

SLOVENSKI STANDARD oSIST prEN IEC 63297:2024

01-november-2024

Senzorske naprave za sisteme nevsiljivega spremljanja obremenitve (NILM)

Sensing devices for non-intrusive load monitoring (NILM) systems

iTeh Standards

Ta slovenski standard je istoveten z: prEN IEC 63297:2024

ICS:

https://17.220.20 https://17.2

oSIST prEN IEC 63297:2024 en,fr,de

oSIST prEN IEC 63297:2024

iTeh Standards (https://standards.iteh.ai) Document Preview

oSIST prEN IEC 63297:2024

https://standards.iteh.ai/catalog/standards/sist/108881d3-a194-4f55-8436-6ba9310aeff3/osist-pren-iec-63297-2024

oSIST prEN IEC 63297:2024

PROJECT NUMBER: IEC 63297 ED1

DATE OF CIRCULATION:



in writing from IEC.

85/933/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

CLOSING DATE FOR VOTING:

	2024-09-27		2024-12-20			
	SUPERSEDES DOCUMENTS:					
	85/911/CD, 85/930/	cc				
IEC TC 85 : MEASURING EQUIPMENT FOR ELE	CTRICAL AND ELECTROM	IAGNETIC QUANTITIES				
SECRETARIAT:		SECRETARY:				
China		Ms Guiju HAN				
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 13,SC 23K,TC 38		HORIZONTAL FUNCTION(S):				
10 10,00 2011,10 00						
ASPECTS CONCERNED:						
Energy Efficiency						
SUBMITTED FOR CENELEC PARALLEL VOT	Teh Sta	□ NOT SUBMITTED FO	OR CENELEC PARALLEL VOTING			
Attention IEC-CENELEC parallel voting	os://stanc		h.ai)			
The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.						
The CENELEC members are invited to vote through the CENELEC online voting system. OSIST prendered (1988) 110 (1988) 100 (1989) 100			hs0210saff2/asist pran ica 62207 20			
/5.// 5tailtiai U5.11U11.a// Uata1U g/ 5tailtiai	us/5151/10001uJ- 0	11/1-11/J-01/J-0	0a7310a0113/0sist-p1011-100-0327/-2 0			
This document is still under study and subj	ect to change. It shoul	d not be used for refe	rence purposes.			
Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.						
Recipients of this document are invited to submit, with their comments, notification of any relevant "In Some Countries" clauses to be included should this proposal proceed. Recipients are reminded that the CDV stage is the final stage for submitting ISC clauses. (SEE AC/22/2007 OR NEW GUIDANCE DOC).						
TITLE:						
Sensing devices for non-intrusive load monitoring (NILM) systems						
PROPOSED STABILITY DATE: 2028						
NOTE FROM TC/SC OFFICERS:						

Copyright © 2024 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission

CONTENTS

-2-

FO	REWO	RD	4
INT	RODU	CTION	6
1	Scop	e	7
2	Norm	ative references	7
3	Term	s and definitions	7
4	Elem	ents of a NILM system	9
4	4.1	General	9
4	4.2	NILM sensing device	10
4	4.3	NILM analytics	10
5	Class	ification of NILM sensing devices (NSD)	10
	5.1	General	
ļ	5.2	Definition of essential NSD parameter classes	
	5.2.1	General	
	5.2.2 5.2.3	Sampling frequency class definition	
	5.2.3	Output data rate class definition	
6			
7	Oper	mentation requirements	13
		informative) Introduction of NILM process	
	A.1	Example of NILM process	
	A.2	Data and techniques for NILM	15
	A.3	Examples of NILM sensing devices (NSD)	
Anr	nex B (informative) Data bit rate an	
anda	B.11.itel	Calculation of data bit rate 08881/13-a194-4f55-8436-6ha9310aeff3/asist-nren-iec	17
Anr	nex C (informative) Measuring equipment compared to NILM sensing devices	19
(C.1	General	19
(C.2	Types of measuring equipment	19
(C.3	Overview of requirements for measuring equipment	
	C.4	Relationship between NILM sensing devices and measuring equipment	
Bib	liograp	hy	22
Fice	ure 1	Principle of non-intrusive load monitoring (NILM)	۵
_		Elements of a NILM system	
_		Component view of a NILM sensing device (NSD)	
·		Framework for NILM systems operation	
_		Example of NILM System implementation	
_		= Example of NILM system implementation ! – Example of NILM sensing device installed in a home panelboard	
_		· · · · · · · · · · · · · · · · · · ·	
rig	ure C.1	– Notion of accuracy class	20
Tab	ole 1 –	Classification of NSDs according to the sampling frequency	11
Tab	ole 2 –	Classification of NSDs according to output data rate	12
Tab	ole 3 –	Classification of NSDs according to the data bit rate	12

IEC CDV 63297 © IEC 2024	– 3 –	85/933/CDV
Table A.1 – Example of data and te	chniques used in NILM systems	15
Table A.2 – Examples of NILM sens	ing devices and typical specification	16
Table B.1 – Examples of data bit ra	e calculation	17
Table C.1 – Overview of measuring	equipment	19

iTeh Standards (https://standards.iteh.ai) Document Preview

oSIST prEN IEC 63297:2024

https://standards.iteh.ai/catalog/standards/sist/108881d3-a194-4f55-8436-6ba9310aeff3/osist-pren-iec-63297-2024

85/933/CDV

V -4-

1

INTERNATIONAL ELECTROTECHNICAL COMMISSION

3

5

SENSING DEVICES FOR NON-INTRUSIVE LOAD MONITORING (NILM) SYSTEMS

6 7

FOREWORD

8

10 11

12

13

14 15

16 17 18 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.

19 2 20 21

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.

30 31 32 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 bodies.

33

services carried out by independent certification bodies. 63297.2024

6) All users should ensure that they have the latest edition of this publication. 629310aeff3/osist-pren-iec-63297-2024

34 35 36 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

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.

41 42 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.

43 44 IEC 63297 has been prepared by IEC technical committee 85: Measuring equipment for electrical and electromagnetic quantities.

45

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

Enquiry draft	Report on voting	

46 47

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

48 49

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,

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

52 IEC are described in greater detail at www.iec.ch/standardsdev/publications.

IEC CDV 63297 © IEC 2024

- 5 -

85/933/CDV

- The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be
- reconfirmed,
- withdrawn,
- 58 amended, or
- revised.

60

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.

61

62

iTeh Standards (https://standards.iteh.ai) Document Preview

https://standards.iteh.ai/catalog/standards/sist/108881d3-a194-4f55-8436-6ba9310aeff3/osist-pren-iec-63297-2024

85/933/CDV – 6 – IEC CDV 63297 © IEC 2024

63

71

72

73

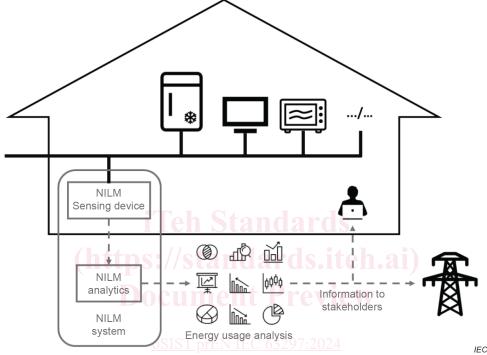
74

75

INTRODUCTION

Non-intrusive load monitoring (NILM), or non-intrusive appliance and load monitoring (NIALM), is a process for providing estimated energy usage, e.g. by type of use (heating, cooling, etc.) or type of appliance (microwave, etc.) based on load signatures at a single point in the installation.

NILM systems can be used to survey the specific uses of electrical power in homes, buildings or industrial areas (see Figure 1).



ttps://standards.iteh.ai/catalog/standards/sist/108881d3-a194-4f55-8436-6ba9310aeff3/osist-pren-iec-63297-202

Figure 1 - Principle of non-intrusive load monitoring (NILM)

At the moment, NILM systems are essentially used in AC distribution networks, but DC networks are not excluded.

IEC CDV 63297 © IEC 2024

-7-

85/933/CDV

SENSING DEVICES FOR NON-INTRUSIVE
LOAD MONITORING (NILM) SYSTEMS

78 79 80

93

76 77

81 **1 Scope**

- This International Standard provides a classification of NILM sensing devices for use in NILM systems, according to the state of the art of NILM technologies.
- The classification of NILM analytics and NILM systems, as well as performance indicators for NILM systems, can be considered in the future.
- NILM systems produce estimated disaggregation into energy usages. When accurate measurement and analysis of energy consumption and/or other electrical parameters is needed (e.g. for monitoring the electrical installation), systems based on standardized measuring devices (e.g. PMD, PQI or meters) are used.
- NOTE Standardized measuring devices have guaranteed accuracy over a specified range and have limited deviations in presence of influence quantities (temperature, frequency deviations...) in addition to safety and constructional requirements. See Annex C for more information.

2 Normative references Tah Standar

- 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
- 97 any amendments) applies.
- 98 IEC 61557-12:2018, Electrical safety in low voltage distribution systems up to 1 000 V AC and
 99 1 500 V DC Equipment for testing, measuring or monitoring of protective measures Part
 100 12: Power metering and monitoring devices (PMD)

3 Terms and definitions

- For the purposes of this document, the following terms and definitions apply.
- 103 ISO and IEC maintain terminological databases for use in standardization at the following addresses:
- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

107

101

108 **3.1**

109 electrical parameter

- electrical quantity to be measured or estimated
- 111 EXAMPLE RMS value of current, RMS value of voltage, active power, reactive power, harmonics, power quality related parameters, etc.
- 113 **3.2**

114 estimated value

- value of an electrical parameter (e.g. current, power, energy related to a specific usage)
- produced by a NILM sensing device or a NILM system

85/933/CDV − 8 − IEC CDV 63297 © IEC 2024

117 Note 1 to entry: Estimated values are typically less accurate than values measured with standardized measuring

- 118 devices (e.g. PMD, PQI, meters).
- 119 3.3
- 120 measured value
- 121 value of an electrical parameter (e.g. current, power, energy related to a specific usage)
- 122 produced by a measuring device complying with an electrical measurement standard
- 123 Note 1 to entry: Example of measuring devices complying with an electrical measurement standard include PMD,
- 124 PQI and meters.
- 125 **3.4**
- 126 load signature
- 127 pattern in the data produced by a NILM sensing device that can be attributed to a specific
- type of load or energy usage
- 129 **3.5**
- 130 non-intrusive load monitoring
- 131 NILM
- 132 process for providing estimated categorization of energy usage based on load signatures
- obtained at a single point in the installation
- 134 **3.6**
- 135 **NILM analytics**
- 136 process for analyzing data produced by a NILM sensing device and providing information
- 137 about energy usage
- 138 Note 1 to entry: NILM analytics can be performed within the NILM sensing device and/or in the cloud.
- 139 **3.7**
- 140 NILM sensing device
- 141 NSD
- device connected to the electrical installation and producing data to be used by NILM
- 143 analytics OSIST prEN JEC 63297:20

ottps://standards.iteh.ai/catalog/standards/sist/108881d3-a194-4f55-8436-6ba9310aeff3/osist-pren-iec-63297-202

- 144 **3.8**
- 145 NILM system
- 146 combination of a NILM sensing device and NILM analytics
- **147 3.9**
- 148 power metering and monitoring device
- 149 PMD
- combination in one or more devices of several functional modules dedicated to metering and
- monitoring electrical parameters in energy distribution systems or electrical installations, used
- for applications such as energy efficiency, power monitoring and network performance
- Note 1 to entry: Under the generic term "monitoring" are also included functions of recording, alarm management,
- 154 etc.
- Note 2 to entry: PMDs have a known measurement uncertainty over a specified measurement range and are
- 156 robust to influence quantities and industrial environments
- 157 [SOURCE: IEC 61557-12:2018, 3.1.1, modified Note 2 to entry has been modified and Note
- 158 3 to entry has been added]
- 159 **3.10**
- 160 power quality instrument
- 161 PQI
- instrument complying with IEC 62586-1 whose main function is to measure, record and
- 163 possibly monitor power quality parameters in power supply systems, and whose measuring
- methods (class A or class S) are defined in IEC 61000-4-30