TECHNICAL SPECIFICATION

ISO/TS 15143-3

Second edition
2020-01

Earth-moving machinery and mobile road construction machinery — Worksite data exchange —

Part 3: Telematics data

Engins de terrassement et machines mobiles de construction de routes — Échange de données sur le chantier —

Partie 3: Données télématiques

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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.

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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.

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This document was prepared by Technical ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 3, *Machine characteristics, electrical and electronic systems, operation and maintenance*.

This second edition cancels and replaces the first edition (ISO/TS 15143-3:2016), which has been technically revised.

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The main changes compared to the previous edition are as follows:

— addition of Annex E (normative) that specifies process for adding new data elements to ISO/TS 15143-3;

— editorial improvement of the text.

This document is intended to be used in conjunction with ISO 15143-1 and ISO 15143-2.

A list of all parts in the ISO 15143 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.

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Introduction

This document is a data schema for data transmitted directly from the equipment manufacturer or provider to the equipment owner in a standardized format for the use and convenience of equipment owners with mixed fleets of equipment.

It defines a set of web services that provide information about fleets of mobile equipment and their associated telematics data. The information about a fleet is provided as a resource, typically on the Internet, at a known Uniform Resource Location (URL).

Customer application can access these resources by sending HTTPS GET requests to the server at the given location. The server responds with an equipment information document whose vocabulary is defined in this document.

ISO/TC 127/SC 3 wishes to acknowledge the Association of Equipment Manufacturers and the Association of Equipment Management Professionals for their contributions to prior work on this subject.

The goal of this document is to provide direct access by end users to their specific fleet data, and not to enable third parties for data aggregation across end users or other purposes. The use of this document enables each end user or assigned customer application developer to develop applications for purposes deemed appropriate by the end user.

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Earth-moving machinery and mobile road construction machinery — Worksite data exchange —

Part 3: Telematics data

1 Scope

This document specifies the communication schema designed to provide mobile machinery status data from a telematics provider's server to customer applications via the Internet. The data is collected from a mobile machine using telematics data-logging equipment and stored on a telematics provider's server. This document describes the communications records used to request data from the server and the responses from the server containing specified data elements to be used in the analysis of machine performance and machine management status related with operation and/or maintenance.

It is applicable to self-propelled earth-moving machinery as defined in ISO 6165 and mobile road construction machinery as defined in ISO 22242 equipped with location and time instrumentation.

It is not applicable to the on-board data collection, on-board communication protocol (e.g. CANbus) or wireless transmission of the mobile machinery data to the telematics provider's server after the data have been collected at the data logger. See Figure 1.

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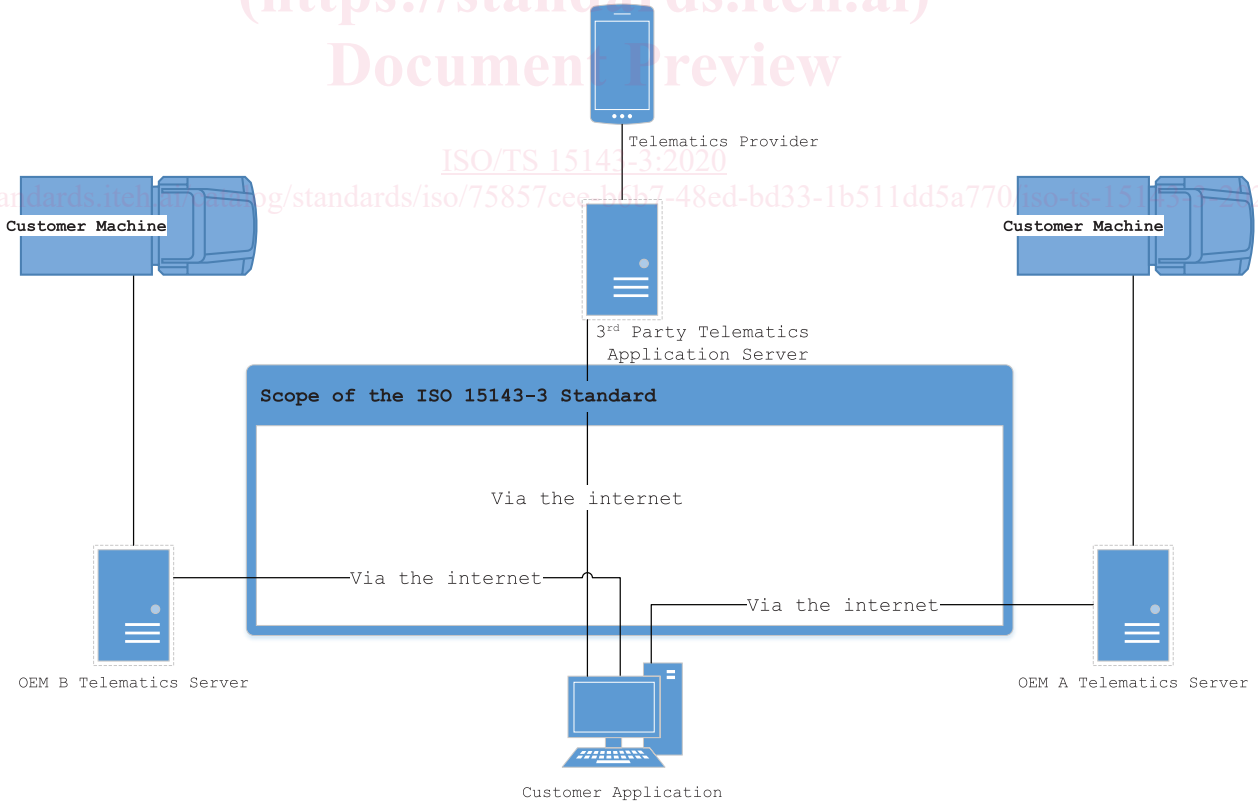

Figure 1 — Topography of conceptual mixed fleet telematics system within the scope of this document

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2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 3779, *Road vehicles — Vehicle identification number (VIN) — Content and structure*

ISO 6405-1, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 6405-2, *Earth-moving machinery — Symbols for operator controls and other displays — Part 2: Symbols for specific machines, equipment and accessories*

ISO 7000, *Graphical symbols for use on equipment — Registered symbols*

ISO 8601 (all parts), *Date and time — Representations for information interchange*

ISO 10261, *Earth-moving machinery — Product identification numbering system*

ISO 15143-2:2010, *Earth-moving machinery and mobile road construction machinery — Worksite data exchange — Part 2: Data dictionary*

IEC 60417, *Graphical symbols for use on equipment*

ECMA-404, *The JSON Data Interchange Format*

IETFRFC 7231, *Hypertext Transfer Protocol (HTTP/1.1): Semantics and Context*

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3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
caution codes referencing number
ISO/IEC symbol registration number as defined in ISO 7000 and referenced in ISO 6405-1 and ISO 6405-2.

Note 1 to entry: Caution codes referencing numbers are returned from the *telematics provider* (3.1.18) server and refer to standardized symbols representing various conditions present on EMM and mobile road construction machinery.

3.1.2
construction worksite
location of the operation of a fleet of mobile equipment generally identified as construction machines, where the machines are used to perform work

3.1.3
customer application
end user (3.1.7) or assigned third-party developer application

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3.1.4
data element
instance of data transmitted by the OEM server to the *customer application* (3.1.3) adhering to the definition of the quantity or condition described by Clause 11 of this document

3.1.5
discoverability
requirement that the data be stored in such a manner that it can be accessed if necessary

3.1.6
endpoint
address or connection point to the provider's server for a specific API method

Note 1 to entry: Endpoints are associated by a URL.

3.1.7
end user
organization owning or operating the mobile machinery or both

Note 1 to entry: The end user utilizes the telematics data for the purpose of managing the tasks associated with work performed on a *construction worksite* (3.1.2).

3.1.8
fault code
set of codes unique to each OEM related to diagnostic trouble codes as defined in SAE J1939-73

Note 1 to entry: Fault codes are defined by the OEM and might not be standardized. The *customer application* (3.1.3) developer needs to obtain fault code definitions from each OEM.

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3.1.9
Internet media-type
two-part identifier for file formats on the Internet

3.1.10
link
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element to allow the *customer application* (3.1.3) to be directed to additional data or resources

3.1.11
make code
alphabetic string representing the OEM of a specific piece of equipment

3.1.12
model
alphanumeric string representing the machine form type and series as defined by the OEM

3.1.13
namespace
set of symbols that are used to organize objects of various kinds, so that these objects may be referred to by name

3.1.14
namespace URL
uniquely named elements and attributes in an XML document

Note 1 to entry: *Namespaces* (3.1.13) are defined in a W3C recommendation. An XML instance might contain element or attribute names from more than one XML vocabulary.

3.1.15
request
HTTP request to retrieve a complete information set

Note 1 to entry: "Request" can be of one or more HTTP request(s)."

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Note 2 to entry: “Request” can be for one or multiple pages.

Note 3 to entry: Fleet snapshot request is a request to retrieve all (or subset) pages for the fleet.

Note 4 to entry: Equipment snapshot request is a request to retrieve all equipment snapshot data.

Note 5 to entry: *Time series* (3.1.19) request is a request to retrieve all details (or subset) of a piece of equipment.

3.1.16
serial number
alphanumeric string defined by the OEM identifying a specific piece of equipment

Note 1 to entry: The serial number is generally the PIN as defined in ISO 10261.

3.1.17
snapshot time
date and time at which the snapshot of the fleet was created

3.1.18
telematics provider
OEM or third party providing telematics equipment or services

3.1.19
time series
sequence of data points, typically consisting of successive measurements made over a period of time

Note 1 to entry: Examples of a time series would be the geospatial position of a piece of equipment or the set of *fault codes* (3.1.8) generated by a piece of equipment over a period of time.

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3.1.20
version
integer that is used to distinguish different editions of the contract

3.1.21
XML declaration
processing instruction that identifies the document as being XML

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Note 1 to entry: All XML documents should begin with an XML declaration, which should be situated at the first position of the first line in the XML.

3.1.22
resource owner
equipment/fleet owner or end-user

3.2 Abbreviated terms

For the purposes of this document, the abbreviated terms given in Table 1 apply.

Table 1 — Abbreviated terms

API	application programming interface
DEF	diesel exhaust fluid
EI	electronic interface
EMM	earth-moving machinery
FMI	failure mode indicator
GPS	global positioning system
HREF	hypermedia reference URL
ID	identification
IETF	Internet engineering task force

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Table 1 *(continued)*

MA	maintenance agency
OEM	original equipment manufacturer
PIN	product identification number
REL	reference attribute
SI	*systeme internationale* (international system of units)
SOAP	simple object access protocol
SPN	suspect parameter number
URL	universal resource location
URN	universal resource name
UTC	universal coordinated time
UTF-8	unicode transformation format, 8 bit
VIN	vehicle identification number
XML	extensible markup language

4 Data management and access control

4.1 Polling period

The recommended frequency the telematics provider will serve data to the customer application is one response per 15 min.

The server will supply the last known data to the application independent of the update rate from the machine to the server. The telematics device communication from the machine can vary due to cell coverage, telematics settings, etc., so last known data may be significantly older, and may not change between server data transmissions.

The data provider may cache telematics data or rate limit responses in order to provide the highest quality of service possible.

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4.2 Editing the data elements over time

The data set identified in this document is expected to be modified over time in a controlled fashion as set forth in ISO 15143-1:2010, A.2 with updated .XSD files to be posted at http://www.jcmanet.or.jp/english2017/ISO/15143/-3/ as they become available. Annex E process shall be followed for this purpose.

An accept header will be included with every request to negotiate the definition of data desired in the response. The accept header will correlate to a version of the ISO document. The version will be the Date String (YYYYMMDD) when the ISO document was published. See Table 2.

NOTE The text in this second edition of this document is referencing "20190501" XSD file folder and relating URLs; any updates to them are made through the MA.

If no accept header is included in a request, version 1 (20161201) will be assumed. This will be the format of the data included in the response.

Example xml accept header for version 1:
Accept: application/x.iso15143-3.v20161201+xml

Example json accept header for version 1:
Accept: application/x.iso15143-3.v20161201+json

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Table 2 — Version number date string example

Version	Data string	XSD URL
1	20161201	http://standards.iso.org/iso/15143/-3/
2	20190501	http://www.jcmanet.or.jp/english2017/ISO/15143/-3/20190501/
3	TBD When Published	http://www.jcmanet.or.jp/english2017/ISO/15143/-3/TBDWhenPublished/

4.3 Data element use case

A use case as described in ISO 15143-1 for each data element defined in this document is presented in Table A.2.

4.4 Data element cross reference

The data element names and attributes identified in this document have been harmonized with similar data elements defined in ISO 15143-2:2010, Table A.1 and further defined in ISO 15143-2:2010, Table A.2. The relationships between the data elements in this document and the related ones in ISO 15143-2 are presented in Annex A.

4.5 Access authentication

Implementers control access via OAuth 2.0 using HTTPS, as defined by the Internet engineering task force (IETF). Refer to http://www.ietf.org for additional information.

The telematics provider assigns security credential and access information when the end user registers the fleet. Each telematics provider has its own registration procedure. End users should contact the telematics provider for information on how to register for access to data via this document.

To prevent excessively frequent access, the provider may return the message “429 Too many requests” or return cached data for requests that are more frequent than allowed by the provider one per 15 min interval as expressed in 4.1.

OAuth provides customer applications a secure delegated access to server resources on behalf of a resource owner. It specifies a process for resource owners to authorize third-party access to the server resources without sharing credentials. OAuth allows access tokens to be issued to customer by an authorization server, with the approval of the resource owner, or end-user. The customer then uses the access token to access the protected resources hosted by the resource server.

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5 Response formats

This document recommends and describes the use of either of two representation formats: XML version 1.0 or JSON.

For examples in this document, XML version 1.0 is used. The recommended encoding is UTF-8. XML files are expected to be stand-alone documents. Each endpoint provides its own XML schema, with a common schema being located at http://www.jcmanet.or.jp/english2017/ISO/15143/-3/20190501/common.xsd. The file or stream that contains one XML document consists of zero or more records. Each record consists of several fields, which are detailed below. An XML document is sent without a wrapper (such as SOAP). Its Internet media-type is application/xml. XML is the preferred representation format.

JSON shall be compliant with the ECMA-404 standard representation. Naming conventions for JSON shall follow XML protocols.

If schema validation is required, use of the XML representation formats is recommended.

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