SVENSK STANDARD SS-EN IEC 62439-3

Fastställd	Utgåva	Sida	Ansvarig kommitté
2018-04-11	3	1 (1+170)	SEK TK 65

Industriell processtyrning – Nät med hög driftsäkerhet – Del 3: Parallel Redundancy Protocol (PRP) och High-availability Seamless Redundancy (HSR)

Industrial communication networks –
High availability automation networks –
Part 3: Parallel Redundancy Protocol (PRP) and
High-availability Seamless Redundancy (HSR)

Som svensk standard gäller europastandarden EN IEC 62439-3:2018. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 62439-3:2018.

Nationellt förord

Europastandarden EN IEC 62439-3:2018

består av:

- **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC
- **IEC 62439-3, Third edition, 2016 - Industrial communication networks - High availability automation networks - Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)**

utarbetad inom International Electrotechnical Commission, IEC.

EN från CENELEC som är identiska med motsvarande IEC-standarder och som görs tillgängliga för nationalkommittéerna efter den 1 januari 2018 får en beteckning som inleds med EN IEC istället för som tidigare bara EN.

Tidigare fastställd svensk standard SS-EN 62439-3, utgåva 2, 2012, gäller ej fr o m 2021-02-02.

ICS 25.040.00; 35.040.00

Denna standard är fastställd av SEK Svensk Elstandard,
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Postadress: Box 1284, 164 29 KISTA
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Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

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Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

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Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 62439-3

February 2018

ICS 25.040; 35.040

Supersedes EN 62439-3:2012

English Version

Industrial communication networks - High availability automation networks - Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR) (IEC 62439-3:2016)

Réseaux industriels de communication - Réseaux d'automatisme à haute disponibilité - Partie 3 : Protocole de redondance parallèle (PRP) et redondance transparente de haute disponibilité (HSR) (IEC 62439-3:2016)

Industrielle Kommunikationsnetze - Hochverfügbare Automatisierungsnetze - Teil 3: Parallelredundanz-Protokoll (PRP) und nahtloser Hochverfügbarkeits-Ring (HSR) (IEC 62439-3:2016)

This European Standard was approved by CENELEC on 2016-05-05. 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.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists 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.

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

CENELEC

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 62439-3:2017 E

European foreword

The text of document 65C/834/FDIS, future edition 3 of IEC 62439-3, prepared by IEC Subcommittee 65C "Industrial networks", of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62439-3:2018.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2018-08-02
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2021-02-02

This document supersedes EN 62439-3:2012.

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

Endorsement notice

The text of the International Standard IEC 62439-3:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61850 (all parts)	NOTE	Harmonized as EN 61850 (all parts).
IEC 61850-8-1	NOTE	Harmonized as EN 61850-8-1 (not modified).
IEC 61850-9-2	NOTE	Harmonized as EN 61850-9-2 (not modified).
IEC 62439-6	NOTE	Harmonized as EN 62439-6 (not modified).
IEC 62439-7	NOTE	Harmonized as EN 62439-7 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60050-191	-	International Electrotechnical Vocabulary - Chapter 191: Dependability and quality of service	-	-
IEC 61588	2009	Precision clock synchronization protocol for networked measurement and control systems	-	-
IEC 62439-1	-	Industrial communication networks - High availability automation networks -- Part 1: General concepts and calculation methods	EN 62439-1	-
IEC TR 61850-90-4	2013	Communication networks and systems for power utility automation - Part 90-4: Network engineering guidelines	-	-
ISO/IEC/IEEE 8802-3	2014	Standard for Ethernet	-	-
IEC/IEEE 61850-9-3	-	Communication networks and systems for power utility automation - Part 9-3: Precision time protocol profile for power utility automation	-	-
IEEE 802.1D	2004	IEEE Standard for local and metropolitan area networks - Media Access Control (MAC) Bridges	-	-
IEEE 802.1Q	2014	IEEE Standard for Local and metropolitan area networks - Bridges and Bridged Networks	-	-
IETF RFC 2578	-	Structure of Management Information Version 2 (SMIv2), April 1999, http://tools.ietf.org/html/rfc2578	-	-
IETF RFC 3418	-	Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)	-	-

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

INDUSTRIAL COMMUNICATION NETWORKS – HIGH AVAILABILITY AUTOMATION NETWORKS –

Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)

FOREWORD

International Standard IEC 62439-3 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This third edition cancels and replaces the second edition published in 2012. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) technical corrections and extension of specifications;

b) consideration of IEC 61588 clock synchronization with end-to-end delay measurement alongside the existing peer-to-peer delay measurement in PRP.

The text of this standard is based on the following documents:

FDIS	Report on voting
65C/834/FDIS	65C/841/RVD

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

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

This International Standard is to be read in conjunction with IEC 62439-1.

A list of all parts in the IEC 62439 series, published under the general title *Industrial communication networks – High availability automation networks*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication 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 publication using a colour printer.

INTRODUCTION

0.1 General

IEC 62439-3 belongs to the IEC 62439 series *“Industrial communication networks – High availability automation networks”*. It specifies the PRP and HSR seamless redundancy protocols. It was adopted by IEC TC57 WG10 as the redundancy method for demanding substation automation networks operating on layer 2 networks, according to IEC 61850-8-1 and IEC 61850-9-2.

The seamless redundancy principle has been extended to clocks operating according to the Precision Time Protocol (IEC 61588) and attached to redundant networks. Two variants are specified: L3E2E for clocks which operate on layer 3 networks with end-to-end link delay measurement (E2E) and L2P2P for clocks that operate on layer 2 with peer-to-peer link delay measurement (P2P).

0.2 Changes with respect to the previous edition

The major changes with respect to IEC 62439-3:2012 are:

– Subclause 4.1.10.3 has been rewritten to explain the calculation of the duplicate rejection for different speeds.
– Annex A has been redrafted as a general concept for doubly attached clocks applicable to end-to-end (E2E) and to peer-to-peer (P2P) link delay measurement; the principle of paired port operation has now been specified in terms of a state machine based on IEC 61588:2009.
– Annex B of IEC 62439-3:2012 has been deleted; its properties are mentioned in 5.3.7.
– Annex B (new) makes the support of redundancy mandatory for IEC/IEEE 61850-9-3 that specifies doubly attached clocks on layer 2, with peer-to-peer delay measurement.
– Annex C specifies two profiles of a precision clock for industrial automation:
  L3E2E for layer 3, end-to-end delay measurement and
  L2P2P for layer 2, peer-to-peer delay measurement.
– Annex D contains the tutorial information on IEC 61588:2009 for understanding the above annexes. It was contained in IEC 62439-3:2012 Annex A.
– Annex E (MIB) contains the SNMP Management Information Base to be used for singly and doubly attached clocks in all profiles.

0.3 Patent declaration

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning filtering of redundant frames in a network node (Siemens Aktiengesellschaft – EP 2127329, US 8184650, CN 101611615B) given in 5.2.3.3.

IEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured the IEC that he/she is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from:

Siemens Aktiengesellschaft
Oto-Hahn-Ring 6
81379 Munich, Germany

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning

Reception of redundant and non-redundant frames (ABB Research Ltd – EP 1825657, US 8582426, CN 101057483, IN 254425) given in 4.2.7, concerning Identifying improper cabling of devices (ABB Technology AG – EP 2163024, US 8344736, CN 101689985) given in 4.3, concerning Critical device with increased availability (ABB Research Ltd – EP 2090950) given in 4.4, concerning Ring coupling nodes for high availability networks (ABB Research Ltd – US 8582424, EP 2327185, CN 102106121) given in 5.2.3.

IEC takes no position concerning the evidence, validity and scope of these patent rights.

The holder of these patent rights has assured the IEC that he/she is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of these patent rights is registered with IEC. Information may be obtained from:

ABB Schweiz AG
Intellectual Property CH-IP (CH-150016-L)
Brown Boveri Strasse 6
CH-5400 Baden, Switzerland
ch-ip.patent@abb.com

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

ISO (www.iso.org/patents) and IEC (http://patents.iec.ch) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

INDUSTRIAL COMMUNICATION NETWORKS – HIGH AVAILABILITY AUTOMATION NETWORKS –

Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)

1 Scope

The IEC 62439 series is applicable to high-availability automation networks based on the Ethernet technology.

This part of IEC 62439 specifies two redundancy protocols designed to provide seamless recovery in case of single failure of an inter-bridge link or bridge in the network, which are based on the same scheme: parallel transmission of duplicated information.

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.

IEC 60050-191, *International Electrotechnical Vocabulary – Chapter 191: Dependability and quality of service*

IEC 61588:2009, *Precision clock synchronization protocol for networked measurement and control systems*

IEC TR 61850-90-4:2013, *Communication networks and systems for power utility automation – Part 90-4: Network engineering guidelines*

IEC 62439-1, *Industrial communication networks – High availability automation networks – Part 1: General concepts and calculation methods*

IEC/IEEE 61850-9-3:—, *Communication networks and systems for power utility automation - Part 9-3: Precision time protocol profile for power utility automation (proposed IEC 61850-9-3)*[1]

ISO/IEC/IEEE 8802-3:2014, *Standard for Ethernet*

IEEE 802.1D:2004, *IEEE Standard for Local and metropolitan area networks – Media Access Control (MAC) Bridges*

IEEE 802.1Q:2014, *IEEE Standard for Local and metropolitan area networks – Media Access Control (MAC) Bridges and Virtual Bridge Local Area Network*

IETF RFC 2578, *Structure of Management Information Version 2 (SMIv2)*

———————

1 To be published.

IETF RFC 3418, *Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)*