IEC 62026-1

Edition 3.0 2019-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

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

IEC 62026-1:2019-05(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

IEC 62026-1

Edition 3.0 2019-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.130.20

ISBN 978-2-8322-6868-1

CONTENTS

FOREWORD 3
INTRODUCTION 5
1 Scope 6
2 Normative references 6
3 Terms and definitions 7
4 Classifications 8
5 Characteristics 8
5.1 CDI components 8
5.2 Interfaces 9
5.3 Topology 9
5.4 Information exchanges 9
5.5 Attributes 9
6 Product information 9
6.1 Instructions for installation, operation and maintenance 9
6.2 Profiles 9
6.3 Marking 10
6.4 Degree of protection 10
7 Normal service, mounting and transport conditions 10
7.1 General 10
7.2 Normal service conditions 10
7.2.1 General 10
7.2.2 Ambient air temperature 10
7.2.3 Altitude 10
7.2.4 Climatic conditions 10
7.3 Conditions during transport and storage 11
7.4 Mounting 11
8 Constructional and performance requirements 11
8.1 General 11
8.2 Electromagnetic compatibility (EMC) 11
8.2.1 Immunity 11
8.2.2 Emission 12
8.2.3 EMC tests 12
9 Tests 12
9.1 General 12
9.2 Type tests 13
9.3 Electromagnetic compatibility 13
Bibliography 14

Table 1 – Immunity requirements 12

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

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

Part 1: General rules

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62026-1 has been prepared by subcommittee 121A: Low-voltage switchgear and controlgear, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low voltage.

This third edition cancels and replaces the second edition published in 2007. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) additional requirements for safety information and instructions, including the measures to be taken, if any, for achieving EMC compliance;
b) EMC immunity requirements aligned with current IEC 61000-6 series of standards. Radiated radio-frequency electromagnetic fields test level increased to 6 GHz;
c) EMC emissions requirements aligned with current CISPR 11 publication.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
121A/280/FDIS	121A/295/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

A list of all parts of the IEC 62026, under the general title *Low-voltage switchgear and controlgear – Controller-device interfaces (CDIs)*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

The class of controller-device interfaces (CDIs) covered in this document 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 document. Standardized definitions of these common CDI requirements assist the user in comparing and selecting technologies to match the distance, node count, throughout and installation requirements for a specific application.

This document 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 4 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 document 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 part of IEC 62026 applies to interfaces between low-voltage switchgear, controlgear, and controllers (e.g. programmable controllers, personal computers, etc.).

This document 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 document 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 document.

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

a) this document, referred to as "IEC 62026-1" 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.

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 document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60947-1:2007/AMD1:2010
IEC 60947-1:2007/AMD2:2014

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
IEC 61000-4-3:2006/AMD1:2007
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*
IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-6-2:2016, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*
CISPR 11:2015/AMD1:2016

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org.obp

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 1 to entry: 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

Note 1 to entry: This note applies to the French language only.

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 1 to entry: 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

EXAMPLE Control circuit device (see 2.2.16 of IEC 60947-1:2007), 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 1 to entry: 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
port
particular interface of the specified apparatus with the external electromagnetic environment

Note 1 to entry: See Figure 17 of IEC 60947-1:2007 for examples of ports.

[SOURCE: IEC 60947-1:2007, 2.7.1]

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

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.

When relevant, safety information and instructions shall be provided in order to achieve the safe use of the CDI. Such information shall be easily understood by the user, for example in the form of commonly used symbols and/or drawings. The instructions shall also 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, the 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 part;

d) any additional marking required by the relevant CDI part.

For CDI components that do not have the physical space to accommodate the 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 60947-1:2007 and IEC 60947-1:2007/AMD1:2010.

7 Normal service, mounting and transport conditions

7.1 General

The requirements given in 7.2, 7.3 and 7.4 shall be met for all CDI components.

If the conditions for operation differ from those given in this document 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

CDI components shall be selected to meet expected environmental conditions.

7.2.2 Ambient air temperature

CDI components shall operate as intended within an 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.

For CDI components intended to be used at higher altitudes, both the reduction of the dielectric strength and the cooling effect of air shall be considered.

7.2.4 Climatic conditions

7.2.4.1 Humidity

CDI components shall be capable of operating as intended 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.