SLOVENSKI STANDARD
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Nadomešča:
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Zahteve za vzporedno vezavo mikro generatorjev z javnim nizkonapetostnim razdelilnim omrežjem

Requirements for the connection of micro-generators in parallel with public low-voltage distribution networks

Anforderungen für den Anschluss von Klein-Generatoren an das öffentliche Niederspannungsnetz

Prescriptions pour le raccordement de micro-générateurs en parallèle avec les réseaux publics de distribution à basse tension

Ta slovenski standard je istoveten z: **prEN 50438:2012**

ICS:
29.160.20 Generatorji Generators

oSIST prEN 50438:2012 **en**

EUROPEAN STANDARD

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Will supersede EN 50438:2007

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This draft European Standard is submitted to CENELEC members for CENELEC enquiry.
Deadline for CENELEC: 2013-01-11.

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

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

This draft European Standard was established by CENELEC in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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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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CENELEC

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

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Contents

Foreword

This document [prEN 50438:2012] has been prepared by CLC/TC 8X "System aspects of electrical energy supply".

This document is currently submitted to the Enquiry.

This document will supersede EN 50438: 2007.

prEN 50438:2012 includes the following significant technical changes with respect to EN 50438: 2007:

— introduction of a power reduction capability in case of over frequency;

— update of national protection parameters settings in the Annex A;

— modification of tests for the verification of interface protections (voltage and frequency);

— modification of the test for islanding detection;

— addition of a test for direct current injection.

1 Scope

This European Standard specifies technical requirements for connection and operation of fixed installed micro-generators and their protection devices, irrespective of the micro-generators primary source of energy, in parallel with public low-voltage distribution networks, where micro-generation refers to equipment rated up to and including 16 A per phase, single or multi phase 230/400 V or multi phase 230 V (phase-to-phase voltage).

In some countries this document may be applied to generators with higher ratings used mostly in domestic and small commercial installations. These countries are listed in Annex F.

Whenever the scope is extended to equipment rated greater than 16 A per phase additional standards could be applicable.

The electrical interface is the principal focus and this includes the method of connection, the settings and protection requirements for connection, the operation of the electrical interface under normal conditions, emergency shutdown, distribution network-independent operation, start-up and distribution network synchronisation.

The provisions of this European Standard are not intended to ensure by themselves the safety of DNO personnel or their contracted parties.

The intention of this European Standard is to ensure that the micro-generator satisfies appropriate provisions for

- the requirements of the DNO,
- information to electricians working in the electrical installation
- quality of supply.

The following aspects are included in the scope:

- all micro-generation technologies are applicable.

The following aspects are excluded from the scope:

- multiple units that for one installation, in aggregate, exceed 16 A;
- issues of revenue rebalancing, metering or other commercial matters;
- generators never working in parallel with the public low-voltage distribution network;
- requirements related to the primary energy source e.g. matters related to gas fired generator units;
- intended network independent operation.

NOTE If independent operation is intended, generally preliminary agreement of the DNO shall be obtained, however this is out of the scope of this document. Specific additional requirements most likely could be applicable.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50110 series, Operation of electrical installations

EN 50160, Voltage characteristics of electricity supplied by public distribution systems

EN 60255-1, Measuring relays and protection equipment - Part 1: Common requirements

EN 60664-1, Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests (IEC 60664-1)

EN 61000-6-1, Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments

EN 61000-6-3+A1:20072011, Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments

IEC/TR 61000-3-15, Electromagnetic compatibility (EMC) - Part 3-15: Limits - Assessment of low frequency electromagnetic immunity and emission requirements for dispersed generation systems in LV network

HD 60364 series, Low-voltage electrical installations

IEC 60364-5-55, Electrical installations of buildings – Part 5-55: Selection and erection of electrical equipment - Other equipment

3 Terms and definitions

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

3.1
cogeneration
combined heat and power (CHP)
combined generation of electricity and heat by an energy conversion system and the concurrent use of the electric and thermal energy from the conversion system

Note 1 to entry: In the context of small-scale generation this concept is sometimes referred to as “micro-CHP”.

3.2
commissioning
process of putting into operation a micro-generator, apparatus, equipment, building, or facility

3.3
decommissioning
process of removing a micro-generator, apparatus, equipment, building, or facility from operation

3.4
disconnection
separation of the active parts of the micro-generator from the network with mechanical contacts providing at least the equivalent of basic insulation

Note 1 to entry: Passive components like filters, auxiliary power supply to the micro-generator and sense lines can remain connected.

Note 2 to entry: For the design of basic insulation all voltage sources have to be considered.

3.5
LV distribution network
low voltage part of the electric power system used for the transfer of electricity within an area of consumption to consumers

3.6
distribution network operator (DNO)
natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution network in a given area and, when applicable, its interconnections with other systems and for ensuring the long term ability of the system to meet reasonable demands for the distribution of electricity (DNO equals DSO, Distribution System Operator)

3.7
droop (derived from IEV 603-04-08)
the ratio of the per-unit change in frequency $(\Delta f)/f_n$ (where f_n is the nominal frequency) to the per-unit change in power $(\Delta P)/ P_M$ (where P_M is the actual active power at the instance when the frequency reaches the frequency threshold):

$s= - (\Delta f/fn) / (\Delta P/ P_M)$

3.8
electrical installation
assembly of wiring and electrical equipment that is used within the domestic premises for the distribution and/or use of electric energy

3.9
fuel cell
electrochemical device that converts chemical energy directly into heat and electricity

3.10
inform & fit
process of installing and commissioning a micro-generator with prior notification of the DNO, followed by commencement of operation without the need of prior formal approval of the DNO

3.11
installer [1)]
person who has received sufficient training to apply safe methods of work to install a micro-generator in compliance with the requirements of this standard

3.12
interface protection
electrical protection required to ensure that the micro-generator is disconnected for any event that could impair the integrity or degrade the safety of the distribution network

3.13
islanding
situation where a section of the electricity network, containing generation, becomes physically disconnected from the rest of distribution network or user's network and one or more generators maintain a supply of electrical energy to the isolated section of the network

3.14
isolation
cut off for reasons of safety from all or a discrete section of the electrical installation by separating the electrical installation or section from every source of electrical energy

3.15
Loss of Mains (LoM) detection
function that will detect the micro-generator operating in an islanding situation

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1) Based on national regulations, other terms may apply.

3.16
low voltage (LV)
for the purpose of this standard a voltage, used for the supply of electricity, whose upper limit of nominal r.m.s. value is 1 kV

3.17
micro-generator (from 617-04-10)
source of electrical energy and all associated interface equipment able to be connected to a regular electric circuit in a low voltage electrical installation and designed to operate in parallel with a public low voltage distribution networks rated up to and including 16A per phase

3.18
nominal voltage
voltage by which a supply network is designated or identified and to which certain operating characteristics are referred

Note 1 to entry: The standard nominal voltage Un for public low voltage is Un = 230 V, either between phase and neutral, or between phases.

3.19
notification
process of informing the DNO of the commissioning of a micro-generation system, or its decommissioning

3.20
opening time of an output-break circuit (from IEV 447-05-01)
duration of the time interval between the instant when the characteristic quantity of a measuring relay in reset condition is changed, under specified conditions, and the instant when a specified output break circuit first opens

Note 1 to entry: *it is the sum of operate time and circuit breaker opening time, the latter in the range 50 ms - 70 ms for MV circuit breakers, nearly half this time for LV circuit breakers*

3.21
operate time (from IEV 447-05-05)
duration of the time interval between the instant when the characteristic quantity of a measuring relay in reset condition is changed, under specified conditions, and the instant when the relay operates

Note 1 to entry: *it includes start time, intentional delay and bounce time*

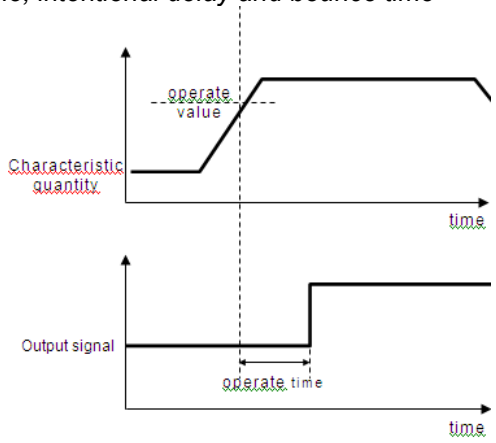

Figure 1: Explanatory diagram for Operate time

3.22
user [2)]
person with responsibility for the premises in which the micro-generator is installed, normally referred to in other documentation as the customer / consumer / network user

4 Connection requirements

4.1 The electrical installation

4.1.1 General

The unit shall be connected in compliance with HD 60364 series and the relevant national standards.

Low voltage electrical installations shall comply with national and local regulation whether the installation is supplied by generation running in parallel with the distribution network, solely by the distribution network or islanded.

In case of any hardware malfunctioning, disconnection is required by means of a galvanic break device.

4.1.2 Over-current protection

The micro-generator installation shall be protected against over-current according to HD 60364 series. When selecting the overcurrent protection within the domestic installation it is necessary to ensure correct discrimination with the DNO's protection devices.

4.1.3 Earthing

Earthing shall be according to HD 60364-5-551 and the relevant national standards.

When a micro-generator is operating in parallel with the distribution network, there shall be no direct connection between the generator winding (or pole of the primary energy source in the case of a DC sourced micro-generator) and the DNO's earth terminal. For installations where the customer provides his own earth terminal, e.g. when connected to a TT system, it is also advisable to avoid connecting the generator winding to this earth terminal. The reason for this precaution is to avoid damage to the generator during faults on the distribution network and to ensure correct operation of protective devices.

For a micro-generator which is designed to operate in parallel with a distribution network but which is connected via an inverter (e.g. a PV array or fuel cell) it is permissible to connect one pole of the DC side of the inverter to the distribution network if there is insulation between the AC and the DC sides of the inverter. In such cases the installer / Manufacturer shall take all reasonable precautions to ensure that the micro-generator unit will not impair the integrity of the distribution network and will not suffer unacceptable damage for all credible operating conditions, including faults on the distribution network.

4.2 Frequency response to overfrequency

Unless stated otherwise in Annex A the generating unit shall be capable of activating active power frequency response at a programmable frequency threshold f_1 between and including 50,2 Hz and 50,5 Hz with a programmable droop in a range of 2 % – 12 %. The droop is relative to P_M, the actual AC output power at the instance when the frequency reaches the threshold f_1. The insensitivity range of the frequency measurement shall be +/- 10 mHz or less.

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2) Based on national regulations other terms may apply.

NOTE 1 The active power droop relative to the actual power might also be defined as an active power gradient relative to the actual power. A Droop in the range of 2 % - 12% represents a gradient of 100 – 16,7% P_M /Hz

The initial intentional delay is programmable between 0 s and 2 s. When applying the frequency droop the actual frequency shall be used at any time

National settings for the threshold frequency f_1 and the droop are listed in Annex A. If no national settings are provided for a particular country, the default settings in Table 1 should be applied.

Table 1 Standard settings for frequency response to overfrequency

Parameter	Value
Threshold frequency	50,3 Hz
Droop	2,4%
Initial intentional delay	0 s

NOTE 2 The Active Power Frequency Response shall be activated as fast as technically feasible with an initial delay that shall be as short as possible and reasonably justified if greater than 2 seconds [ENTSO-E]

NOTE 3 It must be taken into account that, in case of islanding, a power reduction would correct any excess of generation leading to a generation-consumption balance. In these circumstances an islanding situation with stable frequency would take place, in which the correct behaviour of any protections based on frequency, as those mentioned in 4.3.2 and 4.3.4, would be hindered.

Generators not having the ability to reduce power over the full droop range have to activate active power frequency response as above in the controllable range of output power. Once minimum output power is reached, this power level is maintained constant. The unit has to shut off at a random frequency between the frequency threshold f_1 and 52Hz.

NOTE 4 The behaviour required for uncontrollable and partly controllable generating units will for a part of the network with many such units result in a similar droop as stated above for controllable generating units and hence will provide for the necessary system stability

NOTE 5 PV is considered to have the ability to reduce power over the full droop range.

NOTE 6 Protection setting overrules this behaviour

NOTE 7 Similar functions as response to underfrequency are under consideration

4.3 Interface protection

4.3.1 General

4.3.1.1 Introduction

The purpose of the interface protection is to ensure that the connection of a micro-generator unit will not impair the integrity or degrade the safety of the distribution network. The interface protection shall be insensitive to voltage and frequency variations in the distribution network within the voltage and frequency settings.

The interface protection, monitoring and control functions may be incorporated into the micro-generator control system, or may be fitted as discrete separate mounted devices.

4.3.1.2 Default settings versus national settings

If no national settings are provided for a particular country (Annex A), the default settings in Table 1 shall be applied.