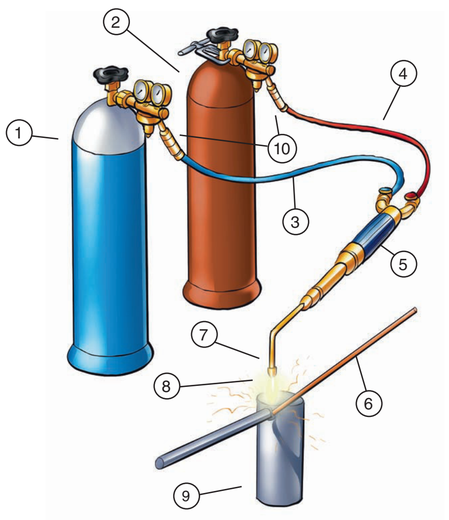
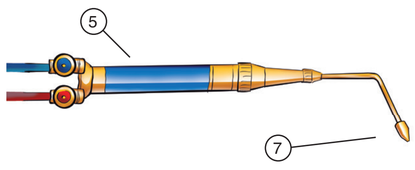
DVS MEDIA

MANUAL WELDING PROCESSES

Gas welding





Brief description

The heat source is a flame which is produced with the acetylene (C_2H_2) fuel gas and oxygen (O_2). The gases flow through the welding torch in a volume ratio of 1:1. After ignition, chemical reactions of these gases with each other produce a flame which exhibits a reducing flame zone closely behind the flame cone. The maximum temperature is 3,200°C. Acetylene constituents are burned completely in the flame envelope with 1.5 parts of atmospheric oxygen in addition. The welding flame is guided along the groove and completely melts the areas to be joined. At the same time, a welding rod (welding filler) is introduced into the molten zone by hand and fills the welding groove when it melts off. The flame zone exerting a reducing effect envelops the weld pool until it solidifies and protects it from the influence of air.

Areas of application

Universal joint welding in all positions on thin-walled sheets and pipes made of alloyed and mild steels with thicknesses up to 6 mm; preferably in pipeline construction, bodymaking and in the installation field as well as for repair welding work; due to the separately controllable complete melting of the base material and the melting-off of the welding rod, it can be used for the manufacture of defect-free welds even in the event of imprecise weld preparation.

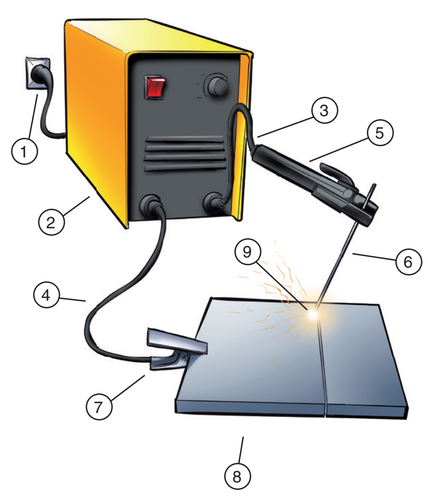
Typical welding data

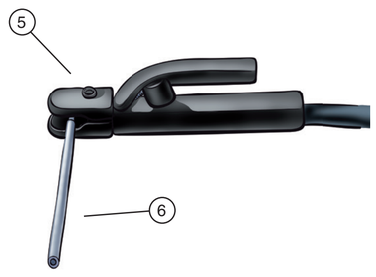
Gas consumption: approx. 100 l/h of acetylene and oxygen per mm of workpiece thickness (the consumption of gases is dependent on the flame size)

Deposition rate: up to 0.5 kg/h

① Oxygen cylinder with pressure regulator
② Acetylene cylinder with pressure regulator
③ Oxygen hose
④ Acetylene hose
⑤ Welding torch
⑥ Welding rod
⑦ Welding nozzle
⑧ Welding flame
⑨ Workpiece
⑩ Flashback arrestor

Manual metal arc welding





Brief description

The heat source is an arc which burns between a covered stick electrode (welding filler) and the workpiece. The arc melts the base material completely (at temperatures above 5,000°C). At the same time, the core rod (frequently mild steel) and covering of the stick electrode melt off in the form of droplets. The covering consists of mineral substances and/or cellulose. It has the tasks of improving the conductivity of the arc gap, of protecting the weld pool from the ingress of air by forming gases and slag and of incorporating the required alloying elements into the weld pool. The type of covering substances also has an influence on the welding behaviour with regard to the welding current type, the droplet size, the weld pool viscosity, the welding position and the slag removability. The stick electrode covering is selected according to the welding task.

Areas of application

Mild and alloyed steels, sheets, sections and pipes; workpiece thickness as from 3 mm in all positions, even in building site conditions; in metal, pipeline and tank construction, mechanical engineering as well as metal-working plants.

Typical welding data

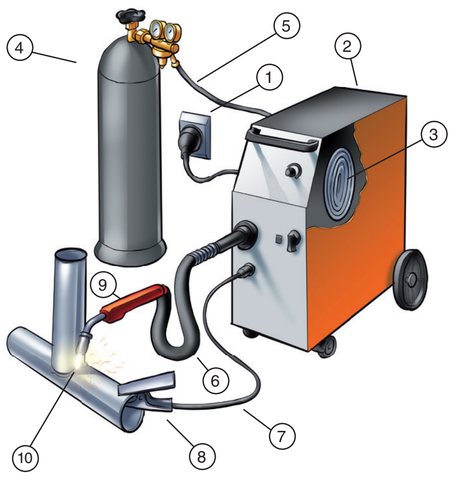
Stick electrodes: Ø 2.0 - 2.5 - 3.2 - 4.0 - 5.0 mm, length: 250 – 450 mm

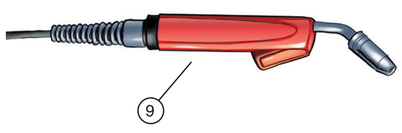
Welding current: amperage according to the data from the manufacturer

Deposition rate: up to 3.5 kg/h

① Mains connection
② Welding power source
③ Welding power supply lead
④ Welding power return lead
⑤ Stick electrode holder
⑥ Covered stick electrode
⑦ Workpiece clamp
⑧ Workpiece
⑨ Arc

Gas-shielded metal arc welding





Brief description

The welding installation consists of the welding power source, the shielding gas supply, the wire feed device, the control unit and the hose package with the welding torch. The shielding gas, the welding current and, as the welding filler, a wire electrode are supplied to the welding torch through the hose package. The welding current is conducted into the wire electrode via a sliding contact in the contact tube of the welding torch. This results in an arc visibly burning between the electrode and the workpiece. The wire electrode melts off in the form of droplets. The supply of the welding current immediately in front of the arc makes it possible to apply a high amperage to the wire electrode (e.g. a wire electrode with a diameter of 1.0 mm and a current-carrying capacity of 40 220 A). Both thin and thick cross-sections can thus be joined in a defect-free and economically viable way. When non-ferrous metals are welded, the weld pool is protected from the ingress of air by inert shielding gases (noble gases such as argon or helium). The process is then called metal inert gas (MIG) welding. Active shielding gases (carbon dioxide or mixtures consisting of argon and carbon dioxide and/or oxygen) are used when mild and alloyed steels are welded. The process is then called metal active gas (MAG) welding.

Areas of application

Mild and alloyed steels (MAG) as well as aluminium and other non-ferrous metals (MIG); can be used in all positions, on components with thicknesses between 0.6 mm and 100 mm; side air may disturb the shielding gas coverage (welding in building site conditions is problematical); wide area of application, e.g. for the manufacture and repair of motor vehicles as well as in structural steel engineering, metal construction, mechanical engineering and apparatus construction.

Typical welding data

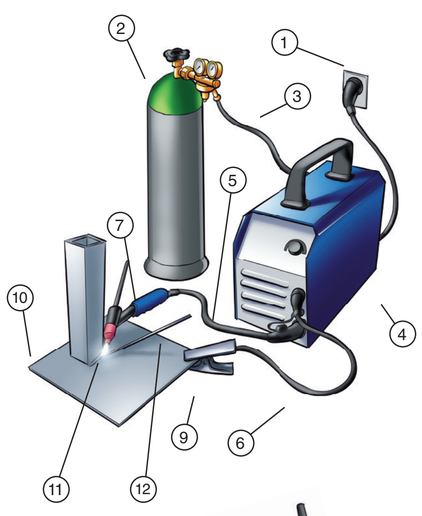
Wire electrode: common Ø 0.8 – 1.0 – 1.2 – 1.6 mm
wire feed speed: up to 15 m/min

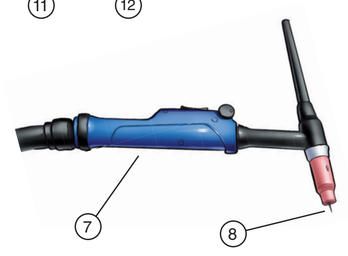
Welding amperage: up to 460 A with a wire electrode diameter of 1.6 mm, direct current or alternating current

Deposition rate: up to 7 kg/h

① Mains connection
② Welding power source
③ Wire electrode spool
④ Shielding gas cylinder with pressure regulator
⑤ Shielding gas hose
⑥ Hose package
⑦ Welding power return lead
⑧ Workpiece clamp
⑨ Welding torch
⑩ Arc

Tungsten inert gas welding





Brief description

The heat source is an arc. It burns between a non-consumable tungsten electrode (which is clamped in the welding torch) and the workpiece. In the case of manual welding, the filler material is guided into the arc by hand and is melted off there. The inert shielding gas (consisting of noble gases such as argon or helium) flowing out of the welding torch protects the glowing tungsten electrode, the weld pool and the adjacent material regions from the effect of air. The thermal load-bearing capacity of the tungsten electrode is limited. For this reason, it is not possible to achieve any high deposition rates with this welding process.

Areas of application

Mild and alloyed steels, aluminium, copper, titanium and nickel materials as well as other non-ferrous metals; can be used in all positions; on components with thicknesses between 0.5 mm and 5 mm (in the case of thicker workpieces, only the root layers are executed with this process); utilisation in aerospace technology, precision mechanics, apparatus and boiler construction as well as installations for the food sector. The shielding gas coverage is disturbed by side wind. Therefore, welding cannot be carried out in building site conditions.

Typical welding data

Welding current: direct current in the case of steel, copper, titanium and nickel, alternating current in the case of aluminium, amperage: up to 250 A with an electrode diameter of 4 mm

Shielding gas volume: 10 – 15 l/min

Deposition rate: up to 0.5 kg/h

① Mains connection
② Shielding gas cylinder with pressure regulator
③ Shielding gas hose
④ Welding power source
⑤ Welding power lead/shielding gas supply
⑥ Welding power return lead
⑦ Welding torch
⑧ Tungsten electrode
⑨ Workpiece clamp
⑩ Workpiece
⑪ Arc
⑫ Welding rod

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