LOW VOLTAGE Capacitor Discharge Welders

Features and Benefits:
- Welds without distortion or discoloration.
- Mechanical tolerances are maintained and parts are assembly ready without cleanup or finish machining.
- Short welding time localizes heat, allowing welds adjacent to heat sensitive parts.
- Excellent bonds with many similar, dissimilar materials as well as metals often considered unweldable.
- Extended electrode life.
- No Water Cooling Required.
- High production speeds limited only by part feeding equipment.
- Unaffected by power grid fluctuations.
- Insensitive to oil or other part surface anomalies.
- Low power requirements.
- Low operating costs even at high production rates.
- No special weld environment required.
- Space efficient and environmentally clean; no smoke or fumes.
- Large capacitor discharge welding machines can output 400KA current, and an energy output of 50kJ
- In the past and other companies today use High Voltage Capacitors. These capacitors range between 500 and 3000 V. Heron's Capacitors are low voltage, with a maximum voltage of 475V.

What is Capacitor Discharge Welding?

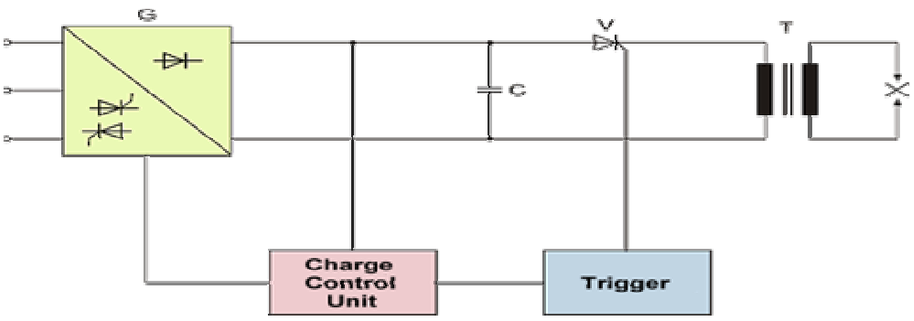
Capacitor Discharge Welding process is a modification of Resistance Welding, based on the principle of the transformed capacitor discharge system, with the advantage of very high reproducibility and low operating costs.

Two parts are welded through the combined application of mechanical pressure to the parts and discharge of constant electrical energy. Both these two components of the welding process are closely controlled and monitored through electrical control loops. The goal is to concentrate the released energy to the spot where the joining is to take place so that the maximum weld current has to pass through the minimum of contact area between the two parts.

The quality of the joint depends beside the pressure from the following factors:

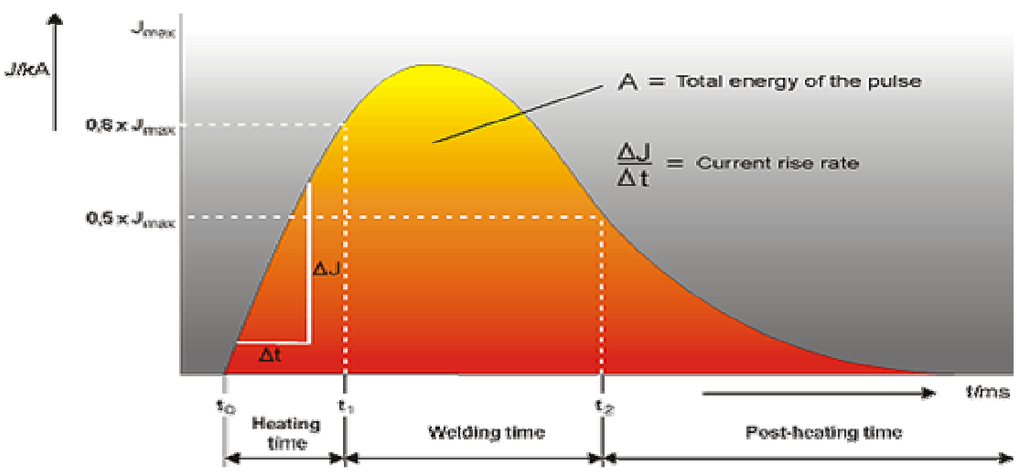
- High weld energy
- Short weld time

A simple principle schematic will explain to get this:



The electrical energy is stored in a capacitor [C] which makes the system independent of voltage fluctuations in the mains supply as well as prevent voltage drops when the weld pulse is triggered. The capacitor is charged via the controlled power supply [G]. The stored energy is discharged through a high performance Thyristor [V] to the primary side of the impulse transformer [T]. Because the special design of the transformer a very high current is induced on the secondary side of the transformer which is conducted directly to the electrodes. This current can be as high as 100 000A. Projections on the parts to be welded provide a very high contact resistance [minimum area of contact]. The current flow through the contact area creates rapid temperature rise which will meld the material. A special mechanical set down spring mechanism will transmit the pressure and produce an even lattice structure on the joint surfaces.

The Weld looks as follows:



The weld time [t1- t0] is between 4 und 12 ms depending on machine type and required energy. Since the released energy is delivered exclusively to the weld zone, the surrounding material is not effected. Should however in adjacent zones occur a change in the metallurgical structure, then a second defined discharge pulse (annealing) can partially correct this occurrence.

Because of the special characteristics which are part of the Capacitor Discharge Welding process, there are a number of technical and economical benefits which recommend this process for many joining applications.

Special Applications:

- Welding of different material components
- Welding of coated materials
- Welding of thin foils
- Welding of metal sheets with different thickness

Improved Quality:

- tight tolerances assure reproducibility
- Process control make easy integration in automated production lines
- Weld parameter control guarantee fluid and gas tight welds each time

Return of Investment:

- low energy cost since small energy loss during welding cycle
- storage of energy in capacitor, therefore independent of mains fluctuations
- long electrode life, no damage to the part surface
- high throughput, because of short weld cycle
- no cooling necessary

Cost Savings:

- no distortion of part due to temperature increase during welding cycle
- parts surface is maintained clean
- because of short weld discharge time, the lattice structure of material is not changed and the material characteristics are maintained

Secondary Current Output:

Model	Secondary Current A
500J	21700A
1000J	32000A
3000J	40600A
4500J	44600A
6000J	57700A
10000J	77400A
15000J	85000A
20000J	125000

Various Applications of Capacitor Discharge Welding

Flexible Exhaust Pipe
500J
Fixing of the flexible part to the tube prior to soldering
Material: CrNi to CrNi stainless

Fuel Connection Stud
500J
Fixing of the connection stud to the tube prior to soldering
Material: CrNi to CrNi stainless

Gear Wheel
42000J
Weld of a chain pinion to a shaft of high compressed sintered material
Material: FeC to FeC

Hydraulic Cylinder Connector
6000J
Pressure tight weld of a stud to a hydraulic cylinder tube
Material: FeC to FeC

Oil Filter
15000J
Oil tight weld of a connection stud on an oil filter housing
Material: FeC to FeC

Oil Overflow Stud
3000J
Pressure tight weld of three different components to an oil overflow
Material: FeC to FeC

Oil Sump
25000J
Pressure tight welds of connection studs to an oil sump body
Material: FeC to FeC

Oil Sump Bottom
25000J
Pressure tight weld of an outlet stud to an oil sump body
Material: FeC to FeC

Power Steering
15000J
Pressure tight weld of an angled connection stud to a tube
Material: FeC to FeC

Shock Absorber
25000J
Pressure tight weld of an endcap to a shock absorber tube
Material: FeC to FeC

Gas Spring
6000J
Pressure tight weld of an endcap for fixing the ball-and-socket joint
Material: FeC to FeC

Tank Filler Stud
15000J
Gas tight weld of a vent pipe on a fuel filler pipe
Material: FeC to FeC

Heater Connector
500J
Weld of a flat connector to a round material without influence of the heat sensitive isolator material
Material: FeC to CrNi

Gas Distributor
15000J
Gas tight weld of a connection stud to a tube Material: FeC to FeC

Gas Distributor
15000J
Pressure tight weld of brass studs to a steel body
Material: FeC to Ms

Thermostat
3000J
Gas tight weld of components of different material for a thermostat
Material: FeC to CuSn

Water Inlet
15000J
Pressure tight weld of a brass stud to a steel body plate

Compressor Connector
6000J
Weld of a copper tube to a steel housing (watertight)

Seat Adjuster

Brake Shoes