INDUSTRIAL GASES

3

View the AFROX INDUSTRIAL GAS EQUIPMENT video on YouTube™

COMPRESSED GASES

Industrial gases are supplied in a range of different cylinders depending on the properties of the gas. Some are supplied at high pressures, while others are only available at low pressures.

The properties of an industrial gas dictate the way in which it is supplied to the customer.

Gases such as oxygen, nitrogen, argon and hydrogen can be readily compressed into a cylinder at pressures up to 200 bar.

Acetylene, because of its properties, needs to be stored in a cylinder containing a 'porous mass' in which the gas is held in a carrier solvent.

Industrial gas cylinders come in a range of sizes which are normally categorised by the water capacity of the container. Which size is most suitable for you will depend on a range of factors including consumption and flow rate.

Each cylinder is fitted with a cylinder valve tailored to suit the gas and pressure requirements.

The outlet thread is determined by national standards to ensure that only regulators compatible with these requirements can be fitted.

For applications requiring higher capacities, Afrox also supplies a range of Manifolded Cylinder Pallets, which are multiple cylinders connected together and palletised.

Afrox Industrial Gas Cylinder Colour Identification

Atmospheric Gases

Air
Dry
- 3,9 kg cylinder
  13-KB
- 8,5 kg dry
  13-RC

Nitrogen
Technical
- 2,2 kg cylinder
  42-IE
- 4,4 kg cylinder
  42-JE
- 11,0 kg cylinder
  42-SE
- 15 x 11,0 kg MCP
  42-ME15
- 120,0 kg PCC
  41-PA
- PCC 35 Bar
  41-PC
- Dewar PVT kg
  P42

High Purity
- 2,2 kg cylinder
  98-IE
- 11,0 kg cylinder
  98-SE
- 15 x 11,0 kg MCP
  98-ME15

Laser Gas
- 15 x 11,0 kg MCP
  98-ME15-LAS

Oxygen
Technical
- 11,5 kg cylinder
  1-QD
- 15 x 12,3 kg MCP
  1-MR15
- PortaPak®
  1,43 kg cylinder
  3-GD
- 180 kg PCC
  554-PA

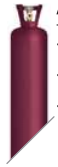
Laser Gas
- 15 x 11,5 kg MCP
  317-MR15

Argon
Technical
- 17,4 kg cylinder
  10-SE
- 220 kg PCC
  556-PA

High Purity
- 17,4 kg cylinder
  11-SE
- 15 x 17,4 kg MCP
  11-ME15

PortaTIG®
- 1,9 kg cylinder
  10-GD1

Fuel Gases



Acetylene
Technical
- 8 kg cylinder
  15-DE
- 12 x 8 kg MCP
  15-MD12
- PortaPak®
  0,9 kg cylinder
  16-DA

Hydrogen
Technical
- 0,74 kg cylinder
  54-SH
- 15 x 0,74 kg MCP
  54-MH15

Other Gases

Carbon Dioxide
Technical
- 31,3 kg cylinder
  40-RC
- 180 kg PCC
  573-PA

Wet
- 31,3 kg cylinder
  40-RC-W

Notes

1. Designated cylinder colours comply with SANS 10019
2. Numbers in grey are Afrox's item numbers

Shielding Gases

Argoshield® Light
- 3,6 kg cylinder
  24-IE
- 17,8 kg cylinder
  24-SE-LIG
- 15 x 17,8 kg cylinder
  24-ME15-LIG

Argoshield® Universal
- 18,5 kg cylinder
  28-SE

Argoshield® Heavy
- 19,6 kg cylinder
  25-SE

Argoshield® 5
- 8,4 kg cylinder
  24-KE
- 17,8 kg cylinder
  24-SE

Portashield®
- 1,8 kg cylinder
  27-GD

Alushield®
- 8,4 kg cylinder
  94-SE

Copashield®
- 4,8 kg cylinder
  395-SE

Fluxshield®
- 20,5 kg cylinder
  26-SE

Stainshield®
- 17,4 kg cylinder
  27-SE

Stainshield® Plus
- 17,6 kg cylinder
  30-SE

Stainshield® Heavy
- 10,4 kg cylinder
  99-SE

Stainshield® TIG
- 16,7 kg cylinder
  87-SE

Stainshield® TIG Plus
- 12,3 kg cylinder
  000187-SE-C

TIGshield®
- 3,5 kg cylinder
  87-IE

RoboShield®
- 19,7 kg cylinder
  20-SE

Class Diamonds

Class 2.2 / 5.1
Oxidising Gas
Yellow / Black lettering

Class 2.1
Flammable Gas
Red / Black lettering

Class 2.3
Toxic Gas
White / Black lettering

Class 2.2
Non-Flammable, Non-Toxic Gas
Green / Black lettering

The gas contents of Afrox cylinders are identified by the labels affixed to the cylinders. A cylinder without a label should not be used, and should be returned to the supplier. An important part of the label is the class diamond, which represents the characteristic of the gas, as illustrated. A label with multiple class diamonds indicates multiple associated hazards.

Porta Cylinder Range

The Porta cylinder range comprises small cylinders ideal for DIY and light fabrication. The Porta range consists of oxygen, acetylene, argon and CO_2 cylinders ideal for gas, GMAW (MIG), TIG welding, cutting and heating processes. The cylinders may only be filled by Afrox. The customer shall be liable to pay a non-refundable maintenance fee for each new Afrox-owned cylinder that they take without returning an empty comparable cylinder (gas price excluded). There is no rental applicable on the PortaPak® range.

PortaPak® Oxygen (Shell - W005740) (Refill: 3-GD)
- 5,8 ℓ steel cylinder
- Contains 1,43 kg of oxygen
- Black body and valve guard
- Valve - PortaPak® right hand female

PortaPak® Acetylene (DA) (Shell - W005782) (Refill: 16-DA)
- 6 ℓ steel cylinder with porous mass
- Contains 0,9 kg of DA
- Maroon body and valve guard
- Valve - PortaPak® left hand female

Portashield® (Ash 5) (Shell - W005170) (Refill: 27-GD)
- 5,8 ℓ steel cylinder
- Contains 1,9 kg mix of argon, CO_2 and 0_2
- Silver body and valve guard
- Valve - 5/8″ BSPF valve (same as large cylinder)

PortaTIG® (Argon) (Shell - W005177) (Refill: 10-GD1)
- 5,8 ℓ steel cylinder
- Contains 1,9 kg of argon
- Peacock blue body and valve guard
- Valve - 5/8″ BSPF valve (same as large cylinder)

Atmospheric Gases

Air

Air, the earth's natural atmosphere, is a non-flammable, colourless and odourless mixture of gases in which nitrogen (78%) and oxygen (21%) predominate. The balance of less than 1% is composed of the rare gases helium, neon, argon, krypton and xenon. Supplied in high pressure in metal cylinders.

Hazards

- High pressure gas in cylinders
- A source of oxygen and will support combustion.

Classifications (Air Dry)	
Gas Components	**Purity**
Air Dry	Moisture <10 vpm
Nitrogen	78%
Oxygen	21%
Argon	0,9%
Carbon Dioxide	0,03%

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
AIR DRY CYL 3,9 kg	3,9	23,6	139	5/8" BSPF right hand female	13-KB
AIR DRY CYL 8,5 kg	8,5	47,2	153	5/8" BSPF right hand female	13-RC
AIR Tec 8,5 kg	8,5	47,2	153	5/8" BSPF right hand female	12-RC

Higher grades and purities of this product are available from Afrox
Specifications are included in the 'Special Products & Chemicals' section

Physical Data	
Appearance/odour	Colourless and odourless
Molecular weight	28,96
Specific volume at 21,1˚C and 101,325 kPa	830,3 ℓ/kg
Boiling point at 101,325 kPa	194,35˚C
Critical temperature	-140,6˚C
Relative density (air = 1) at 1 atm	1,0
Density, gas at 101,325 kPa and 0˚C	1,205 kg/m^3

Uses and Features

- Industrial compressed air is employed as a source for burning and various industrial oxidation processes
- Other common uses include the operation of pneumatic tools, starting diesel engines and 'pigging' pipelines.

Precautions in Use

- Use only approved pressure rated equipment
- Never allow oil or grease on a cylinder or valve
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Dry air is non-corrosive and so any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Nitrogen (N_2)

Nitrogen is a colourless, odourless, non-toxic, almost totally inert gas comprising approximately 79% by volume of air. It is non-flammable and will not support combustion. Nitrogen is supplied in cylinders as a high pressure gas, or in insulated containers as a liquid.

Hazards

- High pressure compressed gas
- Asphyxiant in high concentrations.

Classifications (Nitrogen Technical)	
Gas	**Purity**
Nitrogen Technical	99,5%

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
NIT TEC CYL 11,0 KG	11,0	50,0	200	3/4" BSPF right hand female	42-SE
NIT TEC CYL 4,4 KG	4,4	20,0	200	3/4" BSPF right hand female	42-JE
NIT TEC CYL 2,2 KG	2,2	10,0	200	3/4" BSPF right hand female	42-IE
NIT TEC MCP 15 X 11,0 KG	165,0	MCP	200	3/4" BSPF right hand female	42-ME15
NIT TEC PCC	120	120	180	3/4" BSPF right hand female	41-PA

Higher grades and purities of this product are available from Afrox
Specifications are included in the 'Special Products & Chemicals' section

Classifications (Nitrogen High Purity)	
Gas	**Purity**
Nitrogen High Purity	99,997%

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
NIT HP CYL 11,0 KG	11,0	50,0	200	3/4" BSPF right hand female	98-SE
NIT HP CYL 2,2 KG	2,2	10,0	200	3/4" BSPF right hand female	98-IE
NIT HP MCP 15 X 11,0 KG	165,0	MCP	200	3/4" BSPF right hand female	98-ME15
NIT LASER GAS MCP 15 X 11,0 KG	165,0	MCP	200	3/4" BSPF right hand female	98-ME15-LAS

Higher grades and purities of this product are available from Afrox
Specifications are included in the 'Special Products & Chemicals' section

Physical Data	
Appearance/odour	Colourless and odourless
Molecular weight	28,0134
Specific volume at 20˚C and 101,325 kPa	861,5 ℓ/kg
Boiling point at 101,325 kPa	-195,8˚C
Critical temperature	146,9˚C
Relative density (air = 1) at 1 atm and 25˚C	0,967
Density, gas at 101,325 kPa and 25˚C	1,1455 kg/m³
Flammability	N/A

Uses and Features

- Among the many uses for gaseous nitrogen are flow testing, gauge calibration, plastic forming, aerosol propellant, powering air tools, mechanical agitation in photo processing, metal de-gassing, pipeline testing, pressure testing cables and the handling and transfer of flammable liquids
- To prevent the undesirable presence of oxygen, nitrogen is valuable in furnaces, metal plating and tinning, chemical processing, food packing, wine making, paint and varnish manufacture, tube manufacture, packaging and preserving rubber products and optics
- Dry nitrogen gas is used as a purging medium in drying refrigeration systems, catalytic towers in refineries, chemical processing, electronic tube and light bulb manufacture
- Wherever moisture may not be tolerated, dry nitrogen is the preferred grade
- Nitrogen is also used for the inert packaging of foods, sparging wines, pressurisation of head spaces in liquid containers and conveyance of beverages in pressurised pipe systems
- Carrier gas in chromatography, calibration gas and scientific research.

Precautions in Use

- Wear leather gloves, safety gloves and safety shoes when handling cylinders
- Use only approved pressure rated equipment
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Symptoms and Treatment

Symptoms may include loss of mobility/consciousness since the victim may not be aware of asphyxiation. Remove victim to uncontaminated area wearing self-contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stops.

Material Compatibility

- Nitrogen is non-corrosive and the vast majority of materials are compatible provided equipment is designed to withstand process pressure.

Oxygen (O_2)

A colourless, odourless and tasteless gas. Supplied in high pressure steel cylinders.

Oxygen as a gas is slightly heavier than air, but will dispense fairly rapidly in a well ventilated area. However, it can remain for long periods in cavities, trenches, pits and vessels. Oxygen will also remain for considerable periods in clothing or similar porous materials.

Hazards

- High pressure compressed gas
- Vigorously supports combustion of many materials which will not normally burn in air.

Classifications (Oxygen Technical)	
Gas	**Purity**
Oxygen Technical	99,5%

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
OXY TEC CYL 11,5 KG	11,5	46,6	175	5/8" BSPF right hand female	1-QD
OXY TEC CYL PORTAPAK®	1,43	5,8	175	11/16" x 20 TPI W female	3-GD
OXY TEC MCP 15 X 12,3 KG	184,5	MCP	175	5/8" BSPF right hand female	1-MR15
OXY LASER GAS MCP 15 X 11,5 KG	172,5	MCP	175	5/8" BSPF right hand female	317-MR15

Higher grades and purities of this product are available from Afrox Specifications are included in the 'Special Products & Chemicals' section

Physical Data	
Appearance/odour	Colourless and odourless
Molecular weight	32,0
Specific volume at 21,1˚C and 101,325 kPa	755,4 ℓ/kg
Boiling point at 101,325 kPa	-183,0˚C
Critical temperature	-118,6˚C
Relative density (air = 1) at 1 atm and 25˚C	1,105
Density, gas at 101,325 kPa and 25˚C	1,309 kg/m³
Flammability	Does not burn, but vigorously supports combustion

Fire Hazards

Although non-flammable, oxygen is an active element which supports combustion and combines – directly and indirectly – with all elements except the rare gases neon, helium, argon, krypton, xenon and radon.

The ignition temperature of most material is lowered considerably in the presence of oxygen gas, particularly at high pressure. Fire or an explosion can occur when an igniter, combustion material and an oxidant combine.

Any heat source hotter than 50°C must be regarded as a possible igniter of fires in the presence of gaseous oxygen or oxygen-rich atmospheres.

Igniters

- Naked lights
- Burning cigarettes or pipes
- Cigarettes or pipes that have been visibly extinguished, but are still hot
- Sparks caused by static or live electrical discharge
- Sparks or heat caused by hard materials striking each other
- Sparks and molten metal, or heat from the plate, during and after welding and cutting
- Frictional heat caused by moving machine components
- Sudden gas compression effects can occur when a valve in an oxygen line is closed too quickly
- Heat from a soldering iron
- Heat from open electric fires or electrical motors
- Acetylides
- Exothermic chemical reactions.

Most of these heat sources are readily recognisable and common sense urges that they be avoided. However, it is important for personnel to be made aware of the less obvious causes of ignition. For example, cigarettes that have been extinguished but are still hot are likely to re-ignite in an oxygen-rich atmosphere.

Uses and Features

- In combination with a fuel gas such as acetylene, hydrogen or LPG, it is used in welding, cutting, brazing, hardening, scarfing, flame cleaning and heating
- Oxygen is used in the manufacture of steel, glass, ethylene oxide, methanol, acrolein, titanium dioxide, vinyl acetate and synthesis gas
- Oxygen can be considered for use in any chemical reaction where air is used to give faster reaction time and higher yields. A typical use would be in the treatment of refuse and effluent
- Ultra and high purity oxygen is used in laboratories, in process control operations and in metal analysis instruments and oxidation in semiconductor production
- Oxygen is widely used in medical treatment of respiratory disorders, anaesthetic and hyperbaric chambers.

Precautions in Use

- Use only equipment which is approved for the temperature range and has been degreased for oxygen service
- Wear leather gloves, safety glasses and safety shoes when handling cylinders
- Fit and maintain flashback arrestors when used with acetylene and LPG equipment
- Only experienced and properly instructed people should use this product
- Do not use oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Only oxygen-compatible materials may be used with oxygen and these must be fully degreased. Copper, brass and high quality stainless steel are the most commonly used metals. Most lubricants are NOT compatible. Oil and grease can cause ignition.

Principles of Oxygen Safety

To prevent accidents, the following principles should be applied:

- Personnel should be conversant with the contents of this document and should be competent to operate the oxygen equipment they use
- Where practical, designs should incorporate fail-safe features to protect personnel and property
- All personnel concerned with the operation of equipment and handling of products should be actively aware of the potential hazards and alert to all aspects of safety.

Argon (Ar)

Argon is the third most abundant of the mixture of gases in the air, the concentration being approximately 0,94% by volume. It is inert, non-toxic, colourless, odourless and tasteless. Supplied in high pressure metal cylinders and manifolded cylinder packs.

Hazards

- Compressed high pressure gas in cylinders
- Asphyxiant in high concentrations.

Classifications (Argon Technical)	
Gas	**Purity**
Argon Technical	99,9%

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
ARGON TEC CYL 17,4 KG	17,4	50,0	200	5/8" BSPF right hand female	10-SE
PortaTIG®	1,9	5,8	200	5/8" BSPF right hand female	10-GD1
Argon tec PCC	200	180	200	5/8" BSPF right hand female	556-PA

Higher grades and purities of this product are available from Afrox
Specifications are included in the 'Special Products & Chemicals' section

Gas (Argon High Purity)	Purity
Argon High Purity	99,998%

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
ARGON HP CYL 17,4 KG	17,4	50,0	200	5/8" BSPF right hand female	11-SE
ARGON HP MCP 15 X 17,4 KG	261	MCP	200	5/8" BSPF right hand female	11-ME15

Higher grades and purities of this product are available from Afrox
Specifications are included in the 'Special Products & Chemicals' section

Physical Data	
Appearance/odour	Colourless and odourless
Molecular weight	39,948
Specific volume at 21,1°C and 101,325 kPa	603,7 ℓ/kg
Boiling point at 101,325 kPa	-185,9°C
Critical temperature	-122,4°C
Relative density (air = 1) at 1 atm	1,380
Absolute density, gas at 101,325 kPa and 0°C	1,784 kg/m^3
Flammability	N/A

Uses and Features

- Argon is used in plasma jet torches
- The high temperature preparation, refining and fabrication of many materials must be carried out in an argon atmosphere
- Argon is used as a shielding gas for GTAW applications and for GMAW of aluminium
- Argon is used for purging applications when an inert atmosphere is required.

Precautions in Use

- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Only properly instructed people should handle this gas
- Never allow oil or grease on a cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Argon is non-corrosive and so any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Other Gases

Carbon Dioxide (CO_2)

An odourless, colourless, non-toxic, non-flammable gas.
Supplied as a high pressure liquefiable gas in metal cylinders.

Hazards

- High pressure liquefiable gas
- Sudden expansion will produce low temperatures
- Asphyxiant in high concentration.

Classifications (Carbon Dioxide Technical)	
Gas	**Purity**
Carbon Dioxide Technical	99,0%

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
CO_2 TEC CYL 31,3 KG	31,3	47,2	153	0,860" x 14TPI Right hand male	40-RC
CO_2 TEC CYL 31,3 KG WET	31,3	47,2	153	0,860" x 14TPI Right hand male	40-RC-W
CO_2 TEC PCC	175	175			573-PA

Higher grades and purities of this product are available from Afrox
Specifications are included in the 'Special Products & Chemicals' section

Physical Data	
Appearance/odour	Colourless and odourless
Molecular weight	44,011
Specific volume at 20°C and 101,325 kPa	547 ℓ/kg
Critical temperature	31°C
Relative density (air = 1) at 1 atm	1,53
Density, gas at 101,325 kPa and 0°C	1,977 kg/m³
Flammability	N/A

Store and Handling

- Gas cylinders must be stored in a cool, well-ventilated, dry location
- When cylinders are stored or used inside, ventilation, either natural or forced, should be used
- Because carbon dioxide is heavier than air, it tends to accumulate in low areas, and should not therefore be stored or used in sub-surface spaces such as basements
- The cylinders normally used for carbon dioxide have a gas withdrawal system. However, those that have a yellow stripe along the wall are of the liquid withdrawal type and are fitted with an educator tube. These must not be connected directly to gas systems
- Protective gloves should be used when operating cylinder valves and equipment connected to a liquid withdrawal cylinder
- Many applications for carbon dioxide require the dispensing of carbon dioxide gas only, in which case adequate ventilation must be available at point of use
- A periodic test, as well as a commissioning test, must be carried out to ensure that the level of carbon dioxide in the work area is below 5 000 ppm by volume in air.

Health Hazards

- Carbon dioxide gas will displace oxygen from the breathing atmosphere which may lead to suffocation
- Carbon dioxide helps regulate the body's breathing function. It is normally present in the air at a concentration of 300 ppm by volume. Increasing this level will cause both breathing and heart rate to accelerate, and concentration of the order of 10% can cause respiratory paralysis and can only be endured for a few minutes.

Uses and Features

- Welding grade CO_2 is a general purpose shielding gas for steel sections and plate. Used primarily for short arc welding of mild steels with all diameters of solid steel MIG wire and flux cored gas shielded wires
- Industrial grade CO_2 is used as an inert atmosphere for many industrial applications, e.g. prevention of oxidation, conveying flammable materials
- Some applications for compressed CO_2 include: beer dispensing, post-mix soft drink dispensing, shielded arc welding, sparging, foundry sand mould curing, fire fighting (fire extinguishers), gas atmosphere for preservation of packaged foods, animal immobilisation.

Precautions in Use

- Use only approved pressure rated equipment
- Wear safety glasses, use leather/plastic protective gloves, wear overalls when handling cylinders
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Refer to MSDS for more information.

Material Compatibility

- Dry carbon dioxide is non-corrosive, hence common materials are acceptable, e.g. steel, iron, copper, brass, plastic
- Moist carbon dioxide is slightly corrosive, hence carbonic acid resistant materials are required.

SHIELDING GASES

Shielding gases is a general term for a range of products used in the joining and cutting of predominantly metallic materials. They protect the molten metal in the weld from oxygen and nitrogen in the atmosphere.

Unprotected molten metal can be weakened by oxygen and nitrogen, causing a range of problems including weld failure, defects in the weld metal and decreased corrosion resistance.

The choice of shielding gas is determined by the material, the process being used and the performance and properties required by the customer. Shielding gases can be individual gases or mixtures.

Argon and argon-based mixtures predominate the joining of metals. Shielding gases are used with arc welding and cutting processes such as MIG, TIG and PAC. They can strongly influence the properties, weld metal and even the shape and size of the weld bead.

Shielding Gases

	Carbon & Alloy Steel					Austenitic Stainless Steel					Ferric & Martensitic Stainless Steel					Duplex Stainless Steel					Aluminium				Copper				Cast Iron				Nickel Alloys (not Montels)				Nickel or Copper - Montels				Titanium & Magnesium			
Key	MIG	TIG	Cored Wire	PAC	Purging	MIG	TIG	Cored Wire	PAC	Purging	MIG	TIG	Cored Wire	PAC	Purging	MIG	TIG	Cored Wire	PAC	Purging	MIG	TIG	PAC	Purging	MIG	TIG	PAC	Purging	MIG	TIG	PAC	Purging	MIG	TIG	PAC	Purging	MIG	TIG	PAC	Purging	MIG	TIG	PAC	Purging
Recommended ●																																											
Also Suitable ●																																											
Argoshield® Light	●																																										
Argoshield® Universal	●		●					●					●					●																									
Argoshield® Heavy	●		●					●					●					●																									
Alushield®		●			●		●			●		●			●		●			●	●	●		●	●	●		●		●			●		●		●	●		●	●	●		●
Copashield®		●			●		●			●		●			●		●			●	●	●		●	●	●		●		●			●		●		●	●		●	●	●		●
Portashield®	●																																										
Stainshield® Heavy						●					●					●																	●										
Stainshield® TIG Plus							●			●		●			●																		●			●							
Stainshield® TIG							●			●																							●			●							
TIGshield®		●			●		●			●		●			●		●			●	●	●		●	●	●		●		●		●		●		●	●	●		●	●	●		●
Stainshield® Plus	●					●					●					●																●										
Stainshield®	●					●					●					●																●										
Fluxshield®	●		●					●					●					●																									
Carbon Dioxide	●		●	●				●	●				●	●				●	●				●				●				●				●								
Nitrogen				●	●				●	●				●	●				●	●			●				●				●	●			●	●			●				●

Argoshield® Light

Argoshield® Light has been formulated specifically for welders using the GMAW process on carbon steel typically less than 4 mm thick. This gas mixture, which can be used in all positions, produces low heat input and narrow weld beads, so reducing distortion and burn-through. Together with its excellent arc stability and high speed capability for welding thin sheet, Argoshield® Light is easy to use, provides a quality weld and minimises overall cost.

Afrox MSDS: MS090 ($Ar/CO_2/O_2$)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders
- Use only approved pressure rated equipment.

Classifications
Gas Components
Argon
Carbon Dioxide
Oxygen

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
ARGOSHIELD® LIGHT CYL 17,8 KG	17,8	50,0	200	5/8" BSPF right hand female	24-SE-LIG
ARGOSHIELD® LIGHT CYL 3,6 KG	3,6	10,0	200	5/8" BSPF right hand female	24-IE
ARGOSHIELD® LIGHT MCP 15 x 17,8 KG	267	MCP	200	5/8" BSPF right hand female	24-ME15-LIG

Applications

- Duct and sheet metal engineering industries
- Automotive components manufacture
- Vehicle repair
- Cabinets/steel furniture manufacture
- Domestic appliance manufacture
- Light gauge storage tanks.

Features	Benefits
Excellent arc stability	Minimal spatter
Low distortion	Easy to use. Minimises post weld treatment
Low oxidation potential	Good appearance and quality finish
Wide operating envelope	Allows high productivity. Easy to use
Low levels of nitrogen and moisture	Low porosity and other defects
High levels of accuracy and quality control during production	Reproducible weld quality from cylinder to cylinder

Precautions in Use

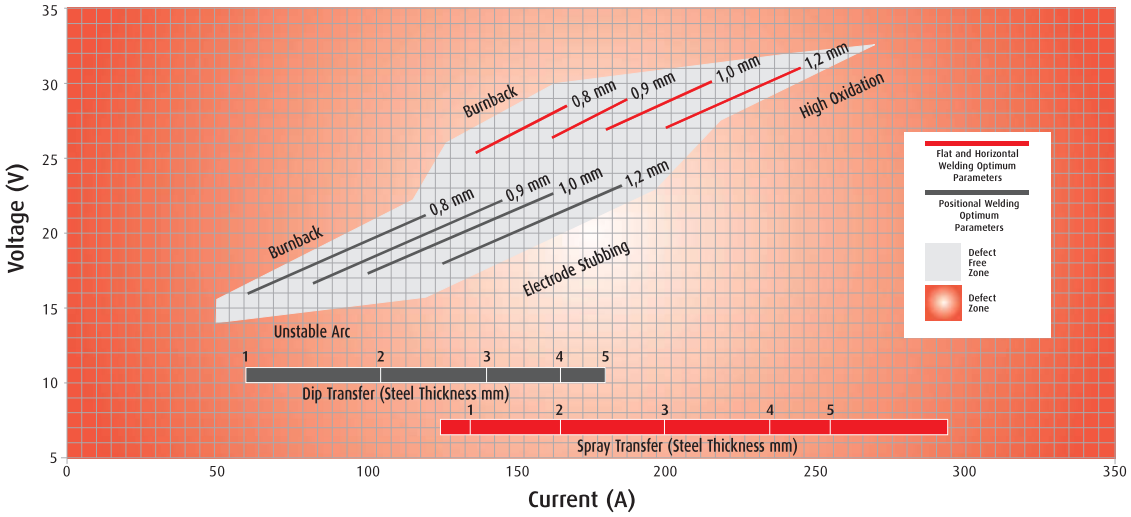
- Asphyxiant in high concentrations
- Compressed high pressure gas in cylinders
- Use only approved pressure rated equipment
- Do not allow oil or grease on cylinder or valve
- Open cylinder valves slowly
- Close cylinder valves when not in use
- Cylinders should be secured from falling over.

Material Compatibility

- Argoshield® Light is non-corrosive, therefore any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Current/Voltage Envelope

Operating limits for 0,8 mm, 0,9 mm, 1,0 mm and 1,2 mm diameter wires.



Electrode stick out, contact tip-to-work distance 18 mm for spray, 15 mm for dip, gas flow rate 15 ℓ/min

Argoshield® Universal

Argoshield® Universal has been formulated for general fabrication of carbon steel over the typical thickness range 5-12 mm. This gas mixture is easy to use, giving good weld performance across a wide range of applications and welding parameters. It can be used in any position, for single- and multi-pass welds in dip, spray, pulsed or synergic mode. Combined with its excellent arc stability, low spatter and broad weld profile, these advantages make Argoshield® Universal an excellent choice for quality and economy in general engineering applications.

Afrox MSDS: MS090 ($Ar/CO_2/O_2$)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders.

Classifications
Gas Components
Argon
Carbon Dioxide
Oxygen

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
ARGOSHIELD® UNIVERSAL CYL 18,5 KG	18,5	50,0	200	5/8" BSPF right hand female	28-SE
Argoshield Universal MCP	15 x 18,5	50,0	200	5/8" BSPF right hand female	28-ME 15

Applications

- General fabrication
- General industrial products
- Light to medium-plate fabrication
- Structural steelworks
- Bridgework
- Pipe and tube joining
- Vehicle manufacture/heavy trucks.

Features	Benefits
Excellent arc stability	Low spatter
Low distortion	Minimal post weld straightening
Low oxidation potential	Smooth weld bead
Used in dip, pulsed and spray metal transfer modes	Higher productivity
Low levels of nitrogen and moisture	Low porosity and other defects
High levels of accuracy and quality control during production	Reproducible weld quality from cylinder to cylinder

Precautions in Use

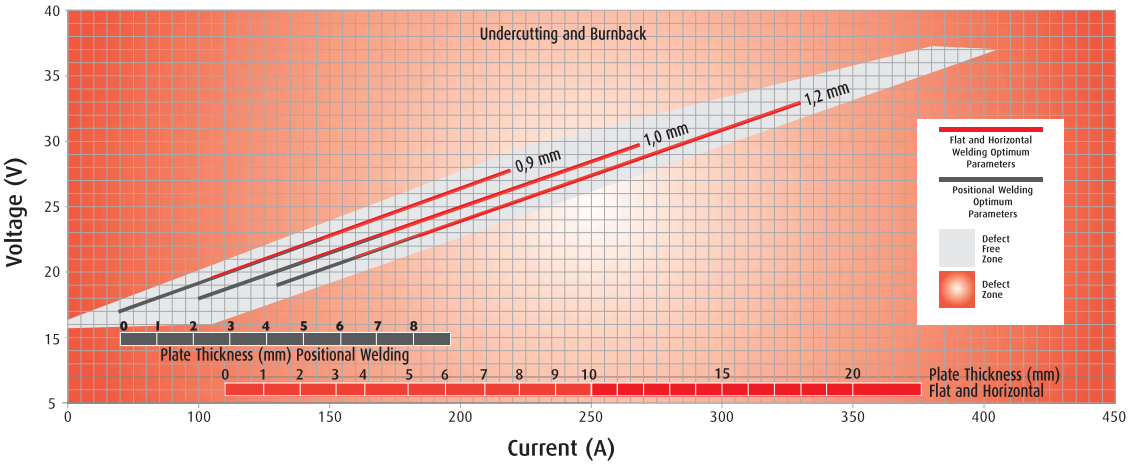
- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Do not allow oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Argoshield® Universal is non-corrosive, therefore any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Current/Voltage Envelope

Operating limits for 0,9 mm, 1,0 mm and 1,2 mm diameter wires.



Electrode stick out, contact tip-to-work distance 19-25 mm for spray, 6-13 mm for dip, gas flow rate 15-20 ℓ/min

Argoshield® Heavy

Argoshield® Heavy has been formulated for welders using the GMAW process on constructional steelworks typically greater than 10 mm thick. Its higher carbon dioxide content gives welds in carbon steel good rounded penetration profiles that are deep and wide. This produces consistently reliable strong welds, which can be used for bridges, buildings, boilers, plant and machinery. Argoshield® Heavy is ideal for multi-pass welds in spray mode on heavy sections, allowing fast welding speeds which reduce costs. It also has the advantage of tolerating contaminants such as dirt, oil, grease and rust and poor joint fit-up.

Afrox MSDS: MS090 ($Ar/CO_2/O_2$)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders.

Classifications
Gas Components
Argon
Carbon Dioxide
Oxygen

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
ARGOSHIELD® HEAVY CYL 19,6 KG	19,6	50,0	200	5/8" BSPF right hand female	25-SE

Applications

- Heavy engineering
- Heavy structural steel
- Boiler manufacture
- Shipbuilding and repair
- Heavy vehicle manufacture
- Thick-walled pipes and pressure vessels
- Pad-eyes and lifting lugs
- Earth-moving equipment.

Features	Benefits
Good arc stability	Easy to use. Low spatter
Low oxidation potential	Reduced spatter. Good weld appearance. Low weld clean-up
Used in dip, pulsed and spray metal transfer modes	Good appearance and finish
	Minimises distortion and maximises productivity
Low levels of nitrogen and moisture	Low porosity and other defects
	Reduced porosity, increased toughness
High levels of accuracy and quality control during production	Suitable for automated applications
	Reproducible weld quality from cylinder to cylinder

Precautions in Use

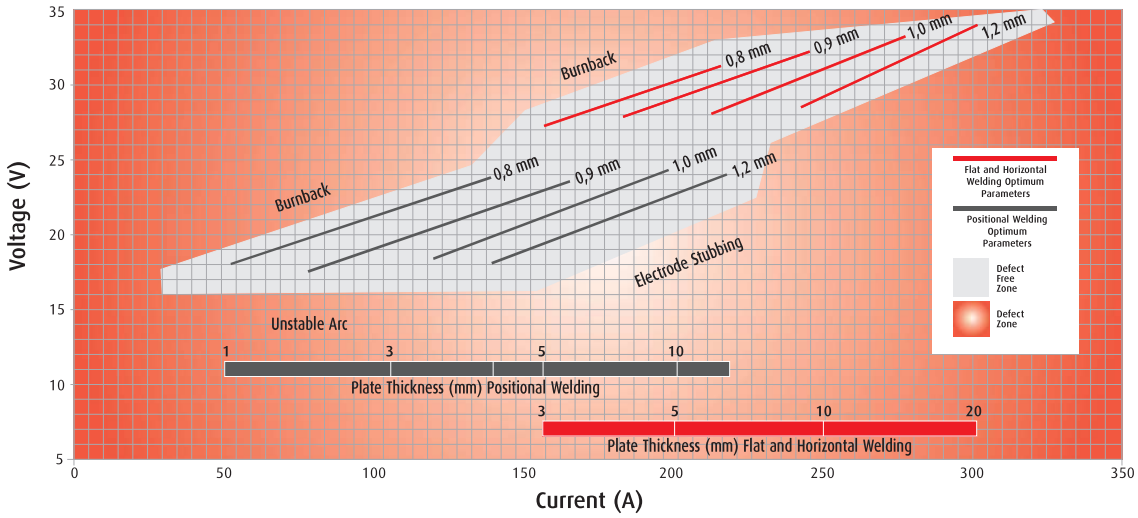
- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Do not allow oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Argoshield® Heavy is inert and non-corrosive, therefore any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Current/Voltage Envelope

Operating limits for 0,8 mm, 0,9 mm, 1,0 mm and 1,2 mm diameter wires.



Electrode stick out, contact tip-to-work distance 18 mm for spray, 15 mm for dip, gas flow rate 16 ℓ/min

Argoshield® 5

Argoshield® 5 has been formulated specifically for welders using the GMAW process on carbon steel typically less than 4 mm thick. This gas mixture, which can be used in all positions, produces low heat input and narrow weld beads, thereby reducing distortion and burn-through. Together with its excellent arc stability and high speed capability for welding thin sheet, Argoshield® 5 is easy to use, provides a quality weld and minimises overall cost.

Afrox MSDS: MS090 ($Ar/CO_2/O_2$)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders.

Classifications
Gas Components
Argon
Carbon Dioxide
Oxygen

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
ARGOSHIELD® 5 CYL 17,8 KG	17,8	50,0	200	5/8" BSPF right hand female	24-SE
ARGOSHIELD® 5 CYL 8,4 KG	8,4	23,6	200	5/8" BSPF right hand female	24-KE
PORTASHIELD® CYL 1,8 KG	1,8	5,8	200	5/8" BSPF right hand female	27-GD

Applications

- Duct and sheet metal engineering industries
- Automotive components manufacture
- Vehicle repair
- Cabinets/steel furniture manufacture
- Domestic appliance manufacture
- Light gauge storage tanks.

Features	Benefits
Excellent arc stability	Minimal spatter
Low distortion	Easy to use, minimal post weld straightening
Low oxidation potential	Good appearance and quality finish
Wide operating envelope	Allows high productivity, excellent welder appeal
Low levels of nitrogen and moisture	Low porosity and other defects, high toughness
High levels of accuracy and quality control during production	Reproducible weld quality from cylinder to cylinder

Precautions in Use

- Asphyxiant in high concentrations
- Compressed high pressure gas in cylinders
- Use only approved pressure rated equipment
- Do not allow oil or grease on cylinder or valve
- Open cylinder and MCP valves slowly
- Close cylinder and MCP valves when not in use
- Cylinders should be secured from falling over.

Material Compatibility

- Argoshield® 5 is non-corrosive, therefore any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Alushield®

Alushield® is a gas mixture of argon and helium for GMAW and GTAW welding of aluminium and its alloys. It is a versatile, high specification gas suitable for welding over a range of thicknesses, giving consistently good penetration and bead shape. The mixture is chemically inert providing a stable, steady and controllable arc. Alushield® can also be used on automated welding processes and by allowing faster welding speeds with lower defect rates, can significantly reduce fabrication costs.

Helium content provides a higher arc energy to combat the high thermal conductivity of these alloys, increasing penetration and minimising the need for preheating.

Afrox MSDS: MS075 (Ar/He)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders.

Classifications
Gas Components
Argon
Helium

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
ALUSHIELD® CYL 8,4 KG	8,4	50,0	200	5/8" BSPF right hand female	94-SE

Applications

- Ship and marine superstructures
- Pressure vessels
- Chemical and petrochemical plant
- Pipework.

Features	Benefits
Excellent arc stability	Little/no spatter
Low oxidation potential	Strong weld
Uses less wire	Reduces wire wastage of high value wires
Used in dip, pulsed and spray metal transfer modes	Easy to use
Fast, high arc energy	Low production costs
High heat input	Low defect levels
High purity argon/helium mixture	Reduced repair
	Reduced clean-up
	Can be used on machines and robots

Precautions in Use

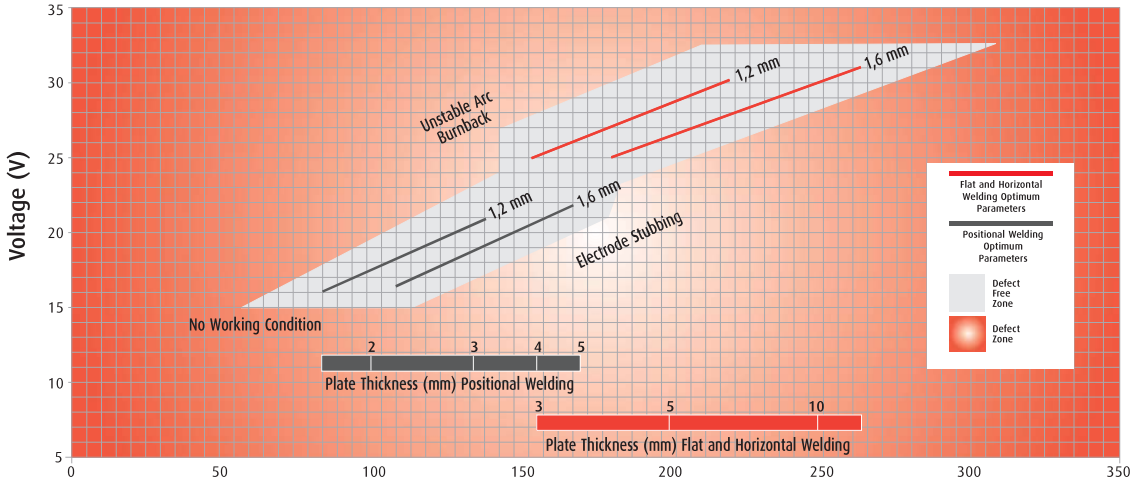
- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Do not allow oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Alushield® is non-corrosive, therefore any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Current/Voltage Envelope

Operating limits for 1,2 mm and 1,6 mm diameter wires.



Electrode stick out, contact tip-to-work distance 19-25 mm for spray, 8-13 mm for dip. Gas flow rate 15-18 ℓ/min

Copashield®

Copper and copper-based alloys are typically characterised by a high thermal conductivity and high heat capacity. The high helium content of Copashield® provides a very intense arc which allows these materials to be welded more readily than by using other gases. In many cases, preheating can be eliminated by the high arc energy available. Copashield® is suitable for both GMAW and GTAW welding. Copashield® can also be used on aluminium and aluminium alloys above 6 mm and is ideal because it is a fast welding gas with hotter arc, with low porosity at high productivity levels.

Afrox MSDS: MS075 (Ar/He)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders.

Classifications
Gas Components
Argon
Helium

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
COPASHIELD® CYL 4,8 KG	4,8	50,0	200	5/8" BSPF right hand female	395-SE

Applications

- Copper-lined steel pressure vessels
- Bus-bar manufacture
- Spirit distillation vessels
- Arc furnace electrode holders
- Heat exchangers
- Petrochemical equipment
- Calorifiers.

Features	Benefits
Helium achieves hotter arc	Reduced preheat requirement – none required below 6 mm*
Good wetting characteristics	Excellent penetration
Good weld penetration profile	Increased strength
Low spatter	Smooth and flat weld surface profiles, less wire used
Ultra-high purity gas mixture	Reduced fusion defects
	Reduced clean-up time

*Above 6 mm preheat from 350-550°C

Precautions in Use

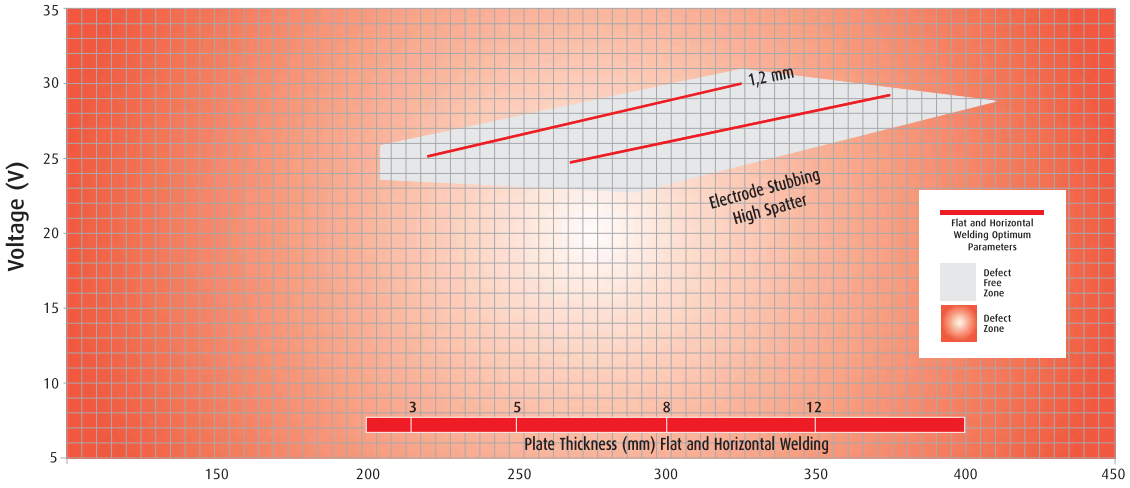
- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Do not allow oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Copashield® is non-corrosive and so any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Current/Voltage Envelope

Operating limits for 1,2 mm and 1,6 mm diameter wires.



Electrode stick out, contact tip-to-work distance 15 mm for spray.
Gas flow rate 18 ℓ/min

Fluxshield®

Fluxshield® is an argon/carbon dioxide-based shielding gas specifically designed for high quality single- and multi-pass welding of mild, low alloy and stainless steels using the flux cored and metal cored wire processes. It can be used in all positions either manually or semi-automated, depending on the wire type. Fluxshield® exhibits excellent arc stability, generates good penetration profiles, a very smooth weld appearance with low spatter levels and promotes excellent slag detachability. Fluxshield® is also tolerant of poor fit-up and less than ideal joint cleanliness.

Afrox MSDS: MS062 (Ar/CO_2)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders.

Classifications
Gas Components
Argon
Carbon Dioxide

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
FLUXSHIELD® CYL 20,5 KG	20,5	50,0	200	5/8" BSPF right hand female	26-SE

Applications

- General plate fabrications
- Structural steel and bridgework
- Heavy engineering type fabrications
- Pressure vessels, piping and tank manufacture
- Offshore drilling rigs and shipbuilding
- Fabrications previously limited to SMAW using AWS-E7018 electrodes, with stringent mechanical strength requirements, i.e. for low temperature impact toughness, high yield and UTS requirements
- Ideal for HSLA, mild, structural and stainless steels.

Features	Benefits
Superior/excellent mechanical properties	High integrity welds exceeding the minimum requirements of AWS-5.18, AWS-A5.20, AWS-5.29 and ASME SFA5.20
Low weld metal hydrogen levels (<5 ml per 100 g of weld metal)	Low risk of hydrogen cracking
Excellent arc stability, very smooth arc	Excellent weldability and welder appeal with excellent weld bead appearance
Deep penetrating capability	Excellent fusion at the weld root
Ultra-high purity gas mixture	Consistent X-ray quality welds
Fast freezing slag	Allows welding in all positions
Low spatter and easy slag removal	Minimum post weld cleaning required
High weld metal deposition rates	High productivity and improved process economics over GMAW

Precautions in Use

- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder and MCP valve slowly
- Close cylinder and MCP valve when not in use
- Do not allow oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Fluxshield® is non-corrosive, therefore any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Welding Parameters for Mild Steel Flux Cored Wire E7 It-1*

	Welding Position	Wire Diameter (mm)	Current		Optimum Settings		Wire Feed Speed (m/min)	Deposited Metal (kg/h)
			Amps (A)	Volts (V)	Amps (A)	Volts (V)		
	Vertical-up	1,2	130 - 200	19 - 25	175 - 185	23 - 25	3,3 - 6,3	1,4 - 2,9
	Vertical-down	1,6	170 - 250	19 - 26	200 - 220	22 - 24	2,5 - 7,3	1,1 - 2,7
	Flat/ downhand welding	1,2	150 - 300	21 - 33	300	33	3,3 - 12,7	1,4 - 4,5
		1,6	200 - 400	22 - 34	350	34	3,7 - 10,8	1,6 - 6,8
	Horizontal fillet welding	1,2 - 1,6	150 - 400	21 - 34	350	34	3,7 - 10,8	1,6 - 6,8

Electrode stick out, contact tip-to-work distance 20 mm. DCEP (direct current electrode positive).
Gas flow rate 15-20 ℓ/min

Stainshield®

Stainshield® is a general formulation gas for welders using the GMAW process on all stainless steels. It offers an economical solution, suitable for many applications on a wide range of metal thicknesses. Stainshield® is particularly suitable where minimal oxidation of the weld is required and where there is a risk of carbon contamination of the product. Stainshield® performs well across a range of applications providing good arc stability in dip, pulse and spray transfer modes.

Afrox MSDS: MS084 (Ar/O_2)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders.

Classifications
Gas Components
Argon
Oxygen

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
STAINSHIELD® CYL 17,4 KG	17,4	50,0	200	5/8" BSPF right hand female	27-SE

Applications

- All stainless steels
- Tubing and pipework
- Tanks and vessels.

Features	Benefits
High weld quality	Proven technology
Good penetration	Low porosity and other defects
No carbon pick-up	Maintains corrosion resistance
Low levels of nitrogen and moisture	Versatile – can be used across a range of thicknesses
High levels of accuracy and quality control during production	Low spatter
	Reproducible weld quality from cylinder to cylinder

Precautions in Use

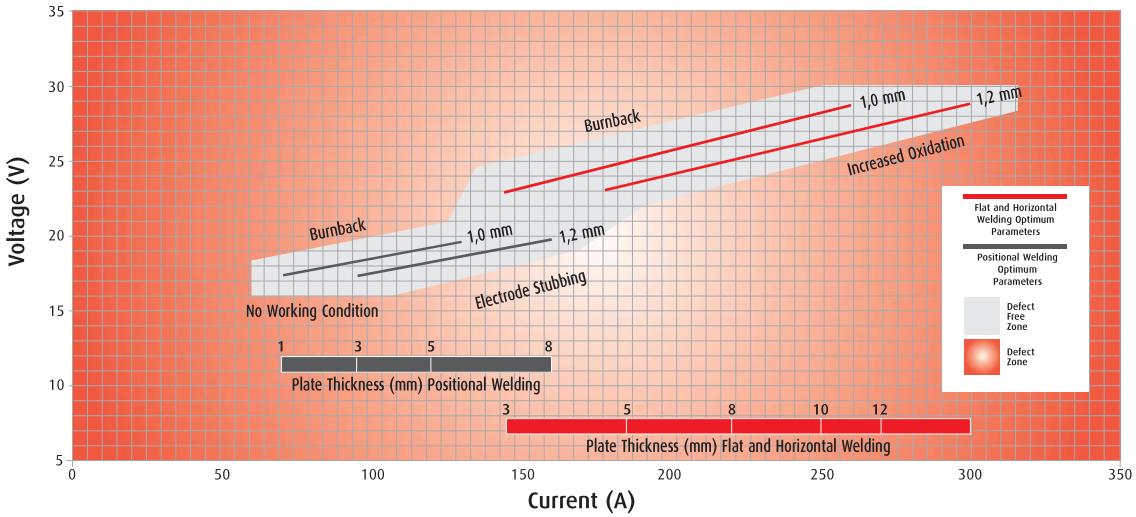
- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Do not allow oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Stainshield® is non-corrosive, therefore any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Current/Voltage Envelope

Operating limits for 1,0 mm and 1,2 mm diameter wires.



Electrode stick out, contact tip-to-work distance 19-25 mm for spray, 8-13 mm for dip, gas flow rate 15-18 ℓ/min

Stainshield® Plus

Stainshield® Plus has been formulated specifically for welders using the GMAW process on all stainless steels, particularly 3CR12. It provides a strong weld and is suitable across a wide range of metal thicknesses, particularly where the final appearance of the weld is important to the product. Its low oxidation potential, stable arc and fluid weld pool produce a decorative finish to the weld.

Afrox MSDS: MS062 (Ar/CO_2)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders.

Classifications
Gas Components
Argon
Carbon Dioxide

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
STAINSHIELD® PLUS CYL 17,6 KG	17,6	50,0	200	5/8" BSPF right hand female	30-SE

Applications

- All stainless steels
- Tubing and pipework
- Tanks and vessels
- Catering equipment
- Components for the petrochemical industry.

Features	Benefits
Good arc stability	Reduced spatter
Low oxidation potential	Low defect levels, good weld appearance
Wide operating envelope	Good weld appeal, versatile
Uses less wire	Minimises waste of expensive wire
Low distortion	Reduced post weld treatment
Fast	Can also be used on machines and robots
Improved fusion characteristics	Good positional welding, X-ray quality welds
Very stable dip transfer	Excellent on thin sheet, e.g. tanks

Precautions in Use

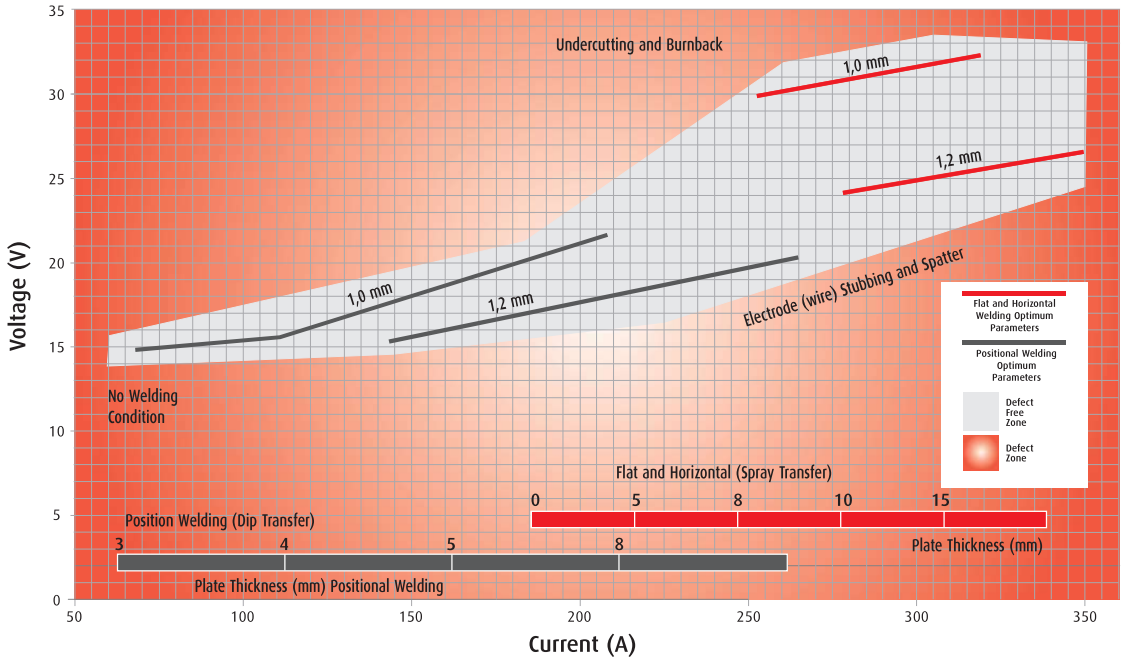
- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Do not allow oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Stainshield® Plus is non-corrosive, therefore any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Current/Voltage Envelope

Operating limits for 1,0 mm and 1,2 mm diameter wires.



Electrode stick out, contact tip-to-work distance 19-25 mm for spray, 8-13 mm for dip, gas flow rate 15-18 ℓ/min

Stainshield® Heavy

Stainshield® Heavy is an argon-rich three component of argon-helium-CO_2 mixture developed primarily for the MIG welding of stainless steels above 10 mm thick, but it also has applications in the MIG welding of other metals. It is slightly oxidising, making it ideal for use with metals or processes that can tolerate the presence of oxidising gases.

The addition of helium to the shielding gas increases the amount of energy transferred into the weld, producing smooth, even and defect-free welds. Stainshield® Heavy has been developed to greatly improve welding speed, increase deposition rates and, in some cases, reduce preheat requirements.

Afrox MSDS: MS092 (Ar/CO_2/He)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders.

Classifications
Gas Components
Carbon Dioxide
Helium
Argon

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
STAINSHIELD® HEAVY CYL 10,4 KG	10,4	50,0	200	5/8" BSPF right hand female	99-SE

Applications

- All stainless steels
- Tubing and pipework
- Tanks and vessels
- Catering equipment
- Components for the petrochemical industry
- Ship repair industry.

Features	Benefits
For materials thicker than 8 mm	Low spatter levels
Very good fusion characteristics	Low defect levels
Very good arc stability	Increased weld speed
Low fusion defects	Excellent porosity control

Precautions in Use

- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Do not allow oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Stainshield® Heavy is non-corrosive, therefore any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Stainshield® TIG Plus

Argon-helium shielding gas mixtures are two component mixtures of argon and helium developed primarily for MIG and TIG welding of non-ferrous metals of between 3-10 mm.

Argon-helium-rich shielding gases input more heat into the weld than pure argon, but the addition of argon improves the arc stability. These gases will help a skilled welder to produce smooth, even and defect-free welds. They are also suitable for TIG welding of copper, copper alloys and nickel alloys where high heat input is required.

Mixtures with a high helium content have the ability to transfer heat more effectively to the weld pool. This makes them ideal for welding thick metals that have to be preheated before welding. Preheat can be reduced or, in some cases, dispensed with altogether.

Afrox MSDS: MS075 (Ar/He)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders.

Classifications
Gas Components
Helium
Argon

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
STAINSHIELD® TIG PLUS CYL 12,3 KG	12,3	50,0	200	5/8" BSPF right hand female	000187-SE-C

Applications

- Automatic and orbital welding
- Pipework
- Electronics
- Petrochemical
- Power generation
- Tubing and seams.

Features	Benefits
High welding speeds	No burn-through
Fluid weld pool	Suited for manual processes
Versatile	Versatile for all grades of stainless steel
Reduced surface tension beads	Slightly flatter weld

Precautions in Use

- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Do not allow oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Stainshield® TIG Plus is non-corrosive, therefore any common metal is acceptable, provided the equipment is designed to withstand process pressure.

TIGshield®

TIGshield® is an argon shielding gas developed primarily for TIG welding. Welding with argon produces a relatively cold arc suitable for welding thin section materials. As it has a low ionisation potential and is a completely inert gas, it easily forms a welding arc without reacting with the metal components being welded.

When welding thicker material, other gases are added to the argon base to produce a hotter welding arc and to improve fusion characteristics when MIG welding, if the metallurgy of the material permits it.

Argon, a colourless, odourless and tasteless gaseous element, is heavier than air.

Afrox MSDS: SG/MSDS 2

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders.

Classifications
Gas Components
Argon

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
TIGSHIELD® CYL 3,5 KG	3,5	10,0	200	5/8" BSPF right hand female	87-IE

Applications

- All types of stainless steels 0-3 mm
- 95% of TIG applications up to 3 mm for stainless steel; 5 mm for carbon steel
- Excellent purging gas
- Thin applications.

Features	Benefits
General purpose shielding gas for all grades of stainless steel, mild steel and aluminium	Ideally suited for thin sections
Can be used as a purge gas	Easy striking arc

Precautions in Use

- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Do not allow oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- Argon is non-corrosive and so any common metal is acceptable, provided the equipment is designed to withstand process pressure.

RoboShield®

RoboShield® has been formulated for robotic and mechanised applications in the automotive industry resulting in strong, spatter-free welding at high production rates. It is also highly suitable for welders using the GMAW process on constructional steelworks typically greater than 12 mm thick. Its higher carbon dioxide content gives welds in carbon steel good rounded penetration profiles that are deep and wide. This produces consistently reliable strong welds, which can be used for bridges, buildings, boilers, plant and machinery. RoboShield® is ideal for multi-pass welds in spray mode on heavy sections, allowing fast welding speeds which reduce costs. It also has the advantage of tolerating contaminants such as dirt, oil, grease and rust and poor joint fit-up.

Afrox MSDS: MS090 (Ar/CO_2)

Hazards

- Asphyxiant in high concentrations
- Compressed – high pressure gas mixture in cylinders
- Use only approved pressure rated equipment.

Classifications
Gas Components
Argon
Carbon Dioxide

Material Description	Mass (kg)	Cylinder Capacity (*l*)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
ROBOSHIELD®	19,7	50	200	5/8" BSPF right hand female	20-SE

Applications

- Mechanised and robotic high speed welding
- General plate fabrications
- Structural steel and bridgework
- Heavy engineering type fabrications
- Pressure vessels, piping and tank manufacture
- Offshore drilling rigs and shipbuilding
- Carbon steels and low alloy steels.

Features	Benefits
Formulated for robotic welding	Resulting in high speed, clean spatter free welding
Superior/excellent mechanical properties	High integrity welds exceeding the minimum requirements of AWS-A5.18, AWS-A5.20, AWS-A5.29 and AWS-A5.36
Low weld metal hydrogen levels (<5 ml per 100 g of weld metal)	Low risk of hydrogen cracking
Excellent arc stability, very smooth arc	Excellent weldability and welder appeal with excellent weld bead appearance
Deep penetrating capability	Excellent fusion at the weld root
Ultra-high purity gas mixture	Consistent X-ray quality welds
High weld metal deposition rates	High productivity and improved process economics over GMAW
Suitable for manual GMAW of solid wires	Low spatter

Precautions in Use

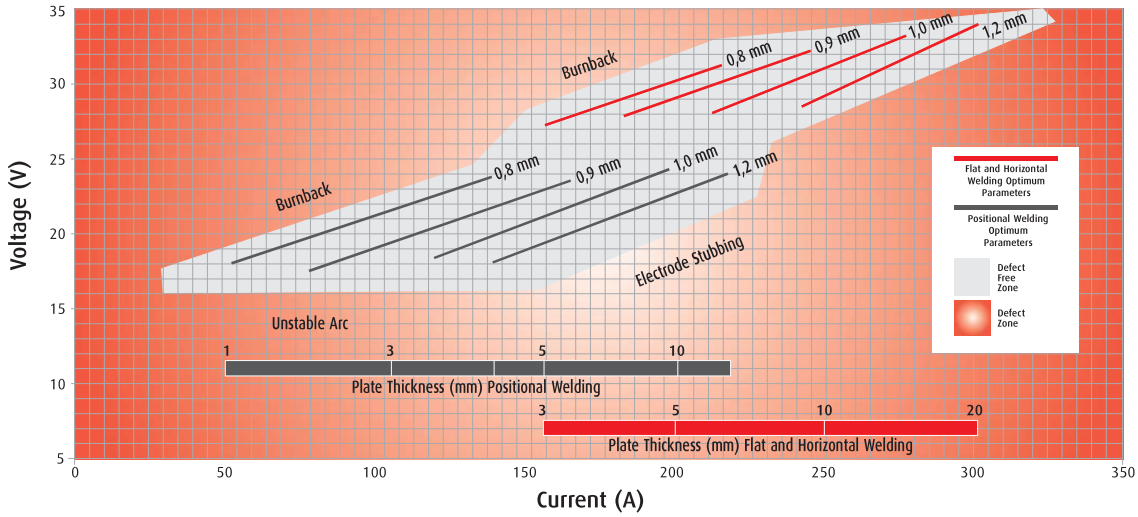
- Use only approved pressure rated equipment
- Use only in well ventilated areas
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Do not allow oil or grease on cylinder or valve
- Cylinders should be secured from falling over
- Refer to MSDS for more information.

Material Compatibility

- RoboShield® is non-corrosive, therefore any common metal is acceptable, provided the equipment is designed to withstand process pressure.

Current/Voltage Envelope

Operating limits for 0,8 mm, 0,9 mm, 1,0 mm and 1,2 mm diameter wires.



Electrode stick out, contact tip-to-work distance 18 mm for spray, 15 mm for dip, gas flow rate 16 ℓ/min

Fuel Gases

Dissolved Acetylene (C_2H_2)

Acetylene is a highly flammable colourless gas of distinct odour. The high solubility of acetylene in acetone (300:1 by volume at 1 100 kPa) enables it to be supplied dissolved in acetone. Acetylene cylinders are filled with porous material which carries the acetone.

Hazards

- An asphyxiant with anaesthetic properties
- Forms an explosive mixture with air
- Can form explosive acetylides with unalloyed copper, silver, mercury, brass containing more than 66% copper, and brazing materials containing copper and silver
- Can spontaneously decompose within equipment and pipework under certain flow, temperature and pressure conditions.

Classifications	
Gas	**Purity**
Acetylene Technical	98,0%

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
ACET TEC CYL 8,0 KG 12/10/5/2/ R 006	8,0	50,0	-	5/8" BSPF left hand female	15-DE
ACET TEC CYL PORTAPAK® 12/10/5/2/ R 006	0,9	5,6	-	11/16" x 20 TPI W left hand female	16-DA
ACET TEC MCP 12 X 8,0 KG 12/10/5/2/ R 006	96,0	MCP	-	5/8" BSPF left hand female	15-MD12

Higher grades and purities of this product are available from Afrox
Specifications are included in the 'Special Products & Chemicals' section

Physical Data	
Appearance/odour	Colourless gas, ethereal when pure. Garlic when commercial
Molecular weight	26,038
Specific volume at 15,6°C and 101,325 kPa	900,8 ℓ/kg
Boiling point at 170 kPa	-75°C
Critical temperature	35,2°C
Relative density (air = 1) at 101,325 kPa	0,908
Density, gas at 101,325 kPa and 0°C	1,1747 kg/m³
Flammable limits in air (by volume)	2,0 - 82%

Uses and Features

- Acetylene is the best and most versatile fuel gas for welding, straightening, bending, forming, hardening, cutting or tempering. It is the hottest flame temperature when compared to MAPP gas, propylene and propane and natural gas (2,910˚C, 2,895˚C, 2,800˚C and 2,780˚C respectively)
- Acetylene is used as a fuel gas for oxy-acetylene welding, cutting, general localised heating, flame hardening, flame cleaning to remove rust from steel, spalling concrete and other processes requiring a high temperature flame (3,160˚C when combusted in oxygen)
- Specially purified instrument grade acetylene which has such impurities (arsine, phosphine, ammonia and hydrogen sulphide) removed is used in atomic absorption, analytical instrumentation and navigational beacons.

Precautions in Use

- Fit and maintain flashback arrestors in equipment
- Keep hot work and sparks away from cylinder relief devices and hoses. Do not work directly above cylinders
- Use only approved equipment
- Do not use at pressure greater than 150 kPa
- Open cylinder valve slowly
- Close cylinder valve when not in use
- Cylinders should be secured from falling over
- Excessive flow rates may remove acetone from the cylinder
- Use personal protective equipment.

Material Compatibility

- Steel, stainless steel, aluminium and wrought iron are recommended for use with acetylene. Joints may be welded, threaded or flanged. The use of cast iron fittings is not permissible. Unalloyed copper, silver and mercury, brasses containing more than 66% copper and brazing materials containing copper and silver should never be used in direct contact with acetylene due to the possible formation of explosive acetylides. Ensure hoses and pipelines are compatible with acetone.

Hydrogen (H_2)

Hydrogen is a colourless, odourless, flammable gas. It is supplied as a permanent gas at high pressure in metal cylinders.

Hydrogen is the lightest substance known to man, and is non-toxic, although it does not support life. It also burns, having a flammability range of 4-75% in air. Hydrogen is useful to industry for three main reasons: it is reactive, it burns and it has a very low boiling point.

Hazards

- High pressure compressed gas
- Forms explosive mixtures in air
- Asphyxiant in high concentrations
- Only gas that becomes warm when expanded
- Risk of static electricity sparking.

Classifications	
Gas	**Purity**
Hydrogen Technical	99,5%

Material Description	Mass (kg)	Cylinder Capacity (ℓ)	Pressure @ 20°C (Bar)	Valve Outlet Connection	Item Number
H_2 TEC CYL 0,74 KG	0,74	50,0	200	5/8" BSPF left hand female	54-SH
H_2 TEC MCP 15 X 0,74 KG	11,1	MCP	200	5/8" BSPF left hand female	54-MH15

Higher grades and purities of this product are available from Afrox
Specifications are included in the 'Special Products & Chemicals' section

Physical Data	
Appearance/odour	Colourless and odourless
Molecular weight	2,016
Specific volume at 21,1°C and 101,325 kPa	11967,4 ℓ/kg
Boiling point at 101,325 kPa	-252,8°C
Critical temperature	-239,9°C
Relative density (air = 1) at 101,325 kPa and 25°C	0,0695
Density, gas at 101,325 kPa and 25°C	0,08235 kg/m³
Flammable limits in air (by volume)	4,0 - 75%

Uses and Features

- Hydrogen finds wide use in the metallurgy field because of its ability to reduce metal oxides and prevent oxidation in the heat treating of certain metals and alloys (reducing atmospheres)
- Hydrogen is also extensively used in the manufacture of chemicals, plastics and in petroleum refining
- Hydrogen is widely used for the hydrogenation of vegetable and animal oils and fats
- Purified hydrogen is used in gas chromatography as a detector fuel and in semiconductor manufacturing
- Not suitable for inflation of balloons.

Precautions in Use

- Use only approved ancillary equipment which is flameproof. Consult our Customer Engineering Services Department for assistance
- High pressure leaks can auto-ignite
- Caution – burns with an almost invisible flame. Use leak-detecting solutions for minor leaks
- Store away from oxidising sources
- Use only in a well ventilated area
- Wear safety glasses, use leather/plastic safety gloves, wear overalls and safety shoes when handling cylinders
- Always use a regulator to connect to system
- Always open and close cylinder valve slowly
- Refer to MSDS for more information.

Material Compatibility

- Hydrogen is non-corrosive, therefore any common metals are acceptable provided the equipment is designed to withstand process pressure and temperature. Hydrogen embrittlement can occur under certain circumstances and needs to be allowed for in-design.

Leak Detection

Leak of hydrogen in lines and equipment may be detected with soapy water (1% Nukleen in water). Leaks will be indicated by bubble formation.

BULK GASES

Large volumes of gas are supplied by bulk deliveries, either as a cryogenic liquid or a high pressure gas into storage on customer sites.

Bulk deliveries of oxygen, nitrogen, argon, hydrogen and carbon dioxide are supplied as liquid because they require much less storage capacity than gas.

The liquid is delivered by our dedicated fleet of cryogenic tankers into vacuum insulated bulk storage vessels that we usually own and maintain on customers' premises. The stored liquid is controlled at the required pressure by means of an automated regulation system.

If the customer process requires gas, the liquid is vaporised and delivered as a gas along the supply pipe. If the process requires liquid, it is delivered directly from the storage vessel through a cryogenic vacuum insulated pipeline.

Bulk Liquid Supply

Oxygen (O_2), Liquid

A pale blue liquid which rapidly evaporates to a colourless, odourless and tasteless gas.

Hazards

- Contact with combustible material may cause fire
- Causes burns
- Extremely cold cryogenic liquid.

Classifications		
Gas	**Purity**	**Valve Outlet Connections**
Oxygen Technical	99,5%	Liquid withdrawal 3/4" BSP R/H male with 45° inverted flare Gas withdrawal 5/8" BSP R/H female with 60° inverted flare

Higher grades and purities of this product are available from Afrox on request

Supply

Details of a wide range of storage vessels and ancillary equipment are available from Afrox on request.

Physical Data	
Appearance/odour	Colourless and odourless
Molecular weight	32,0
Specific volume at 21,1˚C and 101,325 kPa	755,4 ℓ/kg
Boiling point at 101,325 kPa	-183,0˚C
Critical temperature	-118,6˚C
Relative density of gas (air = 1) at 1 atm and 25˚C	1,105
Density, liquid at boiling point	1,309 kg/m^3
Flammability	Does not burn, but supports combustion

Uses and Features

- In combination with a fuel gas such as acetylene, hydrogen or LPG, it is used in welding, cutting, hardening, scarfing, flame cleaning and heating
- Oxygen is used in the manufacture of steel, glass, methanol, titanium dioxide, vinyl acetate and synthesis gas
- Oxygen can be considered for use in any chemical reaction where air is used to give faster reaction time and higher yields
- Can be used for laser gas and metallurgy applications.

Precautions in Use

- Use only approved degreased temperature and pressure rated equipment
- Wear face shield, use leather protective gloves, wear overalls when handling PLCs or liquid oxygen systems
- Refer to MSDS for more information.

Material Compatibility

- Only oxygen-compatible materials may be used with liquid oxygen and these must be fully degreased. Copper, aluminium and stainless steels are the most commonly used metals. Most lubricants are NOT compatible. Oil and grease can cause ignition. Equipment to handle liquid oxygen must be constructed from suitable materials for the temperatures encountered.

Nitrogen (N_2), Liquid

A colourless, odourless, non-toxic liquid.

Hazards

- Extremely cold, cryogenic liquid
- Asphyxiant in high concentrations.

Classifications		
Gas	**Purity**	**Valve Outlet Connections**
Nitrogen Technical	99,5%	Liquid withdrawal 1/2" BSP R/H male with 45° inverted flare Gas withdrawal 3/4" BSP R/H female with 60° inverted flare

Higher grades and purities of this product are available from Afrox on request

Supply

Details of a wide range of storage vessels and ancillary equipment are available from Afrox on request.

Physical Data	
Appearance/odour	Colourless, odourless and non-toxic liquid
Molecular weight	28,0134
Specific volume at 21,1°C and 101,325 kPa	861,5 ℓ/kg
Boiling point at 101,325 kPa	-195,8°C
Critical temperature	146,9°C
Relative density (air = 1) at 101,325 kPa and 25°C	0,967
Density, liquid at boiling point	803,6 kg/m^3
Flammability	Inert

Uses and Features

- To prevent the undesirable presence of oxygen, nitrogen is valuable in furnaces, metal plating and tinning, chemical processing, food packing, wine making, paint and varnish manufacture, tube manufacture and packaging and preserving rubber products
- Dry nitrogen is used for in-transit refrigeration, artificial insemination, biological freezing, tissue preservation, cryosurgery, laboratory low temperature tests, dermatology, low temperature component testing, environmental testing, shrink fitting, grinding of plastics, quick freezing of foods, metal grinding and rubber de-flashing
- Among the many uses for gaseous nitrogen are flow testing, gauge calibration, plastic forming, aerosol propellant, powering air tools, metal de-gassing, pipeline testing, pressure testing cables and generators, recoil systems, hydraulic systems (cushions), inflating aircraft tyres and the handling and transfer of flammable liquids
- Gaseous nitrogen is also used for the inert packaging of foods, sparging wines, pressurisation of head spaces in liquid containers and conveyance of beverages in pressurised pipe systems
- Shrink fitting and pipe freezing
- Carrier gas in chromatography.

Precautions in Use

- Use only approved degreased temperature and pressure rated equipment
- Do not trap liquid between closed valves
- Wear leather gloves, face shield and safety shoes when handling low temperature products
- Keep self-contained full face positive pressure breathing apparatus nearby
- Refer to MSDS for more information.

Material Compatibility

- Nitrogen is non-corrosive and so any common metal is acceptable provided equipment is designed to withstand process pressure and temperature. Equipment to handle liquid nitrogen must be constructed of suitable materials for the low temperatures encountered.

Argon (Ar), Liquid

Non-toxic, colourless, odourless and tasteless liquid.

Hazards

- Extremely cold, cryogenic liquid
- Asphyxiant in high concentrations.

Classifications		
Gas	**Purity**	**Valve Outlet Connections**
Argon Industrial	97,5%	Liquid withdrawal 3/8" BSP R/H male with 45° inverted flare Gas withdrawal 5/8" BSP R/H female with 60° inverted flare
Argon Technical	99,99%	

Higher grades and purities of this product are available from Afrox on request

Supply

Details of a wide range of storage vessels and ancillary equipment are available from Afrox on request.

Physical Data	
Appearance/odour	Colourless and odourless
Molecular weight	39,948
Specific volume at 21,1˚C and 101,325 kPa	603,7 ml/g
Boiling point at 101,325 kPa	-185,9˚C
Critical temperature	-122,29˚C
Relative density (air = 1) at 1 atm and 0˚C	1,380
Absolute density of gas at 101,325 kPa and 0˚C	1,7841 kg/m^3
Flammability	N/A

Uses and Features

- Liquid argon is used in GMAW process of aluminium and the GTAW process of most metals including steel, stainless steel, nickel and copper
- Plasma jet torches, utilising an argon-hydrogen mixture, are used for cutting operations and for coating metals with refractory materials. The high temperature preparation, refining and fabrication of many materials must be carried out in an argon (or helium) atmosphere. Most of the high-purity single crystals used for semi-conducting devices are grown in an argon atmosphere. In doping semiconductors with controlled amounts of impurities, the latter are frequently introduced in a stream of argon.

Precautions in Use

- Use only approved temperature and pressure rated equipment
- Do not trap liquid between closed valves
- Wear face shield, use leather protective gloves and overalls when handling low temperature equipment
- Keep self-contained full face positive pressure breathing apparatus nearby, in the event of accidental spillage
- Use only in well ventilated areas
- Refer to MSDS for more information.

Material Compatibility

- Liquid argon is non-corrosive and so many common metals are acceptable, provided equipment is designed to withstand process pressure and temperature. At cryogenic temperatures, the risk of materials becoming brittle has to be given expert consideration. Please refer to Afrox for advice relative to your specific application.

Carbon Dioxide (CO_2), Liquid

A colourless, odourless, non-flammable gas that is denser than air. Supplied as liquid from tanker to bulk storage vessel.

Hazards

- Low temperature liquid, rapid release to atmosphere will produce solid carbon dioxide (dry ice) and low temperature gas
- High pressure liquefied gas
- Asphyxiant in high concentration.

Classifications		
Gas	**Purity**	**Valve Outlet Connections**
Carbon Dioxide Technical	99,95%	Liquid withdrawal 5/8" BSP R/H male Gas withdrawal 0,860" 14 TPI Witworth male

Supply

Details of a wide range of storage vessels and ancillary equipment are available from Afrox on request.

Physical Data	
Appearance/odour	Colourless, odourless and non-toxic liquid
Molecular weight	44,011
Critical temperature	31,0˚C
Relative density (air = 1) at 101,325 kPa and 0˚C	1,53
Density, liquid at boiling point 156,0 kg/m³	-122,29˚C
Flammability	N/A

Uses and Features

- Carbon dioxide uses include: soft drink carbonisation, food freezing and chilling, purging and inerting, snow shooting for in-transit refrigeration, and potable water treatment
- Carbon dioxide is also used as a chemical reactant, pH buffer, grain storage fumigation, greenhouse atmosphere enrichment, oil well stimulation and clean-out, tobacco processing, propellant in aerosol packaging, solvent for extraction of organic chemicals.

Precautions in Use

- Use only approved pressure and temperature rated equipment
- Workers should use gloves and may require additional protective clothing (apron, face shield) which is resistant to low temperatures to prevent freeze burns and frostbite, if more than momentary contact with solid CO_2 at low temperature is required
- Refer to MSDS for more information.

Material Compatibility

- Dry carbon dioxide is non-corrosive, hence any common material is acceptable, e.g. steel, iron, copper, brass, plastic
- Moist carbon dioxide is slightly corrosive, hence acid resistant materials are required, e.g. stainless steel, certain plastics. Low temperatures require special materials of construction.

On-Site Production (ECOVAR®)

ECOVAR® (ECOnomical and VARiable) - On-site Gas Generation
The ECOVAR® concept from Linde is the solution of choice for a broad range of industries that require continuous, if sometimes fluctuating, amounts of high-quality gases. With our ECOVAR® on-site supply solutions, we ensure a continuous, monitored and flexible gas supply directly at the customer's site. For the on-site production of oxygen, nitrogen and hydrogen, we combine standardised components which are cost-efficiently adapted to specific demands on location.

Nitrogen ECOVAR® Solutions

Range	Capacity Range (TPD)	Purity Range	Spec Power (kWh/Nm³)*
CRYOSS®-N GAN	120 to 900	10 ppm to 1 ppb O_2	0,22 to 0,24
CRYOSS®-N MiniGAN	6 to 78	up to 0,1 ppm O_2	0,25 to 0,34
ADSOSS™-N A-Series	30 to 150	95 to 99,995% N_2	-
ADSOSS™-N G-Series	6 to 60	95 to 99,9% N_2	0,25 to 0,6
ADSOSS™-N ECOVAR® Mini	0 to 6	95 to 99,995% N_2	-

*based on an outlet pressure of 8 bara

Oxygen ECOVAR® Solutions

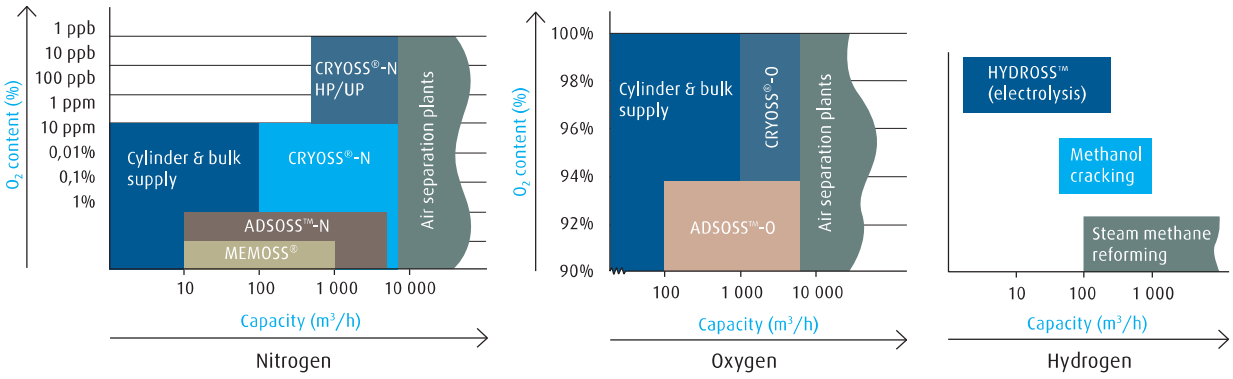
Range	Capacity Range (TPD)	Purity Range	Spec Power (kWh/Nm³)*
CRYOSS®-O	35 to 300	90 to 99,5% O_2	0,4 to 0,5
ADSOSS™-O Modular VPSA	70 to 195	90 to 93% O_2	0,34 to 0,36
ADSOSS™-O Containerised VPSA	7 to 60	91 to 99,5% O_2	0,37 to 0,39
ADSOSS™-O PSA	5 to 20	91 to 93% O_2	0,7 to 0,8

*based on an outlet pressure of 1,2 bara

Hydrogen ECOVAR® Solutions

Range	Capacity Range (kg/day)	Purity Range	Spec Power
HYDROSS™-S Steam Reforming	535 to 2 100	95 to 99,999% H_2	0,4 Nm³ natural gas / Nm³ H_2
HYDROSS™-E Electrolyser	20 to 128	up to 2 ppm O_2	5,4 kWh/Nm³

CRYOSS® = Cryogenic On-Site Supply
ADSOSS™ = Adsorption On-Site Supply
HYDROSS™ = Hydrogen On-Site Supply
VPSA = Vacuum Pressure Swing Adsorption
PSA = Pressure Swing Adsorption
TPD = Tonnes Per Day




1006
AFROX
A Member of The Linde Group
A Member of The Linde Group