

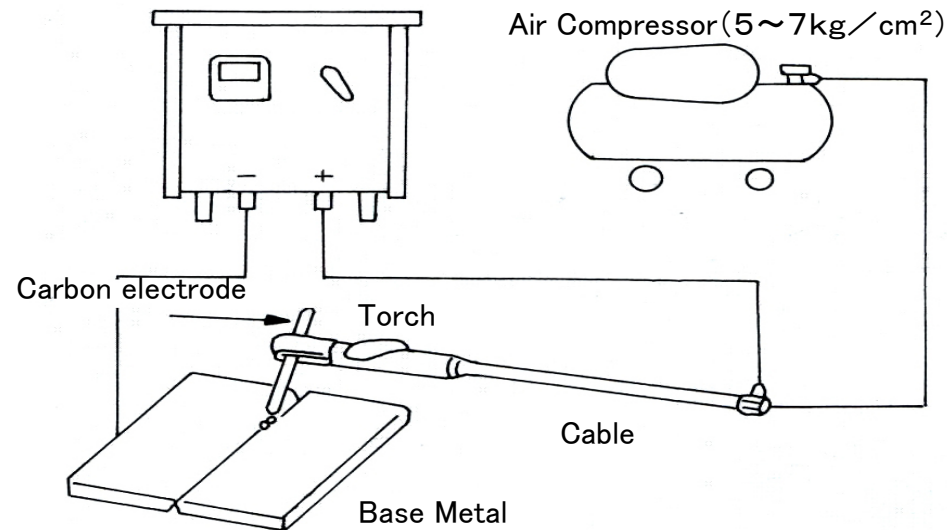
Gouging Carbon General Description

1. Gouging Arc Gouging Method

1 – 1 Working Principle and System Formation

Carbon arc gouging is a method of working upon metallic materials by use of an arc generated between carbon and the metal (steel, cast steel, stainless steel, etc.) Heat from the arc melts the metal and the air-jet spouted from the torch along the carbon simultaneously removes the molten metal to groove or cut the metallic material.

Principles of Carbon Arc Gouging Method



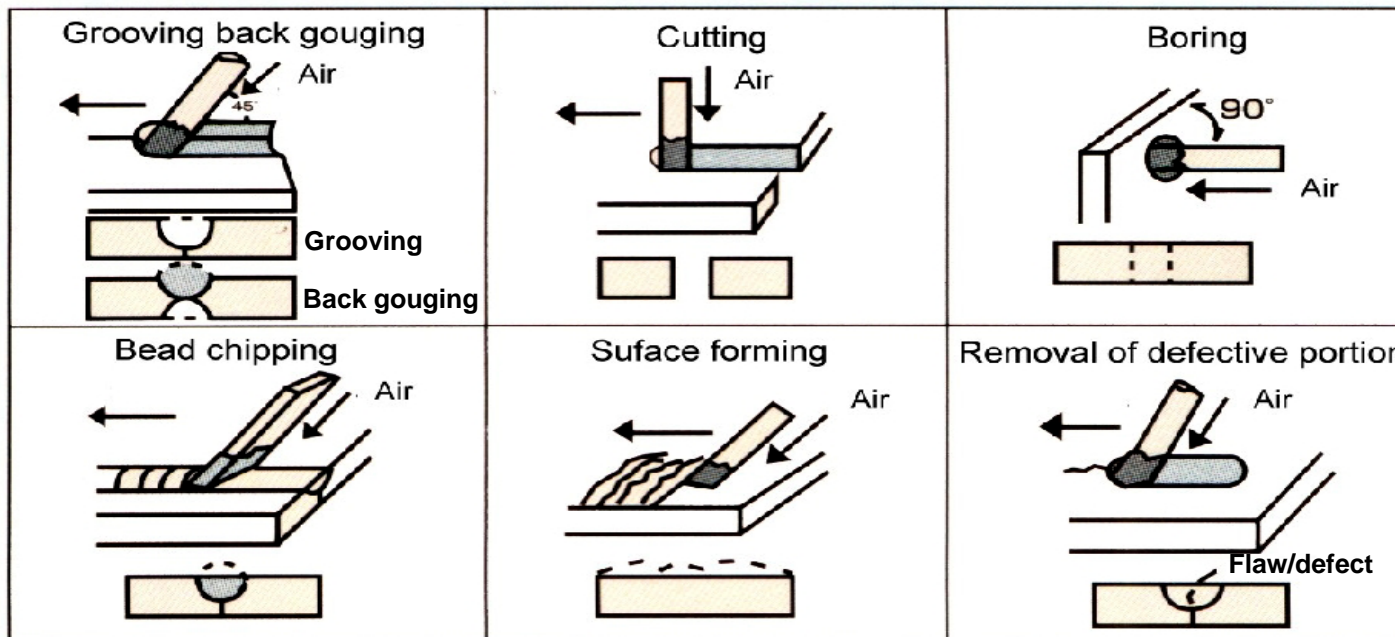
As illustrated above, the system is made up of a power source for carbon arc gouging, air compressor, torch and carbon electrode (gouging carbon).

2. Features and Applications of the Carbon Arc Gouging Method

2-1 Features

1. Economical advantage by high working efficiency
2. No adverse effect on base metals
e.g. Compositional changes of metal caused by high temperatures are limited to the surface layer of the metallic material only.
3. Defects in the welded zone are easily detectable
4. Simple operation enables fast training of operators
5. Various working options by the selection of carbon electrodes

2-2 Applications



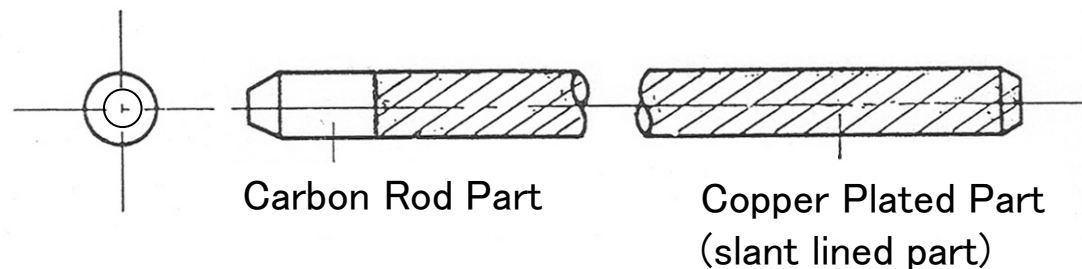
3. Carbon Electrode

The carbon electrode is the most critical part in the carbon arc gouging method.

Requirements for the electrode are as follows:

1. Low material consumption
2. Stable arc
3. Produce uniform groove shape
4. Little peeling—back of the plated copper and no chipping of carbon electrode while working
5. Stable quality

3—1 Configuration of Carbon Electrode



Carbon rod part: Main component is artificial graphite, which is uniformly molded at high density and then sintered.

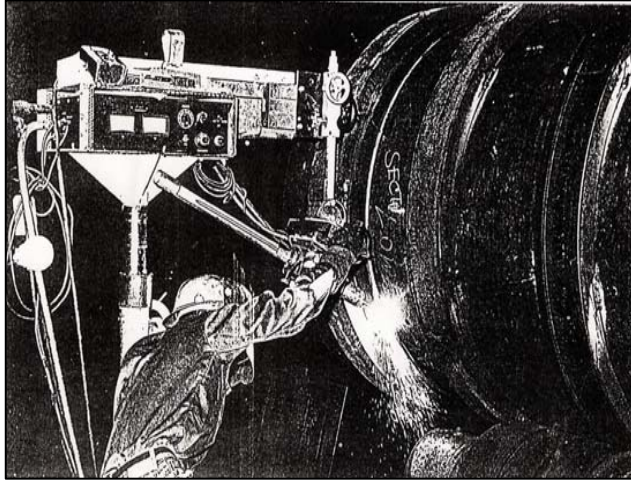
Copper—plated part: Conducts strong electric current to the carbon rod part in use.

3-2 Type of Carbon Electrode

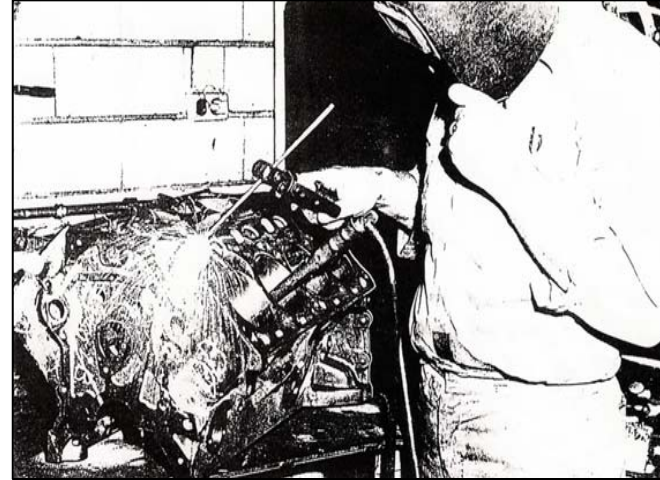
Grouping	Classification	Product Code
Gouging Carbon	DC Gouging Carbon (Standard type) AC Gouging Carbon (For AC power source) Neo-Gouging Carbon (Hollow Shape) Joint Gouging Carbon (Joint type)	GX, GSS, GE, GME AG GN 80; 95; 110J
Blasting Carbon	Blasting Carbon (Standard type) Joint Blasting Carbon (Joint type) Bead Blasting Carbon (Semicircular or plate shape)	130B, BS 130; 160; 190J 130; 160; 190JL S, H

① DC Gouging Carbon

Gouging carbons are used in the back gouging of the welded parts, removal of weld defects, cutting, boring, grooving, etc.



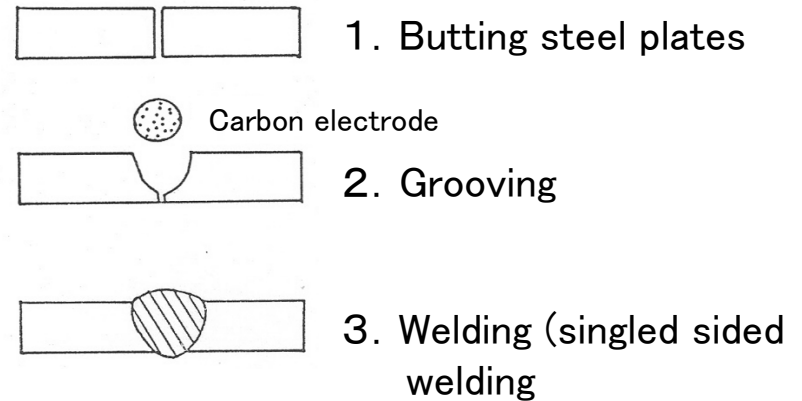
Gouging of a steel pipe
(Automatic gouging equipment)



Gouging work (manual operation)
The operator is removing the cracked portion of a casting.

○Grooving

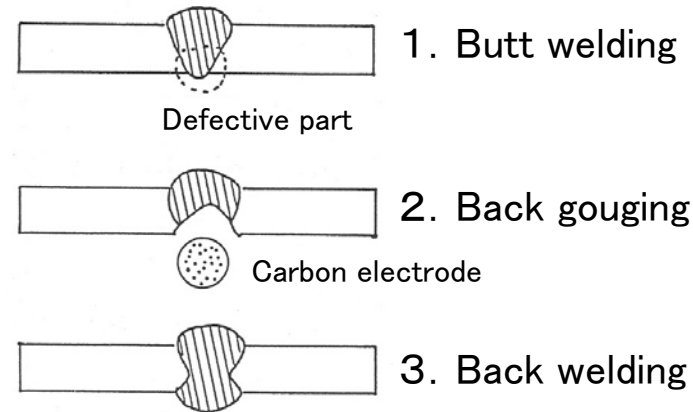
Grooving is preparatory work done prior to welding. For example, when butt welding two pieces of steel plate, grooving provides a groove at the end of each plate so the steel plates can be welded internally, as illustrated below.



Welding preceded by grooving produces an extremely strong weld because two steel plates are connected internally.

○ Back gouging

In butt welding, welding defects often develop near the back side of the material. Back gouging is the process which removes this defective portion.

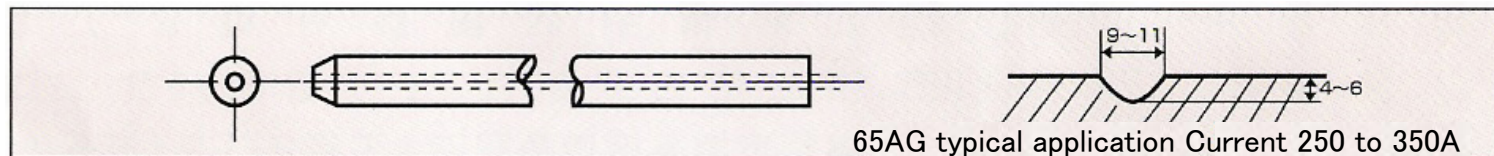


Back welding after back gouging eliminates any welding defects and yields greater weld strength than single-sided welding.

② AC Gouging Carbon

This is the gouging carbon to be employed when an AC power source is used. With AC power, arc discharge between the carbon electrode and metallic material is discontinuous and the arc is inherently less stable than with DC power. For improving arc stability, the AC gouging carbon is compounded with a special arc-stabilizing agent, and fabricated into a hollow shape. This enables stable operation, similar to that using DC power.

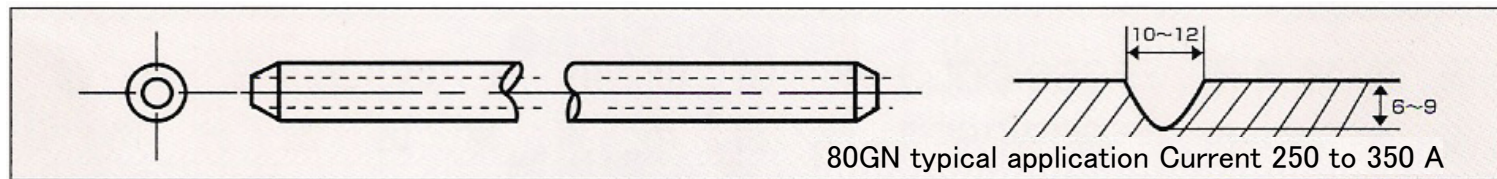
Applications of the AC gouging carbon are the same as for the DC gouging carbon.



③ Neo-Gouging Carbon

With applications similar to those of the DC gouging carbon, it is specifically used when U-shaped grooves are required. Its hollow shape makes it ideal for creating U-shaped grooves.

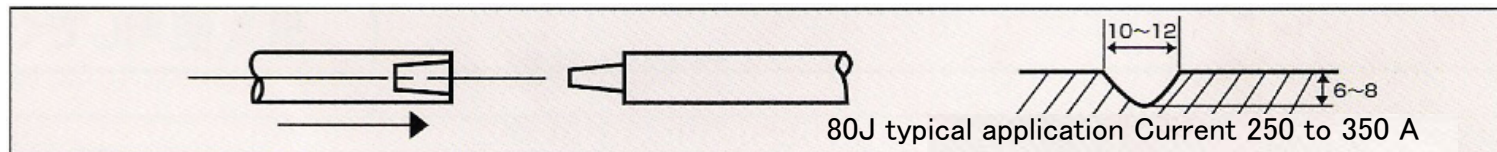
When a DC gouging carbon is used for working a deep groove, the groove tends to be V-shaped.



④ Joint Gouging Carbon

This is the carbon used exclusively for automatic gouging equipment: carbon electrodes are jointed together to facilitate continuous use in succession.

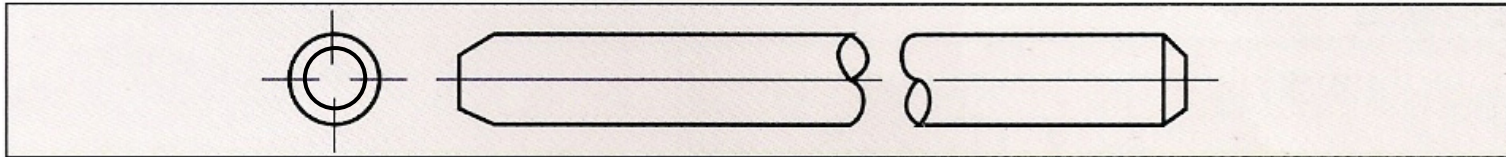
Used for working a long groove, this carbon minimizes electrode waste and improves operating efficiency by saving the time and labor of changing electrodes on the torch.



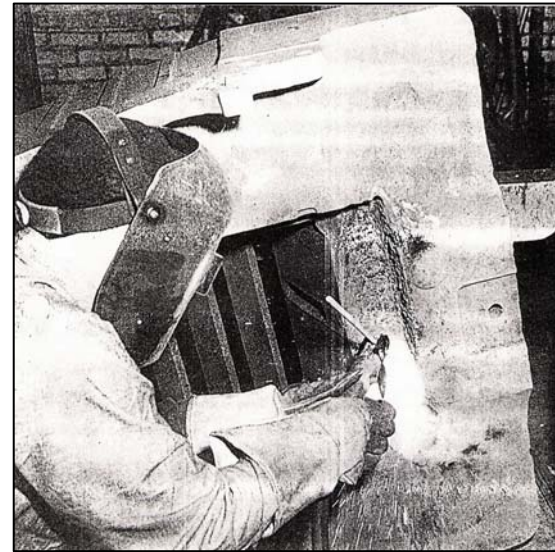
⑤ Blasting Carbon

This is used for cutting off the feeder head part, pads and fins from castings and removing defective portions from castings.

Carbon electrodes with large diameters of $\Phi 13$, $\Phi 16$ and $\Phi 19$ are used. The carbon itself is essentially the same as the gouging carbon.



Working with blasting carbon



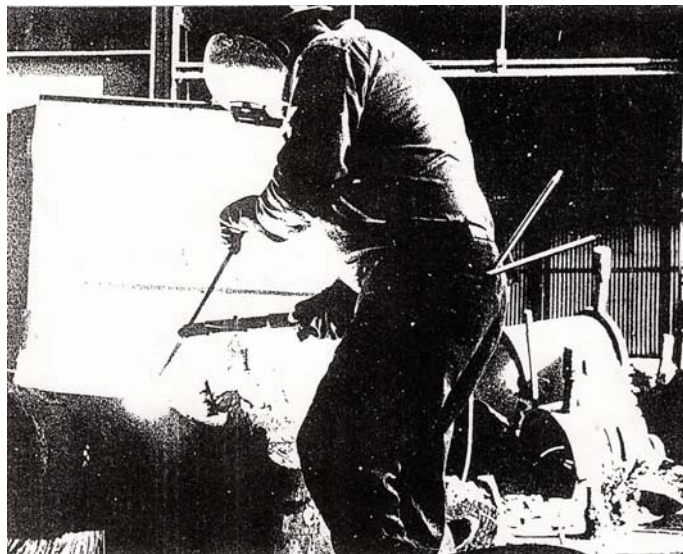
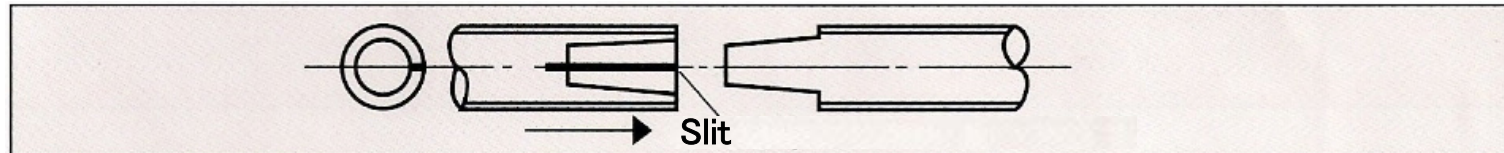
Removal of defective portions in casting

⑥ Joint Blasting Carbon

This is a blasting carbon in which electrodes are jointed together for successive use. It can be used in either manual operation or on automatic equipment.

Highly economical, an improved operating efficiency is achieved by minimizing electrode waste and by eliminating the time and labor for changing electrodes.

For use with automatic equipment, the carbon electrode must be reasonably free from bending and the joint parts must be worked in high precision to prevent easy detachment at the joint.

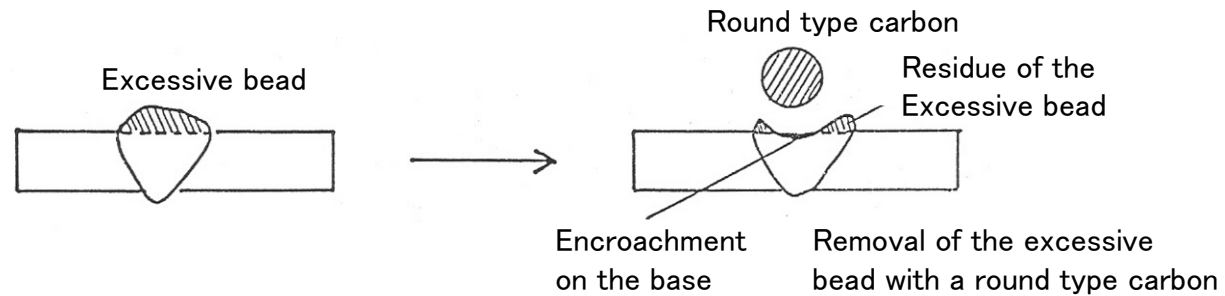


Example of using joint blasting carbon (130J)

⑦ Bead Blasting Carbon

This carbon is used for removing the excessive bead. It has a square (plate carbon) or semicircular (semicircle carbon) cross-section.

A round-type carbon cannot properly remove this excessive bead because molten metal is blown off when the arc is focused at the center of the carbon electrode.



Use of plate or semicircle carbon, depending on the size and shape of the excessive bead, enables effective removal of the excessive bead without creating a defect as illustrated below.

