

**LESSON PLAN**

Date \_\_\_\_\_

Trade:- Welder

Name \_\_\_\_\_

Unit/Lesson:-Forty Three

**Subject:-** Plasma arc welding and cutting process ,equipments, and principle of process.

Types of plasma arc and advantages ,applications.

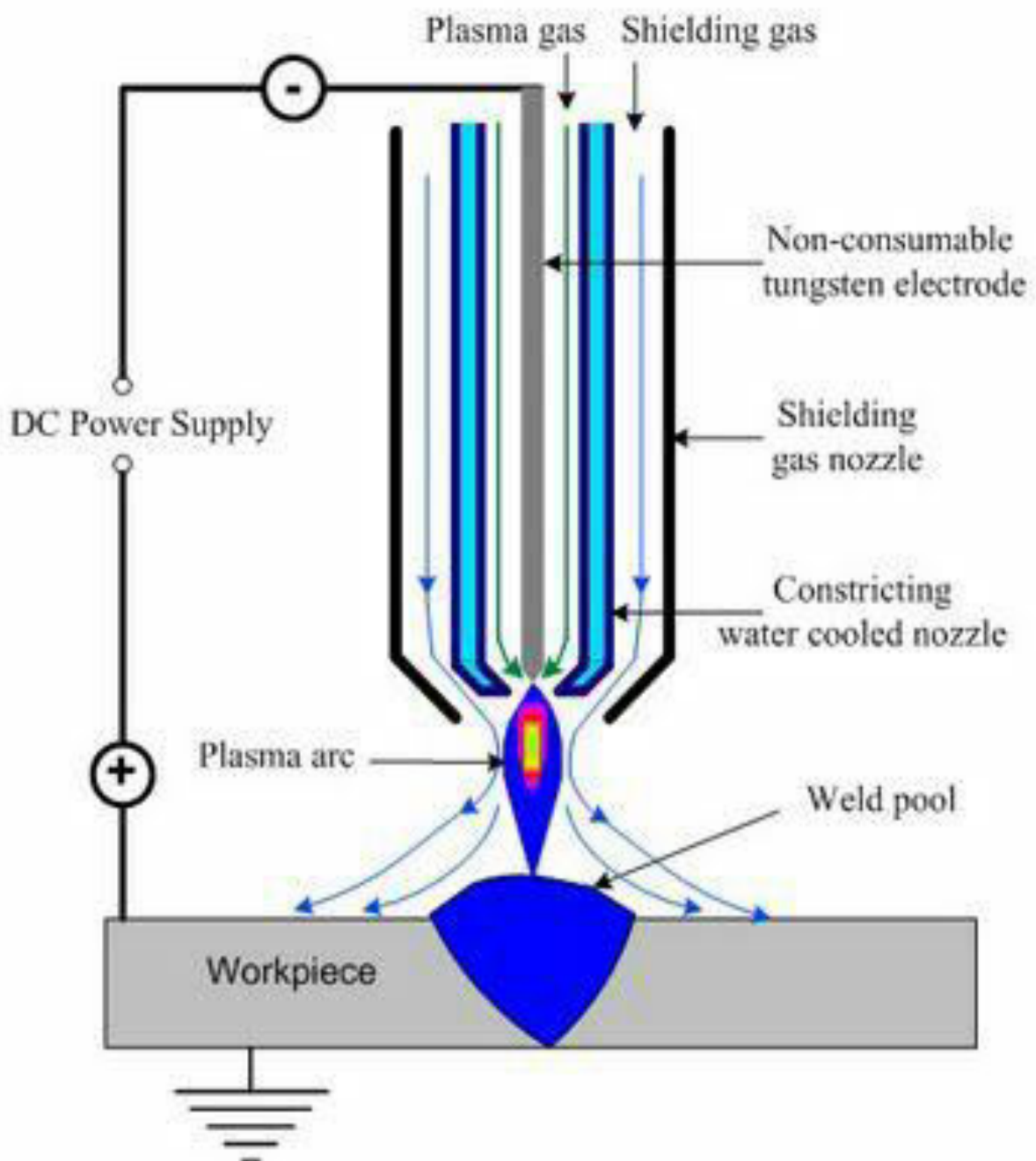
**Motivation:-** In previous lesson we discuss about friction welding and laser beam , electron beam welding.**PREPARATION**

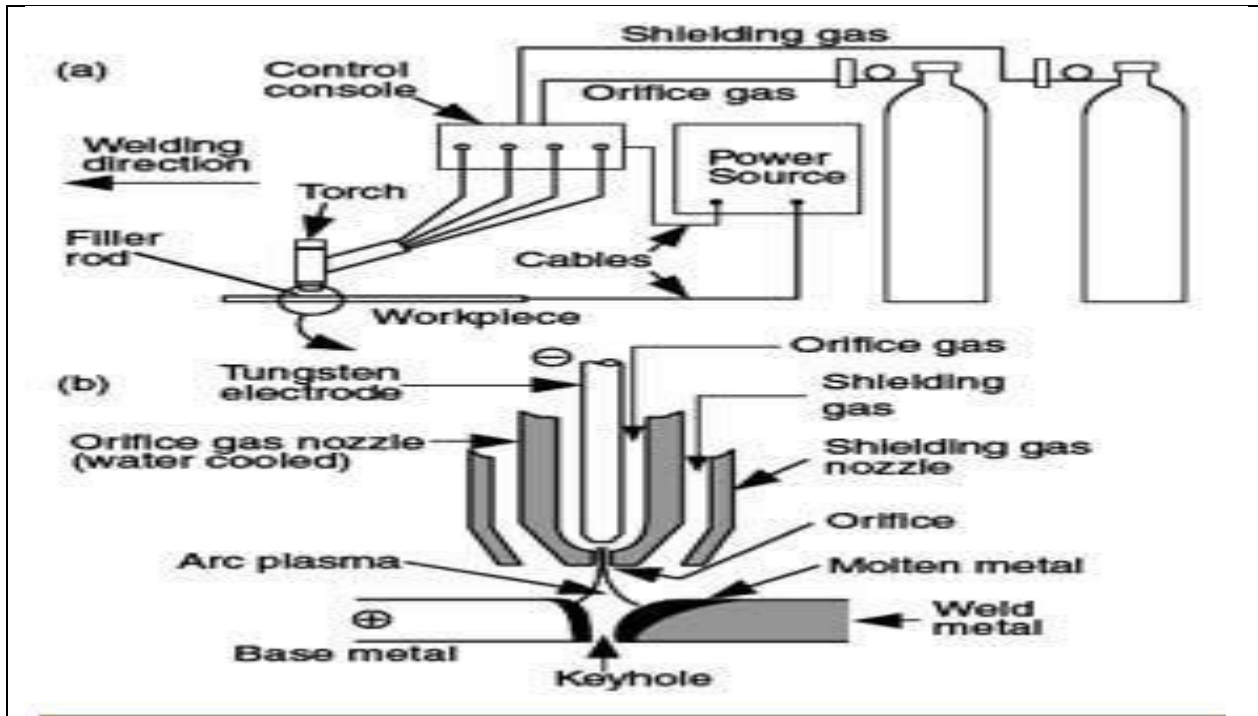
- 1) (Materials, Tools, Models, Charts and other aids)

**INTRODUCTION:-** Plasma arc welding and cutting are a modern process . Today in industry most of computer guided cutting operation done by plasma cutting. This process is cheaper than other .

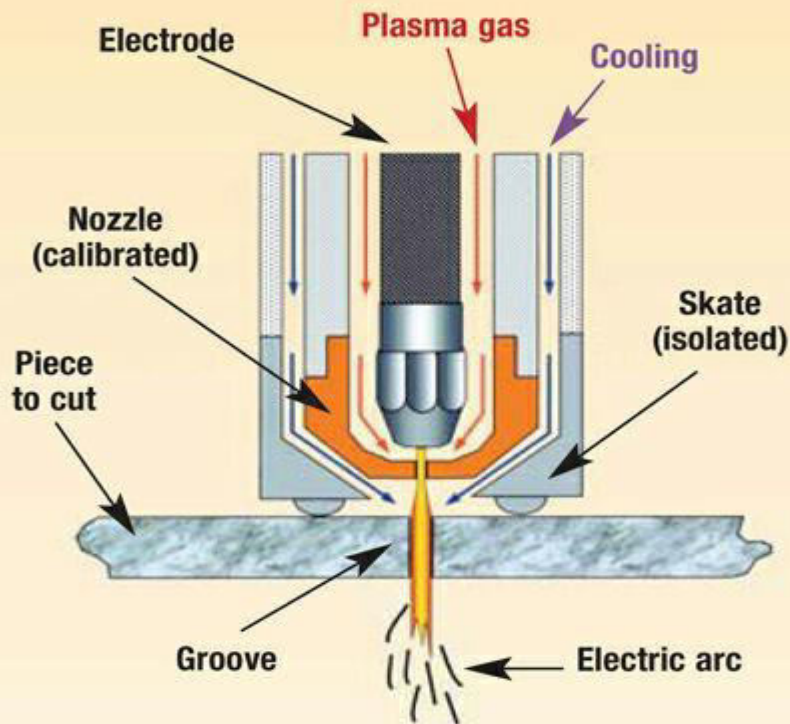
Topic	Information Point	Spot Hint
Plasma	Arc plasma is the temporary state of a gas. Gas gets ionized after passage of electric current through it and it becomes a conductor of electricity. In ionized state atom break into electrons – and + ions and the system contains a mixture of ions. The degree of ionization may be between 1% and greater than 100% ie double and triple degrees of ionization. Such states exist as more number of electrons are pulled from their orbit	
Principle	The electric arc is formed between an electrode(which is usually but not always made of sintered tungsten) and the work piece. The key difference from GTAW is that in PAW, by positioning the electrode within the body of the torch, the plasma arc can be separated from the shielding gas envelope. The plasma is then forced through a fine-bore copper nozzle which constricts the arc and the plasma exits the orifice at high velocities (approaching the speed of sound) and a temperature approaching 28,000 °C (50,000 °F) or higher.	
History	The plasma arc welding and cutting process was invented by Robert M. Gage in 1953 and patented in 1957.	
Types	Non-transferred arc process-The arc is formed between the electrode(-) and the water cooled constricting nozzle(+). Arc plasma comes out of the nozzle as a flame. The arc is independent of the work piece and the work piece does not form a part of the electrical circuit. Just like an arc flame	

(as in atomic hydrogen welding), it can be moved from one place to another and can be better controlled. The non transferred plasma arc possesses comparatively less energy density as compared to transferred arc plasma and it is employed for welding and in applications involving ceramics or metal plating (spraying). High density metal coatings can be produced by this process. A non-transferred arc is initiated by using a high frequency unit in the circuit. Transferred arc process-The arc is formed between the electrode(-) and the work piece(+). In other words, arc is transferred from the electrode to the work piece. A transferred arc possesses high energy density and plasma jet velocity.

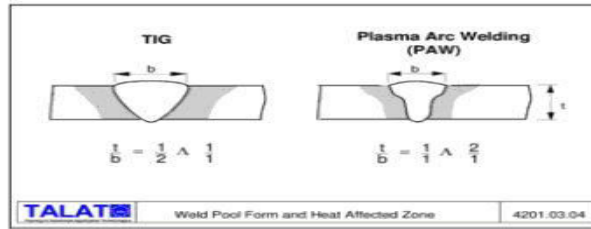




## PLASMA CUTTING PROCESS



equipments	Same as TIG but nozzle is different.	
Applications and advantages	Plasma arc welding is most useful welding and cutting in industry. In present mostly cutting done by computer guided plasma and quality of cutting is very fine. 1 mm to 25 mm cutting done easily.	

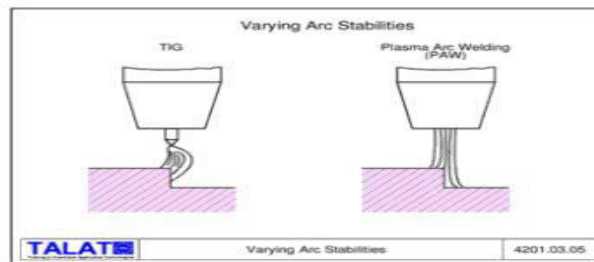


The amount of filler metal and the heat input is much lower, so that distortion is less and heat sensitive materials can be better controlled.

The overhead shows a plasma arc weld with a "wine glass" type of weld penetration (Figure 4201.03.04).

**Varying Arc Stabilities**

The bundled and strongly constricted plasma stream is stabler than in the TIG process. The plasma arc does not tend to "stick" to edges and the weld pool (Figure 4201.03.05).



**Principle of the Keyhole Plasma Arc Welding**

Because of its high energy density, plasma arc welding is suitable for welding thicker cross-sections. One variation is the keyhole plasma arc welding. The plasma arc pierces through the welding parts and pushes the weld pool to the sides. By proper choice of

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**Questions:-**

1. What is plasma arc ?
2. How many types of plasma process?
3. Write two advantages of PAW?
- 4.

Next Lesson:- Resistance welding process types, principles, power sources and welding parameters. Applications and limitations.

Assignments:- Plasma arc welding and cutting process ,equipments, and principle of process.

Types of plasma arc and advantages ,applications.

Checked by.....

Instructor.....