

Gas-Shielded Arc Welding

Gas-shielded welding can be divided into the tungsten gas-shielded welding and the metal gas-shielded welding processes. The tungsten gas-shielded welding covers the processes

- Tungsten plasma arc welding (PAW)
- Inert-gas tungsten-arc welding (TIG),

whereby TIG welding is the most widely used fusion welding process for aluminium.

The plasma welding consists only of the plasma-arc welding process which works with a transferred arc.

The metal shielded-gas welding is limited to the metal inert-gas welding process operating with an inert gas as shield, as well as a process combination with plasma welding (plasma metal shielded-gas welding - PMIG).

The abbreviations used are:

GAW	Gas-shielded arc welding	GMGMMA	Gas-mixture shielded metal-arc welding
GTAW	Gas-shielded tungsten arc welding	(MAGM)	
GMAW	Gas-shielded metal arc welding	MAGC	CO ₂ -shielded metal-arc welding
AHW	Atomic hydrogen welding	NGW	Narrow-gap welding
CAW	Constricted arc welding	EGW	Electro -gas welding
TIG	Tungsten inert-gas arc welding	PMIG	Plasma MIG welding
MIG	Metal inert-gas arc welding	p	Pulsed arc
MAG	Metal active-gas arc welding	sh	Short arc
PJW	Plasma jet welding	sp	Spray arc
PAW	Plasma arc welding	l	Long arc
PJPW	Plasma jet plasma arc welding		

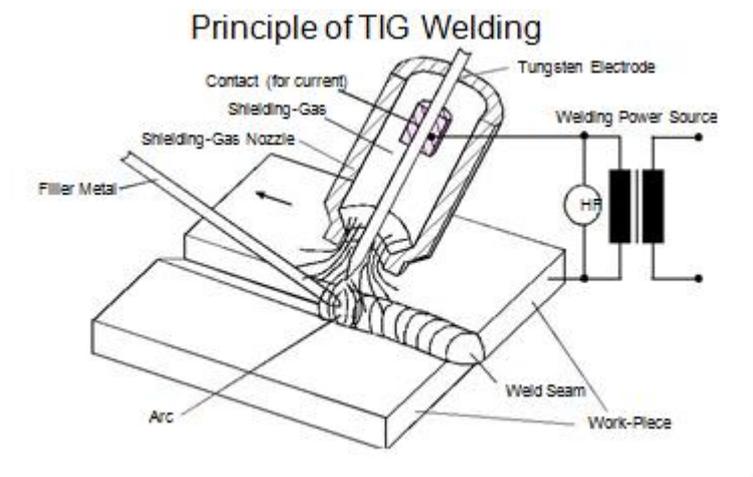
TIG Welding

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Principle of TIG Welding

During TIG welding, an arc is maintained between a tungsten electrode and the work-piece in an inert atmosphere (Ar, He, or Ar-He mixture). Depending on the weld preparation and the work-piece thickness, it is possible to work with or without a filler. The filler can be introduced manually or half mechanically without current or only half mechanically under current



The process itself can be manual, partly mechanised, fully mechanised or automatic. The welding power source delivers direct or alternating current (partly with modulated or pulsed current).

A major difference between the welding of steel and the TIG welding of aluminium is the adhering oxide film on the aluminium surface which influences the welding behaviour and has to be concerned.

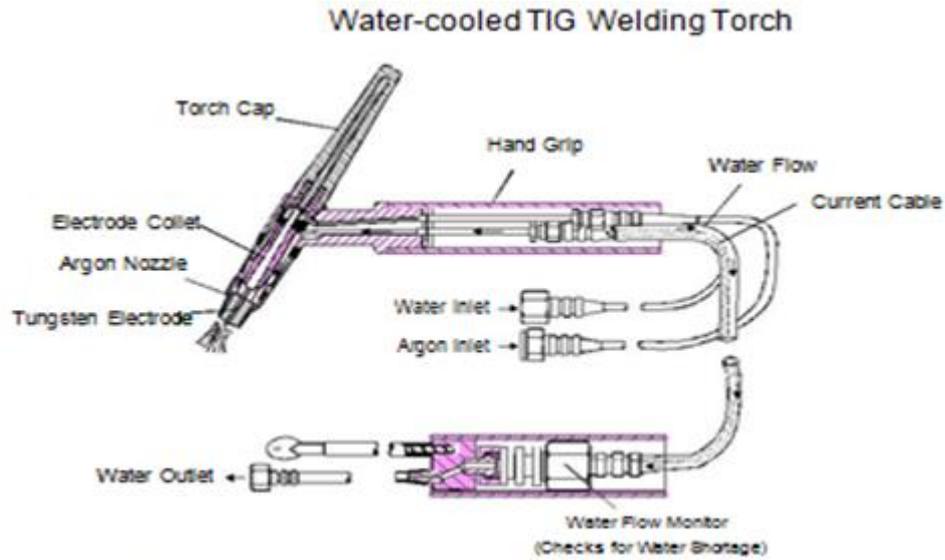
This oxide film has to be removed in order to prevent oxides from being entrapped in the weld. The oxide film can be removed by varying the current type or polarity or also through the use of suitable inert gases.

TIG welding equipment consists of the following components:

- Source of welding current (including welding controls, filtering condensers and pulse modulation)
- Torch unit with hose packet
- Gas cylinders with pressure-reducing valve and flow meter

Modern welding power sources can deliver both direct and alternating current.

The power sources have falling characteristic curves. The current can be varied in steps or continuously. The voltage required depends on the distance between electrode and work-piece and determines the operating point on the characteristic line. In modern power sources designed with transistors, the currents and times can be controlled continuously or can be regulated using control programmes.



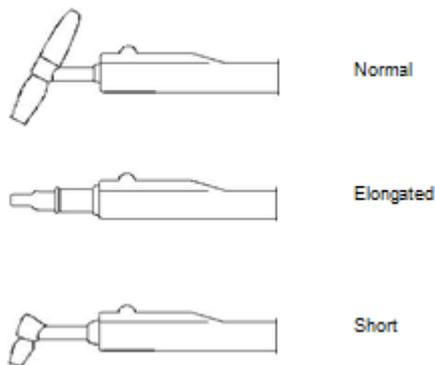
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Torch Forms for TIG Welding

Torches of different configurations are necessary to allow for the different accessibilities of the weld seams (work-piece form, welding position). Welding at locations which are difficult to access can be made easier by using the short or elongated torch forms.

Torch Forms for TIG Welding



Shielding Gases for Welding and Cutting

The type of shielding gas used has a major influence on the weld quality. Only inert gases and their mixtures are utilised for welding aluminium, as opposed to the welding of steels. The required purity of the gases must be guaranteed. It is most important that the limiting value for humidity is not exceeded. The gases are either delivered in compressed form in cylinders or obtained by a vaporisation process (liquefied gas) through pipe lines.