

## No.: 0213 Electromagnetic fields on hand held spot-welding guns

### ○ Problem

Hand held spot-welding guns are widely used in the metalworking industry for the jointing of metals. The spot-welding guns consist of two electrodes of suitable geometry for the task, and an integral or discrete DC or AC source. The heat generated by the flow of current through the electrodes is exploited for the welding process. During a welding operation, short-term currents of over 20 kA may flow, depending upon the task. Since the welder is located in direct proximity to the welding gun and, in particular where integrated current sources are used, touches the cables to the electrode, a correspondingly high exposure to magnetic fields may be anticipated. Excessively high exposure may stimulate nerves and muscle cells in the human body. In a worst-case scenario, this may lead to fibrillation. In order to protect the welder, the magnetic fields must not therefore exceed the permissible values stated in accident prevention regulation BGV B 11 governing electromagnetic fields.

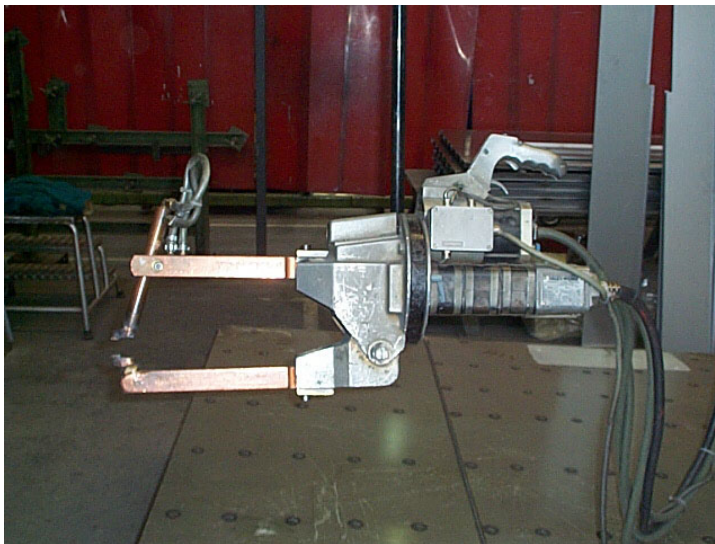


Illustration  
Hand held spot-welding gun  
with integral power supply  
(transformer gun)

### ○ Activities

In conjunction with the Institutions for Statutory Accident Insurance and Prevention (BGs), the magnetic field strengths on hand held spot-welding guns were measured in a number of plants. For the purpose of measurement, areas selected on the spot-welding guns were limited to those normally in the proximity of the operator or with which he comes into contact during operation of the gun.

The hazard presented to the operator by magnetic fields was assessed by comparison of the measurement results with the permissible values stated in the BGV B11, in consideration of the prevailing plant conditions.

## ○ **Results and Application**

At workplaces featuring hand held spot-welding guns, two magnetic field impulses lasting several hundred milliseconds generally occur during a welding operation. The magnetic flux density is at its highest in the vicinity of and between the electrodes of the welding gun. Depending upon the type of gun employed, the peak values for the magnetic flux density lie between 3 millitesla (mT) and over 20 mT. The measured peak values and the maximum and average change in the magnetic flux density frequently exceed the values permitted for the extremities under BGV B 11 (Section 3, Tables 14 and 15) for the increased exposure range.

Magnetic fields may therefore present a health risk to persons coming into contact with the electrodes or remaining in the proximity of spot-welding guns during welding; prevention measures are consequently necessary. A reduction in exposure is possible if the observance of an adequate distance is attained by other measures, such as barrier bars and handles on the electrodes.

Similarly high magnetic flux densities or changes in flux density also occur on the cables of spot-welding guns with external power supply. In this case, it must be ensured that the cables are routed an adequate distance away from the welder.

## ○ **Area of Application**

BGs, safety professionals, appliance manufacturers

## ○ **Additional Information**

- BG-Vorschrift: Elektromagnetische Felder (BGV B11, formerly VBG 25). Published by: Hauptverband der gewerblichen Berufsgenossenschaften (HVBG), Sankt Augustin 2001
- BG-Regeln: Elektromagnetische Felder (BGR B11, formerly ZH 1/257). Published by: Hauptverband der gewerblichen Berufsgenossenschaften (HVBG), Sankt Augustin 2001
- Elektromagnetische Felder an Anlagen, Maschinen und Geräten. BIA-Report [6/03](#). Published by: Hauptverband der gewerblichen Berufsgenossenschaften (HVBG), Sankt Augustin 2003

⇒ Expert assistance: BIA, Fachbereich 4: Arbeitsgestaltung – Physikalische Einwirkungen  
[BIA, Division 4: Ergonomics – Physical environmental factors]

⇒ Literature requests: BIA, Zentralbereich [BIA, Central division]

## ○ **“Focus on BIA's Work”**

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53754 Sankt Augustin

Germany

Edited by: F. Börner

Phone: +49 2241 231-02/Fax: +49 2241 231-2234

e-mail: [bia@hvbg.de](mailto:bia@hvbg.de)

Internet: [www.hvbg.de/bia](http://www.hvbg.de/bia)