BRITISH STANDARD

BS EN
62026-1:2007

Low-voltage switchgear and controlgear — Controller-device interfaces (CDIs) —

Part 1: General rules

The European Standard EN 62026-1:2007 has the status of a British Standard

ICS 29.130.20

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 62026-1:2007. It is identical to IEC 62026-1:2007.

The UK participation in its preparation was entrusted by Technical Committee PEL/17, Switchgear, controlgear, and HV-LV co-ordination, to Subcommittee PEL/17/2, Low voltage switchgear and controlgear.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2007

ISBN 978 0 580 56435 2

Amendments issued since publication

Amd. No.	Date	Comments

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62026-1

September 2007

ICS 29.130.20

English version

Low-voltage switchgear and controlgear - Controller-device interfaces (CDIs) - Part 1: General rules

(IEC 62026-1:2007)

Appareillage à basse tension - Interfaces appareil de commande-appareil (CDI) - Partie 1: Règles générales (CEI 62026-1:2007)

Niederspannungsschaltgeräte - Steuerungs-Geräte-Netzwerke (CDIs) - Teil 1: Allgemeine Festlegungen (IEC 62026-1:2007)

This European Standard was approved by CENELEC on 2007-09-01. 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.

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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 62026-1:2007 E

Foreword

The text of document 17B/1505/CDV, future edition 2 of IEC 62026-1, prepared by SC 17B, Low-voltage switchgear and controlgear, of IEC TC 17, Switchgear and controlgear, was submitted to the IEC-CENELEC parallel Unique Acceptance Procedure and was approved by CENELEC as EN 62026-1 on 2007-09-01.

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)	2008-06-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-09-01

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directives EMC (89/336/EEC) and EMC2 (2004/108/EC). See Annex ZZ.

Annexes ZA and ZZ have been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 62026-1:2007 was approved by CENELEC as a European Standard without any modification.

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CONTENTS

INTRODUCTION

The class of controller-device interfaces (CDIs) covered in this International Standard includes industrial CDIs for control systems, factory automation and process automation.

Industrial CDIs have proliferated to meet specific user needs, but no single CDI meets all needs. The reason for multiple solutions is the wide range of physical, usage, information content and configuration requirements. The physical requirements have resulted in CDIs with widely differing signal and line conditioning mechanisms in order to meet distance, node count and environmental considerations.

While there is wide variation in CDI technologies, there are common components, interfaces and environmental requirements that are specified by this standard. Standardized definitions of these common CDI requirements assist the user to compare and select technologies to match the distance, node count, throughout and installation requirements for a specific application.

This standard simplifies the CDI selection process by providing a common structure for generating a specific CDI's IEC standard while also allowing specific interface features and capabilities to be included. Clauses 1 to 8 contain the outline of general requirements that the CDI's IEC standard identifies. Clause 9 contains the test specification.

Standardization of CDI aspects also simplifies the task of writing the software for the higher layer functions of industrial control systems, such as supervisory control, operator interface and control strategy programming.

For this standard to be complete and usable, it requires the availability of specific CDI standards, which make up the other parts of the IEC 62026 series.

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR – CONTROLLER-DEVICE INTERFACES (CDIs) –

Part 1: General rules

1 Scope

This International Standard applies to interfaces between low-voltage switchgear, controlgear, and controllers (e.g. programmable controllers, personal computers, etc.).

This standard does not apply to higher level industrial communication networks that have become known as fieldbuses and are considered by IEC subcommittee 65C.

The purpose of this standard is to harmonize and define rules, components and requirements of a general nature applicable to industrial CDIs. Those features of the various CDI standards which can be considered as general have therefore been brought together in this part of IEC 62026.

For each CDI, two main documents are necessary to determine all requirements and tests:

a) this part, referred to as “IEC 62026-1” or “Part 1” in the relevant CDI parts covering the various types of CDIs;

b) the specific CDI part of the IEC 62026 series.

A specific CDI part may omit a general requirement if it is not applicable, or it may add to it if it is inadequate in the particular case, but it should not deviate from the requirement unless there is substantial technical justification.

NOTE Product-specific requirements for products incorporating a CDI are given in the relevant product standards. These requirements apply in addition to those given in this International Standard.

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 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*
Amendment 1 (1998)
Amendment 2 (2000)

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated radio-frequency electromagnetic field immunity test*

IEC 61000-4-4:2004, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2005, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

EC 61000-4-6:2003, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*
Amendment 1 (2004)
Amendment 2 (2006)

IEC 61000-6-2:2005, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

CISPR 11:2003, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement*
Amendment 1 (2004)
Amendment 2 (2006)

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
change of state
process of data exchange which occurs only when a device's or controller's data changes state according to specific change criteria

3.2
controller
programmable controller, personal computer or equivalent computing hardware in which the software controlling the application or process runs

3.3
controller-device communication medium
means (such as two or more wires or fibre optic cable) utilized by devices or controllers to transfer data to other devices or controllers

NOTE A CDI that has "power on the communication medium" architecture uses two wires that also distribute power within the CDI.

3.4
controller-device interface (CDI)
arrangement of nodes and their interconnections that transport information between controllers and devices in an industrial control system

3.5
CDI component
device, controller or other component for which the requirements are specified in a CDI part

3.6
CDI power supply
power supply with characteristics and parameters suitable for the CDI's functionality and capability

3.7
CDI power distribution medium
inter-connecting means used to transfer power within a CDI

NOTE In the case of a CDI that has "power on the communication medium" architecture, the CDI power distribution medium also transfers data within the CDI.

3.8
device
physical unit containing application elements and that may contain communication elements

EXAMPLES: Control circuit device (see 2.2.16 of IEC 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.

3.9
device profile
representation of device functionality available to the CDI

3.10
multicast
process of data exchange which occurs when a device or controller produces one message to multiple devices and/or controllers for their appropriate action

3.11
polling
process of data exchange which occurs when a device or a controller sends data to, or requests data from, a specific device or controller

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

3.12
strobing
process of data exchange which occurs when a device or a controller sends a single request for data from one or more devices and/or controllers

NOTE Each device receiving the message then responds with its requested data in a predetermined sequence.

4 Classifications

This clause in the specific CDI parts shall list the classifications below, where applicable, with appropriate details:

– CDI components;
– interfaces;
– topology;
– information exchanges;
– attributes.

5 Characteristics

This clause in the specific CDI parts shall list the applicable characteristics described below with appropriate details.

5.1 CDI components

Specific CDI parts shall specify requirements for the devices, controllers and other components that may be used.

5.2 Interfaces

Specific CDI parts shall include information on the following, if applicable:

- procedural, such as what needs to happen first, second, etc. when the interface system powers up and down, and establishes and terminates data exchange across the interface;
- information exchanges, such as what a device is requested to do across an interface;
  EXAMPLE 1 Polling, change of state.
- services and protocol, i.e. the message structure and content that crosses the interface;
  EXAMPLE 2 Peer-to-peer, master-slave.
- device and controller behaviour as viewed from the CDI;
- mechanical, i.e. the shape, construction, pin size, etc.;
- electrical, such as the voltage, current and timing of the bit levels on the CDI;
- functional, i.e. what interface connections provide which functions.

5.3 Topology

Specific CDI parts shall specify the topologies that may be used.

EXAMPLE Daisy chain, star, tree, trunk/drop.

5.4 Information exchanges

Specific CDI parts shall specify the information exchanges that may be used.

5.5 Attributes

Specific CDI parts shall specify the applicable attribute values including as a minimum:

- data transmission rate (in bits per second);
- maximum length of communication medium or end to end distance;
- message length for single transmission;
  EXAMPLE 4 bits, 8 bytes.
- maximum node count per system;

and other information to support the evaluation of the transmission time of the CDI.

6 Product information

6.1 Instructions for installation, operation and maintenance

The manufacturer shall specify in the documents or catalogues, the conditions for installation, operation and maintenance of the CDI components. The instructions shall specify the measures to be taken, if any, for achieving EMC compliance as described in 8.2.

6.2 Profiles

Devices and controllers shall be marked with, or shall include in the instructions for operation, identification of the device profile(s) supported.

6.3 Marking

CDI components shall be marked as follows:

a) manufacturer's name or trade mark;
b) type designation or other marking which makes it possible to identify the CDI component and to get the relevant information from the manufacturer or his catalogue;
c) reference to the relevant CDI parts;
d) any additional marking required by the relevant CDI parts.

For CDI components that do not have the physical space to accommodate required markings, the information shall be provided on a label or in the manufacturer's documentation.

6.4 Degree of protection

The manufacturer shall state the degree of protection according to Annex C of IEC 60947-1.

7 Normal service, mounting and transport conditions

7.1 General

The following requirements shall be met for all CDI components.

NOTE If the conditions for operation differ from those given in this standard or by the manufacturer, the user should state the deviation from the standard conditions and acquire an agreement with the manufacturer on the suitability for use under such conditions. Information given in the manufacturer's catalogue may take the place of such an agreement.

7.2 Normal service conditions

7.2.1 General

All CDI components shall be designed and used according to the relevant CDI parts.

7.2.2 Ambient air temperature

The operating characteristics of all CDI components shall be maintained at least over the ambient air temperature range of –5 °C to +40 °C.

7.2.3 Altitude

CDI components shall be capable of operating at altitudes of up to 2 000 m.

NOTE For CDI components intended to be used at higher altitudes, it is necessary to take into account the reduction of the dielectric strength and the cooling effect of air.

7.2.4 Climatic conditions

7.2.4.1 Humidity

CDI components shall be capable of operating correctly at +40 °C with a relative air humidity of 50 % and with higher relative humidity at lower temperatures, for example 90 % at +20 °C. Special measures may be necessary in cases of occasional condensation due to variations in temperature.

7.2.4.2 Pollution degree

Unless otherwise stated by the manufacturer, CDI components shall be intended for installation under environmental conditions of pollution degree 3, as defined in IEC 60947-1. However, other pollution degrees may apply, depending upon the micro-environment.

7.3 Conditions during transport and storage

A special agreement shall be made between user and manufacturer if the conditions during transport and storage, for example temperature and humidity, differ from those defined in 7.2. Otherwise, the following temperature range applies during transport and storage: between –25 °C and +55 °C and, for short periods not exceeding 24 h, up to +70 °C.

7.4 Mounting

Mounting dimensions and conditions of the CDI components shall be specified in the specific CDI parts or, if not specified, shall be stated in the manufacturer's instructions.

8 Constructional and performance requirements

8.1 General

All products incorporating a CDI shall comply with their relevant product standards in addition to this standard.

The constructional and performance requirements shall be specified in the specific CDI parts. Requirements shall be specified for

– power supply,
– device,
– controller,
– electromechanical components,
– communication medium.

The requirements shall include but are not limited to

– general requirements,
– connections and ports,
– functions of the device or controller during initiating, sending, receiving and responding to messages, I/O configuration and diagnostic messages,
– electromagnetic compatibility (EMC).

8.2 Electromagnetic compatibility (EMC)

8.2.1 Immunity

CDIs shall meet the minimum requirements given in Table 1, except where a different test level is given and justified in the specific CDI parts.

Table 1 – Immunity requirements

Type of test	Test levels (where applicable)	Performance criterion
Electrostatic discharges IEC 61000-4-2	8 kV / air discharge 4 kV / contact discharge	B
Radiated radio-frequency electromagnetic fields (80 MHz to 1 GHz and 1,4 GHz to 2,0 GHz) IEC 61000-4-3	10 V/m	A
Electrical fast transients/bursts IEC 61000-4-4	1 kV / 5 kHz for all cables that contain CDI communication media 2 kV / 5 kHz for all other cables and ports	B
Surges (1,2/50 μs – 8/20 μs) IEC 61000-4-5	2 kV (a.c. mains line-to-earth) 1 kV (a.c. mains line-to-line)	B
Conducted radio-frequency disturbances (150 kHz to 80 MHz) IEC 61000-4-6	10 V	A
Voltage dips and interruptions	See specific CDI parts	

Performance criteria and specified limits shall be given in the specific CDI parts using the general performance criteria of IEC 61000-6-2.

8.2.2 Emission

CDIs shall meet the requirements given in CISPR 11 for class A, group 1.

These requirements apply to CDIs exclusively used in an industrial environment. When they may be used in a non-industrial environment, the following warning shall be included in the instructions for use:

Attention
This is a class A product. In a non-industrial environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

8.2.3 EMC tests

Electromagnetic compatibility tests shall be made in accordance with 9.3.

9 Tests

9.1 General

Tests shall be made to verify compliance with the requirements of this standard.

9.2 Type tests

Type tests are intended to verify compliance to this standard. Where applicable, they shall include:

– power supply;
– device;
– controller;
– electromechanical components;
– communication medium.

They shall include, as appropriate, the verification of

– general requirements,
– connections and ports,
– functions of the device or controller during initiating, sending, receiving and responding to messages, I/O configuration and diagnostic messages,
– electromagnetic compatibility (EMC).

9.3 Electromagnetic compatibility

The specific CDI parts shall detail the test methods and test set-ups.

Emission and immunity tests are type tests and shall be carried out under representative conditions, both operational and environmental, using the manufacturer's instructions for installation.

The tests shall be carried out in accordance with the reference EMC standards. However, the specific CDI parts shall specify any additional measures necessary to verify the performance.

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 60947-1	2007	Low-voltage switchgear and controlgear - Part 1: General rules	EN 60947-1	2007
IEC 61000-4-2 A1 A2	1995 1998 2000	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2 A1 A2	1995 1998 2001
IEC 61000-4-3	2006	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2006
IEC 61000-4-4	2004	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	2004
IEC 61000-4-5	2005	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	2006
IEC 61000-4-6 + A1 + A2	2003 2004 2006	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6 + corr. August	2007 2007
IEC 61000-6-2	2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments	EN 61000-6-2 + corr. September	2005 2005
CISPR 11 (mod) + A1 A2	2003 2004 2006	Industrial scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement	EN 55011 A2	2007 2007

Annex ZZ
(informative)

Coverage of Essential Requirements of EC Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope the standard covers all relevant essential requirements as given in Article 4 of the EC Directive 89/336/EEC and in Article 1 of Annex I of the EC Directive 2004/108/EC.

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directives concerned.

WARNING: Other requirements and other EC Directives may be applicable to the products falling within the scope of this standard.

NOTE EN 62026-1:2007 does not give presumption of conformity without another part of the standard.

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