SLOVENSKI STANDARD
SIST EN 15969-1:2011

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Posode za prevoz nevarnih snovi - Digitalni vmesniki za prenos podatkov med vozilom s posodo in stacionarnimi napravami - 1. del: Opredelitev protokola - Upravljanje, meritev in zajem podatkov

Tanks for transport of dangerous goods - Digital interface for the data transfer between tank vehicle and with stationary facilities - Part 1: Protocol specification - Control, measurement and event data

Tanks für die Beförderung gefährlicher Güter - Digitale Schnittstelle für den Datenaustausch zwischen Tankfahrzeugen und stationären Einrichtungen - Teil 1: Protokollspezifikation - Steuerungs-, Mess- und Ereignisdaten

Citernes pour le transport de matières dangereuses - Interface numérique pour le transfert de données entre le véhicule-citerne et les installations fixes - Partie 1 : Spécification du protocole - Contrôle, mesurage et données d'évènements

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ICS:

23.020.10	Nepremične posode in rezervoarji	Stationary containers and tanks
35.240.60	Uporabniške rešitve IT v transportu in trgovini	IT applications in transport and trade

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EUROPEAN STANDARD

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ICS 35.240.60

English Version

Tanks for transport of dangerous goods - Digital interface for the data transfer between tank vehicle and with stationary facilities - Part 1: Protocol specification - Control, measurement and event data

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 15969-1:2011) has been prepared by Technical Committee CEN/TC 296 “Tanks for transport of dangerous goods”, 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of an identical text or by endorsement, at the latest by March 2012, and conflicting national standards shall be withdrawn at the latest by March 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This European Standard EN 15969, *Tanks for transport of dangerous goods – Digital interface for the data transfer between tank vehicle and with stationary vehicles*, is divided into the following parts:

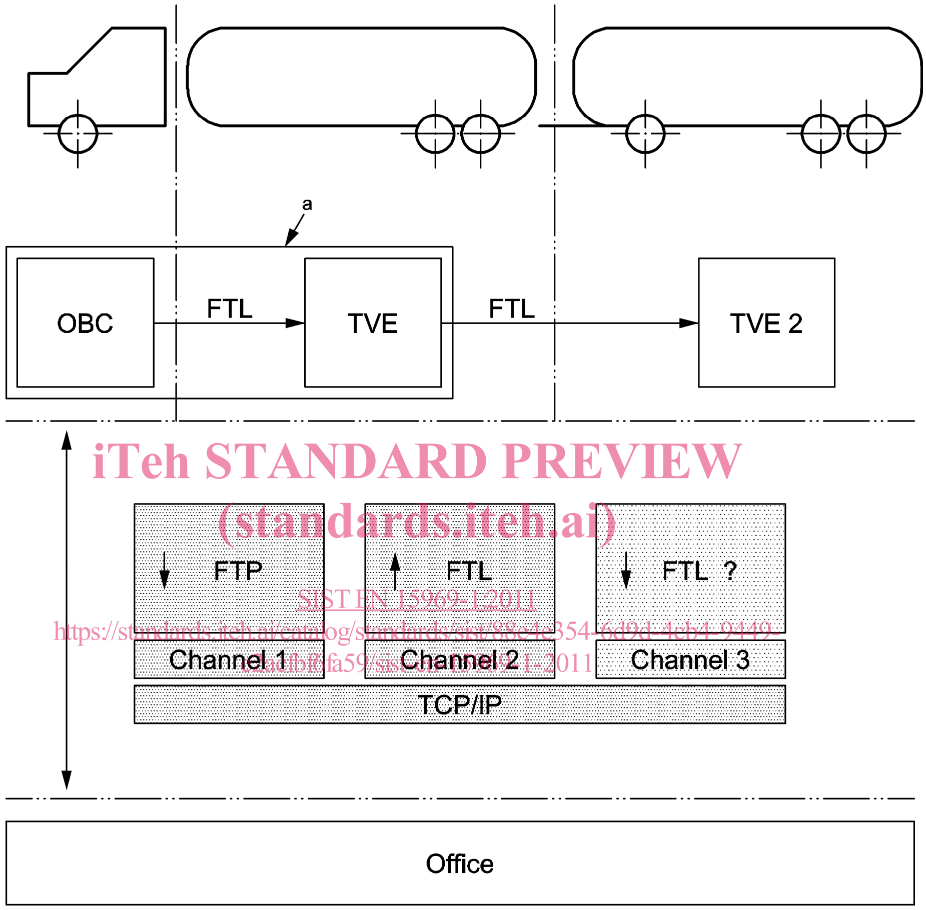
Part 1 — Protocol Specification – Control, measurement and event data

Part 2 — Commercial and logistic data

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

Introduction

FTL is an acronym for **F**uel **T**ruck **L**ink, the interface between electronic system(s) on board of a tank vehicle (tank-vehicle-equipment) and any external computer, e.g. an on-board-computer installed in the driver's cabin; for illustration see Figure 1.



Key

→ direction of communication (client → server)

a may be either two independent units or one single unit which incorporates both functions OBC and TVE

Figure 1

1 Scope

This European Standard specifies data protocols and data format for the interfaces between electronic equipment (TVE), on-board computer (OBC) of the tank vehicle and stationary equipment for all interconnecting communication paths.

This European Standard specifies the basic protocol FTL used in the communication (basic protocol layer), the format and structure of FTL-data to be transmitted (data protocol layer) and describes the content of the FTL-data.

NOTE This data protocol may be used for other application e.g. between stationary tank equipment and offices.

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 13616, *Overfill prevention devices for static tanks for liquid petroleum fuels*

EN 13922, *Tanks for transport of dangerous goods — Service equipment for tanks — Overfill prevention systems for liquid fuels*

EN 14116:2007+A2:2010, *Tanks for transport of dangerous goods — Digital interface for the product recognition device*

EN 15208:2007, *Tanks for transport of dangerous goods — Sealed parcel delivery systems — Working principles and interface specifications*

EN 15969-2:2011, *Tanks for transport of dangerous goods — Digital interface for the data transfer between tank vehicle and with stationary facilities — Part 2: Commercial and logistic data*

ISO 639-1, *Codes for the representation of names of languages — Part 1: Alpha-2 code*

ISO/IEC 10646: 2011, *Information technology — Universal Coded Character Set (UCS)*

DIN 51757:2011, *Testing of mineral oils and related materials — Determination of density*

3 Terms and definitions, abbreviations and conventions

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

3.1 Abbreviations

ACK	acknowledge controlframe
ADF	additional dataframe
ASCII	American Standard Code for Information Interchange
CAN	cancel controlframe
CRC	cyclic redundancy checksum
CSV	comma separated variable record

COP	crossover prevention
EOR	end of record dataframe
EOT	end of transmission dataframe
FTL	fuel-truck-link name of the interface
FTP	file transfer protocol
L_FILE	log file
LH_FILE	log file header
NAK	not acknowledge controlframe
OBC	on-board-computer
	NOTE One party in the FTL-communication (the client).
PID	product identification device according to EN 14116
SYN	synchronisation controlframe
SPDS	sealed parcel delivery system according to EN 15208
TEF	CRC transmission error controlframe
TVE	tank-vehicle-equipment
	NOTE One party in the FTL-communication (the server).
OpCode	operation code

3.2 Terms and definitions

3.2.1
downgrade
intentional loading and discharge of a higher grade product (substance) into a lower grade product of the same group

3.2.2
answer time
time between last frame character transmitted from OBC (client) and first character frame received from TVE (server)

3.2.3
array
collection of elements which have the same structure and are able to be accessed individually by means of an index

3.2.4
client
responsible for initiation and control of data exchange

3.2.5
field
element of a datagram delimited by separators

3.2.6
frame
data packet with variable length and defined structure

3.2.7
list
type of variables consisting of a number of records

3.2.8
MaxFrameSize
maximum number of characters in a frame

3.2.9
node
part of an address of a variable

3.2.10
graphic character
according to Annex D of ISO/IEC 10646-1:2011

3.2.11
record
ordered set of fields, stored contiguously

3.2.12
server
program which provides service to client programs

3.2.13
subnode
subpart of an address of a variable

3.2.14
datagram
instruction or answer to an instruction, which comprises an OpCode and operand

3.2.15
transaction
complete request-answer-cycle

3.2.16
type identifier
character code for the frame type

3.3 Conventions

3.3.1 Syntax conventions

When describing the syntax of e.g. a datagram, some parts are required.

Every abstract part shall get a name, which is encapsulated by “<” and “>”. Optional arguments are additionally encapsulated in square brackets.

EXAMPLE <field>[,<value>]

<field> has always to be given (required). <value> is optional, but when given, it shall be preceded by a comma.

3.3.2 Presentation of communication exchange

In this document several examples can be found, demonstrating the flow of communication.

To illustrate the direction, data sent by the TVE (server) is shown indented.

EXAMPLE

client request 1

server response 1
server response 2
server response 3

client request 2

This means, that the command "client request n" shall be transmitted by the OBC, whereas the lines "server response n" were transmitted by the TVE.

3.3.3 Numbers

Numbers may either be coded in decimal format (e.g. 12) or in hexadecimal format (e.g. 1Bh). In the latter case, the number shall followed by the character “h“.

4 Hardware interface

Communication shall only take place between two parties (point-to-point) the TVE and OBC.

For communication an asynchronous line shall be used (RS232, RS422 or RS485). The OBC and TVE start up and default settings shall be 9600 baud, 8 data bits, 1 stop bit and no parity.

The TVE may optionally support other baud rates (switching and switching back see 7.3.6).

5 Basic protocol layer

5.1 FTL-frame (frame)

The FTL-frame shall be according to Figure 2.

Frame (7 to MaxFrameSize character)

Start-Flag	Type	Content (optional)	End-Flag	Checksum
1 char	1 char	0 to MaxFrameSize - 7 char	1 char	4 char

Figure 2

A frame shall have the following minimum requirements:

- always starts with a Start—Flag
- always followed by type identifier

- 1 End-Flag

- 4 character Checksum (valid or invalid)
- frame length limited to MaxFrameSize

Frames which do not fulfil these requirements shall be ignored and not answered. A new frame starts upon the receipt of a Start-Flag. Any character received before the Start-Flag shall be ignored. All devices using the FTL-protocol shall be able to receive complete frames of MaxFrameSize characters. A frame shall be answered even if it contains an invalid checksum or incorrect characters (see 5.2).

If the type identifier in a frame is unknown a NAK shall be sent.

MaxFrameSize

The MaxFrameSize shall be 255 characters.

Start—Flag

The ASCII code 02h (start of text <STX>) shall be used as the Start-Flag.

Type identifier

The type identifier shall be according to Table 1.

Content

The content may be empty or shall contain up to MaxFrameSize minus 7 characters.
All characters in the content shall be printable characters.

End-Flag

The ASCII code 03h (End of Text <ETX>) shall be used as the End—Flag.

Checksum

The Checksum <CRC> verifies the integrity of a frame. It covers all characters from Start—Flag to End—Flag including these flags. A CRC16 (16 bit) value in hexadecimal format (always 4 characters long) is used and shall consist of the printable ASCII character "0"..."9" or "A"..."F" (example: the value 1AC9h shall be sent with 4 ASCII character "1AC9"). The algorithm for the calculation is described in 5.4.

5.2 Frame flow (handshake)

The character immediately following the Start-Flag defines the frame type. The different frame groups and their frame types are described in Table 1.

Table 1 — Frame groups and frame types

Frame group	Frame type	Abbreviation	Additional fields	Type identifier	
				client to server	server to client
Dataframe	end of record frame	EOR	data	R, V	r, v
	additional dataframe following frame	ADF	data	L, P	l, p
	end of transmission frame	EOT	data	E, I	e, i
Controlframe	acknowledge frame	ACK	no	A	a
	synchronisation/wait frame	SYN	no	-[1)]	s
	cancel frame	CAN	no	C	c
	CRC transmission error frame	TEF	no	T	t
	not acknowledge frame	NAK	NAK-ID according to Table 17	-[1)]	n

[1)] Not applicable.

To distinguish the direction of data (client to server or server to client) upper and lower case type character shall be used.

Every communication shall start with a dataframe.

Every dataframe from the server shall be answered by a controlframe from the client.

Every frame from the client shall be answered by a frame from the server.

If a dataframe is received by the server when an acknowledge is expected it shall be treated as a cancel frame (CAN) regarding the preceding transaction.

Every data frame on each side, independently, shall be flagged alternatively (toggled) with the secondary (V,P,I) and primary (R,L,E) type identifier. If subsequent dataframes with identical type identifier are received, these shall be treated as a repetition with identical data but shall be answered as the original, see Figure 11. This prevents redundant entries in lists resulting from communication faults.

After the startup of the system the first dataframe on each side shall start with the primary type identifier (R,L,E). The first request after startup shall not be a SET-request to a list.

EXAMPLES Examples of frame flows:

- Transaction that requires only one datagram in either direction, each fitting into a single frame, see Figure 3.

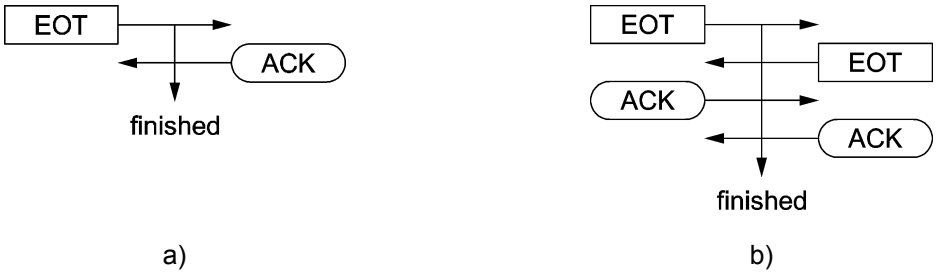


Figure 3

- Transactions that require more than one datagram (e.g multi record transfer), EOR—frames shall indicate that additional datagrames will follow. An EOT—frame shall be the last dataframe of the transaction, see Figure 4.

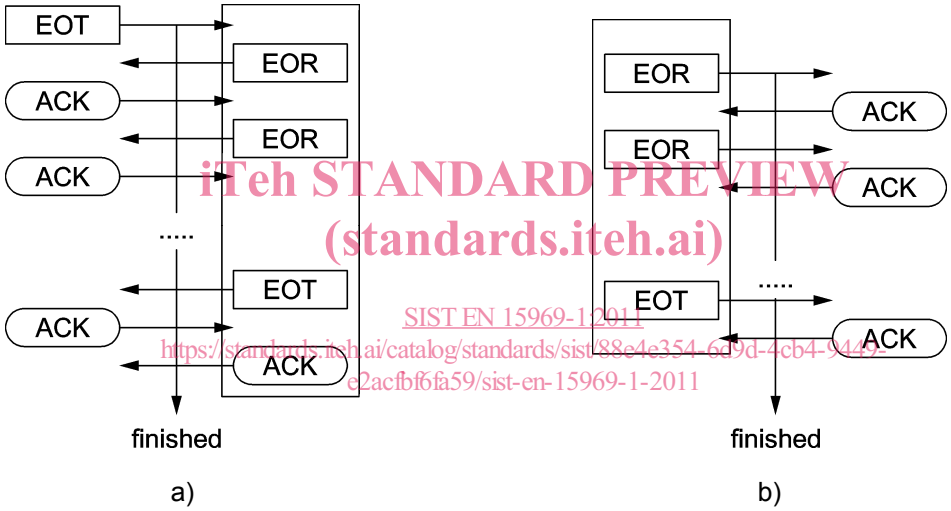


Figure 4

- Datagrams that require more than one frame, because MaxFrameSize is too small to hold a complete datagram shall be split into one or more ADF—frames and an EOT—frame or EOR-frame as appropriate, see Figure 5.

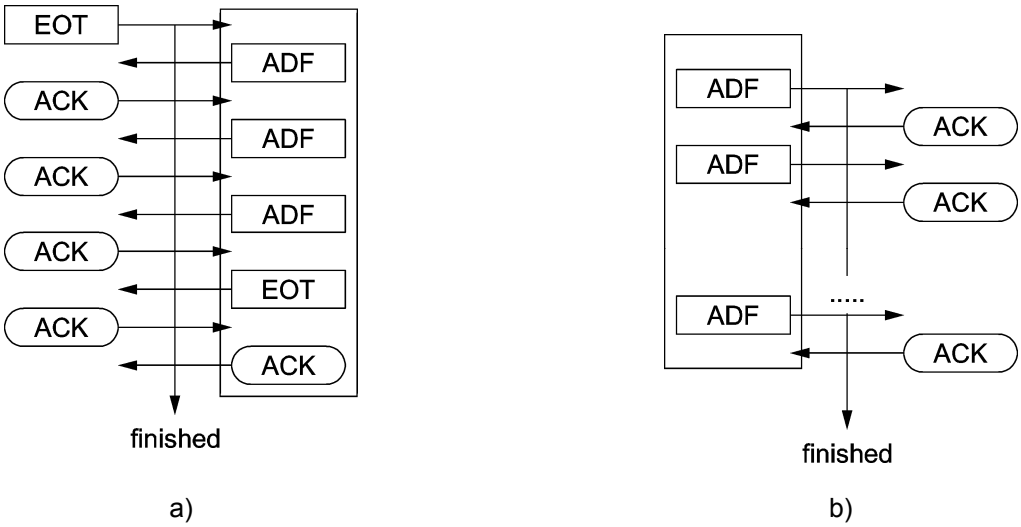


Figure 5

- The preceding examples may be combined as in Figure 6:

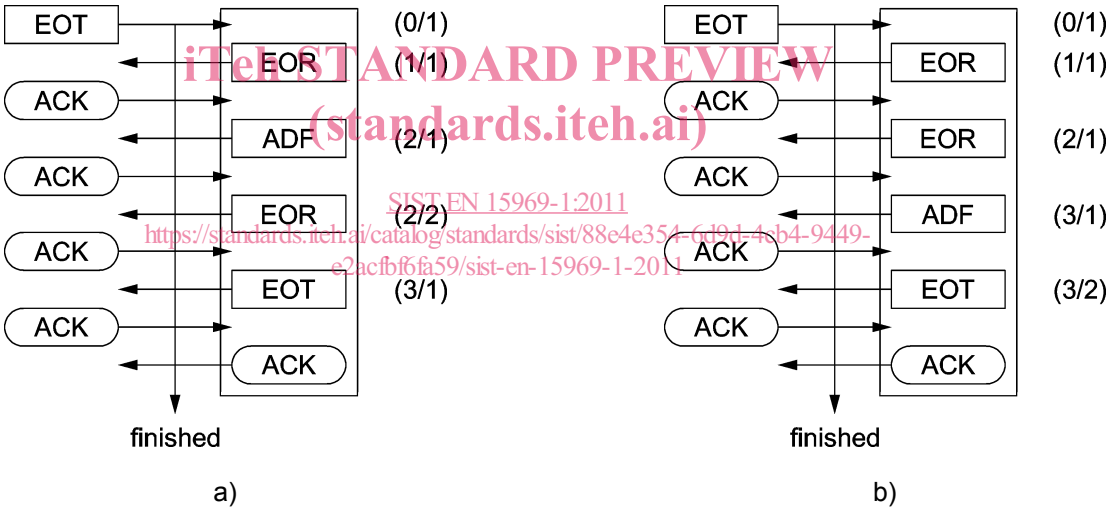


Figure 6