
Cestna transportna in prometna telematika - Elektronsko pobiranje pristojbin (EFC) - Zagotavljanje pravilnega delovanja opreme za elektronsko pobiranje pristojbin (EFC), nameščene za vetrobranskim steklom s kovinsko prevleko

Road transport and traffic telematics - Electronic fee collection (EFC) - Ensuring the correct function of EFC equipment installed behind metallised windshield

Straßenverkehrstelematik - Elektrische Gebührenerhebung (EFC) - Sicherstellung der korrekten Funktion bei Installation der On-board-Units hinter metallisch bedampften Windschutzscheiben

Télématique des transports - Perception électronique des péages routiers -
Fonctionnement des badges en présence de pare-brise athermiques

Ta slovenski standard je istoveten z: CEN/TR 15762:2008

ICS:

35.240.60	Uporabniške rešitve IT v transportu in trgovini	IT applications in transport and trade
43.040.15	Avtomobilska informatika. Vgrajeni računalniški sistemi	Car informatics. On board computer systems

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TECHNICAL REPORT
RAPPORT TECHNIQUE
TECHNISCHER BERICHT

CEN/TR 15762

July 2008

ICS 35.240.60

English Version

**Road transport and traffic telematics - Electronic fee collection
(EFC) - Ensuring the correct function of EFC equipment installed
behind metallised windshield**

Télématique des transports - Perception électronique des
péages routiers - Fonctionnement des badges en présence
de pare-brise athermiques

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(EFC) - Sicherstellung der korrekten Funktion bei
Installation der On-board-Units hinter metallisch
bedampften Windschutzscheiben

This Technical Report was approved by CEN on 1 June 2008. It has been drawn up by the Technical Committee CEN/TC 278.

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Foreword

This document CEN/TR 15762:2008 has been prepared by Technical Committee CEN/TC 278 “Road transport and traffic telematics”, the secretariat of which is held by NEN.

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Introduction

European car manufacturers are introducing metallised windscreens at a wide scale throughout Europe. These windscreens have interesting thermal qualities but risk to compromise the correct functioning of On-Board Units (OBUs) for Electronic Fee Collection (EFC) communicating with the roadside.

As it is essential to come to Europe-wide solutions, an ERTICO committee was created in February 1998 to work toward consensus on a common solution. Overall, 25 organisations have actively followed the work of this committee by attending the meetings and/or by contributing by (e-)mail. As a result the committee proposed the use of a non-metallised window as a Europe-wide solution. This solution consists in providing a zone in the windscreen that is free of metal coating. The ERTICO committee produced a document "Ensuring the correct functioning of EFC equipment installed behind metallised windscreens". During the 37th TC 278 meeting CEN/TC 278 adopted the resolution 037/05/2006 to publish this document as a Technical report.

1 Scope

Metallised windscreens are produced by spraying small metal particles on one of the glass or plastic layers of the vehicle's windscreen. This leads to a windscreen with high thermal qualities, ranging from far-reduced power consumption by air-conditioning equipment to short times for de-icing.

The production of certain vehicles in Europe which were equipped with metallised windscreens has created a major problem for the installation and operation of On-Board Units (OBUs) which rely on Dedicated Short-Range Communications (DSRC) for ITS (as the most widely deployed DSRC ITS application to date, the remainder of this report will refer to Electronic Toll Collection (ETC) but the developed solutions will be valid for all DSRC ITS applications). As is shown in Table 1, windscreen properties have a decisive influence on the transmission of microwave communication and, for metallised windows, it is essential to compensate these losses by special measures (Ref 1).

Table 1 — Transmission losses of safety glass at a frequency of 5.8 GHz (Ref 1)

Glass type	Single-pass transmission losses
glass 3..5 mm	2 .. 4 dB
laminated safety glass 5 mm	2 .. 5 dB
laminated safety glass with heating wire	5 .. 7 dB
laminated safety glass metal-coated 40/11	20 .. 40 dB

As cars equipped with metallised windows are being shipped in large numbers since July 1997, this problem needs to be addressed.

It is important to note that the solution proposed is valid for passenger cars and not for vehicles with near-vertical windscreens such as trucks and buses.

2 Constraints

2.1 General

There are three types of constraints that need to be considered when investigating possible solutions for EFC OBU problems created by metallised windscreens:

- constraints imposed by regulations affecting vehicle design and installation of equipment;
- constraints imposed by European Standards related to EFC;
- constraints imposed by the current market situation.

2.2 Regulations affecting vehicle design and installation of equipment

2.2.1 Introduction

A number of regulations that need to be observed by the design of the windscreen affect the location of the OBU within the vehicle. Important in this respect are the so-called A-zone and B-zone of the windscreen, two safety-critical sub-divisions of the windscreen in which transmission of light and optical distortion are subject to constraints.

Below, the main regulations affecting the installation of EFC tags are summarised.

2.2.2 Windscreen

- ECE-R43 (and all amendments): uniform regulations for the approval of safety glass and glazing materials. <https://standards.iteh.ai/catalog/standards/sist/35bc446e-e304-43e5-876f-6a53f9847d2e/sist-tp-cen-tr-15762-2009>
- EU 92/22 (and all amendments): safety glass and materials for windscreens used in motor vehicles and motor vehicle trailers.
- EU 77/649 (and all amendments): motor vehicle driver's field of view.
- EU 78/317 (and all amendments): defroster and demister systems.

2.2.3 Rear-view mirrors

EU 71/127 to EU 88/321, as well as ECE-R46 (and all amendments) are regulations that apply to the design of rear-view mirrors as well as for mounting them inside the vehicle.

2.2.4 Interior impact safety

- EU 74/60 (and all amendments): interior fittings.
- ECE-R21 (and all amendments): interior fittings.

CEN/TR 15762:2008 (E)**2.2.5 Conclusions**

According to the requirements of the EU-directives with regard to the driver's field of view, no obstruction is allowed in the 180° forward view except for that caused by:

- A-pillars;
- stationary windows or vent windows;
- side windows;
- reveal mouldings;
- rear-view mirror;
- windscreen wipers.

The following are accepted as not obstructing the driver's field of view:

- radio antenna leads of defined thickness;
- heated wire of defined thickness.

Though there are currently no specific regulations covering the installation of OBUs behind windscreens, the two regulations in 2.2.4 also deal with allowable curvatures for OBUs in order to guarantee impact safety for driver and passengers.

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2.3 European Standards related to EFC

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2.3.1 Introduction

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The general requirement for an Electronic Fee Collection System (EFC) is for operators to collect automatically, reliably and accurately fees from the road user for every chargeable event. The user may elect to use an EFC system (optional), or may be required (mandated) to use such system. In either case, the user is required to be reliably and accurately charged once, and once only, for the transaction at the appropriate fee level and any identification and/or value held in the On-Board Equipment (OBE) should be adequately protected.

2.3.2 List of relevant CEN/TC 278 standards

These standards have been prepared by CEN/TC 278 to date:

- EN 12253, Road transport and traffic telematics - Dedicated short-range communication - Physical layer using microwave at 5,8 GHz
- EN 12795 Road transport and traffic telematics - Dedicated Short Range Communication (DSRC) - DSRC data link layer: medium access and logical link control
- EN 12834 Road transport and traffic telematics - Dedicated Short Range Communication (DSRC) - DSRC application layer
- EN 13372 Road Transport and Traffic Telematics (RTTT) - Dedicated short-range communication - Profiles for RTTT applications

- 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 14907-2 Road transport and traffic telematics - Electronic fee collection - Test procedures for user and fixed equipment - Part 2: Conformance test for the onboard unit application interface (ISO/TS 14907-2:2006)
- EN 15509 Road transport and traffic telematics - Electronic fee collection - Interoperability application profile for DSRC

3 Non-metallised window

3.1 General

To ensure the transmission of microwave communication for EFC, the solution consists in providing a zone in the windscreen that is free of metal coating. This metal-free zone is likely to be created in the manufacturing process, either by using a mask when spraying the metal particles on the windscreen or by laser-treatment during the manufacturing process, rather than post-treatment of metallised windscreens by lasers as tests have shown that this laser treatment becomes ineffective (after 1 year).

3.2 Non-metallised window parameters

3.2.1 General

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- lateral position of non-metallised window (OBU): this concerns the horizontal or longitudinal position of the non-metallised window (OBU) on the windscreen.
[SIST-TP CEN/TR 15762:2009](https://standards.iteh.ai/catalog/standards/sist/35bc446e-e304-43e5-876f-0c39447d2c30/EN-15509-2009)
- (maximum) tolerance for lateral position of the non-metallised window: in some cases, vehicle manufacturers may have to move the non-metallised window to the left or to the right of the agreed lateral position, for instance, when the agreed (minimum) space to be provided behind the non-metallised window (see below) cannot be provided at the exact lateral centre on a certain model.
<https://standards.iteh.ai/catalog/standards/sist/35bc446e-e304-43e5-876f-0c39447d2c30/EN-15509-2009>
- (minimum) size of the non-metallised window: This concerns the width and height of the non-metallised window. As these dimensions should allow successful communication with the roadside, these values are influenced by the horizontal (width) and vertical (height) angles in which the OBU communicates with the roadside. They are also influenced by the distance between the OBU (antenna patches) and the windscreen as well as by the inclination of the windscreen.
- (minimum) distance between the furthest edge of the window and vehicle body: This parameter ensures that there will be a minimum distance between the (antenna patches of) the OBU and the edge of the (metal) vehicle body, to keep electromagnetic interference at an acceptable level.
- (minimum) space provided behind the non-metallised window: Placement of the OBU within the vehicle at the agreed position may be impossible if the total volume occupied by the OBU (including distance between antenna patches and windscreen) is too big. This can be the case, for instance, if it is the intention of the car manufacturer to place the OBU (partially) behind the rear-view mirror. This parameter guarantees a minimum space in which OBUs can be placed.

3.2.2 Values

Values for each of these parameters: