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Designation of phase differences by hour numbers in three-phase AC systems

Désignation des déphasages par indices horaires des réseaux en courant alternatif triphasés

[IEC 60152:2021](#)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DESIGNATION OF PHASE DIFFERENCES BY
HOUR NUMBERS IN THREE-PHASE AC SYSTEMS**

FOREWORD

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IEC 60152 has been prepared by IEC technical committee 3: Documentation, graphical symbols and representations of technical information. It is an International Standard.

This second edition cancels and replaces the first edition published in 1963. This edition constitutes a technical revision.

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

- a) the title has been updated to reflect the content of the document;
- b) the concept of identifying conductors with hour number has been removed as the concept is considered out of date and other means for identifying conductors exists;
- c) definition of hour number (clock number) and phase difference introduced.

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

FDIS	Report on voting
3/1490/FDIS	3/1516/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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- withdrawn,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
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DESIGNATION OF PHASE DIFFERENCES BY HOUR NUMBERS IN THREE-PHASE AC SYSTEMS

1 Scope

This document specifies methods and rules for the designation of phase difference between two items in a three-phase AC system. The designations are intended to be applied in the technical documentation of industrial installations, equipment, and products, and also on markings of equipment and products.

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 terminological databases for use in standardization at the following addresses:

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

3.1

hour number clock number

designation of a phase difference between the same quantity of two items in an AC system

3.2

phase difference

φ

for two sinusoidal quantities of the same frequency in a given order, difference between their initial phases with possible addition of a multiple of 2π so that the difference is greater than $-\pi$ and not greater than π

Note 1 to entry: For the quantities $a'(t) = \widehat{A}' \cos(\omega t + \vartheta'_0)$ and $a''(t) = \widehat{A}'' \cos(\omega t + \vartheta''_0)$ the phase difference is $\varphi = \vartheta''_0 - \vartheta'_0 + 2\pi n$ where n is an integer, chosen so that $-\pi < \varphi \leq \pi$.

[SOURCE: IEC 60050-103:2009, 103-07-06]

4 Hour numbers

For the designation of a phase difference in a three-phase AC system, the following hour numbers may be used:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11.

Each hour number shall represent the corresponding multiple of a phase difference of 30° .

EXAMPLE 1

A phase difference designated by the hour number 3 represents a difference in phase of 90°.

EXAMPLE 2

A phase difference designated by the hour number 5 represents a difference in phase of 150°.

5 Phase difference

For designation of a phase difference between two quantities, the hour number shall indicate that the value of the second quantity is lagging the corresponding number of degrees compared with the value of the first quantity.

EXAMPLE 1

To indicate the phase difference between the line conductors L1 and L2 in a three-phase transmission system, the hour number 4 can be used to represent the phase difference of 120°.

For the designation of a phase difference between values of the same quantities with reference to the input side and the output side of an item, the hour number shall indicate how many degrees the quantity value of the output side is lagging compared with the quantity value on the input side.

EXAMPLE 2

To indicate the phase difference or phase rotation between the primary side to the secondary side of a two-winding three-phase transformer where the primary side is connected in a delta configuration (i.e. D connected windings), while the secondary windings are connected in a star configuration (i.e. y connected windings), the hour number 11 can be used to indicate that the secondary side is lagging 330° (or leading 30°) compared with the primary side, e.g. Dy11 (normally, upper-case letters are used for the primary winding while lower-case letters are used for the secondary winding), see also Figure 1.

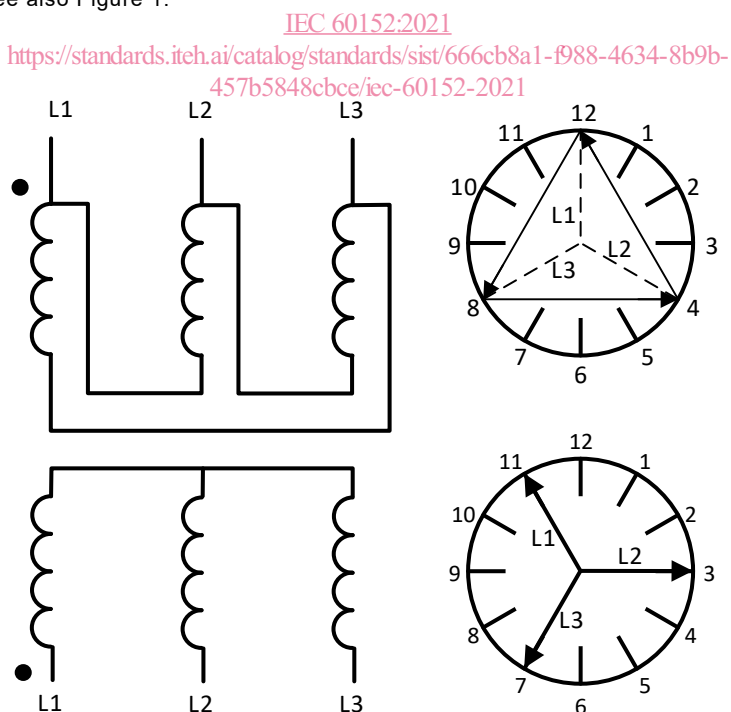


Figure 1 – Illustration of hour number for three-phase transformer Dy11

Figure 2 illustrates some phase differences using a clock.

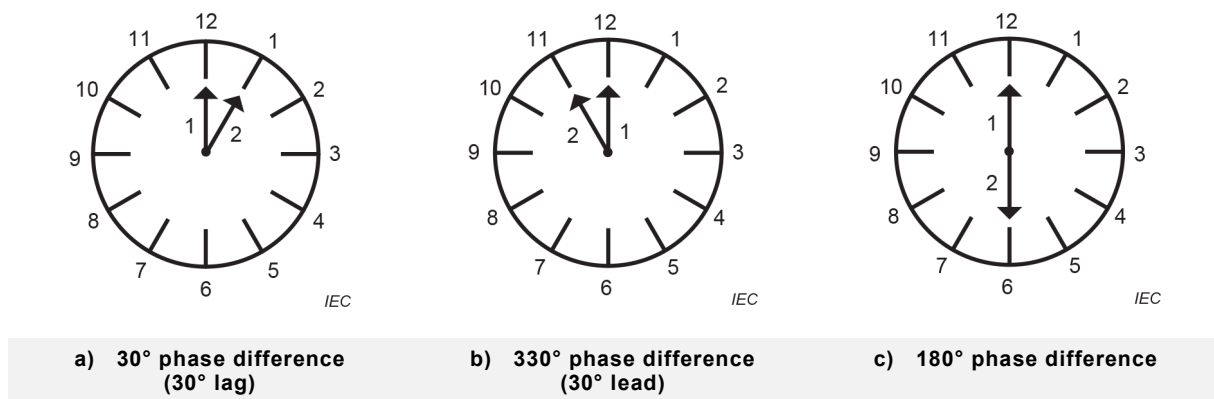


Figure 2 – Examples of hour numbers representing phase differences

NOTE On a clock where the hours are indicated by the numbers 1 to 12, the hour indicated by the number 12 is also representing the hour 0. Thus, in the examples and figures, the hour indicated by the clock position 12 is the hour 0.

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