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Microgrids –
Part 2: Guidelines for operation

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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MICROGRIDS –

Part 2: Guidelines for operation

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC TS 62898-2 edition 1.1 contains the first edition (2018-09) [documents 8B/3/DTS and 8B/13B/RVDTS] and its amendment 1 (2023-11) [documents 8B/164/DTS and 8B/195/RVDTS].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62898-2, which is a technical specification, has been prepared by subcommittee 8B: Decentralized Electrical Energy Systems, of IEC technical committee 8: Systems aspects of electrical energy supply.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62898 series, published under the general title *Microgrids*, can be found on the IEC website.

The committee has decided that the contents of this document and its amendment will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The *'colour inside'* logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Microgrids can serve different purposes depending on the primary objectives of their applications. They are usually seen as means to facilitate the management of grid contingency and the local optimization of energy supply by controlling distributed energy resources (DER). Microgrids also present a way to provide electricity supply in remote areas and to use clean and renewable energy as a systemic approach for rural electrification.

IEC TS 62898 series is intended to provide with comprehensive guidelines and requirements for microgrid projects.

IEC TS 62898-1 mainly covers the following issues:

1) determination of microgrid purposes and application;
2) preliminary study necessary for microgrid planning, including resource analysis, load forecast, DER planning and power system planning;
3) principles of microgrid technical requirements that should be specified during planning stage;
4) microgrid evaluation to select an optimal microgrid planning scheme.

IEC TS 62898-2 mainly covers the following issues:

a) response characteristic requirements of microgrids under different operation modes;
b) the basic control strategies and methods under different operation modes;
c) the requirements of electrical energy storage (EES), communication and monitoring under different operation modes;
d) the principle of relay protection under different operation modes;
e) basic requirements of synchronization and reclosing during mode transfer;
f) principle for power quality, EMC, maintenance and test of microgrid.

Microgrids can be stand-alone or be the sub-system of the smart grid. The technical requirements in this document are intended to be consistent and in line with:

- system requirements from IEC System Committee Smart Energy (e.g. Use Cases “microgrid” to come);
- IEC 62786 requirements for connection of generators intended to be operated in parallel with the grid;
- basic rules from IEC TC 64 and TC 99 for safety and quality of power distribution within installations (essentially through coordination of protective devices in the different operation modes);
- IEC TS 62257 series (IEC TC 82) with respect to rural electrification;
- IEC TS 62749 with respect to power quality.

MICROGRIDS –

Part 2: Guidelines for operation

1 Scope

The purpose of this document is to provide guidelines for operation of microgrids. Microgrids considered in this document are alternating current (AC) electrical systems with loads and distributed energy resources (DER) at low or medium voltage level. This document does not cover direct current (DC) microgrids.

Microgrids are classified into isolated microgrids and non-isolated microgrids.

Isolated microgrids have no electrical connection to a larger electric power system and operate in island mode only.

Non-isolated microgrids may act as controllable units to the electric power system and can operate in the following two modes:

- grid-connected mode;
- island mode.

The 62898 series is intended to provide guidelines and the basic technical requirements to ensure the security, reliability and stability of microgrids.

IEC TS 62898-2 applies to operation and control of microgrids, including:

- operation modes and mode transfer;
- energy management system (EMS) and control of microgrids;
- communication and monitoring procedures;
- electrical energy storage;
- protection principle covering: principle for non-isolated microgrid, isolated microgrid, anti-islanding, synchronization and reclosing, power quality;
- commissioning, maintenance and test.

NOTE 1 Safety for personnel is outside the scope of this document, and such information is referred to in IEC TC 64 and TC 99 publications.

NOTE 2 Local laws and regulations can overrule the requirements of this document.

NOTE 3 The principles for main types of protections in microgrid, fault analysis for converter type and rotating machines type, protection type selection, general technical requirements, setting value principles and so forth are ~~intended to be~~ developed in IEC TS 62898-3-1[1].

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.

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1 Under preparation. Stage at the time of publication: IEC/CD TS 62898-3-1:2018.

IEC TR 61000-1-7:2016, *Electromagnetic compatibility (EMC) – Part 1-7: General – Power factor in single-phase systems under non-sinusoidal conditions*

IEC 61000-4-7:2002, *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*
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IEC 61850-5:2013, *Communication networks and systems for power utility automation – Part 5: Communication requirements for functions and device models*

IEC TS 62749:2020, *Assessment of power quality – Characteristics of electricity supplied by public networks*

IEC TS 62786:2017, *Distributed energy resources connection with the grid*

IEC TS 62898-1, *Microgrids – Part 1: Guidelines for microgrid projects planning and specification*

~~2 This 2nd edition was replaced in 2015 by a 3rd Edition.~~

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