

The Changes in ISO 6892-1:2016 Metallic Materials Tensile Testing Standard

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Abstract— Today, as the current standard tensile test for metallic materials ISO 6892-1 standard are used. The English version of the standard in 2009 and the Turkish version in 2011 were published. The English version was renewed in 2016. In this study, we aimed to summarize the major changes made in this standard. In this way, it is aimed to be transmitted detailed and accurate information for related person.

Keywords— ISO 6892-1, Tensile test, Metallic materials

I. INTRODUCTION

Along with the developing technology, tensile testing practice and calculation differences in results bring about changes in standards. When you search at the changes in the standard of tensile testing in metallic materials in our country; TS 138 EN 10002-1(1996, 2004) and TS EN ISO 6892-1(2011) are published. The English version of the standard is published in ISO 6892-1(2009), and it is published as TS EN ISO 6892-1(2011) by the Turkish standard TSE. In 2016, ISO 6892-1(2016) was revised and published, but Turkish has not been published yet [1-3].

In the metal industry, at room temperature, the tensile test standard comes out against ISO 6892-1(2016) and ASTM E8/8M(2016). ASTM standards are used in America, whereas, ISO standards are used in Europe. Japanese Industrial Standards (JIS) and GBT (Chinese Standards) in Asia have adopted the ISO 6892-1 standard.

The tensile test for metallic materials at ISO 6892-1 ambient temperatures is a very detailed standard. This standard describes the method to be applied in the experiment, the calculations used, the results to be reported, as well as the equipment to be used for the test. The changes in this standard are likely to affect everyone in the metal industry.

This study has highlighted important changes between the ISO 6892-1(2016) standard and the previous ISO 6892-1(2009) standard [1,2]. On this study, it is aimed to give detailed and accurate information to the persons who are related to the emphasis of differences of this standard which is used in metal industry.

II. THE CHANGES OF ISO 6892-1:2016

Its summary is given below those changes between 2016 to 2009 version of ISO 6892-1 tensile testing method of test at room temperature of metallic materials

A. New terms and definitions

The 2016 version of standard is added the following term and definitions.

Item 3.12 computer-controlled tensile testing machine: machine for which the control and monitoring of the test, the measurements, and the data processing are undertaken by computer.

Item 3.13 modulus of elasticity (E): quotient of change of stress ΔR and change of percentage extension Δe in the range of evaluation, multiplied by 100 %.

$$E = \frac{\Delta R}{\Delta e} \cdot 100\%$$

Item 3.14 default value: lower or upper value for stress respectively strain which is used for the description of the range where the modulus of elasticity is calculated

Item 3.15 coefficient of correlation (R^2): additional result of the linear regression which describes the quality of the stress-strain curve in the evaluation range

Item 3.16 standard deviation of the slope (S_m): additional result of the linear regression which describes the difference of the stress values from the best fit line for the given extension values in the evaluation range

Item 3.17 relative standard deviation of the slope ($S_{m(rel)}$): quotient of the standard deviation of the slope and the slope in the evaluation range, multiplied by 100 %.

$$S_{m(rel)} = \frac{S_m}{E} \cdot 100\%$$

The symbols of item 4 in the standard are added the new terms defined in item 3 [1,3].

B. The changes in test speeds

Test speeds or test rates in heading 10.3 of ISO 6892-1:2016 standard have been changed and the speeds are explained in more detail as Method A1, A2 and B, respectively. The extension speed of the method in the 2009 version of the ISO 6892-1 standard was defined as two methods in the 2016 version. It is expressed as Method A1 (Closed loop strain control) and Method A2 (Open loop strain control).

Closed loop strain control, method A1, is the strain rate control based on the feedback of the data obtained from the instrument's extensometer. The application for this method is given by the tolerances of the required 4 step speed standard. The standard speed steps are schematically shown in figure 1 [5-7]. The other method, Method A2, open loop strain control,

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BS EN ISO 6892-1:2016 , *Proceedings of 1st International Conference on Structural Damage Modelling and Assessment* Magd Abdel Wahab, 2020-12-12 This book comprises the select proceedings of Structural Damage Modelling and Assessment SDMA 2020 presented online on 4 5 August 2020 It discusses the recent advances in fields related to damage modelling damage detection and assessment non destructive testing and evaluation structure integrity and structural health monitoring The conference covers all research topics and applications relevant to structural damage modelling and assessment using theoretical numerical and experimental techniques This book is useful to scientists and engineers in academia and industry who are interested in the field of structural damage and integrity **PN-EN ISO 6892-1** , 2016

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Automotive Handbook Robert Bosch GmbH, 2022-05-02 The latest edition of the leading automotive engineering reference In the newly revised Eleventh Edition of the Bosch Automotive Handbook a team of accomplished automotive experts delivers a comprehensive and authoritative resource for automotive engineers designers technicians and students alike Since 1936 the Bosch Automotive Handbook has been providing readers with of the moment coverage of the latest mechanical and research developments in automotive technology from detailed technical analysis to the newest types of vehicles This newest edition is packed with over 2 000 pages of up to date automotive info making it the go to reference for both engineers and technicians It includes detailed and simple explanations of automotive technologies and offers over 1 000 diagrams illustrations sectional drawings and tables Readers will also find 200 pages of new content including the electrification of the powertrain Additional coverage on new driver assistance systems and the automated detection of vehicles surroundings Updates on the on board power supply for commercial vehicles New discussions of autonomous vehicles as well as additional contributions from experts at automotive manufacturers universities and Bosch GmbH Perfect for design engineers mechanics and technicians and other automotive professionals the latest edition of the Bosch Automotive Handbook will also earn a place on the bookshelves of car enthusiasts seeking a quick and up to date guide to all things automotive

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frictional and lubrication dynamics has never been so important Current research is focussed on modification technologies that can increase the surface durability of materials The characteristics of the system reveal which surface engineering methods should be chosen and as a consequence it is essential to study the combination of surface treatment and contact mechanics The accurate characterisation of the physical and chemical properties of materials requires the application of both experimental techniques and computer simulation methods in order to gain a correct analysis A very wide range of materials starting with metals through polymers and semiconductors to composites necessitates a whole spectrum of characteristic experimental techniques and research methods The papers in the book cover a number of topics including Computer methods and simulation Experimental and measurement techniques Mechanical characterisation and testing Materials under extreme conditions Polymers and plastics Advances in composites Micro and macro characterisation Corrosion and erosion Damage fatigue and fracture Recycled materials Materials and energy Surface problems and contact mechanics Surface modification and treatments Thick and thin coatings Tribomechanics and wear mechanics Biomechanical characterisation Biomechanical applications and Case studies

Advanced Composites Viktor Gribniak, 2021-06-02 Engineering practice has revealed that innovative technologies structural applications require new design concepts related to developing materials with mechanical properties tailored for construction purposes This would allow the efficient use of engineering materials The efficiency can be understood in a simplified and heuristic manner as the optimization of performance and the proper combination of structural components leading to the consumption of the least amount of natural resources The solution to the eco optimization problem based on the adequate characterization of the materials will enable implementing environmentally friendly engineering principles when the efficient use of advanced materials guarantees the required structural safety Identifying fundamental relationships between the structure of advanced composites and their physical properties is the focus of this book The collected articles explore the development of sustainable composites with valorized manufacturability corresponding to Industrial Revolution 4.0 ideology The publications amongst others reveal that the application of nano particles improves the mechanical performance of composite materials heat resistant aluminium composites ensure the safety of overhead power transmission lines chemical additives can detect the impact of temperature on concrete structures This book demonstrates that construction materials choice has considerable room for improvement from a scientific viewpoint following heuristic approaches

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Metal Plasticity and Fatigue at High Temperature Denis Benasciutti, Luciano Moro, Jelena Srnec Novak, 2020-05-20 In several industrial fields such as automotive steelmaking aerospace and fire protection systems metals need to withstand a combination of cyclic loadings and high temperatures In this condition they

usually exhibit an amount more or less pronounced of plastic deformation often accompanied by creep or stress relaxation phenomena Plastic deformation under the action of cyclic loadings may cause fatigue cracks to appear eventually leading to failures after a few cycles In estimating the material strength under such loading conditions the high temperature material behavior needs to be considered against cyclic loading and creep the experimental strength to isothermal non isothermal cyclic loadings and not least of all the choice and experimental calibration of numerical material models and the selection of the most comprehensive design approach This book is a series of recent scientific contributions addressing several topics in the field of experimental characterization and physical based modeling of material behavior and design methods against high temperature loadings with emphasis on the correlation between microstructure and strength Several material types are considered from stainless steel aluminum alloys Ni based superalloys spheroidal graphite iron and copper alloys The quality of scientific contributions in this book can assist scholars and scientists with their research in the field of metal plasticity creep and low cycle fatigue

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and authorities are outlined For instance Hazardous material means a substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health safety and property when transported in commerce and has designated as hazardous under section 5103 of Federal hazardous materials transportation law 49 U S C 5103 The term includes hazardous substances hazardous wastes marine pollutants elevated temperature materials materials designated as hazardous in the Hazardous Materials Table see 49 CFR 172 101 and materials that meet the defining criteria for hazard classes and divisions in part 173 of subchapter C of this chapter Hazardous Materials Regulations or HMR means the regulations at 49 CFR parts 171 through 180 Companies responsible for transporting hazardous materials and oil related products should be aware of these regulations and processes Requirements include guidelines for packaging of materials to be transported weight restrictions for certain modes of transportation segregation of hazardous materials safety precautions to include care in loading unloading shipments transports and more Other related products National Traffic Incident Management Responder Training Program Train the Trainer Guide can be found here <https://bookstore.gpo.gov/products/sku/050-001-00347-3> Code of Federal Regulations Title 46 Shipping Pt 140 155 Revised as of October 1 2015 can be found here <https://bookstore.gpo.gov/products/sku/869-082-00201-8> Unlimited Impossibilities Intelligence Support to the Deepwater Horizon Response can be found here <https://bookstore.gpo.gov/products/sku/008-020-01634-9>

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