# ANALYSIS OF THE AUSTENITIC STAINLESS STEEL'S r-VALUE BEHAVIOR AT ELEVATED TEMPERATURES

Dušan Arsić[1], Milan Djordjević[1], Srbislav Aleksandrović[1], Vukić Lazić[1], Ružica Radoslava Nikolić[1,2,*], Branislav Hadzima[2,3]

[1] Faculty of Engineering, University of Kragujevac, Sestre Janjić 6, 34000 Kragujevac, Serbia
[2] Research Centre, University of Žilina, Univerzitna 1, 010 26 Žilina, Slovak Republic
[3] Faculty of Mechanical Engineering, University of Zilina, Univerzitna 1, 010 26 Žilina, Slovak Republic

[*]corresponding author: tel.: +421 948 610-520, e-mail: ruzicarnikolic@yahoo.com

***Resume***

An analysis of the anisotropy properties of austenitic steel AISI 304 (X5CrNi18-10) at elevated temperatures is presented in this paper. Considerations of the anisotropy problems are presented in the theoretical part of the paper, as well as the procedure for determination of the normal anisotropy coefficient. The experimental part of the paper describes the plan, methodology and equipment for testing of material's normal anisotropy and mechanical characteristics. The objective of conducting the experiments was to investigate influence of temperature on normal anisotropy, as well as on the mechanical properties of the considered material. The normal anisotropy was monitored by the coefficient – the so-called "r-value". Besides that, the tensile strength, yield stress and elongation at break were monitored, also. The tests were done on the 0.7 mm thick sheet metal within the temperature range 20 to 700 °C.

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## 1. Introduction

The subject of this work is experimental investigation of the normal anisotropy coefficient of austenitic steel AISI 304 at elevated temperatures. Taking into account that the stainless steels are characterized by relatively high value of strength, subsequently the large deformation force is necessary for piece forming; those steels must be heated to reduce their deformation resistance. The aim of investigations conducted in this paper was to study the change of the mechanical properties, especially the normal anisotropy coefficient of the AISI 304 steel, at elevated temperatures.

The normal anisotropy represents unevenness of material properties over its thickness with respect to properties within the thin sheet plane. It is expressed by the coefficient of the normal anisotropy – or the r-value, which shows the resistance of the thin sheet at gainst thinning. The value of this coefficient is influenced by the in-plane anisotropy, as well. Thus, some materials exhibit the best characteristics in the direction of the thin sheet rolling (0°), some in the direction perpendicular to the rolling direction (90°) and some even in the direction at certain angle to the rolling direction (45°) [1, 2]. Therefore, the low-carbon steel's thin sheet DC 04 has higher values of the r-value in directions at 0° and 90°. On the contrary, the aluminum alloy AlMg4.5Mn0.7 and austenitic and ferritic stainless steels AISI 304 and AISI 430, exhibit maximum of the r-value in the direction of 45° with respect to the rolling direction. Obtained results are presented in Fig. 1.