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Road Vehicles — Extended vehicle (ExVe) methodology —

Part 1: General information

Véhicules routiers — Méthodologie du véhicule étendu (ExVe) —

Partie 1: Information générale

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22 *Road vehicles*, Subcommittee SC 31, *Data communication*.

A list of all parts in the ISO 20077 series can be found on the ISO website.

Introduction

This document is the first part of a series of ISO Standards dedicated to the extended vehicle.

Road Vehicles — Extended vehicle (ExVe) methodology —

Part 1: General information

1 Scope

This document defines the concepts and the terms related to extended vehicles.

It presents general information regarding these vehicles, specifies the dedicated terminology and describes the interrelation with other standards related to extended vehicles.

It concerns:

— road vehicles with four or more wheels designed and constructed primarily for the carriage of persons that are defined as Category 1 vehicles in the United Nations Special Resolution No.1 *in TRANS*/WP.29/1045, as last amended on 19 June 2012;

— road vehicles with four or more wheels designed and constructed primarily for the carriage of goods that are defined as Category 2 vehicles in the United Nations Special Resolution No.1 *in TRANS*/WP.29/1045, as last amended on 19 June 2012;

where these road vehicles are still in accordance with the specifications of the vehicle manufacturer.

While this document mentions already standardized interfaces and devices (e.g. external test equipment) connected to these interfaces, the specification of these interfaces and devices is not within the scope of this document.

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.

ISO 20077-2:—[1)], *Road vehicles – Extended vehicle (ExVe) methodology – Part 2: Methodology for designing the extended vehicle*

3 Terms and definitions

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

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

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

NOTE Illustration through a practical case of the interrelation between the diagnostics and prognostics concepts defined respectively in 3.2 to 3.4 and 3.13 may be found in Annex A.

3.1
diagnosis
result of a *diagnostic process* (3.2) carried out on a vehicle

1) Under preparation. Stage at the time of publication: ISO/FDIS 20077-2:2017

3.2
diagnostics
diagnostic process
process including the detection process of possible vehicle *malfunctions* (3.10), the identification of the likely root cause of these malfunctions and the appraisal of its relevance for the operation of the vehicle

3.3
diagnostics step 1
detection process of possible vehicle *malfunctions* (3.10)

Note 1 to entry: The detection process of possible vehicle malfunctions (diagnostics step 1) may lead to the conclusion of an absence of malfunction.

3.4
diagnostics step 2
identification of the likely root cause of *malfunctions* (3.10)

Note 1 to entry: Root cause analysis (diagnostics step 2) is only performed in presence of a malfunction. Root cause analysis is performed if diagnostics step 1 has been performed.

3.5
extended vehicle
entity, still in accordance with the specifications of the *vehicle manufacturer* (3.20), that extends beyond the physical boundaries of the road vehicle and consists of the road vehicle, *off-board systems* (3.11), external interfaces and the data communication between the road vehicle and the off-board systems

Note 1 to entry: Road vehicles without off-board systems and road vehicles equipped with telematics units are extended vehicles.

3.6
ExVe manufacturer
vehicle manufacturer (3.20) responsible for the *extended vehicle* (3.5)

3.7
function
task, action or activity that should be achieved to satisfy a functional requirement

EXAMPLE "KEY ON-ENGINE OFF".

Note 1 to entry: The same function may be used in several different *use cases* (3.17).

3.8
functionality
set of *functions* (3.7) that ensures the overall capability of the system to satisfy a *functional requirement* (3.9)

EXAMPLE The set of functions necessary for "establishing the communication with an *extended vehicle* (3.5)".

Note 1 to entry: In the set of functions necessary for "establishing the communication with an extended vehicle", one can find such functions as "KEY ON-ENGINE OFF", etc.

Note 2 to entry: The same functionality may be used in several different *use cases* (3.17).

3.9
functional requirement
<extended vehicles> statement issued by the *vehicle manufacturer* (3.20) that identifies what a product or process must accomplish to produce required behaviour and/or results

Note 1 to entry: The functional requirement is issued by the body in charge of the design of the product or process.

[SOURCE: ISO/IEC/IEEE 24765:2010, 3.1229, definition 1, modified — source entry has been modified to introduce that, in the case of extended vehicles, the statement is issued by the vehicle manufacturer and Note 1 has been added to source entry.]

3.10
malfunction
state of a system or a component that deviates from the specifications of the *vehicle manufacturer* (3.20)

Note 1 to entry: A malfunction may be the object of an alert on board the vehicle and possibly lead to a DTC, but a malfunction does not necessarily preclude a DTC.

Note 2 to entry: A slight deterioration of a system, such as the normal wear of that system, is not a malfunction as long as it does not impair the performance of that system against the design specifications of the vehicle manufacturer.

3.11
off-board system
<road vehicles> software and hardware components off-board a road vehicle that have been specified, designed, developed and/or manufactured to address the requested *functionalities* (3.8)

3.12
prognosis
prediction which is the result of a *prognostic process* (3.13)

3.13
prognostics
prognostic process
<automotive> process of forecasting the possible occurrence of vehicle *malfunctions* (3.10) and appraising the likely remaining operation time of the vehicle until these malfunctions occur

Note 1 to entry: A prognostic process cannot be performed without having performed the detection process of possible malfunctions of the same functionally related system [*diagnostics step 1* (3.3)].

Note 2 to entry: A *diagnostic process* (3.2) may be performed without performing a prognostic process (for example, in the case of the presence of a malfunction, when *diagnostics step 2* (3.4) is performed).

3.14
remote, adjective
performed on a vehicle from a distance where the operator responsible for the concerned operation is not co-located with the vehicle and where the vehicle is connected via an external network

EXAMPLE Remote diagnostics, remote access.

Note 1 to entry: The "operator responsible for the concerned operation" is a specific actor in terms of *use case* (3.17).

3.15
remote diagnostician
remote diagnostics operator
physical person that performs a remote diagnostic process

3.16
remote diagnostic support
information provided to a *remote diagnostician* (3.15) to assist in the performance of the remote diagnostic process of a vehicle

Note 1 to entry: Typical examples of remote diagnostics support are:

— information for performing a remote diagnostic process on a vehicle (for example, instructions, training material, etc.),

— information specified for remote diagnostics *use cases* (3.17), and

— information used by the after-sales remote diagnostics tool equipment systems.

Note 2 to entry: Diagnostic support that is provided for performing conventional diagnostics is the foundation for remote diagnostic support (the access to that information in the case of conventional diagnostics is standardized in ISO 18541-1).

3.17
use case
sequence of interactions between one or several actors and the concerned system, which has a defined goal and provides a measurable result

EXAMPLE Read all active DTCs

Note 1 to entry: "Read all active DTCs" may be comprised of the following interactions: initialization of the communication, identification of the vehicle, sending the request to get DTC information ("read DTC"), receiving DTC information, terminating of the communication.

Note 2 to entry: Actors may be both human and machines.

Note 3 to entry: In the case of an *extended vehicle* (3.5), the concerned system is the extended vehicle itself.

Note 4 to entry: In order to be able to perform the design of an extended vehicle, it is necessary that the use cases are completed by the appropriate use case scenarios and use case functional requirements.

3.18
use case cluster
<road vehicles> grouping of *use cases* (3.17) that together have the same goal measurable result

EXAMPLE Remote diagnostics, fleet management.

Note 1 to entry: Use case clusters may be themselves regrouped into areas, the typology of which may generate different types of technical solutions, although some solutions may be common to several areas.

Note 2 to entry: Extended vehicles have been developed to be used in all the use case clusters areas where vehicle connectivity is expected, for example, cooperative ITS, fleet management, remote diagnostic, car sharing, etc.

3.19
use case scenario
set of circumstances under which the sequence of interaction describing a *use case* (3.17) takes place

EXAMPLE Vehicle is in a workshop, vehicle is in a manufacturing process, vehicle is immobilized, etc.

Note 1 to entry: The same use case may take place under different scenarios, but the sequence of interaction may also be affected by the circumstances. In that case, one would have more than one use case.

Note 2 to entry: In the case of an operation performed on an immobilized vehicle, the presence or absence of a technician may be part of the use case scenario.

3.20
vehicle manufacturer
person or body who is responsible to the approval authority for all aspects of the type approval or authorization process and for ensuring conformity of production of a vehicle

Note 1 to entry: It is not essential that the person or body be directly involved in all stages of the construction of the vehicle, system, component or separate technical unit which is the subject of the approval process.

Note 2 to entry: Adapted from Directive 2007/46/EC.

[SOURCE: ISO 18541-1:2014, 3.1.46]

3.21
web service
software system, with an interface described in a machine-processable format and designed to support interoperable machine-to-machine interaction over a network

[SOURCE: WORLD WIDE WEB Consortium Glossary - W3C Working Group Note 11 - February 2004, modified — source entry has been modified not to restrict the concept to one protocol or one type of messages and to partly include Note 1 to source entry and Note 2 to source entry has been disregarded.]

4 Abbreviated terms

DTC	Diagnostic trouble code
ExVe	Extended Vehicle
FMS	Fleet Management System
IT	Information Technology
ITS	Intelligent Transport Systems
OBD	On-board Diagnostics
PTI	Periodical Technical Inspection
RDS	Remote Diagnostic Support
rFMS	remote Fleet Management System
RMI	Repair and Maintenance Information
RSI	Road Side Inspection
VCI	Vehicle Communication Interface
VM	Vehicle Manufacturer
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle
W3C	World Wide Web Consortium
WS	Web Service

5 The extended vehicle

5.1 Background

The technology improvements, especially IT improvements, have permitted vehicle manufacturers to address the constant evolution of the needs of its customers by providing solutions that are not solely on-board the conventional vehicle (whether car, truck or bus) but that also involve off-board components and systems.

Typically, these improvements have been based on new ways of communicating with the vehicle where information can be accessed wirelessly.

The removal of the constraints linked with a physical connection has enabled the possibility of new services based on:

— an access to vehicle functionalities in a way that was previously impossible or very hard;

— multiple access to the vehicle instead of e.g. a single OBD connector; and

— a time-critical access to vehicle operation data.

This evolution adds the additional risks related to remote access (hacking, intrusion, information misuse, etc.) to the already existing typical automotive risks. Accordingly, it is the responsibility of the vehicle manufacturer to take additional specific security measures when designing an extended vehicle.

Figure 1 and Figure 2 illustrate this evolution by presenting typical examples of the 2010s extended vehicles, respectively, the use of an "intelligent" key and the use of a VM server for reprogramming a vehicle ECU.

EXAMPLE 1

The use of an "intelligent key".

In Figure 1, the VM has provided the owner of a vehicle an off-board device that is an intelligent key. This key communicates with the conventional vehicle and enables the opening of the doors and the "activate in-vehicle network" process. For the owner as well as for the manufacturer, this device is part of the vehicle.

EXAMPLE 2

The use of a VM server for reprogramming a vehicle ECU.

In Figure 2, the VM has developed, e.g. in order to comply with the EU legislation on RMI, a reprogramming system that permits reprogramming a vehicle ECU through the OBD connector of the vehicle using a standardized VCI (for example, according to SAE J2534 or ISO 22900). To reprogram, the repairer has first to connect the VCI to a manufacturer end-point, where he will get the information that is necessary to perform the operation. For the owner of the vehicle, the VCI is not part of his vehicle.

The extended vehicle concept is expected to satisfy emerging new services, for example, remote services.

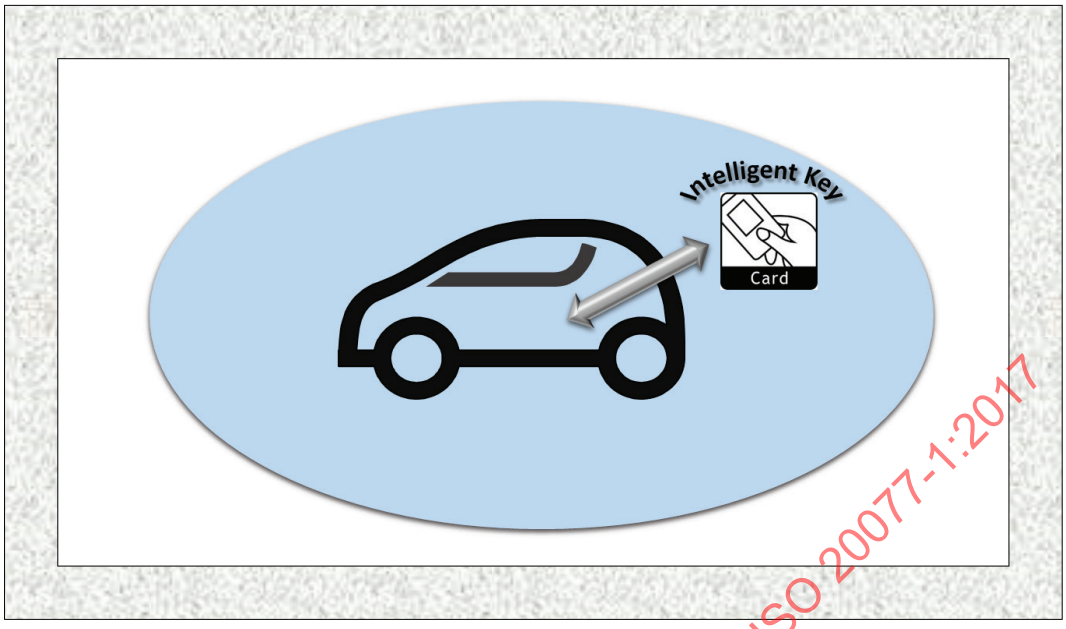
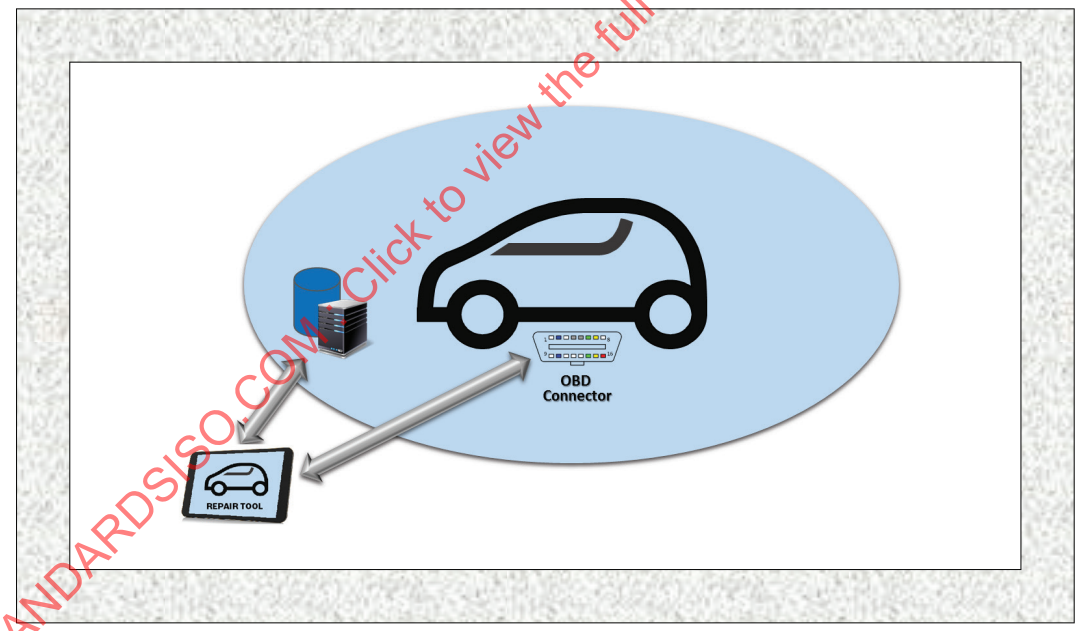


Figure 1 — Legacy and non-standardized extended vehicle: Conventional vehicle with an intelligent key



NOTE The reprogramming device is outside the ExVe.

Figure 2 — Extended vehicle example to comply with the EU legislation on RMI

5.2 The "extended vehicle" concept

An extended vehicle refers to all the technical components which enable a vehicle function, including the on-board and off-board data and systems required to perform this function.

Thereby, the extended vehicle also includes all the interfaces permitting to access its data from the outside. This is illustrated by Figure 3 and Figure 4, as a global concept in Figure 3 and with interface examples in Figure 4. In these figures, the colours used for the interfaces shall be understood as follows.

— The red colour represents the interfaces used for retrieving OBD-related information by means of a wired connection (this interface is here symbolized by the ISO OBD-connector).

— The blue colour represents the interfaces in case of web services (this interface is here symbolized by a server that is part of the extended vehicle, as in the ISO 20078 project).

— The yellow colour represents the interface necessary for wireless time critical communication (for example, for V2V communication in cooperative ITS use-cases).

— The grey colour segment represents all interfaces (in Figure 3) or all other interfaces (in Figure 4) to the extended vehicle, interfaces that may or may not be standardized.

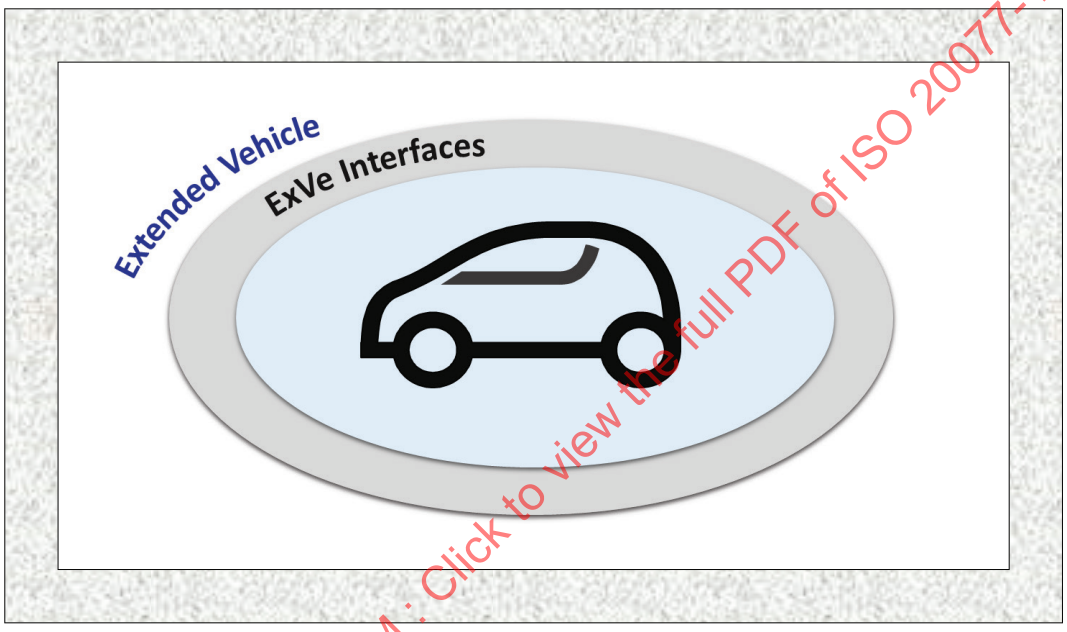


Figure 3 — Extended vehicle and its interfaces

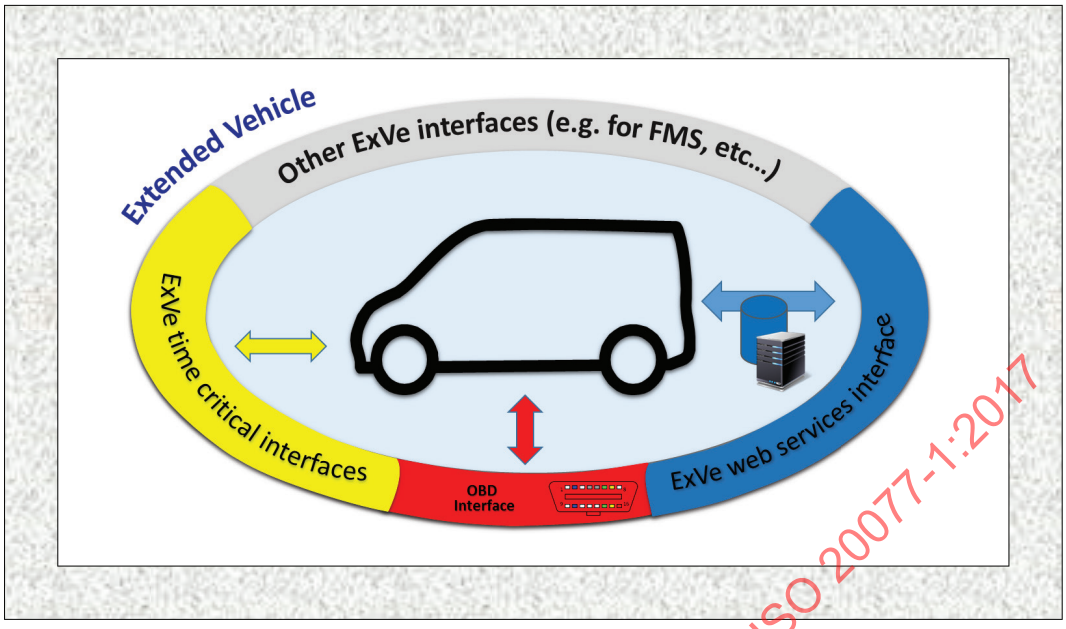


Figure 4 — Typical interfaces of an extended vehicle

It shall be noted that, because the road vehicle is per definition part of the extended vehicle, some interfaces of the extended vehicle may also be physical interfaces to the road vehicle (see Figure 4).

Web services are part of the typical interfaces of an extended vehicle, as shown in Figure 4. This corresponds to the software system designed by the manufacturer in order to support an interoperable machine-to-machine interaction between one of the servers that are part of the extended vehicle and other servers that are managed by service providers, who are external to the extended vehicle and through which a third party may communicate (as shown in the example of Figure 5).

This permits, for example, a diagnostic operator to diagnose the vehicle, in a remote manner, thanks to the services of a service operator adhering to the server-to-server interaction principles retained by the vehicle manufacturer for the relevant use case (for example, the principles of the ISO 20078 project) .

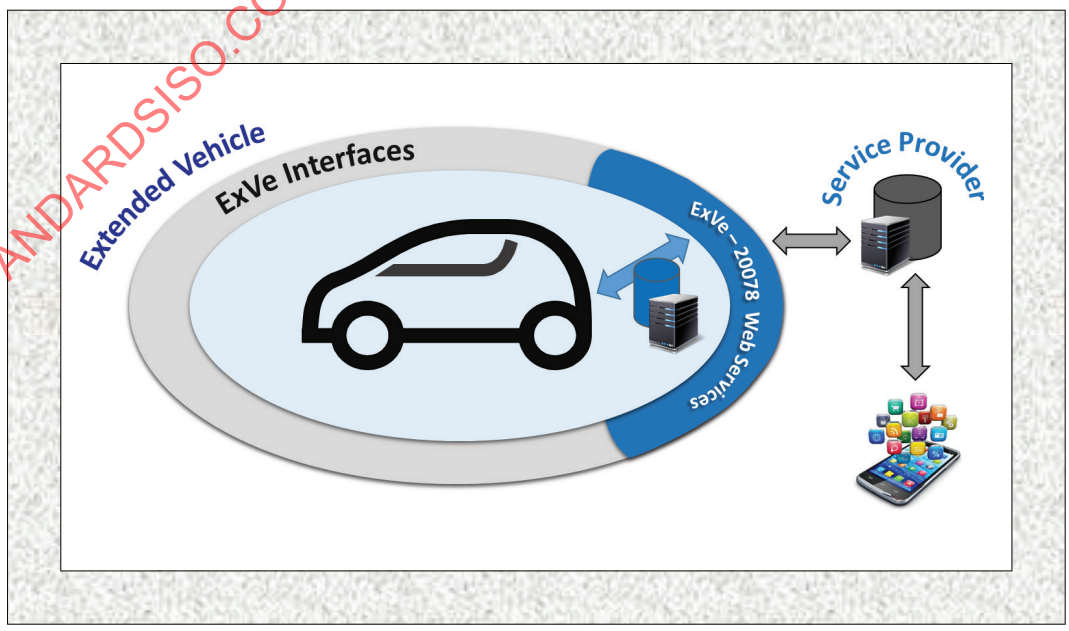


Figure 5 — Description of the web service interface of an extended vehicle according to the ISO 20078 project

5.3 The design constraints applicable to an extended vehicle

The design of an extended vehicle shall take into consideration the following fundamental constraints:

— Remote access shall not jeopardize the basic safety of persons or goods (inside or outside the vehicle) and the security of the vehicle (including cybersecurity) during all its life phases.

5.4 The areas where the extended vehicles are expected to be used

The extended vehicle is not a particular technical solution to solve a particular need (for example, to address remote diagnostics expectations). It is a technology where the conventional road vehicle has been extended to include off-board systems. It shall be used in all the areas where vehicle connectivity is applied.

Although not exhaustive, the following six major areas have been considered because they may generate different types of technical solutions (see Figure 6).

— The vehicle repair and maintenance area. A typical use case cluster of this area is remote diagnostics. A characteristic of this area is that national or regional regulations are very much influencing the design of the extended vehicles.

— The vehicle inspection area. A typical use case cluster of this area is remote road-side inspection (RSI). A characteristic of this area is that the main actors of the inspection report to local authorities.

— The road-traffic management area. Typical use case clusters of this area are vehicle-to-vehicle and vehicle-to-infrastructure communication. A characteristic of this area is the need for an extremely high communication speed.

— The transport management area. A typical use case cluster of this area is remote fleet management. A characteristic of this area is that the vehicle is considered as an entity among others for logistic purposes.

— The manufacturing and sales area. A typical use case cluster of this area would be remote diagnostics of vehicles during the manufacturing process. A characteristic of this area is that the owner of the vehicle is still the vehicle manufacturer.

— The non-automotive areas. Typical use-case clusters of this area are infotainment and vehicle insurance remote drivers and driving survey programs. A characteristic of this area is the very high variety of use cases that typically originate from outside the automotive industry.

With such a variety of needs, a good description of the use case clusters is essential for the development of an appropriate technical solution which is based on the extended vehicle.

This use case description is typically realized:

— through a particular legislation;

— through a particular standard (see 6.4);

— through a full documentation by means of the standardized template specified in ISO 20077-2.

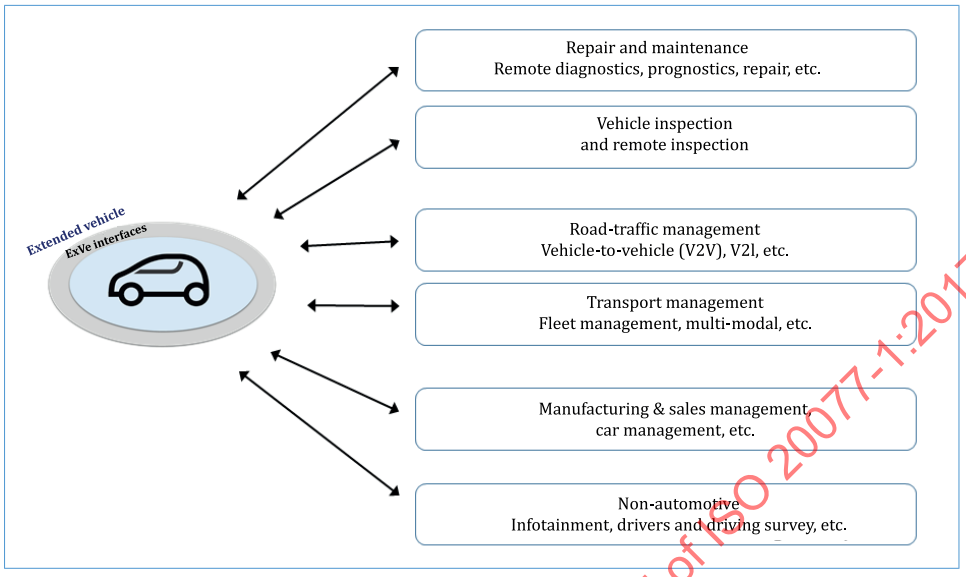


Figure 6 — Examples of possible needs for use case clusters

6 ISO standards dealing with the extended vehicles

6.1 General

The ISO Standards connected with the concept of extended vehicles may be grouped in three categories:

— standards dealing with generic specifications concerning the extended vehicle such as definitions, methodologies, etc.,

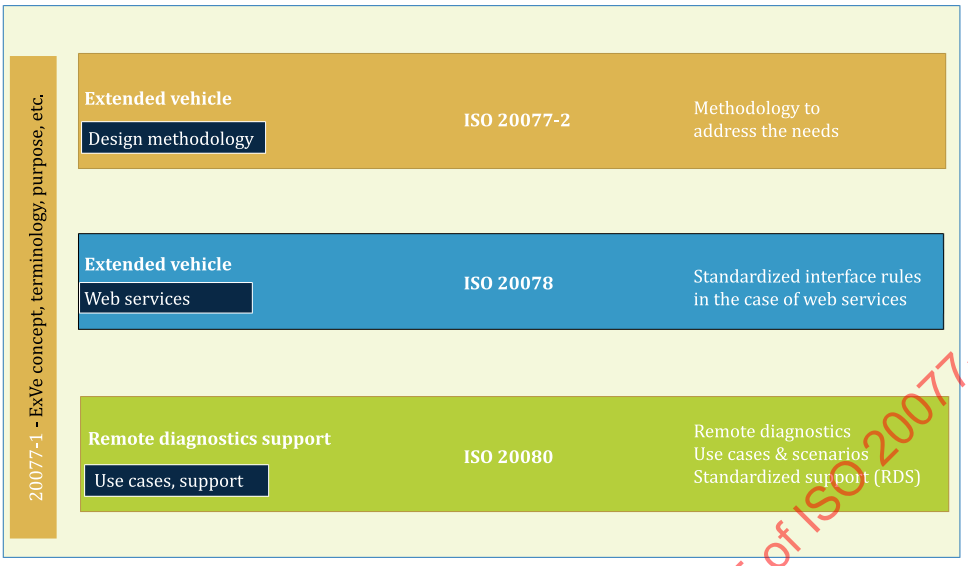
— standards dealing with specific technical specifications of the extended vehicle such as interface specifications, etc., and

— standards dealing with information necessary for an extended vehicle to address specific needs (use cases, usage support, etc.).

EXAMPLE

Figure 7 illustrates this grouping by taking the example of the ISO 20077, ISO 20078 and ISO 20080 standards and projects.

It shall be noted that, because the road vehicle is per definition an element of the extended vehicle, the ISO Standards regarding physical interfaces of the road vehicle (such as, for example, the OBD connector) shall be considered as belonging to the second category of standards.



NOTE The three categories of standards and projects are respectively symbolized by the brown (for generic ExVe standards), blue (for ExVe interfaces) and green colours (for ExVe related use cases).

Figure 7 — The ISO 20077, 20078 and 20080 standards and projects

6.2 Generic ExVe standards: The ISO 20077 series

6.2.1 Content of the ISO 20077 series

The ISO 20077 series contain diverse generic specifications proper to the extended vehicle concept. They do not contain any technical specification.

— This document is the first part of ISO 20077. It contains essentially definitions, concepts and examples concerning extended vehicles and related standards.

— ISO 20077-2 contains a methodology to design an extended vehicle. 6.2.2 presents its content.

6.2.2 ISO 20077-2: The ISO methodology standard for designing an extended vehicle

6.2.2.1 Purpose of the ExVe design methodology standard

The goal of the ExVe design methodology is to guide the design of the extended vehicle and its interfaces (physical, documentation, support, etc.) in order to limit the risks associated with safety, security and regulatory conformance, especially when it deals with fair competition.

It is based on the fact that, in the last decades, most vehicle manufacturers have implemented solid quality management systems that have been certified to comply with, e.g. ISO 9001 or equivalent series of requirements and that are applicable to the design of their vehicles.

Design quality of the extended vehicle is then ensured, thanks to a two-step process.

— First, the VM derives its own methods and procedures to design an extended vehicle adapted to the legislation of the market where the vehicle is intended to be marketed on the basis of the rules and basic principles specified in the ExVe design methodology standard.

— Second, the VM applies its own methods and procedures, the application of which is made mandatory by the VM quality management system.

ISO 20077-2 aims at guiding the ExVe design process. It does not concern the process aiming at getting from the ExVe manufacturer information for developing new services. However, it is recommended to the parties having chosen to apply the ISO 20077-2 ExVe methodology to favour the application of processes that would reduce the risks, including competition risks, mentioned in this subclause.

6.2.2.2 Content of the ExVe design methodology standard

ISO 20077-2 specifies a set of broad principles and rules from which each VM shall derive its own methods or procedures to design an extended vehicle that addresses a specific set of use cases and scenarios.

— It is a **methodology** standard, and therefore specifies a **system of broad principles and rules** from which each VM may derive its own application methods or procedures.

— It is a **design** methodology standard and is therefore applicable to the **VM design process** of the extended vehicle.

Any process that may exist prior to, after, or within the design phase are out of scope of this document.

ISO 20077-2 consists of three parts (see Figure 8):

— a guidance (template), to be used by the requesting party, that fully describes the usage the extended vehicles is requested to address (the use cases proper, the use case scenarios and the use case functional needs);

— a guidance, to be used by the vehicle manufacturer, for not omitting any design step in the design process;

— a guidance (template), to be used by the vehicle manufacturer, for expressing to the requesting party the technical result of the design.

ISO 20077-2 may not concern the complete design process of an ExVe (for example, the competition-related basic principles of the standard may not concern the design of transmission gears and the ExVe manufacturer may want to decide, in accordance with the applicable legislation, not to apply the standard in such cases, although it applies it in other cases).

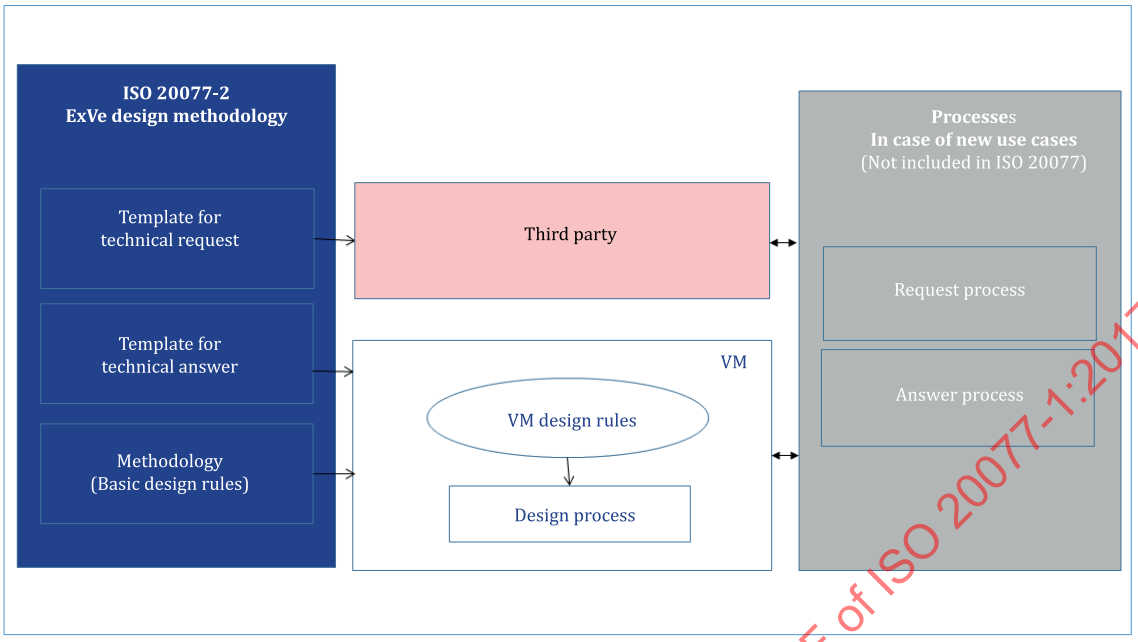


Figure 8 — Content and usage of ISO 20077-2

The ISO 20077-2 "template for technical request" is used by the third party to technically express the request. A request process takes place that is not standardized by ISO 20077-2. The VM performs the design according to the ISO 20077-2 methodology. The VM expresses the technical result of the design by means of the ISO 20077-2 template.

The response to the request process (the "answer process") takes place afterwards. This answer process is not standardized by ISO 20077-2. In the case the answer to the request is negative, the requester, notwithstanding any commercial or legal initiative he may want to initiate, may decide to:

— contract an agreement with the VM in view of obtaining the material and information enabling him to develop a retrofit solution;

— request a new use case cluster to be standardized; and/or

— have the request satisfied by means of an appropriate regulatory change.

It is important to note that ISO 20077-2 does not refer to any particular national or regional piece of legislation, nor to any standard that would specify particular technical construction rules or technical solutions (hardware or software).

6.3 Standards related to ExVe interfaces

6.3.1 Content of the standards related to ExVe interfaces

The standards related to ExVe interfaces are typically those standards that specify the interfaces dedicated to a specific type of remote communication with the extended vehicle.

6.3.2 Standards defining an ExVe interface in the case of web services

Typically, such standards define a web service that shall be used, when appropriate, as an interface of the extended vehicle (ExVe).

This addresses technically the needs for data or information access, data security while observing the applicable requirements of data protection, data economy and product safety.

EXAMPLE

The series of standards resulting from the ISO 20078 project are the typical example of an ISO ExVe web service interface.

In this project, the need of a third party, accessing ExVe information is supported by using the VM backend system (see Figure 5) and the web service is a generic design, such that it can be used by any third party on a common IT basis.

It consists of four parts: ExVe content, ExVe access, ExVe security and ExVe control, in order to satisfy the above description.

6.4 Standards related to ExVe use case clusters

6.4.1 Content of the standards related to ExVe use case clusters

The standards related to ExVe use case clusters are those standards that specify information necessary for designing an extended vehicle that addresses a specific set of needs. Typically, this information includes a precise description of use cases (for example, the use cases for remote diagnostics) and of use case scenarios.

6.4.2 Example of the ISO 20080 project on remote diagnostics

The ISO 20080 project includes typical ISO specifications for the remote diagnostics use case cluster that is, aside, e.g. remote prognostics, one of the use case clusters within the vehicle repair and maintenance area specified in 5.4.

6.5 Practical usage of the extended vehicles standards

6.5.1 Example of designing an extended vehicle for remote diagnostics purposes

When designing the extended vehicle according to its internal design rules, in conformity with the design methodology specified in ISO 20077-2 (step 2 in Figure 9), the manufacturer shall decide about the appropriate interface (hardware and software) to satisfy the needs related to remote diagnostics that are specified, for example, in an ISO Standard related to remote diagnostic (step 1 in Figure 9).

As a result, the manufacturer may decide to use a standardized ExVe web service interface (step 2 in Figure 9).

If he chooses to use a standardized ExVe Web Service interface, the manufacturer shall then design that interface according to the clauses of the chosen standard (step 3 in Figure 9).

The vehicle manufacturer shall then provide information regarding the interface. This information is the support that enables a third party to perform remote diagnostics on the vehicle. In the case the manufacturer has opted for complying with a standard specifying the necessary support for remote diagnostics (RDS), this information shall comply with the RDS specification of that standard (step 4 of Figure 9).

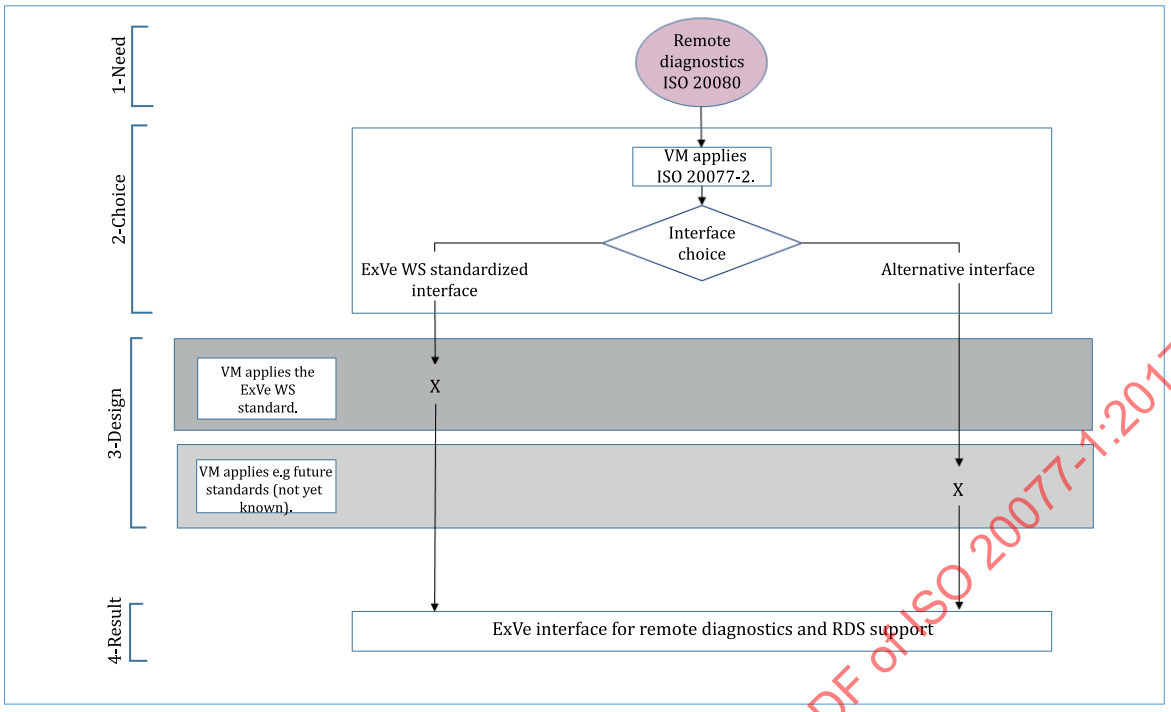


Figure 9 — Example of designing an extended vehicle for remote diagnostics purposes

Figure 10 is a particular case of Figure 9, where the RDS standard is the standard considered by the ISO 20080 project and where the extended vehicle web service standard is the series of standards considered in the ISO 20078 project.

Typically, in this figure, the ISO 20080 project defines the needs by means of a thorough description of the remote diagnostics use cases and scenarios, this decision leads to a web service interface, and the ISO 20078 project together with an annex to the ISO 20080 project define the elements proper to that interface. In this figure, the words "20078" and "20080" shall be understood to mean "as considered by the ISO 20078 project" or respectively "by the ISO 20080 project".

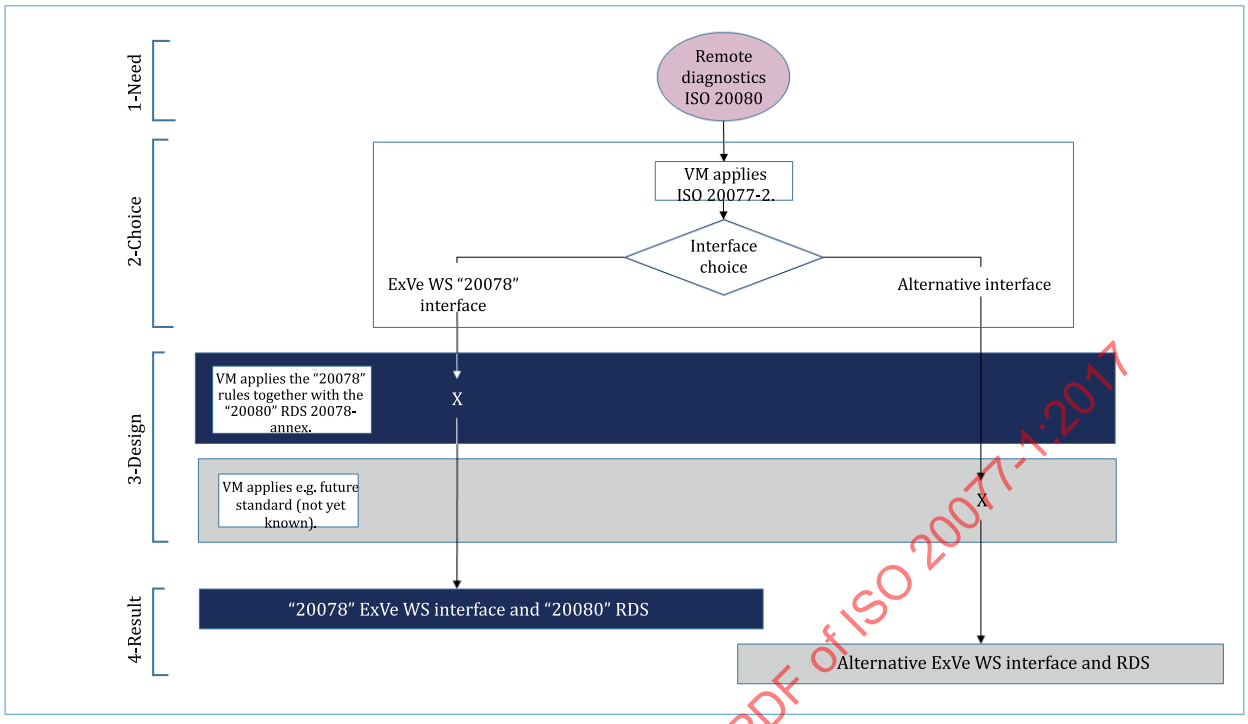


Figure 10 — Particular case of the remote diagnostics use case cluster

6.5.2 Generalization

A generalization of the usage already illustrated on the remote diagnostics example in 6.5.1 can be found in Annex B.

This generalization contains another practical example addressing rFMS.

Annex A
(informative)

Diagnostic and prognostic processes — Practical cases: The malfunction of an air conditioning system

A.1 Case 1: A symptom is reported

This case is illustrated by Figure A.1.

Symptom: The customer reports he does not have enough cooled air, compared to what he had when the car was new.

Diagnostics step 1: The technician tries to detect eventual malfunctions in the cooling system.

— He checks the outlet-temperature (measurement by means of a thermometer) in the car.

— He confirms that there is insufficient cooling from the air conditioning system.

Diagnostics step 2: The technician tries to identify the likely root cause of the insufficient cooling.

— He inspects the service book.

— He observes maintenance errors from the customer and states that the periodic maintenance requirements contained in the service book have not been followed correctly.

Repair process: The technician replaces the filter dryer.

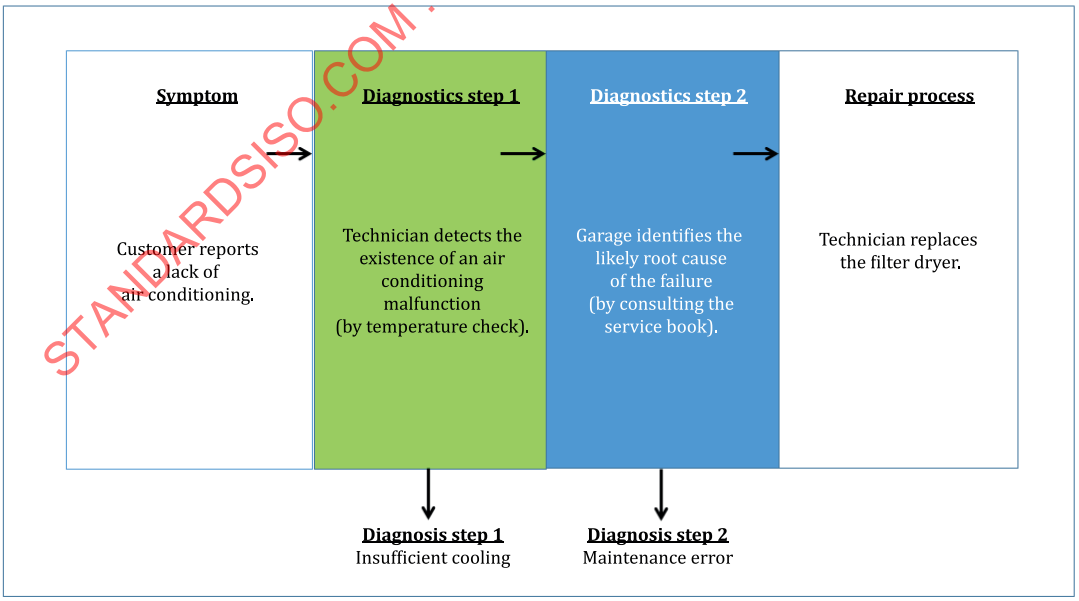


Figure A.1 — Diagnostic process when a customer reports a lack of air conditioning