



**NSAI**  
Standards

Irish Standard Recommendation  
S.R. CWA 16762:2014

# CEN Workshop Agreement - CEN/WS SERES - ICT Standards in Support of an eReporting Framework for the Engineering Materials Sector

**S.R. CWA 16762:2014**

*Incorporating amendments/corrigenda/National Annexes issued since publication:*

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

*This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):*

*NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.*

*This document is based on:*

CWA 16762:2014

*Published:*

2014-05-28

*This document was published under the authority of the NSAI and comes into effect on:*

2014-07-01

ICS number:

35.240.50

NOTE: If blank see CEN/CENELEC cover page

NSAI  
1 Swift Square,  
Northwood, Santry  
Dublin 9

T +353 1 807 3800  
F +353 1 807 3838  
E standards@nsai.ie  
W NSAI.ie

Sales:  
T +353 1 857 6730  
F +353 1 857 6729  
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann



## Correction Notice

**Reference:** CWA 16762:2014

**Title:** CEN Workshop Agreement - CEN/WS SERES - ICT Standards in Support of an eReporting Framework for the Engineering Materials Sector

**Work Item:** WSSER001

Brussels, 2014-06-25

**with reference to the above, please include the following minor editorial correction(s) in the document related to:**

the following language version(s) :

- English
- French
- German

for the following procedure :

- PQ/UQ
- Enquiry
- 2nd Enquiry
- Parallel Enquiry
- 2<sup>nd</sup> Parallel Enquiry
- Formal Vote
- 2<sup>nd</sup> Formal Vote
- Parallel Formal Vote
- 2<sup>nd</sup> Parallel Formal Vote
- UAP
- TC Approval
- 2<sup>nd</sup> TC Approval
- Publication
- Parallel Publication

---

It has been brought to our attention that this document, issued on 2014-05-28, requires modification.

Figure 1 has been replaced.

Please find enclosed the updated English version.

We apologise for any inconvenience this may cause.

*This page is intentionally left BLANK.*

**CEN**

**CWA 16762**

**WORKSHOP**

May 2014

**AGREEMENT**

---

ICS 35.240.50

English version

## **CEN Workshop Agreement - CEN/WS SERES - ICT Standards in Support of an eReporting Framework for the Engineering Materials Sector**

This CEN Workshop Agreement has been drafted and approved by a Workshop of representatives of interested parties, the constitution of which is indicated in the foreword of this Workshop Agreement.

The formal process followed by the Workshop in the development of this Workshop Agreement has been endorsed by the National Members of CEN but neither the National Members of CEN nor the CEN-CENELEC Management Centre can be held accountable for the technical content of this CEN Workshop Agreement or possible conflicts with standards or legislation.

This CEN Workshop Agreement can in no way be held as being an official standard developed by CEN and its Members.

This CEN Workshop Agreement is publicly available as a reference document from the CEN Members National Standard Bodies.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

## Contents

	Page
Foreword.....	8
0 Introduction .....	10
0.1 The Case for Technologies for Engineering Materials Data.....	10
0.2 Harmonization of Existing Technologies for Engineering Materials Data.....	12
0.3 Business, Standardization, and Technological Perspectives.....	12
0.3.1 Profile of the technical experts .....	12
1 Scope .....	14
2 Normative References .....	14
3 Business Analysis .....	14
3.1 Objectives and Methodology .....	14
3.2 Background .....	14
3.2.1 Introduction .....	14
3.2.2 Electronic reporting practices in the engineering sector.....	15
3.2.3 Electronic business specifications for engineering materials reporting.....	16
3.2.4 Audit trail .....	18
3.2.5 Product data chain.....	20
3.3 Case Studies .....	21
3.3.1 Aerospace sector.....	21
3.3.2 Mechanical engineering sector .....	23
3.4 GKN Aerospace Case Study (Aerospace Sector).....	23
3.4.1 Presentation of the company .....	23
3.4.2 Exchange of certificates current state.....	24
3.4.3 Test types and standards .....	24
3.4.4 Process analysis.....	25
3.4.5 Data requirements .....	28
3.4.6 Reasons for a transition to electronic exchange .....	31
3.4.7 Risk assessment.....	31
3.5 Eurocopter Case Study (Aerospace Sector).....	32
3.5.1 Exchange of certificates current state.....	32
3.5.2 Test types and standards .....	33
3.5.3 Process analysis.....	34
3.5.4 Data requirements .....	37
3.5.5 Reasons for a transition to electronic exchange .....	44
3.5.6 Risk assessment.....	44
3.6 Alstom Power Case Study (Mechanical Engineering Sector) .....	44
3.6.1 Presentation of the company .....	44
3.6.2 Exchange of certificates current state.....	45
3.6.3 Test types and standards .....	45
3.6.4 Process analysis.....	45
3.6.5 Data requirements .....	47
3.6.6 Reasons for a transition to electronic exchange .....	52
3.6.7 Risk assessment.....	53
3.7 Systems Integration.....	53
3.7.1 Introduction .....	53
3.7.2 Objectives.....	54
3.7.3 Limitations .....	54
3.7.4 Implementation .....	55
3.8 Conclusions and Recommendations.....	56
4 Standardisation and Governance .....	57

4.1	Objectives and Methodology.....	57
4.2	Background.....	57
4.2.1	Introduction.....	57
4.2.2	Organisations, committees and standards concerned with engineering materials.....	57
4.2.3	Standards concerned with reporting engineering materials data.....	59
4.2.4	Documents concerned with vocabulary and terminology.....	60
4.3	Consultation with Standards Setting Organizations, Fora, and Consortia.....	62
4.4	Outcomes.....	62
4.4.1	Hosting roadmap.....	62
4.4.2	Stakeholder engagement.....	65
4.4.3	Best practices for developing ICT standards for engineering materials data.....	66
4.5	Discussion.....	67
4.5.1	Stakeholder response to ICT standards for engineering materials data.....	67
4.5.2	ISO and CEN materials technical committees.....	67
4.5.3	UN/CEFACT.....	68
4.5.4	Governance.....	69
4.6	Conclusions and Recommendations.....	71
4.6.1	Engineering materials standards.....	71
4.6.2	Engagement with the engineering materials community.....	71
4.6.3	Engagement with UN/CEFACT.....	72
5	Technologies.....	72
5.1	Technology Review.....	72
5.1.1	ASTM Committee E49.....	72
5.1.2	Analysing the E49 approach.....	73
5.1.3	ISO TC 184/SC4.....	77
5.1.4	MatML and NIST.....	81
5.1.5	MatDB and JRC.....	81
5.1.6	Harmonization of the reviewed technologies.....	83
5.1.7	A harmonized high-level model.....	84
5.2	Modelling.....	85
5.2.1	Introduction.....	85
5.2.2	Natural language description of an engineering material.....	86
5.2.3	Written Specification.....	87
5.2.4	Technical Dictionary, Terms and Definitions.....	88
5.2.5	RDF Diagrams and Conceptual Models.....	92
5.2.6	Ontology.....	97
5.2.7	Schema.....	100
5.3	Conclusions and Recommendations.....	100
5.3.1	A harmonized model for engineering materials data.....	100
5.3.2	Assign URIs to the entries in engineering materials vocabulary standards.....	100
5.3.3	Modularize the test data technologies.....	100
5.3.4	Validation and adoption.....	100
6	Conclusions.....	101
6.1	Business.....	101
6.2	Standardization and Governance.....	101
6.3	Technologies.....	102
7	Recommendations.....	102
7.1	Business.....	102
7.2	Standardization and Governance.....	102
7.3	Technologies.....	102
Annex A	.....	104
A.1	Example of Sharing and Exchanging Materials Data.....	104
A.2	Materials Standards Committees.....	105
A.3	Details of Potential Hosting Organizations.....	108
A.3.1	ISO TC 154 Processes, data elements and documents in commerce, industry and administration.....	108
A.3.2	ISO TC 184/SC 4 Industrial data.....	108

## CWA 16762:2014 (E)

A.3.3	OASIS .....	109
A.3.4	CODATA.....	109
A.3.5	VAMAS .....	110
A.3.6	Exploration and Production Information Management Association (EPIM).....	110
A.3.7	ECISS .....	111
A.3.8	National Materials Standards Committees.....	111
A.3.9	ISO TC 164 Mechanical Testing of Metals .....	112
A.4	EN 10204 and EN 10168 .....	113
A.4.1	EN 10204 metallic materials — types of inspection documents.....	113
A.4.2	EN 10168 .....	114
A.5	Use of the Term 'class' .....	116
A.5.1	Introduction .....	116
A.5.2	Formal information modelling use of the term “class” .....	116
A.5.3	Class and individual .....	116
A.5.4	Classification of class .....	118
A.6	The ISO 15926 Ontological Approach.....	119
A.6.1	ISO 15926 Terms and Definitions .....	119
A.6.2	What is a specification? .....	120
A.6.3	Class defined by a physical property .....	120
A.6.4	Class defined by a relationship .....	121
A.6.5	Intersection of classes .....	121
A.6.6	Integration of the ASTM Manual and ISO 15926 .....	122
A.7	Engineering Materials Terms and Definitions .....	123
A.7.1	Introduction .....	123
A.7.2	High-Level Model .....	123
A.7.3	Material Type .....	126
A.7.4	Material Characterization .....	130
A.7.5	Material Process .....	131
A.7.6	Material Source .....	132
A.8	Conceptual Model for a Material .....	138
A.8.1	Principal classes .....	138
A.8.2	Subclasses .....	140
A.8.3	Conceptual Model Examples .....	146
A.9	Establishing a Terminology .....	155
A.9.1	Objective .....	155
A.9.2	Material Processes and Objects.....	155
A.9.3	Engineering Material in Primary Form.....	156
A.9.4	Material Objects and States .....	156
A.9.5	Link Between Engineering Material in Primary Form and Engineered Material Product.....	158
A.9.6	Simple UML Diagrams .....	159
	Bibliography .....	160



## Table of figures

Figure 1 — Electronic data in the engineering materials supply chain .....	10
Figure 2 — CEN/WS SERES organigram .....	12
Figure 3 — Engineering product data chain .....	20
Figure 4 — Aerospace supply chain organisation .....	22
Figure 5 — GKN case study activity diagram .....	26
Figure 6 — GKN case study data model .....	28
Figure 7 — Eurocopter case study activity diagram for qualification report .....	34
Figure 8 — Eurocopter case study activity diagram for incoming inspection .....	36
Figure 9 — Eurocopter case study data model for the qualification report .....	38
Figure 10 — Eurocopter case study data model for the incoming inspection .....	42
Figure 11 — Alstom Power case study activity diagram .....	46
Figure 12 — Alstom Power case study data model .....	48
Figure 13 — Relationships among international and national materials SDOs .....	58
Figure 14 — Roadmap for hosting CEN/WS SERES deliverables .....	65
Figure 15 — EIF interoperability levels. Reproduced from COM(2010) 744 final .....	70
Figure 16 — Graphical representation of the high-level model for engineering materials data .....	85
Figure 17 — Information included in the written specification .....	87
Figure 18 — RDF diagram for engineering material type .....	93
Figure 19 — RDF diagram for engineering material characterization .....	94
Figure 20 — RDF diagram for engineering material process .....	95
Figure 21a — RDF diagram for customer order and works order .....	96
Figure 21b — RDF diagram for works order and manufacture .....	97
Figure 22 — Parts of the CEN/WS SERES ontology for engineering materials data .....	98
Figure 23 — Categorization of concepts according to the CEN/WS SERES model .....	99
Figure 24 — Stainless steel and class of stainless steel .....	117
Figure 25 — Intersection of classes of material .....	122

**CWA 16762:2014 (E)**

Figure 26 — Chemical analysis method .....	134
Figure 27 — An instance of a chemical analysis .....	135
Figure 28 — Manufacturing activity. ....	136
Figure 29 — Purpose and method for an activity. ....	136
Figure 30 — Principal classes of physical object.....	138
Figure 31 — Principal classes of activity .....	139
Figure 32 — Some broad classes of material and specifications.....	140
Figure 33 — Classes defined by external shape.....	141
Figure 34 — Some principal classes of information. ....	141
Figure 35 — Information and Document.....	142
Figure 36 — Classes of activity that are concerned with documents.....	142
Figure 37 — Classes of organization.....	143
Figure 38 — Classes of manufacturing activity .....	143
Figure 39 — Decomposition .....	144
Figure 40 — Chemical element .....	145
Figure 41 — Mass, volume and amount of substance ratio .....	146
Figure 42 — Activities that create a chemical analysis report.....	147
Figure 43 — Extract sample and analyse activities .....	147
Figure 44 — Perform analysis and create report.....	148
Figure 45 — Creation of information and document.....	149
Figure 46 — Decomposition into chemical elements .....	149
Figure 47 — Elements for components .....	150
Figure 48 — Mass ratios for components.....	150
Figure 49 — Processing, fabrication and use activities.....	151
Figure 50 — Manufacturing activities and states of a batch.....	152
Figure 51 — Use activities and states of a component .....	153
Figure 52 — Fabrication activities and states of a batch and component.....	154
Figure 53 — Material object and material process .....	155
Figure 54 — Network of material processes.....	155

Figure 55 — Engineering material in primary form.....	156
Figure 56 — Removing material.....	156
Figure 57 — Adding material.....	157
Figure 58 — Beginning of an identified material object.....	157
Figure 59 — End of an identified material object .....	157
Figure 60 — Short cut "made from" relationship .....	158
Figure 61 — Simple UML for material object and material process.....	159
Figure 62 — Simple UML for state of a material object.....	159

## List of Tables

Table 1 — Aerospace supply chain organisation.....	21
Table 2 — GKN case study test types and reporting standards .....	24
Table 3 — GKN case study classes and attributes.....	29
Table 4 — Eurocopter case study test types and reporting standards .....	33
Table 5 — Eurocopter case study classes used in both incoming inspection and qualification reports .....	42
Table 6 — Eurocopter case study classes specific to incoming inspection .....	43
Table 7 — Alstom Power case study classes .....	49
Table 8 — Structure of ISO TC 37 .....	62
Table 9 — Potential hosting organisations.....	63
Table 10 — Community contributions to ICT standards for engineering materials data.....	66
Table A.1 — ISO Material Products Standards Committees .....	105
Table A.2 — ISO TC 17 Steel Subcommittees .....	106
Table A.3 — European Standards Committee for Metallic and Non-Metallic Material Products .....	106
Table A.4 — ECISS Material Products Standards Committees.....	107
Table A.5 — Certificate types specified in EN 10204:2004.....	113
Table A.6 — Classification of the different classes related to materials .....	118

**CWA 16762:2014 (E)****Foreword**

This CEN Workshop Agreement has been drafted and approved by a Workshop of representatives of interested parties on 2014-03-10, the constitution of which was supported by CEN following the public call for participation made on 2012-01-26.

A list of the individuals and organizations which supported the technical consensus represented by the CEN Workshop Agreement is available to purchasers from the CEN-CENELEC Management Centre. The following organisations support the document:

- AFRL/RXT, United States of America
- Agathis Consulting, Belgium
- Alstom Power Ltd, United Kingdom
- Beta Technology Ltd, United Kingdom
- Caesar Systems Ltd, United Kingdom
- CETIM, France
- DFKI, Germany
- ENEA, Italy
- Federal Institute for Materials Research and Testing (BAM), Germany
- FernUniversität in Hagen, University
- GKN Aerospace Engine System, Sweden
- Granta Design, United Kingdom
- Instron, United Kingdom
- JRC IET, the Netherlands
- Kent State University, United States of America
- McGaw Technology, Inc., United States of America
- National Physical Laboratory (NPL Management Ltd.), United Kingdom
- Nist (National Institute of Standards and Technology), United States of America
- Oak Ridge National Laboratory, United States of America
- R&R Data Services, United States of America
- Tata Steel, United Kingdom
- TOYO Univ. Regional Development Studies, Japan
- TUV Rheinland, Hong Kong
- VZLU Praha, Czech Republic

The SERES Project Team was chaired by Chris Bullough, Alstom Power Ltd, and composed of:

- Alexandre Faget, Granta Design
- Aurélie Virgili, Agathis Consulting
- David Leal, Caesar Systems Ltd
- John Rumble, R&R Data Services
- Malcolm Loveday, Beta Technology Ltd
- Tim Austin, JRC IET

The final review/endorsement round for this CWA was started on 2013-12-23 and was successfully closed on 2014-02-23. The CWA has been officially approved at the final CEN WS/SERES Plenary Meeting on 2014-03-10. The final text of this CWA was submitted to CEN for publication on 2014-03-31.

This CEN Workshop Agreement is publicly available as a reference document from the National Members of The following countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Comments or suggestions from the users of the CEN Workshop Agreement are welcome and should be addressed to the CEN-CENELEC Management Centre.

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

- 
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
  - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-