SLOVENSKI STANDARD
oSIST prEN 13757-4:2018

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Komunikacijski sistemi za števce - 4. del: Brezžično komuniciranje po M-vodilu

Communication systems for meters - Part 4: Wireless M-Bus communication

Kommunikationssysteme für Zähler und deren Fernablesung - Teil 4: Zählerauslesung über Funk (Fernablesung von Zählern im SRD-Band)

Systèmes de communication pour compteurs - Partie 4 : Communication sans fil M-Bus

Ta slovenski standard je istoveten z: **prEN 13757-4**

ICS:

33.200	Daljinsko krmiljenje, daljinske meritve (telemetrija)	Telecontrol. Telemetering
35.100.10	Fizični sloj	Physical layer
35.100.20	Podatkovni povezovalni sloj	Data link layer

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English Version

Communication systems for meters - Part 4: Wireless M-Bus communication

Systèmes de communication des compteurs - Partie 4: Communication par radio, protocole M-bus

Kommunikationssysteme für Zähler und deren Fernablesung - Teil 4: Zählerauslesung über Funk (Fernablesung von Zählern im SRD-Band)

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 294.

If this draft becomes a European Standard, 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.

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

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European foreword

This document (prEN 13757-4:2017) has been prepared by Technical Committee CEN/TC 294 “Communication systems for meters”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13757-4:2013.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

The main changes since EN 13757-4:2013 are as follows:

— referenced standards have been updated to the most recent versions;

— Mode N, in the 169 MHz band has been extended to cover more frequencies see Clause 10;

— new C-field function code (Send User Data - No reply) added see 12.5.4;

— optional Forward Error Correction in the Link Layer added see 12.8;

— CI field for selectable Extended Link Layer added see 13.2;

— management functions for link control added see Clause 14.

The standard is not affected by any of the requirements in Directive 2004/22/EC as it only covers the basic transmission of information from the meter to an external entity. The standard ensures that data transmitted cannot be modified without it being detected. Confidentiality, integrity and authenticity are provided by the capabilities specified in other part of the EN 13757 series of standards. The standard does not specify any of the metering capabilities of the meter nor the metrological capabilities of the meter.

The standard enables encrypted transfer data either directly or as specified in other parts of the EN 13757 series of standards. The encryption ensures the confidentiality of any personal data.

The standard provides capabilities of interoperability of meters as requested in M/441 which can be used to improve the customer awareness of actual consumption.

Introduction

This draft European Standard belongs to the EN 13757 series, which covers communication systems for meters. EN 13757-1 contains generic descriptions and a communication protocol. EN 13757-2 contains a physical and a link layer for twisted pair based Meter-Bus (M-Bus).

prEN 13757-3 describes the application layer protocols (often called M-Bus).

EN 13757-5 describes the wireless network used for repeating, relaying and routing for the different modes of EN 13757-4.

EN 13757-6 describes a twisted pair local bus for short distance (Lo-Bus).

prEN 13757-7 describes transport and security services.

These upper M-Bus protocol layers can be used with various physical layers and with link layers and network layers, which support the transmission of variable length binary transparent messages. Frequently, the physical and link layers of EN 13757-2 (twisted pair) and EN 13757-4 (wireless) as well as EN 13757-5 (wireless with routing function) or the alternatives described in EN 13757-1 are used.

The different parts of this standard are complemented by FprCEN/TR xxxxx that provides examples and supplementary information related to prEN 13757-3 and prEN 13757-7.

These upper M-Bus protocol layers have been optimized for minimum battery consumption of meters, especially for the case of wireless communication, to ensure long battery lifetimes of the meters. Secondly, it is optimized for minimum message length to minimize the wireless channel occupancy and hence the collision rate. Thirdly, it is optimized for minimum requirements towards the meter processor regarding requirements of RAM size, code length and computational power.

This standard concentrates on the meter communication. The meter communicates with one (or occasionally several) fixed or mobile communication partners which again might be part of a private or public network. These further communication systems might use the same or other application layer protocols, security, privacy, authentication, and management methods. To facilitate common communication systems for CEN-meters (e.g. gas, water meters, thermal energy and heat cost allocators) and for electricity meters, in this standard occasionally electricity meters are mentioned. All these references are for information only and are not standard requirements. The definition of communication standards for electricity meters (possibly by a reference to CEN standards) remains solely in the responsibility of CENELEC.

The European Committee for Standardization (CEN) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning Forward Error Correction given in 12.8.

CEN takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has ensured CEN that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with CEN. Information may be obtained from:

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Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. CEN shall not be held responsible for identifying any or all such patent rights.

CEN and CENELEC maintain online lists of patents relevant to their standards. Users are encouraged to consult the lists for the most up to date information concerning patents (ftp://ftp.cencenelec.eu/EN/IPR/Patents/IPRdeclaration.pdf).

1 Scope

This European Standard specifies the requirements of parameters for the physical and the link layer for systems using radio to read remote meters. The primary focus is to use the Short Range Device (SRD) unlicensed telemetry bands. The standard encompasses systems for walk-by, drive-by and fixed installations. As a broad definition, this European Standard can be applied to various application layers.

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.

EN 13757-1, *Communication systems for meters — Part 1: Data exchange*

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

prEN 13757-3:2016, *Communication systems for meters — Part 3: Application protocols*

EN 13757-5, *Communication systems for meters — Part 5: Wireless M-Bus relaying*

prEN13757-7:2016, *Communication systems for meters — Part 7: Transport and security services*

EN 60870-5-1, *Telecontrol equipment and systems — Part 5: Transmission protocols — Section 1: Transmission frame formats (IEC 60870-5-1)*

EN 60870-5-2, *Telecontrol equipment and systems — Part 5: Transmission protocols — Section 2: Link transmission procedures (IEC 60870-5-1)*

ETSI EN 300 220-1, V3.1.1:2017-02, *Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 1: Technical characteristics and methods of measurement*

ETSI EN 300 220-2, *Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 2: Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU for non specific radio equipment*

ETSI EN 300 220-4, *Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 4: Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU; Metering devices operating in designated band 169,400 MHz to 169,475 MHz*

Draft ETSI EN 301 489-1, *V2.1.0:2016-04, ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Harmonised Standard covering the essential requirements of article 3.1(b) of the Directive 2014/53/EU and the essential requirements of article 6 of the Directive 2014/30/EU; Part 1: Common technical requirements*

ETSI EN 301 489-3, *Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz*

CCSDS 131.0-B-2 (Consultative Committee for Space Data Systems (CCSDS)), August 2011, *Recommended standard for TM Synchronization and Channel Coding*, Issue 2

ERC/REC 70-03 relating to the use of short range devices (SRD), issued by the European Conference of Postal and Telecommunications Administrations (CEPT), Electronics Communications Committee on 2016-10-21

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
BER
bit error rate

3.2
FEC
Forward Error Correction

3.3
FFSK
filtered frequency shift keying

3.4
frame
unit of transmission at the Data Link Layer

3.5
FSK
frequency shift keying

3.6
GFSK
gaussian frequency shift keying

3.7
individual transmission interval
exact time between two subsequent synchronous or periodical transmissions which changes with each transmission

3.8
LSB
least significant byte

3.9
LSBit
least significant bit

3.10
message
set of data at the Application Layer

3.11
MSB
most significant byte

3.12
nominal transmission interval
average individual transmission interval between all synchronous or periodical messages (new, old or no data content) for wireless meters

3.13
NRZ
non-return-to-zero

3.14
other Device
end device exchanging information with a meter

Note 1 to entry: A repeater is not an Other Device, as it is not exchanging information but just passing it on. A multi utility controller is an Other Device. A physical meter may take this role if supporting additional network functions.

3.15
PER
packet error rate

3.16
PN9
nine bit pseudo-random pattern

Note 1 to entry: The PN9 needs to be designed according to ITU-T Rec. O.150.

4 Symbols and abbreviations

CI	Control Information Field
Ident no.	Identification number (serial number) (part of meter address)
Manuf.	Manufacturer acronym (part of meter address)
Ver.	Version (part of meter address)
Device Type	Device type (part of meter address)
ACC	Access number (refer to prEN 13757-7)
STS	Status (refer to prEN 13757-7)
Conf.Field	Configuration Field (refer to prEN 13757-7)
M-2-O	Meter to other device (transmission direction)
O-2-M	Other device to meter (transmission direction)
min.	minimum value
typ.	typical value
max.	maximum value
RFU	Reserved for Future Use

5 General

5.1 Modes of operation

The “meters” may communicate with “other” system components, for example mobile readout devices, stationary receivers, data collectors, multi-utility concentrators or system network components. Such devices are in this document named “Other Device”. For the meter side, it is assumed that the communication function will work without any operator’s intervention or need for battery replacement over the full lifetime of the radio part of the meter. Other components such as the mobile readout or stationary equipment may have a shorter battery lifetime or require an external power supply as dictated by the technical parameters and use.

Several different modes of operation are defined for the communication with the meter. Many of the physical and link layer parameters of these different modes are identical, allowing the use of common hardware and software. However, due to the operational and technical requirements of these modes some parameters will differ.

The name of a mode is specified by a letter and a number. The letter specifies a mode and the number specifies whether the modes supports unidirectional (=1) or bidirectional (=2) data transfer.

a) “Stationary mode”, mode S is intended for unidirectional or bidirectional communications between the meter and a stationary or mobile device. A special transmit only sub-mode S1 is optimized for stationary battery operated devices with a long header and the sub-mode S1-m is specialized for mobile receivers.

b) “Frequent transmit mode”, mode T. In this mode, the meter transmits a very short frame (typically 3 ms to 8 ms) every few seconds, thus allowing walk-by and/or drive-by readout.

Transmit only sub-mode T1. It is the minimal transmission of a meter ID plus a readout value, which is sent periodically.

The bidirectional sub-mode T2 transmits frequently a short frame containing at least its ID and then waits for a very short period after each transmission for the reception of a response. The reception of a response will open a bidirectional communication channel. Alternatively, the initial frame contains the readout value as well, and the response is a reverse channel only used for special services.

c) “Frequent receive mode”, mode R. In this mode only R2 is relevant, as R1 makes no sense. The meter listens every few seconds for the reception of a wakeup message from a mobile transceiver. After receiving such a wakeup, the device will prepare for a few seconds of communication dialogue with the initiating transceiver. In this mode a “multi-channel receive mode” allows the simultaneous readout of several meters, each one operating on a different frequency channel. This mode is as well applicable to stationary Other Device's.

d) “Compact Mode” mode C. This mode is similar to mode T but it allows for transmission of more data within the same energy budget and with the same duty cycle. It supports the sub-modes C1 and C2 for unidirectional and bidirectional devices. It is suitable for walk-by and/or drive-by readout. The common reception of mode T and mode C frames with a single receiver is possible.

e) “Narrowband VHF”, mode N. Optimized for narrowband operation in the 169 MHz frequency band, allocated for meter reading and a few other services. The range of sub-modes can be extended using repeaters. Sub-band A is intended for, but not limited to, long range secondary communication using multi-hop repeaters.

f) "Frequent receive and transmit mode", mode F. Used in the 433 MHz frequency band for long range communications. In the bidirectional sub-modes F2-m, the meter listens every few seconds for the reception of a wake up message from a stationary or mobile transceiver. After receiving such a wake up message, the device prepares for a few seconds of communication dialogue with the initiating transceiver. The bidirectional sub-mode F2 transmits a frame and waits for a short period for the reception of a response. The response will open for bidirectional communication.

Meters or other communication devices may support one, multiple or all of the described modes.

NOTE Additional modes, supporting repeating and routing of data, are specified in EN 13757-5.

The detailed handling of broadcast and multicast transmissions is not specified in this standard. The transmission shall be interpreted as multicast if no Extended Link Layer or Transport Layer is used.

5.2 Meter communications types

Table 1 describes the key features of each mode and sub-mode.

Table 1 — Meter communication types

Modes and sub-modes	WAY	Typical use	Chip-rate kcps	Maximum duty cycle[a]	Data coding and header	Description
S1	1	Transmit only meter for stationary receiving readout	32,728	0,02 %[b]	Manchester and long header	Transmit only; transmits a number of times per day to a stationary receiving point. Transmits in the 1 % duty cycle frequency band. Due to long header, it is suitable also for battery economized receiver.
S1-m	1	Transmit only meter for mobile or stationary readout	32,728	0,02 %[b]	Manchester and short header	Transmit only; transmits with a duty cycle limitation of 0,02 % per hour to a mobile or stationary receiving point. Transmits in a 1 % duty cycle frequency band. Requires a continuously enabled receiver.
S2	2	All meter types. Stationary readout	32,728	1 %	Manchester and short header or optionally long header	Meter unit with a receiver either continuously enabled or synchronized requiring no extended preamble for wakeup. Also usable for node transponders or concentrators. A long header is optional.
T1	1	Frequent transmission (short frame meters)	100	0,1 %	3 to 6 and short header	Transmit only with short data bursts typically 3 ms to 8 ms every few seconds, operates in a 0,1 % duty cycle frequency band.