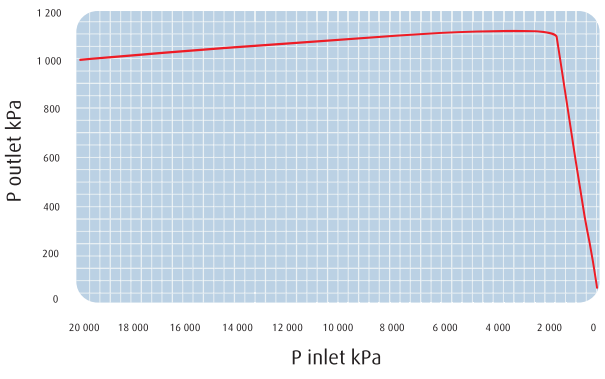
Regulator suitable for: Sulphur Dioxide (SO_2)	
Item Number	**W020121**
	Single-Stage
Primary Pressure (bar)	230
Outlet Pressure (barg)	0 - 1
Connections: Inlet	CGA 240
Outlet	3/8″ RH*
Operating Temperature (°C)	-20 - +65
Body	316 stainless steel
Diaphragm	Stainless steel
Seat	PTFE
Seal	Metal to metal
Encapsulated Valve	Quad-flow stainless steel
Filtration	316 stainless steel
He Leak Certified	<1 x 10^{-8}scc/sec

Regulator suitable for: Ammonia (NH_3)	
Item Number	**W020120**
	Single-Stage
Primary Pressure (bar)	230
Outlet Pressure (barg)	0 - 10
Connections: Inlet	CGA 240
Outlet	3/8″ LH*
Operating Temperature (°C)	-20 - +65
Body	316 stainless steel
Diaphragm	Stainless steel
Seat	PTFE
Seal	Metal to metal
Encapsulated Valve	Quad-flow stainless steel
Filtration	316 stainless steel
He Leak Certified	<1 x 10^{-8}scc/sec

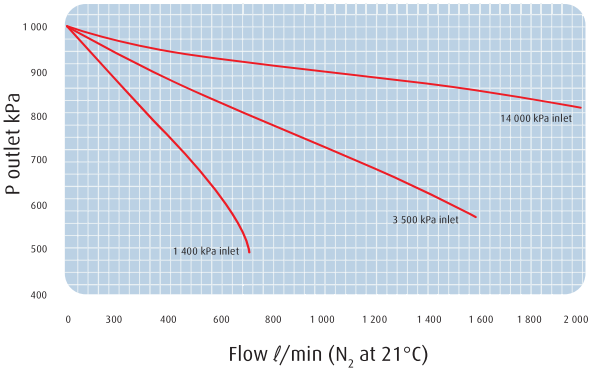
*Connection for nipple and nut

W020121 and W020120

Output pressure versus cylinder pressure for stainless single-stage



Pressure/flow relationship for stainless single-stage

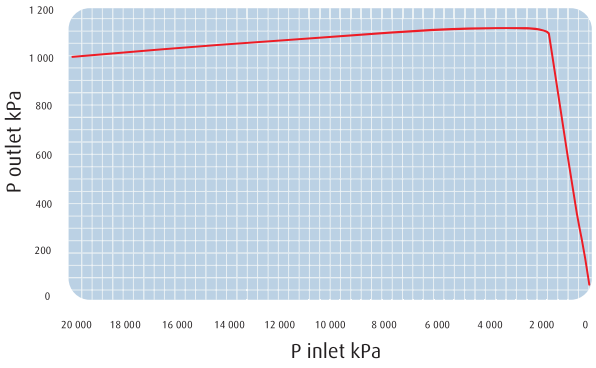


Regulators suitable for: Corrosive, Flammable Mixtures			
Item Number		**W020170**	**W020270**
		Single-Stage	**Multi-Stage**
Primary Pressure (bar)		230	230
Outlet Pressure (barg)		0 - 10	0 - 10
Connections:	**Inlet**	3/8″ LH female	3/8″ LH female
	Outlet	3/8″ LH*	3/8″ LH*
Operating Temperature (°C)		-20 - +65	-20 - +65
Body		316 stainless steel	316 stainless steel
Diaphragm		Stainless steel	Stainless steel
Seat		PTFE	PTFE
Seal		Metal to metal	Metal to metal
Encapsulated Valve		Quad-flow stainless steel	2 x quad-flow stainless steel valves
Filtration		316 stainless steel	2 x 316 stainless steel
He Leak Certified		<1 x 10^{-8}scc/sec	<1 x 10^{-8}scc/sec

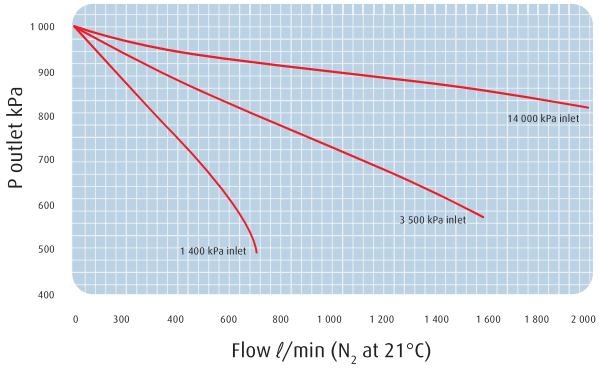
*Connection for nipple and nut

W020170 (Single-Stage)

Output pressure versus cylinder pressure for stainless single-stage

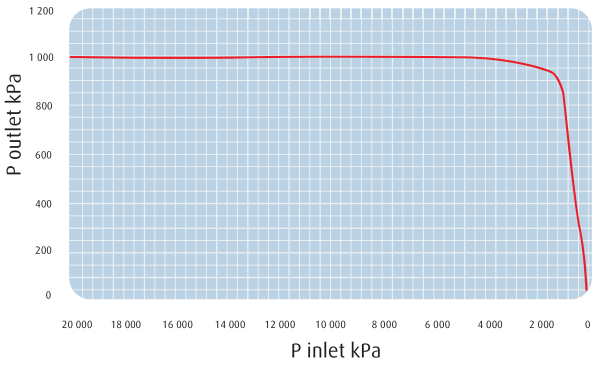


Pressure/flow relationship for stainless single-stage

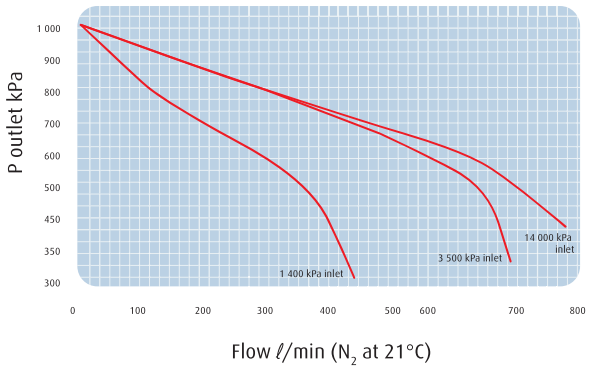


W020270 (Multi-Stage)

Output pressure versus cylinder pressure for stainless multi-stage



Pressure/flow relationship for stainless multi-stage



Cryogenic Equipment

Dewars				
Item Number	**Product**	**Capacity (l)**	**Description**	**Height (mm)**
W011556	Dewar, 5 LD LN_2	5	3,1 kg empty	445
W011563	Dewar, 10 LD LN_2	10	6,6 kg empty	597
W011557	Dewar, 25 LD LN_2	25	10,5 kg empty	655
W011074	Dewar, 25 LD LN_2 Classic	25	8,6 kg empty	582
W011562	Dewar, 50 LD LN_2	50	17,6 kg empty	823
W011214	Hose, transfer, cryogenic 1,8 m long, stainless steel	3/8" NPT male and CGA female fittings		
W011230	Phase separator (69 mm long)	Fit 3/8" NPT end of transfer hose		
W011542	Roller base for LD Range dewars			
W011564	Spare neck tube core (lid) for LD Range			

Dewars					
Models	**LD5**	**LD10**	**LD25**	**Classic 25**	**LD50**
Static Holding Time Delays (l)	6	45	109	119	122
Evaporation Rate (l/days)	0,77	0,22	0,23	0,21	0,41
Liquid Nitrogen Capacity (l)	5	10	25	25	50
Weight Empty (kg)	3,1	6,6	10,5	8,6	17,6
Weight Full (kg)	7,2	14,7	30,8	28,9	58,0
Neck Diameter (mm)	142	51	64	51	64
Overall Height (mm)	445	597	655	582	823
Overall Diameter (mm)	193	290	396	394	475

Ripegas

Ripegas is used for degreening of fruit, by acceleration of the natural ripening process. Ethylene, a naturally occurring hormone, is used in Ripegas. The fruit travels better when it is green and hard, and is ripened quickly and evenly in a controlled manner, near the end of the supply chain. The result is an undamaged, evenly ripened, attractive product. Afrox has two mixtures on the market: Ripegas 5 and Ripegas 10 has to be used with flameproof equipment as it is flammable.

Product Description	Product Mass (kg)	Volume (m^3)	Fill Pressure (bar)	Material Number	Valve Connection	Recommended Regulator
Ripegas 5 (L)	8,15	7,0	150	518705-RC-C	5/8" BSP LH Int	W019120 or W019220
Ripegas 10 (L)	8,30	7,1	150	518710-RC-C	5/8" BSP LH Int	W019120 or W019220

Cylinder Code	Cylinder Description	Water Capacity (ℓ)	Height (m)	Diameter (m)	Empty (kg)	Max Fill Pressure (kPa)
RC	Large Steel Cylinder	47,2	1,46	0,23	68	15 300

Ripegas 5

- Flammable
- 5% ethylene and nitrogen.

Ripegas 10

- Flammable
- 10% ethylene and nitrogen.

Safety Risk

Ripegas 5 & 10 to be used with flameproof equipment, as it is flammable.

Scientific Mixtures

Afrox supplies a wide range of mixtures used in many applications: petrochemical, chemical, pharmaceutical, medical, air monitoring, energy, metal, R&D, automotive, and manufacturing industries. With a database containing over 2 000 mixtures, we are able to meet diverse needs, or new mixtures can be made to suit customer needs. Mixtures are made gravimetrically to a high degree of accuracy. We manufacture these mixtures to ISO 6142 standards in an ISO 9001 facility. Personnel are trained in the latest techniques for making gas mixtures, and are evaluated regularly. Quality control is an important step, and our laboratory has state-of-the-art analytical instrumentation, measuring component levels with an accuracy of better than internationally accepted standards. Certification level depends on application and customer requirements. On a Certificate of Analysis, results are reported to a 95% confidence level. These mixtures are made to order, so please allow for production time.

Each scientific mixture has a unique number, e.g. 802035-NE-A: (500 ppm CO balance Nitrogen (L)). GOC MIX 0259

The NE- denotes the type of cylinder: NE means that it is in a large aluminium cylinder, see table below:

Cylinder Code	Description	Water Capacity (ℓ)	Height (m)	Diameter (m)	Empty Mass (kg)	Max Fill Pressure (kPa)
NE	Large Aluminium Cylinder	40	1,51	0,23	52	20 000
IJ	Small Aluminium Cylinder	10	0,68	0,18	16	20 000
SE	Large Steel Cylinder	50	1,54	0,23	70	20 000
RC	Large Steel Cylinder	47,2	1,46	0,23	68	15 300
IE	Small Steel Cylinder	10	0,60	0,18	18	20 000
SO	Other Cylinder (Usually imported)	Various Sizes				

Code	Certificate
A	Certificate of Analysis
C	Certificate of Conformance
G	Gravimetric Certificate
N	Uncertified
Higher traceability available on imported mixtures, on request	

Type/Level	Blending Tolerance	Analytical Tolerance
% Components	+/-10	+/-2 (95% confidence)
PPM Components	+/-20	+/-5 (95% confidence)
Imported	Narrower blending and analytical tolerances on request	

The purity of a gas component is depicted by a value, e.g. 5.0 or (N5.0)

The '5' equals the number of 9s in the % purity:

5.0 = 99,999% pure (0,001% or 10 ppm maximum impurities)

4.5 = 99,995% pure (0,005% or 50 ppm maximum impurities)

2.8 = 99,8% pure (0,2% or 2 000 ppm maximum impurities)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