SLOVENSKI STANDARD
SIST EN 50549-1:2019/oprA1:2023

01-junij-2023

Zahteve za vzporedno vezavo generatorskih postrojev z razdelilnim omrežjem - 1. del: Vezava z nizkonapetostnim razdelilnim omrežjem - Generatorski postroji do vključno tipa B - Dopolnilo A1

Requirements for generating plants to be connected in parallel with distribution networks - Part 1: Connection to a LV distribution network - Generating plants up to and including Type B

Ta slovenski standard je istoveten z: **EN 50549-1:2019/prA1:2023**

ICS:

29.160.20	Generatorji	Generators
29.240.01	Omrežja za prenos in distribucijo električne energije na splošno	Power transmission and distribution networks in general

SIST EN 50549-1:2019/oprA1:2023 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
EN 50549-1:2019

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ICS 29.160.20 -

English Version

Requirements for generating plants to be connected in parallel with distribution networks - Part 1: Connection to a LV distribution network - Generating plants up to and including Type B

To be completed To be completed

This draft amendment prA1, if approved, will modify the European Standard EN 50549-1:2019; it is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2023-08-11.

It has been drawn up by CLC/TC 8X.

If this draft becomes an amendment, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

This draft amendment was established by CENELEC in three official versions (English, French, German).
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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document EN 50549-1:2019/prA1:2023 has been prepared by TC 8X “System aspects of electrical energy supply”.

This document is currently submitted to the Enquiry.

The following dates are proposed:

• latest date by which the existence of this document has to be announced at national level	(doa)	dor + 6 months
• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	dor + 12 months
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	dor + 36 months (to be confirmed or modified when voting)

This document will amend EN 50549-1:2019.

This amendment includes the following significant technical changes:

— Introduction of a phase jump immunity requirement.

— Harmonizing the ROCOF immunity requirement for synchronous and non-synchronous generating technology.

— Modifying FRT for type A from recommendation to requirement.

— Providing additional detail for EESS in case of overfrequency.

1 Modification to Introduction

Replace item 8. with the following:

“8. Implementation of UVRT and LFSM-U to avoid legal conflict with RfG

Under Voltage Ride Through (UVRT) requirements are defined in RfG for modules type B, type C and type D. There is no mentioning of this topic for type A modules.

Nevertheless, UVRT is seen as an important requirement in some member states even for small generation modules like type A.

NOTE At the time of writing, LVRT requirements for type A modules have been implemented in the following countries: Austria, Czech Republic, Germany, Portugal (for PGM of 15 kW and higher), Switzerland.

From a legal point of view there are two contradicting opinions on whether it is allowed or forbidden to require UVRT for type A modules.

— Opinion 1: It can be required because the topic is not dealt with for type A modules.

— Option 2: It cannot be required because the topic UVRT is dealt within the RfG. Not mentioning UVRT for type A in RfG therefore means that it cannot be required for type A modules.

TC8X WG03 adopts the view of ACER as expressed in “ACER Monitoring of the Implementation of the Grid Connection Network Codes” 11 November 2021 Item 3.3.4 #D where it states the German UVRT requirement for Type A as compliant with NC RfG.

This same explanation can be applied to the requirements regarding Limited Frequency Sensitive Mode - Underfrequency (LFSM-U). In RfG, this LFSM-U is solely defined for type C and type D modules. In EN 50549, LFSM-U is defined as a recommendation (should) for generating modules of type A and type B. The sole exception is electrical energy storage systems having a requirement (shall). These systems are currently not within the scope of the RfG.”

2 Modification to Clause 2, “Normative references”

Add the following reference:

EN 50549-10, *Requirements for generating plants to be connected in parallel with distribution networks - Part 10: Tests for conformity assessment of generating units*

Delete the reference EN 60255-127.

3 Modification to Clause 3, “Terms and definitions”

Add the following note to entry to 3.2.10:

“

Note 3 to entry: Electric vehicle charging stations intended to feed power back to the grid are considered an EESS while a vehicle is connected.”

Add the following note to entry to 3.2.11:

“

Note 2 to entry: Electric vehicle charging stations intended to feed power back to the grid are considered a EES while a vehicle is connected.”

Add the following term entries:

“

3.3.10
apparent power
product of the rms voltage *U* between the terminals of a two-terminal element or two-terminal circuit and the rms electric current *I* in the element or circuit

$$S = UI$$

Note 1 to entry: Under sinusoidal conditions, the apparent power is the modulus of the complex power $\underline{S}$, thus $S = \left|\underline{S}\right|$.

Note 2 to entry: The coherent SI unit for apparent power is voltampere, VA.

[SOURCE: IEV 131-11-41]

3.3.11
reactive power
for a linear two-terminal element or two-terminal circuit, under sinusoidal conditions, quantity equal to the mean value of the product of the instantaneous voltage u and the instantaneous current i' which is equal to i but leading it by $\pi / 2$:

$$Q = \overline{ui'} = \frac{1}{T}\int_0^T ui'dt$$

where T denotes half the period of u, Q being equivalent to the product of the apparent power S and the sine of the displacement angle φ

$$Q = S \sin \varphi$$

Note 1 to entry: The reactive power is the imaginary part of the complex power $\underline{S}$, thus $Q = Im\,\underline{S}$. Its absolute value is equal to the non-active power, thus $\left|Q\right| = Q_{\sim}$.

Note 2 to entry: The coherent SI unit for reactive power is voltampere, VA. The special name var and its symbol var are also used.

[SOURCE: IEV 131-11-44]

3.4.9
phase
instantaneous phase
ϑ
argument of the cosine function in the representation of a sinusoidal quantity

Note 1 to entry: The term “instantaneous phase” is only used when the independent variable is time.

Note 2 to entry: For the quantity a(t) = $\hat{A}\cos\left(\omega t + \vartheta_0\right)$, the phase is $\omega t + \vartheta_0$.

[SOURCE: IEV 103-07-04]

3.4.10
instantaneous frequency
first derivative of instantaneous phase

3.4.11
rate of change of frequency
ROCOF
first derivative of instantaneous frequency or second derivative of instantaneous phase

3.4.12
phase jump
abrupt change in the phase of the voltage of an AC electrical network

“

4 Modification to Clause 4, “Requirements on generating plants”

4.1 Modification to subclause 4.1, “General”

Add the following at the end of the subclause:

“EN 50549-10 provides technical guidance for tests on generating units and interface protection to evaluate their electrical characteristics. EN 50549-10 shall be applied to evaluate the characteristics of generating units and interface protection used in generating plants relating to the requirements of this Standard.

Electrical characteristics may alternatively be evaluated according to standards other than EN 50549-10, if the following prerequisites are fulfilled:

— The alternative verification procedure covers all required technical aspects and characteristic quantities stipulated in EN 50549-1 and EN 50549-2, respectively.

— The alternative verification procedure shall not be less stringent or technically less demanding than the correspondent verification procedure in EN 50549-10.

— The alternative verification procedure leads to results of at least equivalent confidence level as EN 50549-10.

— The equivalent or higher confidence level of the alternative verification procedure shall be confirmed by the entity stating compliance based upon these tests.

— The entity stating compliance based upon these tests shall have sufficient expertise in both EN 50549-10 and the applied standard.

NOTE This also applies for a partial application of another standard only for specific functions or operational capabilities.”

4.2 Modification to subclause 4.5, “Immunity to disturbances”

4.2.1 Modification to subclause 4.5.1, “General”

Add the following at the end of the subclause:

“The described immunity requirements are independent of the interface protection settings. Disconnection settings of the interface protection relay always overrule technical capabilities. So, whether the generating plant will stay connected or not will also depend upon those settings.”

4.2.2 Modification to subclause 4.5.2, “Rate of change of frequency (ROCOF) immunity”

Replace the content of the subclause with the following:

“ROCOF immunity of a power generating plant means that the generating modules in this plant stay connected with the distribution network and are able to operate when the frequency on the distribution network changes with a specified ROCOF. The generating units and all elements in the generating plant that might cause their disconnection or impact their behaviour shall have the same level of immunity.

The generating modules in a generating plant shall have ROCOF immunity to ROCOF equal or exceeding the value specified by the responsible party. If no ROCOF immunity value is specified, at least 2 Hz/s shall apply.

The ROCOF immunity is defined with a sliding measurement window of 500 ms.

NOTE 1 For control action based on frequency measurement shorter measurement periods are expected to be necessary.

NOTE 2 For small isolated distribution networks (typically on islands) higher ROCOF immunity values might be required."

4.2.3 Modification to subclause 4.5.3, "Under-voltage ride through (UVRT)"

4.2.3.1 Modification to subclause 4.5.3.1, "General"

Replace the content of the subclause with the following:

"Generating modules shall comply with the requirements of 4.5.3.2 and 4.5.3.3.

Exempted from this requirement are small generating units below 50 kW of the following generation technologies: CHP, fuel cell, rotating machinery, hydro.

NOTE 1 The power threshold of this exemption is expected to be reduced in future or the exception might be deleted completely especially once the installed capacity becomes relevant for the grid stability.

The requirements apply to all kinds of faults (1ph, 2ph and 3ph).

NOTE 2 A more distinctive differentiation for 1ph, 2ph and 3ph faults is under consideration.

NOTE 3 The FRT curves in Figure 6, Figure 7 and Figure 8 describe the minimum requirements for continued connection of the generating plant to the grid. They are not designed for parameterising the interface protection."

4.2.4 Modification to subclause 4.5.4, "Over-voltage ride through (OVRT)"

Replace the content of the subclause with the following:

"Generating modules shall be capable of staying connected to the distribution network as long as the voltage at the point of connection remains below the voltage-time curve of Figure 8.

The highest phase to neutral voltage or if no neutral is present the highest phase to phase voltage shall be evaluated.

In case of pre-fault voltages below nominal voltage and a voltage step of more than 25 % U_n disconnection is allowed.

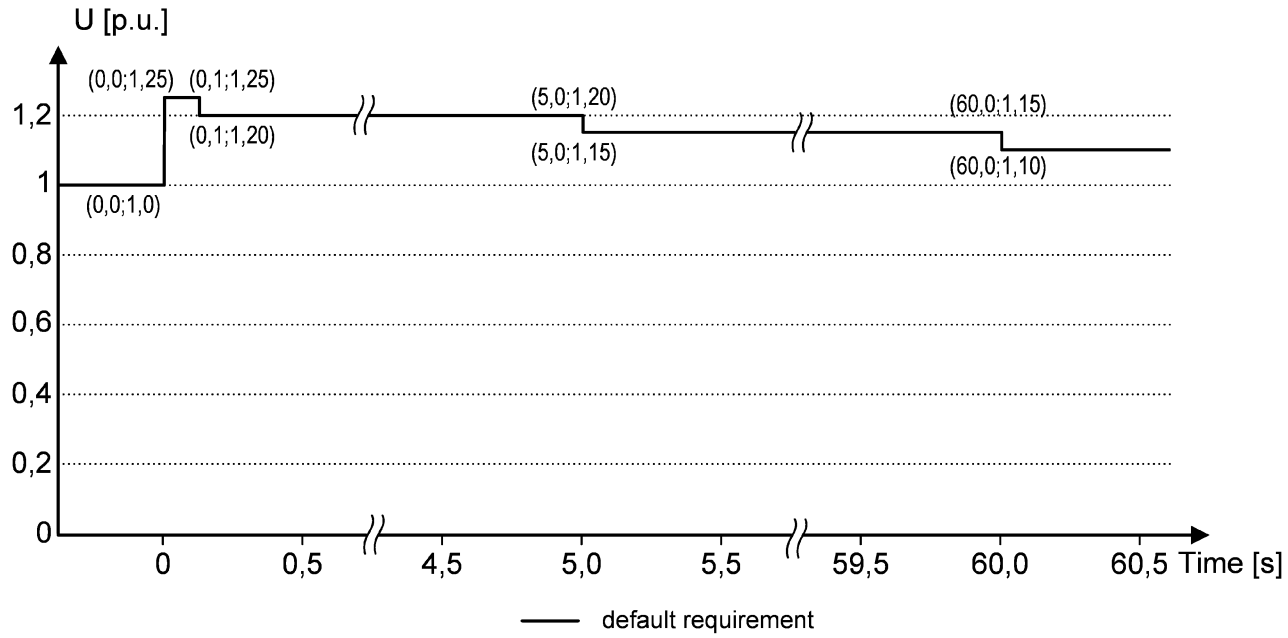

Figure 8 — Over-voltage ride through capability

This means that not only the generating units shall comply with this OVRT requirement but also all elements in a generating plant that might cause its disconnection.

Exempted from this requirement are small generating units below 50 kW of the following generation technologies: CHP, fuel cell, rotating machinery, hydro

NOTE 1 Exemption is acceptable for CHP, fuel cell, and generating units based on rotating machinery below 50 kW as EN 50465 for gas appliance requests disconnection in case of over voltage.

NOTE 2 This is a minimum requirement. Further power system stability aspects might be relevant. The technical discussion is still ongoing. A voltage jump of +10 % of Uc from any stable point of operation is considered. In case of steady-state voltages near the maximum voltage before the event, this will result in an over voltage situation for many seconds. In later editions of this document, more stringent immunity might be required."

4.2.5 Addition of subclause 4.5.5, "Phase jump immunity"

Add the following subclause:

"4.5.5 Phase jump immunity

Phase jump immunity of a power generating plant means that the generating modules in this plant stay connected with the distribution network and are able to operate during and after the occurrence of a phase jump. The generating units and all elements in the generating plant that might cause their disconnection or impact their behaviour shall have the same level of immunity.

The generating modules in a generating plant shall have phase jump immunity equal to or exceeding 20° in case of a symmetrical phase jump.

After the phase jump, 90 % of pre-fault power or available power whichever is the smallest shall be resumed as fast as possible, but at the latest within 3 s in case of synchronous generating technologies and within 1 s in case of non-synchronous generating technologies.

NOTE 1 Asymmetrical phase jumps as present in case of phase to phase faults are included in the requirement of UVRT.

NOTE 2 Generating units based on converter connected generation technology are typically immune to phase jumps up to 50°.