SLOVENSKI STANDARD
SIST EN 50170:2001/A1:2003

01-december-2003

General purpose field communication system - Amendment A1/Note: Includes Corrigendum of August 2002

General purpose field communication system

Ta slovenski standard je istoveten z: EN 50170:1996/A1:2002

ICS:

35.100.01	Medsebojno povezovanje odprtih sistemov na splošno	Open systems interconnection in general
35.200	Vmesniška in povezovalna oprema	Interface and interconnection equipment

SIST EN 50170:2001/A1:2003   **en**

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50170/A1

Volume 4

May 2002

ICS 35.100.00; 35.200

English version

General purpose field communication system

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This amendment A1 modifies the European Standard EN 50170:1996; it was approved by CENELEC on 2000-04-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment 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 amendment exists in one official version (English). 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 50170:1996/A1:2002 E

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Foreword

This amendment has been prepared by the British National Committee following acceptance by technical committee CLC/TC 65CX Fieldbus at its meeting in London on 1996-09-27 that the British Pre-standard DD 238:1996 Fieldbus met the candidate criteria for inclusion within EN 50170 (see the paragraph headed 'Solutions' in clause 2.1 of EN 50170-0-1:1996).

The amendment is limited to:
- necessary editorial alterations to the published text
- new text relating to the inclusion (as A1 Volume 4) of BSI DD 238.

The following changes were made as a result of comments submitted during the first (1997) UAP ballot:
- References to unpublished documents (for example to IEC 61158-2/Amendment 3) have been replaced by the appropriate texts.
- References to IEC 61158 Application Layer CDV drafts have been replaced by references to the resulting IEC Technical Specifications. For completeness, the TSs have been included as Parts 8 and 9.
- Where appropriate cross-references to IEC 61158 have been made more precise.

The text of the draft was submitted to the formal vote and was approved by CENELEC as amendment A1 to EN 50170:1996 on 2000-04-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented   (dop)   2002-11-01
  at a national level by the publication of an identical
  national standard or by endorsement

- latest date by which the national standards conflicting   (dow)   2003-04-01
  with the amendment have to be withdrawn

Structure of the document and overall table of contents

In paragraph 1, lines 1 and 3, delete 'three' and substitute 'four'.

In paragraph 1, lines 3 and 4, delete 'P-NET, PROFIBUS and WorldFIP' and substitute 'P-NET, PROFIBUS, WorldFIP and DD 238 Foundation Fieldbus'.

In paragraph 2, line 2, delete 'three' and substitute 'four'.

Add, after the list of the contents of volume 3, the following text.

'A1 Volume 4 contains:

Part 1-4 (Informative) General description of EN 50170/A1 Volume 4
        (DD 238 Foundation Fieldbus)
Part 2-4 Physical layer specification and service definitions
Part 3-4 Data link layer service definitions
Part 4-4 Data link layer protocol specifications
Part 5-4 Application layer service definitions
Part 6-4 Application layer protocol specifications
Part 7-4 Network management
        Sub-part 7.1-4 System Management
        Sub-part 7.2-4 Network Management'
Part 8-4 IEC/TS 61158-3:1999 Data Link layer service definition
Part 9-4 IEC/TS 61158-4:1999 Data Link layer protocol specification

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Current situation in the European market
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In paragraph 4, line 1, delete 'three' and substitute 'four'.

EN 50170 objective https://standards.iteh.ai/catalog/standards/sist/cb388d06-f9b6-432e-909b-
                       aa3f36d013c1/sist-en-50170-2001-a1-2003
In paragraph 1, indent 2, line 1, delete 'three' and substitute 'four'.

Usage of EN 50170

Delete paragraph 1 entirely and substitute the following new paragraph.

'According to the history and the decision of TC 65CX neither to develop any new compromise nor to re-write the actual concepts on the market, the reader should pay his dedicated
ATTENTION
to the following notes:

   -*"EN 50170 contains the four following different specifications, without attempting to develop any compromise or to mix them, as per the PAS principles:*
        EN 50170 volume 1 (based on and technically identical to DK 502058 and DK 502066)
        EN 50170 volume 2 (based on and technically identical to DIN 19245 series
        EN 50170 volume 3 (based on and technically identical to NF C 46602, NF C 46603, NF C 46605, NF C 46606, NF C 46606/A1, NF C 46607, NF C 46607/A1, EN 61158-2)
        EN 50170/A1 volume 4 (based on and technically identical to BSI DD 238 series, EN 61158-2, IEC/FDIS 61158-3, IEC/FDIS 61158-4)
   The concepts of these four specifications are different. For each implementation, the user has to select the volume of EN 50170 which suits the user's application needs.'

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Part 0-1 Introduction

Contents

Add the title of clause 6 as follows:
'6 MAIN FEATURES OF EN 50170/A1 VOLUME 4 (DD 238 FOUNDATION FIELDBUS)'

5 Main features of EN 50170, Volume 3 (WorldFIP)

Add, at the end of clause 5, the following new clause 6.

'6 Main features of EN 50170/A1 Volume 4 (DD 238 Foundation Fieldbus)

EN 50170/A1 Volume 4 (DD 238) has been originally developed by the Fieldbus Foundation, an open organisation supported by a world-wide consensus of industry suppliers for process control equipment and factory automation equipment.

Responding to strong international user demand, the Foundation has based its specifications on the work of the IEC, and Foundation members also contribute to the IEC committee work.

Following strong requests from user companies in UK, BSI has adopted the Fieldbus Foundation specifications as DD 238 and made it available to CENELEC.

Technically the DD 238 Foundation Fieldbus specification is based on published and draft international standards prepared by the IEC Fieldbus committee IEC/SC 65C.

EN 50170/A1 Volume 4 has been published as a British pre-standard (known as DD 238 Fieldbus) in 8 parts comprising the following main features:

DD 238: Part 1:1996 is an **informative Introductory Guide to System Architecture**. It describes how the components specified in other parts of DD 238 may be related and configured to construct and support DD 238 Fieldbus devices, Networks and Systems. It is technically equivalent to Fieldbus Foundation specification FF-800 revision 1.3

DD 238: Part 2:1996 is a **Physical Layer** profile using the EN 61158-2 specification for 31,25 kbit/s operation. Features of particular importance are:
−   Power can be supplied directly to field devices through the bus signal conductors.
−   Intrinsically safe (IS) fieldbus applications can be supported using bus powered devices and IS barriers.
−   Wiring installed for 4-20 mA devices may also be used for the DD 238 Foundation Fieldbus.

Part 2 is technically equivalent to Fieldbus Foundation specification FF 816 revision 1.3

DD 238: Part 3:1996 is a **Data Link Services Specification** using the IEC/FDIS 61158-3. It is technically equivalent to Fieldbus Foundation specification FF-821 revision 1.3

DD 238: Part 4:1996 is a **Data Link Protocol Specification** using the IEC/FDIS 61158-4. It is technically equivalent to Fieldbus Foundation specification FF-822 revision 1.3

The IEC data link specification has been chosen because it combines the best features of other existing protocols and adds a number of important new service features to support modern application requirements. These include:
−   An integrated access control method combining the token passing approach of PROFIBUS (volume 2), and the time-critical approach of WorldFIP (volume 3) with migration paths from existing applications using these protocols.

- Services needed to support multiple data models with particular features for Client/Server, Publisher/Subscriber and Report Distributor as implemented in DD 238: Part 5.
- Multi-segment addressing to support small and large networks assembled from multiple DD 238 fieldbus segments.
- Tools for accurate time distribution and synchronisation across multi-segment systems.
- Automatic backup capability to continue schedule operation if the current bus master fails.
- On line support for flexible and time critical scheduling including construction and revision.
- On line support for device detection, recognition and configuration.

DD 238: Part 5:1996 is a **Fieldbus Access Sub-layer** building on IEC data link services to provide the needed data models for modern automation systems.
- Client/Server. This is the model used by pairs of application entities using one-to-one communications, for example, a traditional master station issuing confirmed requests and commands to a slave.
- Publisher/Subscriber. This is the model to support efficient simultaneous transfer of data from one data-source (publisher) to multiple data-sinks (subscribers) using retentive buffers.
- Report Distributor. This model supports multi-cast (one source to many sinks) queued and prioritised communication for efficient transfer of messages and data without immediate confirmation.
Part 5 is technically equivalent to Fieldbus Foundation specification FF-875 revision 1.3

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DD 238: Part 6:1996 is a **Foundation Fieldbus Message Specification (FFMS)** defining communication objects and standard services to support user applications such as function blocks. The main service categories include Context Management, Object Dictionary, Variable Access, Event Services, Upload/Download and Program Invocation. Messages are formatted using the Abstract Syntax Notation ASN1.
Part 6 is technically equivalent to Fieldbus Foundation specification FF-870 revision 1.3.

DD 238: Part 7:1996 **Fieldbus Management** is specified in two parts, sub-part 7.1 System Management and sub-part 7.2 Network Management, which are technically equivalent to Fieldbus Foundation specifications FF-880 revision 1.0 and FF-801 revision 1.3.

The **System Management** Kernel in each device maintains the information base for distributed inter-operation of device applications. This includes a secure configuration sequence at start-up with assignment of data link address based on unique manufacturer assigned codes and user assigned tag names. Procedures are included for recognising and supporting temporary devices such as Hand Held Terminals and Workstations. System management also provides scheduling services for user applications and a common application time reference among all devices to ensure that user tasks and function blocks can execute in the proper time relationship across the network.

The **Network Management** agent supports vertical integration of Fieldbus layers by providing capabilities for configuration management, performance management and fault management. These capabilities are accessed by the same services as other device applications, they do not use a specialised management protocol.'

Data Link layer
For completeness, the following documents are included as Parts 8 and 9 respectively:
IEC/TS 61158-3:1999 Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 3: Data link service definition.

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IEC/TS 61158-4:1999 Digital data communications for measurement and control - Fieldbus for use in industrial control systems - Part 4: Data link protocol specification'

Volume 3

Add, at the end of volume 3, the following new A1 volume 4.

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General Purpose Field Communication System

Part 1-4

General Description of EN 50170/A1 Volume 4

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General information on licensing

CENELEC calls attention to the fact that patent rights are linked to EN 50170 Amendment 1 (Foundation Fieldbus). CENELEC takes no position concerning the evidence, validity and scope of this patent right. The following release of rights was made available to CENELEC. This release of rights for EN 50170/A1 contains the following statement (extract):

"… Rosemount Inc. is willing to grant licenses under fair, reasonable and non-discriminatory terms to the invention claimed und Unites States patent number 5,76489 and corresponding foreign patents for purposes of implementing products that are compliant with EN 50170/A1. …"

Rosemount's letter and Fieldbus Foundation's undertakings (policy letter on licensing) in this respect are on file with CENELEC and available for inspection by all interested parties at the CENELEC Central Secretariat.

The license details may be obtained from:

Fisher-Rosemount European Headquarters AG
Blegistrasse 21
CH-6341 Baar
Switzerland

If during the application of this Standard Intellectual Property Rights may appear and will not be made available on reasonable and non discriminatory terms and conditions to anyone wishing to obtain such a license, applying the rules of CEN/CENELEC Memorandum 8, this fact shall be brought to the attention of CENELEC Central Secretariat for further action.

0 Scope

This document is an informative description of the architecture of the EN 50170/A1 Volume 4 Fieldbus. It describes how the components specified in the other Parts of EN 50170/A1 Volume 4 may be related and configured to construct and support EN 50170/A1 Volume 4 Fieldbus devices, networks, and systems.

1 Overview

A fieldbus system is a distributed system composed of field devices and control/monitoring equipment integrated into the physical environment of a plant or factory. Fieldbus devices work together to provide I/O and control for automated processes and operations. Fieldbus systems may operate in manufacturing and process control environments that include intrinsic safety requirements. In these environments, devices operate with limited memory and processing power and with networks that have low bandwidth. The EN 50170/A1 Volume 4 System Architecture provides a framework for describing these systems as a collection of physical devices interconnected by a fieldbus network. Fieldbus networks may be composed of one or more links interconnected by bridges. Bridges transfer messages transparently between links. Communication between physical devices and across bridges is provided by physical layer and data link layer protocols.

Each physical device performs a portion of the total system operation by implementing one or more application processes. Application processes perform one or more time-critical functions, such as providing sensor readings or implementing control algorithms. These and other elementary field device functions are modelled as function blocks. Their activities are coordinated through configuration of their operating parameters, execution schedules, and communications.

> NOTE Application Process (AP) is a term defined by the International Standard "Information technology - Open systems interconnection - Basic reference model (ISO/IEC 7498) to describe the portion of a distributed application that is resident in a single device. The term has been adapted to the fieldbus environment to describe entities within devices that perform a related set of functions, such as function block processing, network management, and system management.

Communication between application processes occurs through application layer protocols. The layers between the data link layer and the application layer, as defined by ISO/IEC 7498, are not present in the EN 50170/A1 Volume 4 System Architecture.

1.1 Key Components of Fieldbus Systems

The EN 50170/A1 Volume 4 System Architecture is *simple* and *open*. It has been designed to be simple and to meet the functional, environmental, and technology needs of distributed manufacturing and process control systems. It is open so that distributed automation systems can be constructed from control and measurement devices manufactured by different vendors.

This architecture represents a departure from vendor specific control systems architectures that have dominated the marketplace in the past. In these architectures, proprietary interfaces define how devices communicate with each other. Devices that work in one vendor's control system, therefore, do not work in that of another. Furthermore, because of these proprietary interfaces, the upgrade and evolution of a system is controlled more by its vendor than by what the industry as a whole has to offer.

The EN 50170/A1 Volume 4 System Architecture has been designed to change this. Its purpose is to open the interface definitions to promote interoperability between and among devices, regardless of vendor. It addresses application and communications interfaces, and provides for network and system management. The basic structure of this architecture is illustrated in Figure 1, followed by an overview of its key components.

> NOTE   EN 50170/A1 Volume 4 specifies the communication layers, shown respectively as PhY (EN 50170/A1-2-4), DLL (EN 50170/A1-3-4 and EN 50170/A1-4-4), FAS (EN 50170/A1-5-4, FFMS (EN 50170/A1-6-4), and their Management components for System Management (EN 50170/A1-7.1-4) and Network Management (EN 50170/A1-7.2-4). The other 'User Layer' components are included and described as informative material to illustrate a full integrated system based on the EN 50170/A1 Volume 4 communication specification.
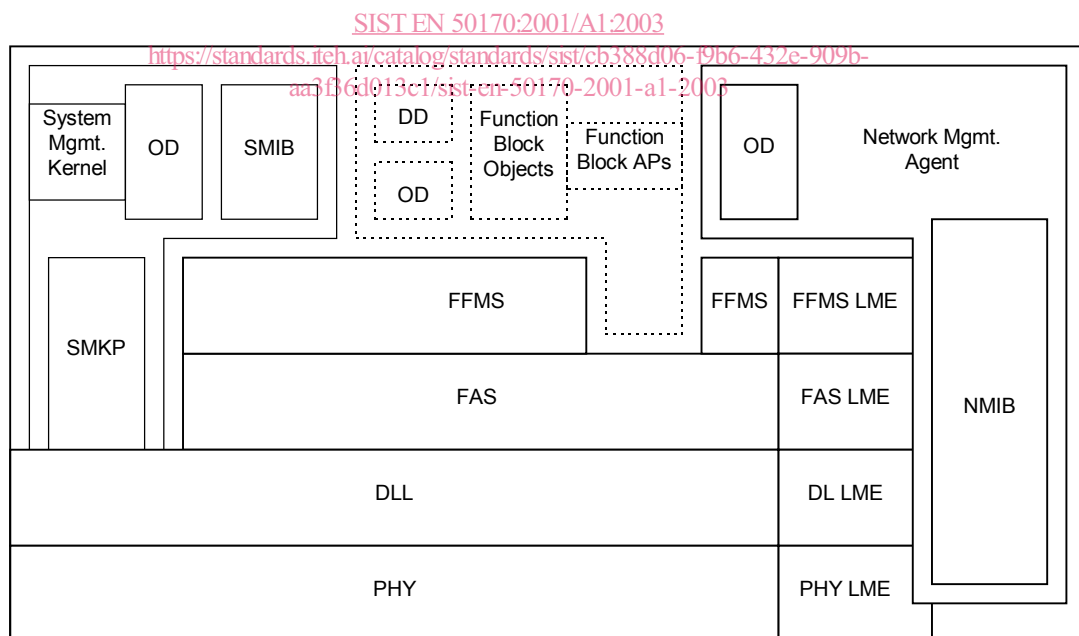
Figure 1 - Key Components of EN 50170/A1 Volume 4 System Architecture

1.1.1 Function Block Application Processes

Automated manufacturing and process control systems perform a variety of functions. Because each system is different, the mix and configuration of functions are different. Therefore, the EN 50170/A1 Volume 4 System Architecture has been designed to support a range of functional models, each addressing a different need.