
Identification of fuel assemblies for nuclear power reactors

*Système d'identification des assemblages combustibles destinés aux
réacteurs nucléaires*

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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 documents 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 85, *Nuclear energy*, Subcommittee SC 6, *Reactor technology*.

This second edition cancels and replaces the first edition (ISO 10979:1994), of which it constitutes a minor revision to update the references in [Clause 2](#) and in the Bibliography.

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.

Identification of fuel assemblies for nuclear power reactors

1 Scope

This document specifies requirements for the unique identification of fuel assemblies utilized in nuclear power plants. It was developed primarily for commercial light-water reactor fuel, but can be used for any reactor fuel contained in discrete fuel assemblies that can be identified with an identification code as specified by this document.

This document defines the characters and proposed sequence to be used in assigning identification to the fuel assemblies. The identification is intended to be borne by the fuel assembly throughout its lifetime.

This document aims at providing an organizing principle for fuel assembly identification systems in order to guarantee unequivocal identification at any time and any place in the world (see also IAEA Safety Guide No. GS-G-3.5).

Considering that existing standards for fuel assembly identification (such as ANSI/ANS-57.8-1995, DIN 25433, IAEA Safety Guide No. GS-G-3.5) ensure unequivocal identification in their respective fields of application, this document allows without restriction the further application of these standards. Moreover, it is intended that this document be used as a guideline for new definitions of identification systems.

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.

ISO 3098-1, *Technical product documentation — Lettering — Part 1: General requirements*

3 Terms and definitions

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

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

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

3.1

fuel assembly

component containing a fissile material and forming a unit in charging and discharging a reactor

3.2

lifetime

<fuel assembly> period of time starting at the time of assembling of the *fuel assembly* (3.1) in the fabricator's facility and ending when the assembly is destroyed as an entity

4 Basic requirements for identification systems

4.1 Identification code

Each fuel assembly shall carry a unique code consisting of between 6 and 8 alphanumeric characters.

NOTE The alphanumeric characters are the Arabic numerals 0 to 9 and the letters of the English alphabet from A to Z.

The letters B, F, I, O, Q and Z shall not be used.

The rightmost character of the identification code shall be used as a test character.

4.2 Allocation of the identification code

The identification code shall be assigned to the individual fuel assembly without repetition i.e. previously allocated identification codes shall not be re-used. Therefore, the identification code shall be allocated by agreement with the authority or institution responsible for an identification system.

4.3 Determining the test character

The test character is intended to prevent reading errors. It is determined by the preceding characters of the identification code using the rules in [Table 1](#).

The preceding characters of the identification code shall be padded to seven characters with leading zeros.

The value associated with the first character of this value is multiplied by 17, that associated with the second character by 13, that associated with the third character by 11, that associated with the fourth by 7, that associated with the fifth by 5, that associated with the sixth by 3 and that associated with the seventh by 2; these products are then added. The test character value is the difference between the next greater multiple of 30 and this sum. The test character is the character associated with this value in [Table 1](#). If the difference amounts to 30, the test character is zero.

Table 1 — Character values

Character	Value	Character	Value	Character	Value
0	0	A	10	N	20
1	1				
2	2	C	11	P	21
3	3	D	12		
4	4	E	13	R	22
5	5			S	23
6	6	G	14	T	24
7	7	H	15	U	25
8	8			V	26
9	9	J	16	W	27
		K	17	X	28
		L	18	Y	29
		M	19		

4.4 Additional marking

At the discretion of the fabricator or operator, additional marking may be added to the fuel assembly. This marking should be in a separate area but where this is not considered possible or desirable, then

the additional marking shall be separated from the unique identification code by a “*” or “/”. Confusion shall not be possible. Any additional mark shall consist of less digits than the unique identification code.

5 Style of characters and application of identification mark

5.1 Style of characters

The characters used for the identification marking on fuel assemblies shall be Arabic numerals and capital letters in, or similar to, the vertical Standard lettering for use in drawings conforming to ISO 3098-1.

5.2 Arrangement of identification code on fuel assembly

The characters of an identification code shall be arranged in horizontal order from left to right, in vertical order from top downwards, or clockwise (reading from the inside outwards) in the sequence specified.

5.3 Location and application of identification code on fuel assembly

The identification code shall be applied to an essential component of the fuel assembly in such a manner that it can be very easily read. If elements of the identification code are identical for a group of fuel assemblies or if, for other reasons, they do not necessarily have to be identifiable on the fuel assembly (e.g. a code for the identification of the reactor), the code need not be so conspicuous.

5.4 Size of characters comprising identification code

The characters of the identification code, including the test character, shall all be of the same size.

5.5 Method of application of identification code to fuel assembly

The identification code shall be applied so that it does not affect the performance and integrity of the fuel assemblies and shall remain readable and indelible during its use in the reactor core.

6 Fuel assembly identification after modification of the fuel assembly

After modification (e.g. repair) of a fuel assembly, the identification code shall remain unmodified if the component to which it is applied will continue to be used. Such modifications shall be registered.

7 Other identification systems

If identification codes are used outside the field of application of an existing system, e.g. ANSI/ANS-57.8, the system to which the code belongs shall be indicated. This indication need not be made on the fuel assembly itself.

Bibliography

- [1] SAFETY GUIDE No IAEA GS-G-3.5, *The Management System for Nuclear Installations*
- [2] ANSI/ANS-57.8 (1995) *Fuel Assembly Identification*
- [3] DIN 25433:2016, *Fuel assembly identification for nuclear power reactors*

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