Standardised Digital Representation of the Measurement of Engineering Properties

Scenarios that have demonstrated the scope of ISO 10303-235 Engineering properties and materials information

Introduction
ISO 10303-235 is a part of the family of standards for digital product data representation and exchange that have been developed over the last 30 years in the global project managed by the ISO Technical Committee 184, Sub-committee 4 (ISO/ TC184/SC4). The Standard is a computer-processable information model that enables the digital representation of any property of any product measured by any method. It has many representations in common with several other standards in the family to provide for the representation of property data across the whole life cycle of a product from conceptual design through to disposal. This is the standard that is being used for the COMP-LIFE Project.

For further information see: CODATA Data Science Journal https://www.jstage.jst.go.jp/browse/dsj/8/0/_contents, pages 190-200.

1. Axial fatigue testing of AISI 4130 steel sheet
Scenario: the representation of data from USA Mil-Hndb-5, 1998, page 2-38. The representation of the page of data included: product details, dimensions and specified composition, product properties (yield tensile strength, maximum tensile strength, test temperature), orientation and dimensions of the test specimen, the dimensions of the notch and the state of the surface, the details of testing process (frequency of load, temperature and atmosphere), the number of samples. The consolidated test results were represented by ISO 10303-235 as an equivalent stress equation: $LogN_f \;= 8.87 - 2.81 \log\left(S_{eq} - 41.5\right)$ where $S_{max} \;= \;(1 - R)^{1.46}$. The Standard Error of the estimate was represented as well as the Standard Deviation in Life. $R^2 \;= 94\%$, where R is the ratio of maximum stress to minimum stress. N_f is the number of cycles to failure, S_{eq} is the equivalent stress, S_{max} is the maximum stress.

2. Corrosion fatigue
Scenario: the testing in fatigue of a pre-cracked specimen in an enhanced corrosive environment. The representation included: the pre-cracking process, the crack monitoring measurement and equipment, the details of the sequence of load cycles and the composition and temperature of the corrosive environment.

3. Axial deformation of composite coupons
Scenario: the measurement of the behaviour in compression buckling and tensile strain of specimens of five uni-directional, fibre-reinforced composite coupons. The properties and their values that were represented were the modulus in buckling and the tensile properties of: tensile modulus, stress at rupture, maximum force, elongation at rupture, Poisson coefficient and mode of rupture. The dimensions of the specimens and characteristics of the testing machine were also represented.

4. Characteristics of steel plate at elevated temperature

Scenario: the characteristics of steel plate specified as P265H. The representation included: references to the complete product history of the steel (heat, ingot, primary product, sample, test piece), the specified elemental compositions, the dimensions of the plate, the specified properties from measurements at elevated temperature of: yield stress, maximum stress and percentage elongation of a specified gauge length. The property values were specifically linked to: the relevant stage in the product history, the thickness of the plate, the conditions of the test, such as the rate of deformation, and to relevant product and testing standards.

5. Characterisation of defects detected by ultrasonic non-destructive methods

5.1. Scenario: the detection by a phased array technique of a weld defect in a piping assembly. The representation included: the location of the assembly and its dimensions, the specified elemental composition of the components, the characteristics and settings of the ultrasonic control instrument, the characteristics and settings of the ultrasonic probe, the location and description of the path of the probe, the dimension of the defect and its location, the qualifications of the operator, the documentation of the procedure, the certification of the supervisor and the approval of the work and the results.

5.2. Scenario: the detection by a pulsed-echo method of a region of hydrogen induced cracking in a part of a steel pressure vessel. The representation included: the location of the part and its dimensions, the specified elemental composition of the steel, the characteristics and settings of the ultrasonic control instrument, the characteristics and settings of the ultrasonic probe, the dimension of the volume of the defective region and its location, the qualifications of the operator, the documentation of the procedure, the certification of the supervisor and the approval of the work and the results.

5.3. Scenario: the detection by time-of-flight diffractometry (ToFD) of three defects in a welded structure. The representation included: the dimensions of the structure, the specified elemental composition of the steel, the characteristics and settings of the ultrasonic control instrument, the characteristics and settings of the ultrasonic probes, the dimensions of the defects and their location, the qualifications of the operator, the documentation of the procedure, the certification of the supervisor and the approval of the work and the results.

6. Tensile testing defined by ISO 6892-1

Scenario: the representation of data from an example of a sample of steel tested at room temperature following the requirements and specifications of ISO 6892-1. The representation included: the dimensions of the test piece, the specified elemental compositions of the steel, the conditions of the test, the progress of the test as a table of values, the final reported values and the uncertainty on the values.

Ferroday Ltd
14 Mere Farm Road
UK- Birkenhead, CH43 9TT
www.ferroday.co.uk