

Product Information Report

MIG/Flux-Cored/Gas Metal Arc Welding



Overview

Gas Metal Arc Welding (GMAW) is an electric-arc process which produces a coalescence of metals by heating them with an arc established between a continuous filler metal (consumable wire) electrode and the work. Shielding of the arc and molten weld pool for most of these wires is obtained from an externally supplied gas or gas mixture. There are a few self-shielded flux-cored wires that require no gas.

This process has come to be known by various names such as MIG (metal inert gas) welding, flux-cored wire welding, CO₂ welding, short-arc welding, spray-arc welding, etc. The formal name is gas metal arc welding since it can be used with both inert and reactive gases.

GMAW is operated in semiautomatic, machine and automatic modes. It is used in high-production welding operations. Its use is becoming more popular in maintenance welding and in hard-surfacing. All commercially-used metals such as carbon steels, stainless steels, aluminum, and copper alloys can be welded in all positions with this process by choosing the appropriate shielding gas, wire and welding parameters.

MIG Welding uses a solid wire and requires an external shielding gas and is usually designated with an "S" in the AWS designation, for example, ER70S-6.

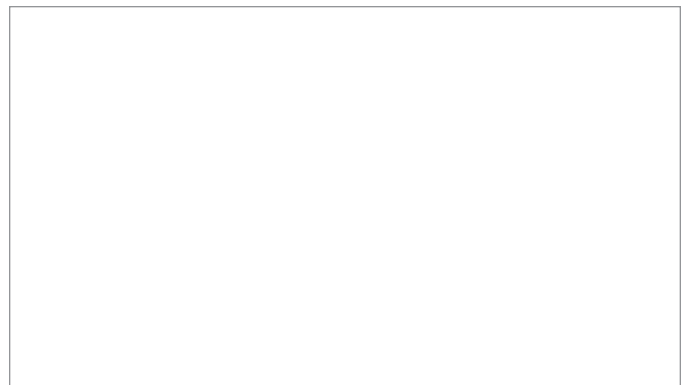
Flux-Cored Welding uses a tubular wire which may or may not require an external shielding gas and is designated with a "T" in the AWS designation, for example, E71T-11.

Advantages of GMAW

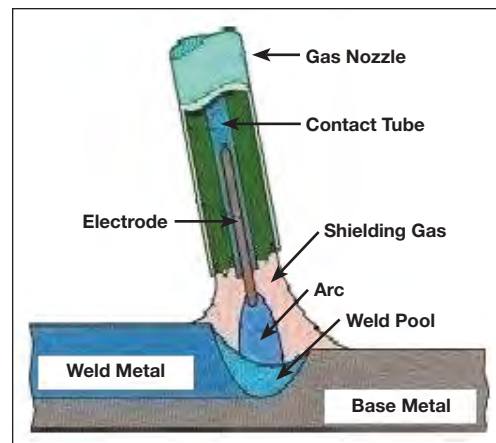
- Can be welded in all positions
- Can be used to weld most alloys
- Higher deposition rates than arc or TIG welding
- Faster welding speeds than arc or TIG welding
- Longer welds can be deposited with fewer starts and stops
- No stub loss (waste) as with arc welding

Limitations of GMAW

- Welding equipment is more expensive, complex and less portable than arc welding
- Process is more difficult to use in small spaces due to the size of the welding gun
- Produces higher levels of radiated heat and arc intensity than other processes
- Weld pool must be protected from air drafts that could interrupt the gas shield



Gas Metal Arc Welding Detail



Contact Tip – A copper tip in the MIG gun that the wire passes through. The tip must be the same size as the wire being used and must not be overly worn. The tip is the point where the wire picks up the voltage from the machine and continuous contact during welding is critical. A worn or oversized tip will result in the wire “lashing” side to side, greatly reducing the efficiency of the wire.

Gas Flow – Shielding-gas flow is measured in CFH (cubic feet per hour) and is adjusted on the gas-flow meter. The flow meter is attached to the regulator and should be adjusted for the proper gas flow while the gas is flowing through the MIG gun. Typical gas flow for MIG/GMAW is normally 20 to 45 CFH.

Shielding Gas Types – Shielding gases can vary from straight CO₂ for steel to pure argon for aluminum wires with hundreds of blends in between. Consult the manufacturer's recommendations for the proper gas choice.

Wire Feed Speed – The rate at which the wire is fed through the gun and to the workpiece. This is usually specified by the manufacturer and is measured in IPM (inches per minute). The machine has a means to adjust this.

Wire Spools – MIG wires are typically sold on spools that vary in size from 4", 8", 12" and larger. They are typically made from plastic, wire or fiberboard, depending on the manufacturer. Larger quantities (60 lbs. and up) may be spooled in coils and drums for hardfacing and production welding.