



BSI Standards Publication

Alcohol interlocks — Test methods and performance requirements

Part 4: Connection and digital interface between the alcohol interlock and the vehicle

National foreword

This British Standard is the UK implementation of EN 50436-4:2022. It supersedes BS EN 50436-4:2019, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AUE/16, Data Communication (Road Vehicles).

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

**Alcohol interlocks - Test methods and performance requirements
- Part 4: Connection and digital interface between the alcohol
interlock and the vehicle**

Ethylotests antidémarrage - Méthodes d'essais et
exigences de performance - Partie 4: Connexion et
interface numérique entre l'éthylotest antidémarrage et le
véhicule

Alkohol-Interlocks - Prüfverfahren und Anforderungen an
das Betriebsverhalten - Teil 4: Verbindung und digitale
Schnittstelle zwischen dem Alkohol-Interlock und dem
Fahrzeug

This European Standard was approved by CENELEC on 2022-06-20. CENELEC 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 Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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European foreword

This document (EN 50436-4:2022) has been prepared by CLC/BTTF 116-2 "Alcohol Interlocks".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2023-06-20
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2025-06-20

This document will supersede EN 50436-4:2019 and all of its amendments and corrigenda (if any).

EN 50436-4:2022 includes the following significant technical changes with respect to EN 50436-4:2019:

- Clause 3, terms and definitions, definitions were added for CAN and DBC;
- Clause 4.2, the CAN data bus was added as new data bus connection;
- Clause 4.3.3, the option to switch off the power supply to the alcohol interlock was included;
- Clause 4.5, the activation of the alcohol interlock was specified;
- Clause 4.6, the deactivation of the alcohol interlock was specified;
- Clause 5, the clause was simplified and updated;
- Clause 6, the alcohol interlock communication state Service was deleted;
- Clause 7.5, the specification of CAN services was added;
- Clause 8, the clause was updated and some communication state parameters were updated and clarified;
- Clause 9, the clause was updated;
- Clause 10, new clause was added to provide a link to the test plan in Annex H;
- Annex A, figures were updated to meet communication states;
- Annex B, tables were updated to meet new transition requirements;
- Annex C, the annex was reworked completely;
- Annex D, the annex was updated;
- Annex E, the annex was updated;
- Annex F, a sample DBC file was added as Annex;
- Annex G, the annex was updated;
- Annex H, the proposed test plan was added as an informative Annex.

EN 50436-4:2022 (E)

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Introduction

The purpose of alcohol interlocks is to enhance traffic safety by preventing persons with alcohol concentrations exceeding a set limit value from driving a motor vehicle. The EN 50436 series specifies test methods and essential performance requirements for alcohol interlocks and gives guidance for decision makers, purchasers and users.

There are several areas in which alcohol interlocks may be used:

- installed in a vehicle as a general preventive measure for the promotion of traffic safety, on a voluntary base or required legally in certain vehicles (e.g. vehicles for children transport), or
- in vehicles as ordered by a court or an administrative authority as part of a drink-driving offender programme, or
- for persons subject to a medical or rehabilitation programme.

Alcohol interlocks are often intended for after-market installation. For this purpose they have to be connected to the electrical circuits of the vehicle.

This installation of an alcohol interlock is expected not to interfere with the proper performance of the vehicle, nor to impair the safety and security of the vehicle; and to be as easy and as fast as possible. Additionally, the installation costs should be low in relation to the total cost of the alcohol interlock.

Therefore, it is desirable to have a standardised interface between alcohol interlocks and vehicles.

The alcohol interlock suppliers are expected to detail all the information that they will use/send. All used data/information is expected to respect the cyber security protocol and rules of the vehicle.

NOTE A new standard ISO/SAE 21434 to define requirements for cybersecurity engineering is under preparation.

All data required by the alcohol interlock from the vehicle is expected to be defined clearly and not be transferred outside the vehicle if this digital communication is used.

1 Scope

This document specifies the interface between an alcohol interlock for production and aftermarket installation and a vehicle. It details the modes of electrical connections, the assignment of electrical connection lines as well as the information to be exchanged between the vehicle and the alcohol interlock.

This document is applicable to alcohol interlocks for drink-driving-offender programmes (as in EN 50436-1) as well as to alcohol interlocks for general preventive use (as in EN 50436-2).

This document is mainly directed at manufacturers of alcohol interlocks and at vehicle manufacturers.

This document is referenced in EN 50436-7 and provides details of the preferred data bus connection suggested therein.

NOTE This document describes the information exchange using a LIN or a CAN (J1939) connection.

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 50436-1:2014, *Alcohol interlocks — Test methods and performance requirements — Part 1: Instruments for drink-driving-offender programs*

EN 50436-2, *Alcohol interlocks — Test methods and performance requirements — Part 2: Instruments having a mouthpiece and measuring breath alcohol for general preventive use*

EN 50436-7:2016, *Alcohol interlocks — Test methods and performance requirements — Part 7: Installation document*

ISO 17987-1:2016, *Road vehicles — Local Interconnect Network (LIN) — Part 1: General information and use case definition*

ISO 17987-2:2016, *Road vehicles — Local Interconnect Network (LIN) — Part 2: Transport protocol and network layer services*

ISO 17987-3:2016, *Road vehicles — Local Interconnect Network (LIN) — Part 3: Protocol specification*

ISO 17987-4:2016, *Road vehicles — Local Interconnect Network (LIN) — Part 4: Electrical physical layer (EPL) specification 12 V/24 V*

ISO/TR 17987-5:2016, *Road vehicles — Local Interconnect Network (LIN) — Part 5: Application programmers interface (API)*

ISO 17987-6:2016, *Road vehicles — Local Interconnect Network (LIN) — Part 6: Protocol conformance test specification*

ISO 17987-7:2016, *Road vehicles — Local Interconnect Network (LIN) — Part 7: Electrical Physical Layer (EPL) conformance test specification*

ISO 17987-8:2019, *Road vehicles — Local Interconnect Network (LIN) — Part 8: Electrical physical layer (EPL) specification: LIN over DC powerline (DC-LIN)*

SAE J1939 (series), *Serial Control and Communications Heavy Duty Vehicle Network*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 50436-1:2014 and EN 50436-7:2016 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org.obp>

3.1

motor

includes combustion engine, electric motor or hybrid power unit

3.2

odometer

instrument that indicates the distance travelled by the vehicle

3.3

passed breath test

breath test for which the user provided an accepted breath sample having a breath alcohol concentration below the breath alcohol concentration limit

3.4

failed breath test

breath test for which the user did not provide an accepted breath sample or has provided an accepted breath sample with an alcohol concentration equal to or above the breath alcohol concentration limit

3.5

lockout

condition in which the alcohol interlock will not accept a breath test and thereby prevents the user from starting the vehicle motor for a predetermined period of time

Note 1 to entry: Lockout could be required by regulatory requirements.

3.6

Local Interconnect Network

LIN

serial network protocol used for digital communication between components in vehicles

3.7

LIN description file

LDF

file that is created in the LIN cluster design and parsed in the LIN cluster generation or by debugging tools

Note 1 to entry: It contains LIN nodes, signals, frames and schedule table and other parameters relevant for LIN communication in a LIN network.

3.8

Controller Area Network

CAN

vehicle bus standard designed to allow microcontrollers and devices to communicate with each other in applications without a host computer

3.9

Database Container File

DBC

CAN data description file format

Note 1 to entry: It is a text file that contains information for decoding raw CAN bus data to physical values.

3.10

ADR

1957 United Nations treaty that governs transnational transport of hazardous materials

Note 1 to entry: The treaty of 30 September 1957 concerns the International Carriage of Dangerous Goods by Road.

4 Connection between alcohol interlock and vehicle

4.1 Installation documentation

4.1.1 Installation document of the vehicle

The installation of an alcohol interlock shall be described in an installation document according to EN 50436-7.

All extra parts that are required for the installation of an alcohol interlock according to this document shall be specified by at least name and part number in the referring installation document according to EN 50436-7.

4.1.2 Labelling and marking of the alcohol interlock

In addition to the labelling and marking according to EN 50436-1:2014, the alcohol interlock shall be marked legibly with the following minimum requirements:

- used interface or used interfaces and versions,
- used protocol version of EN 50436-4,
- reference to other applied technical standards (if applicable).

4.2 Data bus specification

4.2.1 General

The information exchange between the alcohol interlock and the vehicle shall be performed via a LIN data bus or a CAN Data bus.

NOTE For the information exchange between the alcohol interlock and the vehicle, a gateway can be used to adapt to the requested communication standards (LIN or CAN). Both the alcohol interlock and gateway are handled in the following standard as single units.

4.2.2 LIN Data Bus

The LIN master is on the vehicle side.

The alcohol interlock system shall act as a LIN slave.

The LIN Master and the interlock as a LIN slave shall conform to at least one of the following specifications: LIN Revision 2.0, LIN revision 2.1, LIN revision 2.2, LIN revision 2.2A, LIN according to ISO 17987-1:2016, ISO 17987-2:2016, ISO 17987-3:2016, ISO 17987-4:2016, ISO/TR 17987-5:2016, ISO 17987-6:2016, ISO 17987-7:2016, ISO 17987-8:2019 or later.

4.2.3 CAN Data Bus

The CAN data bus shall conform with the SAE J1939 series network protocol with a data rate of at least 250 kBit/s.

4.3 Properties of a connector

4.3.1 Systems using a LIN data bus

If the vehicle provides a connector at the end of cable harnesses or another specific location for the connection to the alcohol interlock, the connector shall have at least 3 connections with the assignments given in Table 1.

The exact type of the connector and pinout shall be specified in the installation document according to EN 50436-7.

It is recommended to propose 6-pin connectors.

NOTE The ground pin can be separated into two independent pins within a 4 pin connector.

4.3.2 Systems using a CAN data bus

If the vehicle provides a connector at the end of cable harnesses or another specific location for the connection to the alcohol interlock, the connector shall have at least 4 connections with the assignments given in Table 1.

The exact type of the connector and pinout shall be specified in the installation document according to EN 50436-7.

It is recommended to propose 6-pin connectors.

4.3.3 Minimum pin assignments

Table 1 gives the minimum pin assignments of a connector for LIN and CAN SAE J1939 series. It is to the discretion of the manufacturer to provide one or both data bus options on the connector.

Table 1 — Minimum pin assignments of a connector for LIN and CAN SAE J1939 series

<i>Purpose</i>	<i>Details</i>
Battery feed of the alcohol interlock	+9 V to + 36 V battery feed (terminal +30) as specified in EN 50436-7:2016, Annex C, with the exception that in the low power consumption mode of the alcohol interlock, the vehicle may switch off the power supply to the alcohol interlock.
Ground for the voltage supply of the alcohol interlock and data bus ground	0 V ground (terminal -30)
Data bus high	LIN High (ISO 17987 series)
CAN_H	CAN High (SAE J1939 series)
CAN_L	CAN Low (SAE J1939 series)

NOTE 1 The sequence of pin listing is arbitrary, e.g. lines are not necessarily in adjacent cavities. The exact pin numbering is specified in the installation document according to EN 50436-7:2016, Annex C, 3c.

NOTE 2 The ground pin can be separated into two independent pins within a 4 pin connector.

4.4 Behaviour of the vehicle

4.4.1 General

The vehicle that is equipped with an alcohol interlock which is installed according to this document shall not enable the start of the motor or vehicle movement if it receives the information that the interlock is in the blocking state or communication to the interlock is not possible or not plausible/unexpected.

The vehicle shall not cause a running vehicle motor to stop, even in the case of receiving a blocking information from the interlock after a missed or a failed retest.

NOTE National regulation or special requirements can modify this requirement.

4.4.2 Installation

The vehicle shall conform to the behaviour of 4.4.1 after the first successful communication with the alcohol interlock with a confirmed protocol validation.

The installation could require specified sequence of actions in order to install the alcohol interlock, that shall be documented according to 4.1.

The installation procedure shall include a test that provides evidence for the successful installation of the alcohol interlock.

4.4.3 Removal

The removal of the alcohol interlock could require a specified sequence of actions in order to remove the alcohol interlock, that shall be documented in the installation document according to EN 50436-7.

4.5 Activation of the alcohol interlock

The alcohol interlock shall be activated when the vehicle is activated.

Vehicles that communicate with the alcohol interlock via LIN Bus shall make use of the LIN WAKE UP procedure.

The LIN WAKE UP procedure shall not be performed by the alcohol interlock.

NOTE 1 This is not a requirement for a breath test with each activation of the vehicle.

NOTE 2 LIN WAKE UP is a procedure described in reference [1] of the bibliography.

NOTE 3 The wake up procedure for CAN systems as is required by the vehicle manufacturer is described in the installation documentation according to EN 50436-7.

4.6 Deactivation of the alcohol interlock following a shutdown request

The alcohol interlock shall go into its low power consumption mode where it can be switched off by the vehicle without error no longer than 10 s after the vehicle goes into its shutdown state and the alcohol interlock has acknowledged this.

NOTE National regulations could require different timings, examples could be vehicles that comply with ADR.

Vehicles that communicate with the alcohol interlock via LIN Bus shall transmit the go to sleep command after receiving the shutdown acknowledgement of the alcohol interlock.

The maximum time period between a not acknowledged shutdown and an acknowledged shutdown shall be 5 min.

4.7 Maintaining power to the alcohol interlock

The vehicle shall maintain uninterrupted power for the alcohol interlock if this is requested by the alcohol interlock.

The alcohol interlock shall only request power maintenance if the vehicle is stationary and in a service environment.

The minimum time period during which power supply to the alcohol interlock shall be maintained after it has entered into a communication state that requests this shall be 5 min.

After the alcohol interlock has communicated that it is in a state where power maintenance is required, the digital connection to the vehicle could be lost e.g. due to a restart of the alcohol interlock. In such cases the alcohol interlock shall restart by entering its initial communication state as described in 6.3.2.

NOTE Power maintenance is designed e.g. software maintenance and update, where complete resets under power could be needed. Complete resets can cause breaks in the communication, which will not lead to a disconnection of power if the alcohol interlock has requested power maintenance. Updates will always be type tested and preferably be performed in a workshop environment.

5 Basic connection architecture for the data bus

There are two basic options for the connection architecture between the vehicle and the alcohol interlock:

- a) Direct connection to a LIN bus or a CAN bus of the vehicle or
- b) Indirect connection to a digital bus of the vehicle via a LIN or CAN gateway.

The specifications of 4.2 apply.

The principle of the connection is shown in Figure 1.

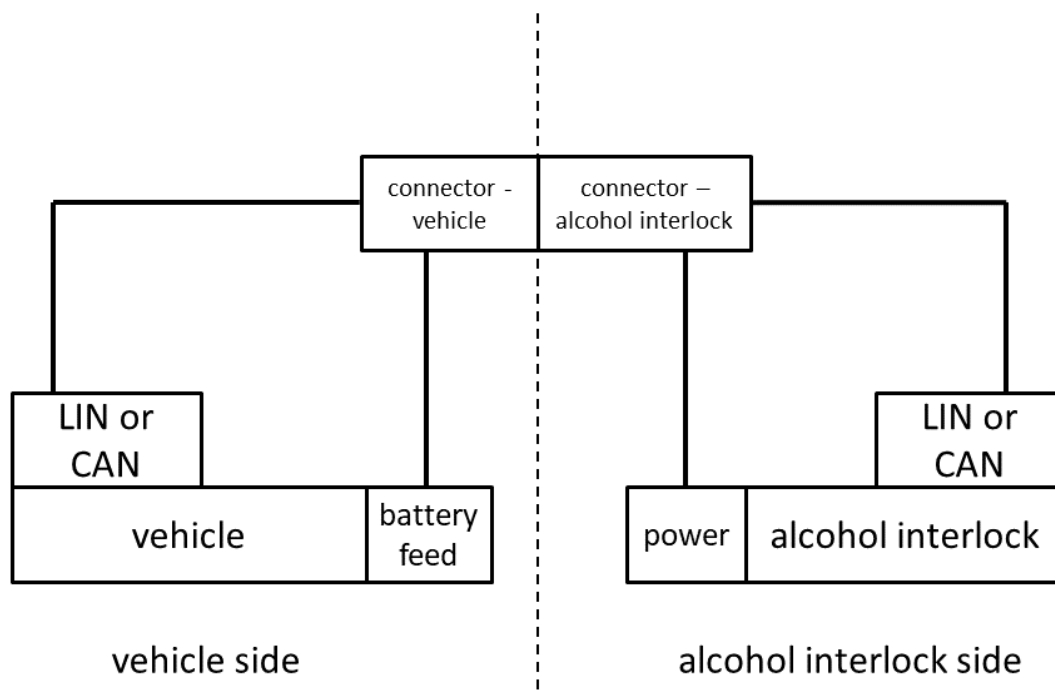


Figure 1 — Direct connection of alcohol interlock and vehicle bus

6 Communication

6.1 General

The communication between the vehicle and the alcohol interlock shall use communication states. Respective state transition tables are provided in Annex B.

6.2 Communication states of the vehicle

6.2.1 General

The vehicle shall have the following communication states:

- a) Protocol Validation;
- b) Set Mode;
- c) Unset Mode;
- d) Shutdown.

6.2.2 Vehicle communication state Protocol Validation

The vehicle shall be in the communication state <PROTOCOL_VALIDATION> if it requests the protocol validation from the alcohol interlock. The communication state <PROTOCOL_VALIDATION> shall be the initial communication state of the vehicle.

The additional entry action is:

- a) the vehicle requests a protocol validation from the alcohol interlock.

The exit actions are:

- b) the alcohol interlock has successfully validated the protocol;
- c) the vehicle shuts down.

The vehicle shall not allow the driver to start the motor or enable the motion of the vehicle if the vehicle is in the communication state <PROTOCOL_VALIDATION>.

6.2.3 Vehicle communication state Set Mode

The vehicle shall be in the communication state <SET_MODE> when the vehicle is in a state in which it cannot be driven normally under its own power. This state shall last until the start of the motor or the motion of the vehicle.

The entry actions are:

- a) the interlock has authenticated itself and the vehicle cannot be driven normally under its own power;
- b) transitions in accordance to 6.2.6.

The exit actions are:

- c) the vehicle shuts down;
- d) the vehicle goes into the state in which it can be driven normally under its own power;
- e) the vehicle goes into bypass mode.

NOTE The most usual way that the vehicle goes into the state in which it can be driven normally under its own power is that the motor is started.

6.2.4 Vehicle communication state Unset Mode

The vehicle shall be in the communication state <UNSET_MODE> when the vehicle is in the state in which it can be driven normally under its own power.

The entry action is:

- a) the vehicle goes into the state in which it can be driven normally under its own power;

The exit actions are:

- b) the vehicle shuts down;
- c) transitions in accordance to 6.2.6.

6.2.5 Vehicle communication state Shutdown

The vehicle shall feature the communication state <SHUTDOWN>.

The entry action is:

- a) the vehicle shuts down.

The exit action is:

- b) the vehicle ends its shut down procedure.

6.2.6 Transitions from Unset Mode to Set Mode

The vehicle shall enter in the communication state <SET_MODE> without supplementary action from the driver by at least one of the following means:

- a) at rotation of the ignition key into the “0” position in the ignition lock or equivalent and activation of a door; in addition, vehicles that enter the communication state <UNSET_MODE> immediately before or during the normal starting procedure of the vehicle are permitted to enter the <SET_MODE> on turning the ignition off;
- b) at a maximum of 1 min after the motor has turned off and is not in stop while the vehicle is stationary.

If there is no ignition key the equivalent to the rotation of the ignition key into the “0” position shall be described in the installation document according to EN 50436-7.

Within the transition period from UNSET to SET, changing ignition states without starting the motor shall not affect the timers or conditions.

6.3 Communication states of the alcohol interlock

6.3.1 General

The alcohol interlock shall have the following communication states:

- a) Activated;
- b) Protocol Validation;
- c) Service Information;
- d) Warm Up;
- e) Test Request;
- f) Analysing;

- g) Result;
- h) Wait Ignition;
- i) Idle;
- j) Lockout;
- k) Error.

6.3.2 Alcohol interlock communication state Activated

The alcohol interlock shall feature the communication state <ACTIVATED>. The communication state <ACTIVATED> shall be the initial communication state of the alcohol interlock.

The entry action is:

- a) the alcohol interlock is activated.

NOTE The procedure of activating the alcohol interlock is left to the discretion of the vehicle manufacturer unless specified elsewhere in this standard.

The exit action is:

- b) the alcohol interlock receives the vehicle message request <PROTOCOL_VALIDATION>.

6.3.3 Alcohol interlock communication state Protocol Validation

The alcohol interlock shall feature the communication state <PROTOCOL_VALIDATION>.

In the communication state <PROTOCOL_VALIDATION> the alcohol interlock shall transmit protocol related information.

The entry action is:

- a) the reception of the vehicle message request <PROTOCOL_VALIDATION>.

The exit action is:

- b) the vehicle message request <SET_MODE> under the condition that the protocol version is supported.

If the protocol is not supported, the alcohol interlock shall stay in its communication state <PROTOCOL_VALIDATION> until it receives the vehicle message request <SHUTDOWN> and then is deactivated.

NOTE According to 6.3.10, the alcohol interlock always transits into the communication state <IDLE> after leaving the communication state <PROTOCOL_VALIDATION>.

6.3.4 Alcohol interlock communication state Service Information

The alcohol interlock shall feature the communication state <SERVICE_INFORMATION>.

In the communication state <SERVICE_INFORMATION> the alcohol interlock transmits service related information.

The entry action is:

- a) that the alcohol interlock needs to send service information.

The exit actions are:

- b) the alcohol interlock has sent the service information;
- c) an error not related to a breath sample occurs;

- d) the reception of the vehicle message request <PROTOCOL_VALIDATION>;
- e) the alcohol interlock receives the <SHUTDOWN> request.

NOTE According to 6.3.10 the alcohol interlock always transits into the communication state <IDLE> after leaving the communication state <SERVICE_INFORMATION>.

6.3.5 Alcohol interlock communication state Warm Up

The alcohol interlock shall feature the communication state <WARM_UP>.

In the communication state <WARM_UP> the alcohol interlock transmits that it is preparing for a breath test.

The entry action is

- a) the interlock communicates that it is preparing for a breath test.

The exit actions are:

- b) the alcohol interlock is prepared for a breath test;
- c) an error not related to a breath sample occurs;
- d) the reception of the vehicle message request <PROTOCOL_VALIDATION>.
- e) the alcohol interlock receives the <SHUTDOWN> request.

NOTE Alcohol interlocks that do not need a preparation period cannot enter the communication state <WARM_UP>.

6.3.6 Alcohol interlock communication state Test Request

The alcohol interlock shall feature the communication state <TEST_REQUEST>.

In the communication state <TEST_REQUEST> the alcohol interlock requests a breath test.

The entry action is:

- a) the alcohol interlock is prepared for a breath test and requests the test;

The exit actions are:

- b) a breath sample was provided;
- c) an error related to a breath sample occurs;
- d) an error not related to a breath sample occurs;
- e) the reception of the vehicle message request <PROTOCOL_VALIDATION>,
- f) the alcohol interlock receives the <SHUTDOWN> request.

NOTE The condition that no breath sample was provided is considered an error related to a breath sample in the context of this clause, i.e. the expiration of the test request period.

6.3.7 Alcohol interlock communication state Analysing

The alcohol interlock shall feature the communication state <ANALYSING>.

In the communication state <ANALYSING> the alcohol interlock analyses a breath sample.

The entry actions are:

- a) a breath sample was provided;
- b) an error related to a breath sample occurred;

The exit actions are:

- c) the result of an accepted breath sample analysis is available;
- d) an error related to a breath sample is recognised;
- e) an error not related to a breath sample occurred;
- f) the reception of the vehicle message request <PROTOCOL_VALIDATION>;
- g) the alcohol interlock receives the <SHUTDOWN> request.

NOTE The condition that no breath sample was provided is considered an error related to a breath sample in the context of this clause, i.e. the expiration of the test request period.

6.3.8 Alcohol interlock communication state Result

The alcohol interlock shall feature the communication state <RESULT>.

In the communication state <RESULT> the alcohol interlock communicates the results of the analysis.

The entry actions are:

- a) the interlock has analysed an accepted breath sample;
- b) the interlock has recognised the reason for an error related to a breath sample.

The exit actions are:

- c) alcohol interlock has transmitted the result information;
- d) an error not related to a breath sample occurred;
- e) the reception of the vehicle message request <PROTOCOL_VALIDATION>;
- f) the alcohol interlock receives the <SHUTDOWN> request.

NOTE The condition that no breath sample was provided is considered an error related to a breath sample in the context of this clause, i.e. the expiration of the test request period.

6.3.9 Alcohol interlock communication state Wait Ignition

The alcohol interlock shall feature the communication state <WAIT_IGNITION>.

In the communication state <WAIT_IGNITION> the alcohol interlock communicates that it waits for the driver to start, or equivalent, the motor of the vehicle.

The entry action is the beginning or the continuation of a start or restart period.

The exit actions are:

- a) the start, or equivalent, of the motor;

- b) the end of the start or restart period;
- c) an error not related to a breath sample occurs;
- d) the reception of the vehicle message request <PROTOCOL_VALIDATION>;
- e) the alcohol interlock receives the <SHUTDOWN> request.

6.3.10 Alcohol interlock communication state Idle

The alcohol interlock shall feature the communication state <IDLE>.

In the communication state <IDLE> the alcohol interlock communicates that it is idle, which means that the alcohol interlock does not request a specific action like e.g. the provision of a breath sample, but nevertheless is operational. In the communication state <IDLE> the alcohol interlock can additionally communicate certain general parameters. The alcohol interlock may also be in the communication state <IDLE> while being serviced.

The entry actions are:

- a) leaving the state <PROTOCOL_VALIDATION>;
- b) leaving the state <SERVICE_INFORMATION>;
- c) leaving the state <LOCKOUT>;
- d) leaving the state <ERROR>;
- e) leaving the state <RESULT>;
- f) leaving the state <WAIT_IGNITION>;
- g) the alcohol interlock receives the <SHUTDOWN> request.

The exit actions are:

- h) the preparation for a breath test;
- i) the alcohol interlock is prepared and requests a breath test;
- j) the beginning or the continuation of a start or restart period;
- k) the alcohol interlock goes into lockout;
- l) an error not related to a breath sample occurs;
- m) entering the state <SERVICE_INFORMATION>;
- n) the reception of the vehicle message request <PROTOCOL_VALIDATION>;
- o) the alcohol interlock is deactivated.

If the alcohol interlock is in the communication state <IDLE> after the reception of a <SHUTDOWN> message from the vehicle, it shall indicate whether it is ready to enter the low power consumption state where the power may be switched off in total by the vehicle.

NOTE An option for the alcohol interlock to be deactivated is for it to enter low power consumption mode.

6.3.11 Alcohol interlock communication state Lockout

The alcohol interlock shall feature the communication state <LOCKOUT>.

In the communication state <LOCKOUT> the alcohol interlock shall communicate that it is in the lockout state.

The entry action is:

- a) the alcohol interlock goes into lockout state.

The exit actions are:

- b) the alcohol interlock leaves the lockout state;
- c) an error not related to a breath sample occurs;
- d) the reception of the vehicle message request <PROTOCOL_VALIDATION>;
- e) the alcohol interlock receives the <SHUTDOWN> request.

6.3.12 Alcohol interlock communication state Error

The alcohol interlock shall feature the communication state <ERROR>.

In the communication state <ERROR> the alcohol interlock shall communicate that an error not related to a breath sample has occurred, provided the interlock is operational (in the sense that it can communicate the error).

The entry action is:

- a) the occurrence of a detected error.

The exit actions are:

- b) the disappearance of the error;
- c) the reception of the vehicle message request <PROTOCOL_VALIDATION>;
- d) the alcohol interlock receives the <SHUTDOWN> request.

6.4 Interaction between vehicle and alcohol interlock

When using a vehicle with an alcohol interlock a certain sequence of operational events will occur. A typical example is shown in Annex A.

7 Implementation of the communication states

7.1 General

The communication states shall be implemented such that the signals and messages can be transmitted using the Local Interconnect Network (LIN) or Controller Area Network (CAN) serial network protocol.

7.2 Coding of data bus signals

7.2.1 General

Data bus signals shall have a data length of 8 bytes.

Vehicle request and interlock response message shall be transmitted at least every 200 ms to allow useful communication. Messages shall not be transmitted more frequently than every 20 ms to avoid an inadequate bus traffic.

Frames are sent with unchanged contents until a state transition occurs.

7.2.2 Vehicle to alcohol interlock

The message request from the vehicle to the alcohol interlock shall consist of 8 bytes of data as given in Table 2.

The first byte Data 1 shall be the status byte that contains the value that represents the vehicle communication state.

The second to the eighth byte Data 2 to Data 8 shall contain additional information as payload or be set to 0xFF.

Table 2 — Structure of a frame from the vehicle to the alcohol interlock

	Status Payload						
Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8
Status	payload byte 1	payload byte 2	payload byte 3	payload byte 4	payload byte 5	payload byte 6	payload byte 7

7.2.3 Alcohol interlock to vehicle

The message response from the alcohol interlock to the vehicle shall consist of 8 bytes of data as given in Table 3.

The first byte Data 1 shall be the status byte that contains the value that represents the interlock communication state.

The second and the third byte Data 2 and Data 3 shall provide the blocking information coded as little-endian.

The fourth to the eighth byte Data 4 to Data 8 shall contain additional information as payload or be set to 0xFF.

Table 3 — Structure of a frame from the alcohol interlock to the vehicle

	Status Payload						
Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8
Status	Blocking byte 1	Blocking byte 2	payload byte 1	payload byte 2	payload byte 3	payload byte 4	payload byte 5

7.3 Signal Validation and error handling

7.3.1 General

Reserved signal values and implausible data values shall lead to the termination of the current interlock communication process by the vehicle, unless specified differently. After termination the interlock communication process shall restart. The interlock shall check the consistency of the interlock communication process.

7.3.2 Bus Wake up

The alcohol interlock shall not wake up the data bus of the vehicle.

7.3.3 Restart by the vehicle

A restart of the communication process without an electrical restart of the alcohol interlock, i.e. without switching the support lines of the alcohol interlock off and on again, is performed by the vehicle by entering its communication state <PROTOCOL_VALIDATION>.

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The alcohol interlock shall be capable to record such restarts by the vehicle in the memory of the alcohol interlock.

NOTE The behaviour after an electrical restart of the alcohol interlock is identical to a normal start-up procedure.

7.3.4 Restart by the alcohol interlock

A restart of the communication process is performed by the alcohol interlock by entering its initial communication state <ACTIVATED>.

The alcohol interlock shall be capable to log such restarts in the data memory.

7.4 LIN identifiers and services

7.4.1 Identifiers

Data frames for the communication between the vehicle and the interlock shall have unique identifiers. The default identifier for data frames from the vehicle to the alcohol interlock shall be 0x3A and the default identifier frames from the alcohol interlock to the vehicle shall be 0x3B. The default identifier for the alcohol interlock status frame shall be 0x39.

NOTE 1 For interlock protocol communication on LIN either one schedule table can be defined containing both messages (0x3A and 0x3B) or alternatively at least two schedule tables are defined containing request and response message and the vehicle LIN master node is changing between those schedule tables so each message is repeated frequently.

NOTE 2 Examples of LIN Description Files (LDF) are given in Annexes E and F.

7.4.2 Alcohol interlock status frame

For LIN conformity reasons the alcohol interlock node shall have one additional transmit frame with the length of 4 bytes and the ID of 0x39. The one bit status signal response error is located in the least significant bit of byte 0. Other bits of the frame may be defined proprietary by the alcohol interlock manufacturer.

7.4.3 Assign Frame identifier

In order to adapt used default LIN frame identifiers each alcohol interlock shall support a minimum set of LIN node configuration and identification services.

An alcohol interlock according to LIN 2.0 shall support Assign Frame Identifier service 0xB1.

An alcohol interlock according to LIN 2.1 and above shall support Assign Frame Identifier service 0xB7.

7.4.4 LIN Product identification of interlock system

LIN diagnostic service 0xB2 Read by Identifier with identifier 0 is mandatory for the alcohol interlock.

NOTE This is outlined in LIN Specification package revision 2.2.A, 4.2.1 and in LIN Specification package revision 2.2.A, 4.2.6.

7.4.5 Generic integration into vehicle

7.4.5.1 Protected frame Identifier and node address for diagnostic usage

The alcohol interlock shall support its generic integration into a vehicle regarding LIN communication parameters Protected Frame Identifiers (PIDs) and Node Address for Diagnostic (NAD) with a default configuration. In this default configuration:

- the initial NAD shall be 0x7A;
- the configured NAD shall be 0x7A;

- for this document, the function identifier as part of the LIN product identifier shall be 0xFA01;
- LIN frame identifier / protected identifier values according to 7.4;
- For an alcohol interlock according to LIN2.0 the message identifier for:
 - frames from the vehicle to the alcohol interlock according to 7.2.2 shall be 0xFA10;
 - frames from the alcohol interlock to the vehicle according to 7.2.3 shall be 0xFA11;
 - alcohol interlock status frames shall be 0xFA12;
- For an alcohol interlock according to LIN 2.1, LIN 2.2(A) and ISO 17987 series the order of frames regarding the assign frame identifier range command shall be:
 - vehicle to the alcohol interlock frame with index 0;
 - alcohol interlock to vehicle frame with index 1;
 - alcohol interlock status frame with index 2.

When the alcohol interlock is integrated into an existing LIN cluster those default values allow communication without further adaptation as long as the alcohol interlock configured NAD and PID values are unique.

If communication parameters are conflicting with other existing slave nodes the LIN Master node shall perform a reconfiguration of the alcohol interlock so that the configured NAD and PIDs are unique. The sequence of LIN reconfiguration commands depends on the used LIN protocol version of the LIN Master and alcohol interlock nodes when assigning PID values. In the first step a unique NAD value shall be assigned to the alcohol interlock by the LIN Master node. To make this command unique for the alcohol interlock it is a prerequisite for the LIN network that the combination of the default value for initial NAD and the default function identifier is unique in the network (0x7A and 0xFA01).

7.4.5.2 LIN reconfiguration

The alcohol interlock shall respond to the LIN Assign NAD request that uses the identifier wildcard 0x7FFF as given in Table 4.

Table 4 — LIN Assign NAD request

NAD	PCI	SID	Data1	Data 2	Data 3	Data 4	Data 5
Initial NAD	0x06	0xB0	Supplier ID LSB	Supplier ID MSB	Function ID LSB	Function ID MSB	New NAD

Where

NAD	contains the initial NAD 0x7A addressing the alcohol interlock;
Data 1	contains the supplier ID wildcard's least significant byte and is set to 0xFF;
Data 2	contains the supplier ID wildcard's most significant byte and is set to 0x7F;
Data 3	contains the LIN function identifier least significant byte and is set to 0x01;
Data 4	contains the LIN function identifier most significant byte and is set to 0xFA;
Data 5	contains the new configured NAD value of the alcohol interlock.

7.4.5.3 LIN 2.0 assign frame identifier

An alcohol interlock according to LIN 2.0 shall support the LIN assign frame ID request given in Table 5.

Table 5 — LIN assign frame identifier request

NAD	PCI	SID	Data1	Data 2	Data 3	Data 4	Data 5
NAD	0x06	0xB1	Supplier ID LSB	Supplier ID MSB	Message ID LSB	Message ID MSB	Protected ID

For the protected frame identifier (PID) for the vehicle to alcohol interlock frame the referring values shall be set as follows, where:

NAD contains the configured NAD of the alcohol interlock;

Data 1 contains the supplier ID wildcard's least significant byte and is set to 0xFF;

Data 2 contains the supplier ID wildcard's most significant byte and is set to 0x7F;

Data 3 contains the frame Message identifiers least significant byte and is set to 0x10;

Data 4 contains the frame Message identifiers most significant byte and is set to 0xFA;

Data 5 contains the PID for vehicle to alcohol interlock transmission.

For the protected frame identifier (PID) for the alcohol interlock to vehicle frame the referring values shall be set as follows, where:

NAD contains the configured NAD of the alcohol interlock;

Data 1 contains the supplier ID wildcard's least significant byte and is set to 0xFF;

Data 2 contains the supplier ID wildcard's most significant byte and is set to 0x7F;

Data 3 contains the Frame Message identifiers least significant byte and is set to 0x11;

Data 4 contains the Frame Message identifiers most significant byte and is set to 0xFA;

Data 5 contains the PID for the alcohol interlock to vehicle transmission.

For the protected frame identifier (PID) for alcohol interlock status frames the referring values shall be set as follows, where:

NAD contains the configured NAD of the alcohol interlock;

Data 1 contains the supplier ID wildcard's least significant byte and is set to 0xFF;

Data 2 contains the supplier ID wildcard's most significant byte and is set to 0x7F;

Data 3 contains the Frame Message identifiers least significant byte and is set to 0x12;

Data 4 contains the Frame Message identifiers most significant byte and is set to 0xFA;

Data 5 contains the PID for the alcohol interlock status frames.

7.4.5.4 LIN 2.1 and above assign frame protected identifier range request

Alcohol interlocks according to LIN 2.1 and above shall support LIN assign frame protected identifier (PID) range request given in Table 6.

Table 6 — LIN assign frame PID range request

NAD	PCI	SID	Data1	Data 2	Data 3	Data 4	Data 5
NAD	0x06	0xB7	start index	PID (index)	PID (index+1)	PID (index+2)	PID (index+3)

Where:

- NAD contains the configured NAD of the alcohol interlock;
- Data 1 contains the frame start index the following PID are assigned to. It is set to 0x00 (referencing to the vehicle to alcohol interlock frame);
- Data 2 contains the first frame to assign to the PID, which is vehicle to alcohol interlock frame;
- Data 3 contains the second frame to assign to the PID, which is alcohol interlock to vehicle frame;
- Data 4 contains the third frame to assign to the PID, which is alcohol interlock status frame;
- Data 5 shall contain 0xFF (do not care).

NOTE According to 7.4, the frame identifier default values are 0x3A for Data 2, 0x3B for Data 3 and 0x39 for Data 4. These values are then combined with their parity values to the protected identifier.

7.4.5.5 Supplier ID Determination

The alcohol interlock shall respond to the LIN read by identifier request as given in Table 7.

Table 7 — Read by identifier request from the vehicle master

NAD	PCI	SID	Data1	Data 2	Data 3	Data 4	Data 5
NAD	0x06	0xB2	Identifier	Supplier ID LSB	Supplier ID MSB	Function ID LSB	Function ID MSB

Where

- NAD contains the configured NAD of the alcohol interlock;
- Data 1 contains the identifier 0x00;
- Data 2 contains the supplier ID least significant byte and is set to the wildcard value of 0xFF;
- Data 3 contains the supplier ID most significant byte and is set to the wildcard value of 0x7F;
- Data 4 contains the LIN function identifiers least significant byte (default 0x01);
- Data 5 contains the LIN function identifiers most significant byte (default 0xFA).

The positive response to this request with identifier value of 0x00 shall be according to Table 8.

Table 8 — Positive response to the read by identifier request from the vehicle master

NAD	PCI	RSID	Data1	Data 2	Data 3	Data 4	Data 5
NAD	0x06	0xF2	Supplier ID LSB	Supplier ID MSB	Function ID LSB	Function ID MSB	Variant

Where

- NAD contains the configured NAD of the alcohol interlock;
- Data 1 contains the supplier ID least significant byte;
- Data 2 contains the supplier ID most significant byte;

Data 3 contains the LIN function identifiers least significant byte (default 0x01);

Data 4 contains the LIN function identifiers most significant byte (default 0xFA);

Data 5 contains the Variant Identifier of the alcohol interlock.

7.4.6 Configuration

Save configuration service 0xB6 is mandatory for alcohol interlocks if the LIN Master is implemented according to LIN 2.1 and above.

Configurations of NAD and PID according to 7.4.5.2 and 7.4.5.4 should be completed using the save configuration service in order to avoid to reiterate the configuration following each reset.

7.5 CAN-Services

7.5.1 Parameter Group Numbers

The parameter group numbers (PGN) are given in Table 9.

Table 9 — Parameter group numbers for the communication between the alcohol interlock and the vehicle

PGN decimal	PGN hexadecimal	Parameter Group Label	Acronym
64390	0xFB86	Alcohol Interlock To Vehicle	AITOV
64391	0xFB87	Vehicle To Alcohol Interlock	VTOAI

7.5.2 Source Address ID

The source address ID of the alcohol-interlock shall be decimal 94 (0x5E) with the name Driver Impairment Device.

7.5.3 Function ID

The function ID of the alcohol-interlock shall be decimal 87 (0x57) with the name Driver Impairment Device.

8 Communication states and corresponding messages

8.1 Vehicle communication states and corresponding frames

8.1.1 Protocol Validation

The status value of the vehicle communication state <PROTOCOL_VALIDATION> represented by Data 1 shall be 0xA9.

Data 2 shall state the protocol version of the communication that it requests to validate.

For this document, this shall be 0x12.

Data 3 shall contain the vehicle bus type and version:

— 0x20 – for LIN 2.0;

— 0x21 – for LIN 2.1;

— 0x22 – for LIN 2.2;

- 0x30 – for ISO 17987-1:2016, ISO 17987-2:2016, ISO 17987-3:2016, ISO 17987-4:2016, ISO/TR 17987-5:2016, ISO 17987-6:2016, ISO 17987-7:2016, ISO 17987-8:2019;
- 0x40 – for CAN J1939.

The remaining five data bytes Data 4 to Data 8 shall be set to 0xFF.

NOTE For EN 50436-4:2019, Data 2 is set to 0x11.

8.1.2 Set Mode

The status value of the vehicle communication state <SET_MODE> represented by Data 1 shall be 0xCC.

Data 2 shall contain the request status of the vehicle master coded as:

- 0x11 no specific request;
- 0x22 driver wants to start the motor;
- 0x33 any door is open (optional);
- 0x44 any door changed from locked to unlocked (optional);
- 0x55 driver change (optional).

Data 3 shall contain the motor status of the vehicle coded as:

- 0xF0 motor not running;
- 0x0F motor running;
- 0xCC motor running in emergency mode (optional).

The vehicle shall transmit its odometer reading in full kilometres or full miles according to the setup of the vehicle.

The Data 4 to Data 7 shall contain the odometer reading of the vehicle coded as little-endian.

Data 8 shall be set to 0xFF.

8.1.3 Unset Mode

The status value of the vehicle communication state <UNSET_MODE> represented by Data 1 shall be 0x99.

Data 2 shall contain the request status of the vehicle master coded as:

- 0x11 no specific request;
- 0x55 driver change (optional).

Data 3 shall contain the motor status of the vehicle coded as:

- 0xF0 motor not running;
- 0x0F motor running;
- 0xCC motor running in emergency mode (optional).

The vehicle shall transmit its odometer reading in full kilometres or full miles according to the setup of the vehicle.

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Data 4 to Data 7 shall contain the odometer reading of vehicle coded as little-endian.

Data 8 shall be set to 0xFF.

The alcohol interlock shall record every bypass of the alcohol interlock in the data memory.

In case the vehicle manufacturer decides on a bypass option for emergency situations that bypasses immobilisers this shall be coded as stated. The bypass option is not a requirement of this document.

In addition to all other bypasses the alcohol interlock shall also record every emergency bypass, they shall be logged in the same manner as other bypasses.

8.1.4 Shutdown

The status value of the vehicle communication state <SHUTDOWN> represented by Data 1 shall be 0xC3.

Data 2 contains the types of shutdown coded as:

- 0xF0 normal shutdown;
- 0x0F ADR shutdown.

The remaining six data bytes Data 3 to Data 8 shall be set to 0xFF.

8.2 Interlock communication states and corresponding frames

8.2.1 Coding of the blocking state and the non-blocking state indication

The information regarding the blocking state and the non-blocking state of the alcohol interlock shall be coded in Data 2 and Data 3 of the message responses that are transmitted from the alcohol interlock.

To indicate that the interlock is in its non-blocking state, Data 2 of the message frame from the alcohol interlock shall contain the value 0xAC, Data 3 shall contain the binary inversion of Data 2 which is 0x53.

To indicate that the interlock is in its blocking state, Data 2 of the message frame from the alcohol interlock shall contain any other value than 0xAC and 0xFF, Data 3 shall contain the binary inversion of Data 2.

8.2.2 Interlock Message Response: <ACTIVATED>

The Interlock shall be able to communicate 100 ms after wake up.

The status value of the interlock communication state <ACTIVATED> shall be 0x01.

With the message response <ACTIVATED> the interlock shall by default transmit the information that it is in the blocking state coded according to 8.2.1.

The remaining five data bytes shall be set to 0xFF.

8.2.3 Interlock Message Response: <PROTOCOL_VALIDATION>

The status value of the interlock communication state <PROTOCOL_VALIDATION> shall be 0x02.

The blocking state information shall be coded according to 8.2.1.

Data 4 and Data 5 shall contain the 16 bit supplier ID of the interlock manufacturer coded as little-endian.

If the protocol version of the vehicle is supported, Data 6 shall contain the protocol version of the interlock communication protocol as the validation reply. For this document this is 0x12.

If the protocol version or bus version received from the vehicle is not supported, Data 6 shall contain the value 0xEE to state that the communication protocol validation has failed.

Data 7 shall contain the alcohol interlock bus type and version:

- 0x20 – for LIN 2.0;

- 0x21 – for LIN 2.1;
- 0x22 – for LIN 2.2;
- 0x30 – for ISO 17987-1:2016, ISO 17987-2:2016, ISO 17987-3:2016, ISO 17987-4:2016, ISO/TR 17987-5:2016, ISO 17987-6:2016, ISO 17987-7:2016, ISO 17987-8:2019;
- 0x40 – for CAN J1939.

Data 8 shall be set to 0xFF.

8.2.4 Interlock Message Response: <SERVICE_INFORMATION>

The status value of the interlock communication state <SERVICE_INFORMATION> shall be 0x04.

With the message response <SERVICE_INFORMATION> the interlock shall transmit the information that it is in the blocking state or in the non-blocking state coded according to 8.2.1.

Data 4 shall contain the information whether service is due coded as:

- 0x0F for service is not mandated;
- 0xF0 for service is mandated.

Data 5 and Data 6 shall contain the integer for the time remaining in hours until the next service is mandated for the alcohol interlock coded as little-endian.

If service is not mandated, Data 5 and Data 6 shall be set to 0xFF.

Data 7 and Data 8 shall contain the integer for the time remaining in hours until the next calibration is required for the alcohol interlock coded as little-endian.

NOTE 1 16 bit are equivalent to 32 767 h or 3 years and 9 months.

NOTE 2 The time beyond the service or the calibration expiry is provided as negative value.

NOTE 3 If service is not required at all or if the alcohol interlock does not provide service information, the alcohol interlock will usually not enter this state.

8.2.5 Interlock Message Response: <WARM_UP>

The status value of the interlock communication state <WARM_UP> shall be 0x08.

The blocking information shall be coded according to 8.2.1. The remaining five data bytes Data 4 to Data 8 shall be set to 0xFF.

8.2.6 Interlock Message Response: <TEST_REQUEST>

The status value of the interlock communication state <TEST_REQUEST> shall be 0x30.

The blocking state information shall be coded according to 8.2.1.

Data 4 shall specify the type of test and be coded as:

- 0x11 for an initial test;
- 0x22 for a retest.

The remaining four data bytes Data 5 to Data 8 shall be set to 0xFF.

8.2.7 Interlock Message Response: <ANALYSING>

The status value of the interlock communication state <ANALYSING> shall be 0x3F.

The blocking state information shall be coded according to 8.2.1.

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Data 4 shall specify the type of test and be coded as:

- 0x11 for an initial test;
- 0x22 for a retest.

The remaining four data bytes Data 5 to Data 8 shall be set to 0xFF.

8.2.8 Interlock Message Response: <RESULT>

8.2.8.1 General

The alcohol interlock shall state the result of a breath test upon completion of the analysis of the breath test. The result shall either indicate the result of the analysis of a valid breath sample, indicate that the breath sample is not accepted or state that no breath sample was provided.

The status value of the interlock communication state <RESULT> shall be 0x40.

The blocking state information shall be coded according to 8.2.1.

Data 4 shall specify the type of test and be coded as:

- 0x11 for an initial test;
- 0x22 for a retest.

8.2.8.2 Accepted breath sample

For a valid breath test Data 5 shall be set to 0xCC.

Data 6 shall then specify the result of the analysis of an accepted breath sample and be coded as:

- 0x0F for a passed breath test;
- 0xF0 for a failed breath test;
- 0x3C for a passed breath test with warning;
- 0xCC for a bypass acting as a passed breath test.

Data 7 and Data 8 may be used for proprietary information. If Data 7 and Data 8 are used for proprietary information, they may use only values from 0x80 to 0xFE.

If Data 7 and Data 8 do not carry proprietary information, they shall be set to 0xFF.

NOTE A bypass acting as a passed breath test is usually performed by entering a code into the alcohol interlock that was gained through a predefined procedure by the alcohol interlock manufacturer or provider.

8.2.8.3 Non accepted breath sample or no breath test

For an invalid breath test Data 5 shall be set to 0xAA.

Data 6 shall specify the reason for the invalidity of the breath test and be coded as:

- 0x01 for a general error;
- 0x02 to state that the user ended blowing too early;
- 0x03 to state that the user blew too soft;
- 0x04 to state that the user blew too hard;
- 0x08 to generally state a non-accepted breath sample;

— 0xA0 to state the end of the expiration of a test period.

Data 7 and Data 8 may be used for proprietary information. If Data 7 and Data 8 are used for proprietary information, they may use only values from 0x80 to 0xFE.

If Data 7 and Data 8 do not carry proprietary information, they shall be set to 0xFF.

8.2.9 Interlock Message Response: <WAIT_IGNITION>

The status value of the interlock communication state <WAIT_IGNITION> shall be 0x48.

The blocking state information shall be coded according to 8.2.1.

Data 4 and Data 5 shall contain the integer for the time remaining in seconds until the interlock will leave the Wait Ignition state coded as little-endian.

Data 6, Data 7 and Data 8 shall be set to 0xFF.

8.2.10 Interlock Message Response: <IDLE>

The status value of the interlock communication state <IDLE> shall be 0xF0.

The blocking state information shall be coded according to 8.2.1.

Data 4 contains the following information:

- 0x06 service;
- 0x1F nothing to report;
- 0x37 maintain power according to 4.7;
- 0x4F installation (if applicable);
- 0x55 shutdown acknowledged;
- 0x85 shutdown not acknowledged.

NOTE For shutdown timing refer to 4.6.

Data bytes Data 5 and Data 6 shall be set to 0xFF.

Data 7 and Data 8 may be used for proprietary information. If Data 7 and Data 8 are used for proprietary information, they may use only values from 0x80 to 0xFE.

If Data 7 and Data 8 do not carry proprietary information, they shall be set to 0xFF.

8.2.11 Interlock Message Response: <LOCKOUT>

The status value of the interlock communication state <LOCKOUT> shall be 0xA0.

The blocking state information shall be coded according to 8.2.1.

Data 4 shall specify the reason for the lockout coded as:

- 0xF0 Initial Test Lockout;
- 0x0F Retest Lockout;
- 0xAA Permanent Lockout;
- 0xBB Recovery Lockout.

If the lockout is not a permanent lockout Data 5, Data 6 and Data 7 shall indicate the time remaining until the end of the lockout state in minutes and seconds. In detail Data 5 and Data 6 shall contain the

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remaining minutes as 16 bit integer value coded as little-endian and Data 7 shall contain the remaining seconds in the range from 0 to 59 as 8 bit integer value.

If the lockout is not permanent Data 8 shall contain 0xFF and if the lockout is permanent the four data bytes Data 5 to Data 8 shall contain 0xFF.

8.2.12 Interlock Message Response: <ERROR>

The status value of the interlock communication state <ERROR> shall be 0xB0.

The blocking state information shall be coded according to 8.2.1.

Data 4 shall specify the reason for the error coded as:

- 0x01 general error;
- 0x02 self-test failed;
- 0x03 alcohol interlock not functioning;
- 0x04 communication error.

The remaining four data bytes Data 5 to Data 8 shall be set to 0xFF.

NOTE Alcohol interlock not functioning also indicates that a part of the system (e.g. the handset) could not be found. The interlock manufacturer can decide to generate or not generate an error according to the indication that a part of the systems (e.g. the handset) could not be found.

9 System safety analysis

The alcohol interlock shall be type tested according to EN 50436-1 or EN 50436-2 to ensure a proper performance.

An example for a generic hazard analysis and risk assessment system safety analysis according to ISO 26262 (series) for an alcohol interlock installed in a vehicle is given in Annex C.

10 Testing

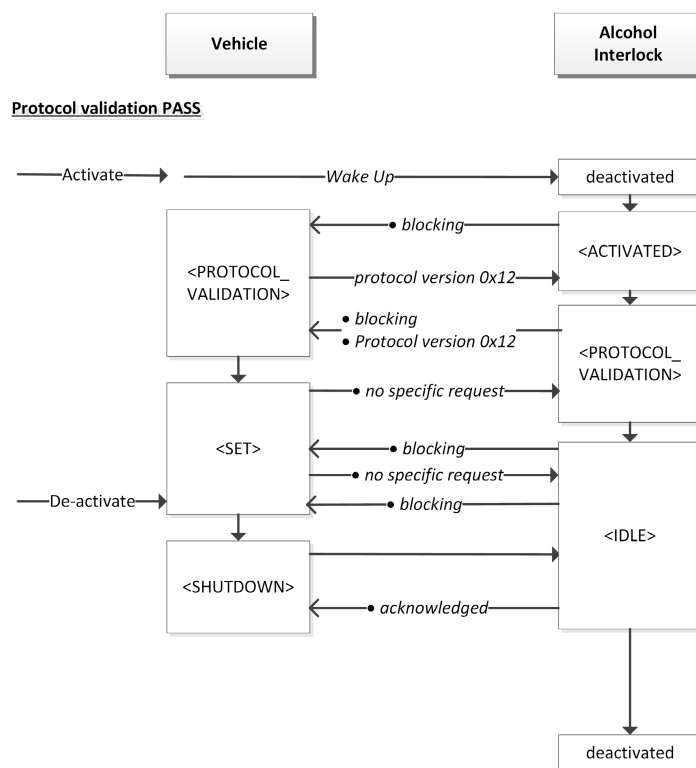
The alcohol interlock shall be tested to this document to ensure a proper performance.

A proposal for a LIN and CAN J3939 conformance testing is given in Annex G.

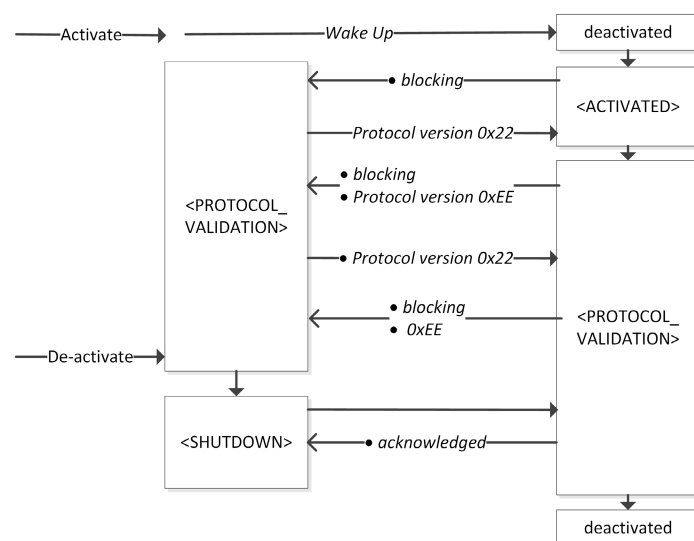
A proposal for a test plan is given in Annex H.

Annex A (informative)

Examples of vehicle – alcohol interlock interactions



Protocol validation FAIL (version 0x22 is unknown to Interlock)



NOTE The diagrams show the successful (PASS) and unsuccessful (FAIL) protocol validation.

Figure A.1 — Example for the interaction of the vehicle and the alcohol interlock communication state machines during protocol validation and without test request

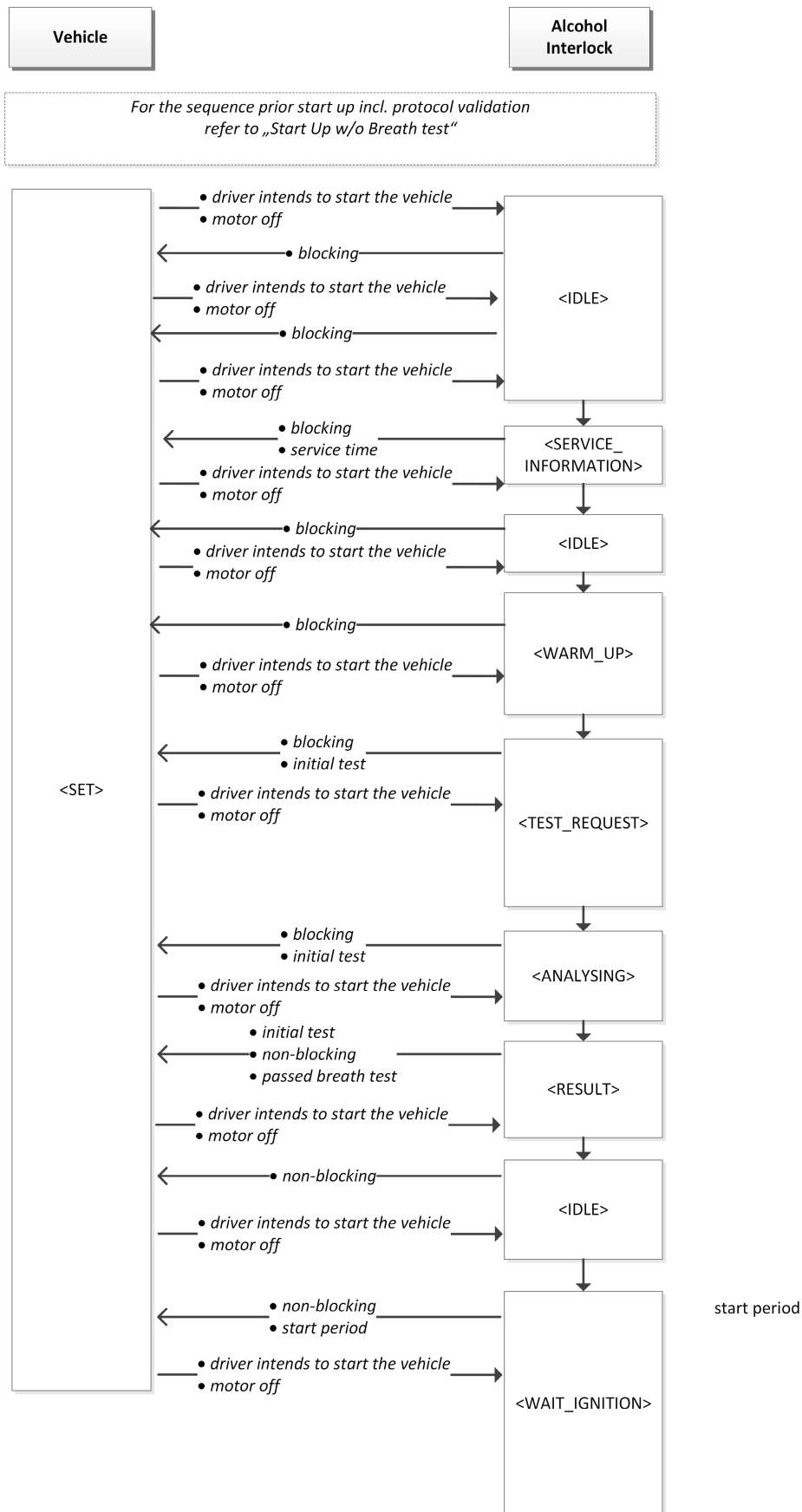


Figure A.2 — Example for the interaction of the vehicle and the alcohol interlock communication state machines during a passed initial breath test

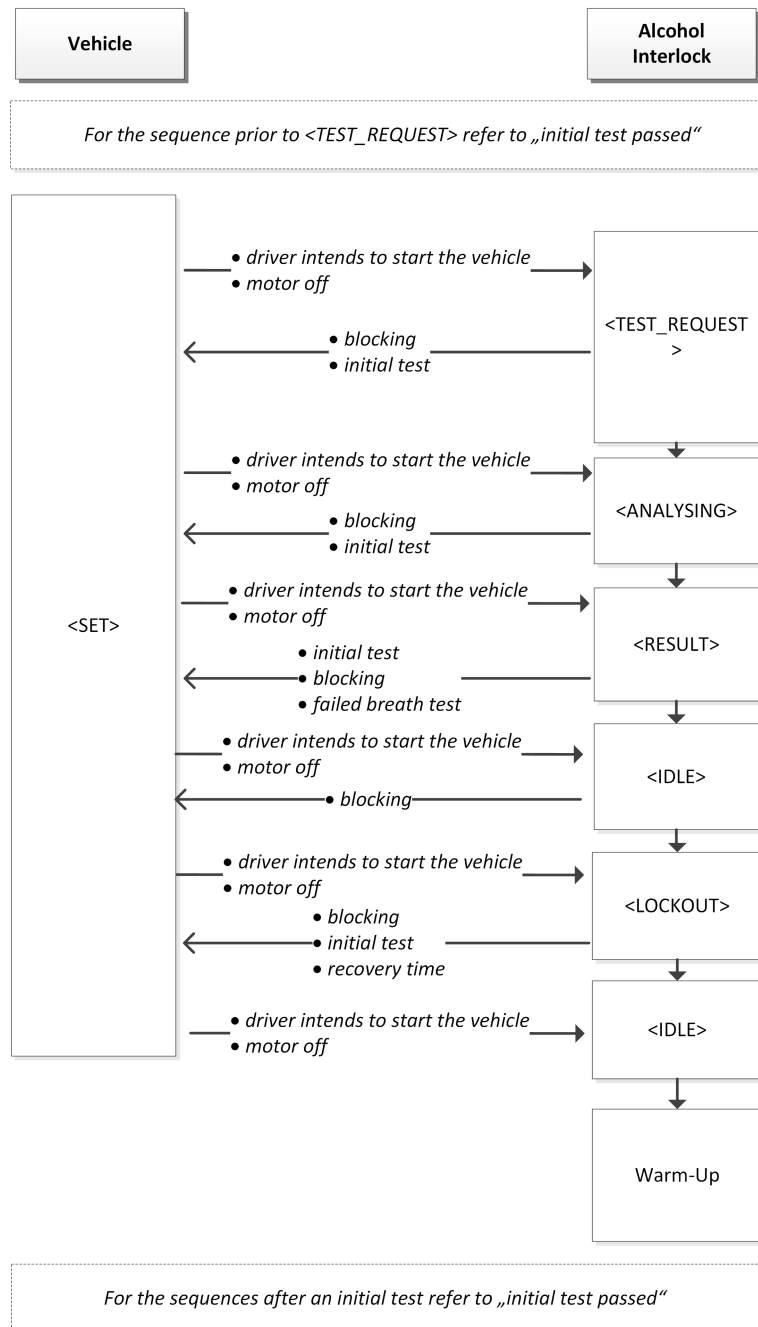


Figure A.3 — Example for the interaction of the vehicle and the alcohol interlock communication state machines during a failed initial breath test and the following lockout