

INTERNATIONAL STANDARD

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**Power line communication systems for power utility applications –
Part 3: Digital Power Line Carrier (DPLC) Terminals and hybrid ADPLC Terminals**

**Systèmes de communication sur lignes d'énergie pour les applications des
compagnies d'électricité –
Partie 3: Équipements terminaux à courants porteurs sur lignes d'énergie
numériques (DPLC) et équipements terminaux hybrides ADPLC**



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

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

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POWER LINE COMMUNICATION SYSTEMS FOR POWER UTILITY APPLICATIONS –

Part 3: Digital Power Line Carrier (DPLC) Terminals and hybrid ADPLC Terminals

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This first edition of IEC 62488-3 cancels and replaces the relevant parts of IEC TR 60663 and IEC 60495, which will be withdrawn at a later date.

The text of this standard is based on the following documents:

FDIS	Report on voting
57/2355/FDIS	57/2372/RVD

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

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

A list of all the parts in the IEC 62488 series, published under the general title *Power line communication systems for power utility applications* can be found on the IEC website

The committee has decided that the contents of this publication 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- withdrawn,
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INTRODUCTION

Since the first introduction of power line carrier communications in the power systems industry this form of communication has become widely spread throughout the world. This worldwide development will be covered by new standards reflecting the current state of the art in digital PLC communications.

The communication services offered by modern digital power line carrier links and networks enable a high efficiency of data transmission and therefore a low level of operational costs of automation equipment especially for long high-voltage power transmission lines.

Analogue and digital PLC terminals may co-exist using principles of frequency division multiplexing, allowing a successive digitalization of PLC based communications.

Digital PLC terminals may also be combined with traditional analogue PLC transmission paths as hybrid analog & digital PLC equipment, offering reliable and seamless communication for control and/or protection operating at extra high-, high- and medium-voltage levels of the electrical transmission networks and at high-voltage electrical distribution networks.

IEC 62488 consists of four parts dealing with all aspects of power line communication systems operating over electricity power lines.

IEC 62488 applies to power line carrier terminals and systems (PLC) used to transmit information over power networks including extra high, high and medium voltage (EHV/HV/MV) power lines.

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Currently this standard series is organised as follows:

- IEC 62488-1, *Planning of analogue and digital power line carrier systems operating over EHV/HV/MV electricity grids*
- IEC 62488-2, *Analogue Power Line Carrier terminals or APLC*
- IEC 62488-3, *Digital Power Line Carrier terminals or DPLC and hybrid ADPLC Terminals*
- IEC 62488-4, *Broadband Power Line systems or BPL*

NOTE IEC 62488-4 has not yet been published.

This document is the third part of IEC 62488 and is composed of the following Clauses:

- Clause 1 – Scope of IEC 62488-3
- Clause 2 – Normative references
- Clause 3 – Terms, definitions and abbreviation contains newly introduce in this document additionally to IEC 62488-1 and IEC 62488-2
- Clause 4 – Introduces generic architectures of DPLC and hybrid ADPLC terminals.
- Clause 5 – Defines access side interfaces of DPLC and hybrid ADPLC terminals.
- Clause 6 – Describes transmission line side high frequency interface and defines related parameters
- Clause 7 – Gives several requirements concerning quality and performance of a single or a couple of interconnected DPLC terminals
- Clause 8 – Defines test setup and describes testing methodology
- Clause 9 – Describes configuration and management requirements for DPLC terminals
- Clause 10 – Describes general requirements regarding cyber security
- Clause 11 – Specifies safety requirements
- Clause 12 – Specifies requirements for storage and transportation, operating conditions, power supply
- Clause 13 – Specifies EMC requirements

POWER LINE COMMUNICATION SYSTEMS FOR POWER UTILITY APPLICATIONS –

Part 3: Digital Power Line Carrier (DPLC) Terminals and hybrid ADPLC Terminals

1 Scope

This part of IEC 62488 applies to power line carrier terminals and networks used to transmit information over power networks including extra high, high and medium voltage (EHV/HV/MV) power lines using both digital and optionally analogue modulation systems in a frequency range between 16 kHz and 1 MHz (see also IEC 62488-1).

In many countries, power line carrier (PLC) channels represent a significant part of the utility-owned telecommunication system. A circuit normally routed via a PLC channel can also be routed via a channel using a different transmission medium such as point to point radio, optical fibre or open wire circuit.

It is therefore important that the input and output interfaces that are used between terminals in the communication system are standardised.

The issues requiring consideration of DPLC and/or APLC devices as parts of a telecommunication network can be found in IEC 62488-1.

Figure 1 shows the correspondence between the elements needed to implement PLC systems and the related International Standards.

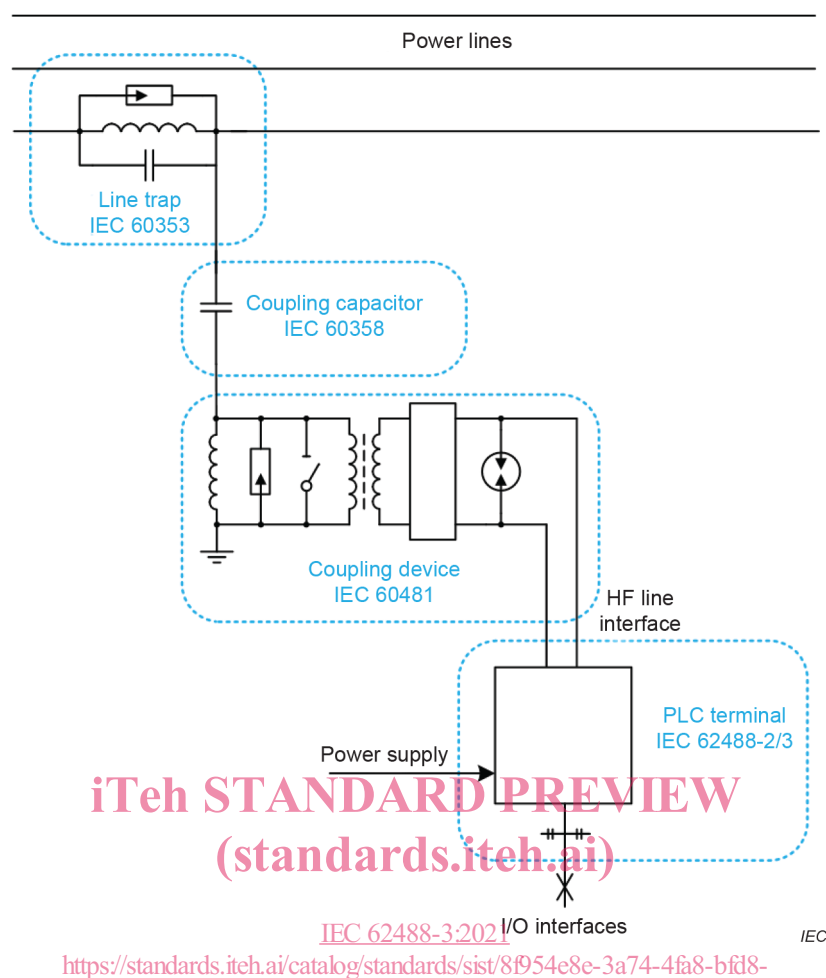


Figure 1 – Schematic representation of the elements needed to implement a PLC system

The scope of this document also includes the description of I/O interfaces and test set-ups that are necessary to qualify characteristics of DPLC or ADPLC terminal at link level.

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 60038, *IEC standard voltages*

IEC 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*

IEC 60255-27:2013, *Measuring relays and protection equipment – Part 27: Product safety requirements*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

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*

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

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

IEC 60721-3-1:1997, *Classification of environmental conditions – Part 3-1: Classification of groups of environmental parameters and their severities – Storage*

IEC 60721-3-3:2002, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Stationary use at weather protected locations*

IEC 60834-1:1999, *Teleprotection equipment of power systems – Performance and testing – Part 1: Command systems*

IEC 61000-6-4:2018, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61000-6-5:2015, *Electromagnetic compatibility (EMC) – Part 6-5: Generic standards – Immunity for equipment used in power station and substation environment*

[IEC 62488-3:2021](https://www.itsai.com/standards/IEC-62488-3-2021)

IEC TS 62351-1:2007, *Power systems management and associated information exchange – Data and communications security – Part 1: Communication network and system security – Introduction to security issues*

IEC TS 62351-8:2011, *Power systems management and associated information exchange – Data and communications security – Part 8: Role-based access control*

IEC 62488-1:2012, *Power line communication systems for power utility applications – Part 1: Planning of analogue and digital power line carrier systems operating over EHV/HV/MV electricity grids*

IEC 62488-2:2017, *Power line communication systems for power utility applications – Part 2: Analogue power line carrier terminals or APLC*

CISPR 32:2015/AMD1:2019, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62488-1, IEC 62488-2 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

DPLC equipment

PLC equipment transmitting information such as digital data or digitized analog signals over the power line using digital modulation techniques

3.1.2

HPLC

any combination of APLC, DPLC and BPLC elements in a single device

3.1.3

ADPLC

PLC equipment containing elements of APLC and DPLC. ADPLC is a sub-class of HPLC

3.1.4

nominal high frequency band for DPLC or HPLC

frequency band in which a particular DPLC or HPLC transmitter or receiver is operating within the carrier frequency range

3.1.5

nominal output power in the high frequency band for DPLC or HPLC

output power of an DPLC or HPLC terminal in the nominal high frequency band (L_{nom}) expressed as PEP for which the terminal has been designed, compatible with the requirements for spurious emissions and inter-channel interference (for multi-channel PLC terminals), available at the high frequency interface output across a resistive load equal to the nominal impedance

3.2 Abbreviated terms

AC	alternating current
AGC	automatic gain control
APLC	analogue PLC
ADPLC	analogue and digital PLC
AWGN	additive white Gaussian noise
BPLC	broadband PLC
BLER	block error rate
BER	bit error rate
B_{nom}	nominal high frequency band for DPLC or HPLC
CDF	cumulative distribution function
CPF	composite peak factor
DC	direct current
DPLC	digital PLC
DSP	digital signal processing
HF	high frequency
HPLC	hybrid PLC
LAN	local area network
LCL	longitudinal conversion loss