

BIULETYN INSTYTUTU SPAWALNICTWA

# BULLETIN

OF THE INSTITUTE OF WELDING ISSN 2300-1674



**Łukasiewicz**  
Instytut  
Spawalnictwa



**No. 1/2022**

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## OF THE INSTITUTE OF WELDING

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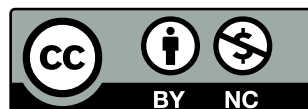
No. 1/2022

BIMONTHLY

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ŁUKASIEWICZ – INSTITUTE OF WELDING

The International Institute of Welding  
and The European Federation for Welding,  
Joining and Cutting member



## Summaries of the articles

### **Piotr Śliwiński, Marek St. Węglowski, Krzysztof Kwieciński, Andrzej Wieczorek – Electron Beam Surface Hardening**

DOI: [10.17729/ebis.2022.1/1](https://doi.org/10.17729/ebis.2022.1/1)

The surface hardening of steel components makes it possible to achieve high abrasive wear resistance without the necessity of hardening the entire cross-section of a given element. As a result, it is possible to apply lower stress and reduce the cost of the process. Because of very high heating rates (of up to 109 K/s) as well as the ease of dynamic deflection and focusing, the use of electron beam to harden component surfaces enables the obtainment of surface layers characterised by required properties. This article constitutes an overview of publications concerning electron beam-based surface hardening.

### **Borys Bednarek, Rafał Jurkiewicz, Agnieszka Rzeźnikiewicz – Detectability of Welding Imperfections in Non-Destructive PA and TOFD Ultrasonic Tests**

DOI: [10.17729/ebis.2022.1/2](https://doi.org/10.17729/ebis.2022.1/2)

The primary objective of the article was to compare the PA and TOFD ultrasonic technique-based detectability of internal imperfections in welded joints. The scope of tests involved the making of joints as well as the performance of ultrasonic, radiographic and macroscopic metallographic tests. The tests enabled the comparison of indications obtained in the tests with the actual location and the size of imperfections. The test results were then compared to identify the accuracy of each technique in relation to previously assumed measurement requirements (e.g. the depth at which a given imperfection was located, characteristic dimensions, shift from the weld axis, etc.).

### **Łukasz Rawicki – Defectoscopic Tests of Railway Rails**

DOI: [10.17729/ebis.2022.1/3](https://doi.org/10.17729/ebis.2022.1/3)

Non-destructive tests are of key importance as regards ensuring the safe operation of the railway track. Such tests enable the detection of discontinuities formed both during production and operation. However, due to their nature, non-destructive tests are characterised by certain limitations. The vast majority of non-destructive tests are indirect, where the presence of discontinuities is inferred on the basis of specific physical phenomena. Through the detection and assessment of the nature of discontinuities, non-destructive testing methods provide information about the properties of objects subjected to examination. The article presents some of the methods, (visual and ultrasonic tests) used in the examination of railway rails. The article also discusses unconventional testing methods, i.e. the method of scatter field flux and the measurement of the alternating current field.

### **Cyprian Tyszko, Jacek Górka – The Effect of the TIG Method-based Melting of Welds on the Properties and the Structure of Welded Joints Made of Austenitic Steel**

DOI: [10.17729/ebis.2022.1/4](https://doi.org/10.17729/ebis.2022.1/4)

The article discusses the effect of TIG method-based melting on the properties and the structure of welded joints made of austenitic steel AISI 304. The tests involved the making of 2 mm thick joints and their subsequent melting in two different ways, i.e. with maintaining interpass temperature and immediately after welding. The study also included the performance of mechanical tests, macro and microscopic metallographic tests as well as

hardness and corrosion resistance tests. Results obtained in the tests justified the conclusion that the melting process and its conditions significantly affect the properties and the structure of welded joints.

### **Antoni Sawicki – The Use of the Integral Method in the Determination of the Mayr-Voronin and Cassie-Voronin Simplified Mathematical Models of Electric Arc with the Changeable Length of the Plasma Column**

DOI: [10.17729/ebis.2022.1/5](https://doi.org/10.17729/ebis.2022.1/5)

The article discusses the possibility of extending the usability of well-known integral method

formulas used to determine the parameters of the Mayr and Cassie mathematical models of fixed-length arc. Simulation tests discussed in the article involved the simplified variants of the Mayr-Voronin and Cassie-Voronin models of electric arc with dissipated power proportional to the volume of the stretched column. Results obtained in the tests proved the usability of the above-named formulas when calculating the parameters of modified arc models within a wide range of elongation rate changes.

**Bulletin of the Institute of Welding /  
Biuletyn Instytutu Spawalnictwa**

ISSN 2300-1674

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Łukasiewicz - Instytut Spawalnictwa

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