

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Industrial communication networks – Fieldbus specifications –
Part 3-21: Data-link layer service definition – Type 21 elements**

**Réseaux de communication industriels – Spécifications des bus de terrain –
Partie 3-21: Définition des services de couche liaison de données – Eléments
de Type 21**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2010 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.
If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.
Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente. un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Industrial communication networks – Fieldbus specifications –
Part 3-21: Data-link layer service definition – Type 21 elements**

**Réseaux de communication industriels – Spécifications des bus de terrain –
Partie 3-21: Définition des services de couche liaison de données – Eléments
de Type 21**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX



ICS 25.04.40; 35.100.20; 35.110

ISBN 978-2-88912-856-3

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
1.1 Overview.....	7
1.2 Specifications.....	7
1.3 Conformance.....	7
2 Normative references.....	8
3 Terms, definitions, symbols, abbreviations, and conventions.....	8
3.1 Reference model terms and definitions.....	8
3.2 Service convention terms and definitions.....	10
3.3 Data link service terms and definitions.....	10
3.4 Symbols and abbreviations.....	13
3.5 Conventions.....	14
4 Data-link layer services and concepts.....	15
4.1 General.....	15
4.2 Detailed description of the data service.....	19
4.3 Detailed description of the sporadic data service.....	21
4.4 Detailed description of network control message service.....	23
5 Data link management services.....	26
5.1 General.....	26
5.2 Data link management service (DLMS) facilities.....	26
5.3 Data link management service (DLMS).....	26
5.4 Overview of interactions.....	27
5.5 Detailed specification of service and interactions.....	29
6 MAC control service.....	37
6.1 General.....	37
6.2 MAC control service.....	37
6.3 Overview of interactions.....	37
6.4 Detailed specification of service and interactions.....	38
7 Ph-control service.....	40
7.1 General.....	40
7.2 Ph-control service.....	40
7.3 Overview of interactions.....	40
7.4 Detailed specification of service and interactions.....	41
Bibliography.....	44
Figure 1 – Full-duplex flow control.....	16
Figure 2 – Sequence diagram of DL-DATA service.....	16
Figure 3 – Sequence diagram of DL-SPDATA service.....	17
Figure 4 – Sequence diagram of NCM service primitive.....	17
Figure 5 – Relationships of DLSAPs, DLSAP-addresses, and group DL-addresses.....	18
Figure 6 – DL-DATA service.....	19
Figure 7 – Sequence diagram of Reset, Set-value, Get-value, SAP-allocation, SAP-deallocation, Get-SAP information and Get-diagnostic information service primitives.....	28
Figure 8 – Sequence diagram of Event service primitive.....	29

Figure 9 – Sequence diagram of MAC-reset and MAC-forward-control service primitive.....	38
Figure 10 – Sequence diagram of Ph-reset and Ph-get-link-status service primitive.....	41
Figure 11 – Sequence diagram of Ph-link-status-change service primitive	41
Table 1 – Destination DL-address	18
Table 2 – Primitives and parameters used in DL-DATA service	20
Table 3 – DL-DATA Primitives and Parameters	20
Table 4 – Primitives and parameters used in DL-SPDATA service	22
Table 5 – DL-SPDATA Primitives and Parameters	22
Table 6 – Primitives and parameters used on DL-NCM_SND service	23
Table 7 – DL-NCM_SND Primitives and Parameters	24
Table 8 – Summary of Network Control Message Type	25
Table 9 – Summary of DL-management primitives and parameters	28
Table 10 – DLM-RESET primitives and parameters	29
Table 11 – DLM-SET_VALUE primitives and parameters	30
Table 12 – DLM-GET_VALUE primitives and parameters	31
Table 13 – DLM-SAP_ALLOC primitives and parameters	32
Table 14 – DLM-SAP_DEALLOC primitives and parameters	33
Table 15 – DLM-GET_SAP_INFO primitives and parameters	33
Table 16 – DLM-GET_DIAG primitives and parameters	34
Table 17 – DLM-EVENT primitives and parameters	35
Table 18 – DLM event identifier	36
Table 19 – DLM-GET_PATH primitives and parameters	36
Table 20 – Summary of MAC control primitives and parameters	38
Table 21 – MAC-RESET primitives and parameters	38
Table 22 – MAC-FW_CTRL primitives and parameters	39
Table 23 – Summary of Ph-control primitives and parameters	40
Table 24 – Ph-RESET primitives and parameters	41
Table 25 – Ph-GET_LINK_STATUS primitives and parameters	42
Table 26 – Ph-LINK_STATUS_CHANGE primitives and parameters	43

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –
FIELDBUS SPECIFICATIONS –****Part 3-21: Data-link layer service definition –
Type 21 elements**

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.

NOTE 1 Use of some of the associated protocol types is restricted by their intellectual-property-right holders. In all cases, the commitment to limited release of intellectual-property-rights made by the holders of those rights permits a particular data-link layer protocol type to be used with physical layer and application layer protocols in type combinations as specified explicitly in profile parts. Use of the various protocol types in other combinations may require permission of their respective intellectual-property-right holders.

International Standard IEC 61158-3-21:2010 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This standard cancels and replaces IEC/PAS 62573 published in 2008. This first edition constitutes a technical revision.

This bilingual version published in 2012-01 corresponds to the English version published in 2010-08.

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

FDIS	Report on voting
65C/604/FDIS	65C/618/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.

The French version has not been voted upon.

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

A list of all parts of the IEC 61158 series, published under the general title *Industrial communication networks – Fieldbus specifications*, can be found on the IEC web site.

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

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

NOTE 2 The revision of this standard will be synchronized with the other parts of the IEC 61158 series.

Withdrawn

INTRODUCTION

This part of IEC 61158 is one of a series produced to facilitate the interconnection of automation system components. It is related to other standards in the set as defined by the “three-layer” fieldbus reference model described in IEC/TR 61158-1.

Throughout the set of fieldbus standards, the term “service” refers to the abstract capability provided by one layer of the OSI Basic Reference Model to the layer immediately above. Thus, the data-link layer service defined in this standard is a conceptual architectural service, independent of administrative and implementation divisions.

Withdrawn