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## Solcellsanläggningar – Detektering och fränkoppling av ljusbågar med likström

*Photovoltaic power systems –  
DC arc detection and interruption*

Som svensk standard gäller europastandarden EN IEC 63027:2023. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 63027:2023.

### Nationellt förord

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- **IEC 63027, First edition, 2023 - Photovoltaic power systems - DC arc detection and interruption** utarbetad inom International Electrotechnical Commission, IEC.

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English Version

## Photovoltaic power systems - DC arc detection and interruption (IEC 63027:2023)

Systèmes photovoltaïques - Détection et interruption d'arc  
en courant continu  
(IEC 63027:2023)

Gleichstrom-Lichtbogenerfassung und -Unterbrechung in  
photovoltaischen Energiesystemen  
(IEC 63027:2023)

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## **European foreword**

The text of document 82/2112/FDIS, future edition 1 of IEC 63027, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 63027:2023.

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) 2024-03-07
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2026-06-07

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## **Endorsement notice**

The text of the International Standard IEC 63027:2023 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

IEC 62606:2013 NOTE Approved as EN 62606:2013 (not modified)

IEC 62606:2013/AMD1:2017 NOTE Approved as EN 62606:2013/A1:2017 (not modified)

IEC 62606:2013/AMD2:2022 NOTE Approved as EN 62606:2013/A2:2022 (not modified)<sup>1</sup>

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<sup>1</sup> Under preparation. Stage at the time of publication: EN 62606:2023/FprA2:2022.

## Annex A (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.cencenelec.eu](http://www.cencenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60730-1	2013	Automatic electrical controls - Part 1: General requirements	EN 60730-1	2016
+ A1	2015		+ A1	2019
+ A2	2020		+ A2	2022
IEC 60947-1	2020	Low-voltage switchgear and controlgear - Part 1: General rules	EN IEC 60947-1	2021
IEC 60947-3	2020	Low-voltage switchgear and controlgear - Part 3: Switches, disconnectors, switch- disconnectors and fuse-combination units	EN IEC 60947-3	2021
IEC 61508	series	Functional safety of electrical/electronic/programmable electronic safety-related systems	EN 61508	series
IEC 62109-1	2010	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements	-	-
IEC/TS 61836	2016	Solar photovoltaic energy systems - Terms, definitions and symbols	-	-

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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**Photovoltaic power systems – DC arc detection and interruption**

**Systèmes photovoltaïques – Détection et interruption d'arc en courant continu**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references .....	9
3 Terms and definitions .....	10
4 Classification.....	12
4.1 General.....	12
4.2 Protection coverage.....	13
4.3 Method of implementation .....	13
4.3.1 PCE integrated device (I).....	13
4.3.2 Stand-alone device (S) .....	14
4.3.3 Distributed detection system (D).....	14
4.4 Functionality .....	14
4.4.1 AFPE: Detection and interruption capability provided.....	14
4.4.2 AFD: Only detection / no interruption capability provided .....	14
4.5 Number of monitored strings (S) .....	14
4.5.1 Single string .....	14
4.5.2 Parallel string .....	14
4.6 Number of input ports (I).....	14
4.7 Number of monitored channels (C).....	14
4.7.1 Single channel.....	14
4.7.2 Multi channel .....	15
4.8 Reconnection method .....	15
4.8.1 General .....	15
4.8.2 Manual reconnection .....	15
4.8.3 Remote manual reconnection .....	15
4.8.4 Automatic reconnection .....	15
5 Ratings of AFPEs and AFDs .....	15
5.1 General.....	15
5.2 PCE integrated AFPEs and AFDs .....	15
5.2.1 Rated and limiting values.....	15
5.3 Stand-alone AFPEs and AFDs .....	16
5.3.1 Rated and limiting values.....	16
5.3.2 Utilization category .....	17
6 Product information .....	17
6.1 General.....	17
6.2 PCE integrated devices.....	17
6.3 Stand-alone devices .....	18
6.3.1 Nature of information .....	18
6.3.2 Marking .....	18
6.3.3 Instructions for installation, operation and maintenance.....	18
7 Normal service, mounting and transport conditions.....	18
7.1 PCE integrated AFPEs.....	18
7.2 Stand-alone AFPEs.....	18
8 Construction and performance requirements.....	19

8.1	General requirements for PCE integrated AFDs/AFPEs and stand-alone AFDs/AFPEs.....	19
8.1.1	General .....	19
8.1.2	Construction requirements.....	19
8.1.3	Operation in case of series arc fault event.....	19
8.1.4	Reconnection capability of AFPE .....	19
8.1.5	Self-test function .....	20
8.2	PCE integrated AFDs and AFPEs .....	21
8.3	Stand-alone AFDs and AFPEs .....	21
9	Tests .....	21
9.1	General.....	21
9.2	Series arc fault test.....	21
9.2.1	General .....	21
9.2.2	Arc generator.....	22
9.2.3	DC source .....	23
9.2.4	Array line impedance network.....	24
9.2.5	Line impedance network .....	24
9.2.6	Test procedure .....	25
9.2.7	Arc energy and response time measurement .....	27
9.2.8	Self-test function .....	27
9.2.9	Reconnection test.....	28
Annex A	(informative) String and channel examples .....	29
A.1	General.....	29
A.2	PCE integrated AFDs and AFPEs .....	29
A.3	Stand-alone AFPEs.....	30
A.4	Distributed AFPEs.....	31
Annex B	(normative) Test setups following different application cases .....	32
B.1	General.....	32
B.1.1	Overview .....	32
B.1.2	PV source models.....	33
B.1.3	Flow chart for test selection.....	34
B.2	Application string inverter .....	36
B.3	Application micro inverter.....	37
B.4	Application module level DC/DC conversion.....	39
B.4.1	Input setups.....	39
B.4.2	Output setups .....	42
B.5	Application external combined strings .....	44
B.5.1	Input setups.....	44
B.5.2	Output setups .....	45
Annex C	(informative) Application examples .....	47
C.1	General.....	47
C.2	Example 1: String inverter with integrated AFPE (F-I-AFPE) .....	47
C.3	Example 2: Module level inverter with integrated AFPE (F-I-AFPE).....	48
C.4	Example 3: External AFPE (P-S-AFPE).....	49
C.5	Example 4: Module level DC-DC converter system with AFPE integrated (F-I-AFPE) .....	52
C.6	Example 5: String inverter with multiple Inputs (F-I-AFPE) .....	55
C.7	Example 6: String inverter with multiple Inputs (F-I-AFPE) .....	57
C.8	Example 7: String inverter with multiple Inputs (F-I-AFPE) .....	59



Annex D (informative) Cross reference application and test setup.....	64
Bibliography.....	65
Figure 1 – Schematic of the arc generator .....	22
Figure 2 – Dimensions of arc generator electrodes .....	23
Figure 3 – DC source decoupling network.....	24
Figure 4 – Array line impedance network .....	24
Figure 5 – Line impedance network.....	24
Figure 6 – Limitation input current.....	26
Figure A.1 – Schematic of string setting of PCE integrated AFDs and AFPEs .....	29
Figure A.2 – Schematic of parallel setting of PCE integrated AFDs and AFPEs.....	29
Figure A.3 – Schematic of string setting of stand-alone AFPEs .....	30
Figure A.4 – Schematic of parallel setting of stand-alone AFPEs .....	30
Figure A.5 – Schematic of single string, single channel distributed AFPEs.....	31
Figure A.6 – Schematic of single string, single channel (Inverter integrated AFD and controller) .....	31
Figure B.1 – PV source model .....	33
Figure B.2 – Flow chart to select applicable test cases .....	35
Figure B.3 – Single string test setup (tests 1, 2, 4).....	36
Figure B.4 – Parallel string test setup (tests 1 and 2).....	36
Figure B.5 – Parallel string test setup (tests 3 and 5).....	36
Figure B.6 – Single string test setup (tests 1 and 2).....	37
Figure B.7 – Single string test setup (tests 1 and 2) – series modules.....	37
Figure B.8 – Parallel string test setup (tests 1 and 2).....	37
Figure B.9 – Parallel string test setup (tests 1 and 2) – series modules.....	38
Figure B.10 – Parallel string test setup (tests 3 and 5).....	38
Figure B.11 – Single string test setup (tests 1, 2, 4).....	39
Figure B.12 – Single string test setup (tests 1, 2, 4) – series modules .....	39
Figure B.13 – Parallel string test setup (tests 1 and 2).....	40
Figure B.14 – Parallel string test setup (tests 1 and 2).....	41
Figure B.15 – Parallel string test setup (tests 3 and 5).....	42
Figure B.16 – Single string test setup (tests 1, 2, 4).....	42
Figure B.17 – Parallel string test setup (tests 1 and 2).....	43
Figure B.18 – Parallel string test setup (tests 3 and 5).....	43
Figure B.19 – Single string test setup (tests 1, 2, 4).....	44
Figure B.20 – Parallel string test setup (tests 1 and 2).....	44
Figure B.21 – Parallel string test setup (tests 3 and 5).....	45
Figure B.22 – Single string test setup (test 1 and 2).....	45
Figure B.23 – Parallel string test setup (tests 3 and 5).....	46
Figure C.1 – Example of a string inverter with single input .....	47
Figure C.2 – Example of a module level inverter with single input .....	48
Figure C.3 – Example of an external AFPE with multiple input ports .....	50
Figure C.4 – Example of a module level DC-DC converter system .....	52

Figure C.5 – Example of a string inverter with multiple input ports .....	55
Figure C.6 – Example string inverter with multiple inputs .....	58
Figure C.7 – Example string inverter with different channel classification .....	60
Table 1 – Classification of protection coverage .....	13
Table 2 – Combined classification of AFPEs and AFDs .....	17
Table 3 – Marking and documentation requirements .....	17
Table 4 – Requirements for documentation, marking and position of marking .....	18
Table 5 – Arcing test conditions .....	25
Table B.1 – General LRC component parameters .....	33
Table B.2 – LCR component parameters for different module configurations .....	34
Table C.1 – Overview tests F-I-AFPE string inverter .....	48
Table C.2 – Overview tests F-I-AFPE module level inverter .....	49
Table C.3 – Overview tests P-S-AFPE stand-alone AFPE .....	51
Table C.4 – Overview tests F-I-AFPE .....	55
Table C.5 – Overview tests F-I-AFPE .....	57
Table C.6 – Overview tests F-I-AFPE .....	59
Table C.7 – Overview tests F-I-AFPE .....	63
Table D.1 – Cross reference application and test setup .....	64

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**PHOTOVOLTAIC POWER SYSTEMS –  
DC ARC DETECTION AND INTERRUPTION**
**FOREWORD**

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IEC 63027 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems. It is an International Standard.

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

Draft	Report on voting
82/2112/FDIS	82/2133/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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## INTRODUCTION

This document provides requirements and testing procedures for arc-fault protection devices used in PV systems to reduce the risk of igniting an electrical fire.

A PV system contains a number of distributed DC sources (PV modules) and circuits. In AC systems series arc durations are limited by the alternating current crossing through zero ampere twice per cycle. In DC systems the arcing current may be constant and longer arc durations are expected. In contrast to a centralized power supply, where in case of a fault the circuit is disconnected at the connection to the supply, a PV system is made up of distributed power supplies which cannot disconnect circuits in a single location. For extinguishing series arcs, however, the location of the arc within the circuit is irrelevant as long as the current is interrupted. This arc fault protection may be located inside the inverter, on array circuits, subarray circuits, string circuits, or at the module level. Therefore, this document provides a range of test setups to cover the expected system topologies.

In PV systems earth fault protection is required according to the IEC installation standards. Moreover, single core cables with double or reinforced insulation are required (except ELV systems). Consequently, the risk of parallel arcs is quite low because in most cases an earth fault occurs first. As such, this document does not address requirements or testing for parallel arc detection. The larger risk for PV systems comes from series arcs, therefore the focus of this document is to provide requirements and tests for arc fault protection equipment to ensure that most series arcs in a PV system will be detected.

Many arc fault detectors detect arcs by analyzing and comparing the arc's HF signal emission. These devices may trip due to external disturbances from other equipment connected to the PV array, e.g. the inverter. Therefore, interoperability needs to be evaluated. Other external influences such as radio signals, sparks from trams, and load switching, among others, may also cause nuisance tripping. These causes are a performance issue and therefore not addressed by this document.

Arc fault detectors for PV systems have been introduced as a requirement in the USA since the 2011 U.S. National Electrical Code was published. This led to the development of a PV arc-fault protection product standard, UL 1699B. Experience derived from these documents and their application in the USA has been used as a basis for this document. This document was written in parallel to the maintenance of UL 1699B. Both writing teams considered the work of each other and aligned requirements as much as possible, including the dimensions of the electrodes.

Arc fault detectors have been mandatory for many years in the USA for certain AC installations. Within the IEC, arc fault detectors required according to IEC 62606 have been introduced for certain locations for AC circuits. For PV circuits there was no IEC product standard available. This document therefore now provides test procedures for PV system arc fault detectors, where required by installation standards.

This document was written for the special needs and characteristics of PV systems. The unique aspects of PV DC sources (group of distributed sources, current behavior, dependency to irradiance, system impedance, etc.) differ considerably from other DC sources and applications. Therefore, this PV specific standard was necessary, and equipment compliant to this document is not suitable for other DC sources and applications.

# PHOTOVOLTAIC POWER SYSTEMS – DC ARC DETECTION AND INTERRUPTION

## 1 Scope

This document applies to equipment used for the detection and optionally the interruption of electric DC arcs in photovoltaic (PV) system circuits. The document covers test procedures for the detection of series arcs within PV circuits, and the response times of equipment employed to interrupt the arcs.

The document defines reference scenarios according to which the testing is conducted. This document covers equipment connected to systems not exceeding a maximum PV source circuit voltage of 1 500 V DC.

The detection of parallel circuit arcs is not covered in this document. This document is not applicable to DC sources or applications other than PV DC sources.

NOTE Parallel arc detection may be considered for a future edition.

## 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 60730-1:2013, *Automatic electrical controls – Part 1: General requirements*  
IEC 60730-1:2013/AMD1:2015  
IEC 60730-1:2013/AMD2:2020

IEC 60947-1:2020, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-3:2020, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC TS 61836:2016, *Solar photovoltaic energy systems – Terms, definitions and symbols*

IEC 62109-1:2010, *Safety of power converters for use in photovoltaic power systems – Part 1: General requirements*