PD IEC TS 62898-3-3:2023

BSI Standards Publication

Microgrids

Part 3-3: Technical requirements — Self-regulation of dispatchable loads

bsi.

National foreword

This Published Document is the UK implementation of IEC TS 62898-3-3:2023.

The UK participation in its preparation was entrusted to Technical Committee GEL/8, Systems Aspects for Electrical Energy Supply.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication is not to be regarded as a British Standard.

Published by BSI Standards Limited 2023

ISBN 978 0 539 00402 1

ICS 29.240.01

Compliance with a Published Document cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 August 2023.

Amendments/corrigenda issued since publication

Date	Text affected

IEC TS 62898-3-3

Edition 1.0 2023-08

TECHNICAL SPECIFICATION

colour inside

Microgrids –
Part 3-3: Technical requirements – Self-regulation for dispatchable loads

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 29.240.01

ISBN 978-2-8322-7336-4

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

MICROGRIDS –

Part 3-3: Technical requirements – Self-regulation of dispatchable loads

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.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TS 62898-3-3 has been prepared by subcommittee SC 8B: Decentralized electrical energy systems, of IEC technical committee TC 8: System aspects of electrical energy supply. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
8B/155/DTS	8B/172/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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 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 document 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

Self-regulation of loads is a phenomenon known very well to transmission system operators, see Annex A. This effect historically emerged from the dynamic behaviour of electric motors that were used to directly power mechanical drivetrains, for example for pumps or air blowers. The higher the rotational speed of the drive, the more active power is used and vice versa. This effect automatically contributes to frequency stabilization without a supervisory control.

There is also a self-regulation effect on the voltage due to resistive loads. At higher voltages, the current through a resistive load increases and therefore the active power consumption increases as well. This increased current also flows through the impedance of the upstream supply network, resulting in a voltage reduction at the load's point of connection and vice versa. This effect helps to stabilise the voltage and is also used indirectly with power system stabilisers (PSS). Modulated system voltage at transmission level is translated to corresponding changes of active power consumption of loads at distribution level which dampen low frequency power oscillations.

This document intends to emulate the above explained beneficial behaviours with dispatchable loads, which do not affect the functionality with regard to the end user, and to make this effect available for frequency and voltage stabilization in microgrids. Dispatchable loads can modify the active power consumption while maintaining their functionality by keeping system parameters within acceptable ranges. This is usually achieved by the use of an internal energy storage, for example thermal energy storage in refrigerators, freezers, air conditioners, water heaters, or electrical energy storage units such as batteries. As the loads respond to the frequency and voltage they experience, no communication channels or complex control systems are necessary to include small loads in the common task of keeping the electric system stable.

MICROGRIDS –

Part 3-3: Technical requirements – Self-regulation of dispatchable loads

1 Scope

This part of IEC 62898 deals with frequency and voltage stabilization of AC microgrids by dispatchable loads, which react autonomously on variations of frequency and voltage with a change in active power consumption. Both 50 Hz and 60 Hz electric power systems are covered. This document gives requirements to emulate the self-regulation effect of loads including synthetic inertia.

The loads recommended for this approach are noncritical loads, this means their power modulation will not significantly affect the user as some kind of energy storage is involved which effectively decouples end energy use from the electricity supply by the electric network. The self-regulation of loads is beneficial both in island mode and grid connected mode. This document gives the details of the self-regulation behaviour but does not stipulate which loads shall participate in this approach as an optional function.

This document covers both continuously controllable loads with droop control and ON/OFF-switchable loads with staged settings. The scope of this document is limited to loads connected to the voltage level up to 35 kV. Reactive power for voltage stabilization and DC microgrids are excluded in this document.

NOTE 1 If agreed between system operator and grid user, the self-regulating principles outlined in this document can also be applied to loads in other electricity networks, see IEC/ISO Directives, Part 1:2023, C.4.3.2, Example 1.

NOTE 2 According to 3.1.7, critical loads with an electrical energy storage system such as an uninterruptable power supply are considered as noncritical and therefore dispatchable.

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.

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

3 Terms, definitions, abbreviated terms and symbols

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp