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Enterprise-control system integration –

**Part 3:
Activity models of manufacturing
operations management**

**Intégration du système
de commande d'entreprise –**

**Partie 3:
Modèles d'activités pour la gestion
des opérations de fabrication**



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ENTERPRISE-CONTROL SYSTEM INTEGRATION –

Part 3: Activity models of manufacturing operations management

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International Standard IEC 62264-1 has been prepared by subcommittee 65A: System aspects, of IEC technical committee 65: Industrial-process measurement and control and ISO SC5, JWG 15, of ISO technical committee 184: Enterprise-control system integration.

It is published as a double logo standard.

The text of this standard is based on the following documents:

CDV	Report on voting
65A/476/CDV	65A/495/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table. In ISO, the standard has been approved by 10 P-members out of 10 having cast a vote.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The list of all the parts of the IEC 62264 series, under the general title *Enterprise-control system integration*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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INTRODUCTION

This part of IEC 62264 shows activity models and data flows for manufacturing information that enables enterprise-control system integration. The modelled activities operate between Level 4 logistics and planning functions and Level 2 manual and automated process control functions. The models are consistent with the object models given in IEC 62264-1 and the Level 3 (manufacturing operations and control) definitions.

The goal of the standard is to reduce the risk, cost and errors associated with implementing enterprise systems and manufacturing operations systems in such a way that they inter-operate and easily integrate. The standard may also be used to reduce the effort associated with implementing new product offerings.

This standard provides models and terminology for defining the activities of manufacturing operations management. The models and terminology defined in this standard are:

- to emphasize the good practices of manufacturing operations;
- to be used to improve existing manufacturing operations systems;
- to be applied regardless of the degree of automation.

Some potential benefits produced when applying the standard may include

- reducing the time to reach full production levels for new products;
- enabling vendors to supply appropriate tools for manufacturing operations;
- enabling more uniform and consistent identification of manufacturing needs;
- reducing the cost of automating manufacturing processes;
- optimizing supply chains;
- improving efficiency in life-cycle engineering efforts.

It is not the intent of this part of the standard to

- suggest that there is only one way of implementing manufacturing operations;
- force users to abandon their current way of handling manufacturing operations;
- restrict development in the area of manufacturing operations;
- restrict use only to manufacturing industries.

ENTERPRISE-CONTROL SYSTEM INTEGRATION –

Part 3: Activity models of manufacturing operations management

1 Scope

This part of IEC 62264 defines activity models of manufacturing operations management that enable enterprise system to control system integration. The activities defined in this standard are consistent with the object models definitions given in IEC 62264-1. The modelled activities operate between business planning and logistics functions, defined as the Level 4 functions and the process control functions, defined as the Level 2 functions of IEC 62264-1. The scope of this standard is limited to

- a model of the activities associated with manufacturing operations management, Level 3 functions;
- an identification of some of the data exchanged between Level 3 activities.

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*

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

IEC 62264-2, *Enterprise-control system integration – Part 2: Object model attributes*

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

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms and definitions apply.

3.1 Terms and definitions

3.1.1

detailed production schedule

organized and structured collection of production work orders and sequencing involved in the production of one or more products

3.1.2

finite capacity scheduling

scheduling methodology where work is scheduled for production equipment, in such a way that no production equipment capacity requirement exceeds the capacity available to the production equipment

3.1.3

inventory operations management

activities within Level 3 of a manufacturing facility which coordinate, direct, manage and track inventory and material movement within manufacturing operations

3.1.4

Level 0

actual physical process

3.1.5

Level 1

functions involved in sensing and manipulating the physical process

3.1.6

Level 2

functions involved in monitoring and controlling of the physical process

3.1.7

Level 3

functions involved in managing the work flows to produce the desired end-products

3.1.8

Level 4

functions involved in the business-related activities needed to manage a manufacturing organization

3.1.9

maintenance operations management

activities within Level 3 of a manufacturing facility which coordinate, direct and track the functions that maintain the equipment, tools and related assets to ensure their availability for manufacturing and ensure scheduling for reactive, periodic, preventive, or proactive maintenance

3.1.10

manufacturing facility

site, or area within a site, that includes the resources within the site or area and includes the activities associated with the use of the resources

3.1.11

manufacturing operations management

activities within Level 3 of a manufacturing facility that coordinate the personnel, equipment and material in manufacturing

NOTE 1 This standard details manufacturing operations management in terms of four categories (production operations management, maintenance operations management, quality operations management and inventory operations management) and provides references for other enterprise activities affecting manufacturing operations.

NOTE 2 In the PERA model, the concept of manufacturing defines the physical resources used in production. The manufacturing operations management activities defined in this standard pertain to the information-handling functions of the PERA model.

3.1.12

production dispatch list

set of specific production work orders to be performed on or by a particular set of resources, at a given location and the time or event to start or stop the activity

NOTE 1 This may take the form of set-up instructions for machines, operating conditions for continuous processes, material movement instructions, or batches to be started in a batch system.

NOTE 2 Dispatch lists are applicable to other operations management areas, such as maintenance dispatch lists, quality test dispatch lists and inventory dispatch lists.

3.1.13

production operations management

activities within Level 3 of a manufacturing facility which coordinate, direct, manage and track the functions that use raw materials, energy, equipment, personnel and information to produce products, with the required costs, qualities, quantities, safety and timeliness

3.1.14**production work order**

unit of scheduled work that may be dispatched to a work center and which consists of lower-level elements

3.1.15**quality operations management**

activities within Level 3 of a manufacturing facility which coordinate, direct and track the functions that measure and report on quality

3.1.16**storage unit**

subordinate entity within a storage zone that consists of equipment and information required to contain, move, condition and handle material

NOTE A storage unit is an element of the equipment hierarchy.

3.1.17**storage zone**

logical grouping of resources that defines a span of logistical control and includes the equipment and information required for containing, moving, conditioning and handling of one or more material items

NOTE A storage zone is an element of the equipment hierarchy.

3.1.18**tracing**

activity that provides an organized record of resource and product use from any point, forward or backward, using tracking information

3.1.19**tracking**

activity of recording attributes of resources and products through all steps of instantiation, use, change and disposition

3.1.20**work center**

process cell, production unit, production line, storage zone, or any other equivalent level equipment element defined as an extension to the equipment hierarchy model

NOTE For compatibility with existing schema implementations the defined term “work center” is used in place of the UK English spelling “work centre”.

3.2 Abbreviations

For the purposes of this standard, the following abbreviations apply.

AGV	Automated guided vehicles
AMS	Asset management system
ASRS	Automated storage and retrieval system
CAPE	Computer-aided process engineering
CAD	Computer-aided design
CAE	Computer-aided engineering
CASE	Computer-aided software engineering
CIM	Computer integrated manufacturing
CNC	Computerized numerical control
DCS	Distributed control system

ERP	Enterprise resource planning
EWI	Electronic work instructions
HR	Human resources
KPI	Key performance indicator
LIMS	Laboratory information management system
MES	Manufacturing execution system
MPS	Master production schedule
MRP	Material resource planning
OEE	Overall equipment effectiveness
PAT	Process analytical technology
PERA	Purdue enterprise reference architecture
PDM	Product data management
PLC	Programmable logic controller
PLM	Product life-cycle management
PRM	Purdue reference model for computer-integrated manufacturing
QA	Quality assurance
R&D	Research and development
RFQ	Request for quote
ROA	Return on assets
SCADA	Supervisory control and data acquisition
SOC	Standard operating conditions
SOP	Standard operating procedure
SQC	Statistical quality control
SPC	Statistical process control
WIP	Work in process
WMS	Warehouse management system

4 Structuring concepts

4.1 Manufacturing operations management

The activities of manufacturing operations management are those activities of a manufacturing facility that coordinate the personnel, equipment, material and energy in the conversion of raw materials and/or parts into products. Manufacturing operations management includes activities that may be performed by physical equipment, human effort and information systems.

Manufacturing operations management shall encompass the activities of managing information about the schedules, use, capability, definition, history and status of all of the resources (personnel, equipment and material) within, and associated with, the manufacturing facility.

NOTE 1 Resources associated with the manufacturing facility but not within it may include, among others, government inspectors, regulatory certifications, resource coordination with other entities, outsourced activities and processes.

The manufacturing operations management activities correspond to the activity set defined in IEC 62264-1. These are the activities contained within the heavy dotted line shown in Figure 1. The heavy dotted line is equivalent to the Level 3/Level 4 interface defined in IEC 62264-1. Manufacturing operations management shall be subdivided into four categories: