Electricity metering –
Data exchange for meter reading, tariff and 
load control –
Part 21: 
Direct local data exchange

This English-language version is derived from the original bilingual publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.
Electricity metering –
Data exchange for meter reading, tariff and
load control –

Part 21:
Direct local data exchange
CONTENTS

FOREWORD ................................................................................................................................. 9
INTRODUCTION .......................................................................................................................... 13

1 Scope ......................................................................................................................................... 15
2 Normative references .................................................................................................................. 15
3 Terms, definitions and abbreviations .......................................................................................... 17
   3.1 Terms and definitions ............................................................................................................. 17
   3.2 Abbreviations ....................................................................................................................... 19
4 Physical properties ....................................................................................................................... 19
   4.1 Electrical current loop interface ............................................................................................ 19
   4.2 Electrical interface V.24/V.28 ............................................................................................ 23
   4.3 Optical interface ................................................................................................................... 25
      4.3.1 Construction of the reading head ................................................................................... 25
      4.3.2 Characteristic data of the magnet ................................................................................. 25
      4.3.3 Arrangement of components in the tariff device ............................................................. 29
      4.3.4 Alignment .................................................................................................................... 29
      4.3.5 Optical characteristics .................................................................................................... 29
5 Character transmission ................................................................................................................ 33
   5.1 Type of transmission ............................................................................................................. 33
   5.2 Transmission speed ............................................................................................................... 33
   5.3 Signal quality ........................................................................................................................ 33
   5.4 Character format .................................................................................................................. 33
   5.5 Character code ..................................................................................................................... 33
   5.6 Character security ............................................................................................................... 33
6 Data transmission protocol ......................................................................................................... 35
   6.1 General ................................................................................................................................. 35
   6.2 Calculation of the block check character .............................................................................. 35
   6.3 Message definitions ............................................................................................................ 37
      6.3.1 Request message ........................................................................................................... 37
      6.3.2 Identification message .................................................................................................. 37
      6.3.3 Acknowledgement/option select message .................................................................. 37
      6.3.4 Data message (except in programming mode) ............................................................... 37
      6.3.5 Acknowledgement message ....................................................................................... 37
      6.3.6 Repeat-request message ............................................................................................. 37
      6.3.7 Programming command message ............................................................................... 39
      6.3.8 Programming command message using optional partial blocks .................................. 39
      6.3.9 Data message (programming mode) ............................................................................ 39
      6.3.10 Data message (programming mode) using optional partial blocks ............................ 39
      6.3.11 Error message (programming mode) ........................................................................... 39
      6.3.12 Break message (programming mode) ......................................................................... 39
      6.3.13 Block message (other protocols) ............................................................................... 39
      6.3.14 Explanations of message contents .............................................................................. 41
6.4 Communication modes ..........................................................................................47
6.4.1 Protocol mode A ........................................................................................47
6.4.2 Protocol mode B ........................................................................................49
6.4.3 Protocol mode C ........................................................................................53
6.4.4 Protocol mode D ........................................................................................61
6.4.5 Protocol mode E (other protocols) ..............................................................61
6.4.6 Entering programming mode (unknown tariff device) ..................................63
6.4.7 Partial block communication (optional, only in protocol mode C) .................65
6.5 Syntax diagrams....................................................................................................71
6.5.1 Readout mode ...........................................................................................73
6.5.2 Programming mode ...................................................................................75
6.6 Data set structure ..................................................................................................77

Annex A (normative) Flow chart for direct local data exchange protocol, protocol mode C .....81
Annex B (normative) Wake-up methods for battery-operated tariff devices .....................85
Annex C (informative) Formatted codes ......................................................................89
Annex D (informative) Levels of access – system security .............................................127
Annex E (normative) METERING HDLC protocol using protocol mode E for direct local
data exchange .................................................................................................................. 129

Bibliography ................................................................................................................... 137

Index .......................................................................................................................... ........ 139

Figure 1 – Circuit diagrams ...........................................................................................23
Figure 2 – Construction of the reading head .......................................................................25
Figure 3 – Characteristic data of the magnet ...................................................................27
Figure 4 – View into optical port .......................................................................................29
Figure 5 – Test arrangement for the transmitter ...............................................................31
Figure 6 – Test arrangement for the receiver ....................................................................31
Figure 7 – Setting up a block check character (example according to ISO/IEC 1155) .............35
Figure 8 – Diagram protocol mode A ...............................................................................47
Figure 9 – Transmission protocol for protocol mode A ....................................................49
Figure 10 – Diagram protocol mode B .............................................................................51
Figure 11 – Transmission protocol for protocol mode B ...................................................51
Figure 12 – Diagram protocol mode C .............................................................................55
Figure 13 – Transmission protocol for protocol mode C giving data readout without
acknowledgement from the HHU .....................................................................................57
Figure 14 – Transmission protocol for protocol mode C giving data readout with
confirmation of the suggested baud rate ........................................................................57
Figure 15 – Transmission protocol for protocol mode C giving data readout with rejection
of the suggested baud rate ..............................................................................................59
Figure 16 – Transmission protocol for protocol mode C. Switching to programming mode
with acceptance of the suggested baud rate ...
INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICITY METERING –
DATA EXCHANGE FOR METER READING,
TARIFF AND LOAD CONTROL –

Part 21: Direct local data exchange

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this International Standard may involve the use of a maintenance service concerning the stack of protocols on which the present standard IEC 62056-21 is based.

The IEC takes no position concerning the evidence, validity and scope of this maintenance service.

The provider of the maintenance service has assured the IEC that he is willing to provide services under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the provider of the maintenance service is registered with the IEC. Information may be obtained:

Manufacturer's identification, item 12) of 6.3.2: from

The FLAG Association, UK
www.dlms.com/flag

Enhanced identification character, item 24) of 6.3.2: from

DLMS User Association
Geneva / Switzerland
www.dlms.ch
International Standard IEC 62056-21 has been prepared by IEC Technical Committee 13: Equipment for electrical energy measurement and load control.

This first edition IEC 62056-21 cancels and replaces the second edition of IEC 61107 published in 1996 and constitutes a technical revision.

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

<table>
<thead>
<tr>
<th>FDIS</th>
<th>Report on voting</th>
</tr>
</thead>
<tbody>
<tr>
<td>13/1271/FDIS</td>
<td>13/1277/RVD</td>
</tr>
</tbody>
</table>

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

Annexes A, B and E form an integral part of this standard.

Annexes C and D are for information only.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

• reconfirmed;
• withdrawn;
• replaced by a revised edition, or
• amended.
INTRODUCTION

IEC TC 13 has the task of preparing standards for data exchange for the purposes of meter reading, tariff and load control, and consumer information using various alternative communication media, with reference to ISO and ITU standards.

Meter data exchange can be local or remote. This part of IEC 62056 is restricted to local data exchange, whereas remote data exchange is covered by other standards of the IEC 62056 series.
1 Scope

This part of IEC 62056 describes hardware and protocol specifications for local meter data exchange. In such systems, a hand-held unit (HHU) or a unit with equivalent functions is connected to a tariff device or a group of devices.

The connection can be permanent or disconnectable using an optical or electrical coupling. An electrical interface is proposed for use with a permanent connection, or when more than one tariff device needs to be read at one site. The optical coupler should be easily disconnectable to enable data collection via an HHU.

The protocol permits reading and programming of tariff devices. It is designed to be particularly suitable for the environment of electricity metering, especially as regards electrical isolation and data security. While the protocol is well-defined, its use and application are left to the user.

This standard is based on the reference model for communication in open systems. It is enhanced by further elements such as an optical interface, protocol controlled baud rate switchover, data transmission without acknowledgement of receipt. The protocol offers several modes for implementation in the tariff device. The HHU or equivalent unit acts as a master while the tariff device acts as a slave in protocol modes A to D. In protocol mode E, the HHU acts as a client and the tariff device acts as a server.

As several systems are in practical use already, particular care was taken to maintain compatibility with existing systems and/or system components and their relevant protocols.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 62051:1999, *Electricity metering – Glossary of terms*


ISO/IEC 1155:1978, *Information processing – Use of longitudinal parity to detect errors in information messages*

ISO/IEC 1177:1985, *Information processing – Character structure for start/stop and synchronous character-oriented transmission*

ISO/IEC 1745:1975, *Information processing – Basic mode control procedures for data communication systems*


ITU-T Recommendation V.24 (2000), *List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)*

ITU-T Recommendation V.28 (1993), *Electrical characteristics for unbalanced double-current interchange circuits*