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**Merjenje parametrov enot iz kremenovega kristala – 7. del: Merjenje aktivnosti in frekvenčnih gibov (frekvenčno odvisni mehanski nihaji) enot iz kremenovega kristala (IEC 60444-7:2004)**

Measurement of quartz crystal unit parameters - Part 7: Measurement of activity and frequency dips of quartz crystal units (IEC 60444-7:2004)

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EUROPEAN STANDARD

**EN 60444-7**

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2004

ICS 31.140

English version

**Measurement of quartz crystal unit parameters**  
**Part 7: Measurement of activity and frequency dips of quartz crystal units**  
(IEC 60444-7:2004)

Mesure des paramètres des résonateurs  
à quartz  
Partie 7: Mesure des crevasses  
de l'activité et de la fréquence  
des résonateurs à quartz  
(CEI 60444-7:2004)

Messung von Schwingquarz-Parametern  
Teil 7: Messung von Aktivitäts- und  
Frequenz-Dips von Schwingquarzen  
(IEC 60444-7:2004)

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SIST EN 60444-7:2005

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**CENELEC**

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

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

The text of document 49/637/FDIS, future edition 1 of IEC 60444-7, prepared by IEC TC 49, Piezoelectric and dielectric devices for frequency control and selection, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60444-7 on 2004-06-01.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2005-03-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2007-06-01

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## Endorsement notice

The text of the International Standard IEC 60444-7:2004 was approved by CENELEC as a European Standard without any modification.

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# INTERNATIONAL STANDARD

# IEC 60444-7

First edition  
2004-04

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## Measurement of quartz crystal unit parameters –

### Part 7: Measurement of activity and frequency dips of quartz crystal units

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MEASUREMENT OF QUARTZ CRYSTAL UNIT PARAMETERS –**

**Part 7: Measurement of activity and frequency dips  
of quartz crystal units**

FOREWORD

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International Standard IEC 60444-7 has been prepared by IEC technical committee 49: Piezoelectric and dielectric devices for frequency control and selection.

The text of this standard is based on the following documents:

FDIS	Report on voting
49/637/FDIS	49/664/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This standard forms Part 7 of a series of publications dealing with measurements of quartz crystal unit parameters

IEC 60444 consists of the following parts, under the general title *Measurement of quartz crystal unit parameters*:

- Part 1: Basic method for the measurement of resonance frequency and resonance resistance of quartz crystal units by zero phase technique in a pi-network
- Part 2: Phase offset method for measurement of motional capacitance of quartz crystal units
- Part 4: Method for the measurement of the load resonance frequency  $f_L$ , load resonance resistance  $R_L$  and the calculation of other derived values of quartz crystal units, up to 30 MHz
- Part 5: Methods for the determination of equivalent electrical parameters using automatic network analyzer techniques and error correction
- Part 6: Measurement of drive level dependence (DLD)
- Part 7: Measurement of activity and frequency dips of quartz crystal units
- Part 8: Test fixture for surface mounted quartz crystal units

The committee has decided that the contents of this publication will remain unchanged until 2008. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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## INTRODUCTION

The tolerable activity dips of resonant resistance and frequency (Bandbreak) will be specified in the detail specification. The measurement and evaluation of the activity/frequency dip for the quartz crystal unit requires special consideration as it uses the linear least squares method.

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## MEASUREMENT OF QUARTZ CRYSTAL UNIT PARAMETERS –

### Part 7: Measurement of activity and frequency dips of quartz crystal units

#### 1 Scope

This standard applies to activity and frequency dips for quartz crystal units over a temperature range.

#### 2 Definitions

##### 2.1

##### **activity dip**

undesirable change in the crystal unit's load resonance frequency and/or resonance resistance caused by the coupling of different modes in a narrow temperature range and at a specified load capacitance and level of drive (see Figures 1 and 2)

##### 2.2

##### **frequency dip (bandbreak)**

undesirable perturbation or fluctuation in the crystal frequency occurring in a narrow temperature range as a deviation of the load resonance frequency from the smooth regular frequency temperature characteristic described by a polynomial of up to the 5<sup>th</sup> order. It usually shows an associated resistance change (see Figure 2) and the effect is usually drive level dependent

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#### 3 Measurements

The following measurement parameters are necessary and should be given in the detail specification:

- operating temperature range;
- load capacitance;
- level of drive.

The evaluation of the data is made using a computer and is described in 3.3.

Care shall be taken in selecting a suitable measurement time; this will depend on the type of crystal unit being measured. The drive current (in microamperes) shall also be correct and controlled.

The inspection method is selected from the following and specified in the individual specification:

- a) lot inspection and guaranteed by process control;
- b) sample inspection.

##### 3.1 Reference method

The measurement system consists of a  $\pi$ -network in accordance with IEC 60444 and a high precision temperature chamber, which allows to ramp-up the temperature at a constant small rate.