

© Copyright SEK. Reproduction in any form without permission is prohibited.

Integrering av processtyrning och affärssystem – Del 1: Modeller och terminologi

*Enterprise-control system Integration –
Part 1: Models and terminology*

Som svensk standard gäller europastandarden EN 62264-1:2008. Den svenska standarden innehåller den officiella engelska språkversionen av EN 62264-1:2008.

Nationellt förord

Europastandarden EN 62264-1:2008

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 62264-1, First edition, 2003 - Enterprise-control system Integration - Part 1: Models and terminology**

utarbetad inom International Electrotechnical Commission, IEC.

ICS 25.040; 35.240.50

Denna standard är fastställd av SEK Svensk Elstandard, som också kan lämna upplysningar om **sakinnehållet** i standarden.
Postadress: SEK, Box 1284, 164 29 KISTA
Telefon: 08 - 444 14 00. Telefax: 08 - 444 14 30
E-post: sek@elstandard.se. Internet: www.elstandard.se

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

EUROPEAN STANDARD

EN 62264-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2008

ICS 25.040; 35.240.50

English version

**Enterprise-control system integration -
Part 1: Models and terminology**
(IEC 62264-1:2003)

Intégration des systèmes
entreprise-contrôle -
Partie 1: Modèles et terminologie
(CEI 62264-1:2003)

Integration von Unternehmensführungs-
und Leitsystemen -
Teil 1: Modelle und Terminologie
(IEC 62264-1:2003)

This European Standard was approved by CENELEC on 2007-12-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

© 2008 CENELEC - All rights of exploitation in any form and by any means reserved worldwide for CENELEC members.

Ref. No. EN 62264-1:2008 E

SEK Svensk Elstandard

Foreword

The text of the International Standard IEC 62264-1:2003, prepared by SC 65A, System aspects, of IEC TC 65, Industrial-process measurement, control and automation, and ISO TC 184/SC 5/JWG 15, Enterprise-control system integration, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 62264-1 on 2007-12-01 without any modification.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2008-12-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2010-12-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62264-1:2003 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61512-1	1997	Batch control - Part 1: Models and terminology	EN 61512-1	1999
ISO 10303-1	1994	Industrial automation systems and integration - Product data representation and exchange - Part 1: Overview and fundamental principles	ENV ISO 10303-1	1995
ISO 15531-1	2004	Industrial automation systems and integration - Industrial manufacturing management data - Part 1: General	-	-
ISO 15704	2000	Industrial automation systems - Requirements for enterprise-reference architectures and methodologies	-	-
ISO/IEC 19501	2005	Information technology - Open Distributed Processing - Unified Modeling Language (UML)	-	-

CONTENTS

1	Scope.....	9
2	Normative references	9
3	Terms and definitions	10
4	Enterprise-control system integration overview.....	13
4.1	Introduction	13
4.2	Criteria for inclusion in manufacturing operations and control domain	14
5	Hierarchy models	15
5.1	Hierarchy model introduction	15
5.2	Scheduling and control hierarchy	15
5.3	Equipment hierarchy	19
5.4	Decision hierarchy	21
6	Functional data flow model	22
6.1	Functional data flow model contents	22
6.2	Functional data flow model notation	22
6.3	Functional enterprise-control model	23
6.4	Functions	23
6.5	Information flows	29
7	Object model	34
7.1	Model explanation	34
7.2	Categories of information	35
7.3	Object model structure	42
7.4	Object model extensibility	43
7.5	Resources and views	43
7.6	Production capability information	52
7.7	Product definition information	56
7.8	Production information	59
7.9	Model cross-reference	67
8	Completeness, compliance and conformance	70
8.1	Completeness	70
8.2	Compliance	70
8.3	Conformance	70
	Annex A (informative) IEC 62264 relationship with some other standardization work in the manufacturing related area	71
	Annex B (informative) Business drivers and key performance indicators	77
	Annex C (informative) Discussion on models	84
	Annex D (informative) Selected elements of the Purdue Reference Model	87
	Annex E (informative) PRM correlation to MESA International model and IEC 62264 models	131
	Annex F (informative) Systems, resources, capability, capacity and time	134
	Bibliography	141

Figure 1 – Outline of models in the standard	13
Figure 2 – Enterprise-control system interface	14
Figure 3 – Functional hierarchy	15
Figure 4 – Equipment hierarchy.....	19
Figure 5 – Functional enterprise/control model.....	23
Figure 6 – Areas of information exchange	35
Figure 7 – Production capability information	36
Figure 8 – Process segment capabilities	37
Figure 9 – Production information definition	38
Figure 10 – Example of process segments	39
Figure 11 – Possible information overlaps	40
Figure 12 – Production information.....	40
Figure 13 – Segment relationships	42
Figure 14 – Personnel model.....	44
Figure 15 – Equipment model.....	45
Figure 16 – Material model.....	48
Figure 17 – Process segment model	51
Figure 18 – Production capability model.....	53
Figure 19 – Process segment capability model.....	55
Figure 20 – Current and future capacities.....	56
Figure 21 – Product definition model	57
Figure 22 – Production schedule model.....	60
Figure 23 – Production performance model	64
Figure 24 – Object model inter-relations.....	68
Figure B.1 – Multiple business and production processes.....	78
Figure C.1 – Scope for Purdue Reference Model (PRM) for manufacturing.....	86
Figure D.1 – Assumed hierarchical computer control structure for a large manufacturing complex	88
Figure D.2 – Assumed hierarchical computer control system structure for an industrial plant.....	89
Figure D.3 – Assumed hierarchical computer control structure for an industrial company to show Level 5 and its relationship to Level 4.....	90
Figure D.4 – Definition of the real tasks of the hierarchical computer control system (as modified).....	94
Figure D.5 – Hierarchy arrangement of the steel plant control to show relationship of hierarchy to plant structure.....	99
Figure D.6 – Hierarchy arrangement of the steel plant control system as studied for energy optimization	99
Figure D.7 – Hierarchy arrangement of the paper-mill control to show relationship of hierarchy to plant structure.....	100
Figure D.8 – The hierarchy control scheme as applied to a petrochemical plant	100
Figure D.9 – The hierarchy control scheme as applied to a pharmaceuticals plant	101
Figure D.10 – Computer-integrated manufacturing system (CIMS) (Cincinnati-Millicron proposal).....	101
Figure D.11 – Relationship of the several classes of functional entities which comprise the CIM reference model and computer-integrated manufacturing itself.....	109

Figure D.12 – Major external influences as used in the data-flow model	109
Figure D.13 – Requirements interfacing of corporate management and staff functional entities to the factory	110
Figure D.14 – Report interfacing to corporate management and staff functional entities from the factory	110
Figure D.15 – Interface of government regulations, etc., to the factory	111
Figure D.16 – 0.0 facility model	112
Figure D.17 – 1.0 order processing	113
Figure D.18 – 2.0 production scheduling	114
Figure D.19 – 3.0 production control	115
Figure D.20 – 3.1 process support engineering	116
Figure D.21 – 3.2 maintenance	117
Figure D.22 – 3.3 operations control	118
Figure D.23 – 4.0 materials and energy control	119
Figure D.24 – 5.0 procurement	120
Figure D.25 – 6.0 quality assurance	121
Figure D.26 – 7.0 product inventory	122
Figure D.27 – 8.0 cost accounting	123
Figure D.28 – 9.0 product shipping administration	124
Figure F.1 – Production or manufacturing system	137
Figure F.2 – IDEF0 actigram	137
Table 1 – Yourdon notation used	22
Table 2 – UML notation used	43
Table 3 – Model cross-reference	69-70
Table D.1 – Generic list of duties of all integrated information and automation systems	92
Table D.2 – An overall plant automation system provides	92
Table D.3 – Notes regarding optimization (improvement) of manufacturing efficiency	93
Table D.4 – Summary of duties of control computer systems	93
Table D.5 – Potential factors for facilitating integrated control system development and use	95
Table D.6 – Required tasks of the intra-company management information system (Level 4B of Figure D.1 or Figure D.2 or Level 5 of Figure D.3)	95
Table D.7 – Duties of the production scheduling and operational management level (Levels 4A or 5A)	95
Table D.8 – Duties of the area level (Level 3)	96
Table D.9 – Duties of the supervisory level (Level 2)	97
Table D.10 – Duties of the control level (Level 1)	97
Table D.11 – Information flow model of generic production facility mini-specs (definition of functions)	102-108
Table D.12 – Correlation of information flow tasks with the tasks of the scheduling and control hierarchy	125

ENTERPRISE-CONTROL SYSTEM INTEGRATION –

Part 1: Models and terminology

1 Scope

This standard describes the interface content between manufacturing control functions and other enterprise functions. The interfaces considered are the interfaces between Levels 3 and 4 of the hierarchical model defined by this standard. The goal is to reduce the risk, cost, and errors associated with implementing these interfaces.

The standard can be used to reduce the effort associated with implementing new product offerings. The goal is to have enterprise systems and control systems that inter-operate and easily integrate.

The scope of this standard is limited to

- a) a presentation of the scope of the manufacturing operations and control domain;
- b) a discussion of the organization of physical assets of an enterprise involved in manufacturing;
- c) a listing of the functions associated with the interface between control functions and enterprise functions; and
- d) a description of the information that is shared between control functions and enterprise functions.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61512-1:1997, *Batch control – Part 1: Models and terminology*

ISO/IEC 19501-1, *Information technology – Unified Modeling Language (UML) – Part 1: Specification*¹

ISO 10303-1:1994, *Industrial automation systems and integration – Product data representation and exchange – Part 1: Overview and fundamental principles*

ISO 15531-1, *Industrial automation systems and integration – Industrial manufacturing management data – Part 1: General overview*²

ISO 15704:2000, *Industrial automation systems – Requirements for enterprise-reference architectures and methodologies*

¹ To be published.

² To be published.