



IEC TS 63444

Edition 1.0 2023-11

# TECHNICAL SPECIFICATION

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**Industrial networks – Ethernet-APL port profile specification**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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ICS 29.240

ISBN 978-2-8322-7821-5

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## INDUSTRIAL NETWORKS –

## Ethernet-APL port profile specification

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IEC TS 63444 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
65C/1250/DTS	65C/1275/RVDTS

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 Technical Specification 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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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](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- withdrawn,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

IEEE Std 802.3™-2022, Clause 146 specifies the Ethernet Physical Layer 10BASE-T1L, suitable to be used for full-duplex communication over a single balanced pair of conductors.

This physical layer is specifically designed for industrial applications, supporting the main requirements for advanced, robust process control and monitoring in safe or hazardous areas.

The primary physical layer solution focuses on four requirements:

- support of single pair cables providing both communication and optional power;
- increased data bandwidth, 10 Mbit/s;
- support of extended Ethernet cable length of up to 1 km;
- support of intrinsically safe protection for use in hazardous areas.

IEEE Std 802.3-2022, Clause 146 only specifies the digital communication method and its electrical characteristics. To assure interoperability between the various interconnected components at different parts of the network, applying this new physical layer for industrial applications requires a further set of specifications and classifications. The "Ethernet Advanced Physical Layer" (Ethernet-APL or APL) references and standardizes industrial automation extensions.

This document specifies port profiles for use in non-hazardous and hazardous areas, with and without power. Ethernet-APL intrinsically safe profiles facilitate the examination of the interconnection of different Ethernet-APL ports. Most common industrial rated connectors for use in process industries are part of this document. A multi-length cable category system maintains communication integrity, while permitting cable constructions optimized for specific applications or environmental ratings.

Ethernet-APL impacts the various physical layers in IEC 61158-2 and its associated Types. This document provides a neutral approach for the new advanced physical layer which can be then transferred to the next editions of different IEC intrinsically safe fieldbus documents. The following documents are representative of potentially affected next editions: IEC 61158-2, IEC 61784-1 series, IEC 61784-2 series, IEC 61918, IEC 61784-5 series.

This document is not intended to assure interoperability at the product level but only at the port level. No reference is made to any Ethernet-based communication protocol above the physical layer.

## **INDUSTRIAL NETWORKS –**

### **Ethernet-APL port profile specification**

#### **1 Scope**

This document is applicable to process automation equipment using a 10BASE-T1L compliant (see IEEE Std 802.3-2022, Clause 146) Physical Layer (PHY). Ethernet-APL intrinsically safe profiles with different predefined entity or limitation parameters (for example voltage, current, power, capacitance, inductance, cable length) simplify the examination of the interconnection of different Ethernet-APL ports.

The following technical features are part of this document:

- topology with trunk/spur installation capability;
- 2-wire technology (full-duplex communication data rate of 10 Mbit/s);
- long distance (refers to cable lengths of several hundred meters, with spans up to 1 000 m);
- intrinsic safety (installation of Ethernet-capable field devices in hazardous areas);
- power supply to field devices over the same 2-wire cable used for data communication.

#### **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 60079-11, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*

IEC 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

IEC 60079-25, *Explosive atmospheres – Part 25: Intrinsically safe electrical systems*

IEC TS 60079-47:2021, *Explosive atmospheres – Part 47: Equipment protection by 2-wire intrinsically safe ethernet concept (2-WISE)*

IEC 61010-1, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

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

IEC 61076-2-104, *Connectors for electronic equipment – Product requirements – Part 2-104: Circular connectors – Detail specification for circular connectors with M8 screw-locking or snap-locking*

IEC 61158-2:2023, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

IEC 61643-21, *Low voltage surge protective devices – Surge protective devices connected to telecommunications and signalling networks – Performance requirements and testing methods*

IEEE Std 802.3-2022, *IEEE Standard for Ethernet*

ASTM D4566-05, *Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable*; available at <[ASTM D4566-05 - Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable \(ansi.org\)](#)> [viewed 2023-10-13]