

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**

Prescriptions relatives au raccordement de générateurs de
plus de 16A par phase - Partie 2: Connexion au réseau de
distribution MT

Anforderungen für den Anschluss von
Stromerzeugungsanlagen über 16 A je Phase - Teil 2:
Anschluss an das Mittelspannungsverteilungsnetz

This Technical Specification was approved by CENELEC on 2014-09-15.

CENELEC members are required to announce the existence of this TS in the same way as for an EN and to make the TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....	3
1 Scope	4
2 Normative references	4
3 Terms and definitions	5
4 Requirements on generating plants	15
4.1 General	15
4.2 Connection scheme	16
4.3 Choice of switchgear.....	16
4.4 Normal operating range	16
4.5 Immunity to disturbances	18
4.6 Active response to frequency deviation	21
4.7 Power response to voltage variations and voltage changes	23
4.8 EMC and power quality.....	29
4.9 Interface protection	30
4.10 Connection and starting to generate electrical power.....	35
4.11 Active power reduction on set point.....	36
4.12 Remote information exchange	37
5 Conformance test procedure.....	37
Annex A (informative) Interconnection requirements.....	38
Annex B (informative) Remote information exchange.....	40
Annex C (informative) Frequency stabilizing services	46
C.1 General.....	46
C.2 Frequency sensitive mode	46
C.3 Power system stabilization	47
C.4 Synthetic inertia	47
Annex D (informative) Loss of Mains and overall power system security.....	48
Annex E (informative) Examples of protection strategies	49
E.1 Introduction.....	49
E.1.1 General	49
E.2 Example strategy 1.....	50
E.3 Example strategy 2.....	54
Annex F (normative) Abbreviations	56
Bibliography.....	57

Foreword

This document (CLC/TS 50549-2:2015) has been prepared by CLC/TC 8X "System aspects of electrical energy supply".

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This Technical Specification relates to both future European Network Codes and current technical market needs. Its purpose is to give detailed description of functions to be implemented in products.

This Technical Specification is also intended to serve as a technical reference for the definition of national requirements where European Network Codes requirements allow flexible implementation. The stated requirements are solely technical requirements; economic issues regarding, e.g. the bearing of cost are not in the scope of this document.

CLC/TC 8X plans future standardization work, in order to ensure the compatibility of this Technical Specification with the evolution of the legal framework.

1 Scope

The purpose of this Technical Specification is to provide technical guidance on the requirements for generating plants which can be operated in parallel with a distribution network.

For practical reasons, this Technical Specification refers to the distribution system operator in case settings have to be defined and/or provided, even when these settings are to be defined and/or provided by another actor according to national and European legal framework.

NOTE 1 This includes European network codes and their national implementation, as well as further national regulations.

NOTE 2 Further national requirements especially for the connection to the distribution network and the operation of the generating plant can apply.

The requirements of this Technical Specification apply to all generating plants, electrical machinery and electronic equipment, irrespective of the kind of primary energy source and irrespective of the presence of loads in the producer's network that meet all of the following conditions:

- converting any primary energy source into AC electricity;
- connected to a MV distribution network;
- intended to operate in parallel with this distribution network under normal network operating conditions.

NOTE 3 Generating plants connected to a LV distribution network fall into the scope of EN 50438 (up to 16 A) and CLC/TS 50549-1 (above 16 A).

Unless stated differently by the DSO, a generating plant with a maximum apparent power up to 100 kVA can, as alternative to the requirements of this Technical Specification, comply with CLC/TS 50549-1. A different threshold may be defined by the DSO.

This Technical Specification defines connection requirements.

This Technical Specification recognizes the existence of National Standards, Network Codes, and specific technical requirements of the DSOs. These should be complied with.

Excluded from the scope are:

- the selection and evaluation of the point of connection;
- power system impact assessment;
- connection assessment;
- island operation of generating plants, both intentional and unintentional, where no part of the distribution network is involved;
- active front ends of drives feeding energy back into the distribution network for short duration;
- requirements for the safety of personnel as they are already adequately covered by existing European Standards.

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 60044-2, *Instrument transformers — Part 2: Inductive voltage transformers (IEC 60044-2)*

EN 60044-7, *Instrument transformers — Part 7: Electronic voltage transformers (IEC 60044-7)*

EN 60255-127, *Measuring relays and protection equipment — Part 127: Functional requirements for over/under voltage protection (IEC 60255-127)*

EN 61000-4-30, *Electromagnetic compatibility (EMC) — Part 4-30: Testing and measurement techniques — Power quality measurement methods (IEC 61000-4-30)*

EN 61869-3, *Instrument transformers — Part 3: Additional requirements for inductive voltage transformers (IEC 61869-3)*

IEC 60050, *International Electrotechnical Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050 and the following apply.

3.1

active factor

for a two-terminal element or a two-terminal circuit under sinusoidal conditions, ratio of the active power to the apparent power

Note 1 to entry: In a three phase system this is referring to the positive sequence component of the fundamental.

Note 2 to entry: The active factor is equal to the cosine of the displacement angle.

[SOURCE: IEC 131-11-49, modified]

3.2

available active power

P_A

maximum AC active power available from the prime mover subject to the availability and magnitude of the primary energy source at the relevant time

Note 1 to entry: The maximum active power considers all constraints regarding e.g. the primary energy source or the availability of a heat sink for CHP.

3.3

basic insulation

insulation of hazardous-live-parts which provides basic protection

Note 1 to entry: This concept does not apply to insulation used exclusively for functional purposes.

[SOURCE: IEC 195-06-06]

3.4

basic protection

protection against electric shock under fault-free conditions

[SOURCE: IEC 195-06-01]

3.5

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

3.6

converter connected generating technology

technology where a generating unit is connected to a distribution grid through a converter including doubly fed induction machine based technology (DFIG)