Gas-shielded metal arc welding (GMAW) is the most frequently used arc welding method. The welding equipment currently on the market is predominantly digitally controlled and programmable. It permits new process variants with specifically adjusted technological characteristics. New terms and names are being coined, and used in a company-specific way. The purpose of this poster is to help users to orient themselves when it comes to the various process control variants for GMAW.

**Classification by the manufacturer classification acc. to the technical bulletin DVS 0973**

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**Controlled/modified short arc**

With controlled short-arc processes, the equipment electronics detect both the short circuit and the arc phase and balance them separately. This can even be split into several temporal sectors (intervals) (controller-based control).

**Low-spatter short arc**

With these types of controlled short-arc processes, control measures ensure that the current is below a specific critical value at the time of re-ignition of the arc (conclusion of the short-circuit phase).

**Energy-reduced short arc**

This type of controlled short-arc process is specially parameterised for low energy input. Low-energy short-arc processes aim to either have a low energy consumption during welding or to keep the heat input into the workpiece low.

**High-performance short arc**

The deposition rate of the short-arc process can be increased through process control by shifting the transition to the mixed arc to higher wire feed rates. Compared with the mixed arc, the short arc introduces less energy into the workpiece and requires less dressing (spray). The desired behaviour is achieved through special current shaping during the short-circuit and arc phases.

**Modified spray arc**

The focused arc and the shortened metal transfer of the modified spray arc results in a higher energy density and a higher arc pressure due to the melt pool. This is an advantage when welding adjusted joint geometries (e. g. narrow gaps and small weld preparation dimensions).

**Pulsed arc**

The welding power source periodically switches to a higher impulse current that allows for a selective and well-controllable metal transfer, while the background current exclusively takes care of ionizing the arc zone and heating the end of the electrode as well as the surface of the base material. Through the current impulse a metal transfer in sync with the pulse frequency is achieved. Based on the controlled droplet transfer with a defined droplet volume, the filler material can be supplied specifically.

**Modified pulsed arc**

Controlled pulsed arc processes have more parameters, which generally require control on the basis of synergy characteristics. The variety of pulsed arc parameters in possible combination with other effects, control strategies and arc types produces a wide range of options for modifying the pulsed arc with a view to optimizing specific process characteristics.

**Alternating current processes**

Controlled changing of the polarity using additional power electronics during certain phases of the welding process adds another degree of freedom to the process control. Benefits primarily result from good bridging characteristics and in applications with low energy introduction and dilution.

**Combined process variants**

Modifications to process control in the timing of each individual metal transfer are no longer visible to the naked eye, the arc shape appears “averaged” to the human eye as a special shape with specific characteristics. The same applies to the heat conduction, the energy input, the penetration profile, the weld surface (e.g. weld ripples). Combined process variants break through this perception and effect, by enabling the timing of these effects to be resolved. By doing so they in turn achieve special new characteristics.

**Cyclic wire movement**

Cyclic modification of the wire feed rate can already be a feature of combined process variants if the individual process variants have different wire feed rates. This increases the demands placed on the wire feed system. Process variants that cyclically change the direction of the wire feed place even higher demands on the wire feed system.