



SLOVENSKI STANDARD

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Industrial communications subsystem based on ISO 11898 (CAN) for controller-device interfaces - Part 1: General requirements

Industrial communications subsystem based on ISO 11898 (CAN) for controller-device interfaces -- Part 1: General requirements

Industrielles Kommunikationssystem basierend auf ISO 11898 (CAN) -- Teil 1: Allgemeine Anforderungen

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EUROPEAN STANDARD

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English version

**Industrial communications subsystem based on ISO 11898 (CAN)
for controller-device interfaces
Part 1: General requirements**

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This European Standard was approved by CENELEC on 2000-01-01. 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 only in 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 version.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, 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

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 65CX, Fieldbus.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50325-1 on 2000-01-01.

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) 2001-05-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2003-01-01

This European standard is divided into three parts:

- Part 1 General requirements
- Part 2 DeviceNet specification
- Part 3 Smart Distributed System (SDS) specification

NOTE This European Standard exists only in English.

The specifications for DeviceNet and SDS are based on ISO 11898, a broadcast-oriented communications protocol. However, ISO 11898 specifies only part of a complete communication system, and additional specifications are needed for other layers to ensure precise data exchange functionality and support of inter-operating devices. The DeviceNet and SDS specifications build on ISO 11898 to describe a complete industrial communication system.

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Honeywell's undertakings (policy letter on licensing, the license offer and the form of license) 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

The Director
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1) in preparation.

Contents

	Introduction	4
1	Scope	5
2	Normative references	6
3	Definitions	6
4	Classifications	7
5	Characteristics	8
	5.1 General	8
	5.2 Components of the network	8
	5.3 Network interfaces	8
	5.4 Topology	8
	5.5 Information exchanges	8
	5.6 Network attributes	9
6	Product information	9
6.1	Instructions for installation, operation and maintenance	9
6.2	Marking	9
7	Normal service, transport and mounting conditions	9
	7.1 Normal service conditions	9
	7.1.1 General	9
	7.1.2 Ambient air temperature	9
	7.1.3 Altitude	10
	7.1.4 Humidity	10
	7.1.5 Pollution degree	10
	7.1.6 Sealed connectors	10
	7.2 Conditions during transport and storage	10
	7.3 Mounting	10
8	Constructional and performance requirements	10
	8.1 General	10
	8.2 Electromagnetic compatibility (EMC)	10
9	Tests	11

Introduction

The controller-device interfaces described in this standard utilise a common base protocol to provide solutions to users in industrial environments who have a need for simple communications and diagnostics. The application layer of each network has been created to meet specific performance and market requirements.

The objective of the interface user is a gain in productivity that may be realised through reduced wiring, reduced start up time, improved quality of output and reduced down time. The interfaces described provide low-cost connectivity between low-voltage switchgear, controlgear, control circuit devices, switching elements and controlling devices (e.g. programmable controllers, personal computers, etc.) and eliminate expensive hardwiring. The direct connectivity provides improved communication between devices as well as important device-level diagnostics not easily accessible or available through hardwired I/O interfaces.

The interfaces described are based on a broadcast-oriented communications protocol - Controller Area Network (CAN). The CAN protocol was originally developed by Robert Bosch GmbH for the European automotive market for replacing expensive, wire harnesses with low cost network cable on vehicles. As a result, the CAN protocol has fast response and high reliability and the protocol has been standardised as ISO 11898. Chips are available in a variety of packages with temperature and noise immunity ratings well suited to the industrial automation market. Demand for CAN is the key driver in the "low price with high performance" characteristic of CAN chips.

As a result of the common use of CAN, the interfaces described provide a common set of capabilities that are ideally targeted to applications which include simple devices, limited distance and limited amount of data per transmission.

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1 Scope

This European Standard applies to controller-device interfaces that provide defined interfaces between low-voltage switchgear, controlgear, control circuit devices, switching elements and controlling devices (e.g. programmable controllers, personal computers, etc.). It may also be applied for the interfacing of other devices and elements to a controller-device interface.

This standard specifies requirements for controllers and devices utilising these interfaces, including not only the communication protocol specification, but also associated relevant electrical and mechanical characteristics. It also specifies the electrical and EMC tests required to verify the performance of each controller-device interface when connected to the appropriate controllers and devices.

This Part 1 establishes a consistent terminology and format for the subsequent interfaces. It also harmonises requirements of a general nature in order to reduce the need for testing to different standards, increase understanding and facilitate comparisons of controller-device interface standards. Those requirements of the various controller-device interface standards which can be considered as general have therefore been gathered in this Part 1.

In addition to meeting the specific requirements stated in this Part 1, the controller-device interfaces included in this standard:

- are documented in the English language in accordance with the requirements specified in this Part 1;
- are already in use in commercial products and running in industrial plants;
- are available in quantity and at low price;
- are available from several sources and commercialised openly;
- satisfy the tests specified, amongst others, in EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, and EN 61000-4-6 against the test levels specified in EN 50082-2;
- have appropriate mechanisms for transmission error detection;
- are open, widely accepted, well documented, stable and support inter-operability;
- are complete and describe the necessary interfaces in sufficient detail to enable error-free implementation;
- are free of any restriction related to testing the implementation.

For each controller-device interface only two documents are necessary to determine all requirements and tests:

- the general requirements of this standard, referred to as "Part 1" in the relevant parts covering the various types of controller-device interfaces;
- the relevant controller-device interface standard hereinafter referred to as the "relevant controller-device interface standard" or "controller-device interface standard".

The solutions described in this standard have been used for many years by industry to solve application requirements involving low-voltage switchgear and controlgear. They are characterised by:

- their ability to power connected devices directly from the network;
- their ability to operate in harsh environments typified by those encountered at the machine level by controls in industrial applications;
- usage of the sophisticated medium access rules of CAN which allows both organisation of traffic based on user-assigned priorities and efficient resolution of occasional access conflict;
- a wide range of exchange services allowing precise tailoring of data exchange to the actual application needs as well as simultaneous distribution of data to a selected set of connected devices;
- their capability to simultaneously support data acquisition, diagnostics, messaging and programming/configuration as required for systems interfacing controllers to low-voltage switchgear and controlgear in industrial applications.

NOTE The controller-device interface standards currently part of this series are:

- EN 50325-2: DeviceNet
- EN 50325-3: Smart Distributed System (SDS) (in preparation)

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

EN 50082-2	1995	Electromagnetic compatibility - Generic immunity standard Part 2: Industrial environment (EMC)
EN 60529	1991	Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)
EN 60947-1	1999	Low-voltage switchgear and controlgear Part 1: General rules (IEC 60947-1:1999, modified)
EN 60947-5-2	1998	Low-voltage switchgear and controlgear Part 5-2: Control circuit devices and switching elements - Proximity switches (IEC 60947-5-2:1997, modified)
EN 61000-4-2	1995	Electromagnetic compatibility (EMC) -- Part 4: Testing and measuring techniques -- Section 2: Electrostatic discharge immunity test (IEC 61000-4-2:1995)
EN 61000-4-3	1996	Electromagnetic compatibility (EMC) -- Part 4: Testing and measuring techniques -- Section 3: Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3:1995, modified)
EN 61000-4-4	1995	Electromagnetic compatibility (EMC) -- Part 4: Testing and measuring techniques -- Section 4: Electrical fast transient / burst immunity test (IEC 61000-4-4:1995)
EN 61000-4-5	1995	Electromagnetic compatibility (EMC) -- Part 4: Testing and measuring techniques -- Section 5: Surge immunity test (IEC 61000-4-5:1995)
EN 61000-4-6	1996	Electromagnetic compatibility (EMC) -- Part 4: Testing and measuring techniques -- Section 6: Immunity to conducted disturbances, induced by radio-frequency fields (IEC 61000-4-6:1996)
ISO/IEC 7498-1	1994	Information technology - Open systems interconnection Part 1: Basic Reference Model : The Basic Model
ISO 11898	1993	Road vehicles - Interchange of digital information - Controller area network (CAN) for high-speed communication

3 Definitions

For the purposes of this Part 1 of the European Standard, the following definitions apply.

NOTE The relevant controller-device interface standards include in their definitions clause those necessary terms and definitions that are not included in this Part of the standard.

3.1

CAN (Controller Area Network)

definition of a generic physical layer and data link medium access procedure based on non-destructive bit-wise arbitration. See ISO 11898.

3.2

controller

network element such as a PLC, PC, or equivalent computing hardware in which the control application or process software runs

3.3**controller-device interface**

arrangement of nodes and their interconnections that transport information in an industrial control system comprising a controller and field devices

3.4**cyclic**

process of data exchange which occurs when devices or controllers produce data at a predetermined rate appropriate to the device and the application's need

3.5**electromechanics**

physical components defined by a controller-device interface such as interconnecting wire, cable or media; and physical connectors

3.6**field device**

physical unit containing application elements and may contain communication elements

EXAMPLES Control circuit device (see 2.2.16 of EN 60947-1), presence sensing device, pressure sensing device, actuator, annunciator, operator terminal, motor controller, current sensor, valve control, data logger, bar-code scanner, push-button, pilot light, etc.

3.7**interface**

boundary between two entities of a network defined by functional, signal, or other characteristics as appropriate

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3.8**messaging**

process of data exchange which occurs when a device or controller sends or requests information such as device I/O, device diagnostic and/or configuration information

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3.9**multicast**

process of data exchange which occurs when a device or controller produces one network message to multiple devices and controllers for their appropriate action

3.10**network power supply**

power supply with characteristics and parameters suitable for the network's functionality and capability

3.11**polling**

process of data exchange which occurs when a device, e.g. a controller, sends or requests data from a specific device

NOTE The receiving device responds to the polling by acting on the data it receives or returning its status data. When this network transaction is completed the device polls the next device in a predetermined sequence.

4 Classifications

This clause in the relevant controller-device interface parts of this standard lists the classifications below, where applicable, with appropriate details:

- components of the network;
- network interfaces;
- topology;
- information exchanges;
- network attributes.