SLOVENSKI STANDARD
SIST EN 50065-1:2011

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SIST EN 50065-1:2003
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Signalizacija po nizkonapetostnih električnih napeljavah v frekvenčnem območju od 3 kHz do 148,5 kHz - 1. del: Splošne zahteve, frekvenčna območja in elektromagnetne motnje

Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148,5 kHz - Part 1: General requirements, frequency bands and electromagnetic disturbances

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Signalübertragung auf elektrischen Niederspannungsnetzen im Frequenzbereich 3 kHz bis 148,5 kHz - Teil 1: Allgemeine Anforderungen, Frequenzbänder und elektromagnetische Störungen

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Transmission de signaux sur les réseaux électriques basse tension dans la bande de fréquences de 3 kHz à 148,5 kHz - Partie 1: Règles générales, bandes de fréquences et perturbations électromagnétiques

Ta slovenski standard je istoveten z: **EN 50065-1:2011**

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33.040.30	Komutacijski in signalizacijski sistem	Switching and signalling systems
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EUROPEAN STANDARD

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EN 50065-1

April 2011

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Supersedes EN 50065-1:2001 + A1:2010

English version

Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148,5 kHz - Part 1: General requirements, frequency bands and electromagnetic disturbances

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CENELEC

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

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Foreword

This European Standard was prepared by the CENELEC technical subcommittee SC 205A, Mains communication systems, of Technical Committee CENELEC TC 205, Home and Building Electronic Systems (HBES).

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50065-1 on 2011-03-21.

This European Standard supersedes EN 50065-1:2001 + A1:2010.

This revision aligns EN 50065-1 with CENELEC Guide 24; this has been done in particular in relation to the responsibilities of parties involved by replacing with references to common application types whilst not making technical changes to the standard. In addition the text on common-mode signalling has been clarified and account taken of use of mains signalling in relation to the charging of electric vehicles. Additional editorial changes have been made to clarify areas on which there have been queries.

The following dates were fixed:

- latest date by which the revision has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-03-21
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2014-03-21

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EN 50065 consists of the following parts, under the general title *Signalling on low voltage electrical installations in the frequency range 3 kHz to 148,5 kHz*:

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Part 1	General requirements, frequency bands and electromagnetic disturbances
Part 2-1	Immunity requirements for mains communications equipment and systems operating in the range of frequencies 95 kHz to 148,5 kHz and intended for use in residential, commercial and light industrial environments
Part 2-2	Immunity requirements for mains communications equipment and systems operating in the range of frequencies 95 kHz to 148,5 kHz and intended for use in industrial environments
Part 2-3	Immunity requirements for mains communications equipment and systems operating in the range of frequencies 3 kHz to 95 kHz and intended for use by electricity suppliers and distributors
Part 4-1	Low voltage decoupling filters – Generic specification
Part 4-2	Low voltage decoupling filters – Safety requirements
Part 4-3	Low voltage decoupling filters – Incoming filter
Part 4-4	Low voltage decoupling filters – Impedance filter
Part 4-5	Low voltage decoupling filters – Segmentation filter
Part 4-6	Low voltage decoupling filters – Phase coupler
Part 7	Equipment impedance

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1 Scope

This standard applies to electrical equipment using signals in the frequency range 3 kHz to 148,5 kHz to transmit information on low voltage electrical systems, either on the public electricity distribution network or within installations in consumers' premises.

It specifies the frequency bands allocated to the different applications, limits for the terminal output voltage in the operating band and limits for conducted and radiated disturbance. It also gives the methods of measurement.

It does not specify the modulation methods, the coding methods or functional features (except those for the prevention of mutual interference).

Environmental requirements and tests are not included.

NOTE 1 Compliance with this standard does not imply permission to establish communication with locations outside the consumer's installation or with other consumers through the public electricity distribution network where this would not otherwise be allowed.

The object of the standard is to limit mutual influence between transmission equipment in electrical installations and between such equipment and other equipment. In addition this standard is intended to limit interference caused by signal transmission equipment to sensitive electronic equipment. However, complete freedom from such interference cannot be assured.

NOTE 2 Designers should consider signalling systems in conformance with this standard when determining immunity for electrical equipment.

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2 Normative references

The following referenced documents are indispensable for the application 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.

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IEC 60050-161		International electrotechnical vocabulary – Chapter 161: Electromagnetic compatibility
EN 55016-1-1	2010	Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus (CISPR 16-1-1:2010)
EN 55016-1-2 + A1 + A2	2004 2005 2006	Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances (CISPR 16-1-2:2003 + A1:2004 + A2:2006)
EN 55016-1-4	2010	Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements (CISPR 16-1-4:2010)
EN 55016-2-2 + A1 + A2	2004 2005 2005	Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-2: Methods of measurement of disturbances and immunity – Measurement of disturbance power (CISPR 16-2-2:2003 + A1:2004 + A2:2005)

3 Terms and definitions

The definitions in IEC 60050-161 apply.

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

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3.1
application
use of a technology, system, or product

3.2
common-mode signalling
form of signalling which intentionally uses the protective conductor as part of the current path of the circuit

3.3
commercial or industrial premises
all premises other than residential premises

3.4
differential-mode signalling
form of signalling between two or more power conductors not requiring use of the protective conductor

3.5
fixed mains network
permanently installed system of wires or cables comprising the mains network but excluding flexible cables that can be connected or disconnected by the user

3.6
residential
premises which are normally used as homes for persons

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3.7
sensitive equipment
equipment which is likely to be adversely affected by disturbances and may result in harm

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3.8
signal/signalling
encoded message, that is, the sequence of digital or analogue states in a communication that is a message

3.9
user
person who uses a system without the complete technical expertise required to fully understand the system

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4 Frequency bands and classifications

4.1 General

In order to provide coexistence between different applications and to prevent mutual interference, this standard designates frequency bands for well-established application types.

NOTE 1 Early drafts of this standard, based upon existing industry documents and an existing national standard, used the terms A-band, B-band, C-band and D-band to designate the frequency bands 3 kHz to 95 kHz, 95 kHz to125 kHz, 125 kHz to 140 kHz and 140 kHz to 148,5 kHz respectively. Although these designations are not used in this standard they remain widely used in industry for convenience. Where such designations are used they should be interpreted as above.

NOTE 2 Additional provisions may apply in the event of interference to radio services.

4.2 Band 3 kHz up to 95 kHz

Frequencies in this band shall only be used for applications for monitoring or controlling the low-voltage distribution network, including energy usage of connected equipment and premises.

NOTE A typical example of an application in this band would be metering communications.

4.3 Band above 95 kHz up to 148,5 kHz

4.3.1 General

Frequencies in this band shall only be used for:

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a) Analogue and digital applications within homes, commercial or industrial premises;

b) Control and monitoring of equipment installed on or connected to the low-voltage distribution network external to premises.

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NOTE 1 Typical examples of b) would be street lighting control or electric vehicle charging.

NOTE 2 This standard conveys no rights to any user to communicate over any part of the electricity network owned by another party.

Equipment for use in this frequency band is designated as either Class 122 or as Class 134 equipment. Class 122 equipment is suitable for general use, but the use of Class 134 equipment shall only be used in the industrial environment and should not be used in locations where interference might be caused to sensitive equipment. .

NOTE 3 The use of Class 134 may require prior notification, or consent of appropriate authorities.

Equipment manufactured to Class 116 of EN 50065-1:1991 will now meet the requirements of Class 122 and may be marked Class 116 provided that its output complies with EN 50065-1:1991.

4.3.2 Sub-band above 95 kHz up to 125 kHz

The use of this sub-band does not require an access protocol.

4.3.3 Sub-band above 125 kHz up to 140 kHz

Signalling in this sub-band requires the use of the access protocol described in Clause 5.

4.3.4 Sub-band above 140 kHz up to 148,5 kHz

The use of this sub-band does not require an access protocol.

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5 Access protocol

5.1 Access Protocol Overview

A carrier-sense multiple-access (CSMA) protocol is used in the frequency sub-band 125 kHz to 140 kHz to allow several systems to operate on the same, or electrically connected, mains networks. These systems may use the same or different communication protocols but shall use the access protocol given in this clause.

Signals transmitted by systems operating in this sub-band are required to have a defined spectral distribution and maximum duration such that their carrier may be detected by other devices on that network. The presence of this characteristic signal on the network above a minimum level indicates that the frequency sub-band is being used. This state is termed “band-in-use”. Devices with pending transmissions may not transmit whilst the band is in use and until the band has been free for a minimum period.

To provide multiple access, devices with pending transmissions are required to randomise their transmission attempts over a time interval to reduce the possibility of collisions between two or more transmissions. The most recent device to transmit is required to wait until the end of that time interval before attempting a further transmission to prevent it taking too great a share of the available transmission capacity. The maximum length of any transmission is limited for the same reason.

5.2 Band in use signalling

All devices shall use the frequency 132,5 kHz to indicate that a transmission is in progress.

To enable band-in-use to be detected, a device shall transmit its signal with a spectral distribution in accordance with Annex B.

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5.3 Band in use condition

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Every device capable of transmitting shall be equipped with a signal detector which shall indicate when the sub-band is in use. Band-in-use is the condition when any signal of at least 86 dB(μV) rms is present anywhere in the frequency range 131,5 kHz to 133,5 kHz for at least 4 ms. This shall be measured at the device’s main input terminations and across the conductors used by the device’s own transmitter. The frequency range of detection of a signal shall be tested as described in Annex A.

The band-in-use indication may be considered false if the output from the signal detector is present without any interruption greater than 80 ms for a continuous period of at least 1,1 s immediately prior to each transmission. For a transmitter or a group of transmitters the measurement of this 1,1 s interval shall recommence after the end of transmission by that transmitter or group of transmitter. Any gap in the band-in-use indication greater than 80 ms shall reset the false band-in-use condition.

NOTE The measurement point referred to in the above subclause differs from that described in EN 55016-1-2.

5.4 Allowed use of the sub-band

A transmission is considered as a series of signals in which there is no gap greater than 80 ms without signal transmission. A group of transmitters is a number of devices, using the same protocol and co-ordinating their actions so as to meet these requirements e.g. a demand-acknowledge-answer sequence.

No transmitter or group of transmitters shall transmit continuously for a period exceeding 1 s. After each transmission a transmitter or a group of transmitters shall not transmit again for at least 125 ms.

The requirements of 5.4 and 5.5 shall be met either by each transmitter individually or, at the equipment supplier’s option, by a group of transmitters. In the second case, the access protocol allows a sequence of transmission, repetition and answer-back signals to occupy the sub-band for the maximum time otherwise permitted for a single message.

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5.5 Access rule

Every device capable of transmitting shall only transmit if its band-in-use detector has shown that the sub-band has not been in use (as defined in 5.3) for a continuous period, randomly chosen on each occasion and uniformly distributed between 85 ms and 115 ms with at least seven possible values in that range.

6 Transmitter output voltage

6.1 General

6.1.1 Introduction

To avoid damage to the device(s) under test or to the test equipment, care shall be taken to ensure that the supply voltage applied to the device(s) under test is within the manufacturer's declared supply voltage range.

NOTE This is especially important in the case of three-phase devices operating without neutral connection where supply voltages may differ from those normally expected.

Differential-mode signalling shall generally be used. Common-mode signalling over the fixed mains network shall only be used in commercial or industrial premises under conditions described in Clause9.

Common-mode signalling is allowed over a flexible cable provided that the transmission of common-mode signals from the fixed plug onto the fixed mains network is below the out-of-band disturbance limits in Clause 7.

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6.1.2 Measuring circuit for single-phase devices

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For any measuring method the output voltage in the frequency range 9 kHz up to 150 kHz shall be measured using a single phase artificial mains network conforming to 4.2 of EN 55016-1-2:2004.

NOTE Attention is drawn to the note to 4.2 of EN 55016-1-2:2004.

For the sub-band 3 kHz to 9 kHz an artificial network conforming to the impedance characteristic of Figure 2 of this standard shall be used.

6.1.3 Measuring circuit for three-phase devices

For any measuring method the output voltage in the frequency range 9 kHz up to 150 kHz shall be measured using a three-phase artificial mains network conforming to 4.2 of EN 55016-1-2:2004.

NOTE 1 The note to 6.1.2 also applies.

For the sub-band 3 kHz to 9 kHz an artificial network conforming to the impedance characteristic of Figure 2 shall be used.

Where the equipment supplier's instructions indicate that the three-phase device can also be used as a single-phase device by connecting all phase terminals to the same phase, the device shall also be tested as a single-phase device. This is because the device performance may change as the loading conditions vary between three-phase and single-phase use.

NOTE 2 Measurements are prescribed in differing manners for three-phase devices which transmit on three phases simultaneously and for three-phase devices which transmit on only a single phase at any one time, even if they may transmit on two or more phases in sequence.

NOTE 3 The use of the three-phase network for testing three-phase devices that transmit between neutral and three phases simultaneously changes the relationship between measurements made on the phases and measurements made on the neutral when compared with practical applications. When using the three-phase network, the value measured on the neutral is increased by approximately 3,5 dB (µV) and those measured on the phase are decreased by 6 dB (µV). The limit values given in 6.3.2, and which apply to the measured values, include corrections for these changes. No correction is required for three-phase devices transmitting only between phases without connection to the neutral.

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6.2 Output signal measurement

6.2.1 Determination of bandwidth

The output signal spectrum is determined by the use of a spectrum analyser having a peak detector and a 100 Hz bandwidth.

The transmitter shall operate in such a way that the bandwidth and output signal magnitude have the greatest values permitted by the manufacturer's specification.

The spectral width (*B* in Hertz) is defined by the length of the interval where all the frequency lines are less than 20 dB below the maximum spectral line (see Figure 1).

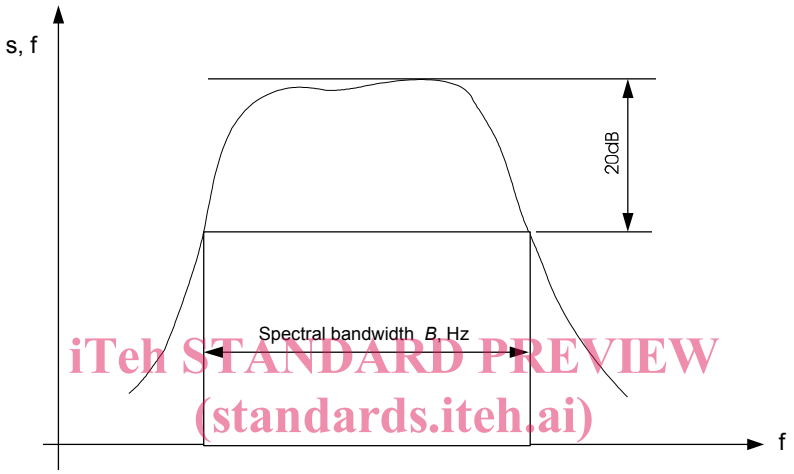

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Figure 1 — Measurement of spectral bandwidth

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6.2.2 Determination of output level

The output level is measured over a period of 1 min using a peak detector. This measurement may be made by a spectrum analyser with a pass-band equal to or greater than the spectral bandwidth *B* of the transmitter output.

For single-phase devices, measurement shall be made on either the phase or neutral connection.

For three-phase devices that transmit on only a single phase, measurements shall be made on that phase and on the neutral connection.

For three-phase devices that transmit on all three phases simultaneously, measurements shall be made in all three phases. No measurement is required on the neutral conductor.