



IEC 61512-1

Edition 2.0 2026-02

INTERNATIONAL STANDARD

**Batch control -
Part 1: Models and terminology**

Sample Document

get full document from standards.iteh.ai



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2026 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search -

webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Warning! Make sure that you obtained this publication from an authorized distributor.

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: <i>Role-based Equipment</i> 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

Batch control - Part 1: Models and terminology

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

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.

Sample Document

get full document from standards.iteh.ai

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.

1 Scope

This part of IEC 61512 applies to systems, specifications, and their use for implementing batch and related procedure-oriented manufacturing controls in the process industries. This document establishes a reference model framework for procedure-oriented control, defines terms to help explain the model relationships and usage, and describes general criteria for evaluating conformance. This follows the principle of separation between *recipe procedural elements* and *equipment procedural elements* enabling *operations* to define *recipes* without the need of changes in *equipment* procedures.

2 Normative references

There are no normative references in this document.

3 Terms, definitions, abbreviated terms and acronyms

3.1 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1.1 allocation

form of *coordination control* that assigns a *resource* or part of a *resource* to a *recipe*, a *procedural element*, or an *equipment entity* as appropriate

3.1.2

arbitration

form of *coordination control* that determines how a *resource* should be *allocated* when there are more requests for the *resource* than can be accommodated at one time

3.1.3

area

role-based equipment entity or component of a *site* that is identified by physical, geographical, operational, or logical segmentation within the *site*

Note 1 to entry: The area can contain *process cells*, production *units*, production lines, and storage zones.

3.1.4

basic control

control dedicated to establishing and maintaining a specific *state* or behaviour of *equipment* and process

Note 1 to entry: *Basic control* can include regulatory control, interlocking, physical and virtual monitoring, *exception handling* and discrete or sequential control necessary for establishing or maintaining a specific *state* or behaviour.

3.1.5

batch

finite quantity of material

3.1.6**batch control**

control activities and functions that direct batch processes

3.1.7**batch process**

process *that leads to the production of a batch according to a recipe*

3.1.8**batch schedule**

ordered list of *batches of material* to be produced in a specific *process cell*

Note 1 to entry: The *ordered list of finite quantities of material to be produced in a specific process cell* typically contains such information as what is to be produced, how much is to be produced, when or in what order the *finite quantities of material* are to be produced, and what *equipment* is to be used.

3.1.9**campaign**

collection of related *batches* for scheduling purposes

3.1.10**common resource**

resource that can provide services to one or more requesters

Note 1 to entry: *Common resources* are identified as either *exclusive-use resources* or *shared-use resources*.

3.1.11**control activity model**

conceptual model identifying interdependent activities (several of which are subdivided into functions) that manage control definition, execution, and information for batch processes

3.1.12**control module**

lowest level functional grouping in the *equipment entity model* that can carry out basic control

Note 1 to entry: The *control module* level contains the interfaces to the *role-based equipment*.

3.1.13**control recipe**

type of *recipe* which, through its execution, defines the manufacture of a single *batch*

3.1.14**coordination control**

type of control that directs, initiates, modifies, or performs a combination of these for the execution of *procedural control* and the utilisation of *equipment entities*

3.1.15**enterprise**

organisation that coordinates the manufacturing at one or more *sites*

3.1.16**equipment**

collection of physical objects or *resources* having defined roles and capabilities in master and a control *recipe* for executing a process

3.1.17**equipment control**

equipment-specific functionality that provides the actual control capability for an *equipment entity*, including *procedural control*, *basic control*, and *coordination control*

3.1.18**equipment entity**

collection of process *equipment*, control *equipment*, and *equipment control* grouped together to perform a certain control function or set of control functions

3.1.19**equipment entity model**

hierarchical model to logically organise the *role-based equipment* used in a *batch process* in combination with the control present at each level

3.1.20**equipment module**

functional grouping in the *equipment entity model* that can carry out specific minor *processing* activities

Note 1 to entry: An equipment module is typically centred around a piece of process *equipment* (a weigh tank, a process heater, a scrubber, etc.).

Note 2 to entry: Examples of minor *processing* activities are dosing and weighing.

Note 3 to entry: Two types of *equipment modules* are identified: *recipe-aware equipment modules* and *generic equipment modules*.

Note 4 to entry: Any reference to an *equipment module* in this document is understood to be a general reference to both the *recipe-aware equipment module* and the *generic equipment module* unless otherwise specified.

3.1.21**equipment operation**

operation that is part of *equipment control*

3.1.22**equipment phase**

phase that is part of *equipment control*

3.1.23**equipment procedure**

procedure that is part of *equipment control*

3.1.24**equipment unit procedure**

unit procedure that is part of *equipment control*

3.1.25**exception handling**

those functions that deal with plant or process contingencies and other events which occur outside the normal or desired behaviour of *batch control*

3.1.26**exclusive-use resource**

common resource that only one user can use at any given time

3.1.27**formula**

category of *recipe* information that includes *process inputs*, *process parameters*, and *process outputs*

3.1.28**general recipe**

type of *recipe* that expresses equipment and *site* independent *processing* requirements