

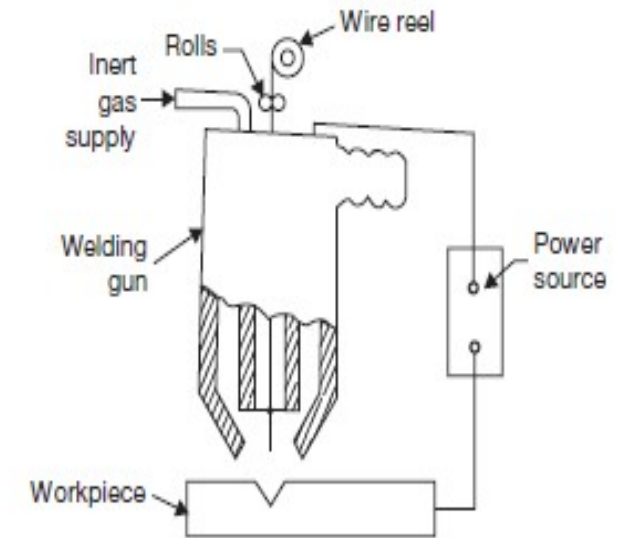
MECHANICAL ENGINEERING SCIENCE

JOINING PROCESSES



Metal Inert Gas Arc Welding (MIG)/Gas Metal Arc Welding (GMAW)

- In MIG welding, a high current density is supplied to the electrode and workpiece.
- Carbon dioxide gas or any inert gas like helium or argon is supplied to protect the weld pool. The electrode used is consumable and is in the form of a wire. Automated feed of the wire is used as shown in Figure .
- The welding current is used in the range of 100-300 amp. In this welding process, the metal transfer rate is very high. Therefore, it is generally used for welding of thick plate.
- The metals, welded by MIG welding are alloy steel, stainless steel, copper, brass, aluminum, magnesium, nickel, lead, silver, tungsten, etc.
- The current used is direct current and voltage is constant-arc voltage (CAV). Electrode used as a positive pole and work as the negative pole.



Metal Inert Gas Arc Welding

Metal Inert Gas Arc Welding (MIG)/Gas Metal Arc Welding (GMAW)

Advantages

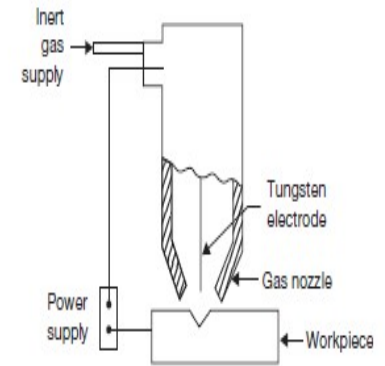
- The rate of weld deposition is very high.
- The quality of the weld is good due to the transfer of molten metal under the protection of inert gases.
- No frequent change of electrode is required.
- No flux is required; therefore no slug forms over the weld. This makes the process cleaner.
- It is a versatile process and can be used on both light and heavy gauge structural plates.

Limitations

- The cost of equipment and the consumable
- wire is much higher as compared to
- shielded arc welding.

Tungsten Inert Gas Arc Welding (TIG)/Gas Tungsten Arc Welding

- In this welding process, a non-consumable electrode of tungsten is used as shown in Figure. The filler material is supplied externally if it is required.
- The tungsten electrode is connected at negative pole of the power supply and work at positive pole of the power supply.
- Inert gas like argon or helium is supplied through a gas nozzle to protect the molten metal pool.
- The current used in TIG welding is both A.C. and D.C.
- Gases used as shielding gases are nitrogen for stainless steel and argon for aluminum and magnesium. Reactivity of nitrogen is very high with aluminum and magnesium at an elevated temperature.
- When an explosion problem does not exist, hydrogen gas may be used.
- The TIG welding may be used as fusion welding of aluminum, magnesium, stainless steel, alloy steel, Monel, Inconel, brass, bronze, tungsten, silver, molybdenum, etc.
- To avoid the melting of the electrodes, for larger current and better thermionic emission thorium or zirconium is added to the tungsten electrode



Tungsten Inert Gas Arc Welding

Tungsten Inert Gas Arc Welding (TIG)/Gas Tungsten Arc Welding

Advantages

- Since no flux is used, no special cleaning or slag removal is required. Most of the fluxes are corrosive in nature which prevents their use in food, drink and some chemical industries.
- It produces smooth and sound welds with fewer spatters.
- It can be easily automated.
- Welding can be done in all positions.

Limitations

- The cost of inert gases is high.
- Due to slow speed, it cannot be used for thick metal plates.