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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 31218-2014

**Metallic materials - Determination of residual stress -
Sectioning relaxation strain gauge method**

金属材料 残余应力测定 全释放应变法

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Table of Contents

- 1 Scope
- 2 Normative references
- 3 Terms and Definitions
- 4 Symbols and
- 8 Error Analysis 5
- 9 References

Foreword

This standard was drafted in accordance with GB/T 1.1-2009 given rules. The standard proposed by China Iron and Steel Association. This standard by the National Steel Standardization Technical Committee (SAC/TC183) centralized. This standard was drafted. Wuhan Iron and Steel (Group) Corporation, Institute of Metal Research, Shenzhen million test test Equipment Co., Navy Engineering University. The main drafters of this standard. IRON Chen Huaining, Yu Li, Xue Huan, Peng Wenjie, Liu Dong, Zhu Hongchuan TRANSACTIONS Zhu Lihong, Hou massive, Wang selected countries. Residual stress determination of metallic materials Full release Strain

1 Scope

China's national standard for determining residual stress in metallic materials by the full relaxation strain gauge method. It specifies the terms and definitions, the symbols, the principle, the measuring devices and equipment, the measurement procedure and the test report, and it applies to the determination of the average macroscopic residual stress in a volume element of a metallic material. Residual stress is the stress locked into a component in the absence of any applied load. Almost every manufacturing process creates it - casting, welding, rolling, forging, machining, quenching, shot peening and grinding all leave the material stressed against itself - and the consequences are large. Residual tension adds directly to service stress and reduces fatigue life; it drives stress corrosion cracking in materials that would otherwise be immune; and it causes a part to distort as soon as material is removed from it, which is why a machined component moves after the last cut. The method here is the most direct one available. A strain gauge rosette is bonded to the surface, its output is recorded, and the material around it is then cut free so that the residual stress in that piece is released; the strain that appears as the stress relaxes is measured, and the original stress is calculated from it using the elastic modulus and Poisson's ratio of the material. It is destructive, and that is its cost: the component is cut

apart and cannot be returned to service. What it gives in exchange is a full relaxation - the stress is completely released rather than partially, as in hole drilling - so no assumption about the depth or distribution of the stress field is needed. Issued on 30 September 2014 and in force since 1 May 2015.

This standard specifies the method for the determination of metal release with full surface residual stress of terms and definitions, symbols and descriptions, principles, measurement devices Equipment, measurement procedures, test report. This standard applies to the determination of the average macroscopic residual stress in a variety of metal materials volume unit.

2 Normative references

The following documents for the application of this document is essential. For dated references, only the dated version suitable for use herein Member. For undated references, the latest edition (including any amendments) applies to this document.

GB/T 13992-2010 Metal Bonded resistance strain gauges JJG623 resistance strain gauges

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 Strain Release relaxed strain $\Delta\epsilon$ After the specimen is cut due to the release of the original residual stress fields due to strain variation.

4 Symbols and

Symbols and illustrate the criteria used in Table 1. Table

1 Symbols and Symbol Description Unit MPa E modulus of elasticity of the material being tested Angle β maximum strain and the maximum principal stress, a positive counterclockwise ($^\circ$) $\Delta\epsilon$ strain release - $\Delta\epsilon_1$ strain gage on the gate release strain 1 - On $\Delta\epsilon_2$ strain gage Strain Release 2 of the gate - On $\Delta\epsilon_3$ strain gage Strain Release 3 of the gate - ν Poisson's ratio of the material being tested - σ_1 along the strain gage direction residual stress MPa * * *