SLOVENSKI STANDARD

SIST EN 62008:2006

01-september-2006

Karakteristike delovanja in postopki kalibracije sistemov za zajemanje digitalnih podatkov in pripadajoļ e programske opreme (IEC 62008:2005)

Performance characteristics and calibration methods for digital data acquisition systems and relevant software

Leistungseigenschaften und Kalibrierverfahren für digitale Datenerfassungssysteme und entsprechende Software

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Caractéristiques de performance et méthodes d'étalonnage pour les systèmes d'acquisition de données numériques et logiciels appropriés

SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0aab5f0c43a7/sist-en-62008-2006

Ta slovenski standard je istoveten z: **EN 62008:2005**

ICS:

35.080

35.160

SIST EN 62008:2006 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

EUROPEAN STANDARD **EN 62008**

NORME EUROPÉENNE

EUROPÄISCHE NORM October 2005

ICS 33.200

English version

Performance characteristics and calibration methods for digital data acquisition systems and relevant software
(IEC 62008:2005)

Caractéristiques de performance et méthodes d'étalonnage pour les systèmes d'acquisition de données numériques et logiciels appropriés (CEI 62008:2005)

Leistungseigenschaften und Kalibrierverfahren für digitale Datenerfassungssysteme und entsprechende Software (IEC 62008:2005)

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

This European Standard was approved by CENELEC on 2005-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

© 2005 CENELEC - All rights of exploitation in any form and by any means reserved worldwide for CENELEC members.

Ref. No. EN 62008:2005 E

Foreword

The text of document 85/267/FDIS, future edition 1 of IEC 62008, prepared by IEC TC 85, Measuring equipment for electrical and electromagnetic quantities, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62008 on 2005-10-01.

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)	2006-07-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2008-10-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62008:2005 was approved by CENELEC as a European Standard without any modification.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

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

Publication	Year	Title	EN/HD	Year
IEC 60748-4	1997	Semiconductor devices - Integrated circuits Part 4: Interface integrated circuits	-	-
IEC 60748-4-3	- [1)]	Part 4-3: Interface integrated circuits - Dynamic criteria for Analogue-Digital Converters (ADC)	-	-
ISO/IEC 17025	- [2)]	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	2005 [3)]
BIPM/IEC/IFCC/ISO/ IUPAC/IUPAP/OIML	- [2)]	Guide to the expression of uncertainty in measurement (GUM)	-	-

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

1) To be published.

2) Undated reference.

3) Valid edition at date of issue.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
62008

Première édition
First edition
2005-07

Caractéristiques de performance et méthodes d'étalonnage pour les systèmes d'acquisition de données numériques et logiciels appropriés

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Performance characteristics and calibration methods for digital data acquisition systems and relevant software

SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

© IEC 2005 Droits de reproduction réservés — Copyright - all rights reserved

Aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'éditeur.

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE X

Pour prix, voir catalogue en vigueur
For price, see current catalogue

CONTENTS

FOREWORD 7
INTRODUCTION 11

1 Scope 13
2 Normative references 13
3 Terms, definitions, abbreviations and symbols 15
3.1 Terms and definitions 15
3.2 Abbreviations and symbols 17
4 General requirements 17
4.1 Test procedures and measurement uncertainty estimation 17
4.2 General requirements for ADMs 19
4.3 Descriptions of parameters 19
4.4 Testing methods of measurable parameters 27
5 Hardware functionality for calibration 51
5.1 Onboard calibration information 51
5.2 General measurement adjustment hardware 51
5.3 Self-adjustment hardware 53
6 Software calibration methods 53
6.1 Calibration application programming interface (API) 53
6.2 Self-calibration methods 53
6.3 External calibration methods 55
7 Calibration procedures 55

Annex A (informative) Examples of calculation of modular DAQ system uncertainty 57
Annex B (normative) Pseudo-code to perform static test by method B (see 4.4.1.2) and a numerical example 63
Annex C (informative) ADM characteristics 83

Bibliography 93

Figure 1 – Test signals applied to the ADM 31
Figure 2 – Test procedure 35
Figure 3 – Representation in different grey tones of the cumulative histograms computed in each step in the case of a 5-bit ADM and a test with 4 steps 35
Figure 4 – Test arrangement for noise measurements on ADMs 43
Figure C.1 – Bipolar ADM with true zero 85
Figure C.2 – Bipolar ADM with no true zero 87
Figure C.3 – Offset (specified at step 000) 89
Figure C.4 – Gain component of uncertainty (after correction of offset) (specified at step 011) 91

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

Table 1 – Precision of estimates of code transition level for different record lengths 29
Table 2 – Example of parameters specification of ADM for measurement uncertainty estimation of DAQ device 49
Table B.1 – Derivation of the amplitude (A) and offset (C_j) of the small triangular waves, the number of samples per record (M) and the number of records (R). 73
Table B.2 – Results of the histogram test and corresponding transition voltages for a 5-bit ADM tested by method B in 4 steps 75
Table B.3 – Deriving INL and DNL from the measured transition voltages. 79

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PERFORMANCE CHARACTERISTICS AND CALIBRATION METHODS FOR DIGITAL DATA ACQUISITION SYSTEMS AND RELEVANT SOFTWARE

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

International Standard IEC 62008 has been prepared by IEC technical committee 85: Measuring equipment for electrical and electromagnetic quantities.

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

FDIS	Report on voting
85/267/FDIS	85/268/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.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

INTRODUCTION

Totally automated measurement systems are becoming the norm for manufacturing test, research and any other area where measurements are made. Measurement automation leads to extensive data sharing, inter-instrument communication and remote measurement control. Multifunction data acquisition (DAQ) devices meet these measurement needs. They rely on standard computer technology, allowing measurement systems developers to leverage open computer standards. The measurements made by DAQ devices are accurate and traceable. The need for measurement integrity requires developing standards not only for the measurement hardware but also for the software that calibrates the hardware.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

PERFORMANCE CHARACTERISTICS AND CALIBRATION METHODS FOR DIGITAL DATA ACQUISITION SYSTEMS AND RELEVANT SOFTWARE

1 Scope

This International Standard specifies performance characteristics and calibration methods for digital data acquisition systems and relevant software to ensure that all measurement systems relying on DAQ devices meet a common standard.

This standard covers:

– the minimum specifications that the DAQ device manufacturer must provide to describe the performance of the analogue-to-digital module (ADM) of the DAQ device;

– standard test strategies to verify the minimum set of specifications;

– the minimum calibration information required by the ADM that is stored on the DAQ device;

– the minimum calibration software requirements for external and self-calibration of the ADM of the DAQ device.

This standard deals with low frequency signal conversion, e.g. applications such as plant control, vibration measurement, vibro-diagnostics, acoustics, ultrasonic measurements, temperature measurements, pressure measurements, measurement in power electronics, etc.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

2 Normative references

SIST EN 62008:2006

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.

IEC 60748-4:1997, *Semiconductor devices – Integrated circuits – Part 4: Interface integrated circuits*

IEC 60748-4-3:___ [1)], *Semiconductor devices – Integrated circuits – Part 4-3: Interface integrated circuits – Dynamic criteria for analogue-to-digital converters (ADC)*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, *Guide to the Expression of Uncertainty in Measurement (GUM)*

---

1) To be published.

3 Terms, definitions, abbreviations and symbols

3.1 Terms and definitions

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

3.1.1
analogue-to-digital module
ADM
analogue input of a multifunction DAQ device

3.1.2
application program interface
API
standardized set of subroutines or functions along with the parameters that a program can call. An API for DAQ devices allows the programmer to communicate and control the operation of the device

3.1.3
code transition level
value of the input parameter of an ADM at the transition point between two adjacent output codes. The transition point is defined as the input value that causes 50 % of the output codes to be less than and 50 % to be greater than or equal to the upper code of the transition. The transition level $T[k]$ lies between code k -1 and code k

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.1.4
data acquisition device
DAQ
device for entering or collecting data

SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5be43a7/sist-en-62008-2006

NOTE Multifunction DAQ devices rely on a personal computer (commercial PC, Industrial PC, Compact PCI, notebook etc.) for control. These devices are designed to meet the needs of a general-purpose measurement system. They are not designed for a specific type of measurement. DAQ devices generally provide multiple measurement modes such as analogue input, analogue output, digital input, digital output, and counter-timer functionality. This standard only deals with the ADM of a DAQ device.

3.1.5
midstep value
analogue value for the centre of the step excluding the steps at the two ends of the total range of analogue values

NOTE For the end steps, the midstep value is defined as the analogue value that results when the analogue value for the transition to the adjacent step is reduced or enlarged as appropriate by half the nominal value of the step width.

3.1.6
nominal midstep value
specified analogue value within a step that is ideally represented and free of error by the corresponding digital output code

3.1.7
rated operating conditions
set of conditions that must be fulfilled during the measurement in order that the parameters determining the measurement uncertainty may be valid.

3.1.8
step
the fractional range of analogue input values and the corresponding digital output value.

3.1.9
step width
the absolute value of the difference between the two ends of the range of analogue values corresponding to one step.

3.2 Abbreviations and symbols

ADM	Analogue to digital module
API	Application program interface
CMRR	Common mode rejection ratio
DAQ	Data acquisition device
DIFF	Differential
DNL	Differential non-linearity
ENOB	Effective number of bits
FS	Full scale
INL	Integral non-linearity
LSB	Least significant bit
NRSE	Non-referenced single ended
PC	Personal computer
RSE	Referenced single ended
SINAD	Signal to noise and distortion
SFDR	Spurious free dynamic range
V_{FS}	Full scale
V_{FSnom}	Nominal full scale range
V_{FSR}	Practical full scale range
V_Z	Zero
V_{ZS}	Zero scale

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 62008:2006
https://standards.iteh.ai/catalog/standards/sist/2be9d197-df72-4df3-944c-0fabb5bc43a7/sist-en-62008-2006

4 General requirements

4.1 Test procedures and measurement uncertainty estimation

A common set of specifications must be presented for comparing the ADM of one DAQ device to the ADM of another DAQ device. This is especially true when different manufacturers produce the ADMs. This document includes a core set of information that allows a side-by-side comparison of ADM capabilities.

DAQ devices are designed to meet their published specifications. If there is a need to verify these specifications, this standard presents procedures for testing the ADM to confirm the specifications of the DAQ device.

Using the specifications listed in 4.2, the measurement uncertainty of the ADM of a DAQ device can be determined.