Industrial-process measurement, control and automation - Digital factory framework - Part 1: General principles

EESTI STANDARDIKESKUS **EVS**
ESTONIAN CENTRE FOR STANDARDISATION

EESTI STANDARDI EESSÕNA NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 62832-1:2020 sisaldab Euroopa standardi EN IEC 62832-1:2020 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 62832-1:2020 consists of the English text of the European standard EN IEC 62832-1:2020.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 04.12.2020.	Date of Availability of the European standard is 04.12.2020.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 25.040.40

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 62832-1

December 2020

ICS 25.040.40

English Version

Industrial-process measurement, control and automation - Digital factory framework - Part 1: General principles
(IEC 62832-1:2020)

Mesure, commande et automation dans les processus industriels - Cadre de l'usine numérique (digital factory) - Partie 1: Principes généraux
(IEC 62832-1:2020)

Industrielle Leittechnik - Grundstruktur der digitalen Fabrik - Teil 1: Allgemeine Grundsätze
(IEC 62832-1:2020)

This European Standard was approved by CENELEC on 2020-11-30. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN IEC 62832-1:2020 E

European foreword

The text of document 65/836/FDIS, future edition 1 of IEC 62832-1, prepared by IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62832-1:2020.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2021-08-30 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2023-11-30 document have to be withdrawn

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 62832-1:2020 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 standards indicated:

IEC 61360 (series)	NOTE	Harmonized as EN 61360 (series)
IEC 61360-1	NOTE	Harmonized as EN 61360-1
IEC 61360-2	NOTE	Harmonized as EN 61360-2
IEC 61987 (series)	NOTE	Harmonized as EN IEC 61987 (series)
IEC 61987-10:2009	NOTE	Harmonized as EN 61987-10:2009 (not modified)
IEC 62264 (series)	NOTE	Harmonized as EN 62264 (series)
IEC 62264-1:2013	NOTE	Harmonized as EN 62264-1:2013 (not modified)
IEC 62264-2	NOTE	Harmonized as EN 62264-2
IEC 62683 (series)	NOTE	Harmonized as EN 62683 (series)
ISO 11354-1:2011	NOTE	Harmonized as EN ISO 11354-1:2011 (not modified)
IEC 62656 (series)	NOTE	Harmonized as EN IEC 62656 (series)
ISO 19439	NOTE	Harmonized as EN ISO 19439

Annex ZA
(normative)

Normative references to international publications
with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 62832-2	-	Industrial-process measurement, control and automation - Digital factory framework - Part 2: Model elements	EN IEC 62832-2	-
IEC 62832-3	-	Industrial-process measurement, control and automation - Digital factory framework - Part 3: Application of Digital Factory for life cycle management of production systems	EN IEC 62832-3	-
IEC 62832	series	Industrial-process measurement, control and automation - Digital factory framework	EN IEC 62832	series
ISO/IEC 6523	series	Information technology - Structure for the identification of organizations and organization parts	-	-
ISO/IEC 11179-6	-	Information technology - Metadata registries (MDR) – Part 6: Registration	-	-
ISO/TS 29002-5	2009	Industrial automation systems and integration - Exchange of characteristic data – Part 5: Identification scheme	-	-

IEC 62832-1

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour
inside

**Industrial-process measurement, control and automation – Digital factory framework –
Part 1: General principles**

**Mesure, commande et automation dans les processus industriels – Cadre de l'usine numérique (digital factory) –
Partie 1: Principes généraux**

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.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

IEC 62832-1

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

**Industrial-process measurement, control and automation – Digital factory framework –
Part 1: General principles**

**Mesure, commande et automation dans les processus industriels – Cadre de l'usine numérique (digital factory) –
Partie 1: Principes généraux**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

**INDUSTRIAL-PROCESS MEASUREMENT, CONTROL
AND AUTOMATION – DIGITAL FACTORY FRAMEWORK –**

Part 1: General principles

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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62832-1 has been prepared by IEC technical committee 65: Industrial-process measurement, control and automation.

This first edition cancels and replaces the first edition of IEC TS 62832-1 published in 2016. This edition constitutes a technical revision.

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

- correction of terms and definition of additional terms (Clause 3);

- correction of description of header;

- moved UML diagram to IEC 62832-2.

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

FDIS	Report on voting
65/836/FDIS	65/845/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

A list of all parts in the IEC 62832 series, published under the general title, *Industrial-process measurement, control and automation – Digital Factory framework* 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 "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

0.1   Market demand and situation

High performance, flexible dynamic processes, and agile machines and production systems are essential to meet the demands for quality, delivery and cost of the products. This situation results in an increased complexity of the plant life cycle. In addition, all existing information of a product or a production system is described and modified through the whole life cycle of a product or of a production system, for example during the planning, development process, and operation. This situation spurs the enterprise to exchange product data and production system data in electronic form.

However, each enterprise and each department inside the enterprise describe their products and production systems according to their own data management schemes, often using different terms, structures, and media.

EXAMPLE   Examples for data management schemes are paper-based, databases, disks, e-catalogues, and cloud.

Therefore, no seamless information exchange between all the actors involved in the life cycles of both products and production systems can be found.

Efficient exchange of data between and within enterprises can only be performed if syntax (format) and semantics (meaning) of the information has been defined in a unanimous and shared manner.

0.2   History of standardization in this area

Earlier work on electronic product data started with the initial objective to replace paper data sheets with an electronic description of electronic components used in products, and to use it in software tools for electronic wiring and assembly (for example, when designing electronic boards).

Additionally, concepts were developed for profiling of devices used in production systems, in order to describe parameters and behavioural aspects to facilitate integration and reduce engineering costs, providing guides for standards developers.

NOTE 1   See Device Profile Guideline (IEC TR 62390).

IEC 61987-10 made an important step toward this objective by defining fundamentals that aim at describing devices used in production systems by creating lists of properties (LOPs). The properties themselves are compiled into blocks that describe given features of a device. Further parts of IEC 61987 and other related standards (e.g. IEC 62683 (all parts)) define reference LOPs for electronic/electric components and materials used in electro-technical equipment and systems, such as equipment for measuring flows, pressures, temperatures, levels and densities.

NOTE 2   Although the title of IEC 62683 is "Low-voltage switchgear and controlgear – Product data and properties for information exchange", the intent of IEC 62832 is to use the information exchange for interoperability in describing devices that are used in production systems.

IEC 61360-1, IEC 61360-2 and ISO 13584-42 specify the principles to be used for defining characterization classes of parts and their properties. As a result, a database was developed, also named IEC Common Data Dictionary (IEC CDD), which contains the reference collection of classes and associated properties. ISO 22745 (all parts) specifies open technical dictionaries (OTDs) and their application to master data. ISO/IEC Guide 77 provides recommendations for the description of products and their properties for the creation of these classes, catalogues and reference dictionaries.

NOTE 3   ISO/IEC Guide 77 uses the term "product". It is taken to include devices, processes, systems, installations, etc.

ISO 15704 specifies requirements of enterprise reference architectures and methodologies for supporting the applications in terms of the interoperability, the integration, and the architectures of the applications throughout the life cycle and supply chain aspects of the systems.

A number of efforts have addressed the development of business and manufacturing enterprise models to aid in understanding of different aspects of the enterprise to realize improvements in enterprise operations. Additionally, models for enterprise and control systems have been developed to support the production operations, but gaps remain in development of models to bridge from the manufacturing system design environments to the manufacturing operation environments, in terms of sharing information of the process, equipment, and devices.

NOTE 4　IEC 62264 (all parts) defines models of functions in the manufacturing and control domains and information exchanged with the enterprise domain.

0.3　Purpose and benefits of IEC 62832 (all parts)

While the standards mentioned above provide a method for describing properties of a given device, IEC 62832 (all parts) extends this method by defining a reference model for the representation of production systems, which include the devices.

In order to manage a production system effectively throughout its life cycle, it is very important to have its digital representation and to maintain the contents appropriately in response to its evolution in its life cycle. Activities related to the production system will access, update, and use the contents of digital representation in order to support the whole life cycle of the production system. This digital representation provides a consistent information interchange between all processes and partners involved and makes related information understandable, reusable and changeable through the entire production system life cycle.

Dictionaries and models can help to establish such digital representation by providing descriptions of elements, such as equipment and devices, of the production system. However, additional information is needed in order to achieve the intended digital representation of production systems, such as descriptions of relationship between the elements.

IEC 62832 (all parts) provides a framework for establishing and maintaining the digital representations of production systems, including the elements, relationships between these elements and the exchange of information about these elements.

The framework aims at reducing the interoperability barriers for exchange of information for the various activities related to production systems. The main advantages of this method are that all information related to a production system is described in a standardized manner, and it can be used and modified through its entire life cycle.

The method defined in IEC 62832 (all parts) is kept as generic as possible in order to enable its use in several industrial sectors.

NOTE　Enterprise modelling concepts are described in standards referenced in the Bibliography (for example ISO 15704, ISO 11354-1).

0.4　Contents of IEC 62832 (all parts)

IEC 62832 (all parts) consists of multiple parts which provide:

- general introduction to the model and principles of the Digital Factory framework (DF framework) (IEC 62832-1);
- detailed data model for all the model elements of the DF framework (IEC 62832-2);
- description of how the DF framework is used to manage the life cycle of a production system (IEC 62832-3).

INDUSTRIAL-PROCESS MEASUREMENT, CONTROL AND AUTOMATION – DIGITAL FACTORY FRAMEWORK –

Part 1: General principles

1 Scope

This part of IEC 62832 defines the general principles of the Digital Factory framework (DF framework), which is a set of model elements (DF reference model) and rules for modelling production systems.

This DF framework defines:

- a model of production system assets;

- a model of relationships between different production system assets;

- the flow of information about production system assets.

The DF framework does not cover representation of building construction, input resources (such as raw production material, assembly parts), consumables, work pieces in process, nor end products.

It applies to the three types of production processes (continuous control, batch control and discrete control) in any industrial sector (for example aeronautic industries, automotive, chemicals, wood).

NOTE This document does not provide an application scenario for descriptions based on ISO 15926 (all parts), because ISO 15926 (all parts) uses a different methodology for describing production systems.

The representation of a production system according to this document is managed throughout all phases of the production system life cycle (for example design, construction, operation or maintenance). The requirements and specification of software tools supporting the DF framework are out of scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 62832-2, *Industrial-process measurement, control and automation – Digital Factory framework – Part 2: Model elements*

IEC 62832-3, *Industrial-process measurement, control and automation – Digital Factory framework – Part 3: Application of Digital Factory for life cycle management of production systems*

IEC 62832 (all parts), *Industrial-process measurement, control and automation – Digital Factory framework*

ISO/IEC 6523 (all parts), *Information technology – Structure for the identification of organizations and organization parts*

ISO/IEC 11179-6, *Information technology – Metadata registries (MDR) – Part 6: Registration*