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Batch control - Part 1: Models and terminology (IEC 61512-1:2026)

Chargenorientierte Fahrweise - Teil 1: Modelle und Terminologie (IEC 61512-1:2026)

Contrôle-commande des processus de fabrication par lots - Partie 1: Modèles et terminologie (IEC 61512-1:2026)

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European foreword

The text of document 65A/1178/FDIS, future edition 2 of IEC 61512-1, prepared by SC 65A "System aspects" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61512-1:2026.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2027-04-30
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2029-04-30

This document supersedes EN 61512-1:1999 and all of its amendments and corrigenda (if any).

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The text of the International Standard IEC 61512-1:2026 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 61512-1:1997	NOTE	Approved as EN 61512-1:1999 (not modified)
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IEC 61512-3	NOTE	Approved as EN 61512-3
IEC 61512-4	NOTE	Approved as EN 61512-4
IEC 62264 (series)	NOTE	Approved as EN IEC 62264 (series)
IEC 62264-1	NOTE	Approved as EN 62264-1
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Batch control -
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CONTENTS

FOREWORD 6
INTRODUCTION 9
1 Scope 11
2 Normative references 11
3 Terms, definitions, abbreviated terms and acronyms 11
3.1 Terms and definitions 11
3.2 Abbreviated terms and acronyms 18
4 Batch processes and equipment 19
4.1 General 19
4.2 Types of manufacturing 19
4.2.1 General 19
4.2.2 Continuous process manufacturing 19
4.2.3 Discrete parts manufacturing 19
4.2.4 Batch process manufacturing 20
4.3 Process model 20
4.3.1 General 20
4.3.2 Process 21
4.3.3 Process stage 21
4.3.4 Process operation 21
4.3.5 Process action 22
4.3.6 Collapsing and expanding the process model 22
4.4 Equipment and equipment control 22
4.4.1 General 22
4.4.2 Role-Based Equipment model 23
4.4.3 Equipment entity model 25
4.5 Process cell classification 33
4.5.1 General 33
4.5.2 Classification by number of products 33
4.5.3 Classification by role-based equipment structure 33
5 Structure for batch control 35
5.1 General 35
5.2 Basic control 36
5.2.1 General 36
5.2.2 Basic control in equipment entities 36
5.3 Procedural control 37
5.3.1 General 37
5.3.2 Procedural control model 38
5.3.3 Process model/procedural control model/equipment entity model relationship 40
5.3.4 Procedural control in equipment entities 42
5.4 Coordination control 43
5.4.1 General 43
5.4.2 Allocation and arbitration 43
5.4.3 Coordination control in equipment entities 44
6 Recipes and procedural elements 45
6.1 General 45

6.2 Recipe types 45
6.2.1 General 45
6.2.2 General recipe 46
6.2.3 Site recipe 47
6.2.4 Master recipe 47
6.2.5 Control recipe 48
6.3 Recipe contents 48
6.3.1 General 48
6.3.2 Header 48
6.3.3 Formula 48
6.3.4 Equipment requirements 49
6.3.5 Procedure 49
6.3.6 Other information 50
6.4 Recipe components 50
6.5 Recipe procedures by type of recipe 51
6.5.1 General 51
6.5.2 General recipe procedure 51
6.5.3 Site recipe procedure 52
6.5.4 Master recipe procedure 52
6.5.5 Control recipe procedure 54
6.6 Control recipe procedure/equipment control relationship 55
6.6.1 General 55
6.6.2 Linking recipes and equipment entities 55
6.6.3 Linking recipe phases and equipment phases 56
6.6.4 Linking recipe procedural elements and equipment procedural elements above the phase level 57
6.6.5 Control recipe procedure/equipment control collapsibility 62
6.6.6 Linking recipe procedural elements and equipment procedural elements when using an expanded procedural control model 63
7 Batch control considerations 63
7.1 General 63
7.2 Process and control engineering tasks 63
7.3 Modes and states 65
7.3.1 General 65
7.3.2 Modes 65
7.3.3 States 66
7.4 Exception handling 67
7.5 Example procedural state model 68
7.5.1 General 68
7.5.2 Procedural states 70
7.5.3 Procedural commands 71
7.6 Batch schedules 72
7.6.1 General 72
7.6.2 Campaign 73
7.7 Production information 73
7.7.1 General 73
7.7.2 Batch-specific information 73
7.7.3 Common (non-batch specific) batch information 74
7.7.4 Batch history 74

7.7.5 Batch reports 75
8 Activities and functions in batch control 75
8.1 General 75
8.2 Control activity model 75
8.2.1 General 75
8.2.2 Information handling 76
8.3 Recipe Management 78
8.3.1 General 78
8.3.2 Manage general recipes 78
8.3.3 Define general recipe procedural elements 79
8.3.4 Manage site recipes 79
8.3.5 Manage master recipes 79
8.3.6 Define master recipe procedural elements 80
8.4 Production Planning and Scheduling 81
8.5 Production Information Management 81
8.5.1 General 81
8.5.2 Receiving and storing batch history information 82
8.5.3 Manipulating historical data 85
8.5.4 Producing batch reports 85
8.6 Process Cell Management 86
8.6.1 General 86
8.6.2 Manage batches 88
8.6.3 Track and allocate process cell resources 89
8.6.4 Collect batch and process cell information 90
8.7 Unit Supervision 90
8.7.1 General 90
8.7.2 Acquire and execute procedural elements 91
8.7.3 Manage unit resources 92
8.7.4 Collect batch and unit information 92
8.8 Process Control 93
8.8.1 General 93
8.8.2 Execute equipment procedural control 94
8.8.3 Execute basic control 94
8.8.4 Collect data 94
8.9 Personnel and Environmental Protection 95
9 Completeness, compliance, and conformance 95
9.1 Completeness 95
9.2 Compliance 96
9.3 Conformance 96
Annex A (informative) Model philosophy 97
Annex B (informative) Reference procedural state model 98
B.1 General 98
B.2 Procedural states 103
B.3 Procedural commands 105
B.4 Using collapsed or expanded versions of the Reference Procedural State Model 105
Annex C (informative) Frequently asked questions 107
C.1 Conformance and compliance 107

C.2 Batch manufacturing roles 107
C.3 Exception handling details 108
C.4 Further description of basic control 109
C.5 Further description of equipment modules 110
C.6 Recipe building blocks 111
C.7 Processing a recipe 111
C.8 Multiple batches through units 112
Annex D (informative) Software entities explanation 113
D.1 General 113
D.2 Enhanced PID configurations 113
D.3 Advanced process control 113
D.4 Virtual (soft) sensors based on a single measurement 113
D.5 Virtual (soft) sensors based on multiple measurements 113
D.6 Permanent software interlocks 113
D.7 Data validity checking, data reduction, etc. algorithms 114
Annex E (informative) Overview of IEC 61512-1:2025 changes 115
E.1 General 115
E.2 Key clarifications 115
E.3 Changes in definitions 116
E.4 Changes in structure 116
E.5 Changes in models 120
E.5.1 What has been updated 120
E.5.2 What has been added 125
E.5.3 What has been removed 127
E.6 Other changes 128
E.7 Summary 128
Bibliography 129

Figure 1 – Process model (instance diagram) when not collapsed or expanded 21
Figure 2 – Example of Role-Based Equipment model 24
Figure 3 – Equipment entity model 26
Figure 4 – Equipment entity model example 1 32
Figure 5 – Equipment entity model example 2 32
Figure 6 – Single-path structure 33
Figure 7 – Multiple-path structure 34
Figure 8 – Network structure 35
Figure 9 – Procedural control model (instance diagram) when not collapsed or expanded 38
Figure 10 – Typical process/procedure/equipment mapping to achieve process functionality 41
Figure 11 – Recipe types model 46
Figure 12 – Master recipe component encapsulation 50
Figure 13 – General recipe procedure model 52
Figure 14 – Master recipe procedure model 53
Figure 15 – Information flow from general recipe to equipment entity 56
Figure 16 – Control recipe procedure referencing equipment procedural elements at the phase level 57

Figure 17 – Control recipe referencing equipment procedural elements at the operation level; equipment procedural control structure undefined 58
Figure 18 – Control recipe referencing equipment procedural elements at the operation level; combination implements the full procedural control model 59
Figure 19 – Control recipe referencing equipment procedural elements at the unit procedure level; equipment procedural control structure undefined 59
Figure 20 – Control recipe referencing equipment procedural elements at the unit procedure level; combination implements the full procedural control model 60
Figure 21 – Control recipe referencing equipment procedural elements at the procedure level; equipment procedural control structure undefined 60
Figure 22 – Control recipe referencing equipment procedural elements at the procedure level; combination implements the full procedural control model 61
Figure 23 – Referencing equipment procedural elements at different levels within the same recipe procedure 62
Figure 24 – Control recipe procedure/equipment procedure collapsibility examples 63
Figure 25 – Simultaneous definition/selection of procedural elements and equipment entities 64
Figure 26 – State transition diagram for example states for procedural elements 69
Figure 27 – Control activity model 76
Figure 28 – Recipe Management 78
Figure 29 – Process Cell Management 87
Figure 30 – Unit Supervision 91
Figure 31 – Process Control 93
Figure B.1 – State transition diagram for the reference procedural state model 101
Figure E.1 – Changes in structure *(1 of 4)* 117
Figure E.2 – Changes in structure *(2 of 4)* 118
Figure E.3 – Changes in structure *(3 of 4)* 118
Figure E.4 – Changes in structure *(4 of 4)* 119
Figure E.5 – Updated: Process model 120
Figure E.6 – Updated: *Role-based Equipment* role 121
Figure E.7 – Updated: Process cell path structures 122
Figure E.8 – Updated: Process/procedure/equipment mapping to achieve process functionality 123
Figure E.9 – Updated: Recipe types model 123
Figure E.10 – Updated: Control recipe procedure linking examples 124
Figure E.11 – Updated: Procedure/equipment procedure collapsibility examples 124
Figure E.12 – Updated: Example state model 125
Figure E.13 – Removed: Procedural element relationships in the site recipe and master recipe 127
Figure E.14 – Removed: Control recipe procedure/equipment control separation 127

Table 1 – Example modes 66
Table 2 – State transition matrix for example states for procedural elements 70
Table 3 – State descriptions in the example procedural state model 70
Table B.1 – State transition matrix for the reference procedural state model 101
Table B.2 – State descriptions in the reference procedural state model 103

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Batch control - Part 1: Models and terminology

FOREWORD

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IEC 61512-1 has been prepared by subcommittee 65A: System aspects, of IEC technical committee 65: Industrial-process measurement and control. It is an International Standard.

This second edition cancels and replaces the first edition published in 1997. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Models and text are modified to provide more detail and clarity. Key clarifications are:
   1) Two types of *equipment* modules are defined: generic and *recipe-aware*. All *recipe-aware equipment modules* contain procedural control and can be used as phases in the recipe.
   2) Execution of all procedural control contained directly in *units* is part of the Unit Supervision activity.
   3) The relationships between types of *recipes*, *recipe components*, and *equipment* control are more fully described and illustrated.
   4) Entity relationship diagrams have been replaced with more intuitive UML instance diagrams, except for the *equipment entity model*.
   5) The transition diagram for the procedural *states* example has been updated with a more intuitive and complete UML *state* diagram.
   6) References to other standards in the series and to IEC 62264 are included to provide direction for further clarification of selected topics.
   7) Activity names are capitalised to help prevent confusion with similar terms, such as their underlying functions.
b) Previous Clauses 4 through 6 (now Clauses 4 through 8) were rearranged to provide a clearer top-down organisation of the document. Key changes are:
   1) Removing the lower levels of the physical (*role-based equipment*) model (see 4.4.2) to eliminate redundancy because their groupings are defined by the associated functionality in the *equipment entity model* and are not meaningful for batch control without those associations.
   2) Describing *equipment* control and the *equipment entity model* immediately after the physical (*role-based equipment*) model and describing each level as completely as possible without excessive use of forward references (see 4.4.3).
   3) Combining the descriptions of basic, procedural, and coordination control with their usage in each type of *equipment entity*, providing a single consolidated discussion of each type of control (see Clause 5).
   4) Additional considerations to support application of the models have been grouped in Clause 7 to clarify their supporting relationship to the core models.
c) Clause 9 was added to define completeness, compliance, and conformance in relation to this document.
d) Annex B was added to provide a more expansive procedural *state* reference model. The model found in Clause 7 can be considered a collapsed version of this more general model.
e) Annex C was added to clarify a number of points concerning the models, their application, and the new Clause 9 on conformance and compliance.
f) Annex E was added to more fully describe the changes in this update to IEC 61512-1:1997.

The text of this International Standard is based on the following documents:

Draft	Report on voting
65A/1178/FDIS	65A/1197/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

In this standard, the following print type is used:

Defined terms are italicised in the body of this document to avoid misinterpretation based on meanings outside of the IEC 61512 series.

A list of all parts in the IEC 61512 series, published under the general title *Batch control*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

The IEC 61512 series of standards comprises several parts. This document describes an overarching framework of models and definitions for batch manufacturing. Other parts of the series describe in more detail particular focus areas within this framework.

All IEC documents follow a fixed structure consisting of Clause 1 “Scope”, Clause 2 “Normative references” and Clause 3 “Terms and definitions”. This document therefore contains a Normative references clause even if it is empty.

Clause 3 provides terms and definitions that are important for the understanding of certain terms used in the document. Each definition can be considered a summary statement for the associated term. Since this document defines models and terminology as a whole, all of its provisions contribute to each term’s full meaning and to its relationship to the models.

Clauses 4 through 8 incrementally complete these definitions by starting at a very high level, progressively detailing a set of conceptual models, and describing how they collectively interact to control of a production of a batch. The models are presumed to be complete as indicated. However, they can be collapsed and expanded as described in the explanation of each model.

Clause 4 Batch processes and equipment is normative. The intent of this clause is to provide models and terminology that describe *batch processes* and the *equipment* used to perform them.

Clause 5 Structure for batch control is normative. The intent is to describe three types of control used in *batch processing* and their relationships to the previously defined process and *equipment* models.

Clause 6 Recipes and procedural elements is normative. The intent is to describe the roles and contents of four types of *recipes* used in batch manufacturing, their use of the previously defined process and procedural control models, and their connection to *equipment* control.

Clause 7 Batch control considerations is normative. The intent is to describe additional considerations related to iterative design, exception handling, *modes* and states, production plans and schedules, and production information.

Clause 8 Activities and functions in batch control is normative. The intent is to describe the control activities that are necessary to address the diverse control requirements of batch manufacturing.

Clause 9 Completeness, compliance, and conformance is normative. The intent is to define compliance and conformance relative to the normative models and terminology in this document.

Annex A is informative. It provides guidance towards understanding the model types used in this document. Usage of UML instance diagrams and *state* diagrams is described in Annex A and contrasted with the corresponding figures of IEC 61512-1:1997 as shown in Annex E.

Annex B is informative. It provides a more expansive procedural *state* reference model. The model found in 7.5 can be considered a collapsed version of this more general model.

Annex C is informative. It provides answers to typical questions that can arise in applying this document.

Annex D is informative. It provides further explanation of the software entities listed in 4.2.

Annex E is informative. It provides a summary of the changes made in this update as compared with IEC 61512-1:1997.

The bibliography is informative, giving references for further investigation concerning safety and other relevant standards.

This document is intended for those who are

- involved in the design, *operation*, or both of batch manufacturing plants,
- responsible for specifying controls and the associated application programs for batch manufacturing plants, or
- involved in the design and marketing of products in the area of batch control.

This document defines standard models and terminology for specifying the control requirements for batch manufacturing plants. The models and terminology

- emphasise good practices for the design and *operation* of batch manufacturing plants,
- can be used to improve control of batch manufacturing plants, and
- can be applied regardless of the degree of automation.

This document provides standard terminology and a consistent set of concepts and models for batch manufacturing plants and batch control that are intended to

- improve communications between all parties involved,
- reduce the user's time to reach full production levels for new products,
- enable vendors to supply appropriate tools for implementing batch control,
- enable users to better identify their needs,
- make *recipe* development straightforward enough to be accomplished without the services of a control systems engineer,
- reduce the cost of automating batch processes, and
- reduce life-cycle engineering efforts.

It is not the intent of this document to

- suggest that there is only one way to implement or apply batch control,
- force users to abandon their current way of dealing with their batch processes, or
- restrict development in the area of batch control.

The key concepts defined in this document are:

- description of *recipes*, procedures, their contents, and their structure;
- definition of levels of *recipes* and procedures;
- recognition of product specific *recipes* and procedures that are separate from process-oriented *equipment* and its direct control;
- identification of a hierarchy of manufacturing *equipment* and its dedicated control;
- recognition of *equipment* capabilities that are utilised during *recipe* and procedure driven production; and
- recognition of the need for modular and reusable control functionality.