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Standards

Standard Recommendation
S.R. CEN ISO/TS 17444-2:2013

Electronic fee collection - Charging performance - Part 2: Examination Framework (ISO/TS 17444-2:2013)

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NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

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English Version

**Electronic fee collection - Charging performance - Part 2:
Examination Framework (ISO/TS 17444-2:2013)**

Perception du télépéage - Performance d'imputation -
Partie 2: Cadre d'examen (ISO/TS 17444-2:2013)

Elektronische Gebührenerhebung - Erhebungsqualität - Teil
2: Rahmenbedingungen für Prüfungen (ISO/TS 17444-
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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....	3
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Foreword

This document (CEN ISO/TS 17444-2:2013) has been prepared by Technical Committee ISO/TC 204 "Intelligent transport systems" in collaboration with Technical Committee CEN/TC 278 "Intelligent transport systems" the secretariat of which is held by NEN.

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Endorsement notice

The text of ISO/TS 17444-2:2013 has been approved by CEN as CEN ISO/TS 17444-2:2013 without any modification.

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**Electronic fee collection — Charging
performance —**

**Part 2:
Examination Framework**

Perception du télépéage — Performance d'imputation —

Partie 2: Cadre d'examen





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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
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Contents

Page

Foreword	vi
Introduction.....	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Symbols and Abbreviated terms	7
5 Examination Framework.....	8
5.1 General	8
5.2 Method for defining a Specific Examination Framework	9
5.2.1 Selection of Metrics to be evaluated	9
5.2.2 Definition of environmental conditions and associated performance requirements.....	10
5.2.3 Determination of Required Sample Sizes	10
5.2.4 Selection of methods for generating Charging Input and Reference Data	10
5.2.5 Determination of Test Routes / Sub-set of Charged Network for generating representative trips	10
5.2.6 Documentation of the Specific Examination Framework.....	11
5.3 Sources of Data	11
5.4 Methods of generating charging input.....	14
5.4.1 Predefined routes (identifier: “PVP”)	15
5.4.2 Reference System (used in combination with identifiers: “PVR” and “UVR”)	16
5.4.3 Simulated OBE / FE (identifier: “SO”)	17
5.4.4 Dedicated OBE Testing (identifier: “DO”).....	17
5.5 Applicability of metrics scheme types	18
5.6 Charging Metric Selection Tables.....	21
5.6.1 General	21
5.6.2 DSRC Discrete	21
5.6.3 Autonomous Discrete	22
5.6.4 Autonomous Continuous	23
6 Examination Tests	25
6.1 Common (and DSRC Discrete) Examination Tests.....	25
6.1.1 General	25
6.1.2 ET-CM-E2E-1 E2E Correct Charging Rate.....	25
6.1.3 ET-CM-E2E-2 E2E Overcharging Rate.....	26
6.1.4 ET-CM-E2E-3 E2E Undercharging Rate.....	26
6.1.5 ET-CM-E2E-4 E2E Late Charging Rate	27
6.1.6 ET-CM-UA-1 UA - Correct Charging Rate.....	28
6.1.7 ET-CM-UA-2 UA - Overcharging Rate	28
6.1.8 ET-CM-UA-3 UA - Undercharging Rate.....	29
6.1.9 ET-CM-UA-4 UA - Accurate application of Payments and Refunds	30
6.1.10 ET-CM-UA-5 UA – Accurate Personalisation of OBUs	30
6.1.11 ET-CM-PC-1 PC - Correct Charging Rate	31
6.1.12 ET-CM-PC-2 PC – Overcharging Rate	31
6.1.13 ET-CM-PC-3 PC - Undercharging Rate	32
6.1.14 ET-CM-PC-4 PC - Latency – TC	33
6.1.15 ET-CM-PC-5 PC - Late Payment Claims	33
6.1.16 ET-CM-PC-6 PC – Rejected Payment Claim Rate	34
6.1.17 ET-CM-BD-1 BD - Correct Charging Rate.....	34
6.1.18 ET-CM-BD-2 BD – Overcharging Rate	35
6.1.19 ET-CM-BD-3 BD - Undercharging Rate.....	36
6.1.20 ET-CM-BD-4 BD - Incorrect Charging Rate	37

6.1.21	ET-CM-BD-5 BD - Latency – TC	37
6.1.22	ET-CM-BD-6 BD – Late Billing Details	38
6.1.23	ET-CM-BD-7 BD – Rejected Billing Details Rate	38
6.1.24	ET-CM-BD-8 BD – Incorrectly rejected Billing Details Rate	39
6.1.25	ET-CM-BD-9 BD – Inferred Billing Details Rate	39
6.2	DSRC Discrete – Optional DSRC Toll Declaration Metrics	40
6.2.1	General	40
6.2.2	ET-CM-TD-1 TD - Correct Toll Declaration Generation	40
6.2.3	ET-CM-TD-2 TD - Incorrect Toll Declaration Generation	40
6.2.4	ET-CM-TD-3 TD – Late Toll Declarations	41
6.2.5	ET-CM-TD-4 TD - TSP Event Detection	41
6.2.6	ET-CM-TD-5 TD - TSP False Positive	42
6.3	Autonomous Discrete Specific Examination Tests	43
6.3.1	General	43
6.3.2	ET-CM-TD-1 TD - Correct Toll Declaration Generation	43
6.3.3	ET-CM-TD-2 TD - Incorrect Toll Declaration Generation	43
6.3.4	ET-CM-TD-3 TD – Late Toll Declarations	44
6.3.5	ET-CM-TD-4 TD - TSP Event Detection	44
6.3.6	ET-CM-TD-5 TD - TSP False Positive	45
6.3.7	ET-CM-DTD-1 DTD - Correct Charging Rate (Chargeable Events)	45
6.3.8	ET-CM-DTD-2 DTD - Incorrect Charge Event recognition	46
6.3.9	ET-CM-DTD-3 DTD - Missed Charge Event Recognition	46
6.3.10	ET-CM-DTD-4 DTD Overcharging Rate	47
6.3.11	ET-CM-CR-1 CR - Correct Charge Report Generation	47
6.3.12	ET-CM-CR-2 CR - Incorrect Charge Report Generation	48
6.3.13	ET-CM-CR-3 CR - Charge Report Latency	48
6.3.14	ET-CM-CR-4 CR – TSP Front End Event Detection	49
6.3.15	ET-CM-CR-5 CR – TSP Front End False Positive	49
6.3.16	ET-CM-DCR-1 DCR - Correct Charging Rate (Chargeable Events)	50
6.3.17	ET-CM-DCR-2 DCR - Incorrect Charge Event recognition	50
6.3.18	ET-CM-DCR-3 DCR - Missed Charge Event Recognition	51
6.3.19	ET-CM-DCR-4 DCR - Overcharging rate (Incorrect false positive Charge Event Recognition)	51
6.4	Autonomous Continuous Specific Examination Tests	52
6.4.1	General	52
6.4.2	ET-CM-TD-1 TD - Correct Toll Declaration Generation	52
6.4.3	ET-CM-TD-2 TD - Incorrect Toll Declaration Generation	52
6.4.4	ET-CM-TD-3 TD – Late Toll Declarations	53
6.4.5	ET-CM-TD-4 TD - TSP Event Detection	53
6.4.6	ET-CM-TD-5 TD - TSP False Positive	54
6.4.7	ET-CM-CTD-1 CTD Correct Charging Rate	54
6.4.8	ET-CM-CTD-2 CTD Overcharging Rate	55
6.4.9	ET-CM-CTD-3 CTD Accuracy of Distance/Time Measurement	55
6.4.10	ET-CM-CR-1 CR - Correct Charge Report Generation	56
6.4.11	ET-CM-CR-2 CR - Incorrect Charge Report Generation	57
6.4.12	ET-CM-CR-3 CR - Charge Report Latency	57
6.4.13	ET-CM-CR-4 CR – TSP Front End Event Detection	58
6.4.14	ET-CM-CR-5 CR – TSP Front End False Positive	58
6.4.15	ET-CM-CCR-1 CCR - Correct Charging Rate	59
6.4.16	ET-CM-CCR-2 CCR - Overcharging Rate	59
6.4.17	ET-CM-CCR-3 CCR - Accuracy of Distance/Time Measurement	60
	Annex A (informative) Examination Test Documentation Template	61
	Annex B (informative) Examination Framework Considerations	62
	Annex C (informative) Statistical Considerations	66
	Annex D (informative) Methods for reducing sample sizes for very high/low probability metrics during the Evaluation Phase	72
	Annex E (informative) Example Specific Examination Frameworks	75

Bibliography	93
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
- an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

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 17444-2 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*, and by Technical Committee CEN/TC 278, *Road transport and traffic telematics* in collaboration.

ISO/TS 17444 consists of the following parts, under the general title *Electronic fee collection — Charging performance*:

- *Part 1: Metrics*
- *Part 2: Examination Framework*

Introduction

Electronic Tolling systems are complex distributed systems involving critical technology such as dedicated short range communication (DSRC) and global navigation satellite systems (GNSS) both subject to a certain random behaviour that may affect the computation of the charges. Thus, in order to protect the interests of the different involved stakeholders, in particular Service Users and Toll Chargers, it is essential to define metrics that measure the performance of the system as far as computation of charges is concerned and ensure that the potential resulting errors in terms of size and probability are acceptable. These metrics will be an essential tool when establishing requirements for the systems and also for examination of the system capabilities both during acceptance and during the operational life of the system.

In addition, in order to ensure the interoperability of different systems it will be necessary to agree on common metrics to be used and on the actual values that define the required acceptable performances although this is not covered in this Technical Specification.

This Technical Specification is defined as a toolbox standard of examination tests plus a method for defining and documenting Specific Examination Frameworks to meet specific needs. The detailed choice of the set of examination tests within an Examination Framework depends on the application and the respective context. Compliance with this specification is understood as using the definitions and prescriptions laid out in this Technical Specification whenever the respective system aspects are subjected to performance measurements, rather than using other definitions and examination methods than the ones specified in this Technical Specification.

ISO/TS 17444-1 defines a set of charging performance metrics with appropriate definitions, principles and formulations, which together make up a reference framework for the establishment of requirements for EFC systems and their later examination of the charging performance.

These charging performance metrics are intended for use with any toll scheme, regardless of its technical underpinnings, system architecture, tariff structure, geographical coverage, or organizational model. They are defined to treat technical details that may be different among technologies as a “black box”. They focus solely on the outcome of the charging process – i.e. the amount charged in relation to a pre-measured or theoretically correct amount – rather than intermediate variables from various components as sensors, such as positioning accuracy, signal range, or optical resolution. This approach ensures comparable results for each metric in all relevant situations.

The metrics are designed to cover the information exchanged on the front-end interface and the interoperability interfaces between Toll Service Providers and Toll Chargers as well as information on the end-to-end level.

Metrics for the following information exchanges are defined:

- charge reports;
- toll declarations;
- billing details and associated event data;
- payment claims on the level of user accounts;
- end to end metrics which assess the overall performance of the charging process.

The proposed metrics are specifically addressed to protect the interests of the actors in a toll system, such as Toll Service Providers, Toll Chargers and Service Users. The metrics can be used to define requirements (e.g. for requests for proposals) and for performance assessment.

ISO/TS 17444-2:2013(E)

Toll schemes take on various forms as identified in ISO/TS 17575 suite and ISO 14906. In order to create a uniform performance metric specification toll schemes are grouped into two classes, based on the character of their primary charging variable: Charging based on discrete events (charges associated to the fact that a vehicle is crossing or standing within a certain zone), and those based on a continuous measurement (duration or distance).

In all these toll schemes, tolls may additionally vary as a function of vehicle class characteristics such as trailer presence, number of axles, taxation class, operating function, and depending on time of day or day of week, such that e.g. tariffs are higher in rush hour and lower on the weekends.

With this degree of complexity, it is not surprising to find that the attempts to evaluate and compare technical solutions for Service User charging have been made uniquely each time a procurement or study is initiated, and with only limited ability to reuse prior comparisons made by other testing entities.

Examination Framework

The Examination Framework that is defined in this part of ISO/TS 17444 is designed for measuring the metrics defined in ISO/TS 17444-1. The general aim is to achieve a maximum of comparability and reproducibility of the results without restricting the technological choices in system design. Specific Examination Frameworks maybe defined for the Evaluation and Monitoring Phases of a project due to the differences in the availability of equipped vehicles.

Evaluation Phase

This phase encompasses system evaluation and selection as well as commissioning and ramp up during implementation. Important aspects of this phase are:

- relatively small sample sizes;
- well controlled behaviour of test vehicles.

Monitoring Phase

After the system has gone into operation, its behaviour needs to be monitored for several reasons, such as fine-tuning of the system performance, monitoring of SLAs between contractual partners (supplier, Toll Charger, Toll Service Provider, etc.). In this phase the following system aspects can be expected:

- very large sample sizes possible, but with unknown behaviour of the vehicles;
- in principle all measurements from implementation phase possible, too.

Readers Guide

To understand the content of this part of ISO/TS 17444, the reader should be aware of the methodology and assumptions used to develop the Examination Framework and associated examination tests; therefore a suggested reading order is given below:

- 1) Annex B provides details of the underlying considerations for developing the Examination Framework.
- 2) Annex C provides background statistical information which will enable the reader to determine sample sizes and confidence limits based on the defined performance requirements.
- 3) Clause 5 provides the definition of the Examination Framework for the evaluation of Charging Performance.
- 4) Clause 6 contains the toolbox of Examination Tests for the evaluation of charging performance for the identified scheme types.

- 5) Annex D contains methods which can be used to reduce the required sample sizes for metrics with high / low probabilities during the evaluation phase.
- 6) Annex E provides an example(s) of Specific Examination Frameworks which have been developed in accordance with the methodology in Clause 5.2.

S.R. CEN ISO/TS 17444-2:2013

Electronic fee collection — Charging performance — Part 2: Examination Framework

1 Scope

This part of ISO/TS 17444 defines the Examination Framework for the measurement of Charging Performance Metrics defined in ISO/TS 17444-1 to be used during Evaluation and/or on-going Monitoring.

It specifies a method for the specification and documentation of a Specific Examination Framework which can be used by the responsible entity to evaluate charging performance for a particular information exchange interface or for overall charging performance within a Toll Scheme.

It provides a toolbox of Examination Tests for the roles of Toll Charger and Toll Service Provider for the following Scheme types:

- a) DSRC Discrete;
- b) Autonomous Discrete;
- c) Autonomous Continuous.

The detailed choice of the set of examination tests to be used depends on the application and the respective context. Compliance with this specification is understood as using the definitions and prescriptions laid out in this Technical Specification whenever the respective system aspects are subjected to performance measurements, rather than using other definitions and examination methods than the ones specified in this Technical Specification.

Out of scope of this specification are the following aspects:

- This Technical Specification does not propose specific numeric performance bounds, or average or worst-case error bounds in percentage or monetary units. Those decisions are left to the Toll Charger (or to agreements between Toll Charger and Service Provider). This Technical Specification does not consider the evaluation of the expected performance of a system based on modelling and measured data from trial at another place.
- This Technical Specification does not consider the specification of a common reference system which would be required for comparison of performance between systems.
- This Technical Specification defines measurements only on standardised interfaces. Proprietary interfaces are excluded, because it is not possible to define standardised metrics on such system properties. These excluded interfaces are among others the link between Toll Charger RSE and central systems in DSRC systems, and the additional sensor input of GNSS modules (inertial sensors, CAN-bus for wheel ticks, etc.).

2 Normative references

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

ISO/TS 17444-1, *Electronic fee collection — Charging performance — Part 1: Metrics*

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