

Electromagnetic Compatibility (EMC)

Introduction

EMC is the ability of different items of electrical equipment to work together without suffering the effects of interference. Equipment should operate without interfering with broadcast and communications signals and be immune to normal levels of such signals. For a given environment, e.g. on the factory floor, EMC implies that equipment should not generate unacceptable levels of interference which affect the performance of other products designed to operate in an industrial environment. Also, equipment should have sufficient immunity to electrical interference, such that the equipment continues to operate in an acceptable manner.

Welding processes inherently generate high levels of electrical noise and EMC has always been an issue, requiring careful design and use of equipment. But, recently EMC has become a wider issue, with the publication of an EC Directive on Electromagnetic Compatibility (89/336/EEC), which came into full effect in 1996. Under this Directive, manufacturers of equipment have a legal requirement to make a statement, that their equipment satisfies the requirements of the EMC Directive. The UK regulations implementing the EMC Directive were revised in 2005 and published as Statutory Instrument 2005/281.

EMC Directive and Standards

Since 1 January 1996, most electrical products sold in the EU must be constructed so that they do not cause excessive electromagnetic interference and are not duly affected by electromagnetic interference. They must carry a CE mark and a manufacturers 'Declaration of Conformity' must be prepared.

In most cases conformance can be claimed by meeting an appropriate Harmonised European Standard, which gives a 'presumption of conformity' to the Directive. There are four generic standards:

EN 61000-6-3:2001 EMC - Generic emission standard - Part 1. Residential commercial and light industry.

EN 61000-6-4:2001 EMC - Generic emission standard - Part 2. Industrial environment.

EN 61000-6-1:2001 EMC - Generic immunity standard - Part 1. Residential commercial and light industry.

EN 61000-6-2 1999 EMC - Part 6-2: Generic standards - Immunity for Industrial Environments.

Many products can comply with these standards, but for some products specific standards have been published and these take precedence. For arc welding equipment, there is a product standard EN 60974-10:2003, which specifies test procedures, emission limits and immunity requirements. The emission limits for arc welding equipment are higher than the generic limits, so care must be taken in the installation and use of the equipment to minimise interference. Another standard for resistance welding equipment is being drafted.

Sources of interference

Electromagnetic interference can radiate through the air or be conducted through the mains wiring. For arc welding, the main sources of interference are the power source electronics and the arc itself. High frequency (HF), used for arc starting in TIG welding creates the highest levels of interference.

Other phenomena which may cause interference are harmonic currents and voltage fluctuations. These are mains conducted phenomena, due to taking power from the mains. Problems of interference due to these phenomena are more likely to occur if the impedance of the mains is high, as may occur in rural areas with overhead power cables a long distance away from the sub-station.

Recommendations for reducing interference

Radiated interference can be reduced by screening of the equipment and cables. Conducted interference can be reduced by filtering of the mains supply.

The product standard EN 60974-10, includes an Annex, with recommendations for reducing interference from arc welding. To minimise interference:

Keep all cables as short as possible

Separate power cables and signal cables from each other and from different equipment

Shield the mains cable to the welding equipment

Apply earthing and equipotential bonding to the welding installation

Connect the equipment to a separate mains supply spur or using a different phase

Physically separate welding equipment from other equipment

Weld at times which cause minimum disruption.

Further information

The articles below may also be of interest:

Melton G B: 'Electromagnetic compatibility: what it means for welding'. *Welding and Metal Fabrication*, 1992 60 (6) 286-288.

Melton G B: 'Updating the current situation on the Electromagnetic Compatibility Directive'. *Welding and Metal Fabrication*, 1994 62 (7) 289-290.

EN60974-10:2003 Arc welding equipment. Part 10: Electromagnetic compatibility.

More information is available from Geoff Melton at TWI Limited (geoff.melton@twi.co.uk)