

JIS

JAPANESE INDUSTRIAL STANDARD

**Representation of Numerical
Values in Character Strings for
Information Interchange**

JIS X 0210—1986

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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Representation of Numerical Values in Character
Strings for Information Interchange

X 0210-1986

1. Scope

This Japanese Industrial Standard specifies three presentations of numerical values, which are represented in character strings in a form reasonable by machine, for use in interchange between data processing systems.

This Japanese Industrial Standard applies only to numerical values consisting of a finite number of digits with or without the decimal mark.

This standard does not specify the mechanism to communicate the accuracy of the number being represented or the method of delimiting the numerical representations or the organization of the numerical representations into larger aggregates.

This standard also provides guidance for developers of programming language standards and implementors of programming products. These representations are recognizable by humans, and thus may be useful in communication between humans.

2. Conformance

A representation of a numerical value is in conformance with this standard if it is one of the three representations specified herein.

A conformance statement shall identify the representation and, where applicable, specify whether COMMA or FULL STOP is used as the decimal mark. In the absence of such a statement, the FULL STOP is deemed to be the decimal mark.

3. Definitions

The meanings of principal terms used in this standard shall be as follows:

- (1) positional notation A numeration system in which a real number is represented by a string of characters in such a way that the value contributed by a character depends on its position as well as its value.
- (2) decimal mark The character that separates the digits forming the integral part of a number from those forming the fractional part.

Applicable Standards:

JIS X 0201-Code for Information Interchange

JIS X 0202-Code Extension Techniques for Use with the Code for
Information Interchange

Corresponding International Standard:

ISO 6093 Representation of numerical values in character strings for
information interchange

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- (3) field A continuous string of character positions on a data carrier.
- (4) field description The set of characteristics possessed by the field to ensure that its contents have a unique numerical interpretation to the interchange parties.

Remark: For each field within a set of interchanged data the field description is specified in documentation associated with the interchange agreement between the parties. The field description includes the specification of the length of the field.

- (5) length of a field The number of character positions of a field.

4. Character Set

4.1 Description The character set for the representation of numeral values shall be a sub-set of the character set specified in JIS X 0201.

4.2 Syntax The following syntatic objects are defined using the method of syntax specification described in Appendix 1.

- (1) Digit = 0/1/2/3/4/5/6/7/8/9
- (2) Sign = +/-
- (3) Decimal mark = ,/.
- (4) Space = SPACE (SP)
- (5) Exponent-mark = E/e

4.3 Semantics of Syntax The characters defining syntax elements shall be the characters specified in JIS X 0201. Table 4 is reproduced from the 7-bit coded table for Roman characters of JIS X 0201 and the characters arranged in the portion without any slanting line of the table shall be used as syntax elements.

4.4 Coding of Characters The coding of the characters shall be as specified in JIS X 0201. Further, the coding in the case of using extension coding scheme shall be as specified in JIS X 0202.

5. First Numerical Representation (NR 1)

The first numerical representation shall be a positional notation in which each number shall be represented by a string of digits, the decimal mark is implicit and its position fixed.

Remark: This representation is also called implicit-point representation.

5.1 Description Each instance of NR 1 shall be composed of optional leading SPACES followed by a sign (in the signed representation) and a string of digits.

There shall be at least one digit. No embedded or trailing SPACES shall be contained in the field.

5.2 Syntax The syntax shall be as follows:

NR 1 = unsigned-NR 1/signed-NR 1

Unsigned-NR 1 = space* digit digit*

Signed-NR 1 = space* (sign/space) digit digit*

Remark: As to the syntax description, refer to Appendix 1.

5.3 Semantics of Syntax Each representation shall be contained in a field the length of which shall be equal to the sum of the number of SPACES and the number of digits, plus 1 if a sign is present. At least one digit shall be present.

In an unsigned NR 1 the value represented shall be greater than, or equal to zero.

In a signed NR 1 the PLUS SIGN can be replaced by a SPACE.

The implied decimal mark shall follow the right-most digit in the NR 1, unless a scaling factor to be applied to the field is specified in accompanying documentation.

The signed representation of the numerical value zero shall contain a PLUS SIGN or a SPACE, but not a MINUS SIGN.

5.4 Examples of NR 1 In the examples given in Table 1 the field length is assumed to be seven and the character SPACE is represented by Δ .

Table 1. Example of NR 1

Common notation	Unsigned NR 1	Signed NR 1
4902	0004902	+004902
	$\Delta\Delta$ 04902	$\Delta\Delta$ +04902
	$\Delta\Delta\Delta$ 4902	$\Delta\Delta$ +4902
		$\Delta\Delta\Delta$ 4902
+1234	0001234	+001234
	$\Delta\Delta\Delta$ 1234	$\Delta\Delta$ +1234
		$\Delta\Delta\Delta$ 1234
-56780	No representation	-056780
		Δ -56780
0	0000000	+000000
	$\Delta\Delta\Delta\Delta\Delta\Delta$ 0	$\Delta\Delta\Delta\Delta\Delta$ +0
		$\Delta\Delta\Delta\Delta\Delta$ 0
1234567	1234567	No representation

6. Second Numerical Representation (NR 2)

The second numerical representation shall be a positional notation in which each number shall be represented by a string of characters, the decimal mark is explicitly indicated by a specific character.

Remark: This representation is also called explicit-point unscaled representation.

6.1 Description Each instance of an NR 2 shall be composed of optional leading SPACES followed by a sign (in the signed representation) and a string of digits.

There shall be at least one digit. No embedded or trailing SPACES shall be contained in the field.

It is recommended that there is at least one digit to the left of the decimal mark even when there is at least one to right.

6.2 Syntax The syntax shall be as follows:

NR 2 = unsigned-NR 2 / signed-NR 2

Unsigned-NR 2 = (space* digit digit* decimal-mark digit*) /
(space* digit* decimal-mark digit digit*)

Signed-NR 2 = (space* (sign/space) digit digit* decimal-mark digit*) / (space* (sign/space) digit* decimal-mark digit digit*)

Remark: As to the syntax description, refer to Appendix 1.

6.3 Semantics of Syntax Each representation shall be contained in a field the length of which shall be equal to the sum of the number of SPACES and of the number of digits, plus 1; or plus 2 in the signed NR 2, if the sign is present. At least one digit and the decimal mark shall be present.

In an unsigned NR 2 the value represented shall be greater than or equal to zero.

In a signed representation the PLUS SIGN may be replaced by a SPACE.

The position of the decimal mark shall represent the position of the actual decimal mark in the value, unless a scaling factor to be applied to the field is specified in accompanying documentation.

The signed representation of the numerical value zero shall contain a SPACE, but not a MINUS SIGN.

6.4 Examples of NR 2 In the examples given in Table 2 the field length is assumed to be eight and the character SPACE is represented by Δ .

Table 2. Example of NR 2

Common notation	Unsigned NR 2	Signed NR 2
1327.	1327.000	+1327.00
	0001327.	△△+1327.
	△△△1327.	△△△1327.
123,45	00123,45	△+123,45
	△△123,45	△△123,45
1237,0	△△1237,0	△+1237,0
		△△1237,0
.00001	00.00001	+0.00001
-5,678	No representation	-5,67800 -05,6780
1234,567	1234,567	No representation
0	000,0000	+0,00000
	△△△△△0,0	△△△△+0,0
		△△△△△0,0
		△△△△△△0,

7. Third Numerical Representation (NR 3)

The third numerical representation shall be a notation in which a number is represented by two strings of digits called significand and exponent. The value of the number equals the number of the significand multiplied by 10 raised to the power represented by the exponent.

Remark: This representation is also called explicit-point scaled presentation.

7.1 Description NR 3 shall consist of representation of numerical values of the general form (A) E (B) which represent the value

$$A \times 10^B$$

where B is an integer.

In each instance of NR 3 the significand shall be composed of optional leading SPACES, followed by an optional sign (in the signed representation) and a string of digits.

There shall be at least one digit in the significand; the location of the decimal mark in the significand is explicitly specified in the character string.

The character E (or e) shall follow the significand, and the exponent, preceded by its sign, shall immediately follow the character E (or e).

The exponent shall be composed of a leading sign followed by at least one digit.