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Extended master connection file (χMCF) — Description of mechanical connections and joints in structural systems

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Contents

Page

Foreword ..... **vi**
Introduction ..... **vii**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Design principles and basic features of χMCF **1**
4.1 General 1
4.2 Design principles 2
4.3 Idealization of joints 2
4.4 Reconstruction of joints from χMCF 3
4.5 Description of topology 3
4.6 χMCF in the development processes 4
5 Keywords of XML specification **5**
5.1 Keywords 5
6 Parts, properties and assemblies **7**
6.1 General 7
6.2 Parts 7
6.2.1 General 7
6.2.2 Part labels 7
6.2.3 Part instances 7
6.3 Properties 7
6.4 Assemblies 8
7 File structure of χMCF **8**
7.1 General 8
7.2 Elements containing general information 9
7.2.1 General 9
7.2.2 Date 9
7.2.3 Time 9
7.2.4 Version 10
7.2.5 Unit system 10
7.3 Application, user and process specific data 10
7.3.1 General 10
7.3.2 User specific data `<appdata/>` 11
7.3.3 Finite element specific data `<femdata/>` 12
7.4 Connection data `<connection_group/>` 13
7.4.1 General 13
7.4.2 Connected objects 14
7.4.3 Contacts and friction 19
7.4.4 Joints 21
7.5 Minimalistic example of a χMCF file 21
7.6 XML schema definition 22
8 Data common to any connection **22**
8.1 Indices and their properties 22
8.2 Connection referencing 23
8.2.1 Need for referencing 23
8.2.2 Attribute `label` 23
8.2.3 Attribute `ident` 23
8.3 Dimensions and coordinates 23
8.4 Attribute `quality_control` 23
8.5 Custom attributes list 23
8.6 Distinction between `<custom_attributes/>` and `<appdata/>` 27
8.6.1 General 27

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8.6.2 Needs of different process roles, addressed by <custom_attributes/> and <appdata/> 28
8.6.3 Needs of different applications, addressed by <custom_attributes/> and <appdata/> 28
8.6.4 Different levels of <custom_attributes/> and <appdata/> within χMCF data model 28

9 0D connections 29
9.1 Generic definitions 29
9.1.1 Identification 29
9.1.2 Location 30
9.1.3 Direction 30
9.1.4 Type specification 31
9.2 Spot welds 31
9.2.1 General 31
9.2.2 Attribute diameter 32
9.2.3 Attribute technology 32
9.3 Robscans 33
9.4 Rivets 35
9.4.1 General 35
9.4.2 Blind rivets 37
9.4.3 Self-piercing rivets 39
9.4.4 Solid rivets 40
9.4.5 Swop rivets 43
9.4.6 Clinch rivet studs 44
9.5 Threaded connections — Bolts and screws 45
9.5.1 General 45
9.5.2 Contacts and friction 47
9.5.3 Definition of element <threaded_connection/> 50
9.5.4 Washer 52
9.5.5 Nut 53
9.5.6 Bolt 54
9.5.7 Screw 58
9.6 Gum drops 62
9.7 Clinches 62
9.8 Heat stakes / Thermal stakes 65
9.9 Clips / Snap joints 68
9.10 Nails 70
9.11 Rotation joints 73
9.11.1 General 73
9.11.2 ROTAV 74

10 1D connections 75
10.1 Generic definitions 75
10.1.1 Identification 75
10.1.2 Location 75
10.1.3 Intermittent connection lines 77
10.1.4 Type specification 84
10.2 Seam welds 84
10.2.1 Description and modelling parameters 84
10.2.2 Seam weld definition overview 84
10.2.3 Specific XML realization 86
10.2.4 Generic seam weld definition 86
10.2.5 Butt joint 95
10.2.6 Corner weld 98
10.2.7 Edge weld 104
10.2.8 I-weld 107
10.2.9 Overlap weld 110
10.2.10 Y-joint 116
10.2.11 K-joint 120

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10.2.12 Cruciform joint 124
10.2.13 Flared joint 129
10.3 Adhesive lines 131
10.3.1 Element <adhesive_line/> 131
10.3.2 Element <loc_list/> 132
10.3.3 Element <appdata/> 132
10.3.4 Element <femdata/> 132
10.4 Hemming flanges 132
10.4.1 General 132
10.4.2 Element <hemming/> is placed within <connection_1d/> 134
10.4.3 Element <loc_list/> 135
10.4.4 Element <appdata/> 135
10.4.5 Element <femdata/> 135
10.4.6 Element <hemming/> 135
10.5 Sequence connections 137

11 2D Connections 139
11.1 Generic definitions 139
11.1.1 Identification 139
11.1.2 Connection face 140
11.1.3 Type specification 141
11.2 Adhesive faces 141

12 Future extensions 143
12.1 General 143
12.2 Additional parameters for spot and seam welds 143
12.3 Other relevant and new joint types 143

Annex A (informative) **Derivation of formulae used for regular intermittent welds 144**

Annex B (informative) **Federative use of χMCF with ISO 10303-242 ..... 146**

Annex C (informative) **Background and context to this document 149**

Bibliography 150

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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This document was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

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Introduction

This document aims at describing mechanical connections or joints related to mechanical systems or structures. The demand for such a standard has grown from the observation that modern product lifestyle management (PLM) systems, while working well with part information (e.g. geometry, material, weight), are lacking a consistent handling of logical and process related connection information (e.g. parts being connected, orientation of point connections, assembly process parameter).

PLM workstreams need to include connection data to automate development processes and enable seamless data flows between engineering functions. χMCF is intended to be the "language" that is understood and used by the various tools to exchange connection data along the development chain.

The initial motivation to develop this document came from the automotive industry (see Annex C for background and context on this document). However, there is no element in this document that limits it to this industry. It is clearly targeted to support virtual development processes for mechanical systems or structures in any industrial area.

One design goal of χMCF is to support the widest possible range of development and manufacturing processes. This makes it very likely that xMCF and STEP (ISO 10303-242),[1] will be used together. Annex B investigates how this can be done in a way that benefits both standards.

Regardless of the respective industrial domain, complex technical systems (e.g. vehicles, planes, ships) typically consist of thousands of individual parts which are assembled by joints. Depending on the involved materials and the manufacturing processes, a wide range of joining types are used within an individual technical structure or system. Typical connection types are welds, bolt connections, adhesives, rivets, clips, etc. Efficient and reliable data management of such connection data is not only required for the actual design and verification process [computer-aided design (CAD) and computer-aided engineering (CAE)], but also for manufacturing planning and even cost estimation. Various design, material and manufacturing parameters are required to be managed for each connection.

Details for connections or joints grow and mature along the development process. At different development stages (e.g. concept phase, detailed design, verification, manufacturing planning) and engineering functions (e.g. CAD, CAE, manufacturing), data will be added and consumed. Therefore, a database for connection data is required. But also, the software tools adding or extracting data need to understand the data structure and use a common description language. χMCF, defined in this document, serves as this language.

The advantages are evident. Integrating dedicated connection data into the PLM structure and using a common language (χMCF) for data exchange avoids data conversions or re-generations and, therefore, decreases inconsistencies and flaws during system development.

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Extended master connection file (χMCF) — Description of mechanical connections and joints in structural systems

1 Scope

This document specifies XML definitions that are used to describe data and information related to connections or joints in mechanical systems or structures.

The following is within the scope of this document:

— description and explanation of XML definitions for logical or process related data or other properties of a connection.

The following aspects are outside the scope of this document:

— geometry of fasteners or other parts,

— handling of χMCF data in

  — product data management (PDM) systems,

  — subscriber data management (SDM) systems, and

  — other data management systems.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp,

— IEC Electropedia: available at https://www.electropedia.org/.

4 Design principles and basic features of χMCF

4.1 General

The Extended Master Connection File (χMCF) is a container for connection information of complex structures. A complex structure consists of individual parts which are joined together. Connections establish a topology between the parts. Therefore, a database or container designed to gather connection information should be equipped with data structures which reflect this topology between the parts.

χMCF is intended to define an industry standard for the exchange of connection data between different CAx tools (e.g. CAD, CAE, CAM, CAT) along development process steps. Design principles for χMCF are required to keep the standard as lean as possible on one hand, but also enable use case dependent extensions.

Subclause 4.2 explains the design principles and basic features of χMCF.

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