

DIN EN 13757-2



ICS 33.200; 35.100.10; 35.100.20

**Kommunikationssysteme für Zähler und deren Fernablesung –
Teil 2: Physical und Link Layer;
Englische Fassung EN 13757-2:2004**

Communication systems for and remote reading of meters –
Part 2: Physical and link layer;
English version EN 13757-2:2004

Systèmes de communication et de télérelevé de compteurs –
Partie 2: Couches physique et couche de liaison;
Version anglaise EN 13757-2:2004

Gesamtumfang 30 Seiten

Normenausschuss Heiz- und Raumlufttechnik (NHRS) im DIN
DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

Beginn der Gültigkeit

Diese Norm gilt ab 2005-02-01.

Nationales Vorwort

Diese Europäische Norm wurde vom Technischen Komitee CEN/TC 294 „Kommunikationssysteme für Zähler und deren Fernablesung“ (Sekretariat: AFNOR) erarbeitet und der englische Originaltext unverändert übernommen. Der Arbeitsausschuss 3.66 „Kommunikationssysteme für Zähler und deren Fernablesung“ im Normenausschuss Heiz- und Raumluftechnik (NHRS) war für das DIN Deutsches Institut für Normung e. V. an der Erstellung dieser Norm beteiligt.

Das Präsidium des DIN hat mit seinem Beschluss 1/2004 festgelegt, das von dem in den Regeln der europäischen Normungsarbeit von CEN/CENELEC verankerten Grundsatz, wonach Europäische Normen in den drei offiziellen Sprachen Deutsch, Englisch, Französischer veröffentlicht werden, in begründeten Ausnahmefällen abgewichen und auf die Deutsche Fassung verzichtet werden kann. Die Genehmigung dafür hat die DIN-Geschäftsleitung entsprechend ihren in Anlage 1 zu dem DIN-Rundschreiben A 5/2004 festgelegten Kriterien für die vorliegende Norm auf Antrag des NHRS als Ergebnis einer Einzelfallentscheidung erteilt, zumal bereits dieser Norm zugrunde liegende Papiere überwiegend in englischer Sprache auch von den deutschen Marktteilnehmern angewendet werden.

Da sich die Benutzer der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die englische Fassung der DIN EN 13757-2 veröffentlicht.

Eine deutsche Einführung für den Anwendungsbereich und eine allgemeine Beschreibung befinden sich im Teil 1 der Normenreihe DIN EN 13757.

English version

Communication systems for and remote reading of meters
Part 2: Physical and link layer

Systèmes de communication et de télérelevé
de compteurs —
Partie 2: Couches physique et couche de liaison

Kommunikationssysteme für Zähler und deren
Fernablesung —
Teil 2: Physical und Link Layer

This European Standard was approved by CEN on 23 September 2004.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

	Page
Foreword	3
Introduction	4
1 Scope.....	5
2 Normative references	5
3 Terms and definitions	5
4 Physical layer specifications	6
5 Link Layer (master and slave).....	12
6 Tables and figures.....	17
Annex A (informative) Schematic implementation of slave	21
Annex B (informative) Protection against mains voltages.....	22
Annex C (informative) Slave powering options	23
Annex D (informative) Slave collision detect.....	24
Annex E (informative) Cable installation	25
Annex F (informative) Protocol examples	27
Bibliography	28

Foreword

This document (EN 13757-2:2004) has been prepared by Technical Committee CEN/TC 294 "Communication systems for meters and remote reading of meters", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

This standard consists of the following parts:

EN 13757-1, *Communication system for meters and remote reading of meters — Part 1: Data exchange.*

EN 13757-2, *Communication systems for and remote reading of meters — Part 2: Physical and link layer.*

EN 13757-3, *Communication systems for and remote reading of meters — Part 3: Dedicated application layer.*

prEN 13757-4, *Communication systems for meters and remote reading of meters — Part 4: Wireless meter readout.*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

The physical and link layer parameters for baseband communication over twisted pairs has first been described in EN 1434-3:1997 ("M-Bus") for heat meters. This standard is a compatible and interworking update of a part of EN 1434-3:1997 and includes also other measured media (water, gas, heat cost allocators), the master side of the communication and newer technical developments. It should be noted that the EN 1434-3:1997 covers also other communication techniques.

It can be used with various application layers especially the application layer of EN 13757-3.

1 Scope

This document covers the physical and link layer parameters of baseband communication over twisted pair (M-Bus) for meter communication systems. It is especially applicable to heat meters, heat cost allocators, water meters and gas meters.

NOTE It is usable also for other meters (like electricity meters) and for sensors and actuators.

For generic descriptions concerning communication systems for meters and remote reading of meters see EN 13757-1.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 60870-5-2, *Telecontrol equipment and systems — Part 5: Transmission protocols — Section 2: Link transmission procedures* (IEC 60870-5-2:1992).

EN 61000-4-4, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 4: Electrical fast transient/burst immunity test — Basic EMV publication* (IEC 61000-4-4:1995).

EN 61000-4-5, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 5: Surge immunity test* (IEC 61000-4-5:1995).

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

unit load

one unit load ($1 U_L$) is the maximum mark state current of 1,5 mA

3.2

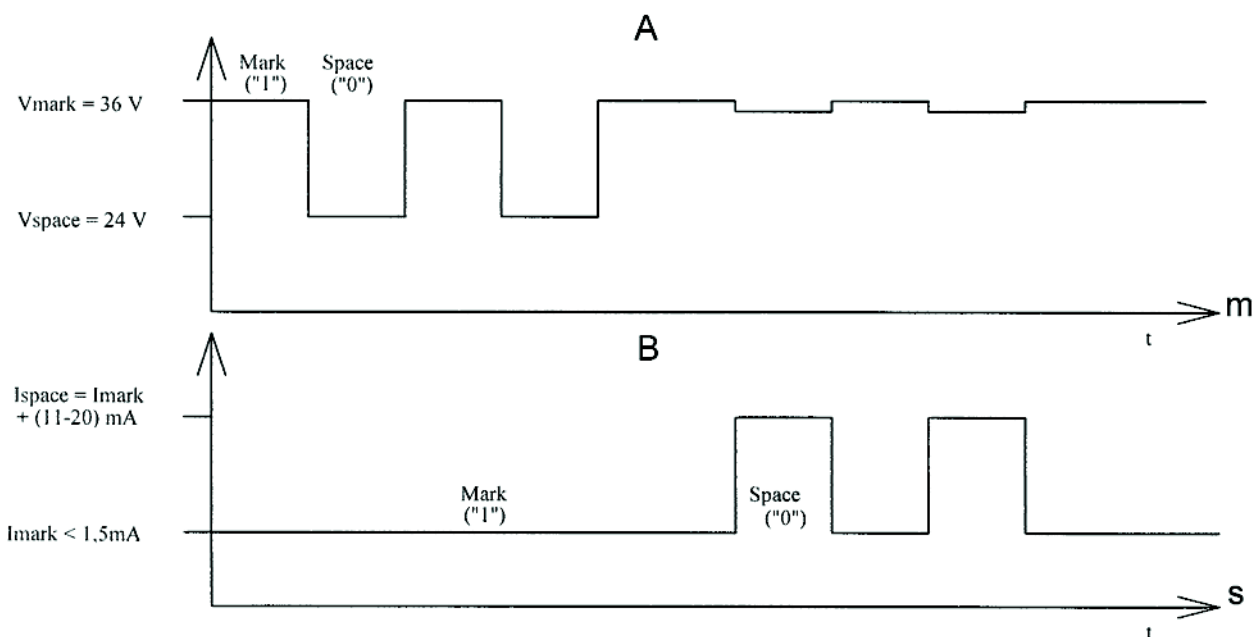
other definitions

for further definitions see 4.6 and annex C of EN 13757-1:2002

4 Physical layer specifications

4.1 General

Figure 1 shows the principal electrical concept of the physical layer: Information from the master to the slaves is transmitted via voltage level changes. A (high) quiescent voltage level U_{mark} (idle state, typically 36 V) and an active voltage level (space state) which is typically 12 V below U_{mark} (but at least 12 V) is used for the data transmission. The high voltage step improves the noise immunity in the master to slave direction. The required minimum voltage supports continuous remote powering of all slaves of a segment. Signalling via a voltage change rather than by absolute voltage levels supports even large voltage drops due to wiring resistance of the cable installation. All slaves are constant current sinks. Their idle (mark state) current of typically 1,0 mA to 1,5 mA can be used for powering the transceiver IC in the slave and optionally also the slave (meter). The active (space state) current transmit of a slave is signalled by an increase of this constant current by (11...20) mA. Signalling via constant current improves the immunity against induced voltages and is independent on wiring resistance. On the input of each slave transceiver a rectifier bridge makes each slave independent of the wiring polarity and reduces installation errors. Protective resistors in front of each slave transceiver simplify the implementation of overvoltage protection and safeguards the bus against a semiconductor short circuit in a slave by limiting the current of such a defective slave to 100 mA. Annex A shows the principal function of a slave transceiver. Integrated slave transceivers which include a regulated buffered voltage output for slave (meter) powering, support of battery supply with supply switchover and power down signalling are commercially available.



Key

- A Bus Voltage at Repeater
- B Current composition of a Slave
- t Time
- m Master transmits to Slave
- s Slave transmits to Master

Figure 1 — Representation of bits on the M-Bus

All specification requirements shall be held over the full range of temperature and operating voltage for the responsible system component.

4.2 Electrical requirements slave

4.2.1 Master to slave bus voltages

Maximum permanent voltage : $-50\text{ V} \dots 0\text{ V} \dots +50\text{ V}$ (no damage).

Voltage range for meeting all specifications: $\pm (12\text{ V} \dots 42\text{ V})$.

The Bus voltage at the slave terminals in mark-(quiescent) state of master slave communication ($= U_{\text{Mark}}$) shall be $\pm (21\text{ V} \dots 42\text{ V})$.

The mark voltage shall be stored by a voltage maximum detector with an asymmetric time constant. The discharge time constant shall be greater than $30 \times$ (charge constant) but less than 1 s.

The stored voltage maximum U_{Mark} may drop in 50 ms by not more than 0,2 V for all voltages between 12 V and U_{Mark} .

Bus voltage Mark/Space state for master slave communication.

Space: $U_{\text{Bus}} < U_{\text{Mark}} - 8,2\text{ V}$

Mark: $U_{\text{Bus}} \geq U_{\text{Mark}} - 5,7\text{ V}$

Maximum space state time 50 ms.

Maximum space state duty cycle: 0,92.

4.2.2 Slave bus current and multiple unit loads

4.2.2.1 General

A slave device may require a maximum mark current of an integer multiple N (in the range 1 ... 4) unit loads. Each terminal device shall be marked with the unit load number N (If > 1) and the device description shall contain a note on the multiple unit loads for this device.

4.2.2.2 Mark state bus current of a slave device

The mark state current I_{Mark} shall be $\leq N$ unit loads.

4.2.2.3 Variation of the mark state current over bus voltage

For bus voltages in the range of $\pm (12\text{ V} \dots 42\text{ V})$ a voltage variation of 1 V ... 15 V shall not change the bus current by more than $N \times 3\text{ }\mu\text{A/V}$.

4.2.2.4 Short term variation of the mark state current

At constant bus voltage the bus current shall not change by more than $\pm 1\%$ within 10 s.

4.2.2.5 Total variation over allowed temperature and voltage range of slave device

The total variation of the mark state current of a slave device shall not vary by more than $\pm 10\%$ over the full voltage and temperature range of the slave device.