TECHNICAL SPECIFICATION

ISO/TS 14033

First edition
2012-03-15

Environmental management — Quantitative environmental information — Guidelines and examples

Management environnemental — Information environnementale quantitative — Lignes directrices et exemples

Reference number
ISO/TS 14033:2012(E)

Documents
Document Sharing Hub

© ISO 2012

Full document details: ISO_TS 14033_2012

COPYRIGHT PROTECTED DOCUMENT

© ISO 2012

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

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
Web www.iso.org

Published in Switzerland

© ISO 2012 – All rights reserved

Documents
Document Sharing Hub

Full document details: ISO_TS 14033_2012

Contents

Page

Foreword iv
Introduction v
1 Scope 1
2 Normative references 1
3 Terms and definitions 1
4 Use of quantitative environmental information 2
4.1 General 2
4.2 Internal use of quantitative environmental information 3
4.3 External use of quantitative environmental information 3
4.4 Using quantitative environmental information for comparisons 3
5 Principles for generating and providing quantitative environmental information 4
5.1 General 4
5.2 Relevance 4
5.3 Credibility 4
5.4 Consistency 4
5.5 Comparability 4
5.6 Transparency 4
5.7 Completeness 5
5.8 Accuracy 5
5.9 Appropriateness 5
6 Guidelines 5
6.1 General 5
6.2 Plan 6
6.2.1 Conceptualize whole system 6
6.2.2 Breakdown system components 7
6.2.3 Select parameters 7
6.2.4 Define basic data 8
6.2.5 Identify measuring methods 8
6.2.6 Primary and secondary data sources 8
6.3 Do 9
6.3.1 Set up measuring methods 9
6.3.2 Acquire basic data 9
6.3.3 Consolidate parameters 9
6.3.4 Synthesize system components 10
6.3.5 Aggregate whole system 10
6.4 Check 10
6.5 Act 10
Annex A (informative) Supplementary guidelines, examples and case studies 11
Bibliography 37

© ISO 2012 – All rights reserved

Documents
Document Sharing Hub
Full document details: ISO_TS 14033_2012

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 14033 was prepared by Technical Committee ISO/TC 207, *Environmental management*, Subcommittee SC 4, *Environmental performance evaluation*.

© ISO 2012 – All rights reserved
Documents
Document Sharing Hub
Full document details: ISO_TS 14033_2012

Introduction

This Technical Specification provides guidelines for the acquisition and provision of quantitative environmental information to support the use of the International Standards on environmental management produced by ISO/TC 207. The purpose of this Technical Specification is to help break down the complexity of environmental data handling into manageable and understandable elements, in order to assist the process of gathering and processing quantitative environmental information. This Technical Specification is intended for use by people who work with environmental reporting, e.g. engineers and technical staff.

The structure of this Technical Specification and of the guidelines adheres to the general principle of continual improvement and therefore follows an iterative approach. The guidelines are structured in a Plan, Do, Check, Act (PDCA) cycle, (see Figure 1). In this Technical Specification, PDCA is intended to implement and improve the handling of quantitative environmental information.

This Technical Specification addresses the general issues of data quality by providing clear guidelines on how to acquire and provide quantitative environmental information in a structured way. Data quality is an intended and implicit result from the guidelines provided by this Technical Specification, but it is not specifically addressed throughout the text.

The guidelines range from planning, defining and acquiring quantitative data, to performing mathematical processing. They can be used to review the work that results in environmental quantitative information for an application as part of a method or tool, such as life cycle assessment or environmental performance indicators. The guidelines do not include specific methods or tools, but they address how to acquire and provide quantitative data for such applications.

The guidelines are developed with an understanding that many applications of quantitative environmental information are intended for different types of assessments within organizations. The quality of the results of such assessments greatly depends on the underlying quantitative information. Any type of intended application and related assessment is dependent on first identifying the expectations linked to the results generated using the quantitative environmental information, before establishing statistical and numerical design criteria to be used for data collection.

The guidelines are also developed with the understanding that many applications of environmental information are intended for quantitative comparisons, such as levelling and benchmarking, controlling continual improvement (comparing with the previous year), quantitative identification of priority areas, numerical appraisal and comparison of risks, decisions about design, investment or procurement. This Technical Specification supports quantitative comparisons by highlighting aspects of the planning of the acquisition and provision that are particularly relevant to achieving comparable quantitative results.

This Technical Specification provides guidelines for acquiring and providing a broad variety of quantitative environmental information and data. When an organization applies this Technical Specification for various purposes within its environmental management system, or for specific tools, purposes or applications, maximum benefit is gained by following the principles described in Clause 5.

© ISO 2012 – All rights reserved

Documents
Document Sharing Hub
Full document details: ISO_TS 14033_2012

Documents
Document Sharing Hub

Full document details: ISO_TS 14033_2012

Environmental management — Quantitative environmental information — Guidelines and examples

1 Scope

This Technical Specification supports the application of standards and reports on environmental management. It provides guidelines on how to acquire quantitative environmental information and data and implement methodology. It gives guidelines to organizations on general principles, policy, strategy and activities necessary to obtain quantitative environmental information for internal and/or external purposes. Such purposes can be, for example, to establish inventory routines and support decision making related to environmental policies and strategies, aimed in particular at comparing quantitative environmental information. The information is related to organizations, activities, facilities, technologies or products.

This Technical Specification addresses issues related to defining, collecting, processing, interpreting and presenting quantitative environmental information. It provides guidelines on how to establish accuracy, verifiability and reliability for the intended use. It utilizes proven and well-established approaches for the preparation of information adapted to the specific needs of environmental management. It is applicable to all organizations, regardless of their size, type, location, structure, activities, products, level of development and whether or not they have an environmental management system in place.

This Technical Specification supplements the contents of other International Standards on environmental management.

NOTE Annex A provides illustrative guidelines, examples of how to apply the guidelines and case studies with examples.

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.

ISO 14050, *Environmental management — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14050 and the following apply.

3.1
activity data
quantitative measure of an activity that results in an environmental impact

3.2
basic data
data acquired from a data acquisition process

NOTE Basic data consist of one or several values and units, depending on the nature of the item that the basic data represent. Some basic data can be dimensionless and have no units, e.g. an index or ratio.

© ISO 2012 – All rights reserved

Documents
Document Sharing Hub
Full document details: ISO_TS 14033_2012

3.3
data quality
characteristics of data that relate to their ability to satisfy stated requirements

[ISO 14044:2006, definition 3.19]

3.4
data source
origin of information

EXAMPLES Literature; databases; human resources; instruments.

3.5
physical object
identifiable entity in the real world which is described by basic data

EXAMPLES An existing production plant; an output of an emission, effluent or deposit; a potential eco-system.

3.6
system
group or groups of independent and interrelated objects or processes

3.7
transparency
open, comprehensive and understandable presentation of information

[ISO 14044:2006, definition 3.7]

3.8
quantitative data
numerical data item which includes its unit

3.9
quantitative information
quantitative data which has been processed or analysed to be meaningful for a specific purpose or objective

NOTE Quantitative data can originate from primary or secondary data sources. See 6.2.6 for examples of primary and secondary data.

4 Use of quantitative environmental information

4.1 General

Quantitative environmental information is used for environmental measurements, calculations, assessments, comparisons, reporting and communication. This Technical Specification supports any such use or application of quantitative environmental information throughout International Standards on environmental management. Examples are environmental performance indicators, environmental communication, environmental declarations, life cycle assessment, greenhouse gas emission reporting, carbon footprint, water footprint, eco-efficiency, reporting to authorities, sustainability reporting and social responsibility reporting.

The role of an application in relation to this Technical Specification is shown in Figure 1. The requirement of an application is the basis for the specifications for how data and information is acquired and provided. The application also specifies the intended use and the requirements or expectations concerning credibility, accuracy and transparency. This Technical Specification gives specific guidelines when the application implies a comparison between quantitative environmental information about different products, processes or systems.

© ISO 2012 – All rights reserved
Documents
Document Sharing Hub
Full document details: ISO_TS 14033_2012

4.2 Internal use of quantitative environmental information

This Technical Specification gives guidelines for the acquisition and provision of quantitative environmental information for internal applications. Typical applications are as follows:

— monitoring of environmental performance indicators; acquisition and provision routines for the repeated information handling tasks required for documentation and support the continual improvement of the environmental management system;

— environmental risk assessment; quantified environmental information about identified risk factors and possible impacts as intended or accidental;

— life cycle assessment studies of products and services (LCA); data acquisition procedures for acquisition and provision of life cycle inventory (LCI) data for internal use are required;

— material flow cost accounting (MFCA); quantitative information on material and energy flows on the process level of an organization to be acquired and provided in order to improve resource efficiency of production systems;

— business intelligence; quantitative methods and routines for the assessment of environmental performance and requirements for the general market need to be specified.

Ideally, the routines for acquisition and provision of the different applications are based on one general set of guidelines to ensure consistency between different applications and also to ensure the maximum usability of the acquired and provided information.

4.3 External use of quantitative environmental information

This Technical Specification also gives guidelines for the acquisition and provision of quantitative environmental information for external applications, such as the following:

— greenhouse gas (GHG) trading scheme and GHG emission reporting;

— corporate environmental and sustainability reporting;

— governmental reporting;

— external communication, such as eco-labelling, environmental product declarations and other public life cycle assessments, by providing guidelines on how to specify requirements on transparency, accuracy and other aspects that are important when communicating results of complex studies externally;

— environmental performance reporting, such as setting the quantitative specifications for the reporting of the eco-efficiency of products and services of a company.

Any external application that uses quantified environmental information demands consistent, reliable and transparent acquisition and provision routines. These are based on one general set of guidelines to ensure credibility and reproducibility of such data. Information that is acquired and provided following one general set of guidelines can be more easily used by different external applications, thus reducing or avoiding parallel data acquisition.

4.4 Using quantitative environmental information for comparisons

This Technical Specification gives specific guidelines when the quantitative environmental information is intended for comparisons, such as the following:

— comparing carbon dioxide emissions from different production plants;

— comparing eco-efficiency of different products;

© ISO 2012 – All rights reserved

Documents
Document Sharing Hub
Full document details: ISO_TS 14033_2012

— comparing life cycle impact assessment of different functional units;

— comparing electricity consumption by different production units.

When acquiring and providing data intended for comparison, it is important to consider not only the application at hand, but also that any decisions are generalizable and repeatable when acquiring the same or similar data for the other system(s) for comparison.

One of the objectives of quantitative data may be to carry out comparative studies, such as the following:

a) comparison of a system at two or more different time intervals;

b) comparison of the effect of changes in systems, areas and product lines;

c) comparison of different organizational and operational boundaries internally or externally.

5 Principles for generating and providing quantitative environmental information

5.1 General

These principles are fundamental for ensuring that quantitative environmental information provides a true and fair account and is used as guidelines for decisions relating to this Technical Specification.

5.2 Relevance

Ensure that selected data sources, system boundaries, measurement methods and assessment methods meet the requirements of the interested parties and/or the application.

NOTE These requirements can vary for different interested parties and different applications.

5.3 Credibility

Provide quantitative environmental information that is truthful, accurate and not misleading to interested parties.

5.4 Consistency

Develop compatible, coherent and not self-contradictory quantitative environmental data and information using recognized and reproducible methods and indicators, which respect related integrity constraints.

5.5 Comparability

Ensure that the quantitative environmental information is generated, selected and provided in a consistent way, with consistent measurement units, thereby allowing for comparisons.

EXAMPLES Comparison of environmental performance of an organization over time; comparison of environmental performance of different organizations.

5.6 Transparency

Make the processes, procedures, methods, data sources and assumptions for providing and generating quantitative information available to all interested parties.

NOTE This is in order to ensure a proper interpretation of the results and to give explicit reasons for any extrapolations, simplifications or modelling performed, taking into account confidentiality of information, if required. In addition, any volatility or uncertainty is disclosed.

© ISO 2012 – All rights reserved
Documents
Document Sharing Hub
Full document details: ISO_TS 14033_2012

5.7 Completeness

Reflect all significant quantitative environmental information for the intended use, in such a way that no other relevant information needs to be added.

5.8 Accuracy

Minimize uncertainties as far as practicable and eliminate tendencies towards a particular perspective or bias.

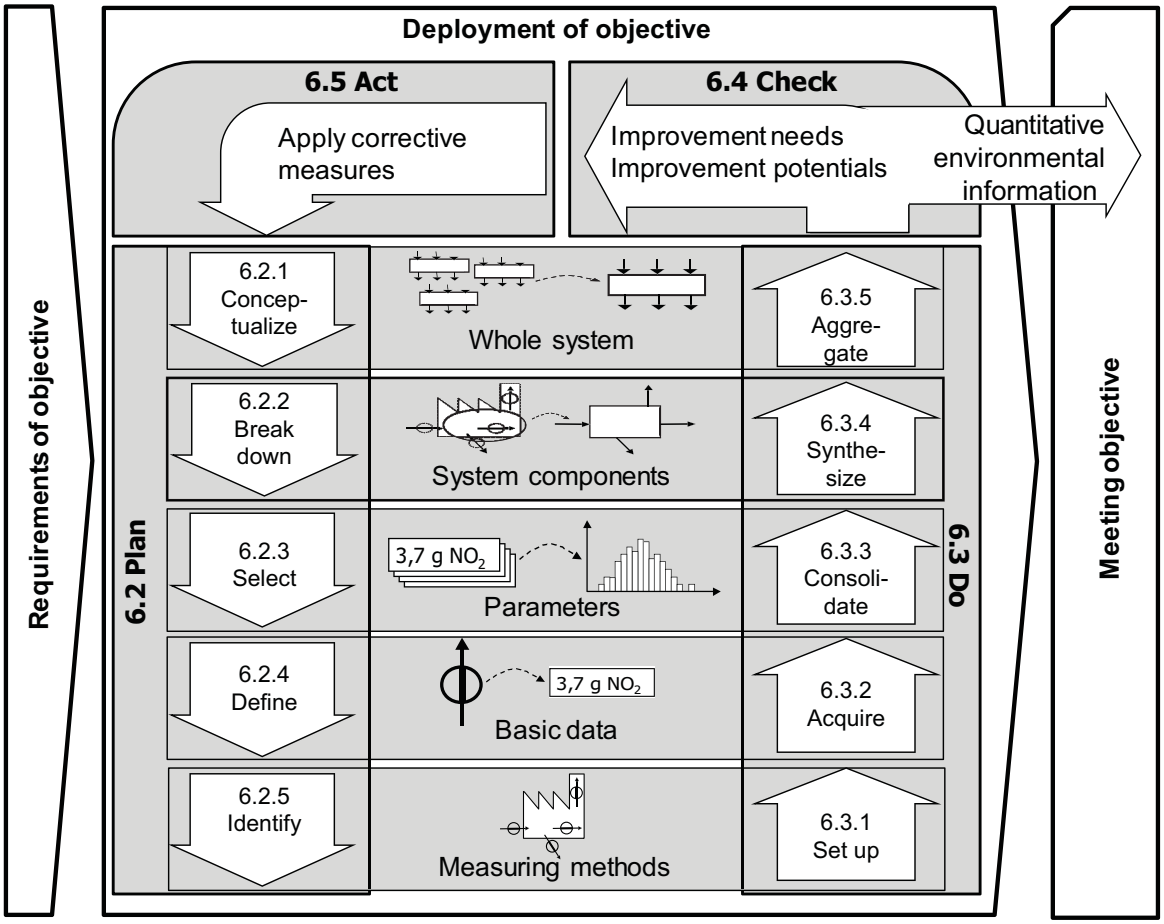
5.9 Appropriateness

Make quantitative environmental information relevant and fully understandable to interested parties, by using formats, language and media that meet their expectations and needs.

6 Guidelines

6.1 General

The guidelines in this Technical Specification are based on the methodology known as Plan-Do-Check-Act (PDCA), as illustrated in Figure 1.



NOTE The numbers in the figure refer to clauses and subclauses in this Technical Specification.

Figure 1 — Guidelines for acquiring and providing quantitative environmental information in accordance with the Plan-Do-Check-Act methodology

© ISO 2012 – All rights reserved

Documents
Document Sharing Hub
Full document details: ISO_TS 14033_2012

The emphasis of the guidelines lies in tasks which belong to Plan and Do. Each task of Plan corresponds to a task in Do. This covers the handling of specific issues down through the planning and data acquisition, up to the provision of the quantitative environmental information.

Although the process may appear straightforward, data aggregation for the whole system may require iterative steps in planning and doing, such as defining basic data requirements, modifying measurement systems, and use of additional data analysis tools. Even if not always expressed explicitly, the handling of secondary or other external data is covered by the guidelines.

The guidelines, as described in Figure 1, support a process view. The guidelines distinguish the three consecutive phases:

— requirements of objectives,

— deployment of objectives, and

— meeting objectives.

The focus of the guidelines is on the middle phase, the deployment of objectives. In this phase, the quantitative environmental information is prepared and delivered according to the requirements of the objective. The aim of the process of the guidelines is to meet the objectives by consecutively planning the acquisition of information and data and consecutively acquire, compile and provide the quantitative environmental information. The objectives are met by following the internal Plan-Do-Check-Act process of this phase, if necessary in the form of a continual improvement.

In practice, the guidelines may be approached from three viewpoints, as follows:

a) top down, as detailed guidelines for specifying quantitative environmental information for one or several defined applications, where it gives guidelines towards stepwise increase of specification (see 6.2, Plan);

b) bottom up, as stepwise guidelines for how to compile basic data into quantitative environmental information intended for given applications (see 6.3, Do);

c) from the viewpoint of guidelines about what and how to check and review quantitative environmental information (see 6.4, Check).

The guidelines relate to the application of quantitative environmental information. The application sets the requirements and defines the intended use of the information. The guidelines do not include the application.

In 6.2 to 6.5, the guidelines are presented top down, starting with Plan. Supplementary guidelines and examples of applying the guidelines are given in Annex A.

6.2 Plan

6.2.1 Conceptualize whole system

Conceptualizing the whole system involves understanding the basis for the collection of the quantitative environmental information. This includes the following:

— the objective of the information and intended use;

— the object on which information is to be provided;

— system boundaries;

— interested parties and target audience;

— requirements for the general quality of the information.

© ISO 2012 – All rights reserved
Documents
Document Sharing Hub
Full document details: ISO_TS 14033_2012

EXAMPLE For a public sustainability report, the yearly energy use for all heat treatment units is compiled, from gate to gate. The yearly energy use can be given both in terms of total energy use, in megajoules, and types of energy purchased. The energy use data in the sustainability report are also used to follow up performance tracking. The yearly energy use can be calculated by aggregating all heat treatment units. The publication format requires an average to be calculated for the heat treatment unit.

6.2.2 Breakdown system components

Breaking down into system components means dividing the object (described in 6.2.1) into manageable components. This can be done iteratively in order to reach a level where parameters can be selected.

The breaking down into system components can be performed on the basis of different aspects, for example:

— activities, functions and processes performed by the system,

— operational, technological, temporal, geographical or other features of the system,

— organizational, economic or responsibility structures and boundaries of the system,

— physical properties, for example transformation, transportation, capability to build up stocks,

— species, eco-systems, media types and internal material transportation within, into and out from the system, and

— indicators, aspects, inputs, outputs and stocks of the system.

When performing system breakdown for a comparison application, it is essential that the individual system components are functionally comparable with the system components of any of the systems intended for comparisons.

EXAMPLE Identifying each specific heat treatment unit and clarifying their respective system boundaries.

6.2.3 Select parameters

Selection of parameters means identifying quantifiable entities of a system component that represent quantified data. The parameters chosen are those needed to perform calculations and aggregations.

Different types of parameters can be chosen from system characteristics, e.g.:

— technical: activity data, production data, geographical data, energy data and emission data;

— ecological: biodiversity data, habitat data, nutrient data and biological data;

— socio-economic: demographic data, health data, development status data and economic data;

— other factors.

When selecting parameters for a comparison application, it is essential that the environmental significance of the individual parameters is comparable with the environmental significance of the parameters of any of the systems intended for comparisons.

EXAMPLE From an analysis of the economic bookkeeping, it is concluded that the major energy purchases are electricity and natural gas for all heat treatment units. Therefore, a decision is made to acquire data for the two parameters: electricity and natural gas.

© ISO 2012 – All rights reserved

Documents
Document Sharing Hub
Full document details: ISO_TS 14033_2012

6.2.4 Define basic data

Defining basic data means describing the data needed to quantify each parameter selected as described in 6.2.3. This includes the following:

— which basic data are needed to obtain the quantitative value for the parameter;

— how the basic data are transformed into quantitative value for the parameter;

— the scale of precision and statistical representativeness.

Basic data are defined in order to fulfil the quantity and quality requirements of the objectives of the intended information. This also includes the selection of the appropriate statistical or numerical guidelines for subsequent analysis and synthesis into useful data.

Basic data differ depending on which object, which property and which scale of precision is intended. When defining basic data for a comparison application, it is essential that any comparable basic data are equally defined for any of the systems intended for comparisons.

EXAMPLE The basic data needed is electricity consumption data. Electricity consumption data from different time periods will be combined into a consumption value of the whole year. Due to high fluctuations in electricity consumption, the highest possible sampling frequency needs to be used.

6.2.5 Identify measuring methods

Identifying measuring methods involves describing how to acquire the basic data with the required scale of precision and statistical representativeness, as described in 6.2.4.

The measurement method depends on the object from which data are acquired, on the property data about which they are acquired, and on the required scale of precision of the basic data. The measurement method should be suitable regarding the definition of the basic data. Methods may be selected based on available standards, literature and/or expert advice.

When identifying measurement methods for a comparison application, it is essential that these measurement methods provide comparable results for the systems intended for comparisons.

Part of the definition of the measuring method is the data quality assurance associated with the measuring method, e.g. establishing baselines, calibration or validation of equipment or measuring system and verification of data collected.

EXAMPLE Identifying the measuring points where the electric meters need to be installed at each heat treatment unit. The meters can be equipped with a logging function connected to a database for the log-file.

6.2.6 Primary and secondary data sources

A collection of data specifically for the task at hand is referred to as a primary data source. Data collected for another task, but which is useful for the task at hand, is referred to as a secondary data source.

Primary data source may for example be acquired by optically reading of meters and diagrams, collecting electricity and raw material bills, collecting laboratory samples/performing laboratory analysis or by producing/running calculation models. Secondary data source may be collected by acquiring literature and databases or by consulting experts.

For secondary data, the key question is to choose those which are sufficiently representative for the intended use. For secondary data sources, there can be an assessment of the credibility of the data source, the relevance of the data and the sufficiency of the data for the purpose.

EXAMPLE 1 An example of choice of secondary data sources is fuel consumption that can be derived from literature providing data about technical estimations of fuel consumption at different effect levels for that type of technology.

Documents
Document Sharing Hub

© ISO 2012 – All rights reserved

Full document details: ISO_TS 14033_2012