

Background Information and References:

GMAW: Gas Metal Arc Welding; [MIG (Metal Inert Gas) or wire-feed welding]

This is the most common form of welding. This welding process uses a wire consumable electrode that matches the base metal and uses a shielding gas to protect the arc. There are several types of wire and several types of shielding gas which are selected based on a variety of factors. There are four common modes of GMAW transfer: short circuit, globular, spray, and pulse. These processes are used in industry based on the application. GMAW is found in most welding shops, especially for production and fabrication applications. It is also commonly found in custom welding shops, maintenance departments, and sometimes construction.

FCAW: Flux Core Arc Welding

This is a wire-feed process that uses a special type of wire. Flux core wire is a hollow consumable wire with flux on the inside that helps to shield the arc and add properties to the weld. There are two main categories of flux core wire: FCAW-S and FCAW-G. FCAW-S is a self-shielding wire, meaning that it does not require shielding gas. This type of wire is beneficial for welding outdoors and is commonly used in construction because it provides the efficiency of GMAW without having to worry about wind blowing away shielding gas and causing weld defects. FCAW-G wire is often referred to as dual shield because it requires an external shielding gas along with the flux on the inside. This type of wire is commonly used in structural welding that is done in a shop and is beneficial because it provides the strength of FCAW with a better appearance than FCAW-S.

SMAW: Shielded Metal Arc Welding; [arc or stick welding]

This welding process uses consumable electrode, AKA welding rod, which consists of a metal core wire that is covered with flux. There are several types of SMAW electrodes that are used for different applications depending on the specific properties of the electrode and the type of base metal being welded on. SMAW is commonly used in construction and maintenance because it requires minimal equipment and can be used outdoors. SMAW is also common in pipe welding because of the portability and the ability of the electrodes to penetrate better than other welding processes.

GTAW: Gas Tungsten Arc Welding; [TIG (Tungsten Inert Gas), Heli-arc welding]

This welding process uses a non-consumable electrode made of tungsten to create an arc and an inert shielding gas, typically argon, to protect the arc. The welder often uses a filler wire that matches the base metal and is added to the molten weld puddle to add size and strength to the weld. This type of welding is commonly used to weld light gauge stainless steel, aluminum and magnesium. It is commonly

used in the food industry and for thin stainless steel pipe. It is also used for welding on bicycles, motorcycles, boats, ships, etc.

OAW: Oxyacetylene Welding

This welding process uses a flame produced with oxygen and acetylene gasses through a torch which melts the base metal. The welder often uses a filler wire that matches the base metal and is added to the molten weld puddle to add size and strength to the weld. This process has mostly been replaced with faster, stronger welding processes, especially in a production setting, but is still used for certain applications. Oxyacetylene welding is commonly used today for brazing applications, but is sometimes used for certain pipe welding or general welding.

Robotic welding:

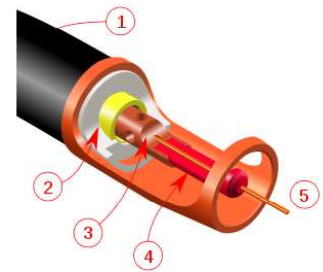
Used in production and only beneficial with applications where the same part needs to be welded repeatedly. Robots do not necessarily take away welding jobs because they require a welder to run one. It is important that a robotic welder is programed and operated by a welder because welders understand how welds are supposed to look, and need to be able to repair a weld in case the robot malfunctions. Robotic welding can use most of the arc processes, including GMAW, GTAW and SMAW. Robotic welding can also perform laser and spot (projection) welding. ***This is a process that will not be included in the curriculum, but may be wanted to introduce in the lesson.***

Lesson 1.2: Fact Sheet -Types & Applications of Welding – Overview

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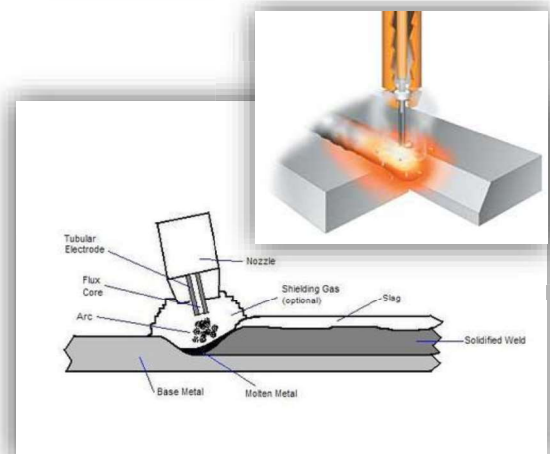
Shielding of the arc and the molten weld pool is often obtained by using inert gases such as argon and helium, and this is why GMAW is also called the metal-inert gas (MIG) welding process. Since non-inert gases, particularly CO₂, are also used, GMAW seems a more appropriate name. This is the most widely used arc welding process for aluminum alloys.



GMAW torch nozzle cutaway image. (1) Torch handle, (2) Molded phenolic dielectric (shown in white) and threaded metal nut insert (yellow), (3) Shielding gas diffuser, (4) Contact tip, (5) Nozzle output face

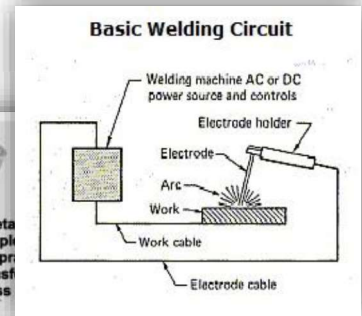
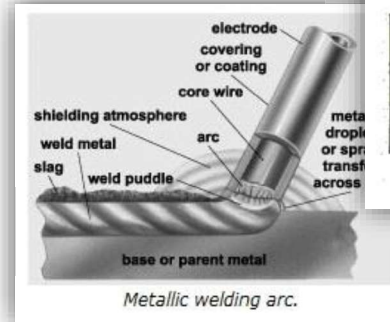
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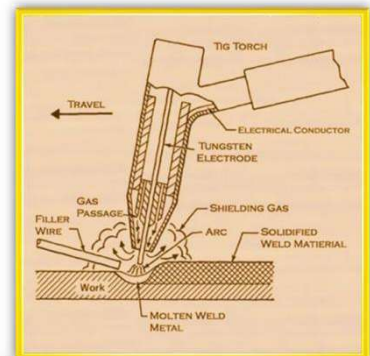
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