



Edition 1.0 2017-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Computation of waveform parameter uncertainties VIEW

Calcul des incertitudes des paramètres des formes d'onde

<u>IEC 62754:2017</u> https://standards.iteh.ai/catalog/standards/sist/8413230b-b50e-4694-ab6e-8564f23dff79/iec-62754-2017





THIS PUBLICATION IS COPYRIGHT PROTECTED Copyright © 2017 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, 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 either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, 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'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office	Tel.: +41 22 919 02 11
3, rue de Varembé	Fax: +41 22 919 03 00
CH-1211 Geneva 20	info@iec.ch
Switzerland	www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications. 8564123df79/i

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms, containing 20,000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.





Edition 1.0 2017-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Computation of waveform parameter uncertainties VIEW (standards.iteh.ai) Calcul des incertitudes des paramètres des formes d'onde

> <u>IEC 62754:2017</u> https://standards.iteh.ai/catalog/standards/sist/8413230b-b50e-4694-ab6e-8564f23dff79/iec-62754-2017

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 17.220.20

ISBN 978-2-8322-4345-9

Warning! Make sure that you obtained this publication from an authorized distributor. Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

 Registered trademark of the International Electrotechnical Commission Marque déposée de la Commission Electrotechnique Internationale

CONTENTS

FC	DREWO	RD	4
1	Scop	e	6
2	Norm	ative references	6
3	Term	s and definitions	6
4	Waveform measurement		
	4.1	General	16
	4.2	Waveform parameters	17
	4.3	Waveform measurement process	17
	4.3.1	General	17
	4.3.2	General description of the measurement system	18
5	Wave	oform and waveform parameter corrections	19
	5.1	General	19
	5.2	Waveform parameter corrections	19
	5.3	Waveform corrections and waveform reconstruction	20
	5.3.1	General	20
	5.3.2	Sample-by-sample correction	20
	5.3.3	Entire waveform correction	20
6	Unce	rtainties	22
	6.1	General.	22
	6.2	Propagation of uncertainties ndards.iteh.ai)	22
	6.2.1	General	22
	6.2.2	Uncorrelated input quantities <u>62754:2017</u>	23
	6.2.3	Correlated input quantities/standards/sist/8413230b-b50e-4694-ab6e-	23
	6.3	Pooled data and its standard deviation	23
	6.4	Expanded uncertainty and coverage factor	25
	6.4.1	General	25
	6.4.2	Effective degrees of freedom	27
	6.5	Entire waveform uncertainties	28
7	Wave	orm parameter uncertainties	29
	7.1	General	29
	7.2	Amplitude parameters	30
	7.2.1	State levels	30
	7.2.2	State boundaries	35
	7.2.3	Waveform amplitude (state levels)	36
	7.2.4	Impulse amplitude (state levels)	37
	7.2.5	Percent reference levels (state levels, waveform amplitude)	37
	7.2.6	Transition settling error (state levels, waveform amplitude)	38
	1.2.1	Overshoot aberration (state levels, waveform amplitude)	38
	7.2.8	Undershoot aberration (state levels, waveform amplitude)	39
	1.3	remporar parameters	39
	7.3.1		39
	7.3.2	Petereneo lovel instanto (nereent reference lovels, weveference)	40
	1.3.3	initial instant)	41
	7.3.4	Impulse centre instant (impulse amplitude, reference level instants)	42
	7.3.5	Transition duration (reference level instants)	42

	7.3.6	Transition settling duration (reference level instants)	43
	7.3.7	Pulse duration (reference level instants)	43
	7.3.8	Pulse separation (reference level instants)	43
	7.3.9	Waveform delay (advance) (reference level instants)	44
8	8 Monte	e Carlo method for waveform parameter uncertainty estimates	44
	8.1	General guidance and considerations	44
	8.2	Example: state level	44
1	Annex A (state level	informative) Demonstration example for the calculation of the uncertainty of Is using the histogram mode according to 7.2.1.2	46
		Waveform measurement	
		Splitting the himodal histogram and determining the state levels	40
	A.2	Uncertainty of state levels	40
		informative). Computation of Σ and Σ for estimating the uncertainty of	
	state level	Is using the shorth method according to 7.2.1.3	49
Ì	Ribliograp		52
	Jibilograp	лу	JZ
	-:		
ו 1	ransition	duration for a single positive-going transition	7
l		- Overshoot undershoot state levels and state boundaries for a single	
i	positive-g	oing transition	11
I	- - 	- Creation of measured, corrected, and reconstructed waveforms and the	
1	inal estim	nate of the input signal standards.itch.ai)	17
I	-igure 4	- Example of waveform bounds focusing on the trajectories that impact pulse	
I	parameter	measurements	28
I	-igure 5	- Relationship/between selected waveform parameters0e-4694-ab6e-	30
I	igure A.1	I – Waveform obtained from the measurement of a step-like signal from	
١	which the	state levels and uncertainties are calculated	46
	Figure A.2	2 – Histograms of state s1 (a) and state s2 (b) of the step-like waveform	47
I	Jolled III		47
	-igure B.1	I – Diagram showing location of waveform elements, $y_{(\beta)}^{(\alpha)}$, in Y_1 and Y_2 , and	
t	he constr	fuction of Y from Y_1 and Y_2	49
-	Table 1 –	Value of the coverage factor k_p that encompasses the fraction p of the t -	
(distributio	n for different degrees of freedom (from ISO/IEC Guide 98-3)	26
1	Table 2 – heir unce	Different methods for determining state levels, as given in IEC 60469, and rtainty type and method of computation	31
-	Table 3 – and metho	Different methods for determining state boundaries and their uncertainty type od of computation	36
-	Table 4 –	Variables contributing to the uncertainty in overshoot	39
-	Table 5 –	Variables contributing to the uncertainty in the reference level instant	42
-	Table A 1	- Uncertainty contributions and total uncertainty for $lovel(s_i)$ determined from	

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMPUTATION OF WAVEFORM PARAMETER UNCERTAINTIES

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, EC 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.
- the latter. (standards.iteh.ai)
 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies4:2017
- 6) All users should ensure that they have the latest edition of this publication 0e-4694-abbe-
- 7) No liability shall attach to IEC or its directors, 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.

International Standard IEC 62754 has been prepared by IEC technical committee 85: Measuring equipment for electrical and electromagnetic quantities.

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

FDIS	Report on voting
85/585/FDIS	85/X588/RVD

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

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

The terms used throughout this document which have been defined in Clause 3 are in italic type.

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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

iTeh STANDARD PREVIEW (standards.iteh.ai)

<u>IEC 62754:2017</u> https://standards.iteh.ai/catalog/standards/sist/8413230b-b50e-4694-ab6e-8564f23dff79/iec-62754-2017

COMPUTATION OF WAVEFORM PARAMETER UNCERTAINTIES

1 Scope

This document specifies methods for the computation of the temporal and amplitude parameters and their associated uncertainty for step-like and impulse-like waveforms. This document is applicable to any and all industries that generate, transmit, detect, receive, measure, and/or analyse these types of pulses.

2 Normative references

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.

IEC 60469:2013, Transitions, pulses and related waveforms – Terms, definitions and algorithms

3 Terms and definitions STANDARD PREVIEW

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

ISO and IEC maintain terminological databases: https://standards.iteh.ai/catalog/standards/sist/8413230b-b50e-4694-ab6e-8564f23dff79/iec-62754-2017

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

3.1

aberration region

3.1.1

post-transition aberration region

interval between a user-specified *instant* and a fixed *instant*, where the fixed *instant* is the first sampling *instant* succeeding the 50 % *reference level instant* for which the corresponding *waveform* value is within the *state boundaries* of the *state* succeeding the 50 % *reference level instant* for which the state boundaries of the state succeeding the 50 % *reference level instant*.

[SOURCE: IEC 60469:2013, 3.2.1.1, modified – the note 1 to entry has been deleted.]

3.1.2

pre-transition aberration region

interval between a user-specified *instant* and a fixed *instant*, where the fixed *instant* is the first sampling *instant* preceding the 50 % *reference level instant* for which the corresponding *waveform* value is within the *state boundaries* of the *state* preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the 50 % *reference level instant* for which the state preceding the state preceding the 50 % *reference level instant* for which the state preceding the state preceding the 50 % *reference level instant* for which the state preceding the st

[SOURCE: IEC 60469:2013, 3.2.1.2, modified – the note 1 to entry has been deleted.]

3.2 amplitude

3.2.1

impulse amplitude

difference between the specified *level* corresponding to the *maximum peak* (*minimum peak*) of the positive (negative) *impulse-like waveform* and the *level* of the *state* preceding the first *transition* of that *impulse-like waveform*

[SOURCE: IEC 60469:2013, 3.2.3.1]

3.2.2

waveform amplitude

difference between the levels of two different states of a waveform

SEE Figure 1.



Figure 1 – Reference levels, reference level instants, waveform amplitude, and transition duration for a single positive-going transition

[SOURCE: IEC 60469:2013, 3.2.3.2, modified – the Note 1 to entry has been deleted and the reference to Figure 1 has been added.]

3.3

correction

operation that combines the results of the conversion operation with the transfer function information to yield a *waveform* that is a more accurate representation of the *signal*

Note 1 to entry Correction may be effected by a manual process by an operator, a computational process, or a compensating device or apparatus. Correction shall be performed to an accuracy that is consistent with the overall accuracy desired in the *waveform measurement process*.

[SOURCE: IEC 60469:2013, 3.2.4]

3.4

coverage factor

numerical factor used as a multiplier of the combined standard uncertainty in order to obtain an expanded uncertainty

Note 1 to entry: A coverage factor, *k*, is typically in the range 2 to 3.

Note 2 to entry: Coverage factor is also defined as a "number larger than or equal to one by which a *combined standard measurement uncertainty*," (See ISO/IEC Guide 99:2007, 2.38).

[SOURCE: ISO/IEC Guide 98-3:2008, 2.3.6, modified – the Note 2 to entry has been added.]

3.5

degrees of freedom

in general, the number of terms in a sum minus the number of constraints on the terms of the sum

[SOURCE: ISO/IEC Guide 98-3:2008, C.2.31]

3.6

impulse response

output *signal* from an instrument, device, or system that is the result of an input *signal*, where this input *signal* can be described by a unit impulse function, $\delta(t)$:

iTeh STANDARD, PREVIEW (stand(arg)s, ibeh.ai) (1)

3.7

IEC 62754:2017

instant https://standards.iteh.ai/catalog/standards/sist/8413230b-b50e-4694-ab6eparticular time value within a *waveform2epoch*_that73unless otherwise specified, is referenced relative to the *initial instant* of that *waveform epoch*

[SOURCE: IEC 60469:2013, 3.2.13]

3.7.1

initial instant first sample *instant* in the *waveform*

[SOURCE: IEC 60469:2013, 3.2.13.3]

3.7.2

impulse center instant

instant at which a user-specified approximation to the *maximum peak* (*minimum peak*) of the positive (negative) *impulse-like waveform* occurs

[SOURCE: IEC 60496:2013, 3.2.13.2]

3.7.3

reference level instant

instant at which the waveform intersects a specified reference level

SEE Figure 1.

[SOURCE: IEC 60469:2013, 3.2.13.5, modified – the reference to Figure 1 has been added.]

IEC 62754:2017 © IEC 2017

3.8 interval

set of all values of time between a first instant and a second instant, where the second instant is later in time than the first

Note 1 to entry: These first and second instants are called the endpoints of the interval. The endpoints, unless otherwise specified, are assumed to be part of the interval.

[SOURCE: IEC 60469:2013, 3.2.15]

3.9

level

constant value having the same units as y

SEE Figure 1.

Note 1 to entry: y is the signal.

[SOURCE: IEC 60469:2013, 3.2.17, modified – the reference to Figure 1 has been added as well as the note 1 to entry.]

3.9.1

percent reference level reference level specified by:

iTeh STANDARD PREVIEW

(stars a 100% (itosh. 20%)

(2)

where

IEC 62754:2017 https://standards.iteh.ai/catalog/standards/sist/8413230b-b50e-4694-ab6e-0 % < x < 100 %

8564f23dff79/iec-62754-2017

 $y_{0\%}$ = level of low state

 $y_{100\%}$ = level of high state

 $y_{0\%}$, $y_{100\%}$, and $y_{x\%}$ are all in the same unit of measurement

SEE Figure 1.

Note 1 to entry: Commonly used reference levels are: 0 %, 10 %, 50 %, 90 %, and 100 %.

[SOURCE: IEC 60469:2013, 3.2.17.3, modified – the reference to Figure 1 has been added.]

3.10 measurand

quantity intended to be measured

[SOURCE: ISO/IEC Guide 99:2007, 2.3, modified - the notes have been deleted.]

3.11 measurement model model of measurement model mathematical relation among all quantities known to be involved in a measurement

[SOURCE: ISO/IEC Guide 99:2007, 2.48, modified - the notes have been deleted.]

3.12 measurement uncertainty uncertainty of measurement uncertainty

non-negative parameter characterizing the dispersion of the quantity values being attributed to a *measurand*, based on the information used

Note 1 to entry Measurement uncertainty is also defined as a "parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand." (See ISO/IEC Guide 98-3:2008, 2.2.3).

[SOURCE: ISO/IEC Guide 99:2007, 2.26, modified - the notes have been deleted and the note 1 to entry has been added.]

3.12.1 standard measurement uncertainty standard uncertainty of measurement standard uncertainty *measurement uncertainty* expressed as a standard deviation

Note 1 to entry: Standard measurement uncertainty is also defined as an "uncertainty of the results of measurement expressed as a standard deviation," (See ISO/IEC Guide 98-3:2008, 2.3.1).

[SOURCE: ISO/IEC Guide 99:2007, 2.30, modified – the note 1 to entry has been added.]

Teh STANDARD PREVIEW 3.12.2 combined standard measurement uncertainty

combined standard uncertainty standards.iteh.ai) standard measurement uncertainty that is obtained using the individual standard measurement uncertainties associated with the input quantities in a measurement model

Note 1 to entry: Combined standard uncertainty is also defined as a "standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or covariances of these other quantities weighted according to how the measurement result varies with changes in these quantities," (See ISO/IEC Guide 98-3:2008, 2.3.4).

[ISO/IEC Guide 99:2007, 2.31, modified – the note has been deleted and the note 1 to entry has been added.]

3.12.3 expanded measurement uncertainty expanded uncertainty

product of a combined standard measurement uncertainty and a factor larger than the number one

[SOURCE: ISO/IEC Guide 99:2007, 2.35]

Note 1 to entry: Expanded uncertainty is also defined as a "quantity defining an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution values that could reasonably be attributed to the measurand," (See ISO/IEC Guide 98-3:2008,2.3.5).

[SOURCE: ISO/IEC Guide 99:2007, 2.35, modified – the notes have been deleted and the note 1 to entry has been added.]

3.12.4

instrumental measurement uncertainty instrumental uncertainty

component of *measurement uncertainty* arising from a measuring instrument or measuring system in use

IEC 62754:2017 © IEC 2017 - 11 -

[SOURCE: ISO/IEC Guide 99:2007, 4.24, modified – the term "instrumental uncertainty" has been added as a synonym and the notes have been deleted.]

3.12.4.1

intrinsic (instrumental) uncertainty

uncertainty of a measuring instrument when used under reference conditions

[SOURCE: IEC 60359:2001, 3.2.10]

3.12.4.2

operating instrumental uncertainty

instrumental uncertainty under the rated operating conditions

[SOURCE: IEC 60359:2001, 3.2.11]

3.13

overshoot

waveform aberration within a post-transition aberration region or pre-transition aberration region that is greater than the upper state boundary for the associated state level

SEE Figure 2.



Figure 2 – Overshoot, undershoot, state levels, and state boundaries for a single positive-going transition

[SOURCE: IEC 60469:2013, 3.2.19, modified – the reference to Figures 5 and 6 in the source definition has been replaced by the reference to Figure 2.]

3.14

parameter

any value (number multiplied by a unit of measure) that can be calculated from a waveform

[SOURCE: IEC 60469:2013, 3.2.20]

3.15_.

maximum peak pertaining to the greatest value of the *waveform*

[SOURCE: IEC 60469:2013, 3.2.21]

3.16 minimum peak

pertaining to the least value of the waveform

[SOURCE: IEC 60469:2013, 3.2.22]

3.17

pulse duration

difference between the first and second transition occurrence instants

[SOURCE: IEC 60469:2013, 3.2.27, modified - the note has been deleted.]

3.18

pulse separation

duration between the 50 % reference level instant, unless otherwise specified, of the second transition of one pulse in a pulse train and that of the first transition of the immediately following pulse in the same pulse train

(standards.iteh.ai)

[SOURCE: IEC 60469:2013, 3.2.28]

IEC 62754:2017

3.19 https://standards.iteh.ai/catalog/standards/sist/8413230b-b50e-4694-ab6ewaveform reconstruction 8564f23dff79/iec-62754-2017

deconvolution

process of removing the effect of the measurement instrument, connectors, cables, and jitter on the measured *waveform*

Note 1 to entry: This process deconvolves the impulse response of the measurement instrument from the measured *waveform*.

3.20

sample

element of a sampled waveform, given in units of the amplitude of the signal at a given time

3.21

signal

physical phenomenon, one or more of whose characteristics may vary to represent information

Note 1 to entry: This phenomenon is a function of time.

[SOURCE: IEC 60469:2013, 3.2.38]

3.22

state

particular *level* or, when applicable, a particular *level* and upper and lower limits (the upper and lower *state boundaries*) that are referenced to or associated with that *level*

Note 1 to entry Unless otherwise specified, multiple *states* are ordered from the most negative *level* to the most positive *level*, and the *state levels* are not allowed to overlap. The most negative *state* is called *state* 1. The most positive *state* is called *state* n. The *states* are denoted by $s_1, s_2, ..., s_n$; the *state levels* are denoted by *level*(s_1),

IEC 62754:2017 © IEC 2017

level(s_2), ..., *level*(s_2); the upper state boundaries are denoted by upper(s_1), upper(s_2), ..., upper(s_2); and the lower state boundaries are denoted by lower(s_1), lower(s_2), ..., lower(s_n).

SEE Figure 2.

[SOURCE: IEC 60469:2013, 3.2.40, modified – the reference to Figure 2 has been added and note 2 of the original definition has been deleted.]

3.23

state boundaries

upper and lower limits of the states of a waveform

SEE Figure 2.

Note 1 to entry: All values of a waveform that are within the boundaries of a given state are said to be in that state. The state boundaries are defined by the user.

[SOURCE: IEC 60469:2013, 3.2.41, modified – the reference to Figure 2 has been added.]

3.24

state occurrence

contiguous region of a waveform that is bounded by the upper and lower state boundaries of a state, and whose duration equals or exceeds the specified minimum duration for state attainment. The state occurrence consists of the entire portion of the waveform that remains within the state boundaries of that state. DARD PREVIEW

Note 1 to entry State occurrences are numbered as ordered pairs (s_i, n) , where s_i refers to the ith state, and n is the number of the occurrence of that particular state within the waveform epoch. In a given waveform epoch, when the waveform first enters a state s_1 , that state occurrence is $(s_1, 1)$. If and when the waveform exits that state, that state occurrence is over. If and when the waveform next enters and remains in state s1, that state occurrence would be labelled $(s_1, 2)$; and so on. https://standards.iteh.ai/catalog/standards/sist/8413230b-b50e-4694-ab6e-

[SOURCE: IEC 60469:2013, 3.2.42; modified to the mote has been shortened so that it does not discuss figures that are not contained in this document]

3.25

timebase

that component of a measurement instrument that provides the unique instant for each sample in a sampled waveform

Note 1 to entry: The timebase provides a vector of sampling instants where each instant corresponds to a unique sample in the waveform. Often the interval between sample instants is not uniform and exhibits both systematic and random errors.

3.26

transition

contiguous region of a *waveform* that connects, either directly or via intervening *transients*, two state occurrences that are consecutive in time but are occurrences of different states

[SOURCE: IEC 60469:2013, 3.2.47]

3.26.1

negative-going transition

transition whose terminating state is more negative than its originating state

Note 1 to entry: The endpoints of the negative-going transition are the last exit of the waveform from the higher state boundary and the first entry of the waveform into the lower state boundary.

[SOURCE: IEC 60469:2013, 3.2.47.1, modified – note 2 has been deleted.]