SLOVENSKI STANDARD
SIST EN 50549-2:2019/oprA1:2023

01-junij-2023

Zahteve za vzporedno vezavo generatorskih postrojev z razdelilnim omrežjem - 2. del: Vezava s srednjenapetostnim razdelilnim omrežjem - Generatorski postroji do vključno tipa B - Dopolnilo A1

Requirements for generating plants to be connected in parallel with distribution networks - Part 2: Connection to a MV distribution network - Generating plants up to and including Type B

Ta slovenski standard je istoveten z: **EN 50549-2:2019/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 50549-2:2019/oprA1:2023 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
EN 50549-2:2019

prA1

May 2023

ICS 29.160.20 -

English Version

Requirements for generating plants to be connected in parallel with distribution networks - Part 2: Connection to a MV 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 50549-2:2019; 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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Project: 73644 Ref. No. EN 50549-2:2019/prA1:2023 E

Contents

Page

European foreword

This document EN 50549-2:2019/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 50549-2:2019.

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 a 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:

“

3.4.9
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 Modifcation 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.

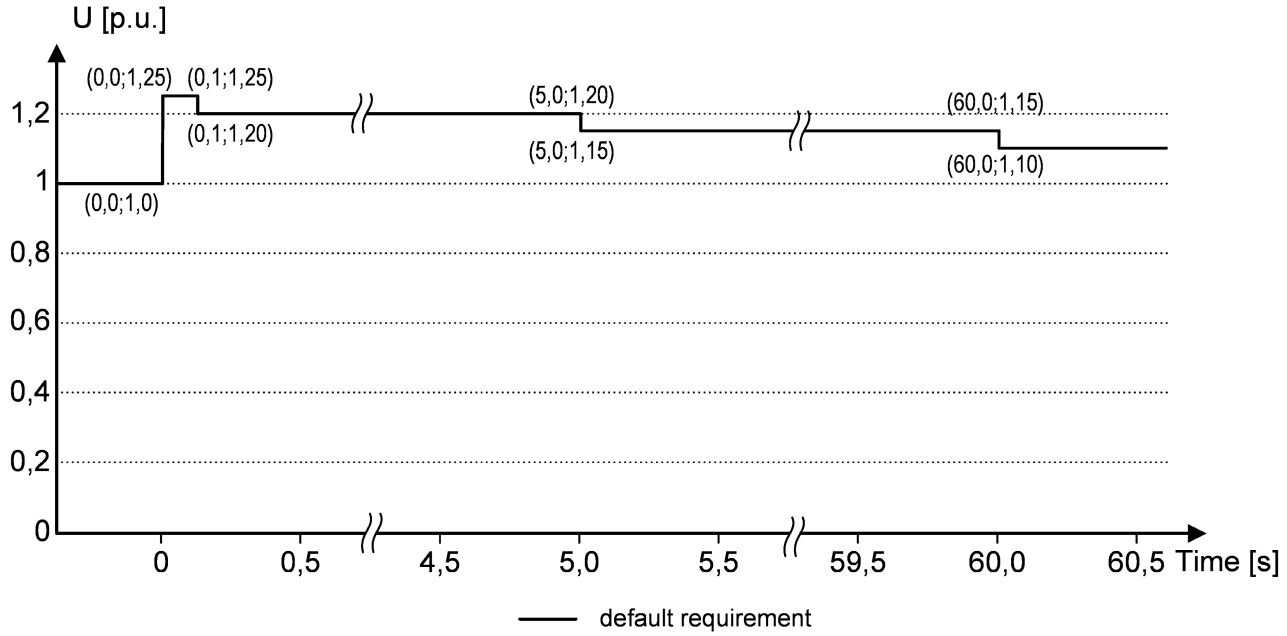

Figure 8 — Over-voltage ride through capability

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°.

NOTE 3 The 20° value is considered a state of the art immunity present for all generating technologies. System studies currently in preparation might result in the need for higher immunity levels for the next edition of this standard."

4.3 Modification to subclause 4.6, "Active response to frequency deviation"

4.3.1 Modification to subclause 4.6.1, "Power response to overfrequency"

Delete Note 3 and the paragraph above Note 3 and replace with the following:

"The generating plant shall be capable of activating active power response to overfrequency as fast as technically feasible with an intrinsic dead time that shall be as short as possible with a maximum of 2 s. An intentional delay shall be programmable to adjust the dead time to a value between the intrinsic dead time and 2 s. The response time shall be as fast as technically feasible.

EXAMPLE:

— The following response times are considered technically feasible for specific generating technologies.

— For PV and battery inverters below 1 s for ΔP of 100 % Pmax .

— For wind turbines 2 s for ΔP < 50 % Pmax.

— For combustion engines, gas turbines, fuel cells below 2 MW 66 % /min for a 100 % change.

— For combustion engines, gas turbines, fuel cells above 2 MW 20 % /min for a 100 % change.

*Delete the last paragraph that starts with "*EES units that are in charging mode …" *and ends with* "… a reduction of charging power is permitted."

Add the following:

"EES units upon reaching zero power output shall continue to follow the configured droop by switching into charging mode. EES units that are in charging mode shall increase the charging power according to the configured droop. In both cases, the minimum regulating level is considered as the maximum charging power taking the state of charge of the storage into account. In case the maximum charging capacity is reached or to prevent any other risk of injury or damage of equipment, a reduction of charging power is permitted.

NOTE 13 In this context charging is regarded as a point of operation with negative active power output.

If required by the DSO and the responsible party a mode shall be available where an EES upon reaching zero power will remain at zero power and will not switch into charging mode and an EES unit that is in charging mode shall keep the charging power constant.

DC coupled storage integrated into the DC side of a generating unit are exempted from this requirement, if they are not capable of charging from AC. These exempted units upon reaching zero power shall remain at zero power and shall not switch into charging mode."

4.4 Modification to subclause 4.7, "Power response to voltage changes"

4.4.1 Modification to subclause 4.7.2, "Voltage support by reactive power"

4.4.1.1 Modification to subclause 4.7.2.2, "Capabilities"

Replace Note 1 and the paragraph that starts with "All involved parties …" *and ends with* "… of a generating unit." *with the following:*

"

NOTE 1 The generating unit manufacturer has a certain freedom in the sizing of the output side of the generating unit in order to respond to the requirements of this document (e.g. due to voltage changes or reactive power exchange). This is indicated by the Design freedom area in Figure 12.