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BSI Standards Publication

Nuclear energy, nuclear technologies, and radiological protection — Vocabulary

Part 3: Nuclear installations, processes and technologies

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National foreword

This British Standard is the UK implementation of ISO 12749-3:2024. It supersedes BS ISO 12749-3:2015, which is withdrawn.

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A list of organizations represented on this committee can be obtained on request to its committee manager.

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Part 3: Nuclear installations, processes and technologies

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Partie 3: Installations nucléaires, procédés et technologies

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*.

This second edition cancels and replaces the first edition (ISO 12749-3:2015), which has been technically revised.

The main changes are as follows:

— addition of new concepts;

— modification of definitions;

— change of sources.

A list of all parts in the ISO 12749 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document will provide terms and definitions for concepts associated with nuclear installations, processes, and technologies. These include specific subjects such as the nuclear fuel cycle; ex-reactor nuclear criticality safety, analytical methodologies, transport of radioactive materials, characterization of materials, radioactive waste management, and decommissioning of nuclear installations. Excluded topics are specific enabling technologies and techniques for non-peaceful applications, sealed sources, radiation processing, nuclear power plants and research reactors (with regard to nuclear criticality safety while fuel is loaded in the reactor core). Terminological data are taken from ISO standards developed by ISO/TC 85/SC 5 and other technically validated documents issued by the International Atomic Energy Agency (IAEA) or other international organizations.

Unambiguous communication of concepts associated with nuclear installations, processes, and technologies is crucial to prevent misunderstandings or misinterpretations of terms used in documents developed by ISO/TC 85/SC 5. In line with the international demand for harmonization of terminology regarding nuclear and radiological activities, this document will contribute by providing terms and definitions to meet the requirements of users and industry. It will also improve promotion, knowledge and use of international standards dealing with nuclear installations, processes and technologies and will help experts developing technical standards to avoid overlapping and contradiction.

Nuclear fuels for different power reactors are produced according to different designs. However, several concepts are present in all of them and need to be designated by common terms and described by harmonized definitions in order to avoid misunderstandings. Difficulties can also arise due to the wide variety of units of measure employed. Thus, to enhance comprehension as well as comparability, it is advisable to adopt unified units of measure.

Arrangement of terms and definitions is based on concepts systems that show corresponding relationships among the various concepts. Such arrangement provides users with a structured view of the nuclear installations, processes, and technologies sector and will facilitate common understanding of all related concepts. In addition, concepts systems and conceptual arrangement of terminological data will be helpful to any kind of user because it will promote clear, accurate, and useful communication.

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Nuclear energy, nuclear technologies, and radiological protection — Vocabulary —

Part 3: Nuclear installations, processes and technologies

1 Scope

This document deals with the terminological data used in the standards regarding the standardization and promotion of good practices associated with the planning, design, construction, operation and decommissioning of installations, processes and technologies involving radioactive materials.

The vocabulary of nuclear installations, processes and technologies includes fuel cycle, ex-reactor nuclear criticality safety, analytical methodologies, transport of radioactive materials, materials characterization, radioactive waste management and decommissioning.

NOTE See Annex A for the methodology used to develop the vocabulary.

2 Normative references

There are no normative references in this document.

3 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:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms related to nuclear materials

3.1.1
nuclear material
material containing one or more of the following: plutonium except that with isotopic concentration exceeding 80 % in ^{238}Pu; uranium enriched in the isotope 235 or 233; uranium containing the mixture of isotopes as occurring in nature other than in the form of ore or ore residue

[SOURCE: IAEA. IAEA Nuclear Safety and Security Glossary. Terminology Used in Nuclear Safety, Nuclear Security, Radiation Protection and Emergency Preparedness and Response. Vienna: IAEA, 2022. 246 p. ISBN: 978-92-0-141822-7.]

3.1.2
critical
having an effective neutron multiplication factor equal to unity

[SOURCE: ISO 1709:2018, 3.1]

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3.1.3
nuclear criticality
state of a nuclear chain reacting medium when the *nuclear chain reaction* (3.1.9) is just self-sustaining (or *critical* (3.1.2)), i.e. when the reactivity is zero

[SOURCE: IAEA. IAEA Nuclear Safety and Security Glossary. Terminology Used in Nuclear Safety, Nuclear Security, Radiation Protection and Emergency Preparedness and Response. Vienna: IAEA, 2022. 246 p. ISBN: 978-92-0-141822-7]

3.1.4
radionuclide
nuclide which is in an unstable state due to excess of internal energy and which will attain a stable state by emitting radiation

Note 1 to entry: *Radionuclides* (3.1.4) are either naturally occurring, such as ^{40}K, ^{235}U, ^{238}U, ^{232}Th and their radioactive decay products, or produced by activation or other artificial means.

[SOURCE: ISO 12749-1:2020, 3.1.8]

3.1.5
radioactivity
stochastic process whereby nuclei undergo spontaneous disintegration, usually accompanied by the emission of subatomic particles, or photons

[SOURCE: ISO 12749-1:2020, 3.1.1]

3.1.6
nuclear installation
any nuclear facility subject to authorization that is part of the *nuclear fuel cycle* (3.3.1), except facilities for the mining or processing of uranium ores or thorium ores and disposal facilities for *radioactive waste* (3.6.1)

[SOURCE: IAEA. IAEA Nuclear Safety and Security Glossary. Terminology Used in Nuclear Safety, Nuclear Security, Radiation Protection and Emergency Preparedness and Response. Vienna: IAEA, 2022. 246 p. ISBN: 978-92-0-141822-7]

3.1.7
fissionable nuclide
<neutrons> nuclide capable of undergoing fission by interaction with neutrons of some energy

[SOURCE: LA-11627-MS, Glossary of Nuclear Criticality Terms. Los Alamos National Laboratory, 1989]

Note 1 to entry: Fissionable nuclides include ^{238}U, ^{240}Pu, and others with neutron-energy fission thresholds, in addition to those nuclides that are fissile.

3.1.8
fissile nuclide
nuclide capable of undergoing fission by interaction with neutrons of any energy

[SOURCE: ISO 1709:2018, 3.4]

Note 1 to entry: The term is usually applied to fission predominantly with slow neutrons. The interpretation of “slow” may vary but the properties of fissile nuclides are clearly distinct from other *fissionable nuclides* (3.1.7).

Note 2 to entry: Particular examples are ^{233}U, ^{235}U, ^{239}Pu and ^{241}Pu.

3.1.9
nuclear chain reaction
series of nuclear reactions in which one of the agents necessary to the series is itself produced by the same reactions

[SOURCE: ISO 1709:2018, 3.8]

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3.1.10
fission product
radionuclide (3.1.4) produced by nuclear fission

[SOURCE: IAEA. IAEA Nuclear Safety and Security Glossary. Terminology Used in Nuclear Safety, Nuclear Security, Radiation Protection and Emergency Preparedness and Response. Vienna: IAEA, 2022. 246 p. ISBN: 978-92-0-141822-7]

3.1.11
burnup
loss of fissile material by the fission process that is usually described in terms of the number of fissioned atoms or on the total energy liberated in unit volume or mass

Note 1 to entry: Burnup *fission product* (3.1.10) as energy released by fissions is commonly used for NPP

Note 2 to entry: Burnup as number of fissions per unit volume or mass is commonly used for fuel behaviour modelling and neutronic calculations

Note 3 to entry: Burnup as number of fissions is commonly used for experimental reactors

3.1.12
subcriticality
having or involving a chain reaction that is not self-sustaining

3.1.13
subcriticality limit
limit value of *subcriticality dimension* (3.1.14) which is respected in order to ensure *subcriticality* (3.1.12) of a unit

[SOURCE: ISO 21391:2019, 3.8]

3.1.14
subcriticality dimension
controlled geometrical dimension (item dimension or layout dimension) for which a limit shall be respected to ensure *subcriticality* (3.1.12) of a unit

[SOURCE: ISO 21391:2019, 3.7, modified — The word "controlled" was moved at the beginning of the definition.]

3.1.15
neutron leakage
neutrons leaving a fissile system boundary such that they no longer interact with that system

Note 1 to entry: For an array of fissile units, neutron leakage from one unit may or may not interact with other units.

[SOURCE: ISO 1709:2018, 3.7]

3.1.16
neutron absorber
material with which neutrons interact significantly by reactions resulting in their disappearance as free particles

[SOURCE: ISO 1709:2018, 3.6]

3.1.17
over batching
unintended increase in the quantity of a material that is controlled for *nuclear criticality safety* (3.4.1) such that one or more extra discrete quantities are present

[SOURCE: ISO 1709:2018, 3.13]

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