SLOVENSKI STANDARD
SIST EN IEC 60444-6:2021

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Nadomešča:
SIST EN 60444-6:2014

Merjenje parametrov kvarčnih kristalov - 6. del: Merjenje odvisnosti od ravni napajanja (DLD) (IEC 60444-6:2021)

Measurement of quartz crystal unit parameters - Part 6: Measurement of drive level dependence (DLD) (IEC 60444-6:2021)

Messung von Schwingquarz-Parametern - Teil 6: Messung der Belastungsabhängigkeit (DLD) (IEC 60444-6:2021)

Mesure des paramètres des résonateurs à quartz - Partie 6: Mesure de la dépendance du niveau d'excitation (DNE) (IEC 60444-6:2021)

Ta slovenski standard je istoveten z: **EN IEC 60444-6:2021**

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31.140	Piezoelektrične naprave	Piezoelectric devices

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EUROPEAN STANDARD

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English Version

Measurement of quartz crystal unit parameters - Part 6: Measurement of drive level dependence (DLD) (IEC 60444-6:2021)

Mesure des paramètres des résonateurs à quartz - Partie 6: Mesure de la dépendance du niveau d'excitation (DNE) (IEC 60444-6:2021)

Messung von Schwingquarz-Parametern - Teil 6: Messung der Belastungsabhängigkeit (DLD) (IEC 60444-6:2021)

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CENELEC

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

The text of document 49/1374/FDIS, future edition 3 of IEC 60444-6, prepared by IEC/TC 49 “Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60444-6:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022–07–06
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024–10–06

This document supersedes EN 60444-6:2013 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users’ national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 60444-6:2021 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60444-1 NOTE Harmonized as EN 60444-1

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60444-5	-	Measurement of quartz crystal units parameters - Part 5: Methods for the determination of equivalent electrical parameters using automatic network analyser techniques and error correction	EN 60444-5	-
IEC 60444-8	-	Measurement of quartz crystal unit parameters - Part 8: Test fixture for surface mounted quartz crystal units	EN 60444-8	-

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Measurement of quartz crystal unit parameters – Part 6: Measurement of drive level dependence (DLD)

Mesure des paramètres des résonateurs à quartz – Partie 6: Mesure de la dépendance du niveau d'excitation (DNE)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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MEASUREMENT OF QUARTZ CRYSTAL UNIT PARAMETERS –

Part 6: Measurement of drive level dependence (DLD)

FOREWORD

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IEC 60444-6 has been prepared by IEC technical committee 49: Piezoelectric, dielectric and electrostatic devices and associated materials for frequency control, selection and detection. It is an International Standard.

This third edition cancels and replaces the second edition published in 2013. This edition constitutes a technical revision.

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

a) some equations have been removed and corrected;

b) it has been specified in the note of the Scope that the measurement methods specified in this document are not only applicable to AT-cut but also to other crystal cuts and vibration modes.

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

FDIS	Report on voting
49/1374/FDIS	49/1377/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.

A list of all parts in the IEC 60444 series, published under the general title *Measurement of quartz crystal unit parameters*, can be found on the IEC website.

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
- amended.

INTRODUCTION

The drive level (expressed as power/voltage across or current through the crystal unit) forces the resonator to produce mechanical oscillations by way of piezoelectric effect. In this process, the acceleration work is converted to kinetic and elastic energy and the power loss to heat. The latter conversion is due to the inner and outer friction of the quartz resonator.

The frictional losses depend on the velocity of the vibrating masses and increase when the oscillation is no longer linear or when critical velocities, elongations or strains, excursions or accelerations are attained in the quartz resonator or at its surfaces and mounting points (see Annex A). This causes changes in resistance and frequency, as well as further changes due to the temperature dependence of these parameters.

At “high” drive levels (e.g. above 1 mW or 1 mA for AT-cut crystal units) changes are observed by all crystal units and these also can result in irreversible amplitude and frequency changes. Any further increase of the drive level may could destroy the resonator.

Apart from this effect, changes in frequency and resistance are observed at “low” drive levels in some crystal units (e.g. below 1 µW or 50 µA for AT-cut crystal units). In this case, if the loop gain is not sufficient, the start-up of the oscillation is difficult. In crystal filters, the transducer attenuation and ripple will change.

Furthermore, the coupling between a specified mode of vibration and other modes (e.g. of the resonator itself, the mounting and the back-fill gas) also depends on the level of drive.

Due to the differing temperature response of these modes, these couplings give rise to changes of frequency and resistance of the specified mode within narrow temperature ranges. These changes increase with increasing drive level. However, this effect will not be considered further in this part of IEC 60444.

In this new edition, the concept of DLD in IEC 60444-6:2013 is maintained. However, the more suitable contents for the user’s severe requirements have been introduced.