2017-01-17

Project Plan for the CEN Workshop on Materials modelling terminology, classification and metadata, WS number or WS Acronym:

Workshop
(to be approved during the Kick-off meeting on 2017-01-17/18)

Table of content

1. Status of the Project Plan

- Initial draft Project Plan, to be further developed, prior to submission for approval
- Draft Project Plan to be approved at the Kick-off meeting of the Workshop
- Approved Project Plan

2. Background to the Workshop

2.1 General

Materials modelling is highly complementary to experimentation and characterisation of materials and is nowadays regarded as one of the pillars supporting the development of new and advanced materials and their engineering and upscaling into new products.

Materials modelling provides insights into the behaviour of materials providing information and insights that would not be available otherwise. It aids the interpretation of experimental results and the analysis of characterisation data. Modelling provides also valuable materials property data and predictions on the evolution of a system in a quicker or cheaper way than with experimental methods.

Industry uses modelling for a wide range of tasks including

- Saving costs by establishing a strategy for testing and by screening new material candidates, when a “try and fail” approach cannot be carried out in the industry or it would be too complicated, dangerous or expensive.
- Understanding results of measurements. This is particularly important at the nanoscale and at femtoscale where access to materials properties and processing methods is often difficult. The simulation can provide this information for every point in the sample at every time.
- Reducing the time to market, by accelerating the time scales of understanding and developing new materials and of existing materials in new applications.
- Suggesting new materials and experimental procedures to create them. Materials design by modelling is about investigation of relations between chemical and physical composition, microstructure and effective properties at a macroscale, so that a material can be designed with desired macro-properties. Modelling can be used to examine the properties of materials and devices that have not or cannot yet be created.

These and a range of other benefits were also confirmed in a recent study of the economic impact of materials modelling. It has been demonstrated in many individual cases that materials

modelling is a key enabler of R&D efficiency and innovation. Based on responses of 29 manufacturing organisations, an average Return on investment (ratio of revenue generated and investment in modelling), of 8 was found.

2.2 Motivation for the CEN Workshop

Due to the complexity of materials and the wide range of applications, the materials modelling field consists of a number of communities that have over the years developed models and expertise in their areas. These communities typically focus on particular types of models (electronic, atomistic, mesoscopic and continuum) as well as applications of these models to certain areas (e.g. hard versus soft matter). Along with these domains a wide range of domain specific software codes has evolved as well as domain related terminology. However, applications to industrial problems in nanotechnology and advanced materials require a strong interdisciplinary approach between these fields and communities.

Firstly, the workshop will seek to establish a common terminology in materials modelling which will lead to greatly simplified and much more efficient communication, especially benefitting industrial end users in their understanding and lowering the barrier to utilising materials modelling. The terminology will include a classification of models leading to relatively small number of distinct materials models replacing the current situation of opacity of materials models that make the field hard to access for outsiders.

Secondly, users and beneficiaries of materials modelling seek to organise the information so that even complex modelling workflows can be conveyed more easily and key data about the models and their implementation captured. Such a materials modelling metadata schema will help to communicate, disseminate, store, retrieve and mine data about materials modelling. It can also be used as a basis to develop standards to facilitate interoperability between models.

2.3 The market environment

Industry and R&D communities in the following fields have been considered as target groups that benefit from the implementation of a harmonized terminology and classification in materials modeling:

- Chemicals,
- Consumer Goods,
- Electronics,
- Energy,
- Environment,
- Health,
- Transport,
- Manufacturing.

2.4 The legal environment

This topic is not concerned by any directive or national legislation.

2.5 Existing standards and standard related activities and documents

The most important existing standards for the Project Plan are listed in the following table.

ISO/TS 80004	Nanotechnologies - Vocabulary Part 1: Core terms (ISO/TS 80004-1) Part 2: Nano-objects (ISO/TS 80004-2) Part 3: Carbon nano-objects (ISO/TS 80004-3) Part 4: Nanostructured materials (ISO/TS 80004-4) Part 5: Nano/bio interface (ISO/TS 80004-5) Part 6: Nano-object characterization (ISO/TS 80004-6) Part 7: Diagnostics and therapeutics for healthcare (ISO/TS 80004-7) Part 8: Nanomanufacturing processes (ISO/TS 80004-8)
ISO/TR 11360	Nanotechnologies - Methodology for the classification and categorization of nanomaterials
ISO/TR 12802	Nanotechnologies - Model taxonomic framework for use in developing vocabularies - Core concepts
NEN ISO 24622-1	Language resource management - Component Metadata Infrastructure (CMDI) - Part 1: The Component Metadata Model
CWA 16385	Interoperability of Registries
CWA 16799	Validation of computational solid mechanics models
CWA 16200:2010	A Guide to the Development and Use of Standards compliant Data Formats for Engineering Materials Test Data
CWA 16762:2014	ICT Standards in Support of an eReporting Framework for the Engineering Materials Sector
ISO/IEC TR 20943-6	Information technology - Procedures for achieving metadata registry content consistency - Part 6: Framework for generating ontologies
IEC 62656	Standardized product ontology register and transfer by spreadsheets – Part 1: Logical structure for data parcels (IEC 62656-1) Part 2: Application guide for use with IEC CDD (IEC/TS 62656-2) Part 3: Interface for Common Information Model (IEC 62656-3)
ANSI/INCITS/ISO/IEC 19763-3	Information technology – Metamodel framework for interoperability (MFI) - Part 3: Metamodel for ontology registration

3. Workshop proposers and Workshop participants

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The participants of the kick-off meeting will be listed in Annex A. The list of registered participants having approved the current Project Plan during the kick-off workshop is in Annex B.

4. Workshop scope and objectives

Standardisation is relevant for an integrated technological development. Particularly, early standardisation of terminology has been identified as critical in and to European research projects. The Review of Materials Modelling (RoMM) and the Materials Modelling Metadata (MODA) – both attached as Annex D – elaborated in the context of the European Materials Modelling Council (EMMC) might be used as “first mover” towards standardisation of vocabulary and taxonomy of computational material modelling in the repository of standardization documents published by officially recognized standards bodies. The definition of a common terminology and taxonomy shall be a first part of the envisaged CWA. This will facilitate the application of the potential standard and can also be used as basis for other future standardization initiatives in the field, as stakeholders can rely on the same terms to express their needs in view of a standard.

A standardised terminology could improve future exchanges among experts in the entire area of materials modelling.
The overall goal of the envisaged CEN Workshop Agreement “materials modelling terminology, classification and metadata” is to achieve wide agreement on the terminology used to describe materials modelling; their classification and the basic elements (MODA) required describing materials models and modelling workflows. For further information please see Annex D.

5. Workshop programme

The deliverable of this Workshop consists of one CEN Workshop Agreement; it shall be drafted and published in English.
Anyone can comment on this Project Plan of the envisaged CWA. All comments received will be considered by the chairperson preliminary to the kick-off meeting of participants of the Workshop where each comment received shall be presented, discussed and resolved.
Any meeting except for the kick-off and the final meeting can be organized as virtual meetings.
Table 1 gives an overview of the planned work schedule.

Table 1: Work plan

	2016						2017								
	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
Preparation of the project plan															
Public availability of project plan															
Kick-Off meeting															
Elaboration of Draft CWA															
Endorsement to final version of CWA															

6. Workshop structure

This Workshop shall be led by a chairperson and in case of absence or unavailability, by a vice-chair. The Workshop secretariat shall be responsible for the management of the Workshop.

6.1 CEN Workshop Chairperson

A proposal for the chairperson will be made by the Workshop proposers; he/she or any other candidate nominated during the period of publication of this Project Plan or at the Kick-Off will be approved at the Kick-off meeting by the parties present. His / her responsibilities include:

- Chairing the CEN Workshop meetings,

- Representing the CEN Workshop in outside meetings in cooperation with CCMC and with the Workshop secretariat,
- Monitoring the progress of the CWA,
- Interface with CCMC regarding strategic directions, problems arising, external relationships, etc.

6.2 CEN Workshop Vice-Chair

The Workshop vice-chair shall be appointed in the Kick-off meeting. The vice-chair shall support and assist in all responsibilities outlined for the chairperson. In the absence of the chairperson, the vice-chair will represent the CEN Workshop at outside meetings in cooperation with CCMC and will interface with CCMC regarding strategic directions, problems arising, external relationships etc.

6.3 CEN Workshop Secretariat

The CEN Workshop Secretariat is providing the formal link to the CEN system. The following main activities will be carried out by the Workshop Secretariat:

- Organizing CEN Workshop plenary meetings,
- Producing CEN Workshop minutes and action lists,
- Forming the administrative contact point for CWA project,
- Managing CEN Workshop attendance lists,
- Managing CEN Workshop document registers,
- Following-up action lists,
- Assisting Chairperson in monitoring and following-up of electronic discussions – in case the CEN Workshop is mainly working by electronic means,
- Administrating the liaison with relevant CEN/TCs, if applicable.

7. Resource requirements

7.1 Costs of the CEN Workshop Secretariat

The administrative costs of CEN Workshop Secretariat will be covered by resources from the FP7 project MoDeNa.
The copyright of the CWA shall be with CEN.

7.2 Participation and Registration Fee

The registration and participation at this CEN Workshop is free of charge; each participant shall bear his/her own cost for travel and subsistence.

8. Related activities, liaisons, etc.

While preparing this Project Plan no requirements for liaison or other related activities have occurred.

The *CEN/TC 304 Information and communications technologies - European localization requirements* shall be informed about this Project Plan. If CEN/TC 304 is interested, a presentation of the proposed topic to the Technical Committee can be organised.

The *CEN/TC 352 – Nanotechnologies* shall be informed about this Project Plan. If CEN/TC 352 is interested, a presentation of the proposed topic to the Technical Committee can be organised.

The focus of the *CEN/WS SERES* is to formulate a metadata standard for representing conventional materials; it is planned that the model will extend to virtual materials. It is planned to contact and inform *CEN/WS SERES* regarding the project plan.

However, the participation of CEN/TC 304 as well as CEN/TC 352 is very welcome.

9. Contact points

Proposed Chairperson:

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Annexes

Annex A: List of Workshop proposers and participants

Other interested stakeholders are welcomed to register for membership in accordance with the CEN Rules for CEN Workshops. New participants could join the WS in accordance with point 4.3.2 of CEN/CLC Guide 29 on CEN/CLC Workshop agreements expressing their interest by writing to philipp.albrecht@din.de.

	Company	**Name**
1	Goldbeck Consulting Ltd	Gerhard Goldbeck
2	European Commission	Anne de Baas
3	Politecnico di Torino	Pietro Asinari
4	Fraunhofer IWM	Adham Hashibon
5	D'Appolonia S.p.A	Daniela Reccardo
6	University of Tampere	Jaakko Akola
7	TU Eindhoven	Peter Bobbert
8	CEA	Jesus Carrete Montaña
9	University Montpellier	Marie-Liesse Doublet
10	BC Materials	Naiara Elejalde
11	TU Eindhoven	Ivo Filot

12	University Picardie	Alejandro Franco
13	University Bologna	Emmanuele Ghedini
14	Imperial College	Jiango LIN
15	ICIQ	Nuria Lopez
16	SINTEF	Philippe Maincon
17	CSIC	Adrián Quesada
18	IFAM	Peter Schiffels
19	FIW München	Christoph Sprengard
20	University of Bath	Alison Walker
21	Imperial College	Aron Walsh
22	KIT	Wolfgang Wenzel
23	Warwick University	Dhammika Wideanalage
24	Fraunhofer LBF	Thilo Bein
25	CEA	Natalio Mingo
26	General Numerics	Dmitry Berkov

27	Uppsala University	Marika Edoff
28	Aalto University	Adam Foster
29	ETH	Mathieu Luisier
30	Tyndall Institute	Eoin O'Reilly
31	University of York	Roy Chantrell
32	SISSA	Michele Fabrizio
33	IMDEA	Javier Llorca
34	ACCESS	Georg Schmitz
35	University of Bologna	Matteo Gherardi
36	Helmholtz Zentrum	Daniel Hoeche
37	DPI	Denka Hristova-Bogaerds
38	CERTH	Costas Kiparissides
39	IPCF	Vincenzo Carravetta
40	ICCOM-CNR U.O.S. di Pisa	Susanna Monti
41	CEDRAT	Frank Claeyssen

42	OSM-DAN	Dan Prina
43	University of Palermo	Andrea Cipollina
44	Warwick University	Lukasz Figiel
45	CEA	Mohamad Ibrahim
46	Technische Universität Wien	Nadja Adamovic

Annex B: Participants that approved Project Plan during Kick-off meeting

	Company	Name
1		
2		
3		
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Annex C: Relevant standards and Standards Committees

Standards Committee	Title
CEN/TC 352	Nanotechnologies
CEN/TC 304	Information and communications technologies - European localization requirements

The following standards have been identified as a result of an analysis of existing standards in the field of integrated multi-scale modelling environment for nanomaterials on national, European and international level. This analysis was conducted within the FP7 MoDeNa project. The most relevant documents have already been listed in section 2.5 *Existing standards and standard related activities and documents* in this project plan. Most of the following listed standards are related to other tasks of the MoDeNa project or are just rudimentary linked to the project and are not necessarily relevant for the envisaged CWA.

Table 2: Scale and Nanomaterials

ANSI/ASME V&V 20	Standard for Verification and Validation in Computational Fluid Dynamics and Heat Transfer
TS EN 24006	Measurement of fluid flow in closed conduits - Vocabulary and symbols
SFS-ISO 1219-1	Fluid power systems and components -- Graphic symbols and circuit diagrams -- Part 1: Graphic symbols for conventional use and data-processing applications
DIN CEN ISO/TR 11811*DIN SPEC 91217	Nanotechnologies - Guidance on methods for nano- and microtribology measurements (ISO/TR 11811:2012); German version CEN ISO/TR 11811:2012
DS/ISO/IEC 10646	Information technology - Universal Coded Character Set (UCS)
CWA 13678:1999	Guidelines for naming in the Directory
NEN-ISO 26824:2013	Particle characterization of particulate systems - Vocabulary
DIN EN ISO 10991	Micro process engineering - Vocabulary (ISO 10991:2009);
DIN IEC/TS 62844*VDE V 0051-1	Guidelines for quality and risk assessment for nano-enabled electrotechnical products (IEC 113/196/CD:2013)
DS/ISO/TR 14786	Nanotechnologies - Considerations for the development of chemical nomenclature for selected nano-objects
DIN CEN ISO/TS 80004-4, DIN SPEC 52400-4	Nanotechnologies - Vocabulary - Part 4: Nanostructured materials

DS/ISO/TS 80004-6	Nanotechnologies - Vocabulary - Part 6: Nano-object characterization
DIN SPEC 1121, DIN ISO/TS 27687	Nanotechnologies - Terminology and definitions for nano-objects - Nanoparticle, nanofibre and nanoplate
PAS 71:2011	Nanoparticles. Vocabulary
PAS 136:2007	Terminology for nanomaterials
PAS 137:2013	Nanomaterials and nanotechnology-based products. Guide to regulation and standards
PAS 139:2012	Detection and characterization of manufactured nano-objects in complex matrices. Guide
DS/ISO/TR 11360	Nanotechnologies - Methodology for the classification and categorization of nanomaterials
DS/ISO/TR 12802	Nanotechnologies - Model taxonomic framework for use in developing vocabularies - Core concepts
DS/ISO/TS 12805	Nanotechnologies - Materials specifications - Guidance on specifying nano-objects
DS/ISO/TS 80004-5	Nanotechnologies - Vocabulary - Part 5: Nano/bio interface
NEN-ISO 11358-2:2014	Plastics - Thermogravimetry (TG) of polymers - Part 2: Determination of activation energy
DIN 13343	Linear viscoelastic materials; concepts, constitutive equations, basic functions
DIN EN 16245-5	Fibre-reinforced plastic composites - Declaration of raw material characteristics - Part 5: Specific requirements for core materials; German version EN 16245-5:2013
DIN EN ISO 1856	Flexible cellular polymeric materials - Determination of compression set (ISO 1856:2000+Amd 1:2007); German version EN ISO 1856:2000+A1:2007
DIN EN ISO 5999	Flexible cellular polymeric materials - Polyurethane foam for load-bearing applications excluding carpet underlay - Specification (ISO 5999:2013); German version EN ISO 5999:2013
ABNT NBR 8516	Flexible polyurethane foam - Determination of tear strength
ABNT NBR 8537	Flexible polyurethane foam - Determination of density
ABNT NBR 8619	Flexible polyurethane foam - Determination of resilience
ABNT NBR 8797	Flexible polyurethane foam - Determination of compression set
ABNT NBR 9177	Flexible Polyurethane foam - Dynamic fatigue test
ABNT NBR 9178	Flexible Polyurethane foam - Determination of burning behaviour
ABNT NBR 9429	Flexible polyurethane foam - Dimensions determination
UNE 53967:2003 IN	Plastics. Flexible polyurethane foam. Tolerances in specifications of ether polyurethane block foams.

Table 3: Software structure / platform

DIN EN 61691-2	Behavioural languages - Part 2: VHDL multilogic system for model interoperability (IEC 61691-2:2001); German version EN 61691-2:2001
DIN EN 82045-2	Document management - Part 2: Metadata elements and information reference model (IEC 82045-2:2004); German version EN 82045-2:2005
NPR ISO/IEC TR 30102:2012	Information technology. Distributed Application Platforms and Services (DAPS). General technical principles of Service Oriented Architecture
CAN/CSA-ISO/IEC-11179-3:04 (R2009)	Information Technology - Metadata Registries (MDR) - Part 3: Registry Metamodel and Basic Attributes
NEN ISO 24622-1:2015	Language resource management - Component Metadata Infrastructure (CMDI) - Part 1: The Component Metadata Model
DIN EN 62656-3, VDE 0040-8-3	Standardized product ontology register and transfer by spreadsheets - Part 3: Interface for Common Information Model
DS/ISO/IEC 25040	Systems and software engineering - Systems and software Quality Requirements and Evaluation (SQuaRE) - Evaluation process
DS/EN 62264-1	Enterprise-control system integration - Part 1: Models and terminology
CWA 16385	Interoperability of Registries
ISO/IEC 9545	Information technology - Open Systems Interconnection - Application layer structure
ISO 10303-242	Industrial automation systems and integration - Product data representation and exchange
ISO/TS 10303-1404	Industrial automation systems and integration - Product data representation and exchange
ISO/IEC 11072	Information technology; computer graphics; computer graphics reference model
NEN-ISO/IEC 19505-1:2012 and NEN-ISO/IEC 19505-2:2012	Information technology - Object Management Group Unified Modeling Language (OMG UML) - Part1: Infrastrusture; Part 2: Superstructure
NPR-CR 12804:1997 en	Conceptual Model and Taxonomy for Information Systems Engineering
PN-EN 15943:2011 E*EN 15943	Curriculum Exchange Format (CEF) - Data model
PN-IEC 62050:2009 P*IEC 62050	VHDL Register Transfer Level (RTL) synthesis
PN-ISO/IEC 10731:1996 P*ISO/IEC 10731	Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI services
ANSI/INCITS/ISO/IEC	Information Technology - Open Distributed Processing - Type

14769	Repository Function
ANSI/INCITS/ISO/IEC 14753	Information Technology - Open Distributed Processing - Interface References and Binding
ANSI/INCITS/ISO/IEC 14750	Information Technology - Open Distributed Processing - Interface Definition Language
ANSI/INCITS 532	Information technology - Vocabulary description and management
IEEE 1175.3	Recommended practice for CASE tool interconnections - Reference model for specifying software behavior
SANS 10746-4:2003	Information technology - Open distributed processing - Reference model: Architectural semantics
DS/ISO/IEC 13673	Information technology - Document processing and related communication - Conformance Testing for Standard Generalized Markup Language (SGML) Systems
DS/ISO/IEC 14977	Information technology - Syntactic metalanguage - Extended BNF
DS/ISO/IEC 19793	Information technology - Open Distributed Processing - Use of UML for ODP system specifications
BS ISO/IEC 29500 PARTS 1-4:2012	Information technology. Document description and processing languages. Office Open XML File Formats.
ISO/IEC 15476	Information technology - CDIF semantic metamodel
CAN/CSA-ISO/IEC 15474-2:04 (R2012)	Information Technology - CDIF Framework - Part 2: Modelling and Extensibility
NEN-ISO/IEC 15475-1 NEN-ISO/IEC 15475-2 NEN-ISO/IEC 15475-3	Information technology - CDIF transfer format
DS/ISO/IEC 18021	Information technology - User interfaces for mobile tools for management of database communications in a client-server model
ISO/IEC 10181-1 ISO/IEC 10181-2 ISO/IEC 10181-3 ISO/IEC 10181-4 ISO/IEC 10181-5 ISO/IEC 10181-6	Information technology - Open Systems Interconnection - Security frameworks for open systems
DS/ISO/IEC 10026-1	Information technology - Open Systems Interconnection - Distributed Transaction Processing - Part 1: OSI TP Model
NEN-ISO/IEC/IEEE 24765:2011	Systems and software engineering - Vocabulary
DIN SPEC 91222	Information technology - Platform and programming language independent interoperability
ITU-T X.1528	Common platform enumeration
ANSI/INCITS/ISO/IEC 10746-3	Information technology - Open distributed processing - Reference model: Architecture
ANSI/INCITS/ISO/IEC	Information technology - Trusted Platform Module - Part 1: Overview

11889-1	
ANSI/INCITS/ISO/IEC 11889-2	Information technology - Trusted Platform Module - Part 2: Design Principles
ANSI/INCITS/ISO/IEC 11889-3	Information technology - Trusted Platform Module - Part 3: Structures
ANSI/INCITS/ISO/IEC 11889-4	Information technology - Trusted Platform Module - Part 4: Commands

Table 4: Model based design of experiments

CWA 16799:2014	Validation of computational solid mechanics models
DS/ISO/IEC 9636-2	Information Technology - Computer graphics - Interfacing techniques for dialogues with graphical devices - Functional specification - Part 2: Control
EN 62541-3	OPC unified architecture
NPR-ISO/IEC TR 11580:2007	Information technology - Framework for describing user interface objects, actions and attributes
NPR-ISO/IEC TR 14471:2007	Information technology - Software engineering - Guidelines for the adoption of CASE tools
PN-ISO 14976:2002 P*ISO 14976	Surface chemical analysis - Data transfer format
DS/ISO 28640	Random variate generation methods
DIN EN ISO 295	Plastics - Compression moulding of test specimens of thermosetting materials (ISO 295:2004); German version EN ISO 295:2004
DS/ISO/IEC 14769	Information Technology - Open Distributed Processing - Type Repository Function
DS/ISO/IEC 10744	Information technology - Hypermedia/Time-based Structuring Language (HyTime)
DS/ISO/IEC 25010	Systems and software engineering - Systems and software Quality Requirements and Evaluation (SQuaRE) - System and software quality models
NEN-ISO/IEC 19501:2005	Information technology - Open Distributed Processing - Unified Modeling Language (UML) Version 1.4.2
NEN-ISO/IEC 13817-1:1997	Information technology - Programming languages, their environments and system software interfaces - Vienna Development Method - Specifiction Language - Part 1: Base language (ISO/IEC 13817-1:1996)
NEN-ISO 8805:1992	Information processing systems - Computer graphics - Graphical Kernel System for Three Dimensions (GKS-3D) - Functional description
NEN-ISO/IEC 24707:2007	Information technology - Common Logic (CL): a framework for a family of logic-based languages

Table 5: Forward and backward mapping

DS/ISO/IEC 10967-1	Information technology - Language independent arithmetic - Part 1: Integer and floating point arithmetic
DS/ISO/IEC 10967-2	Information technology - Language independent arithmetic - Part 2: Elementary numerical functions
VDMA 24583	GUSMA - An integrational platform for coupled, cross-company simulation
DS/ISO 28640	Random variate generation methods
CAN/CSA-ISO/IEC 12087-5:12	Information technology - Computer graphics and image processing - Image Processing and Interchange (IPI) - Functional specification - Part 5: Basic Image Interchange Format (BIIF)
CAN/CSA-ISO/IEC 10746-1:13	Information technology - Open Distributed Processing - Reference model: Overview
NEN-ISO/IEC 19505-1:2012 and NEN-ISO/IEC 19505-2:2012	Information technology - Object Management Group Unified Modeling Language (OMG UML) - Part1: Infrastrusture; Part 2: Superstructure
NEN-ISO/IEC 9594-10:2011 en	Information technology - Open Systems Interconnection - The Directory: Use of systems management for administration of the Directory
NPR-ISO/TS 18876-1:2003 en	Industrial automation systems and integration - Integration of industrial data for exchange, access and sharing - Part 1: Architecture overview and description
ANSI/SCTE 121	Test Method for Downstream Bit Error Rate

Table 6: Ontology

ANSI/IEEE 1175.4	Standard for CASE Tool Interconnections - Reference Model for Specifying System Behavior
NPR-ISO/IEC TR 20943-6:2013 en	Information technology - Procedures for achieving metadata registry content consistency - Part 6: Framework for generating ontologies
ETSI GS MOI 002 V 1.1.1	Measurement Ontology for IP traffic (MOI) - Requirements for IP traffic measurement ontologies development
ETSI GS MOI 003 V 1.1.1	Measurement Ontology for IP traffic (MOI) - IP traffic measurement ontologies architecture
ETSI GS MOI 010 V 1.1.1	Measurement Ontology for IP traffic (MOI) - Report on information models for IP traffic measurement
NPR-ISO/TS 29002-31:2010 en	Industrial automation systems and integration - Exchange of characteristic data - Part 31: Query for characteristic data
CWA 15142:2004 en	European eConstruction Ontology (EeO)
CWA 15141:2004 en	European eConstruction Meta-Schema (EeM)
DIN IEC 62656-1*VDE 0040-8-1	Standardized product ontology register and transfer by spreadsheets - Part 1: Logical structure for data parcels (IEC 3D/177/CD:2009)
NPR-IEC/TS 62656-	Standardized product ontology register and transfer by spreadsheets

2:2013 en	- Part 2: Implementation guide for parcel interchange with IEC CDD
DIN EN 62656-3, VDE 0040-8-3	Standardized product ontology register and transfer by spreadsheets - Part 3: Interface for Common Information Model
IEC 3D/225A/CD*CEI 3D/225A/CD*IEC 62656-5*CEI 62656-5	IEC 62656-5, Ed. 1: Standardized Product Ontology Register and Transfer by Spreadsheets
DS/ISO 21127	Information and documentation - A reference ontology for the interchange of cultural heritage information
NEN-ISO/IEC 11179-2:2005 en	Information technology - Metadata registries (MDR) - Part 2: Classification
ANSI/INCITS/ISO/IEC 19763-3	Information technology - Metamodel framework for interoperability (MFI) - Part 3: Metamodel for ontology registration
NEN-ISO/IEC 15944-5:2008 en	Information technology - Business Operational View - Part 5: Identification and referencing of requirements of jurisdictional domains as sources of external constraints
NEN-ISO/IEC 15944-4:2007 en	Information technology - Business Operational View - Part 4: Business transaction scenarios - Accounting and economic ontology

Table 7: Numerical methods

DS/ISO/IEC 25062	Software engineering - Software product Quality Requirements and Evaluation (SQuaRE) - Common Industry Format (CIF) for usability test reports
DIN EN 61970-452	Energy Management System Application Program Interface (EMS-API) - Part 452: CIM static transmission network model profiles (IEC 57/1451/CDV:2014); English version FprEN 61970-452:2014
ASTM D 7846	Standard Practice for Reporting Uniaxial Strength Data and Estimating Weibull Distribution Parameters for Advanced Graphites
DS/EN 61784-3-3	Industrial communication networks - Profiles - Part 3-3: Functional safety fieldbuses - Additional specifications for CPF 3
DIN EN 16603-32-03	Space engineering - Structural finite element models; English version EN 16603-32-03:2014
ISO 18437-5	Mechanical vibration and shock - Characterization of the dynamic mechanical properties of visco-elastic materials
CWA 15142:2004	European eConstruction Ontology (EeO)
NEN-ISO 10303-209:2001	Industrial automation systems and integration - Product data representation and exchange - Part 209: Application protocol: Composite and metallic structural analysis and related design
NEN-ISO 10303-104:2001	Industrial automation systems and integration - Product data representation and exchange - Part 104: Integrated application resource : Finite element analysis

Annex D: List of links for further information

Description	Link	Access on
Complete Review of Materials Modelling (RoMM)	http://bookshop.europa.eu/en/what-makes-a-material-function--pbKI0115957/	2016-11-18
Summary of the new Modelling Vocabulary	http://ec.europa.eu/research/industrial_technologies/pdf/summary_of_new_modeling_vocabulary.pdf	2016-11-18
MODA (Elements in Materials Modelling)	http://emmc.info/wp-content/uploads/2016/06/MODA_V2-2016.06.01-annotated.pdf	2016-11-18
Workflow templates	http://emmc.info/wp-content/uploads/2016/03/Workflow_templates-2016.03.06.pdf	2016-11-18
Examples for MODA and workflow	https://emmc.info/example-workflows-and-moda/	2016-11-18