
**Road transport and traffic telematics —
Electronic fee collection — Test
procedures for user and fixed
equipment —**

Part 1:

Description of test procedures

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*Télématique de la circulation et du transport routier — Perception du
télépéage — Modes opératoires relatifs aux équipements embarqués et
aux équipements fixes —*

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Partie 1: Description des modes opératoires



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Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
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Foreword

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In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

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An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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.

ISO/TS 14907-1 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 204, *Intelligent transport systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European pre-Standard..." to mean "...this Technical Specification...".

ISO/TS 14907 consists of the following parts, under the general title *Road transport and traffic telematics — Electronic fee collection — Test procedures for user and fixed equipment*:

- *Part 1: Description of test procedures*

The following parts are under preparation:

- *Part 2: EFC application interface conformance tests specification*

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Foreword

This document (CEN ISO/TS 14709-1:2005) has been prepared by Technical Committee CEN/TC 278 "Road Transport and Traffic Telematics", the secretariat of which is held by NEN, in collaboration with Technical Committee ISO/TC 204 "Intelligent Transport Systems".

This document supersedes ENV ISO 14907-1:2000.

This document is part of the following series of standards related to testing of electronic fee collection (EFC) equipment and systems:

- CEN ISO/TS 14907-1, *Road transport and traffic telematics – Electronic fee collection – Test procedures for user and fixed equipment – Part 1: Description of test procedures (ISO/TS 14907-1:2005)*
- CEN ISO/TS 14907-2¹⁾, *Road transport and traffic telematics – Electronic fee collection – (EFC) Test procedures for user and fixed equipment - Part 2: EFC application interface conformance tests specification*

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

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¹⁾ To be published.

Introduction

For an EFC system, approvals and tests are required to determine whether the system (or individual modules of the system) conforms to standards and application requirements, and to enable parameters, such as quality, availability and maintainability, to be measured.

There are complete EFC systems including documentation and approvals available which are possibly in operation in some countries of Europe. This document provides a toolbox of tests and procedures for the assessment and proof of such EFC systems that they are suitable for specified EFC applications under specific operational conditions. Dependent on a system to be tested and based on the available documentation and the status of already carried out approvals this document enables parties involved e.g. system provider, operators and test houses to take into consideration already proven references and to identify such parameters which still have to be tested according to the specified applications.

At the time of drafting this document, the determination of common system requirements for Europe (or any other region) has not been agreed. This document therefore does not specify any particular performance requirements unless these are already determined elsewhere (such as safety or radio regulations) but rather identifies the key parameters which will comprise such requirements. Where reference to an existing test is available, this document provides that reference. This document defines only the test and test procedures, not the benchmark figures that these are to be measured against. This document is Part 1 of a series of standards. This Part 1 describes the test procedures. Part 2 describes EFC OBU conformance test procedures. Future standards will provide the benchmark figures to which the systems or components under test must be compared and validated.

This document is furthermore limited to automated (electronic) payment using a standardised dedicated short-range communication (DSRC). The scope of this document does not include manual payment, conventional money transaction, nor does it include payment by means of sticker, vignettes, tickets, or magnetic stripe cards etc. The applications to which EFC is related are Toll Collection, Road Pricing, Parking and Individual Traffic Information.

This is an enabling document to enable groups of operators to determine common specific performance levels and operating conditions, and to enable regional variation where appropriate. It provides operating and environmental parameters (or classes of operating and environmental parameters) within which such systems shall successfully function without impairing interoperability to ensure that the person specified the system can state his requirements clearly to implementation designers and integrators, and to enable the measurement of the performance of such systems.

The following guidelines have been followed when selecting the test procedures for test parameters:

- reference as far as possible to existing standardised test procedures;
- concentrate on those tests which are essential to ensure that EFC equipment is able to exchange information and mutually use the exchanged information.

A brief guide describing how to use this document is provided by Annex A of this document.

Whilst the scope of this document is generic, certain provisions relate specifically to 'test procedures' for certification purposes. Some or all of the features of this document are relevant internationally and this document therefore has relevance and is published by both CEN and ISO. However, it is recognised that due to different regulatory requirements outside Europe, extension will be required to make the Technical Specification as comprehensive in non CEN countries, before this document can be submitted for acceptance as a full standard.

1 Scope

This document specifies the test procedures of EFC road-side equipment (RSE) and on-board equipment (OBE) with regard to the conformance to standards and requirements for type approval and acceptance testing which is within the realm of EFC application specifically.

The scope of this document is restricted to systems operating within the radio emission, EMC regulations, traffic and other regulations of the countries in which they are operated and it is therefore a requirement that all required equipment approvals from an authenticated and accredited test house have been obtained in order to claim compliance.

This document identifies a set of suitable parameter and provides test procedures to enable the proof of a complete EFC system as well as components of an EFC system e.g. OBE related to the defined requirements of an application. The defined parameter and tests are assigned to the following groups of parameter:

- Functionality;
- Quality;
- Referenced pre-tests.

An overview of the tests and parameters provided by this document is given in 5.1 and 5.2. OBU conformance testing against EN ISO 14906 (EFC- Application interface definition for DSRC) is covered by CEN ISO/TS 14907-2 (Part 2 of this document).

The Technical Specification describes procedures, methods and tools and a test plan which enables to show the relation between all tests and the sequence of these tests. It lists all tests which are required to measure the performance of EFC equipment. The Technical Specification describes which EFC-equipment is covered by the test procedures; the values of the parameters to be tested are not included. It describes also how the tests are to be performed and which tools and pre-requisites are necessary before this series of tests are undertaken. It is assumed that the security of the system is inherent in the communications and EFC functionality tests and are thus not addressed specifically here. All tests in this document provide instructions to evaluate the test results.

The test procedures can be used for prototype testing, type approvals, test of installations and periodic inspections. Thus this Part 1 is a document that defines only the test and test procedures, not the benchmark figures that these are to be measured against.

Related to a conceptual model of an EFC system this document relates only to the equipment of the user and the service provider as illustrated in Figure 1. Any other entities are outside the scope of this document.

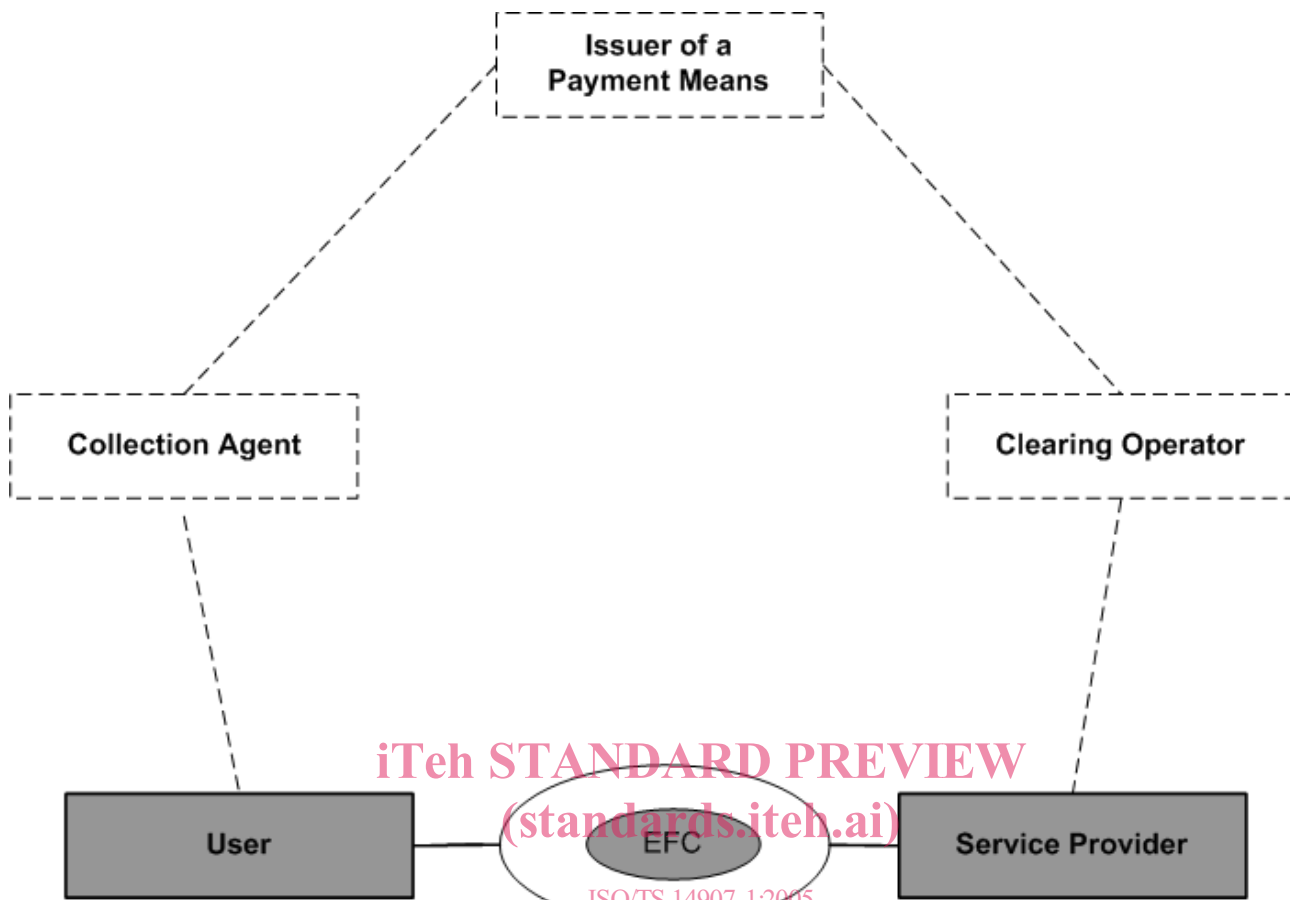


Figure 1 — Conceptual model of EFC

EFC systems for DSRC consist, in principle, of a group of technical components, which in combination fulfil the functions required for the collection of fees by electronic automatic means. These components comprise all or most of the following:

- on-board equipment (OBE) within a vehicle;
- on-board unit containing the communications and computing sub-functions;
- optional integrated circuit card which may carry electronic money, service rights and other secured information;
- communication between OBE and RSE based on DSRC;
- equipment for the fee collection at the road-side (RSE) containing the communications and computing sub-functions;
- equipment for the enforcement at the road-side;
- central equipment for the administration and operation of the system.

The scope of this document relates solely to OBE and RSE and the DSRC interface between OBE and RSE including its functions to perform the fee collection as illustrated by Figure 2. All the equipment used for enforcement (e.g. detection, classification, localisation and registration) and central equipment are outside the scope of this document.

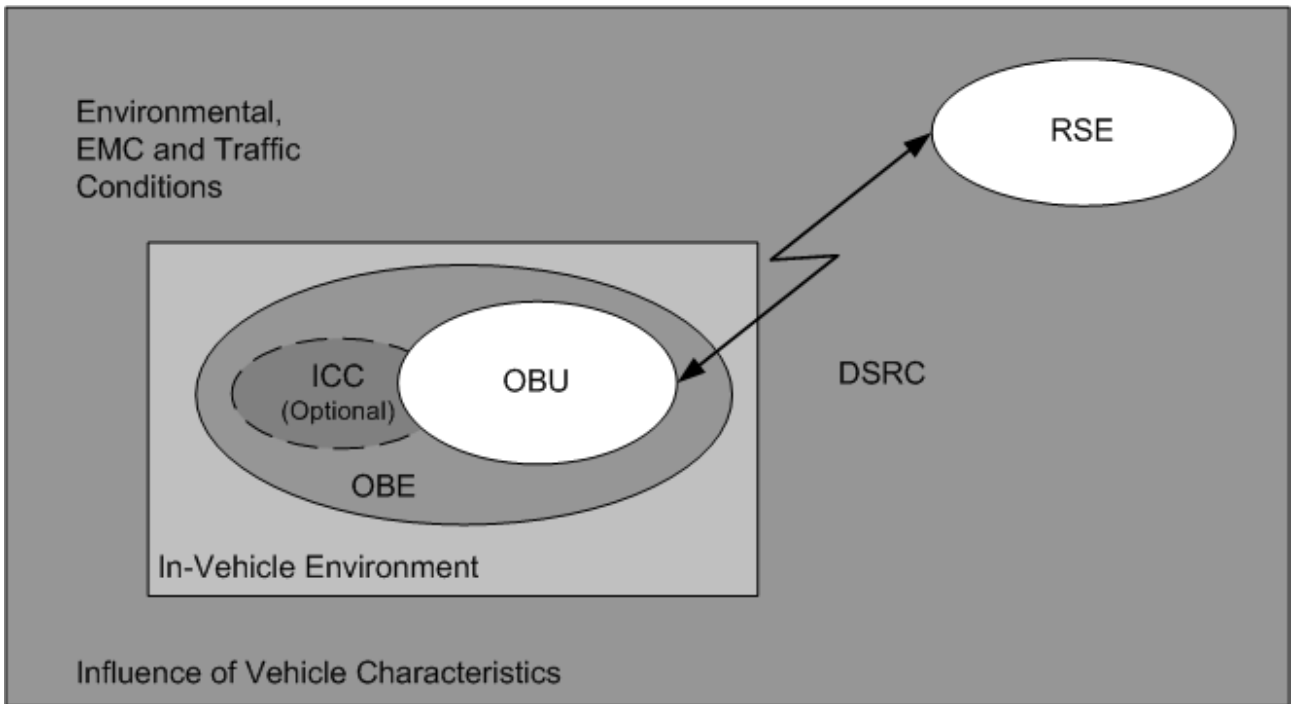


Figure 2 — OBE/RSE interface and associated environments
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2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 45011, *General requirements for bodies operating product certification systems (ISO/IEC Guide 65:1996)*.

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:1999)*.

3 Terms and definitions

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

3.1

acceptance testing

examination that a duly identified product, process or service is in conformity with the system specification

3.2

EFC equipment

EFC Equipment consists of Roadside Equipment (RSE) and On-Board Equipment (OBE)

3.3

EFC system

system that enables electronic debiting, i.e. paying for a transport service, without any action from the user at the moment of the use of the service

3.4

availability

probability that a unit at a random point in time within a given interval is in least a certain degree of preparedness to function or functioning under given running, environmental and maintenance conditions

3.5

certification

procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements

3.6

compatibility

suitability of products, processes or services for use together under specific conditions to fulfil relevant requirements without causing unacceptable interactions

3.7

evaluation

systematic examination of the extent to which an entity e.g. system, process, product, or a unit is capable of fulfilling specified requirements

3.8

field tests

tests which are performed under real life conditions

3.9**functionality**

group of parameter which are able to measure the performance of an EFC system, e.g. communication, application, vehicle and traffic characteristics

3.10**inspection**

conformity evaluation by observation and judgement accompanied as appropriate by measurement, testing or gauging

3.11**interoperability**

interoperability is the ability of systems to provide services to and accept services from other systems and to use the services so exchanged to enable them to operate effectively together

3.12**laboratory tests**

tests which are performed in a laboratory under specified conditions

3.13**maintainability**

ability of a device to be maintained or restore to specified conditions within a given period of time

3.14**on-board equipment**

equipment located within the vehicle and supporting the information exchange across the interfaces of its sub-units. It is composed of the On Board Unit (OBU) and other sub-units whose presence has to be considered optional for the execution of the DSRC interface

3.15**quality**

all of the features and characteristics of the capability of a product or service to satisfy the requirements of the users (easiness of use, safety, availability, reliability, sturdiness, economy, environmental safety) whether given explicitly or implicitly

3.16**quality of EFC equipment**

group of parameter (reliability, availability, maintainability) which are able to define the quality of EFC equipment by qualitative and quantitative figures

3.17**reliability**

ability of a device to perform its intended function under given conditions of use for a specified period of time

3.18**roadside equipment**

equipment located at a fixed position along the road transport network, allowing for the communication and data exchange with the on-board equipment

3.19**simulation**

simulation is the representation of selected behavioural characteristics of one physical or abstract system by another system

[ISO 2382-1]

3.20

simulation of an EFC system

in a simulation of an DSRC-based EFC system, selected behavioural characteristics of the EFC system are represented by a computer model to enable the testing of the EFC equipment in a realistically modelled environment

3.21

test

technical operation that consists of the determination of one or more characteristics of a given product, process or device according to a specified procedure

3.22

test parameter

one or more test parameter which are able to specify one or more characteristics of an EFC system

3.23

test procedure

specific procedure for performing a test

3.24

test status

indication of the nature of a test. Conditional: A test labelled 'conditional' shall be subject to testing if and only if it is a feature of the system or component according to the specification. Basic: A test labelled 'basic' indicates a highly recommended test as part of a foundation for meaningful evaluation

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3.25

test type

kind of test, e.g. inspection, simulation, lab-test and field test

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3.26

test house

third party by a person or body that is recognized as being independent of the parties involved, as concerns the issue in question

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3.27

type approval

approval based on conformity testing on the basis of one or more specimens of a product representative of the production

3.28

validation

confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled

3.29

verification

confirmation by examination and provision of objective evidence that specified requirements have been fulfilled

4 Abbreviations

4.1

DSRC

Dedicated Short Range Communication

4.2

EFC

Electronic Fee Collection

4.3**EMC**

Electromagnetic Compatibility

4.4**ICC**

Integrated Circuit Card

4.5**IEC**

International Electro Technical Committee

4.6**IUT**

Implementation Under Test

4.7**MMI**

Man Machine Interface

4.8**MTBF**

Mean Time Between Failure

4.9**MTTF**

Mean Time To Failure

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4.10**MTTR**

Mean Time To Repair <https://standards.iteh.ai/catalog/standards/sist/db4b4281-d0a7-49b1-b202-79e4a821a405/iso-ts-14907-1-2005>

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4.11**OBE**

On Board Equipment

4.12**OBU**

On Board Unit

4.13**RSE**

Road Side Equipment

4.14**SUT**

System Under Test

5 Test parameters and test procedures for EFC**5.1 Tests overview****5.1.1 Introduction**

The test parameters for EFC systems or components are categorised in three groups as follows:

- a) Functionality Tests;
- b) Quality Tests;
- c) Referenced Pre-Tests.

Figure 3 shows the general structure of all test parameter groups relevant for EFC systems and those which are relevant to this document. The test parameters of the already mentioned pre-tests are referenced from sources other than this document. The specific test parameters which are ultimately deemed relevant for a specific EFC system shall be identified and listed in the test plan according to 5.3. The individual test plan for type approval or acceptance testing shall take into account the already passed tests of the pre-tests, e.g. for EMC, DSRC and environment.

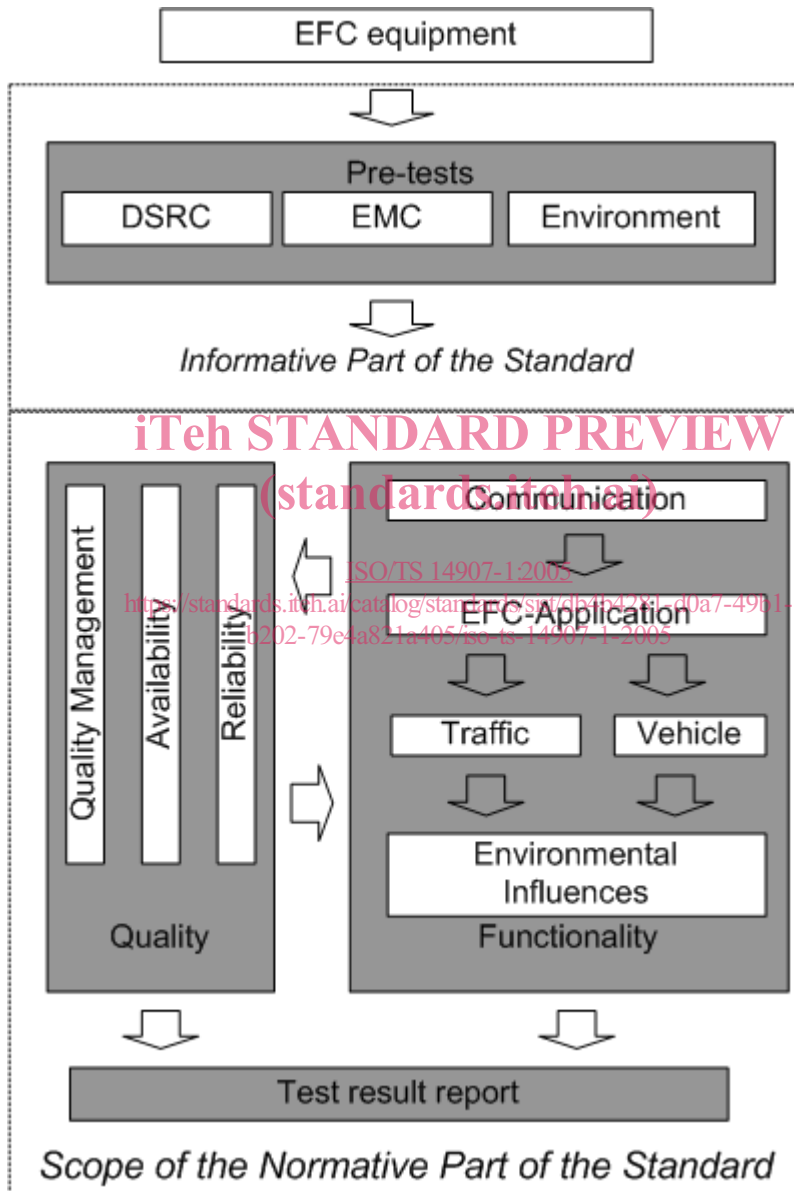


Figure 3 — Test plan - interdependencies

5.1.2 Functionality tests

The first category of tests is related to test procedures which aim to verify the functionality of the EFC equipment.

The functionality tests are related to the essential test parameters which need to be applied to verify the performance and capability of EFC equipment of different vendors and system operators.

The following test parameters shall be tested:

- Communication;
- EFC Application;
- Vehicle Characteristics;
- Traffic Characteristics;
- Environmental Influences.

Communication and EFC application tests are described in 6.1. Tests related to vehicle and traffic characteristics and environmental influences are listed in Annex B.

5.1.3 Quality tests

The second category of tests is related to test procedures which aim to test the quality of the EFC equipment. These are relevant for both operators and users.

Within the scope of the document, the following test parameters shall be tested:

- Quality Management;
- Reliability;
- Availability.

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For some of these test parameters, there are partly existing test procedures available, which are referenced.

These tests are described in 6.2 and Annex C.

5.1.4 Referenced pre-tests

The third category of tests is related to test parameter which are fundamental for the performance of EFC equipment. The specific parameters and requirements are not in the scope of this document. The parameters which are relevant can be assigned to the following groups:

- DSRC;
- EMC;
- environment.

5.2 Parameter overview

The following tables provide a comprehensive list of the parameters that are relevant for type approval or acceptance testing of a complete EFC system as well as components of an EFC system. The tables are divided according to the aforementioned three sections, namely functionality, quality and referenced pre-tests. The section in this document where the tests are described or referenced is shown. An indication as to the nature of these tests (basic or conditional) is provided as not all tests are relevant to all operators and their specific operating situations and environment. **Basic** used in these tables does mean that the identified tests are highly recommended tests as part of a foundation for meaningful evaluation. **Conditional** means that a test labelled 'conditional' shall be subject to testing if and only if it is a feature of the system or