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Industrial systems, installations and equipment and industrial products — Structuring principles and reference designations —

Part 1: Basic rules

Systèmes industriels, installations et appareils, et produits industriels — Principes de structuration et désignations de référence —

Partie 1: Règles de base

ICS: 29.020; 01.110

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INDUSTRIAL SYSTEMS, INSTALLATIONS AND EQUIPMENT AND INDUSTRIAL PRODUCTS – STRUCTURING PRINCIPLES AND REFERENCE DESIGNATIONS –

Part 1: Basic rules

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.
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IEC 81346-1 has been prepared by IEC technical committee 3: Documentation, graphical symbols, and representations of technical information in close co-operation with ISO technical committee 10: Technical product documentation.

It is published as a double logo standard and has the status of a horizontal publication in accordance with IEC Guide 108.

This second edition cancels and replaces the first edition of IEC 81346-1, published in 2009. This edition constitutes a technical revision.

This edition includes the following substantial changes with respect to the first edition of IEC 81346-1:

- the scope includes a reference to Guide 108 for being a horizontal publication
- synchronization with IEC 81346-2:2019 and ISO 81346-12:2018
- the introduction of the type aspect
- introduction of an information model of the reference designation system

- 220 – introduction of an information model for the framework of reference designation system to
- 221 comply with IEC/ISO 81346 series
- 222 – introduction of recommendation for metadata for design structure management
- 223 – introduction of rules and method for designation of relations between objects
- 224 – Introduction of requirements for development of sector specific parts of the IEC/ISO 81346
- 225 series
- 226 – introduction of requirements for incorporation of sub-object in object structures
- 227 – introduction of recommendations for documentation of the application of the IEC/ISO 81346
- 228 series
- 229 – introduced definition of new terms used
- 230 – new rules added and existing rules modified

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

FDIS	Report on voting
3/xxx/FDIS	3/xxx/RVD

232
233 Full information on the voting for the approval of this standard can be found in the report on
234 voting indicated in the above table. In ISO, the standard has been approved by xx members out
235 of xx having cast a vote.

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

237 A list of all parts of the International Standard 81346 series, under the general title *Industrial*
238 *systems, installations and equipment and industrial products – structuring principles and*
239 *reference designations*, can be found on the IEC website.

<https://standards.iteh.ai/catalog/standards/sist/a791f443-0be9-45e9-a209-9253e9259789/iec-dis-81346-1>

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

- 243 • reconfirmed,
- 244 • withdrawn,
- 245 • replaced by a revised edition, or
- 246 • amended.

247

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248

249

250 INTRODUCTION

251 0.1 General

252 This standard establishes a further development of earlier and withdrawn standards on item
253 designation. It provides basics for establishing models of plants, machines, buildings etc.

254 The standard specifies:

- 255 • principles for structuring of objects including associated information;
- 256 • rules on forming of reference designations based on the resulting structure.

257 By applying the structuring principles, even very large sets of information in a complex system
258 can be handled efficiently.

259 The structuring principles and the rules for reference designations:

- 260 • are applicable to objects of both physical and non-physical character.
- 261 • provide a system that is easy to navigate within and easy to maintain. This system provides
262 an excellent overview on a technical system since composite structures are simple to
263 establish and understand.
- 264 • support alternative design and engineering processes in the life cycle of an object since
265 they are based on the successively established results of this process and not on how the
266 engineering process itself is carried out.
- 267 • allow, by accepting more than one aspect, that more than one coding principle can be
268 applied. This technique also allows 'old structures' to be handled together with 'new
269 structures' by using multiple unambiguous identifiers.
- 270 • support individual management for the establishment of reference designations and enable
271 subsequent integration of modules into larger constructs. They also support the
272 establishment of reusable modules, either as functional specifications or as physical
273 deliverables.

274 NOTE The concept of reusable modules encompasses for example, for manufacturers: the establishment of
275 contract independent modules, and, for operators of complex assemblies: the description of requirements in
276 terms of supplier independent modules.

- 277 • support concurrent work and allow different partners within a project to add and / or remove
278 data to the structured project result as it proceeds.
- 279 • recognize time factor within the life cycle as important for the application of different
280 structures based on different views on the considered technical system.

281 The rules for structuring of information and for the construction of reference designations forms
282 the basis for creating a reference designation system (RDS) complying with the IEC/ISO 81346
283 series. Such systems are used for structuring and designating objects based on the needs of
284 the organization using them.

285 Annex A provides an information model of the framework described in this publication and
286 IEC 81346-2. Annex A includes also elements related to other publications where the
287 application of the reference designation in accordance with IEC/ISO 81346 series are
288 considered.

289 0.2 Basic requirements for this standard

290 The basic requirements were developed during the preparation of IEC 61346-1 Ed. 1 and
291 accepted by vote by the national committees.

NOTE These basic requirements concern the development of the structuring principles in this standard and not its application. They are therefore not normative vis-à-vis the application of this standard.

- This standard should be applicable to all technical areas and enable a common application.
- This standard shall be applicable to all kind of objects and their constituents, such as plants, systems, assemblies, software programs, spaces, etc.
- This standard should be capable of being consistently applied in all phases (i.e. conceptual development, planning, specification, design, engineering, construction, erection, commissioning, operation, maintenance, decommissioning, disposal, etc.) of the life time of an object of interest, i.e. an object to be identified.
- This standard shall provide the ability to identify unambiguously any single object being a constituent of another object.
- This standard shall support the incorporation of sub-object structures from multiple organizations into objects from other organizations without change to the original object structures and neither to the sub-object structures nor any of their documentation.
- This standard shall support a representation of an object independently of the complexity of the object
- This standard should be easy to apply and the designations should be easy for the user to understand.
- This standard should support the use of, and should be able to be implemented by, computer-aided tools for conceptual development, planning, specification, design, engineering, construction, erection, commissioning, operation, maintenance, decommissioning, disposal, etc.

0.3 Required properties of the standard

The required properties were developed during the preparation of IEC 61346-1 Ed. 1 and accepted by vote by the national committees.

NOTE 1 These required properties concern the development of the letter code classification system in this standard and not its application. They are therefore not normative vis-à-vis the application of this standard.

- This standard shall not contain rules and restrictions that prohibit its use within a technical area.
- This standard shall cover all its foreseeable applications within all technical areas.
- This standard shall support addressing of information to objects at all phases in their lifetime.
- This standard shall allow construction of designations at any time from the currently available information.
- This standard shall support the identification of objects based on a constituency principle.
- This standard shall contain rules that enable the formulation of unambiguous designations.
- This standard shall be open and allow a designation to be extended.
- This standard shall support modularity and reusability of objects.
- This standard shall support the description of different users' views on the object
- This standard shall provide rules for the interpretation of designations where needed.

Figure 1 provides an overview on international standards providing a consistent system for designation, documentation, and presentation of information. 0 provides more information on the relations between the IEC/ISO 81346 series and other publications applying reference designations.

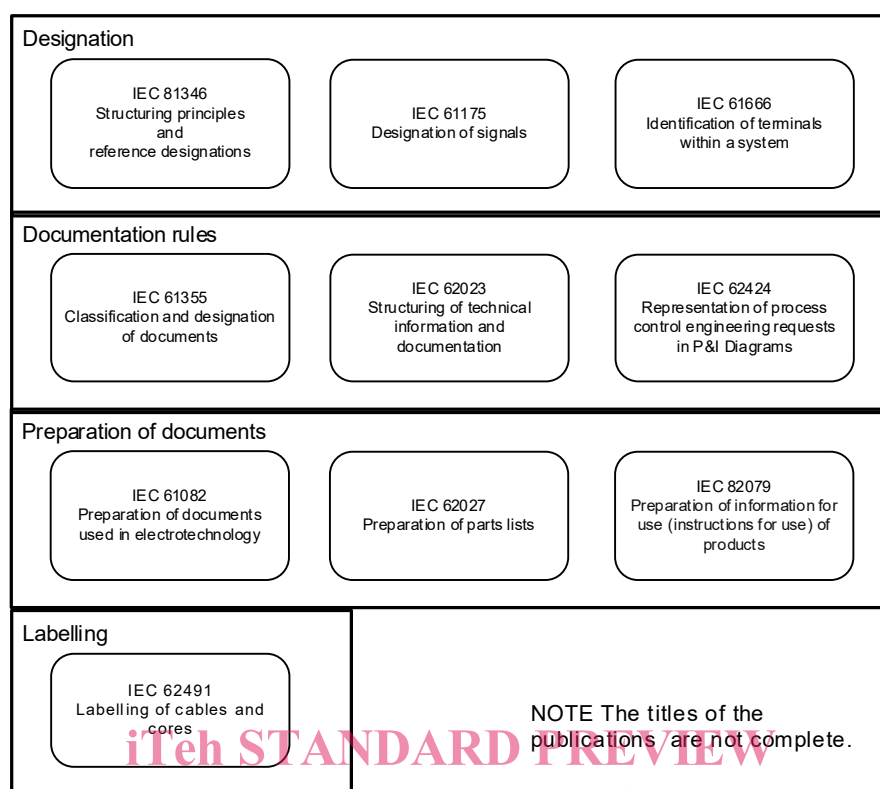


Figure 1 – International standards providing a consistent system for designation, documentation and presentation of information

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0.4 Framework of the IEC/ISO 81346 series

IEC 81346-1 describes the fundamental rules and methods for structuring of information and for the definition of reference designation of objects within an industrial systems, installations and equipment and industrial products. These rules form a basis for the establishment of specific Reference Designation Systems (RDS) for use by industries, enterprises, projects or other organizational contexts.

IEC 81346-2 establishes classification schemes with defined object classes and their associated letter codes and is primarily intended for use in reference designations and for designation of generic types. Classes can also be used for other purposes, e.g. by manufacturers to show multiple potential use of a product. In this way, the classification can enhance searchability.

Used in combination, IEC 81346-1 and IEC 81346-2 define a fundamental framework for reference designations that is independent of the context in which reference designations are applied and are applicable for objects in all technical disciplines and all branches of industry, and is applicable through the whole life-cycle of objects.

The IEC/ISO 81346 series of standards additionally include parts that define sector-specific Reference Designation Frameworks that tailor the fundamental Reference Designation Framework of IEC 81346-1 and IEC 81346-2 to the needs of specific sectors. Requirements for developing sector-specific parts of the IEC/ISO 81346 series are given in Annex J.

**INDUSTRIAL SYSTEMS, INSTALLATIONS
AND EQUIPMENT AND INDUSTRIAL PRODUCTS –
STRUCTURING PRINCIPLES AND REFERENCE DESIGNATIONS –**

Part 1: Basic rules

1 Scope

This part of IEC 81346, published jointly by IEC and ISO, establishes general principles for the structuring of systems including structuring of the information about systems.

Based on these principles, rules and guidance are given for the formulation of unambiguous reference designations for objects in any system.

The reference designation identifies objects for the purpose of creation and retrieval of information about an object, and where realized about its corresponding component.

A reference designation labelled at a component is the key to find information about that object among different kinds of documents.

The principles are general and are applicable to all technical areas (for example mechanical engineering, electrical engineering, construction engineering, process engineering). They can be used for systems based on different technologies or for systems combining several technologies.

This document is also a horizontal publication intended for use by technical committees in preparation of publications related to reference designations in accordance with the principles laid down in IEC Guide 108.

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 Guide 108, *Guidelines for ensuring the coherence of IEC publications – Horizontal functions, horizontal publications and their application*

IEC 81346-2:2019, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 2: Classification of objects and codes for classes*

ISO 81346-10:20XX, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 10: Power systems*¹

ISO 81346-12:2018, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations – Part 12: Construction works and building services*

ISO/IEC 646, *Information technology – ISO 7-bit coded character set for information interchange*

¹ To be published

3 Terms and definitions

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

NOTE Terms given in *italics* are defined elsewhere in this clause.

3.1

object

entity involved in a *process* of development, implementation, usage and disposal

Note 1 to entry: The object may refer to a physical or non-physical.

Note 2 to entry: The object has information associated to it.

3.2

system

set of interrelated *objects* considered in a defined context as a whole and separated from their environment

Note 1 to entry: A system is generally defined with the view of achieving a given objective, e.g. by performing a definite function.

Note 2 to entry: Elements of a system may be natural or man-made material objects, as well as modes of thinking and the results thereof (e.g. forms of organisation, mathematical methods, programming languages).

Note 3 to entry: The system is considered to be separated from the environment and from the other external systems by an imaginary boundary, through which the system is related to the external systems.

Note 4 to entry: The term “system” should be qualified when it is not clear from the context to what it refers, e.g. control system, colorimetric system, system of units, transmission system.

Note 5 to entry: When a system is part of another system, it may be considered as an object as defined in this standard.

[SOURCE: IEV 151-11-27, modified – the word “elements” replaced by “objects” in the definition, in note 3 the phrase “surface, which cuts the links between them and the systems” replaced by “boundary, through which the system is related to the external systems”, note 5 to entry added]

3.3

aspect

specified way of viewing an *object*

3.4

process

set of interacting operations by which material, energy or information is transformed, transported or stored

[SOURCE: IEV 351-42-33, modified – the words “complete” and “in a system” are deleted and the word “matter” replaced by “material”, the examples and notes to entry are deleted]

3.5

function

intended or accomplished purpose or task

3.6

product

intended or accomplished result of labour, or of a natural or artificial *process*

3.7

component

product used as a constituent in an assembled *product*, *system* or plant

441 **3.8**
 442 **location**
 443 intended or accomplished space

444 **3.9**
 445 **structure**
 446 organization of relations among *objects* of a *system*

447 Note 1 to entry: In the context of this standard the relations **considered** are partitive relations (see ISO 1087:2019,
 448 3.2.14), i.e. consists-of / is-a-part-of relations

449 **3.10**
 450 **identifier**
 451 attribute associated with an *object* to unambiguously distinguish it from other *objects* within a
 452 specified domain

453 **3.11**
 454 **reference designation**
 455 *identifier* of a specific *object* formed with respect to the *system* of which the *object* is a
 456 constituent, based on one or more *aspects* of that *system*

457 **3.12**
 458 **single-level reference designation**
 459 *reference designation* assigned with respect to the *object* of which the specific *object* is a direct
 460 constituent in one *aspect*

461 Note 1 to entry: A single-level reference designation does not include any reference designations of upper level or
 462 lower level objects.

463 **3.13**
 464 **multi-level reference designation**
 465 *reference designation* consisting of concatenated *single-level reference designations*

466 **3.14**
 467 **reference designation set**
 468 collection of two or more *reference designations* associated with an *object* of which at least one
 469 unambiguously identifies this *object*

470 **3.15**
 471 **object occurrence**
 472 the existence of an *object* when viewed using an *aspect*

473 **3.16**
 474 **product individual**
 475 one specimen of a product *type* irrespective of where or if it is being used

476 **3.17**
 477 **class**
 478 set of *objects* having at least one *characteristic* in common

479 Note 1 to entry: The characteristics may be embodied by the use of properties, operations, methods, relations,
 480 semantics, etc.

481 [SOURCE: ISO 5127:2017, definition 3.8.5.03, modified – "elements" replaced by "objects", note
 482 1 and 2 to entry removed and a new note 1 to entry added]

483 **3.18**
 484 **characteristic**
 485 distinguishing feature

486 Note 1 to entry: A characteristic can be inherent or assigned.

487 Note 2 to entry: A characteristic can be qualitative or quantitative.

488 [SOURCE: ISO 9000:2015, definition 3.10.1, modified – removed Note 3 to entry]

489 3.19

490 **property**

491 defined characteristic suitable for the description and differentiation of objects

492 [SOURCE: ISO/IEC Guide 77-2:2008, definition 2.18, modified – “parameter” replaced by
493 “characteristic”, “products” replaced by “objects”, and removed all notes to entry]

494 3.20

495 **type**

496 set of objects defined by a class

497 3.21

498 **associative relation**

499 **pragmatic relation**

500 non-hierarchical relation between concepts

501 3.22

502 **relation designation**

503 identifier of an associative relation with respect to the related object occurrences

504 4 Concepts

505 4.1 Object

[IEC/DIS 81346-1](https://standards.iteh.ai/catalog/standards/sist/a7916443-0be9-45e9-a209-975379259789/iec-dis-81346-1)

506 The definition of the term “object” is very general (see 3.1) and covers all items that are subject
507 to activities during the life cycle of a system.

508 Most objects have a physical existence as they are tangible (e.g. a transformer, a lamp, a valve,
509 a building). However, there are objects that do not have a physical existence but exist for
510 different purposes, for example:

- 511 • an object which exists only by means of the existence of its sub-objects, thus the considered
- 512 object is defined for structuring purposes;
- 513 • a function;
- 514 • a type;
- 515 • a process;
- 516 • a space, being limited by some three-dimensional extent;
- 517 • an object which exists for identification of a set of information.

518 This international standard does not distinguish between those objects that have a physical
519 existence and those that have not. Both kinds of objects can be relevant for being identified
520 and handled in the life cycle of a system.

521 There are no rules on how an object is established. In fact, it is the designer/engineer who
522 decides that an object exists and establishes the need to identify this object.

523 When an object is established, information may be associated with it. This information may
524 change throughout the life cycle of that object.