

Programmable controllers - Part 9: Single-drop digital communication interface for small sensors and actuators (SDCI)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

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English Version

Programmable controllers - Part 9: Single-drop digital
communication interface for small sensors and actuators (SDCI)
(IEC 61131-9:2022)

Automates programmables - Partie 9: Interface de
communication numérique point à point pour les petits
capteurs et actionneurs (SDCI)
(IEC 61131-9:2022)

Speicherprogrammierbare Steuerungen - Teil 9:
Schnittstelle für die Kommunikation mit kleinen Sensoren
und Aktoren über eine Punkt-zu-Punkt-Verbindung
(IEC 61131-9:2022)

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European foreword

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60870-5-1	NOTE	Harmonized as EN 60870-5-1
IEC 61158-2	NOTE	Harmonized as EN 61158-2
IEC/TR 62453-61	NOTE	Harmonized as CLC/TR 62453-61
IEC 62443 (series)	NOTE	Harmonized as EN IEC 62443 (series)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61000-6-4	-	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	EN IEC 61000-6-4	-
IEC 61010-2-201	-	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-201: Particular requirements for control equipment	EN IEC 61010-2-201	-
IEC 61076-2-101	-	Connectors for electronic equipment - Product requirements - Part 2-101: Circular connectors - Detail specification for M12 connectors with screw-locking	EN 61076-2-101	-
IEC 61131-1	-	Programmable controllers - Part 1: General information	EN 61131-1	-
IEC 61131-2	-	Industrial-process measurement and control - Programmable controllers - Part 2: Equipment requirements and tests	-	-

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Programmable controllers –
Part 9: Single-drop digital communication interface for small sensors and
actuators (SDCI)**

**Automates programmables –
Partie 9: Interface de communication numérique point à point pour petits
capteurs et actionneurs (SDCI)**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PROGRAMMABLE CONTROLLERS –**Part 9: Single-drop digital communication interface
for small sensors and actuators (SDCI)****FOREWORD**

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IEC 61131-9 has been prepared by subcommittee 65B: Measurement and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This second edition cancels and replaces the first edition published in 2013. This edition constitutes a technical revision.

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

- a) requirements for Port Class B have been refined;
- b) best practice patterns for Data Storage (backup of Device parameters) and Device reset functions have been introduced;
- c) a new Standardized Master Interface (SMI) for PLC, IT, and an engineering tool access have been added.

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

Draft	Report on voting
65B/1218/FDIS	65B/1219/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 61131 series, published under the general title *Programmable controllers*, 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 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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

0.1 General

IEC 61131-9 is part of a series of standards on programmable controllers and the associated peripherals and should be read in conjunction with the other parts of the series.

Where a conflict exists between this and other IEC standards (except basic safety standards), the provisions of this document should be considered to govern in the area of programmable controllers and their associated peripherals.

The increased use of micro-controllers embedded in low-cost sensors and actuators has provided opportunities for adding diagnosis and configuration data to support increasing application requirements.

The driving force for the SDCI (IO-Link™¹) technology is the need of these low-cost sensors and actuators to exchange this diagnosis and configuration data with a controller (PC or PLC) using a low-cost, digital communication technology while maintaining backward compatibility with the current DI/DO signals.

In fieldbus concepts, the SDCI technology defines a generic interface for connecting sensors and actuators to a Master unit, which can be combined with gateway capabilities to become a fieldbus remote I/O node.

Any SDCI compliant Device can be attached to any available interface Port of the Master. SDCI compliant Devices perform physical to digital conversion in the Device, and then communicate the result directly in a standard format using "coded switching" of the 24 V I/O signalling line, thus removing the need for different DI, DO, AI, AO modules and a variety of cables.

Physical topology is point-to-point from each Device to the Master using three wires over distances up to 20 m. The SDCI physical interface is backward compatible with the usual 24 V I/O signalling specified in IEC 61131-2. Transmission rates of 4,8 kbit/s, 38,4 kbit/s and 230,4 kbit/s are supported.

The Master of the SDCI interface detects, identifies, and manages Devices plugged into its Ports.

Tools allow the association of Devices with their corresponding electronic I/O Device Descriptions (IODD) and their subsequent configuration to match the application requirements.

The SDCI technology specifies three different levels of diagnostic capabilities: for immediate response by automated needs during the production phase, for medium term response by operator intervention, or for longer term commissioning and maintenance via extended diagnosis information.

The structure of this document is described in 4.8.

Conformity with IEC 61131-9 cannot be claimed unless the requirements of Annex H are met.

¹ IO-Link™ is a trade name of the "IO-Link Community". This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trade name holder or any of its products. Compliance with this document does not require use of the registered logos for IO-Link™. Use of the registered logos for IO-Link™ requires permission of the "IO-Link Community".

Terms of general use are defined in IEC 61131-1 or in the IEC 60050 series [1]². More specific terms are defined in this document.

0.2 Patent declaration

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent. IEC takes no position concerning the evidence, validity, and scope of this patent right.

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² Numbers in square brackets refer to the Bibliography.

PROGRAMMABLE CONTROLLERS –

Part 9: Single-drop digital communication interface for small sensors and actuators (SDCI)

1 Scope

This part of IEC 61131 specifies a single-drop digital communication interface technology for small sensors and actuators SDCI (commonly known as IO-Link™³), which extends the traditional digital input and digital output interfaces as defined in IEC 61131-2 towards a point-to-point communication link for the exchange of complex data in both directions. This technology also enables the transfer of parameters to Devices and the delivery of identification and diagnostic information from the Devices to the automation system.

This technology is mainly intended for use with simple sensors and actuators in factory automation, which include small and cost-effective microcontrollers.

This document specifies the SDCI communication services and protocol (physical layer, data link layer and application layer in accordance with the ISO/OSI reference model) for both SDCI Masters and Devices.

This document also includes EMC test requirements.

This document does not cover communication interfaces or systems incorporating multiple point or multiple drop linkages, or integration of SDCI into higher level systems such as fieldbuses.

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 60664 (all parts), *Insulation coordination for equipment within low-voltage supply systems*

IEC 60947-5-2, *Low-voltage switchgear and controlgear – Part 5-2: Control circuit devices and switching elements – Proximity switches*

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

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

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

³ IO-Link™ is a trade name of the "IO-Link Community". This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trade name holder or any of its products. Compliance with this document does not require use of the registered logos for IO-Link™. Use of the registered logos for IO-Link™ requires permission of the "IO-Link Community".

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

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

IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

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

IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61076-2-101, *Connectors for electronic equipment – Product requirements – Part 2-101: Circular connectors – Detail specification for M12 connectors with screw-locking*

IEC 61010-2-201, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-201: Particular requirements for control equipment*

IEC 61131-1, *Programmable controllers – Part 1: General information*

IEC 61131-2, *Industrial-process measurement and control – Programmable controllers – Part 2: Equipment requirements and tests*

3 Terms, definitions, symbols, abbreviated terms, and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61131-1 and IEC 61131-2 and the following 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>

3.1.1

address

part of the M-sequence control to reference data within data categories of a communication channel

3.1.2

application layer

AL

<SDCI> part of the protocol responsible for the transmission of Process Data objects and On-request Data objects

3.1.3

Block Parameter

consistent parameter access via multiple Indices or Subindices