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Intelligent transport systems — Extracting trip data using nomadic and mobile devices for estimating CO_2 emissions — Part 1: Fuel consumption determination for fleet management

Systèmes de transport intelligents — Extraction des données de voyage via des dispositifs nomades et mobiles pour l'estimation des émissions de CO_2 —

Partie 1: Détermination de la consommation de carburant pour la gestion de la flotte

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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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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

A list of all parts in the ISO 23795 series can be found on the ISO website.

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

This document has been established to define the monitoring of energy consumption based on measured speed profiles from a vehicle in motion compared to a virtual vehicle driving with defined speed reference cycles.

The service uses in-vehicle nomadic and mobile devices and a client server architecture where the dynamic speed profile per second is evaluated with fixed vehicle configuration parameters inside the server. With the near real-time communication between the nomadic device (ND) and the server, the results of the calculation can also be made visible to the driver during the trip for eco-drive purposes.

The application allows NDs to become a measurement tool for quantifying the energy contributions and inertia forces of a moving vehicle in units of [%] relative to the virtual vehicle moving along the reference cycles.

This document can be used by fleet operators, logistic service providers, public transport operators and eco-drive trainers to develop applications which allow the measurement (in units of [%]) of the energy consumption in litres of gasoline or diesel equivalent (in joules or kWh), relative to the energy consumption of a given standard vehicle.

The methodology also optimizes carbon emission calculations using standard energy consumption without being calibrated to the real trip behaviour of a moving vehicle. This solution has been successfully implemented in the public-private partnership research and development (R&D) projects listed in Table 1:

Table 1 — List of public-private partnership R&D projects

Name	Full name	Duration
LCMM	Low Carbon Mobility Management co-funded by the: Federal Ministry for Economic Cooperation and Development https://energypedia.info/wiki/Emission_Data_Monitoring_Technology	2010 - 2014
AEOLIX	Architecture for European Logistics Information eXchange https://aeolix.eu/	09/2016 – 08/2019
CO-GISTICS	Deploying Cooperative Logistics https://cogistics.eu/	01/2014 – 05/2016
ESA	European-wide mobility, safety and efficiency management for logistics enterprises https://business.esa.int/projects/eu-wide-mobility-safety-efficiency-management-logistics	12/2013 – 01/2017

Intelligent transport systems — Extracting trip data using nomadic and mobile devices for estimating $C0_2$ emissions —

Part 1: Fuel consumption determination for fleet management

1 Scope

This document specifies a method for the determination of fuel consumption and resulting CO_2 emissions to enable fleet managers to reduce fuel costs and greenhouse gas (GHG) emissions in a sustainable manner. The fuel consumption determination is achieved by extracting trip data and speed profiles from the global navigation satellite system (GNSS) receiver of a nomadic device (ND), by sending it via mobile communication to a database server and by calculating the deviation of the mechanical energy contributions of:

a) aerodynamics,

b) rolling friction,

c) acceleration/braking,

d) slope resistance and

e) standstill,

relative to a given reference driving cycle in [%]. As the mechanical energy consumption of the reference cycle is known by measurement with a set of static vehicle configuration parameters, the methodology enables drivers, fleet managers or logistics service providers to calculate and analyse fuel consumption and CO_2 emissions per trip by simply collecting trip data with a GNSS receiver included in an ND inside a moving vehicle. In addition to the on-trip and post-trip monitoring of energy consumption (fuel, CO_2), the solution also provides information about eco-friendly driving behaviour and road conditions for better *ex-ante* and *ex-post* trip planning. Therefore, the solution also allows floating cars to evaluate the impact of specific traffic management actions taken by public authorities with the objective of achieving GHG reductions within a given road network.

The ND is not aware of the characteristics of the vehicle. The connection between dynamic data collected by the ND and the static vehicle configuration parameters is out of scope of this document. This connection is implementation-dependent for a software or application using the described methodology which includes static vehicle parameters and dynamic speed profiles per second from the ND.

Considerations of privacy and data protection of the data collected by a ND are not within the scope of this document, which only describes the methodology based on such data. However, software and application developers using the methodology need to carefully consider those issues. Nowadays, most countries and companies are required to be compliant with strict and transparent local regulations on privacy and to have the corresponding approval boards and certification regulations in force before bringing new products to the market.

2 Normative references

There are no normative references in this document.