# Industrial communication networks - High availability automation networks - Part 6: Distributed Redundancy Protocol (DRP)

EESTI STANDARDIKESKUS
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## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

| | |
|---|---|
| Käesolev Eesti standard EVS-EN 62439-6:2010 sisaldab Euroopa standardi EN 62439-6:2010 ingliskeelset teksti. | This Estonian standard EVS-EN 62439-6:2010 consists of the English text of the European standard EN 62439-6:2010. |
| Standard on kinnitatud Eesti Standardikeskuse 30.04.2010 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas. | This standard is ratified with the order of Estonian Centre for Standardisation dated 30.04.2010 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation. |
| Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 19.03.2010. | Date of Availability of the European standard text 19.03.2010. |
| Standard on kättesaadav Eesti standardiorganisatsioonist. | The standard is available from Estonian standardisation organisation. |



**ICS** 25.040, 35.040

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 62439-6

March 2010

ICS 25.040; 35.040

Supersedes EN 62439:2008 (partially)

English version

# Industrial communication networks - High availability automation networks - Part 6: Distributed Redundancy Protocol (DRP)

(IEC 62439-6:2010)

Réseaux de communication industrielle - Réseaux d'automatisme à haute disponibilité - Partie 6 :Protocole de redondance distribuée (DRP) (CEI 62439-6:2010)

Industrielle Kommunikationsnetze - Hochverfügbare Automatisierungsnetze - Teil 6: Protokoll für verteilte Redundanz (DRP) (IEC 62439-6:2010)



This European Standard was approved by CENELEC on 2010-03-01. 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 Central Secretariat 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 Central Secretariat 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

**Central Secretariat: Avenue Marnix 17, B - 1000 Brussels**



Ref. No. EN 62439-6:2010 E

## Foreword

The text of document 65C/583/FDIS, future edition 1 of IEC 62439-6, prepared by SC 65C, Industrial networks, of IEC TC 65, Industrial-process measurement, control and automation, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62439-6 on 2010-03-01.

This EN 62439-6 together with EN 62439-1, EN 62439-2, EN 62439-3, EN 62439-4 and EN 62439-5 supersedes EN 62439:2008.

EN 62439-6:2010 includes the following significant technical changes with respect to EN 62439:2008:

– adding a calculation method for RSTP (rapid spanning tree protocol, IEEE 802.1Q),

– adding two new redundancy protocols: HSR (High-availability Seamless Redundancy) and DRP (Distributed Redundancy Protocol),

– moving former Clauses 1 to 4 (introduction, definitions, general aspects) and the Annexes (taxonomy, availability calculation) to EN 62439-1, which serves now as a base for the other documents,

– moving Clause 5 (MRP) to EN 62439-2 with minor editorial changes,

– moving Clause 6 (PRP) was to EN 62439-3 with minor editorial changes,

– moving Clause 7 (CRP) was to EN 62439-4 with minor editorial changes, and

– moving Clause 8 (BRP) was to EN 62439-5 with minor editorial changes,

– adding a method to calculate the maximum recovery time of RSTP in a restricted configuration (ring) to EN 62439-1 as Clause 8,

– adding specifications of the HSR (High-availability Seamless Redundancy) protocol, which shares the principles of PRP to EN 62439-3 as Clause 5, and

– introducing the DRP protocol as EN 62439-6.

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

The following dates were fixed:

| | | |
|---|---|---|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2010-12-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2013-03-01 |

Annex ZA has been added by CENELEC.

## Endorsement notice

The text of the International Standard IEC 62439-6:2010 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:

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|---|---|---|
| IEC 62439-2 | NOTE | Harmonized as EN 62439-2. |
| IEC 62439-3 | NOTE | Harmonized as EN 62439-3. |
| IEC 62439-4 | NOTE | Harmonized as EN 62439-4. |
| IEC 62439-5 | NOTE | Harmonized as EN 62439-5. |

## Annex ZA
(normative)

## Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC 60050-191 | - | International Electrotechnical Vocabulary (IEV) - Chapter 191: Dependability and quality of service | - | - |
| IEC 61158 | Series | Fieldbus standard for use in industrial control systems | EN 61158 | Series |
| IEC 61588 | 2009 | Precision clock synchronization protocol for networked measurement and control systems | - | - |
| IEC 62439-1 | 2010 | Industrial communication networks - High availability automation networks - Part 1: General concepts and calculation methods | EN 62439-1 | 2010 |
| ISO/IEC/TR 8802-1 | - | Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 1: Overview of Local Area Network Standards | - | - |
| ISO/IEC 8802-3 | 2000 | Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications | - | - |
| IEEE 802.1D | 2004 | IEEE Standard for Local and Metropoitan Area Networks - Media Access Control (MAC) Bridges | - | - |
| IEEE 802.1Q | - | IEEE Standard for Local and Metropolitan Area Networks - Virtual Bridged Local Area Networks | - | - |

# CONTENTS

# INTRODUCTION

The IEC 62439 series specifies relevant principles for high availability networks that meet the requirements for industrial automation networks.

In the fault-free state of the network, the protocols of the IEC 62439 series provide ISO/IEC 8802-3 (IEEE 802.3) compatible, reliable data communication, and preserve determinism of real-time data communication. In cases of fault, removal, and insertion of a component, they provide deterministic recovery times.

These protocols retain fully the typical Ethernet communication capabilities as used in the office world, so that the software involved remains applicable.

The market is in need of several network solutions, each with different performance characteristics and functional capabilities, matching diverse application requirements. These solutions support different redundancy topologies and mechanisms which are introduced in IEC 62439-1 and specified in the other Parts of the IEC 62439 series. IEC 62439-1 also distinguishes between the different solutions, giving guidance to the user.

The IEC 62439 series follows the general structure and terms of IEC 61158 series.

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 about the communication procedure and fault detection and recovery for DRP given in 5.2 and 5.3.

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 either free of charge or 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:

SUPCON Group Co., Ltd & Zhejiang University
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ISO (www.iso.org/patents) and IEC (http://www.iec.ch/tctools/patent_decl.htm) 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 6: Distributed Redundancy Protocol (DRP)

## 1 Scope

The IEC 62439 series is applicable to high-availability automation networks based on the ISO/IEC 8802-3 (IEEE 802.3) (Ethernet) technology.

This part of the IEC 62439 series specifies a recovery protocol based on a ring topology, designed to react deterministically on a single failure of an inter-switch link or switch in the network. Each switch has equal management role in the network. Double rings are supported.

## 2 Normative references

The following referenced documents are indispensable for the application 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.

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

IEC 61158 (all parts), *Industrial communication networks – Fieldbus specifications*

IEC 61588:2009, *Precision clock synchronization protocol for networked measurement and control systems* (IEEE 1588)

IEC 62439-1:2010, *Industrial communication networks – High availability automation networks – Part 1: General concepts and calculation methods*

ISO/IEC/TR 8802-1, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 1: Overview of Local Area Network Standards Technologies de* (IEEE 802.1)

ISO/IEC 8802-3:2000, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

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

IEEE 802.1Q, *IEEE standards for local and metropolitan area network. Virtual bridged local area networks*

## 3 Terms, definitions, abbreviations, acronyms, and conventions

### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-191, as well as in IEC 62439-1, apply, in addition to the following.