

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

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

**Réseaux industriels de communication – Réseaux d'automatisme à haute  
disponibilité –  
Partie 3: Protocole de redondance parallèle (PRP) et redondance transparente de  
haute disponibilité (HSR)**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –  
HIGH AVAILABILITY AUTOMATION NETWORKS –****Part 3: Parallel Redundancy Protocol (PRP) and  
High-availability Seamless Redundancy (HSR)**

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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 second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision. The main changes with respect to the previous edition are listed below:

- specification of the interconnection of PRP and HSR networks;
- introduction of a suffix for PRP frames;
- clarification and modification of specifications to ensure interoperability;
- slackening of the specifications to allow different implementations;
- consideration of clock synchronization according to IEC 61588;
- introduction of test modes to simplify testing and maintenance.

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

FDIS	Report on voting
65C/687/FDIS	65C/705/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 International Standard is to be read in conjunction with IEC 62439-1:2011.

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

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

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- withdrawn,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.

Withdrawn

## 0 INTRODUCTION

### 0.1 General

IEC 62439-3 standard belongs to IEC 62439 series, *Industrial communication networks – High availability automation networks*, specifying the HSR and PRP redundancy protocols, and was adopted by TC57 WG10 as the redundancy method for demanding substation automation networks based on IEC 61850 series, introducing new requirements.

### 0.2 Changes with respect to the previous edition

The major changes with respect to IEC 62439-3:2010 are listed below.

Aligning the sequence number between PRP and HSR, to enable coupling of HSR and PRP networks and simplify the implementation of dual-mode nodes in hardware. At the same time, introduce a suffix in the PRP Redundancy Control Trailer to allow better identification, future extensions and coexistence with other protocols that also happen to use a trailer. This change is not backwards-compatible, so means are provided to identify the version and ensure that the networks are homogeneous.

Removing all implementation restrictions on the Duplicate Discard algorithm (especially references to the drop window algorithm and references to connection orientation) since other methods such as hash tables can be used.

Removing the purging of the duplicate table. Replace this specific method by requiring that any Duplicate Discard algorithm provides a mechanism to remove old entries, thus ensuring that a node can properly reboot.

Making node tables optional for simple nodes to simplify hardware implementation.

Suppression of explicit mention of the HSR-PRP mode (PRP with HSR Tags), but allow it through the Mode N (no forwarding).

Introducing Mode T (forward through) to allow maintenance laptops to configure an open ring when attached to one end and Mode M (mixed) to allow forwarding of non-HSR-tagged frames in a closed ring.

Recommending the position of connectors, rather than impose it.

Defining the behaviour of an HSR node when non-HSR frames are encountered without requiring the recording of the source addresses and specify how IEEE 802.1D:2004, Table 7-10 frames are treated.

Prefixing the supervision frames on HSR by an HSR tag to simplify the hardware implementation and introduce a unique EtherType for HSR to simplify processing.

Changing the rule for the RedBox to allow more than one PRP network to be connected to an HSR ring, and introduce an identifier per RedBox pair.

Specifying tagging of IEC 61588 frames to follow IEEE C37.238 recommendations (informal).

Suppressing MAC address substitution.

Adapting the MIB to above changes.