
**Road vehicles — Ergonomics aspects
of transport information and control
systems — Human machine interface
specifications for keyless ignition
systems**

*Véhicules routiers — Aspects ergonomiques des systèmes de
commande et d'information du transport — Spécifications d'interface
homme-machine pour des systèmes de démarrage sans clé*

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Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Design guidelines	3
4.1 Actuation of keyless ignition control.....	3
4.1.1 Actuation for emergency starting – Restarting the propulsion system after unintended engine stall.....	3
4.1.2 Actuation for starting – Design to avoid accidental starting – Stationary vehicle ..	3
4.1.3 Actuation for stopping while a vehicle with automatic start/stop is in run mode.	3
4.1.4 Actuation for stopping (commercial vehicles only) – Design to avoid accidental stopping - Stationary vehicle.....	3
4.1.5 Actuation for emergency stopping – Interruption of starting.....	3
4.2 Starting a propulsion system in case key code carrying device battery runs out.....	3
4.2.1 Operation methods.....	4
4.2.2 Instructions in case key code carrying device battery runs out.....	4
4.3 Alerts and information to the driver.....	4
4.3.1 Key left in vehicle.....	4
4.3.2 Missing key code carrying device when starting vehicle propulsion system.....	4
4.3.3 Ignition mode active at exit.....	5
4.3.4 Ignition mode active at exit (commercial vehicles only).....	5
4.3.5 Key code carrying device leaves the vehicle.....	5
4.3.6 Power shut off without key code carrying device.....	6
4.3.7 Power shut off when not in “parked” or without activated parking brake for automatic transmission vehicles.....	6
4.3.8 Power shut off when not in “parked” or “neutral” for automatic transmission vehicles (commercial vehicles only).....	7
4.3.9 Steering not unlocked.....	7
Annex A (informative) Keyless ignition control use cases	8
Bibliography	11

Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The conventional method of operating motor ignition systems requires use of a mechanical key. Keyless ignition systems, that do not require the mechanical interface with the vehicle, improve driver's convenience and are becoming more widespread. This has created a need for immediate standardization of the Human Machine Interface (HMI), since some drivers may have difficulty understanding how to use these systems. This document complements SAE J2948, which covers the operation of keyless ignition systems with the goal of helping to minimize user-initiated errors. That includes:

- the inability to start and stop the vehicle propulsion system,
- exiting the vehicle with the automatic transmission in a non-parking gear,
- exiting the vehicle while the vehicle propulsion system is enabled, and
- exiting the vehicle while the vehicle propulsion system is disabled, but the accessory or electrical systems are active.

This document's scope differs from SAE J2948 as follows:

- actuation of keyless ignition control that is equipped with automatic start/stop systems,
- actuation to start or stop the vehicle propulsion system under emergency situations,
- actuation to start the propulsion system with low battery in the key,
- actuation of keyless ignition control without key code carrying device, and
- recommendations for detailed alerts and status indications identified with specific use-case examples.

Many of these HMI issues vary among manufacturers and even among models from the same manufacturer. To help clarify the use of keyless ignition systems, this document sets guidelines for these new HMI solutions.

As additional explanation and support for developing specific requirements, keyless ignition control use cases are provided as an [Annex A](#).

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Road vehicles — Ergonomics aspects of transport information and control systems — Human machine interface specifications for keyless ignition systems

1 Scope

This document provides human machine interface (HMI) design specifications for keyless ignition systems that use key code carrying device for passenger cars (including sport utility vehicles and light trucks) and commercial vehicles (including heavy trucks and buses), independent of vehicle propulsion system. HMI specifications for the electrical key functions include actuation in normal conditions, emergencies, low battery, and avoidance of inadvertent actuations, alerts and specific non-standard situations.

2 Normative references

There are no normative references in this document.

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:

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

3.1

key code

electronic code, which when transmitted to and stored in the *starting system* (3.4) software, allows the driver to select a vehicle ignition mode using a *keyless ignition control* (3.3)

3.2

key code carrying device

physical device capable of transmitting an electronic *key code* (3.1) to the vehicle *starting system* (3.4)

3.3

keyless ignition control

permanently mounted physical device such as a pushbutton, rocker switch, multi-position control, or rotary control used to perform ignition control such as start or stop a *vehicle propulsion system* (3.6) without need for insertion or removal of a conventional key into/from an ignition slot

3.4

starting system

electronic system that controls the transition between *ignition modes* (3.5) related to the starting or stopping of a vehicle based on driver's request and vehicle conditions

3.5

ignition mode

propulsion and/or vehicle electrical states as determined by vehicle operating conditions and driver actuation of the *keyless ignition control* (3.3)

3.5.1

start mode

transient mode where the *vehicle propulsion system* (3.6) is initiated (e.g. engine cranking), leading to *run mode* (3.5.2), while an electronic key code is present in the *starting system* (3.4)

3.5.2

run mode

mode in which the *vehicle propulsion system* (3.6) is enabled, and an electronic key code is present in the *starting system* (3.4)

Note 1 to entry: Automatic start/stop-equipped vehicles remain in run mode when automatic stop is engaged.

3.5.3

stop mode

mode in which the vehicle propulsion and vehicle electrical systems are disabled, and an electronic key code is not present in the *starting system* (3.4)

Note 1 to entry: Vehicle manufacturers may choose to temporarily keep vehicle electrical systems active, and the key code in the starting system in this mode until a trigger event occurs (such as a driver-door open event or timer event). This vehicle state is sometimes provided to allow use of in-vehicle displays and entertainment systems after the propulsion system is disabled.

3.5.4

electrical mode

accessory mode

mode in which the *vehicle propulsion system* (3.6) is disabled, the vehicle electrical system elements are active as determined by the vehicle manufacturer, and an electronic key code is present in the *starting system* (3.4)

3.5.5

lower ignition mode

modes, which are lower than the *electrical mode* (3.5.4)

Note 1 to entry: This applies to commercial vehicles only.

Note 2 to entry: These become important for commercial vehicles where the drivers must comply with valid driving time regulations that separate between driving, resting and other work. The lower modes help to record time periods spent on alternative activities. Examples of lower ignition modes can be living, parked or hibernate modes.

3.5.5.1

living mode

leisure mode

mode when driver is in the vehicle and can sleep or use some functions to support living in the vehicle

Note 1 to entry: It is necessary to ensure that some safety critical functions are available, e.g. burglar alarm.

3.5.5.2

parked mode

mode when vehicle is parked and not in use and no one is in the cab using the functions

Note 1 to entry: The time is counted to be compared with regulated driving and resting times.

3.5.5.3

hibernate mode

logistics mode

transition time from production to delivery to end customer delivery

Note 1 to entry: This secures very limited functionality like facilitating inserting the key and applying or releasing the parking brake.

3.6**vehicle propulsion system**

system that provides forward or rearward movement proportional to driver control inputs

3.7**electronic steering lock**

steering lock that enables the steering to lock or unlock electronically

4 Design guidelines**4.1 Actuation of keyless ignition control****4.1.1 Actuation for emergency starting – Restarting the propulsion system after unintended engine stall**

After an unintended engine stall, a method of restarting the propulsion system without key code carrying device verification shall be provided at minimum, in the owner's manual. The driver can restart the propulsion system by operating the keyless ignition control or other alternative methods such as pressing the clutch (and brake) pedal for manual transmission vehicles or pressing the brake pedal for automatic transmission vehicles.

For detailed use cases related to each design, see [Annex A](#).

4.1.2 Actuation for starting – Design to avoid accidental starting – Stationary vehicle

The keyless ignition systems shall be designed to prevent accidental activation of putting the vehicle in run mode by requiring a combination of two separate actions. The separate actions can be pressing the brake pedal or other means while operating the keyless ignition control.

For vehicles with integrated power take-offs (e.g. for power take-offs supporting loading or unloading goods), the keyless ignition control shall require a specific operation (e.g. multiple control actuation or long push) and the system shall include precautions so that the vehicle cannot start to move unintentionally (e.g. inactivated transmission and engaged parking brake).

4.1.3 Actuation for stopping while a vehicle with automatic start/stop is in run mode

When the propulsion system (engine) is deactivated (turned off) during idle mode with enabled automatic start/stop, the following applies as the driver operates the keyless ignition control: the propulsion system should exit from run mode and change into the same mode as when operating the keyless ignition control with the propulsion system in ordinary drive mode.

4.1.4 Actuation for stopping (commercial vehicles only) – Design to avoid accidental stopping - Stationary vehicle

The keyless ignition control may have a design to prevent accidental deactivation into stop mode while the propulsion system is needed for a stationary vehicle to secure system durability or safe use of external motorized equipment (e.g. power take-offs for cranes).

4.1.5 Actuation for emergency stopping – Interruption of starting

While the vehicle is in start mode, this process should be stopped when the driver operates the keyless ignition control again before the propulsion system (engine) completes its starting action.

4.2 Starting a propulsion system in case key code carrying device battery runs out

If the battery fails in the key code carrying device, the manufacturer shall provide instructions for how to start the propulsion system.

4.2.1 Operation methods

With regard to the instructions for starting the vehicle propulsion system or activating electrical mode, the operation methods should follow the recommendation by the vehicle manufacturer such as holding the key code carrying device close to the keyless ignition control or inserting it into key slot or mechanical key cylinder.

NOTE This operation is not necessary if the key code has already been stored in the starting system.

4.2.2 Instructions in case key code carrying device battery runs out

Detailed step-by-step instructions shall be provided in the owner's manual, "Quick Start Guide" or other means of communication media. For example, the instructions can be provided using in-vehicle display screen popup messages or viewed on a smartphone or personal computer.

4.3 Alerts and information to the driver

4.3.1 Key left in vehicle

An electrical key system, which has a specific physical location where a key can be inserted, should have an alert to help minimize the user-initiated error of exiting the vehicle when the key is left in the vehicle.

It is recommended that an owner's manual or other means of driver communications, explains where the key code carrying device is located within the vehicle, and provides descriptions of the alerts.

4.3.1.1 Conditions

Conditions for activating the alert are as follows:

- a) Ignition mode is in stop mode.
- b) The key code carrying device is inserted in the location specified by the vehicle manufacturer.
- c) The driver's door is opened.

4.3.1.2 Alerts

When all conditions are met, an internal auditory and/or visual alert shall be activated.

4.3.2 Missing key code carrying device when starting vehicle propulsion system

Alerts should be provided to indicate when incomplete conditions occur while a driver tries to activate the vehicle propulsion system.

4.3.2.1 Conditions

Conditions for activating the alert are as follows:

- a) Ignition mode is in stop mode.
- b) Key code carrying device is not present in the vehicle.
- c) The driver operates keyless ignition control.

4.3.2.2 Alerts

When all conditions are met, an internal auditory and/or visual alert shall be activated.

4.3.3 Ignition mode active at exit

There should be an alert to help minimize user-initiated errors from exiting a vehicle via the driver door while the ignition mode is still active (electrical mode).

NOTE The alert is not required if ignition mode turns to stop mode automatically.

4.3.3.1 Conditions

Conditions for activating the alert are as follows:

- a) Ignition mode is in electrical mode.
- b) The driver's door is opened.

4.3.3.2 Alerts

When all conditions are met, an internal auditory alert shall be activated. A visual alert may be added to aid understanding of the auditory alert.

4.3.4 Ignition mode active at exit (commercial vehicles only)

There should be an alert to help minimize user-initiated errors from exiting a vehicle via the driver door while the ignition mode is still active (electrical mode or run mode).

4.3.4.1 Conditions

Conditions for activating the alert are as follows:

- a) Ignition mode is in electrical mode or run mode.
- b) The driver's door is opened.

4.3.4.2 Alerts

When all conditions are met, an internal auditory alert shall be activated. A visual alert may be added to aid understanding of the auditory alert.

NOTE In cases of commercial vehicles where power take offs are used to drive external equipment, the auditory alert can be deactivated.

4.3.5 Key code carrying device leaves the vehicle

Alerts should occur to announce if the key code carrying device leaves the vehicle when the ignition mode is not in stop mode. Alerts are not required if the vehicle automatically enters stop mode when stationary.

4.3.5.1 Conditions

Conditions for activating the alert are as follows:

- a) Ignition mode is not in stop mode.
- b) An electronic key code carrying device is not present in the vehicle.

4.3.5.2 Alerts

When all conditions are met, an auditory alert should be activated. A visual alert may be added to aid understanding of the auditory alert.

4.3.5.3 Alerts (commercial vehicles only)

When all conditions are met, an internal auditory alert should be activated, and at the same time, an external auditory alert should be activated. A visual alert may be added to aid understanding of the auditory alert.

It should be possible to turn off the auditory and visual alerts in cases when drivers frequently work outside the vehicle with the engine running.

4.3.6 Power shut off without key code carrying device

Alerts shall occur to announce when a driver tries to shut off the power without key code carrying device.

4.3.6.1 Conditions

Conditions for activating the alert and the system control are as follows:

- a) Ignition mode is not in stop mode.
- b) An electronic key code carrying device is not present in the vehicle.
- c) The driver operates the keyless ignition control.

4.3.6.2 Alerts and controls

When all conditions are met, an auditory and/or visual alert shall be activated. The vehicle manufacturer may design the system to keep the state of ignition mode simultaneously with the alert. In that case, if the driver wants to exit the ignition mode, the system should require a specific operation (e.g. multiple control actuation, etc.) of the keyless ignition control.

4.3.7 Power shut off when not in "parked" or without activated parking brake for automatic transmission vehicles

Vehicles having a "parked" position in the transmission shift sequence shall be equipped with an alert system to provide a warning if the driver attempts to leave the vehicle with the transmission in another position other than "parked".

NOTE The alert is not required for vehicles in electrical mode if either of the following two automatic functions are provided: 1) the vehicles shifts to "parked" or 2) the vehicle engages the parking brake when the key code carrying device is removed from the vehicle or the driver's door is opened.

4.3.7.1 Conditions

Conditions for activating the alert are as follows:

- a) Ignition mode is not in run mode.
- b) The transmission is in a position other than "parked" and the parking brake is not activated.
- c) The system detects operations when the driver leaves the vehicle, such as when the driver door is opened, the key code carrying device is removed from the vehicle or the vehicle is locked from its exterior.

4.3.7.2 Alerts

When all conditions are met, an auditory alert shall be activated. A visual alert may be added to aid understanding of the auditory alert. It is recommended to differentiate this auditory alert, relating to the risk of unintended vehicle movement, from other auditory alerts (e.g. key left in vehicle).

4.3.8 Power shut off when not in “parked” or “neutral” for automatic transmission vehicles (commercial vehicles only)

Vehicles having a “parked” or “neutral” position in the transmission shift sequence shall be equipped with an alert system to provide a warning if the driver attempts to go from run mode to lower ignition modes or leave the vehicle with the transmission in a position other than “parked” or “neutral” and without having an activated parking brake.

NOTE Vehicles that automatically shift to “parked” or “neutral” and activate the parking brake when any of 1) run mode is left for lower ignition modes or 2) the driver’s door is opened or 3) the key code carrying device is removed from the vehicle, are not required to have this alert.

4.3.8.1 Conditions

Conditions for activating the alert are as follows:

- a) Ignition mode is in run mode.
- b) The transmission is in a position other than “parked” or “neutral”.
- c) The system detects operations to go from run mode to lower ignition modes or to leave the vehicle, such as when the driver door is opened or the key code carrying device is removed from the vehicle.
- d) The parking brake is not activated.

4.3.8.2 Alerts

When all conditions are met, an auditory alert shall be activated. A visual alert may be added to aid understanding of the auditory alert. It is recommended to differentiate this auditory alert, relating to the risk of unintended vehicle movement, from other auditory alerts (e.g. key left in vehicle).

4.3.9 Steering not unlocked

There should be an alert to notify the driver of the need to unlock the steering lock, if the steering lock is not unlocked for any reason when keyless ignition control is operated.

4.3.9.1 Conditions

Conditions for activating the alert are as follows:

- a) Vehicle is equipped with electronic steering lock.
- b) The steering lock is not unlocked even after the conditions have been met by operation of the keyless ignition control.

4.3.9.2 Alerts

When all conditions are met, an auditory and/or visual alert shall be activated. It is recommended that information is also provided to the driver of what is causing the alert.

Annex A (informative)

Keyless ignition control use cases

A.1 General

This annex provides the use cases that result in the requirements provided in this standard. The use cases can also be used as guidance for establishing additional requirements for specific vehicle applications (see [Table A.1](#)).

Table A.1 — List of keyless ignition control use cases

Reference subclause	Use case definition	Critical situation (example)	Justification	Time of alert (examples)	Type of alert (examples)
4.1.1	Restart engine after unintended engine stall	Engine stall on the railroad track	Provide method for immediate restart of the engine in any condition.	—	—
4.1.2	Avoid accidental starting - Stationary vehicle	Vehicle starts to move when engine is started, for example, children start the engine.	Risk to endanger people, to damage property, or to lose control over vehicle	—	—
4.1.3	Actuation for stopping while a vehicle with automatic start/stop is in run mode	System acts opposite to manual control input when the engine needs to be shut down.	Avoided confusion so propulsion system OFF (engine off) can be secured.	—	—
4.1.4	Avoid accidental stopping - Stationary vehicle (Commercial vehicles)	Engine turned off when required for system durability or external motorized equipment	Avoid system damage or safety risks related to loading / unloading with engine support equipment	—	—
4.1.5	Immediate interruption of starting	It takes too long time to interrupt the engine, for example when exhaust or noise is not allowed.	Secure direct opportunity to stop engine.	—	—
4.2	Start engine with key "out of battery charge"	Cannot start engine, for example at the service centre on a highway.	Provide another means to start engine in an urgent situation or to go for service.	When trying to activate propulsion system (start engine)	Provide instructions
4.3.1	Key left in vehicle.	Vehicle is stolen with the key.	Verify that the driver knows where the key is to avoid losing it or theft of vehicle.	Driver door opens	Internal auditory and/or visual
4.3.2	Try to activate propulsion system without key.	Driver cannot understand why engine does not start.	Provide reason for why start is not possible, so driver can solve problem	When trying to activate propulsion system (start engine)	Internal auditory and/or visual