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Siehe Anwendungsbeginn

Entwurf**Integration von Unternehmensführungs- und Leitsystemen –
Teil 4: Attribute des Objektmodells für die Integration des operativen
Produktionsmanagements
(IEC 65E/384/CD:2013), Text in Englisch**

Enterprise-Control System Integration –
Part 4: Object model attributes for manufacturing operations management integration
(IEC 65E/384/CD:2013), Text in English

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2014-05-23 wird der Öffentlichkeit zur Prüfung und
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Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses
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Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten
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DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

Nationales Vorwort

Die englische Originalfassung des internationalen Dokuments IEC 65E/384/CD:2013 „Enterprise-Control System Integration – Part 4: Object model attributes for manufacturing operations management integration“ (CD, en: Committee Draft) ist unverändert in diesen Norm-Entwurf übernommen worden.

Das internationale Dokument wurde vom SC 65E „Devices and integration in enterprise systems“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet und den nationalen Komitees zur Stellungnahme vorgelegt.

Die IEC und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Da der Abstimmungszeitraum für einen FDIS bzw. Schluss-Entwurf prEN nur 2 Monate beträgt, und dann keine sachlichen Stellungnahmen mehr abgegeben werden können, sondern nur noch eine „JA/NEIN“-Entscheidung möglich ist, wobei eine „NEIN“-Entscheidung fundiert begründet werden muss, wird bereits der CD als DIN-Norm-Entwurf veröffentlicht, um die Stellungnahmen aus der Öffentlichkeit frühzeitig berücksichtigen zu können.

Für dieses Dokument ist das nationale Arbeitsgremium K 931 „Systemaspekte“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (www.dke.de) zuständig.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für den vorliegenden Normentwurf erfüllt.

Da sich die Benutzer des vorliegenden Normentwurfs der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der IEC 62264-4 veröffentlicht. Zu deren Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA des vorliegenden Normentwurfs hinzugefügt. Für viele der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Dieser Normentwurf steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Es ist vorgesehen, auch bei der entsprechenden zukünftigen Deutschen Norm auf die deutsche Sprachfassung zu verzichten und diese in der englischsprachigen Fassung zu veröffentlichen.

Das Original-Dokument enthält Bilder in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder in der originalen Farbdarstellung.

Nationaler Anhang NA (informativ)

3 Begriffe und Abkürzungen

Für die Anwendung dieses Dokuments gelten die Begriffe nach IEC 62264-1 und die folgenden Begriffe.

3.1 Begriffe

3.1.1

Auftragsliste

(en: job list)

Sammlung von Aufträgen für einen oder mehrere Arbeitsplätze und/oder Ressourcen für einen genauen Zeitrahmen

3.1.2

Auftrag

(en: job order)

kleinste Einheit an auszuführender Arbeit, festgelegt vom Arbeitsmaster

3.1.3

Auftragsrückmeldung

(en: job response)

Daten eines ausgeführten Auftrags, welche einer Produktion, Instandhaltung, Bestands- oder Qualitäts-Aktivitäten oder beliebige Kombination von Aktivitäten betreffen

3.1.4

Ressourcen-Beziehungsnetzwerk

(en: resource relationship network)

eine oder mehrere Ausdrücke einer Beziehung zwischen zwei oder mehreren Ressourcen

3.1.5

Arbeitswarnung

(en: work alert)

Meldung eines Level 3-Events, welches keine Quittierung erfordert

3.1.6

Arbeitskalender

(en: work calendar)

Sammlung von Kalendereintragungen

3.1.7

Arbeitsfähigkeit

(en: work capability)

spezielle Kombination an Ressourcen mit bestimmten Fähigkeiten, welche nötig und ausreichend sind, um einen oder mehrere Schritte an Arbeitsfestlegung auszuführen

3.1.8

Arbeitsfestlegung

(en: work definition)

Sammlung an Informationen über Ressourcen und Arbeitsablauf-Festlegungen in Verbindung mit Arbeit

3.1.9

Arbeitsrichtlinie

(en: work directive)

Arbeitsfestlegung, abgeleitet vom Arbeitsmaster und verwendet, um einen Auftrag durchzuführen

3.1.10**Arbeits-Leistungskennzahl****(en: work KPI)**

quantifizierbare Maßeinheit, welche einen geschäftlichen oder betrieblichen Wert bezüglich der Arbeitsleistung hat

3.1.11**Arbeitsmaster****(en: work master)**

Typ der Arbeitsfestlegung, welcher eine Vorlage für Arbeit ist, die für einen Auftrag ausgeführt wird

3.1.12**Arbeitsleistung****(en: work performance)**

Sammlung von Arbeitsrückmeldungen

3.1.13**Arbeitsmaster-Fähigkeit****(en: work master capability)**

das Können der Ressourcen, um eine Arbeit auszuführen, und die Belastbarkeit solcher Ressourcen

3.1.14**Arbeitsbericht****(en: work report)**

Teilmenge der Ausführung und der Geschäftsinformationen, die basierend auf Geschäftsanforderungen einbehalten werden

3.1.15**Arbeitsanfrage****(en: work request)**

Sammlung von Aufträgen

3.1.16**Arbeits-Rückmeldung****(en: work response)**

Sammlung von Auftragsrückmeldungen

3.1.17**Arbeitsplan****(en: work schedule)**

Sammlung von Arbeitsanfragen

3.1.18**Arbeitsablauf****(en: workflow)**

- Modell, um Arbeit als Muster von Aktivitäten darzustellen
- Information, verwendet, um die Ausführung von Prozeduren zu manipulieren

BEISPIEL Eine wiederholbare Folge von Prozeduren, freigegeben von einer Organisation von Ressourcen mit festgelegten Rollen, entsprechend dem Durchlauf der Menge, Energie oder Information.

3.1.19**Arbeitsablaufprozess****(en: workflow process)**

Teil der Prozedur einer Arbeitsfestlegung, die einen Arbeitsablauf beschreibt

CONTENTS

INTRODUCTION	14
1 Scope	16
2 Normative references	16
3 Terms, definitions and abbreviations	17
3.1 Terms and definitions.....	17
3.2 Abbreviations	18
4 Information exchange between manufacturing operations	18
4.1 Activity information exchange network	18
4.2 Information exchange models	19
5 Object model attributes	20
5.1 Object models	20
5.2 Attribute extensibility.....	21
5.3 Object model structure	21
5.4 Conventions used in tables	22
6 Resource relationship network model	23
6.1 Resource relationship network	23
6.2 Resource relationship network attributes	24
6.3 Resource network connection	25
6.4 Resource network connection property	26
6.5 From resource reference	26
6.6 From resource reference property	27
6.7 To resource reference	27
6.8 To resource reference property	28
6.9 Resource network connection type	28
6.10 Resource network connection type property	29
7 Work definition model	29
7.1 Work definition	29
7.2 Work master	30
7.3 Work directive	30
7.4 Work definition attributes	32
7.5 Parameter specification.....	32
7.6 Personnel specification	32
7.7 Personnel specification property	33
7.8 Equipment specification	33
7.9 Equipment specification property	33
7.10 Physical asset specification	33
7.11 Physical asset specification property	33
7.12 Material specification	33
7.13 Material specification property	33
7.14 Workflow specification	33
8 Work schedule and job list models	39
8.1 Work schedule	39

8.2	Work schedule attributes	42
8.3	Work request	43
8.4	Job list model	44
8.5	Job list attributes	45
8.6	Job order attributes	45
8.7	Job order parameter	47
8.8	Personnel requirement	47
8.9	Personnel requirement property	47
8.10	Equipment requirement	47
8.11	Equipment requirement property	47
8.12	Physical asset requirement	47
8.13	Physical asset requirement property	47
8.14	Material requirement	47
8.15	Material requirement property	47
8.16	Workflow specification node request	47
9	Work performance model	47
9.1	Work performance	47
9.2	Work performance attributes	49
9.3	Work response	49
9.4	Job response	50
9.5	Job response data	51
9.6	Personnel actual	51
9.7	Personnel actual property	51
9.8	Equipment actual	51
9.9	Equipment actual property	51
9.10	Physical asset actual	51
9.11	Physical asset actual property	52
9.12	Material actual	52
9.13	Material actual property	52
9.14	Workflow specification node response	52
10	Work capability model	52
10.1	Work capability	52
10.2	Work capability attributes	53
10.3	Personnel capability	53
10.4	Personnel capability property	54
10.5	Equipment capability	54
10.6	Equipment capability property	54
10.7	Physical asset capability	54
10.8	Physical asset capability property	54
10.9	Material capability	54
10.10	Material capability property	54
11	Work master capability model	54
11.1	Work master capability	54
11.2	Work master capability attributes	56

11.3	Personnel capability.....	56
11.4	Personnel capability property	56
11.5	Equipment capability.....	56
11.6	Equipment capability property	57
11.7	Physical asset capability	57
11.8	Physical asset capability property	57
11.9	Material capability	57
11.10	Material capability property	57
12	Work KPI model	57
12.1	Work KPI	57
13	Work alert model	57
13.1	Work alert	57
13.2	Work alert definition	58
13.3	Work alert definition property	59
13.4	Work alert attributes.....	60
13.5	Work alert property	60
14	Work calendar model	61
14.1	Work calendar definition and work calendar	61
14.2	Work calendar definition.....	62
14.3	Work calendar definition entry.....	62
14.4	Work calendar definition entry property	63
14.5	Work calendar.....	63
14.6	Work calendar entry.....	63
14.7	Work calendar entry property	64
15	Documents.....	64
16	Work record model	64
16.1	Work record definition	64
16.2	Work record	65
16.3	Work record extensions	66
16.4	Work record model.....	68
16.5	Work record entry	69
16.6	Work record container objects.....	70
16.7	Event types and subtypes	70
17	Object lists and relationships	71
18	Compliance	74
Annex A (Informative)	Questions and answers about object use	76
Annex B (Informative)	Related standards.....	80
Annex C (Informative)	Representing a workflow specification in BPMN.....	82
Annex D (Informative)	Representing a workflow specification in flowchart notation	86
Annex E (Informative)	Example of Work Calendars.....	88

Tables

Table 1 — UML notation used	21
Table 2 — Example table.....	22
Table 3 — Resource relationship network attributes	25
Table 4 — Resource network connection attributes	26
Table 5 — Resource network connection property attributes	26
Table 6 — From resource reference attributes	27
Table 7 — From resource reference property attributes	27
Table 8 — To resource reference attributes	28
Table 9 — To resource reference property attributes	28
Table 10 — Resource network connection type attributes	29
Table 11 — Resource network connection type property attributes	29
Table 12 — Work definition attributes	32
Table 13 — Workflow specification attributes.....	36
Table 14 — Workflow specification node attributes	36
Table 15 — Workflow specification node property attributes	37
Table 16 — Workflow specification connection attributes	37
Table 17 — Workflow specification connection property attributes	38
Table 18 — Workflow specification node type attributes	38
Table 19 — Workflow specification node type property attributes	38
Table 20 — Workflow specification connection type attributes	39
Table 21 — Workflow specification connection property attributes	39
Table 22 — Work schedule attributes	43
Table 23 — Work request attributes	44
Table 24 — Job list attributes	45
Table 25 — Job order attributes	46
Table 26 — Work performance attributes.....	49
Table 27 — Work response attributes	50
Table 28 — Job response attributes	51
Table 29 — Work capability attributes	53
Table 30 — Work master capability attributes.....	56
Table 31 — Work alert definition attributes	58
Table 32 — Work alert definition property attributes	59
Table 33 — Work alert attributes	60
Table 34 — Work alert property attributes	60
Table 35 — Work calendar definition attributes.....	62
Table 36 — Work calendar definition entry attributes	62
Table 37 — Work calendar definition entry property attributes	63
Table 38 — Work calendar attributes	63

Table 39 — Work calendar entry attributes	63
Table 40 — Work calendar entry property attributes	64
Table 41 — Work record entry attributes	69
Table 42 — Additional event types and subtypes	71
Table 43 — Objects and models	73
Table 44 — 4 Day 24 Hour shift pattern example	88
Table 45 — Work calendar definition for 4 Day 24 Shift entry examples	88
Table 46 — Work calendar definition entry 4 Day 24 Shift example	88
Table 47 — Work calendar entries for 2014 shift calendar	89
Table 48 — Work calendar definition for 2014 England bank holidays	90
Table 49 — Work calendar definition entries for 2014 England bank holidays	90

Figures

Figure 1 — Information exchange models for manufacturing operations management	19
Figure 2 — Resource relationship network model	24
Figure 3 — Work definition model	30
Figure 4 — Relationship of work master to work directive	31
Figure 5 — Workflow specification model	34
Figure 6 — Example of a workflow specification in BPMN format	34
Figure 7 — Example of a workflow specification in flowchart format	35
Figure 8 — Work schedule model	40
Figure 9 — Operations schedule for a site	41
Figure 10 — Work schedule for an area	41
Figure 11 — Work request, job order, job list	42
Figure 12 — Work request example for continuous processing	42
Figure 13 — Work performance model	48
Figure 14 — Work capability model	52
Figure 15 — Work master capability object model	55
Figure 16 — Work alert model	58
Figure 17 — Work calendar model	61
Figure 18 — Work record environment	65
Figure 19 — Work record container example	67
Figure 20 — Work record element reference example	68
Figure 21 — Work record model	69
Figure 22 — Relationship between models	73
Figure 23 — Equipment resources	76
Figure 24 — Routing relationship network	77
Figure 25 — Gas main relationship network	77

Figure 26 — “Usable in” relationship network 78

Figure 27 — Relationship to IEC 62264-2 and IEC 61512 standards..... 81

Figure 28 — Example of a workflow specification in BPMN notation 85

Figure 29 — Example workflow process in the workflow specification model..... 85

Figure 30 — Example of a workflow specification in flowchart notation 86

Figure 31 — Example workflow process in the workflow specification model..... 87

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ENTERPRISE-CONTROL SYSTEM INTEGRATION –

Part 4: Object model attributes for manufacturing operations management integration

FOREWORD

This part of IEC 62264 defines the interfaces between enterprise activities and control activities.

The scope of this part of IEC 62264 is limited to defining the details of the interface content within manufacturing operations management. The scope is limited to the definition of object models and attributes for the information defined in IEC 62264-3. The goal is to reduce the effort, cost, and errors associated with implementing these interfaces.

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2. Therefore, the first three clauses present the scope of the standard, normative references, and definitions, in that order.

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INTRODUCTION

This part of IEC 62264 further defines the object models and attributes involved in data exchange between the categories and activities defined in 62264-3 Enterprise-Control System Integration - Part 3: Activity Models of Manufacturing Operations Management (hereafter referred to as IEC 62264-3). The models and terminology defined in IEC 62264-3 and this part of IEC 62264.

- a) emphasize good manufacturing operations management integration practices during the entire life cycle of the systems;
- b) can be used to improve existing integration capability of manufacturing operations management systems; and
- c) can be applied regardless of the degree of automation.

Specifically, IEC 62264-3 and this part of IEC 62264 provide a standard terminology and a consistent set of concepts and models for integrating manufacturing operations management systems that will improve communications between all parties involved. Benefits produced will

- a) reduce the user's time to reach full production levels for new products;
- b) enable vendors to supply appropriate tools for implementing integration of manufacturing operations management systems;
- c) enable users to better identify their needs;
- d) reduce the cost of automating manufacturing processes;
- e) optimize supply chains; and
- f) reduce life-cycle engineering efforts.

IEC 62264-3 and this part of IEC 62264 may be used to reduce the effort associated with implementing new product offerings. The goal is to have manufacturing operations management systems that interoperate and easily integrate.

It is not the intent of the standards to

- a) suggest that there is only one way of implementing integration of manufacturing operations management systems;
- b) force users to abandon their current way of handling integration; or
- c) restrict development in the area of integration of manufacturing operations management systems.

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ENTERPRISE-CONTROL SYSTEM INTEGRATION –

Part 4: Object and attributes for manufacturing operations management integration

1 Scope

This part of IEC 62264, in conjunction with IEC 62264-3, Enterprise-control system integration: Activity models of manufacturing operations management, specifies interface content between manufacturing operations management categories and activities. The interfaces considered are the interfaces across and within Level 3 categories of the functional hierarchical model defined in IEC 62264-1 (see Clause 2 below). The goal is to reduce the risk, cost, and errors associated with implementing these interfaces.

The scope of this part of IEC 62264 is limited to the definition of object models and attributes exchanged between activities defined in IEC 62264-3. Interfaces between level 3 and other levels are out of scope

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.

ANSI/ISA-95.00.01-2010 (IEC 62264-1 Mod) - Enterprise-Control System Integration - Part 1: Models and Terminology

ANSI/ISA-95.00.02-2010 (IEC 62264-2 Mod) - Enterprise-Control System Integration - Part 2: Object Model Attributes

ANSI/ISA-95.00.03-2005, Enterprise-Control System Integration Part 3: Activity Models of Manufacturing Operations Management

ANSI/ISA-88.00.01-2010, Batch Control – Part 1: Models and Terminology

IEC 62264-1, Enterprise-control system integration – Part 1: Models and terminology

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

ANSI/ISA-18.2-2009, Management of Alarm Systems for the Process Industries

ISO 8601, Data elements and interchange formats — Information interchange — Representation of dates and times

ISO/IEC 19501:2005, Information technology-- Open distributed processing -- Unified modeling language (UML) Version 1.4.2

ISO/IEC 19505-1, Information technology -- OMG Unified modeling language (OMG UML) Version 2.1.2 -- Part 1: Infrastructure

ISO/IEC 19505-2, Information technology -- OMG Unified modeling language (OMG UML) Version 2.1.2 -- Part 2: Superstructure

ISO/CD 22400-1 - Automation systems and integration — Key performance indicators (KPIs) for manufacturing operations management — Part 1: Overview, concepts and terminology

ISO/DIS 22400-2 Automation systems and integration — Key performance indicators (KPIs) for manufacturing operations management — Part 2: Definitions and descriptions

3 Terms, definitions and abbreviations

For the purposes of this document the definitions given in IEC 62264-1 and the following apply.

3.1 Terms and definitions

3.1.1

job list

collection of job orders for one or more work centers and/or resources for a specific time frame

3.1.2

job order

smallest unit of work for execution as defined by a work master

3.1.3

job response

data on the execution of a job order pertaining to production, maintenance, inventory or quality activities, or any combination of the activities

3.1.4

resource relationship network

one or more expressions of a relationship between two or more resources

3.1.5

work alert

notification of a Level 3 event that does not require acknowledgement

3.1.6

work calendar

collection of calendar entries

3.1.7

work capability

particular combination of resources with certain capabilities that are necessary and sufficient to accomplish one or more steps of a work definition

3.1.8

work definition

collection of information about resources and workflow definitions associated with work

3.1.9

work directive

work definition derived from a work master and used to perform a job order

3.1.10

work KPI

quantifiable measurement that has a business or operational value regarding performance of work

3.1.11

work master

type of work definition that is a template for work to be performed for a job order

3.1.12

work performance

collection of work responses

3.1.13

work master capability

ability of resources to perform work and the capacity of those resources

3.1.14

work report

subset of the execution and business information that is retained based upon business requirements

3.1.15

work request

collection of job orders

3.1.16

work response

collection of job responses

3.1.17

work schedule

collection of work requests

3.1.18

workflow

- model to represent work as a pattern of activities
- information used to orchestrate the execution of procedures

EXAMPLE a repeatable sequence of procedures, enabled by an organization of resources with defined roles corresponding to flows of mass, energy or information

3.1.19

workflow process

the procedure part of a work definition describing a workflow

3.2 Abbreviations

BPMN	Business Process Modeling Notation
KPI	Key Performance Indicator
MOM	Manufacturing Operations Management
SOP	Standard Operating Procedures
UML	Unified Modeling Language
UTC	Coordinated Universal Time

4 Information exchange between manufacturing operations

4.1 Activity information exchange network

A set of models are used to represent the information exchanged between activities of manufacturing operations management categories, as defined in IEC 62264-3. This is illustrated in Figure 1 with each information exchange model represented as black rounded rectangles. This part of IEC 62264 defines information which can be exchanged between Level 3 activities (represented as ellipses in the figure) within an operational category or across operational categories. IEC 62264-2 defines objects that may be exchanged between Level 4 activities and Level 3 activities and are represented as yellow rounded rectangles. Other information (represented as hashed elements) shown in Figure 1 are defined in other standards, such as the ANSI/ISA-88.00.01-2010, IEC 61512 and IEC 62541.

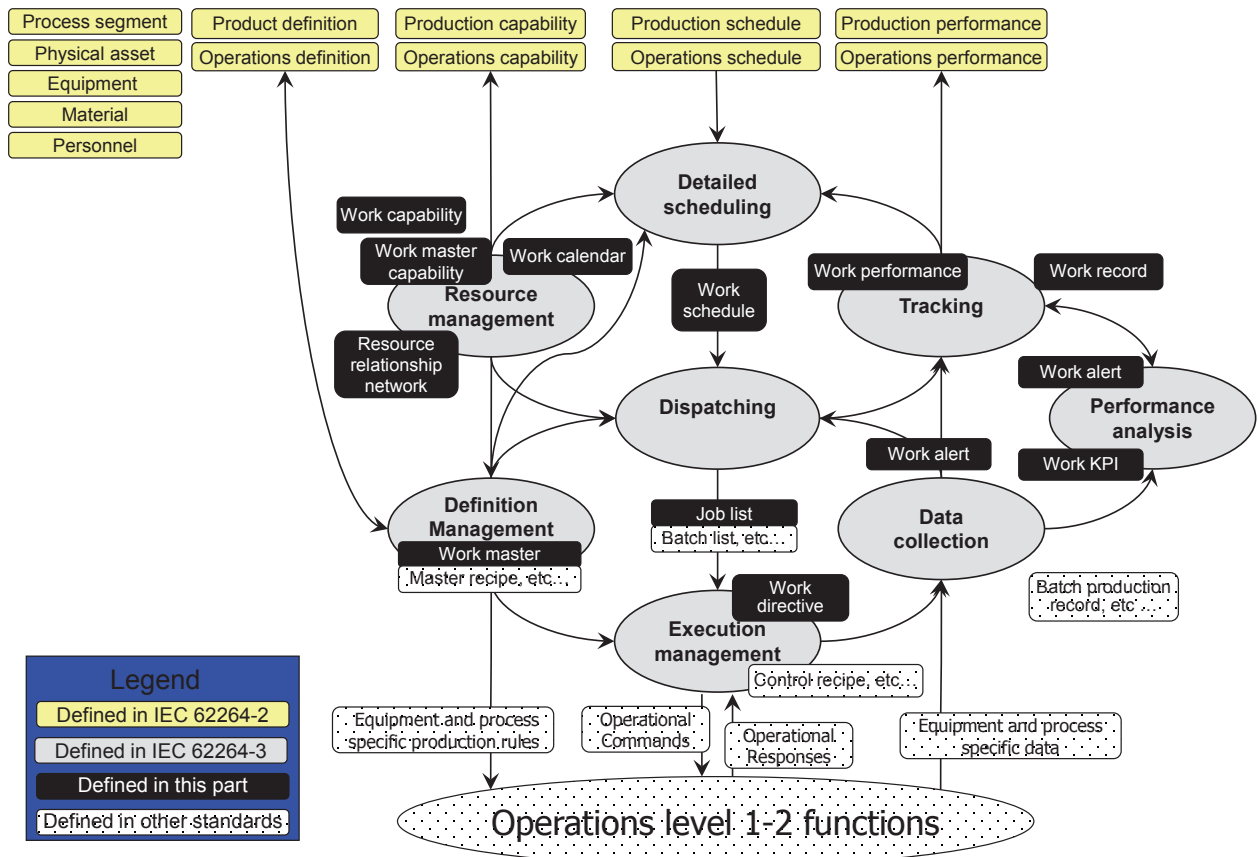


Figure 1 — Information exchange models for manufacturing operations management

NOTE The ISA-88 and IEC 61512 standards define object models that relate to the lower elements of the Level 3 activities and define the information used to create and manage master recipes, control recipes, batch lists, and batch production records. Equivalent structures, or IEC 61512 structures, could be used for other types of production. This standard does not redefine these objects.

4.2 Information exchange models

4.2.1 Level 3 object models

The information exchange models define structures that can be used to define, manage, and execute work within Level 3. The work models define the managed elements of work. The models are similar in structure to those defined in IEC 62264-2 but are defined for Level 3 information exchange.

4.2.2 Process segments and work masters

IEC 62264-2 models define the view of manufacturing as seen by Level 4 business systems and based on a view of the manufacturing processes defined in *Process Segments*. The models of this part of IEC 62264 define the view of manufacturing as seen by Level 3 operations and are based on a view of the manufacturing processes defined in *Work Masters and Work Directives*.

Work masters and work directives are the elements of manufacturing activities that are visible to manufacturing operations management processes. They define the resources and steps for job orders that are scheduled, displayed, executed, and tracked by Level 3 activities.

NOTE: IEC 62264-2 models are used to exchange information from the process segment (business) view for Level 4 planning. Models such as operations definition and operations schedule support the allocation of resources and scheduling activities to the plant. Models in this part of IEC 62264 are used to exchange information for Level 3 execution. Models such as work definition reference the operations definition exchanged with Level 4, but they have the details needed for actual execution of Level 3

activities. See Annex B for additional discussion of IEC 62264-2, this part of IEC 62264, and ISA-88 / IEC 61512 model relationships.

4.2.3 Common resource definitions

The object models in this part of IEC 62264 use the personnel, equipment, physical asset, and material information defined in IEC 62264-2. When used with Level 3 work objects, the personnel, equipment, physical asset, and material information may include information required for Level 3 activities in addition to the information required to be shared with Level 4 activities.

EXAMPLE 1 The personnel information required for Level 3 activities may include detailed experience and qualification levels that are not shared with a Level 4 personnel or training management system.

EXAMPLE 2 The material information maintained for Level 3 activities may include subplot information which is not shared with Level 4 material management systems.

EXAMPLE 3 Delivery, usage and emission of energy units may be handled as material information.

4.2.4 Level 3 work models

The following object models are defined in this part of IEC 62264.

1. Resource relationship network – Resource relationship networks are created by tasks in resource management and definition management activities.
2. Work definition
 - a. Work Master – Work masters are created by an engineering activity defined in IEC 62264-1 and to be managed by a task in definition management activities.
 - b. Work Directive – Work directives are created by a task in execution management activities.

3. Work schedule – Work schedules are created by a task in detailed scheduling activities.

4. Job list – Job lists are created by a task in dispatching activities.

NOTE In this part of IEC 62264 of the standard, the term job is sometimes used instead of job order when referring to an entry in a job list.

5. Work performance – Work performances are created by a task in tracking activities.
6. Work capability – Work capabilities are created by a task in resource management activities.
7. Work master capability – Work master capabilities are created by a task in resource management activities.
8. Work KPI – Work KPIs are created by a task in analysis activities.
9. Work alert – Work alerts are created by any activity in the activity model.

4.2.5 Value types

Value attributes are used in properties, parameters, and data to exchange actual values.

Value attributes are also used to exchange the allowed or expected values in properties and parameters. See IEC 62264-2 Clause 4.8 Value types for a complete definition.

5 Object model attributes

5.1 Object models

Clause 5 describes the object models and attributes for information exchanged in between Level 3 activities. The attributes are part of the definition of object models for exchanged information.

In this a minimum set of industry-independent information is defined as attributes of the object models. However, values for all attributes may not be required depending on the actual usage of the models. If additional information, including industry- and application-specific information, is needed, it shall be represented as property objects. This solution increases the usability through the use of standard attributes, and allows flexibility and extensibility through the use of properties. This was written to make the standard as widely applicable as practical.

5.2 Attribute extensibility

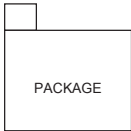
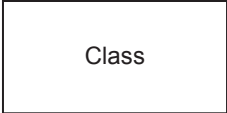
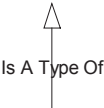
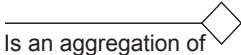
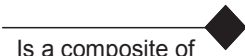
For particular applications the objects defined in the object models will be extended through the addition of attributes to object class definitions. Accordingly this standard provides for attributes that are application or industry specific, to be modeled in terms of properties and represented in property classes in the model. For example, the personnel class property may define application or industry specific attributes for personnel classes, and person property may contain values for the properties.

5.3 Object model structure

The object models are depicted using the Unified Modeling Language (UML) notational methodology, as defined in ISO/IEC 19501, ISO/IEC 19505-1 and ISO/IEC 19505-2.

Table 1 defines the UML notations used in the object diagrams.

Table 1 — UML notation used

Symbol	Definition
	Defines a package, a collection of object models, state models, use cases, and other UML models. Packages are general-purpose grouping mechanisms used to organize semantically related model elements. In this document a package is used to specify an external model, such as a production rule model, or a reference to another part of the model.
	Represents a UML class of objects, each with the same types of attributes. Each object is uniquely identifiable or enumerable. No operations or methods are listed for the classes.
	An association between elements of a class and elements of another or the same class. Each association is identified. May have the expected number or range of members of the subclass, when 'n' indicates an indeterminate number. For example, 0..n means that zero or more members of the subclass may exist.
	Generalization (arrow points to the super class) shows that an element of the class is a specialized type of the super class.
	Dependence is a weak association that shows that a modeling element depends on another modeling element. The item at the tail depends on the item at the head of the relationship.
	Aggregation (made up of) shows that an element of the class is made up of elements of other classes.
	Composite shows a strong form of aggregation, which requires that a part instance be included in at most one composite at a time and that the composite object has sole responsibility for disposition of its parts.

5.4 Conventions used in tables

5.4.1 Table entries

Each table includes a listing of object attributes, as follows, the object identification, data types, and examples of the attributes and its values.

5.4.2 Object identification

Many objects in the information model require unique identifications (IDs). These IDs shall be unique within the scope of the exchanged information. This may require translations:

- From the internal ID of the source system to the interface content ID
- From the interface content ID to the internal ID of the target system

EXAMPLE A unit may be identified as "X6777" in the interface content, as resource "R100011" in the business system, and as "East Side Reactor" in the control system.

A unique identification set shall be agreed upon in an implementation in order to exchange information.

The object IDs are used only to identify objects within related exchanged information sets. The object ID attributes are not global object IDs or database index attributes.

Generally, objects that are elements of aggregations, and are not referenced elsewhere in the model, do not require unique IDs.

5.4.3 Data types

The attributes presented are abstract representations, without any specific data type specified. A specific implementation will show how the information is represented.

EXAMPLE 1 An attribute may be represented as a string in one implementation and as a numeric value in another implementation.

EXAMPLE 2 A date/time value may be represented in ISO 8601 standard format in one implementation and in Julian calendar format in another.

EXAMPLE 3 A relationship may be represented by two fields (type and key) in data base tables or by a specific tag in XML.

5.4.4 Presentation of examples

Examples are included with each attribute given. Examples are presented for each of the main operations categories defined in IEC 62264-3 . See Table 2 below for how the example rows and columns are used.

Table 2 — Example table

Attribute name	Description	Production examples	Maintenance examples	Quality examples	Inventory examples
Name of first attribute	Description of first attribute	Production example	Maintenance example	Quality example	Inventory example
Name of second attribute	Description of second attribute	Production example	Maintenance example	Quality example	Inventory example
Name of third attribute	Description of third attribute	Production example	Maintenance example	Quality example	Inventory example

When an example value is a set of values, or a member of a set of values, the set of values is given within a set of braces, {}.

The examples are purely made up. They are provided to further describe attributes in the model. No attempt was made to make the examples complete or representative of any manufacturing enterprise.

5.4.5 Data relationships

The models used to document a reference to a resource, in another package with additional optional specification using properties, are not fully illustrated in IEC 62264-2 object model figures. See IEC 62264-2 Clause 4.5.5 Data relationships, for a complete description of data relationships.

6 Resource relationship network model

6.1 Resource relationship network

Resource relationship networks shall be used to describe relationships between two or more resources in order to represent information that may be required for detailed scheduling activities, dispatching activities, execution activities, or other Level 3 activities.

Each resource relationship network is a collection of relationships.

Each relationship shall be represented as a directed connection between a “To Resource” and a “From Resource”.

NOTE 1 Relationships are represented as directed multi-graphs in graph theory. Each relationship represents an “edge” with the resource references represented as vertices.

NOTE 2 The attributes of the resource relationship elements are used to represent constraints in the network, such as constraints in flow, direction, set or ordering.

EXAMPLE 1 A “route” resource network connection between equipment may include properties that include the material transport time between the equipment and the material transfer rate between the equipment.

EXAMPLE 2 An “approved for use” resource network connection between equipment and material definitions may define which specific equipment has been approved for use with specific materials. A property of the resource network connection may be the date at which the approval for use is expired or revoked.

EXAMPLE 3 A “material substitution” resource network connection may define a primary material and the list of possible alternate materials.

Each resource network connection is defined by a resource network connection type. The resource network connection type may include property definitions, which define the allowable resource network connection properties.

NOTE 3 The resource relationship network model is conceptually similar to the MIMOSA CCOM network model. See Bibliography

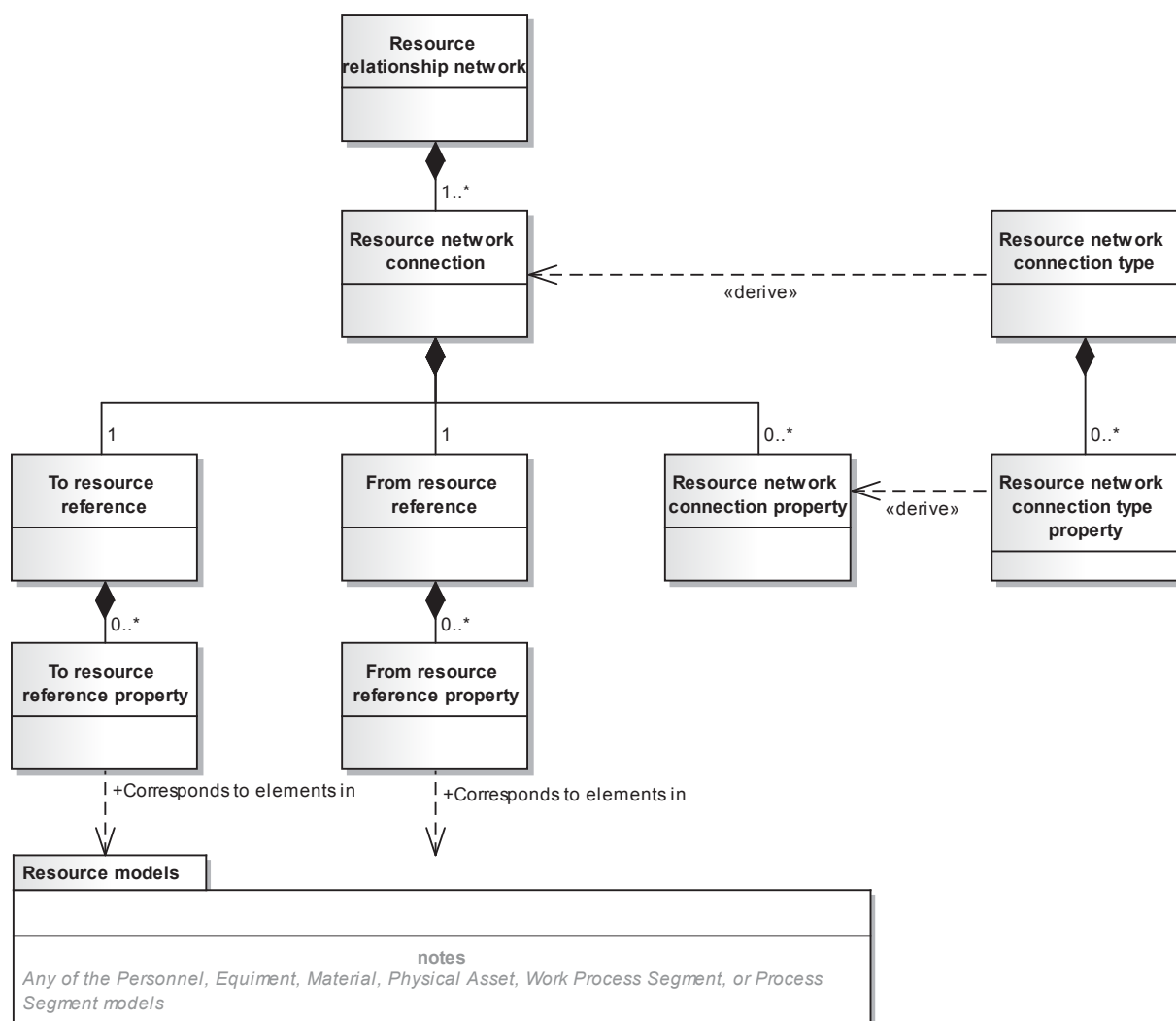


Figure 2 — Resource relationship network model

6.2 Resource relationship network attributes

A *resource relationship network* shall be a composition of one or more *resource network connections*.

Table 3 defines the attributes for *resource relationship network* objects.

Table 3 — Resource relationship network attributes

Attribute name	Description	Production examples	Maintenance examples	Quality examples	Inventory examples
ID	A unique identification of a <i>resource relationship network</i> .	BN5FP	B5EN	B5RS	BFFTR
Description	A description of the <i>resource relationship network</i> .	Building 5 flow path	Building 5 electrical network	Building 5 receive signoff	Building 5 fork truck route
Relationship type	Optional: Defines the type of the relationship. The defined types are: Physical – The elements of the relationship are physically connected or in the same area. Logical – The elements of the relationship are not necessarily physically connected or in the same area.	Physical	Physical	Logical	Logical
Relationship form	Optional: Defines the form of the relationships. The defined types are: Permanent – The relationship is not intended to be split or changed during operations processes. Transient – The relationship may be split or changed during operations processes.	Permanent	Permanent	Permanent	Transient

6.3 Resource network connection

The directed relationship between two resources in a resource relationship network shall be defined as a *resource network connection*.

A *resource network connection* shall be composed of the following:

- a “From” relationship defining one *resource reference* (as the starting point of a directed connection or the tail of an arrow that graphically represents the relationship)
- a “To” relationship defining one *resource reference* (as the ending point of a directed connection or the head of an arrow that graphically represents the relationship)
- zero or more *resource network connection properties*
- an associated *resource network connection type*.

Table 4 defines the attributes for *resource network connection* objects.

Table 4 — Resource network connection attributes

Attribute name	Description	Production examples	Maintenance examples	Quality examples	Inventory examples
ID	A unique identification of a <i>resource network connection</i> .	7685	6383290	Hyuwq9	TT28623
Description	A description of a resource network connection.	Piping	Wiring	Next signer	Next stop

6.4 Resource network connection property

A property of a resource network connection shall be defined as a resource network connection property.

Resource network connection properties are used to contain property values that are associated with the specific connection.

Table 5 defines the attributes of *resource network connection property* objects.

Table 5 — Resource network connection property attributes

Attribute name	Description	Production examples	Maintenance examples	Quality examples	Inventory examples
ID	A unique identification of a <i>resource network connection property</i> .	Pipe type	Gauge	N/A	Inside
Description	Additional information about the <i>resource network connection property</i> .	Type of piping	Wire type	N/A	Location
Value	The value, set of values, or range of the property.	53	20	N/A	TRUE
Value unit of measure	The unit of measure of the associated property value, if applicable.	Steel grade	AWG	N/A	Boolean

6.5 From resource reference

A “from” reference to a resource shall be defined as a *from resource reference*.

A *from resource reference* may be composed of zero or more *from resource reference properties*.

Table 6 defines the attributes for *from resource reference* objects.

Table 6 — From resource reference attributes

Attribute Name	Description	Production Examples	Maintenance Examples	Quality Examples	Inventory Examples
ID	A unique identification of a <i>from resource reference</i> .	12345	12346	A123	S7728
Resource ID	The ID of a resource.	B5Tank08	B5V480Box	Supervisor	Line3EndOf Line
Resource type	The type of the resource. The defined types are: Personnel class Person Equipment class Equipment Physical asset class Physical asset Material class Material definition Material lot Material subplot Work master Process segment	Equipment	Physical asset	Personnel class	Equipment

6.6 From resource reference property

A property of a *from resource reference* shall be defined as a *from resource reference property*.

NOTE A *from resource reference* with one or more *from resource reference properties* define the subset of the *resource* that has the defined *resource property* values.

Table 7 defines the attributes for *from resource reference property* objects.

Table 7 — From resource reference property attributes

Attribute name	Description	Production examples	Maintenance examples	Quality examples	Inventory examples
ID	A unique identification of a <i>from resource reference property</i> .	A7872	CB101	Hhjjw78	N/A
Property ID	The ID of a resource property.	Outlet flow rate	Circuit breaker	Shift	N/A
Property value	A value of a property that is used to identify the subset of the resources that are referenced.	200 L/Min	40 AMP	First	N/A
Value unit of measure	The unit of measure of the associated property value, if applicable.	Steel grade	Type	N/A	Boolean

6.7 To resource reference

A “to” reference to a resource shall be defined as a *to resource reference*.

A *to resource reference* may be composed of zero or more *to resource reference properties*.

Table 8 defines the attributes for *to resource reference* objects.

Table 8 — To resource reference attributes

Attribute name	Description	Production examples	Maintenance examples	Quality examples	Inventory examples
ID	A unique identification of a <i>to resource reference</i> .	12345	12346	A123	S7728
Resource ID	The ID of a resource.	B5Tank08	B5V480Box	Supervisor	Line3EndOf Line
Resource type	The type of the resource. The defined types are: Personnel class Person Equipment class Equipment Physical asset class Physical asset Material class Material definition Material lot Material subplot Work master Process segment	Equipment	Physical asset	Personnel class	Equipment

6.8 To resource reference property

A property of a *to resource reference* shall be defined as a *to resource reference property*.

NOTE A *to resource reference* with one or more *to resource reference properties* define the subset of the *resource* that has the defined *resource property* values.

Table 9 defines the attributes for *to resource reference property* objects.

Table 9 — To resource reference property attributes

Attribute name	Description	Production examples	Maintenance examples	Quality examples	Inventory examples
ID	A unique identification of a <i>to resource reference property</i> .	A7872	CB101	Hhjjw78	N/A
Property ID	The ID of a resource property.	Outlet flow rate	Circuit breaker	Shift	N/A
Property value	A value of a property that is used to identify the subset of the resources that are referenced.	200 L/Min	40 AMP	First	N/A
Value unit of measure	The unit of measure of the associated property value, if applicable.	Steel grade	Type	N/A	Boolean

6.9 Resource network connection type

A definition of a type of a resource network connection shall be defined as a *resource network connection type*.

A *resource network connection type* may be composed of zero or more *resource network connection type properties*.