Shielding gas.

Gases for welding carbon and low-alloy steels.
Steel forms the largest and most widely used group of structural and engineering alloys with more steel being used in manufacturing than all other metals and alloys put together.

Steel is a term generally used to describe an extensive range of iron-carbon alloys. The carbon content may be up to 2% but the majority of steels contain less than 1%.

Simple steels, with carbon, silicon and manganese as the main alloying additions are often called carbon steels or carbon-manganese steels, whereas steels with small amounts of additional alloying additions such as chromium, nickel and molybdenum are called low-alloy steels. Low-alloy steels are used in a wide range of applications such as low and high temperature service, creep and wear resisting applications.
Improved performance for MAG welding.

Its versatility also allows it to be used either manually, automatically or robotically. The choice is determined by the complexity of the component to be welded, the skill of the workforce and production requirements.

Argon based gas mixtures are commonly used to weld carbon and low-alloy steels. These mixtures contain additions of active gases – oxygen and/or carbon dioxide – to improve welding performance. Helium may also be added, especially if high production rates are required. How much of these active gases is added depends on the material thickness, production performance required and welding method, be it manual, automatic or robotic.

**SPECSHIELD® 8% CO₂/Argon**

A good general purpose shielding gas for use in dip, pulse and spray transfer. The amount of spatter and slag islands produced by this mixture is low, making it ideal for applications where minimum post weld cleaning is required, saving time and reducing the cost of manufacture. The low surface oxidation also makes it ideal for applications that require post weld painting.

Although suitable for a range of material thicknesses, care must be taken when welding above 8 mm thickness in spray transfer, as lack of sidewall fusion can be a problem.

Used in a wide range of industries from truck manufacture to shipbuilding, it has proved ideal in applications where components are powder coat painted after welding.

**ARGOSHIELD® Light**

This three component shielding gas is designed predominantly for welding thinner materials. The low levels of carbon dioxide and oxygen in the weld reduce the risk of burning through and leaving holes in the weld area.

The addition of O₂ reduces the surface tension of the molten weldpool thus reducing the risk of spatter produced. Reduced spatter means less welding wire being wasted, as well as shorter clean up time – both again lowering production costs. This makes the product ideal for welding components that are painted or powder coated after welding.

The faster welding speeds achievable with this gas coupled with a low heat input also help to reduce welding distortion.

However, this product can suffer from lack of sidewall fusion and inter-run porosity when welding thicker materials.

MAG welding is the most common welding process used for welding carbon and low-alloy steels. The high productivity obtained through this process makes it ideally suited for the construction and manufacturing of steel structures and components.
**SPECIALSHIELD 15% CO₂**

SPECIALSHIELD 15% CO₂ produces welds with very good penetration and sidewall fusion, especially when welding thicker materials. This reduces the number of defects in the weld, cutting down on rejected components. This mixture performs extremely well in both dip and spray but is on the upper limit of CO₂ content for pulse welding.

The high CO₂ content helps cope with surface contamination such as oil, moisture or rust, reducing pre-weld cleaning so reducing the cost of manufacture.

However, the higher CO₂ content produces more spatter and slag islands, which can add cost to the manufacturing process if clean, smooth weld areas are required. Welding sheet material is also more difficult with this gas, as the more fluid weld pool makes it easier to burn through.

**ARGOSHIELD Universal**

A three component mixture designed for maximum performance. It has a large current/voltage operating envelope making it easier to set a good welding condition, giving it a high level of welder acceptance, reducing the instances of weld defects.

Ideal for manual, automatic and robotic applications, it is the most stable and fluid shielding gas of its type. This ensures low spatter levels along with good penetration and sidewall fusion, reducing weld defects and keeping component reject levels to a minimum.

ARGOSHIELD Universal also produces smooth flat welds with low levels of reinforcement, wasting less welding wire than other mixtures. The fluid nature of the molten weld metal ensures good wetting action at the edges of the weld and the parent material, reducing the risk of stress defects occurring.

Welding speeds are high over a wide range of welding conditions, making it the first choice product when high levels of productivity are important.
Benefits for flux and metal cored welding.

Alloy flux cored and metal cored arc welding

<table>
<thead>
<tr>
<th></th>
<th>Carbon dioxide</th>
<th>SPECSHIELD® 20% CO₂</th>
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<tbody>
<tr>
<td>Welding speed</td>
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<tr>
<td>Spatter control</td>
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<td>Porosity control</td>
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<td>Fusion</td>
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<td>Penetration</td>
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<tr>
<td>Ease of use</td>
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Note: the greater the number of dots, the better the gas performs.

Flux cored arc welding and metal cored arc welding processes are similar to MAG welding, except that the welding wires are of a tubular construction containing flux powders and/or metal powders rather than being solid.

Consumable manufacturers blend their wires to suit one or two shielding gas mixtures; check which are recommended before commencing welding.

Carbon dioxide

This gas is suitable for use with many brands and types of flux cored wire. Often suggested by flux cored wire manufacturers because of its lower price, CO₂ gives good penetration even when welding in position.

However, it also produces a less stable welding arc which can increase the amount of spatter and particulate fume. This can lead to an increase in the cost of post weld cleaning.

**SPECSHIELD 20% CO₂**

For use with flux cored wires which are recommended for use with “mixed gas”. In general it gives lower fume and spatter levels than pure carbon dioxide. Lower fume levels can improve the workplace environment as well as improve the well being of the workforce.
High quality in TIG welding.

TIG welding is less frequently used with carbon steels and is used more for welding low-alloy steels where high precision joints and excellent surface finish are more important than high productivity.

Argon is the most common gas for TIG welding both carbon and low alloy steels because of its versatility. The welding arc is very easy to initiate which makes it ideal for all types of arc initiation systems.

The addition of helium to argon creates a more fluid weld pool which reduces porosity levels in the weld. The extra energy available from the helium also produces deeper penetration and better fusion, improving weld quality and reducing the risk of defects occurring.

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ALUSHIELD Light

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ALUSHIELD Universal

This higher helium mixture is best suited for use on thicker section materials to take advantage of the additional energy available. This helps improve penetration and fusion, producing welds with lower defects and is widely used on automatic welding stations where high welding speeds are the primary concern.

Gases for TIG welding

<table>
<thead>
<tr>
<th>Gases</th>
<th>Welding speed</th>
<th>Ease of arc striking</th>
<th>Porosity control</th>
<th>Fusion</th>
<th>Penetration</th>
<th>Ease of use</th>
<th>Thickness range (mm)</th>
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<tbody>
<tr>
<td>Argon</td>
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<td>0 to 5</td>
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<tr>
<td>ALUSHIELD Light</td>
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<td>1.6 to 10+</td>
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<td>ALUSHIELD Universal</td>
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<td>3 to 10+</td>
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BOC – turning ideas into solutions.

BOC is a member of The Linde Group, the leading global gases and engineering company. BOC is the UK’s largest provider of industrial, specialist and medical gases, as well as related products and services. As a leader in the application of technology, we are constantly looking for new ways to provide our customers with high quality products and innovative solutions.

At BOC we help our customers to create added value, clearly discernible competitive advantage and hence greater profitability. To achieve this we have a comprehensive range of products and services, and technical support which can be customised to meet the individual requirements of our clients.

To keep ahead of the competition in today’s market, you need a partner for whom quality, service, process and productivity optimisation are an integral part of customer support. We are there for you and with you, helping to build your success.

BOC’s reputation has been forged through partnerships – with customers, with relevant regulatory authorities and with key suppliers. In this way, we deliver comprehensive and consistent benefits to you.

BOC – world-leading knowledge and resources adapted to local requirements.