INTERNATIONAL STANDARD

ISO 15143-2

First edition
2010-08-01

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

Part 2: Data dictionary

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

Partie 2: Dictionnaire de données

Reference number
ISO 15143-2:2010(E)

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Published in Switzerland

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Foreword

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ISO 15143-2 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 3, *Machine characteristics, electrical and electronic systems, operation and maintenance*.

ISO 15143 consists of the following parts, under the general title *Earth-moving machinery and mobile road construction machinery — Worksite data exchange*:

— *Part 1: System architecture*

— *Part 2: Data dictionary*

Introduction

Electronic data exchange on the construction worksite is rapidly becoming a key technology enabling a number of advances in the construction industry. Moving from predominantly manual data collection methods to more automated data collection and communication will improve worksite quality control. Electronic data exchange will further aid in the scheduling of maintenance, the provision of supervisory functions to be conducted remotely from the worksite and the enhancement of the coordination between engineering tasks, construction management and day-to-day operations on the worksite.

The implementation of an electronic data communication system requires an *a-priori* definition and specification of the elements of data to be communicated. Specification of unique data elements for worksite communication involves the use of an application schema to diagrammatically identify the scenario in which each item of data is to be used. After the scenario has been described, data elements are assigned metadata attributes to fully define and describe the individual data element. The list of data elements with attributes are compiled in tabular form in a data dictionary, which forms the subject of this part of ISO 15143.

Generally, the purpose of data dictionaries is recognized to be the following:

a) to improve the ability to share data elements in a particular domain or among different domains;

b) to provide a base for better understanding of the semantic meaning and syntax of data elements;

c) to manage a data resource so as to maintain the correctness and consistency of the resource;

d) to provide a basis for the development of consistent databases and software that use databases.

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

Part 2: Data dictionary

1 Scope

This part of ISO 15143 specifies a data dictionary for the exchange of data in worksite data-controlled construction operations as specified in ISO 15143-1. It also applies to worksite data exchange for the purpose of services related to machine use (see ISO 15143-1:2010, Clause 4), and gives definitions of terms used in relation to the data dictionary.

For the purposes of data exchange between different systems, it includes

— identification, definition and specification of common items of data to be exchanged on typical earth-moving construction worksites,

— definition of application schema,

— metadata describing the attributes of each data element, and

— basic normative data elements with their attributes (in tabular format).

NOTE ISO 15143-1:2010, Annex A, describes the means to extend the data element table presented in Annex A of this part of ISO 15143.

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 5353:1995, *Earth-moving machinery, and tractors and machinery for agriculture and forestry — Seat index point*

ISO 15143-1:2010, *Earth-moving machinery and mobile road construction machinery — Worksite data exchange — Part 1: System architecture*

ISO 19107:2003, *Geographic information — Spatial schema*

ISO/IEC 10646, *Information technology — Universal Multiple-Octet Coded Character Set (UCS)*

ISO 16754, *Earth-moving machinery — Determination of average ground contact pressure for crawler machines*

ISO/IEC 11179-1:2004, *Information technology — Metadata registries (MDR) — Part 1: Framework*

ISO/IEC 11179-3:2003, *Information technology — Metadata registries (MDR) — Part 3: Registry metamodel and basic attributes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15143-1 and ISO/IEC 11179-1, and the following apply.

3.1 General

3.1.1
information
〈information processing〉 knowledge concerning objects, such as facts, events, things, processes, or ideas, including concepts, that within a certain context has a particular meaning

[ISO/IEC 11179-1]

3.1.2
information system
information processing system, together with associated organizational resources such as human, technical, and financial resources, that provides and distributes information

[ISO 2382-1]

3.1.3
data dictionary
database used for data that refers to the use and structure of other data; that is, a database for the storage of metadata

[ISO/IEC 11179-1]

3.1.4
metadata
data that defines and describes other data

[ISO/IEC 11179-3]

3.1.5
metadata registry
MDR
information system for registering metadata

[ISO/IEC 11179-3]

3.1.6
metamodel
data model that specifies one or more other data models

[ISO/IEC 11179-3]

3.1.7
metamodel construct
unit of notation for modelling

[ISO/IEC 11179-3]

3.1.8
designation
representation of a concept by a sign which denotes it

[ISO 1087-1]

cf. **designation** (3.2.1.2)

NOTE See also **name** (3.2.1.9).

3.2 Metadata

3.2.1 Data elements

3.2.1.1
administered item
registry item for which administrative information is recorded in an Administration Record

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Class*.

NOTE 2 ISO/IEC 11179-3:2003, 4.7.2, lists the specifying types of *administered item*.

3.2.1.2
designation
⟨administered item⟩ designation of an administered item within a context

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Class*.

NOTE 2 ISO/IEC 11179-3 also defines “designation” as defined in 3.1.8 above.

3.2.1.3
classification scheme
descriptive information for an arrangement or division of objects into groups based on characteristics which the objects have in common

[ISO/IEC 11179-3]

3.2.1.4
classification scheme item
CSI
item of content in a classification scheme

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Class*.

NOTE 2 This may be a node in a taxonomy or ontology, a term in a thesaurus, etc.

3.2.1.5
classification scheme item value
classification scheme name
instance of a classification scheme item (CSI)

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Attribute of classification scheme item*.

NOTE 2 See also Table 1, for the instance of the classification scheme item value.

3.2.1.6
data element concept
DEC
concept that can be represented in the form of a data element (DE), described independently of any particular representation

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Class*.

3.2.1.7
data element concept name
designation item of a data element concept

3.2.1.8
data element
DE
unit of data for which the definition, identification, representation and permissible values are specified by means of a set of attributes

NOTE Metamodel construct is: *Class*.

3.2.1.9
name
⟨administered item⟩ name by which an administered item is designated within a specific context

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Attribute of designation*.

NOTE 2 ISO/IEC 11179-3 also defines “name” as the designation of an object by a linguistic expression.

3.2.1.10
definition
⟨administered item⟩ definition of an administered item within a context

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Class*.

NOTE 2 ISO/IEC 11179-3 also defines “definition” as the representation of a concept by a descriptive statement which serves to differentiate it from related concepts.

3.2.1.11
definition text
definition
text of the definition

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of definition*.

3.2.1.12
definition source reference
reference to the source from which the definition is taken

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of definition*.

3.2.1.13
data element example
representative illustration of the data element

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Class*.

3.2.1.14
data element example item
actual illustrative case of the data element

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of data element example*.

3.2.1.15
data origin
reference to the physical source of the data; the instrument, individual or device that performs the measurement and originates the value of the data element

NOTE Metamodel construct is: *Attribute of source*.

3.2.1.16
origin
⟨administered item⟩ source (document, project, discipline or model) of the administered item

NOTE Metamodel construct is: *Attribute of administration record*.

3.2.1.17
data identifier
item identifier
unique identifier for an administered item within a maintenance agency

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of item identifier*.

3.2.1.18
version
version number
unique version identifier of the administered item

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of item identifier*.

3.2.1.19
administrative status
current status
designation of the status in the administrative process of a maintenance agency for handling registration requests

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Attribute of administration record*.

NOTE 2 The values and associated meanings of “administrative status” are determined by each maintenance agency.

3.2.1.20
last change date
date of last change
date the administered item was last changed

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of administration record*.

3.2.1.21
explanatory comment
comment
descriptive comments about the administered item

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of administration record*.

3.2.1.22
organization
unique framework of authority within which a person or persons act, or are designated to act, towards some purpose

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Class*.

EXAMPLE Organization incorporated under law; unincorporated organization or activity providing goods and/or services including partnerships, social or other non-profit organizations or similar bodies in which ownership or control is vested in a group of individuals, sole proprietorships and governmental bodies; groupings of the preceding types of organizations where there is a need to identify these in information interchange. [ISO/IEC 6523-1]

3.2.1.23
organization name
responsible organization
designation for the organization

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Attribute of organization*.

NOTE 2 It is the name by which the organization is known to the maintenance agency.

3.2.1.24
value domain name
text string identifying the nomenclature assigned to a specific value domain

NOTE 1 See also **value domain** (3.2.2.5)

3.2.1.25
data element derivation
relationship between a data element which is derived, the rule controlling its derivation, and the data element(s) from which it is derived

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Association class*.

3.2.1.26
derivation rule
logical, mathematical, and/or other operations specifying derivation

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Class*.

3.2.1.27
input data element for derivation
source data element(s) for a data element derivation

3.2.1.28
language section
part of a terminological entry containing information related to one language

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Class*.

3.2.1.29
language identifier
information in a terminological entry which indicates the name of a language

NOTE 1 The three-character alphabetic codes and names specified in ISO 639-2 are used, with extensions as required.

NOTE 2 Metamodel construct is: *Attribute of language identification*.

3.2.2 Value domain

3.2.2.1
representation class
classification of types of representations

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Class*.

3.2.2.2
representation class name
text string identifying the nomenclature assigned to a specific representation class

NOTE See also Table 2, for the instance of representation class name.

3.2.2.3
conceptual domain
CD
set of valid value meanings

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Class*.

NOTE 2 The value meanings may be either enumerated or expressed via a description.

3.2.2.4
conceptual domain name
set of permissible concepts

3.2.2.5
value domain
VD
set of permissible values

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Class*.

NOTE 2 The value domain provides representation, but has no implication as to the data element concept (DEC) with which the values may be associated, nor of the values' meaning.

3.2.2.6
value domain name
text string identifying the nomenclature assigned to a specific value domain

NOTE 1 Metamodel construct is: *Class.*

3.2.2.7
datatype name
data type name
designation for the datatype

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of datatype*.

3.2.2.8
datatype scheme reference
reference identifying the source of the datatype specification

[ISO/IEC 11179-3]

NOTE 1 In ISO/IEC 11179-3, the manner of reference is specified by the maintenance agency.

NOTE 2 Metamodel construct is: *Attribute of datatype*.

3.2.2.9
value domain unit of measure
unit of measure used in a value domain

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of value domain*.

3.2.2.10
unit of measure name
name of a unit of measure

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of unit of measure*.

3.2.2.11
unit of measure precision
data resolution
degree of specificity for a unit of measure

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Attribute of unit of measure*.

NOTE 2 It is expressed as a number of decimal places to be used in any associated data element values, and is used as a default if no precision is specified on the data element.

3.2.2.12
value domain maximum character quantity
data length
maximum number of characters to represent the data element value

[ISO/IEC 11179-3]

NOTE 1 Metamodel construct is: *Attribute of value domain*.

NOTE 2 Applicable only to character datatypes.

3.2.2.13
value domain format
format
template for the structure of the presentation of the value(s)

[ISO/IEC 11179-3]

EXAMPLE YYYY-MM-DD for a date.

NOTE Metamodel construct is: *Attribute of value domain*.

3.2.2.14
value
data value

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Class*.

3.2.2.15
value item
code value
representation of a value meaning in a specific value domain — the actual value

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of value*.

3.2.2.16
non-enumerated value domain
value domain that is specified by a description rather than a list of all permissible values

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Class*.

3.2.2.17
non-enumerated value domain description
data upper [lower] limit
description or specification of a rule, reference, or range for a set of all permissible values for the value domain

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of non-enumerated value domain*.

3.2.2.18
value domain administration record
administration record for a value domain

[ISO/IEC 11179-3]

NOTE Metamodel construct is: *Attribute of value domain*.

3.3 Elements (see Annex A for data element concept names and definitions)

3.3.1 Frequency, forces, pressures and related dimensions

3.3.1.1
frequency
number of cycles per second

[ISO 8811]

NOTE The frequency is expressed in hertz (Hz).

3.3.1.2
centrifugal force
product of the eccentric moment and the square of the angular rotating velocity

[ISO 8811]

NOTE The centrifugal force is expressed in newtons (N). It could be permissible to express the value, divided by 1 000, in kilonewtons (kN).

3.3.1.3
eccentric moment
product of the eccentric mass and its radius of eccentricity

[ISO 8811]

NOTE It is expressed in kilogram metres (kg·m).

3.3.1.4
dynamic linear pressure
sum of axle load force (portion of the operating mass on the corresponding drum multiplied by gravity acceleration) and the centrifugal force of the drum exerted on the ground divided by the drum's rolling width

NOTE It is expressed in newtons per centimetre (N/cm).

3.3.1.5
average ground contact pressure
〈crawler machines〉 average ground contact pressure, in kilopascals, determined in accordance with ISO 16754

3.3.1.6
theoretical surface pressure
〈pneumatic tyres〉 ratio of the machine load, with or without ballast, and the total contact area, measured on an even, hard surface

[ISO 8811]

NOTE The theoretical surface pressure is expressed in megapascals (MPa) and values can be shown in a diagram as the relation between the theoretical surface pressure and the wheel load (force), tyre inflation pressure and contact area.

3.3.1.7
compaction width
width relating to rolling width of drum(s) of a roller where the roller provides compaction forces to the material(s) beneath it

3.3.1.8
track shoe width
$W4$
distance on Y coordinate between Y planes passing through the extreme lateral points of the same track shoe

[ISO 6746-1]

3.3.1.9
track gauge
$W2$
distance on Y coordinate between two Y planes passing through the middle of the width of the sprocket teeth

[ISO 6746-1]

3.3.2 Machine masses

3.3.2.1
axle load
mass on each axle at the operating mass

[ISO 6016]

3.3.2.2
gross machinery mass
GMM
maximum machine mass as approved by the manufacturer, which combines the operating mass (OM) of the machine with the heaviest combination of equipment and attachments, the heaviest combination of optional equipment, the rated payload (PL), as specified by the manufacturer, the rated ballast mass (BM) and, when applicable, full sprinkler water tank(s)

[ISO 6016]

3.3.2.3
operating mass
OM
mass of the base machine, with equipment and empty attachments in the most usual configuration as specified by the manufacturer, and with the operator (75 kg), a full fuel tank and all fluid systems (i.e. hydraulic oil, transmission oil, engine oil, engine coolant) at the levels specified by the manufacturer and, when applicable, with sprinkler water tank(s) half-full

NOTE 1 The mass of an operator is not included for non-riding machines.

NOTE 2 Ballast mass included at delivery can be included if specified by the manufacturer.

[ISO 6016]

3.3.2.4
rated payload
PL
paymass
mass that can be carried by the machine, as specified by the manufacturer

[ISO 6016]

3.3.2.5
shipping mass
SM
mass of the base machine without an operator, and with fuel level at 10 % of tank capacity or with the minimum fuel level needed for machine shipping purposes as specified by the manufacturer, whichever is higher, all fluid systems at the levels specified by the manufacturer, and with empty sprinkler tank(s), if required, and with or without equipment, ballast, attachment, cab, canopy, operator-protective structures, wheels and counterweights as stated by the manufacturer

NOTE If the machine has to be disassembled for shipping purposes, the masses of these dismounted components should be stated by the manufacturer.

3.3.3 Machine dimensions

For the specific dimensions for each machine family, see ISO 6747, ISO 7131, ISO 7132, ISO 7133, ISO 7134, ISO 7135, ISO 8811, ISO 8812 and ISO 13539.

3.3.3.1
Ackermann steering angle
$A2$
angle in Z plane described by the front or rear axle of the machine when the wheels are pivoting from the straight-ahead position to the maximum left or right position

[ISO 6746-1]

3.3.3.2
angle of approach
$A3$
angle in Y plane between the GRP and a plane tangent to the forward tyres or tracks and passing through the lowest point of any structure of the base machine forward of the tyres or tracks, which limits the magnitude of the angle

[ISO 6746-1]

3.3.3.3
angle of departure
$A4$
angle in Y plane between the GRP and a plane tangent to the rear tyres or tracks and passing through the lowest point of any structure of the base machine behind the tyres or tracks, which limits the magnitude of the angle

[ISO 6746-1]

3.3.3.4
articulation angle
$A1$
angle in Z plane described by the front portion of a machine when pivoting from the straight-ahead position to the maximum left or right position

[ISO 6746-1]

3.3.3.5
blade height
distance on Z coordinate between GRP and the top of the blade (excluding name plate and spill guard) with the blade on the ground in mid-pitch position (where applicable) with no blade tilt or angle

[ISO 6746-2]

3.3.3.6
clearance radius
$R2$
distance in Z plane between the turning centre and the farthest point of the machine while it is executing its smallest practicable turn

NOTE For machines with independent steering, $R2$ will be measured from the machine centreline.

[ISO 6746-1]

3.3.3.7
crawler base
$L2$
distance on X coordinate between two X planes passing through the front idler axis and the sprocket (or rear idler) axis

[ISO 6746-1]

3.3.3.8
ground clearance
$H4$
distance on Z coordinate between the GRP and the central part of the machine, minus dimension $H5$

NOTE The central part of the machine is defined as 25 % of the track gauge ($W2$) or tread (wheel type, $W3$) to either side of the zero Y plane.

[ISO 6746-1]

3.3.3.9
ground reference plane
GRP
plane on which the machine is placed for measurements: in the case of the base machine, a hard, level surface; in the case of equipment and attachments, either a hard, level surface or compacted earth

NOTE The surface used depends on the intended use of the machine and its equipment and attachments. This needs to be defined when developing specific ISO terminology standards or commercial specifications.

[ISO 6746-1]

3.3.3.10
grouser height
$H5$
distance on Z coordinate between two Z planes passing through the face of the shoe and the tip of the grouser

NOTE For a triangular section shoe, it is the distance between two Z planes passing through the track link bolting surface and the tip of the grouser.

[ISO 6746-1]

3.3.3.11
maximum height
$H1$
distance on Z coordinate between the GRP and the highest point of the machine with cab or operator protective structures (e.g. ROPS), including track grousers resting on a hard surface with no penetration

[ISO 6746-1]

3.3.3.12
maximum length
$L1$
distance on X coordinate between two X planes passing through the farthest points on the front and rear of the machine

[ISO 6746-1]

3.3.3.13
maximum width
$W1$
distance on Y coordinate between two Y planes passing through the farthest points of the machine on both sides of the zero Y plane

[ISO 6746-1]

3.3.3.14
rear axle to pivot of articulated steering
$L5$
distance on X coordinate between two X planes passing through the rear axle and pivot centre

[ISO 6746-1]

3.3.3.15
rear overhang
$L4$
⟨crawler machines⟩ distance on X coordinate between two X planes passing through the sprocket or rear idler axis and the rear mounting surface of the machine

[ISO 6746-1]

3.3.3.16
rear overhang
$L4$
⟨wheeled machines⟩ distance on X coordinate between two X planes passing through the rear wheel centre and the rearmost feature

[ISO 6746-1]

3.3.3.17
seat index point
SIP

point on the central vertical plane of the seat as determined by the device shown in ISO 5353:1995, Figure 1, when installed in the seat as specified in ISO 5353:1995, 5.3

3.3.3.18
three-dimensional reference system
system used to determine dimensions of earth-moving machines

[ISO 6746-1]

3.3.3.19
tread
$W3$
⟨wheel type⟩ distance on Y coordinate between two Y planes passing through the tyre centreline

NOTE 1 In the case of dual wheels, it is the distance between two Y planes passing through the centreline of the dual wheels.

NOTE 2 If the machine has more than one tread (wheel track) dimension, each is specified.

[ISO 6746-1]

3.3.3.20
turning radius
$R1$
distance in Z plane between the turning centre and the track or tyre centreline describing the largest circle, while the machine is executing its smallest practicable turn

NOTE For machines with independent steering, $R1$ will be measured from the machine centreline.

[ISO 6746-1]

3.3.3.21
wheel base
$L3$
distance on X coordinate between two X planes passing through the centres of the front wheels and the rear wheels with machine and wheels in the straight-ahead position

NOTE For machines equipped with rear tandem, the centre of the rear wheels is the line midway between the two axles of the tandem.

[ISO 6746-1]

4 Data dictionary

4.1 General

The data dictionary defines the meanings and attributes of each data element. For its function in worksite data exchange, see ISO 15143-1.

4.2 Composition of data dictionary

The data dictionary is a composition of data elements that define data exchanged between worksite information systems (machines, etc.). It is composed of two tables: the data element table and the value domain table. The former lists elements that are classified according to generalized schema for worksite data exchange, while the latter lists value domains that are classified according to representation class and specifies the description format of data elements. See Figure 1.

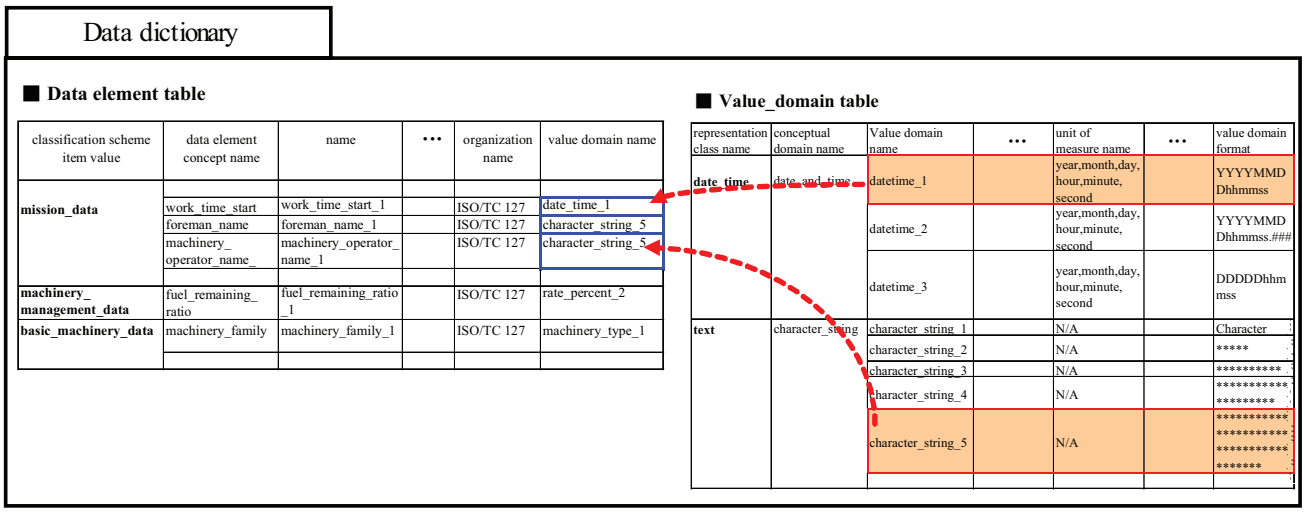


Figure 1 — Components of the data dictionary — Conceptual illustration

NOTE 1 Each data attribute of each data element is specified according to metadata specified in 4.3.

NOTE 2 To share a value domain among various data elements, items for the value domain are placed in an independent value domain table.

NOTE 3 The data dictionary specified in this part of ISO 15143 is the metadata registry of worksite exchanged data.

4.3 Metadata

4.3.1 General

Metadata specifies each data attribute of each data element.

NOTE 1 Metadata is descriptive information about an object or resource whether it be physical or electronic.

NOTE 2 See Annex B for metadata composition.

4.3.2 Data element metadata

Table 1 shows metadata of the data dictionary. Based on these metadata, data elements are treated consistently throughout the data exchange process.

Table 1 — Metadata of data element

Metadata of data element	Allowed occurrences
Classification scheme item value	Zero or one per classification scheme item
Data element concept name	One per data element
Name	One per designation
Definition text	One for each context in which the metadata item is used
Data element example item	One or more per data element example
Definition source reference	Zero or one per definition
Data identifier	One per item identifier
Version	One per item identifier
Administrative status	One per administration record
Last change date	Zero or one per administration record
Explanatory comment	Zero or one per administration record
Organization name	One per organization
Value domain name	Zero or one per data element
Input data element for derivation	One or more per derivation rule
Derivation rule	Zero or one per derivation rule
Language identifier	One per language identification

4.3.3 Metadata of value domain table

Table 2 shows metadata of the value domain. Based on these metadata, value domain attributes are treated consistently.

Table 2 — Metadata of value domain

Metadata of value domain	Allowed occurrences
Representation class name	Zero or one per data element
Conceptual domain (CD) name	One per value domain
Value domain name	Zero or one per data element
Datatype name	Zero or one per data element. Required if neither value domain name nor value domain identifier is specified.
Datatype scheme reference	Zero or one per datatype name
Unit of measure precision	Zero or one per unit of measure
Value domain maximum character quantity	Zero or one per value domain
Value domain format	Zero or one per value domain
Value item	One per enumerated value domain
Non-enumerated value domain description	One per non-enumerated value domain

4.4 Classification of the data dictionary

4.4.1 Classification for data element

Table 3 shows classification scheme item values of data elements

Table 3 — List of classification scheme item values

Classification scheme item value	Description
Basic project data	This class is of the basic data of the construction project. It includes construction name, period of construction, execution place, etc.
Design data	This class shows design information for the construction project which was prepared at pre-construction stage. For example, design information includes technical specification, drawings, and necessary design documents.
Construction planning data	This class represents construction plan data which is prepared at construction stage. For example, construction plan includes shape control data, quality control data, progress control data, material information data, arrangement plan data for materials and construction machinery. This class contains accumulated “mission data”.
Machine management data	This class represents the data for planning machine use, maintenance and monitoring machine condition. It contains “basic machine data” and “machine running record (health)”.
Machine running record	This class includes the accumulated data for the maintenance of the machine.
Machine running state	This class includes real-time data for the operation of the machine at the worksite. Additionally, it provides for the transfer of the data group to “machine running record”.
Basic machine data	This class includes the fundamental attribute information describing a particular machine at the worksite. For example, it contains ability, distinction number, classification, etc.
Mission data	This class includes short-term planning data establishing an incremental goal for a machine. This data is used for a unit of work. A unit of work means a sequence of work for a construction machine. For example, these data describe the work area, type of construction machinery, operator information, working process, and type of work. This class is contained in “construction planning data”. It contains accumulated “target data”.
Target data	This class represents data describing the shape and the quality of a given object shown by the directions.
As-built data	This class represents data describing the shape and the quality resulting from carrying out the work in accordance with the directions for the work. The “as-built data” format is to be compared directly with the “target data”.
Construction checking data	This class includes the difference between the “as-built data” and the “mission data”.
Achieved work data	This class represents all data showing the results and progress of the work which has been executed in response to “Mission data”. It is composed of “as-built data”, “machine working record” and “measurement record”.
Machine working record	This class represents the data which shows the process of machine working and the work quantity of a machine. This class includes the working state of the construction machines.
Machine working state	This class is the data group that shows the real-time working state of each construction machine at the worksite. It also consists of the content of “Machine working record”
Measurement record	This class represents the data which shows the transition of the state of the execution object and environment, acquired from the measuring equipment at the worksite. It contains “measurement data” in part. This data is used for quality control and shape management.
Measurement data	This class is the data group which includes the real-time state of the execution object and environment, acquired from the measuring equipment at the worksite. It consists of the content of “measurement record”.
Machine control data	This class includes the data for supervising the machine or supporting machine operation during the work. For example, it includes the service reporting when a machine deviates from the prescribed execution route. The machine may detect the deviation automatically and signal the operator with an alarm. It is created by comparing “machine working state” and “measurement data” with “target data”.

4.4.2 Classification for value domain

The value domain table specifies the classification scheme according to the concept of the *representation class* specified in ISO 11179-3. See Table 4.

Table 4 — List of representation class names

Representation class name	Description
Code	System of valid symbols that substitute for longer values
Name	Designation for an object
Group	Designation for a set of data elements that have relationships to each other
Text	Unformatted descriptive field
Date_and_time	Calendar date and time of day
Quantity	Non-monetary numeric value not arrived at by counting
Rate	Quantity or amount considered in relation to another quantity or amount
Measure	Record of the dimensions, capacity/amount (non-monetary) of an object
Count	Non-monetary numeric value arrived at by counting
Picture	Visual representation of a person, object, or scene
Graphic	Diagrams, graphs, mathematical curves, or the like
Icon	Sign or representation that stands for its object by virtue of a resemblance or analogy to it
Amount	Monetary quantity

4.5 Description method of data dictionary contents

4.5.1 General

The character code used to describe the data dictionary and its contents shall be in accordance with ISO/IEC 10646.

Within the tables of the data dictionary, data for classification or identification purposes shall be described according to 4.5.2.

4.5.2 Description of data dictionary contents

The description of data element attributes corresponding to designations and classifications relating to metadata shall be according to the following rules for avoiding difficulty in identification, searching and maintenance. The relating metadata are “classification scheme item value”, “data element concept name”, “name”, “representation class name”, “conceptual domain name” and “value domain name”.

The data dictionary presented in Annex A is specified according to these rules; the same applies to possible future additions/extensions.

a) **Rules for clear understanding**

1) Words shall be generally understood within their application fields (earth-work using earth-moving machinery or similar).

2) In case a synonym or synonyms exist, the policy for their selective use shall be clearly provided.

3) Long sentences should be avoided.

b) **Rules for simple description**

1) The description should start from a general concept, then move to more detail.

2) Nouns should be in the singular form and verbs should be in the present tense.

3) Descriptions should use lower case letters, and an underscore ("_") shall be used to connect words so as to avoid blanks.

4) Descriptions shall be unique to each other throughout the data dictionary.

NOTE The above is according to ISO/IEC 11179-5.

5 Application schema for worksite data exchange

The application schema is a class diagram which statically shows the mutual relations of data elements in data provided for data exchange purposes between specific domains or a specific supplier and user.

— The application schema is developed for a specific purpose.

— The application schema is specifically introduced from, or can be generalized into, a "generalized schema".

— The application schema can be developed by extending a class of "generalized schema" as a sub-class.

Figure 2 definitively shows the mutual relations between the application schema, the ISO 15143-1 generalized schema, the ISO 15143-2 data dictionary and the worksite data dictionary as described in ISO 15143-1.

The site information system application schema and data dictionary are extensions of generalized schema and the ISO 15143 data dictionary; the generalized schema and data dictionary are those generalized from the site information system application schema and data dictionary.

The site information system application schema and the data dictionary shall not redefine data elements already defined in ISO 15143.

An application schema may partially use classes within generalized schema and may not be composed of those classes of generalized schema as a whole.

An application schema shall be developed for specific data exchange using the data dictionary.

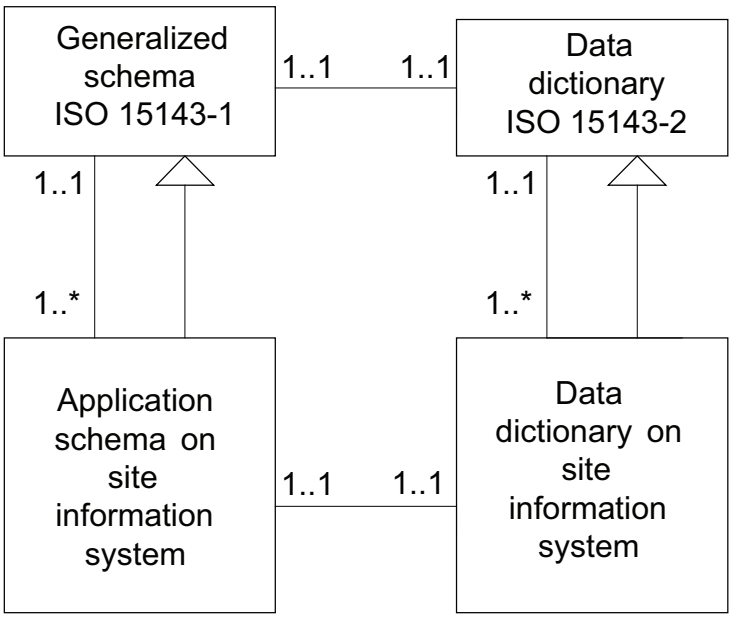


Figure 2 — Mutual relations between schemas and data dictionaries

Annex A
(normative)

Basic data dictionary tables

See Tables A.1 and A.2.

Table A.1 — Basic data dictionary table — Data elements

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
basic_ project_ data	project_ name	project_name_1	project name of the contract	The project for construcution of National highway No.1	—	contract document	—	1	proposed	2010-07-15	—	ISO/TC 127	character_ string_5	NA	NA	EN
basic_ project_ data	contractor_ name	contractor_name_1	name of person or organization that undertakes construction work in accordance with a contract	National Road Construction Co., Ltd.	—	contract document	—	1	proposed	2010-07-15	—	ISO/TC 127	character_ string_5	NA	NA	EN
basic_ project_ data	project_ beginning_ date	project_beginning_ date_1	beginning date of the project	2001-01-01	—	contract document	—	1	proposed	2010-07-15	—	ISO/TC 127	date_1	NA	NA	EN
basic_ project_ data	project_ completion_ date	project_ completion_date_1	completion date of the project	2001-01-01	—	contract document	—	1	proposed	2010-07-15	—	ISO/TC 127	date_1	NA	NA	EN
basic_ project_ data	station_ beginning	station_ beginning_1	beginning of station as construction area boundary	STA000+ 00,000	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	road_ station_2	NA	NA	EN
basic_ project_ data	station_end	station_end_1	end of station as construction area boundary	STA999+ 99,999	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	road_ station_2	NA	NA	EN
basic_ project_ data	coordinate_ system	reference_ coordinate_ system_ horizontal_1	horizontal coordinate system that is related to the real world by a datum	1	ISO 19111	—	—	1	proposed	2010-07-15	—	ISO/TC 127	coordinate_ code_ horizontal_1	NA	NA	EN
basic_ project_ data	coordinate_ system	reference_ coordinate_ system_vertical_1	vertical coordinate system that is related to the real world by a datum	1	ISO 19111	—	—	1	proposed	2010-07-15	—	ISO/TC 127	coordinate_ code_ vertical_1	NA	NA	EN
design_data	worksite_ name	worksite_name_1	unique name of operation range for each worksite	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	character_ string_3	NA	NA	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
design_data	worksite_ boundary	worksite_ boundary_1	range of worksite which organizes the range of construction by the machine	+354124 +1394536 +00006/, +454124 +1394536 +00006/, +454124 +1494536 +00006/, +354124 +1494536 +00006/	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	surface_ designation _1	NA	NA	EN
construction _planning_ data	fill_material_ id	fill_material_id_1	unique number or symbol for each worksite fill material, distinguished by soil material characteristic, etc.	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	material_ id_1	NA	NA	EN
construction _planning _data	fill_material_ name	fill_material_ name_1	unique name for each worksite fill material, distinguished by soil material characteristic, etc.	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	character_ string_4	NA	NA	EN
construction _planning _data	fill_material_ characteristic	fill_material_ characteristic_1	type and characteristic of fill material	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	character_ string_6	NA	NA	EN
construction _planning _data	planning_ quantity_fill_ material	planning_quantity_ fill_material_1	fill material planned quantity for spreading	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	volume_2	NA	NA	EN
construction _planning_ data	destination_ address_fill_ material	destination_ address_fill_ material_1	destination address for fill material, where the address indicates a spreading site	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	point_1	NA	NA	EN
construction _planning_ data	target_ quantity_ fill_material	target_quantity_ fill_material_1	target quantity of fill material	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	volume_2	NA	NA	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
construction_planning_data	pit_point_fill_material	pit_point_fill_material_1	borrow pit point for fill material	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	point_1	NA	NA	EN
mission_data	work_time_start	work_time_start_1	date and time of work starting provided for the machine; starting time of operation allocated to the machine	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	datetime_1	NA	NA	EN
mission_data	work_time_end	work_time_end_1	date and time of work finished provided for the machine; ending time of operation allocated to the machine	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	datetime_1	NA	NA	EN
mission_data	foreman_name	foreman_name_1	name of the person employed by a contractor to be in charge of site labour	—	ISO 6707-2	—	—	1	proposed	2010-07-15	—	ISO/TC 127	character_string_5	NA	NA	EN
mission_data	machine_operator_name	machine_operator_name_1	name of machine operator	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	character_string_5	NA	NA	EN
mission_data	work_area_name	work_area_name_1	unique name of operation range where the range corresponds to a mission	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	character_string_3	NA	NA	EN
mission_data	work_area_id	work_area_id_1	unique number or code for the range of operation space	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	character_string_4	NA	NA	EN
mission_data	work_area_boundary	work_area_boundary_1	range of operation/space which organizes the range of construction by the machine	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	surface_designation_1	NA	NA	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
mission_ data	work_point	work_point_1	point which describes range of operation space	—	—	—	—	1	proposed	2010-07-15	Latitude sexagesimal converts to latitude degrees by the following formula: seconds /60 = minutes, decimal minutes/ 60 = decimal degrees	ISO/TC 127	point_2	NA	NA	EN
machine_ management _data	fuel_ remaining_ ratio	fuel_remaining_ ratio_1	ratio of volume of fuel remaining in construction machine to volume full	—	—	fuel level indicator	—	1	proposed	2010-07-15	—	ISO/TC 127	rate_ percent_2	NA	NA	EN
basic_ machine_ data	machine_ family	machine_family_1	group of machines designed for the same type of operation	compactor	ISO 6165	—	—	1	proposed	2010-07-15	—	ISO/TC 127	machine_ type_1	NA	NA	EN
basic_ machine_ data	machine_ name	machine_name_1	unique machine name classified by its operation purpose	vibrating roller	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	character_ string_2	NA	NA	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
basic_ machine_ data	product_ identification _number _PIN	product_ identification_ number_PIN_1	unique set of 17 alphanumeric characters assigned to a complete machine by the manufacturer for identification purposes	—	ISO 10261	—	—	1	proposed	2010-07-15	First field three alpha-numeric characters of the PIN show world manufacture code (WMC) information to identify manufacturer	ISO/TC 127	product_ identification _number_1	NA	NA	EN
basic_ machine_ data	machine_ manufacturer	machine_ manufacturer_1	name of machine manufacturer	ABCD Construction Machinery	JCMAS G 007	—	—	1	proposed	2010-07-15	—	JCMA	character_ string_1	NA	NA	EN
basic_ machine_ data	machine_ serial_ number	machine_serial_ number	serial number of this machine	—	JCMAS G 007	—	—	1	proposed	2010-07-15	—	JCMA	character_ string1	NA	NA	EN
basic_ machine_ data	local_ machine_id	local_machine_id_1	unique number/code for the individual machine for the specific site use	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	machine_ local_id_1	NA	NA	EN
basic_ machine_ data	cutting_ edge_ width	cutting_edge_ width_1	distance on Y coordinate between two Y planes through the extreme ends of the cutting edges or end bits (being attached to the blade)	—	ISO 7134	catalogue	—	1	proposed	2010-07-15	—	ISO/TC 127	length_2	NA	NA	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
basic_ machine_ data	working_ width	working_width_1	rotor working width of a road milling machine cutting and milling system or so on similar width of a similar function device	—	ISO 15645	catalogue	—	1	proposed	2010-07-15	—	ISO/TC 195	length_2	NA	NA	EN
basic_ machine_ data	work_area_ capacity	work_area_ capacity_1	work capacity indicating rated (maximum) area, per unit time, to which the work can be done by using the machine	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	capacity_ per_hour_ area_1	NA	NA	EN
basic_ machine_ data	work_ volume_ capacity	work_volume_ capacity_1	work capacity indicating rated (maximum) volume, per unit time, at which the work can be treated by using the machine	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	capacity_ per_hour_ volume_1	NA	NA	EN
basic_ machine_ data	ground_ contact_ pressure	ground_contact_ pressure_1	average ground contact pressure as defined in ISO 16754 for crawler type machines or theoretical surface pressure as defined in ISO 8811 for rubber tyred machines	—	ISO 8811 ISO 16754	catalogue	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_3	NA	NA	EN
basic_ machine_ data	compaction_ width	compaction_ width_1	width width relating to rolling width of drum(s) of roller (or pneumatic tyres of rubber-tyred roller) where the roller provides compaction forces to the material(s) beneath it	—	ISO 8811	catalogue	—	1	proposed	2010-07-15	—	ISO/TC 127	length_2	NA	NA	EN
basic_ machine_ data	track_shoe_ width	track_shoe_ width_1	track shoe width as defined in ISO 6746-1	—	ISO 6746-1	catalogue	—	1	proposed	2010-07-15	—	ISO/TC 127	length_2	NA	NA	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
basic_ machine_ data	track_ gauge	track_gauge_1	track gauge as defined in ISO 6746-1	—	ISO 6746-1	catalogue	—	1	proposed	2010-07-15	—	ISO/TC 127	length_2	NA	NA	EN
basic_ machine_ data	centrifugal_ force	centrifugal_force_1	centrifugal force as defined in ISO 8811	—	ISO 8811	catalogue	—	1	proposed	2010-07-15	—	ISO/TC 127	force_1	NA	NA	EN
basic_ machine_ data	dynamic_ linear_press-ure	dynamic_linear_ pressure_1	dynamic linear pressure as defined in 3.3.1.4	—	ISO 8811	catalogue	—	1	proposed	2010-07-15	—	ISO/TC 127	force_2	NA	NA	EN
basic_ machine_ data	rated_ paymass	rated_paymass_1	rated paymass (payload) (PM) as defined in ISO 6016	—	ISO 6016	—	—	1	proposed	2010-07-15	—	ISO/TC 127	mass_2	NA	NA	EN
basic_ machine_ data	measure-ment _equipment _family	measurement_ equipment_ family_1	group of items of measurement equipment designed for the same type of operation	positioning instrument	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	equipment_ type_1	NA	NA	EN
basic_ machine_ data	measure-ment_ equipment_ name	measurement_ equipment_ name_1	unique machine name classified by its operation purpose	GPS	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	character_ string_4	NA	NA	EN
basic_ machine_ data	measure-ment _equipment _local_id	measurement_ equipment_ local_id_1	unique number/code for the individual measurement equipment for the specific site use	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	equipment_ local_id_1	NA	NA	EN
target_data	deformation _modulus _target	deformation_ modulus_target_1	modulus of deformation as a measure of compaction quality prepared by contractor in advance	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_3	NA	NA	EN
target_data	soil_density_ target	soil_density_ target_1	density of soil of deformation as a measure of compaction quality, prepared by contractor in advance	1,6 g/cm^3	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	density_1	NA	NA	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
target_data	material_density_target	material_density_target_1	density of material of deformation as a measure of compaction quality, prepared by contractor in advance	1,6 g/cm^3	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	density_1	NA	NA	EN
target_data	pass_number_prescript	pass_number_prescript_1	prescript number of passes as a measure of compaction quality, prepared by contractor based on test construction	5	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	count_integer_1	NA	NA	EN
target_data	cross_slope_target	cross_slope_target_1	target gradient of ground surface vertical to alignment according to shop drawings, viewing along the road centreline from the beginning to the end and vice versa	1,20 % –1,20 %	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	gradient_percent_1	NA	NA	EN
target_data	grade_target	grade_target_1	target gradient of ground surface along alignment according to shop drawings, viewing along the road centreline from the beginning to the end and vice versa	1,20 % –1,20 %	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	gradient_percent_2	NA	NA	EN
target_data	combine_gradient_target	combine_gradient_target_1	target gradient of ground surface according to shop drawings, the gradient is combined grade and cross slope	1,26 % –1,26 %	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	gradient_percent_2	grade target 1, cross slope target 1	combined gradient is computed from the following formula: $S=(i^2+j^2)^{0.5}$ combined gradient: S %; grade: j %; cross slope: i %	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
target_data	spreading_thickness_target	spreading_thickness_target_1	soil (or so on) material thickness for a spreading layer after spreading, the thickness which satisfies strength parameter and deformation parameter on the designed specification	2,0 m 40 cm	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	length_7	N/A	N/A	EN
target_data	spreading_elevation_target	spreading_elevation_target_1	ground surface altitude for a spreading layer after spreading, the altitude which satisfies strength parameter and deformation parameter on the designed specification	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	altitude_measure_decimal_1	N/A	N/A	EN
target_data	compaction_thickness_target	compaction_thickness_target_1	soil (or so on) material thickness for a compaction layer after compaction, the thickness which satisfies strength parameter and deformation parameter on the designed specification	1,6 m 32 cm	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	length_7	N/A	N/A	EN
target_data	compaction_elevation_target	compaction_elevation_target_1	ground surface altitude for a compaction layer after compaction, the altitude which satisfies strength parameter and deformation parameter on the designed specification	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	altitude_measure_decimal_1	N/A	N/A	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
target_data	compaction_quality_target	compaction_quality_target_1	target compaction count for a compaction layer, the count which satisfies strength parameter and deformation parameter on the designed specification	5	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	count_integer_2	N/A	N/A	EN
construction_checking_data	cross_slope_difference_target_and_as-built	cross_slope_difference_target_and_as-built_1	difference between target and as-built gradient of cross slope, viewing along the road centreline from the beginning to the end and vice versa	0,40 % –0,40 %	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	gradient_percent_3	N/A	N/A	EN
construction_checking_data	grade_difference_target_and_as-built	grade_difference_target_and_as-built_1	difference between target and as-built gradient of grade, viewing along the road centreline from the beginning to the end and vice versa	0,05 % –0,05 %	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	gradient_percent_4	N/A	N/A	EN
construction_checking_data	combined_gradient_difference_target_and_as-built	combined_gradient_difference_target_and_as-built_1	difference between target and as-built gradient of combined gradient	0,50 % –0,50 %	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	gradient_percent_4	N/A	N/A	EN
construction_checking_data	spreading_thickness_difference_target_and_as-built	spreading_thickness_difference_target_and_as-built_1	difference between target thickness of spreading and as-built thickness of spreading	+20,0 cm –5,0 cm	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	thickness_measure_decimal_1	N/A	N/A	EN
construction_checking_data	compaction_thickness_difference_target_and_as-built	compaction_thickness_difference_target_and_as-built_1	difference between target thickness of compaction and as-built thickness of compaction	+20,0 cm –5,0 cm	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	thickness_measure_decimal_1	N/A	N/A	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
construction_checking_data	soil_density_difference_target_and_as-built	soil_density_difference_target_and_as-built_1	difference between target quality of soil density and as-built quality of soil density	0,2 g/cm^3	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	density_1	N/A	N/A	EN
construction_checking_data	material_density_difference_target_and_as-built	material_density_difference_target_and_as-built_1	difference between target quality of material density and as-built quality of material density	0,2 g/cm^3	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	density_1	N/A	N/A	EN
construction_checking_data	deformation_modulus_difference_target_and_as-built	deformation_modulus_difference_target_and_as-built_1	difference between target quality of modulus of deformation and as-built quality of modulus of deformation	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_3	N/A	N/A	EN
construction_checking_data	pass_number_difference_between_prescript_and_as-bulit	pass_number_difference_between_prescript_and_as-bulit_1	difference of count of passes between target quantity of passes and as-built quantity of passes	2	—	—	—	1	proposed	2010-07-15	Quality control by number of path of the roller, by soil (or so on) material density or by co-efficient of elasticity	ISO/TC 127	count_integer_2	N/A	N/A	EN
construction_checking_data	judgment_result	judgment_result_1	decision on pass or fail, decided by difference or ratio between technical standard value or control standard value set in execution and surveyed value	—	—	user	—	1	proposed	2010-07-15	—	ISO/TC 127	decision_1	N/A	N/A	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
machine_control_data	distance_between_intended_area_and_machine	distance_between_intended_area_and_machine_1	distance from limit of working area to actual location of the construction machine	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	length_5	N/A	N/A	EN
as-built_data	cross_slope_as-built	cross_slope_as-built_1	as-built gradient of ground surface vertical to alignment, viewing along the road centreline from the beginning to the end and vice versa	1,20 % –1,20 %	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	gradient_percent_1	N/A	N/A	EN
as-built_data	grade_as-built	grade_as-built_1	as-built gradient of ground surface along alignment, viewing along the road centreline from the beginning to the end and vice versa	0,40 % –0,40 %	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	gradient_percent_2	N/A	N/A	EN
as-built_data	combined_gradient_as-built	combined_gradient_as-built_1	as-built gradient of ground surface; the gradient is combined grade and cross slope	1,26 % –1,26 %	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	gradient_percent_2	grade as-built 1, cross slope as-built 1	combined gradient is computed from the following formula: $S=(i^2+j^2)^{0,5}$ combined gradient: S %; grade: j %; cross slope: i %	EN
as-built_data	spreading_elevation_as-built	spreading_elevation_as-built_1	spreading elevation according to target elevation of spreading	+ –	—	sensor or meter on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	altitude_measure_decimal_1	N/A	N/A	EN
as-built_data	spreading_thickness_as-built	spreading_thickness_as-built_1	spreading thickness according to target thickness of spreading	2,0 m 40 cm	—	sensor or meter on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	length_7	N/A	N/A	EN
as-built_data	compaction_elevation_as-built	compaction_elevation_as-built_1	compacted elevation according to target elevation of compaction	+ –	—	sensor or meter on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	altitude_measure_decimal_1	N/A	N/A	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
as-built_data	compaction_thickness_as-built	compaction_thickness_as-built_1	compacted thickness according to target thickness of compaction	2,0 m 40 cm	—	sensor or meter on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	length_7	N/A	N/A	EN
as-built_data	compaction_count_as-built	compaction_count_as-built_1	filling quality as compaction count after compaction work	5	—	sensor or meter on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	count_integer_1	N/A	N/A	EN
as-built_data	compaction_soil_density_as-built	compaction_soil_density_as-built_1	filling quality as soil density after compaction work	1,5 g/cm^3	—	sensor or meter on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	density_2	N/A	N/A	EN
as-built_data	compaction_material_density_as-built	compaction_material_density_as-built_1	filling quality as material density after compaction work	1,5 g/cm^3	—	sensor or meter on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	density_2	N/A	N/A	EN
as-built_data	compaction_deformation_modulus_as-built	compaction_deformation_modulus_as-built_1	filling quality as modulus of deformation after compaction work	—	—	sensor or meter on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_3	N/A	N/A	EN
machine_working_record	work_time_total	work_time_total_1	the total amount of actual working time of the construction machine	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	time_2	N/A	N/A	EN
machine_working_record	work_time_suspension_start	work_time_suspension_start_1	time of work suspension beginning	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	datetime_1	N/A	N/A	EN
machine_working_record	work_time_suspension_end	work_time_suspension_end_1	time of work suspension closed	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	datetime_1	N/A	N/A	EN
machine_working_record	work_time_compaction	work_time_compaction_1	amount of actual working time of construction machine for compaction	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	time_2	N/A	N/A	EN
machine_working_record	work_time_spreading	work_time_spreading_1	amount of actual working time of construction machine for spreading	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	time_2	N/A	N/A	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
machine_working_state	machine_id	machine_id_1	unique identification number/code which unambiguously identifies the individual machine	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	local_machine_id_1	N/A	N/A	EN
machine_working_state	machine_name_machine_working_state	machine_name_machine_working_state_1	unique machine name which identifies individual machine	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	machine_name_1	N/A	N/A	EN
machine_working_state	date_and_time_machine_working_state	date_and_time_machine_working_state_1	date and time set in execution	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	datetime_1	N/A	N/A	EN
machine_working_state	travel_direction	travel_direction_1	state of machine moving direction by transmission shift position	—	—	sensor	—	1	proposed	2010-07-15	—	ISO/TC 127	direction_1	N/A	N/A	EN
machine_working_state	vibration_condition	vibration_condition_1	physical information on ON/OFF of vibration in a vibration roller	—	—	switch	—	1	proposed	2010-07-15	—	ISO/TC 127	condition_1	N/A	N/A	EN
machine_working_state	centrifugal_force_condition	centrifugal_force_condition_1	centrifugal force at machine working state	—	ISO 8811	—	—		proposed	2010-07-15	—	ISO/TC 127	force_1	N/A	N/A	EN
machine_working_state	machine_position_working_state	machine_position working_state_1	three-dimensional working position of construction machine to structure, the position is computed from machine measuring position and offset of machine working position	+354124 +1394536 +00006/	—	sensor	—	1	proposed	2010-07-15	Latitude sexagesimal converts to latitude degrees by the following formula: seconds /60 = minutes, decimal minutes/ 60 = decimal degrees	ISO/TC 127	point_2	N/A	N/A	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
machine_working_state	machine_position_offset_working_state	machine_position_offset_working_state_1	three-dimensional offset from the measuring point on the construction machine to the machine working position; amount of offset for computing a machine working position from machine measuring position	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	length_6	N/A	N/A	EN
machine_working_state	cutting_depth_working_state	cutting_depth_working_state_1	distance on Z coordinates between compacted earth (or so on) material and the lowest point of the cutting edge	—	—	sensor	—	1	proposed	2010-07-15	—	ISO/TC 127	length_4	N/A	N/A	EN
machine_working_state	machine_travel_speed	machine_travel_speed_1	running speed of the construction machine	—	ISO 6014	speed-ometer	—	1	proposed	2010-07-15	—	ISO/TC 127	velocity_2	N/A	N/A	EN
machine_working_state	dumper_material_quantity	dumper_material_volume_1	volume of material carried in the dumper body	—	ISO 6483	sensor	—	1	proposed	2010-07-15	—	ISO/TC 127	volume_2	N/A	N/A	EN
machine_working_state	dumper_material_quantity	dumper_material_paymass_1	mass of material carried in the dumper body	—	—	sensor	—	1	proposed	2010-07-15	—	ISO/TC 127	mass_2	N/A	N/A	EN
measurement_record	soil_density	soil_density_1	mass of soil per unit volume	—	—	sensor	—	1	proposed	2010-07-15	—	ISO/TC 127	density_2	N/A	N/A	EN
measurement_record	material_density	material_density_1	mass of material per unit volume	—	—	sensor	—	1	proposed	2010-07-15	—	ISO/TC 127	density_2	N/A	N/A	EN
measurement_record	elasticity_coefficient	elasticity_coefficient_1	soil strain per unit load, force per unit area	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_3	N/A	N/A	EN
measurement_record	move_pass	move_pass_1	number of passes means compaction count from machine passes	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	count_integer_2	N/A	N/A	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
measurement_record	compaction_surface_altitude	compaction_surface_altitude_1	ground surface altitude after compaction	—	—	sensor	—	1	proposed	2010-07-15	—	ISO/TC 127	altitude_measure_decimal_1	N/A	N/A	EN
measurement_data	measurement_date_and_time	measurement_date_and_time_1	measurement date and time of measurement equipment	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	datetime_1	N/A	N/A	EN
measurement_data	measurement_equipment_id	measurement_equipment_id_1	unique identification of measurement equipment for each worksite	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	machine_local_id_1	N/A	N/A	EN
measurement_data	measurement_equipment_association_construction_machine_id	measurement_equipment_association_construction_machine_id_1	unique identification of intended construction machine of measurement equipment for each worksite	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	machine_local_id_1	N/A	N/A	EN
measurement_data	measurement_equipment_association_construction_machine_name	measurement_equipment_association_construction_machine_name_1	name of intended construction machine of measurement equipment for each worksite	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	machine_name_1	N/A	N/A	EN
measurement_data	machine_measuring_position	machine_measuring_position_1	three-dimensional position of measuring position of construction machine NOTE This is the position used for computing machine working position and machine running position with each offset.	+354124 +1394536 +00006/	—	sensor	—	1	proposed	2010-07-15	Latitude sexagesimal converts to latitude degrees by the following formula: seconds /60 = minutes, decimal minutes/ 60 = decimal degrees	ISO/TC 127	point_2	N/A	N/A	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
measurement_data	response_acceleration_spectrum	response_acceleration_spectrum_1	response acceleration spectrum is numerical treated acceleration NOTE The spectrum related with ground stiffness.	—	—	sensor	—	1	proposed	2010-07-15	—	ISO/TC 127	acceleration_1	N/A	N/A	EN
measurement_data	machine_vibration_system_frequency	machine_vibration_system_frequency_1	frequency, as defined in ISO 8811, of the machine vibration system	—	ISO 8811	sensor	—	1	proposed	2010-07-15	—	ISO/TC 127	frequency_1	N/A	N/A	EN
machine_running_state	machine_running_date_and_time	machine_running_date_and_time_1	date and time for attendant on machine running state	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	datetime_1	N/A	N/A	EN
machine_running_state	running_time_of_construction_machine	running_time_of_construction_machine_1	running time of construction machine	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	time_2	N/A	N/A	EN
machine_running_state	operating_hours	operating_hours_1	total amount of time an engine-powered machine has been in use	—	—	Hour meter or similar	—	1	proposed	2010-07-15	—	ISO/TC 127	time_3	N/A	N/A	EN
machine_running_state	engine_condition	engine_condition_1	information of engine running condition (on/off)	0:Start / not 0:Stop	JCMAS G 007	—	—	1	proposed	2010-07-15	—	ISO/TC 127	condition_2	N/A	N/A	EN
machine_running_state	machine_running_position	machine_running_state _1	three-dimensional running position of construction machine for machine management NOTE The position is computed from machine measuring position and offset of machine running position.	+354124 +1394536 +00007/	—	sensor	—	1	proposed	2010-07-15	Latitude sexagesimal converts to latitude degrees by the following formula: seconds /60 = minutes, decimal minutes/ 60 = decimal degrees	ISO/TC 127	point_2	N/A	N/A	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
machine_ running_ state	machine_ running_ state_ offset	machine_running_ state_offset_1	three-dimensional offset from the measuring point on the construction machine to the machine running position computing a machine running position from the machine measuring position	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	length_4_ offset_1	N/A	N/A	EN
machine_ running_ state	remaining_ fuel	remaining_fuel_1	remaining fuel volume of construction machine	—	—	fuel level indicator	—	1	proposed	2010-07-15	—	ISO/TC 127	volume_3	N/A	N/A	EN
machine_ running_ state	operation_ count	number_of_ hydraulic_function_ operation(s)_1	accumulated number of actuations of a given hydraulic function	—	—	timed history of hydraulic function flag(s)	—	1	proposed	2010-07-15	—	ISO/TC 127	count_ integer_3	N/A	N/A	EN
machine_ running_ state	operation_ count	number_of_brake/ decel_actuations_1	accumulated number of actuations of the brake/decel pedal	—	—	timed history of brake/ decal flags	—	1	proposed	2010-07-15	—	ISO/TC 127	count_ integer_3	N/A	N/A	EN
machine_ running_ state	gear_shift_ count	gear_shift_count_ low_RPM_1	accumulated number of gear shifts at idle	—	—	trans- mission control unit	—	1	proposed	2010-07-15	—	ISO/TC 127	count_ integer_3	N/A	N/A	EN
machine_ running_ state	gear_shift_ count	gear_shift_count_ high_RPM_1	accumulated number of gear shifts at high RPM	—	—	trans- mission control unit	—	1	proposed	2010-07-15	—	ISO/TC 127	count_ integer_3	N/A	N/A	EN
machine_ running_ state	transmission _status	gear_of_ operation_1	forward or reverse gear selected by the operator	—	—	trans- mission control unit	—	1	proposed	2010-07-15	—	ISO/TC 127	gear_ number	N/A	N/A	EN
machine_ running_ state	differential_ status	differential_lock_ engaged_1	state of the differential lock	—	—	trans- mission control unit	—	1	proposed	2010-07-15	—	ISO/TC 127	condition_4	N/A	N/A	EN
machine_ running_ state	operating_ status	hydraulic_function_ operation_flag(s)_1	flag to indicate current operation of hydraulic function (may be expanded to multiple functions)	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	condition_1	N/A	N/A	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
machine_running_state	operating_count	number_of_brake_actuations_1	accumulated number of actuations of the brake pedal	—	—	timed history of brake flag	—	1	proposed	2010-07-15	—	ISO/TC 127	condition_1	N/A	N/A	EN
machine_running_state	operating_count	number_of_decel_actuations_1	accumulated number of actuations of the decel pedal	—	—	timed history of decal flag	—	1	proposed	2010-07-15	—	ISO/TC 127	condition_1	N/A	N/A	EN
machine_running_state	temperature	charge_air_temperature_1	temperature of the charge air manifold	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	celsius_temperature_1	N/A	N/A	EN
machine_running_state	temperature	fuel_temperature_1	temperature of the fuel at the fuel injection pump	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	celsius_temperature_1	N/A	N/A	EN
machine_running_state	temperature	transmission_oil_temperature_1	temperature of oil in the transmission	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	celsius_temperature_1	N/A	N/A	EN
machine_running_state	engine_coolant_temperature	engine_coolant_temperature_1	temperature of the coolant in the engine	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	celsius_temperature_1	N/A	N/A	EN
machine_running_state	temperature	exhaust_temperature_1	temperature of exhaust gasses in the exhaust manifold	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	celsius_temperature_1	N/A	N/A	EN
machine_running_state	haydraulic_temperature	hydraulic_temperature_1	temperature of hydraulic fluid in the hydraulic reservoir	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	celsius_temperature_1	N/A	N/A	EN
machine_running_state	haydraulic_temperature	hydraulic_temperature_2	temperature of hydrostatic fluid in the hydrostatic reservoir	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	celsius_temperature_1	N/A	N/A	EN
machine_running_state	temperature	ambient_air_temperature_1	temperature of ambient air in which the machine is operating	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	celsius_temperature_1	N/A	N/A	EN
machine_running_state	pressure	fuel_pressure_1	pressure of fuel at the fuel injector	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_4	N/A	N/A	EN
machine_running_state	pressure	transmission_oil_pressure_1	pressure of fluid in the transmission	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_4	N/A	N/A	EN

Table A.1 (*continued*)

Classification scheme item value	Data element concept name	Name	Definition text	Data element example item	Definition source reference	Data origin	Data identifier	Version	Administrative status	Last change date	Explanatory comment	Organization name	Value domain name	Input data element for derivation	Derivation rule	Language identifier
machine_running_state	engine_oil_pressure	engine_oil_pressure_1	pressure of oil in the engine	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_4	N/A	N/A	EN
machine_running_state	hydraulic_oil_pressure	hydraulic_oil_pressure_1	pressure of oil in the hydraulic system	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_4	N/A	N/A	EN
machine_running_state	hydraulic_oil_pressure	hydraulic_oil_pressure_2	pressure of oil in the hydrostatic system	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_4	N/A	N/A	EN
machine_running_state	pressure	turbo_boost_pressure_1	air boost pressure from the turbo charger	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_4	N/A	N/A	EN
machine_running_state	pressure	tyre_air_pressure_1	air pressure in the tyres	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	pressure_4	N/A	N/A	EN
machine_running_state	battery_condition	battery_voltage_1	voltage in the battery	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	electric_potential_1	N/A	N/A	EN
machine_running_state	engine_speed	engine_speed_1	speed of the engine	—	—	engine control unit	—	1	proposed	2010-07-15	—	ISO/TC 127	rotational_frequency_1	N/A	N/A	EN
machine_running_state	ground_speed	ground_speed_1	speed of travel of the machine	—	—	sensor on the machine	—	1	proposed	2010-07-15	—	ISO/TC 127	velocity_2	N/A	N/A	EN
machine_running_state	caution_code	caution_code_1	caution code of warning related to machine operation	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	code_condition_1	N/A	N/A	EN
machine_running_state	caution_code_referencing_number	caution_code_referencing_number_1	ISO/IEC registration number of the symbol on the display used to warn of a system problem	—	ISO 6405-1, ISO 6405-2	—	—	1	proposed	2010-07-15	—	ISO/TC 127		N/A	N/A	EN
machine_running_state	caution_condition	caution_condition_1	condition of caution code (on/off)	—	—	—	—	1	proposed	2010-07-15	—	ISO/TC 127	condition_3	N/A	N/A	EN
machine_running_state	trouble_code	active_trouble_code_1	value representing a trouble code currently active on the machine	—	—	various control units, typically the monitor	—	1	proposed	2010-07-15	—	ISO/TC 127	code_integer_2	N/A	N/A	EN

Table A.2 — Basic data dictionary table — Value domain

Repre-sentation class name	Conceptual domain name	Value domain name	Datatype name	Datatype scheme reference	Unit of measure name	Unit of measure precision	Value domain maximum character quantity	Value domain format	Value item	Non-enumerated value domain description	Explanatory comment
code	code_integer	code_integer_1	integer	ISO 15143	N/A	0	100	integer	N/A	larger than 0	—
code	code_integer	code_integer_2	integer	ISO 15143	N/A	0	3	###	N/A	N/A	—
code	code_integer	code_integer_3	integer	ISO 15143	N/A	0	5	#####	N/A	N/A	—
code	code_integer	code_integer_4	integer	ISO 15143	N/A	0	10	##########	N/A	N/A	—
code	code_alphanumeric	code_alphanumeric_1	character	ISO 15143	N/A	0	100	alphanumeric string	N/A	larger than 0	—
code	code_alphabetic	code_alphabetic_1	character	ISO 15143	N/A	N/A	100	alphabetic string	N/A	larger than 0	—
code	code_alphabetic	code_alphabetic_2	character	ISO 15143	N/A	N/A	5	*****	N/A	N/A	—
code	code_alphabetic	code_alphabetic_3	character	ISO 15143	N/A	N/A	10	**********	N/A	N/A	—
code	code_character	code_character_1	character	ISO 15143	N/A	N/A	100	character string	N/A	larger than 0	—
code	machine_id	product_identification_ number_1	string	ISO 10261	N/A	N/A	17	**********	N/A	N/A	product identification number: PIN
code	machine_id	machine_local_id_1	code_ alphabetic_2	ISO 15143	N/A	N/A	5	*****	N/A	N/A	—
code	equipment_id	equipment_local_id_1	code_ alphabetic_2	ISO 15143	N/A	N/A	5	*****	N/A	N/A	—
code	material_id	material_id_1	code_ alphabetic_2	ISO 15143	N/A	N/A	5	*****	N/A	N/A	—
code	decision	decision_1	integer	ISO 15143	N/A	N/A	1	N/A	0:NG 1:OK	N/A	—
code	decision	decision_2	integer	ISO 15143	N/A	N/A	1	N/A	0:NO 1:YES	N/A	—
code	direction	direction_1	integer	ISO 15143	N/A	N/A	1	N/A	0:reverse 1:forward	N/A	—
code	condition	condition_1	integer	ISO 15143	N/A	N/A	1	N/A	0:OFF 1:ON	N/A	—
code	condition	condition_2	integer	ISO 15143	N/A	N/A	1	N/A	0:start not 0:stop	N/A	—
code	condition	condition_3	integer	ISO 15143	N/A	N/A	1	N/A	0:event not 0:event has finished	N/A	—
code	condition	condition_4	integer	ISO 15143	N/A	N/A	1	N/A	0:not engaged 1:engaged	N/A	—

Table A.2 (*continued*)

Repre-sentation class name	Conceptual domain name	Value domain name	Datatype name	Datatype scheme reference	Unit of measure name	Unit of measure precision	Value domain maximum character quantity	Value domain format	Value item	Non-enumerated value domain description	Explanatory comment
code	caution_code	caution_code_1	caution_code_1	ISO 6405-1	N/A	N/A	4	N/A	See ISO 6405-1, Common symbols, ISO/IEC registration number	N/A	See ISO 6405-1, Common symbols, ISO/IEC registration number
code	coordinate_code	coordinate_code_ horizontal_1	integer	ISO 15143	N/A	N/A	1	N/A	1:WGS84 2:National coordinate reference system 3:Site local coordinate reference system 4:Others	N/A	—
code	coordinate_code	coordinate_code_ vertical_1	integer	ISO 15143	N/A	N/A	1	N/A	1:WGS84 2:National coordinate reference system with geoid correction 3:National coordinate system without geoid correction 4:Others	N/A	—
name	machine_type	machine_type_1	character	ISO 15143	N/A	N/A	5	N/A	dozer roller	N/A	—
name	equipment_type	equipment_type_1	character	ISO 15143	N/A	N/A	5	N/A	GPS, total station, accelerometer, nuclear gauge (RI method)	N/A	—
name	machine_name	machine_name_1	character_string_4	ISO 15143	N/A	N/A	20	********	unique machine name	N/A	—
group	—	—	—	—	—	—	—	—	—	—	—
text	real_number	real_number_1	real	ISO 15143	N/A	—	100	real number	N/A	—	—
text	natural_number	natural_number_1	natural number	ISO 15143	N/A	—	100	natural number	N/A	—	—
text	integer	integer_1	integer	ISO 15143	N/A	—	100	integer	N/A	—	—
text	alphanumeric_string	alphanumeric _string_1	character	ISO 15143	N/A	—	100	alphanumeric string	N/A	—	—

Table A.2 (*continued*)

Repre-sentation class name	Conceptual domain name	Value domain name	Datatype name	Datatype scheme reference	Unit of measure name	Unit of measure precision	Value domain maximum character quantity	Value domain format	Value item	Non-enumerated value domain description	Explanatory comment
text	alphabetic_string	alphabetic_string_1	character	ISO 15143	N/A	—	100	alphabetic string	N/A	—	alphabetic letters
text	character_string	character_string_1	character	ISO 15143	N/A	—	100	character string	N/A	—	characters
text	character_string	character_string_2	character	ISO 15143	N/A	N/A	5	*****	N/A	N/A	—
text	character_string	character_string_3	character	ISO 15143	N/A	N/A	10	**********	N/A	N/A	—
text	character_string	character_string_4	character	ISO 15143	N/A	N/A	20	**********	N/A	N/A	—
text	character_string	character_string_5	character	ISO 15143	N/A	N/A	40	********** **********	N/A	N/A	—
text	character_string	character_string_6	character	ISO 15143	N/A	N/A	60	********** ********** **********	N/A	N/A	—
date_time	date	date_1	character	ISO 8601	N/A	0	10	YYYY-MM-DD	N/A	larger than 0	gregorian date
date_time	time	time_1	character	ISO 8601	N/A	0	8	hh:mm:ss	N/A	larger than 0	local time
date_time	time	time_2	character	ISO 8601	N/A	0	5	hh:mm	N/A	larger than 0	—
date_time	time	time_3	character	ISO 8601	N/A	2	8	hhhhhh,##	N/A	larger than 0	—
date_time	date_and_time	datetime_0	character	ISO 8601	N/A	0	25	YYYY-MM-DD Thh:mm:ss±hh:mm	N/A	larger than 0	date and coordinate universal time
date_time	date_and_time	datetime_1	character	ISO 8601	year,month, day,hour, minute, second	0	14	YYYYMMDD hhmmss	N/A	larger than 0	gregorian date
date_time	date_and_time	datetime_2	character	ISO 8601	year,month, day,hour, minute, second	3	18	YYYYMMDD hhmmss,###	N/A	larger than 0	gregorian date
date_time	date_and_time	datetime_3	character	ISO 31-1	year,month, day,hour, minute, second	0	11	DDDDDhhmmss	N/A	larger than 0	to count day from start
date_time	date_and_time	datetime_4	character	ISO 8601	month, day,hour, minute, second	0	10	MMDDhhmmss	N/A	larger than 0	none

Table A.2 (*continued*)

Repre-sentation class name	Conceptual domain name	Value domain name	Datatype name	Datatype scheme reference	Unit of measure name	Unit of measure precision	Value domain maximum character quantity	Value domain format	Value item	Non-enumerated value domain description	Explanatory comment
date_time	date_and_time	dayhour_1	character	ISO 31-1	year,month, day,hour, minute, second	0	11	DDDDDhhmmss	N/A	larger than 0	to count day from start
quantity	length	length_1	real	ISO 1000	m	—	—	real number	N/A	larger than 0	—
quantity	length	length_2	real	ISO 15143	m	2	5	##,##	N/A	larger than 0	—
quantity	length	length_3	real	ISO 15143	m	2	9	######,##	N/A	larger than 0	—
quantity	length	length_4	real	ISO 15143	m	3	7	###,###	N/A	none	—
quantity	length	length_5	real	ISO 15143	m	0	5	#####	N/A	larger than 0	—
quantity	length	length_6	real	ISO 1000	mm	0	5	real number	N/A	—	—
quantity	length	length_7	real	ISO 1000	cm	2	6	real number	N/A	none	—
quantity	area	area_1	real	ISO 1000	m^2	2	8	#####,##	N/A	larger than 0	—
quantity	volume	volume_1	real	ISO 15143	m^3	2	6	###,##	N/A	more than 0	—
quantity	volume	volume_2	real	ISO 15143	m^3	2	8	#####,##	N/A	more than 0	—
quantity	volume	volume_3	real	ISO 15143	L	2	6	#####,##	N/A	more than 0	—
quantity	mass	mass_1	real	ISO 1000	kg	—	—	real number	N/A	larger than 0	—
quantity	mass	mass_2	real	ISO 1000	kg	2	8	#####,##	N/A	more than 0	—
quantity	mass	mass_3	real	ISO 1000	g	0	6	######	N/A	more than 0	—
quantity	mass	mass_4	real	ISO 1000	t	2	6	###,##	N/A	more than 0	—
quantity	density	density_1	real	ISO 1000	t/m^3	2	6	###,##	N/A	more than 0	—
quantity	density	density_2	real	ISO 1000	g/cm^3	2	6	###,##	N/A	more than 0	—
quantity	time_and_date	second_1	real	ISO 1000	s	—	—	real number	N/A	larger than 0	—
quantity	time_and_date	minute_1	real	ISO 31-1	min	2	10	real number	N/A	larger than 0	minute as quantity
quantity	time_and_date	hour_1	real	ISO 31-1	hour	2	10	real number	N/A	larger than 0	hour as quantity
quantity	time_and_date	time_3	integer	ISO 31-1	hour	0	2	hh	N/A	larger than 0	—
quantity	time_and_date	hour_2	integer	ISO 31-1	hour	0	2	hh	N/A	larger than 0	—
quantity	time_and_date	day_1	real	ISO 31-1	day	2	10	real number	N/A	larger than 0	day as quantity
quantity	electric_current	electric_current_1	real	ISO 1000	A	—	—	real number	N/A	—	—
quantity	electric_potential	electric_potential_1	real	ISO 1000	V	—	—	real number	NA	—	—
quantity	thermodynamic_ temperature	thermodynamic_ temperature_1	real	ISO 1000	K	—	—	real number	N/A	—	—

Table A.2 (*continued*)

Repre-sentation class name	Conceptual domain name	Value domain name	Datatype name	Datatype scheme reference	Unit of measure name	Unit of measure precision	Value domain maximum character quantity	Value domain format	Value item	Non-enumerated value domain description	Explanatory comment
quantity	thermodynamic_ temperature	celsius_ temperature_1	real	ISO 1000	degrees Centigrade (C)	—	—	real number	N/A	—	—
quantity	thermodynamic_ temperature	fahrenheit_ temperature_1	real	ISO 1000	degrees Fahrenheit (F)	—	—	real number	N/A	—	—
quantity	amount_of _ substance	amount_of_ substance_1	real	ISO 1000	mol	—	—	real number	N/A	larger than 0	—
quantity	luminous	luminous_1	real	ISO 1000	cad	—	—	real number	N/A	larger than 0	—
quantity	plane_angle	plane_angle_1	real	ISO 1000	rad	—	—	real number	N/A	larger than 0	—
quantity	solid_angle	solid_angle_1	real	ISO 1000	sr	—	—	real number	N/A	larger than 0	—
quantity	frequency	frequency_1	real	ISO 1000	Hz	2	5	real number	N/A	larger than 0	—
quantity	rotational_frequency	rotational_ frequency_1	real	ISO 1000	min^{-1}	—	—	real number	N/A	larger than 0	—
quantity	force	force_1	real	ISO1000	—	—	—	real number	N/A	larger than 0	—
quantity	force	force_1_centrifugal_ force	real	ISO 1000	kN	2	6	###,##	N/A	more than 0	—
quantity	force	force_2	real	ISO 1000	N/m	2	10	#######,##	N/A	more than 0	—
quantity	pressure_and_stress	pressure_1	real	ISO 1000	Pa	—	—	real number	N/A	larger than 0	—
quantity	pressure_and_stress	pressure_2	real	ISO 1000	N/mm^2	—	—	real number	—	—	—
quantity	pressure_and_stress	pressure_3	real	ISO 1000	N/mm^2	2	6	###,##	N/A	more than 0	—
quantity	pressure_and_stress	pressure_4	real	—	MPa	2	6	###,##	N/A	more than 0	—
quantity	energy_work_calorie	energy_1	real	ISO 1000	J	—	—	real number	—	larger than 0	—
quantity	power	power_1	real	ISO 1000	W	—	—	real number	—	larger than 0	—
quantity	velocity	velocity_1	real	ISO 1000	m/s	1	4	real number	N/A	more than 0	—
quantity	velocity	velocity_2	real	ISO 1000	km/h	—	—	real number	N/A	more than 0	—
quantity	acceleration	acceleration_1	real	ISO 1000	m/s^2	2	6	###,##	N/A	more than 0	—
rate	rate_percent	rate_percent_1	real	ISO 15143	non-dimensional	1	4	###,#	N/A	N/A	% expression
rate	rate_percent	rate_percent_2	real	ISO 15143	non-dimensional	2	6	###,##	N/A	0 to 100	% expression
rate	rate_percent	rate_percent_3	real	ISO 15143	non-dimensional	2	6	##,##%	N/A	—	% expression
rate	rate_decimal	rate_decimal_1	real	—	N/A	5	7	real number	N/A	0 to 1	—

Table A.2 (*continued*)

Repre-sentation class name	Conceptual domain name	Value domain name	Datatype name	Datatype scheme reference	Unit of measure name	Unit of measure precision	Value domain maximum character quantity	Value domain format	Value item	Non-enumerated value domain description	Explanatory comment
rate	rate_decimal	rate_decimal_2	real	ISO 15143	non-dimensional	0	4	####	N/A	—	—
measure	capacity_per_ hour_area	capacity_per_ hour_area_1	real	ISO 15143	m^2/h	1	5	###,#	N/A	larger than 0	—
measure	capacity_per_ hour_volume	capacity_per_hour_ volume_1	real	ISO 15143	m^3/h	1	5	###,#	N/A	larger than 0	—
measure	road_station_ measure	road_station_1	character	ISO 15143	non-dimensional	3	13	STA###+##,###	N/A	road stations are placed every 20 m from base point	—
measure	road_station_ measure	road_station_2	character	ISO 15143	non-dimensional	3	13	STA###+##,###	N/A	road stations are placed every 100 m from base point	—
measure	latitude_measure	latitude_measure_ sexagesimal_1	character	ISO 6709	sexagesimal	7	13	±DDMMSS,SSSSS	N/A	Latitude measure on or north of the equator is positive; latitude measure south of equator is negative. The range limit for degrees is 0 to 90, for minutes is 0 to 59, and for seconds is 0 to 59.	—
measure	latitude_measure	latitude_measure_ sexagesimal_2	real	ISO 6709	degrees, minutes and decimal minutes	2	8	DDDMM,MM	N/A	—	—
measure	latitude_measure	latitude_measure_ sexagesimal_3	real	ISO 6709	degrees, minutes and decimal minutes	2	10	DDDMMSS,SS	N/A	—	—
measure	latitude_measure	latitude_measure_ decimal_1	character	ISO 6709	degree	3	10	±DD,DDDDDD	N/A	Latitude measure on or north of the equator is positive; latitude measure south of equator is negative. The range limit for degrees is –90,0 to +90,0.	—
measure	latitude_measure	latitude_measure_ decimal_2	real	ISO 6709	degrees and decimal degrees	2	6	DDD,DD	N/A	—	—
measure	longitude_measure	longtitude_measure_ sexagesimal_1	character	ISO 6709	sexagesimal	5	14	±DDDMMSS,SSSSS	N/A	Longitude measure on or east of the Greenwich is positive; latitude measure south of equator is negative. The range limit for degrees is 0 to 180, for minutes is 0 to 59, and for seconds is 0 to 59.	—

Table A.2 (*continued*)

Repre-sentation class name	Conceptual domain name	Value domain name	Datatype name	Datatype scheme reference	Unit of measure name	Unit of measure precision	Value domain maximum character quantity	Value domain format	Value item	Non-enumerated value domain description	Explanatory comment
measure	longitude_measure	longtitude_measure_ decimal_1	character	ISO 6709	degree	6	11	±DDD,DDDDDD	N/A	Longitude measure on or east of the Greenwich is positive; latitude measure south of equator is negative. The range limit for degrees is −180,0 to +180,0.	—
measure	longitude_measure	longitude_measure_ sexagesimal_2	real	ISO 6709	degrees and decimal degrees	2	6	DDD,DD	N/A	—	—
measure	longitude_measure	longitude_measure_ sexagesimal_3	real	ISO 6709	degrees, minutes and decimal minutes	2	8	DDDMM,MM	N/A	—	—
measure	longitude_measure	longitude_measure_ sexagesimal_4	real	ISO 6709	degrees, minutes, seconds and decimal seconds	2	10	DDDMMSS,SS	N/A	—	—
measure	altitude_measure	altitude_measure_ decimal_1	character	ISO 6709	m	5	12	±#####,#####	N/A	altitude measure on or above geodetic reference datum is positive; altitude measure below the geodetic reference datum is negative	altitude based on geodetic reference datum
measure	altitude_measure	altitude_measure_ decimal_2	real	ISO 15143	m	3	8	####,###	N/A	—	—
measure	gradient_measure	gradient_percent_1	real	ISO 15143	non-dimensional	2	8	±###,##%	N/A	anticlockwise difference above horizontal plane is +100 to −100	% expression
measure	gradient_measure	gradient_percent_2	real	ISO 15143	non-dimensional	2	8	±###,##%	N/A	difference above horizontal plane is +100 to −100	% expression
measure	gradient_measure	gradient_percent_3	real	ISO 15143	non-dimensional	2	8	±###,##%	N/A	anticlockwise difference above target data is +100 to −100	% expression
measure	gradient_measure	gradient_percent_4	real	ISO 15143	non-dimensional	2	8	±###,##%	N/A	difference above target data is +100 to −100	% expression
measure	thickness_measure	thickness_measure_ decimal_1	real	ISO 15143	cm	1	7	±####,#	N/A	thickness measure on or above target reference datum is positive; thickness measure below the target reference datum is negative	
count	count_real	count_real_1	—		—	—	—	—	—	—	—

Table A.2 (*continued*)

Repre-sentation class name	Conceptual domain name	Value domain name	Datatype name	Datatype scheme reference	Unit of measure name	Unit of measure precision	Value domain maximum character quantity	Value domain format	Value item	Non-enumerated value domain description	Explanatory comment
count	count_integer	count_integer_1	integer	ISO 15143	non-dimensional	0	2	##	N/A	more than 0	—
count	count_integer	count_integer_2	integer	ISO 15143	non-dimensional	0	3	###	N/A	more than 0	—
count	count_integer	count_integer_3	integer	ISO 15143	non-dimensional	—	—	—	—	more than 0	—
count	count_natural_ number	count_natural_ number_1	—	—	—	—	—	—	—	—	—
picture	—	—	—	—	—	—	—	—	—	—	—
graphic	point	point_1	character	ISO 6709	sexagesimal and m	5	35	±DDMMSS,SSSSS ±DDDMMSS,SSSSS ±####,###/	N/A	—	sexagesimal 2-D point
graphic	point	point_2	character	ISO 6709	sexagesimal and m	5	35	±DDMMSS,SSSSS ±DDDMMSS,SSSSS ±####,###/	N/A	—	sexagesimal 3-D point
graphic	point	point_3	Coodinate Code, real number	ISO 19107	—	—	—	See ISO 19107	—	—	It will be registered by user in accordance with ISO 19107
graphic	line	line_1	See ISO 19107	ISO 19107	—	—	—	See ISO 19107	—	—	It will be registered by user in accordance with ISO 19107
graphic	surface	surface_1	See ISO 19107	ISO 19107	—	—	—	See ISO 19107	—	—	It will be registered by user in accordance with ISO 19107
graphic	surface_designation	surface_designation_1	point_2	ISO 6709	sexagesimal and m	5	1 000	point_2, point_2, point_2/	N/A	more than three points	—
graphic	solid	solid_1	See ISO 19107	ISO 19107	—	—	—	See ISO 19107	—	—	It will be registered by user in accordance with ISO 19107

Table A.2 (*continued*)

Repre-sentation class name	Conceptual domain name	Value domain name	Datatype name	Datatype scheme reference	Unit of measure name	Unit of measure precision	Value domain maximum character quantity	Value domain format	Value item	Non-enumerated value domain description	Explanatory comment
icon	—	—	—	—	—	—	—	—	—	—	—
amount	amount_currency	usd_1	integer	ISO 4217	dollar	2	—	real number	N/A	—	—
amount	amount_currency	eur_1	integer	ISO 4217	euro	2	—	real number	N/A	—	—
amount	amount_currency	jpy_1	integer	ISO 4217	yen	2	—	real number	N/A	—	—

Annex B
(normative)

Structure of data dictionary

The metadata registry (MDR) developing method according to ISO/IEC 11179-3 has been referred to and applied in this part of ISO 15143 and the data dictionary developed and standardized for worksite data exchanged between earth-moving machinery, mobile road construction machinery and site information systems.

Whereas this part of ISO 15143 specifies the composition of a data dictionary with reference to ISO/IEC 11179-3, that other International Standard specifies metadata and their composition. Nevertheless, ISO/IEC 11179-3 should be referred to when the data dictionary needs to be extended.

Figure B.1 shows the relations between Tables A.1 and A.2. The mutual relations between metadata that specify the data dictionary contents are shown as follows.

a) Metadata that specify data dictionary structure are contained within the data element table or the value domain table.

b) Each data element has its identifier name for identification purposes and its expressions are specified in the value domain. Each data element uses the value domain by referring to its identifier, the “value domain name”.

c) The value domain may also be available for elements other than single data elements.

d) It is permitted to define a new data element combining a certain number of data elements.

e) The value domain is either of the enumerated type or non-enumerated type, and is identified by having a value within either the value item or non-enumerated value domain.

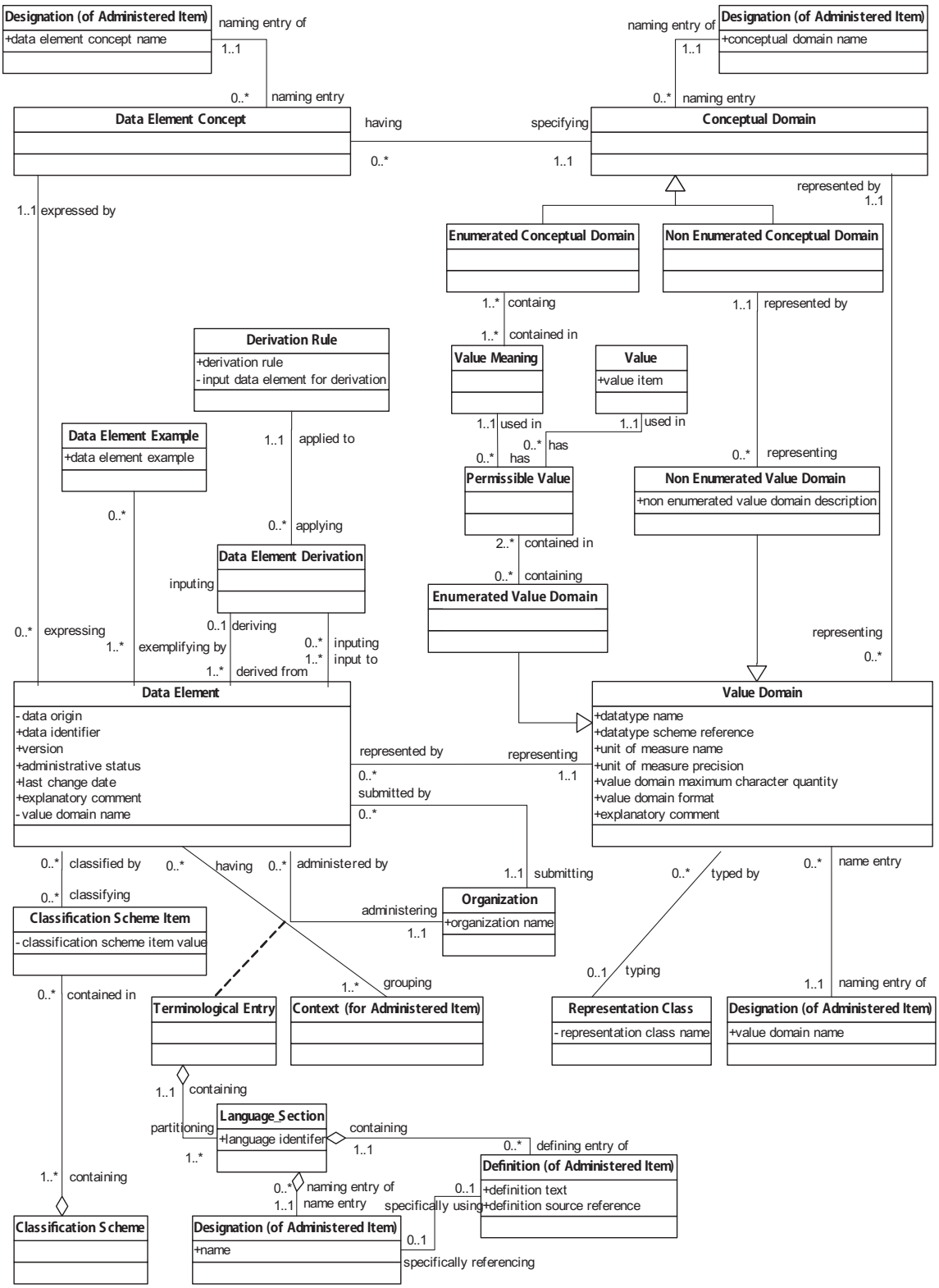


Figure B.1 — Mutual relations between metadata

Annex C
(informative)

Application example of machine management using ISO 15143

C.1 General

This annex presents an ISO 15143 application example of machine management as defined by US experts. Machine management is defined to include those activities that support machine health, maintenance and operational data logging.

C.2 Agreement for worksite machine management data exchange

C.2.1 Objective

The objective of worksite data exchange is to promote the efficiency and accelerate progress of construction worksite and machine management.

C.2.2 Worksite machine management data exchange system function

Machine management data is comprised of the machine running state real-time data. This includes all physical measurement data and status conditions generated by the electronic control system of the machine in support of an on-board machine information system. The data can be classified by the occurrence of transmission of the data from the machine to various users. Three classes of machine management data exist: machine running record, machine work shift record and machine status record.

The machine running record is the accumulation of machine running state parametric data. This data is generated and typically stored on the machine to be downloaded by hand or by wireless remote file transfer of large amounts of data. The data can be formatted into histograms or plotted to review the historical record of machine operation. It is intended to be used for trend analysis, prognostic and diagnostic purposes, and for the support of resale value when the machine is sold from one owner to the next.

The machine work shift record is the accumulation of machine running state representing the functions actuated and parameters recorded during a single work period such as a shift or a day. This data is expected to be reported from the machine to the machine management office via a periodic poll from the office. It is intended to support daily operation of the machine by service functions and by monitoring the performance of the operator.

The machine status record is a set of data representing out-of-range, error or status flags generated by the machine electronic control system. This data is to be transmitted from the machine to the machine management office in near real time on an exceptional basis, as initiated by the machine.

C.3 Machine management information

C.3.1 Real-time remote reporting

a) Real-time machine utilization
   1) Volumetric fuel rate
   2) Position
   3) Date and time stamp
   4) Operator ID
   5) Task ID
   6) Run time on task
      i) Tram direction at rate
      ii) Hydraulic function(s) enabled
      iii) Payload mass

b) Real-time machine health
   1) Current error codes
   2) Out-of-range fluid/charge parameters
      i) Pressure/voltage
      ii) Temperature
      iii) Level
   3) Out-of-range shift parameters
   4) Out-of-range engine speed parameters

Scenario description

Purpose

The intent of this scenario is to provide real-time sampled data from a mobile construction machine to a remote location for instantaneous monitoring and the cumulative compilation of histographic plots.

Architecture

This system assumes a continuously operating wireless communication path between the mobile machine and a local data collection node. Data originating on the machine will be transmitted to the local node, tabulated with respect the date and time and transferred to a remote node via internet connection.

Data origin

The data will originate with the machine operator, machine sensors and the on-board machine network.

Data consumer

The data will be used by remote supervisory personnel for real-time monitoring and periodic review. Real-time out-of-range data will be used for immediate response. Cumulative data will be compiled, formatted and used for periodic maintenance scheduling and planning.

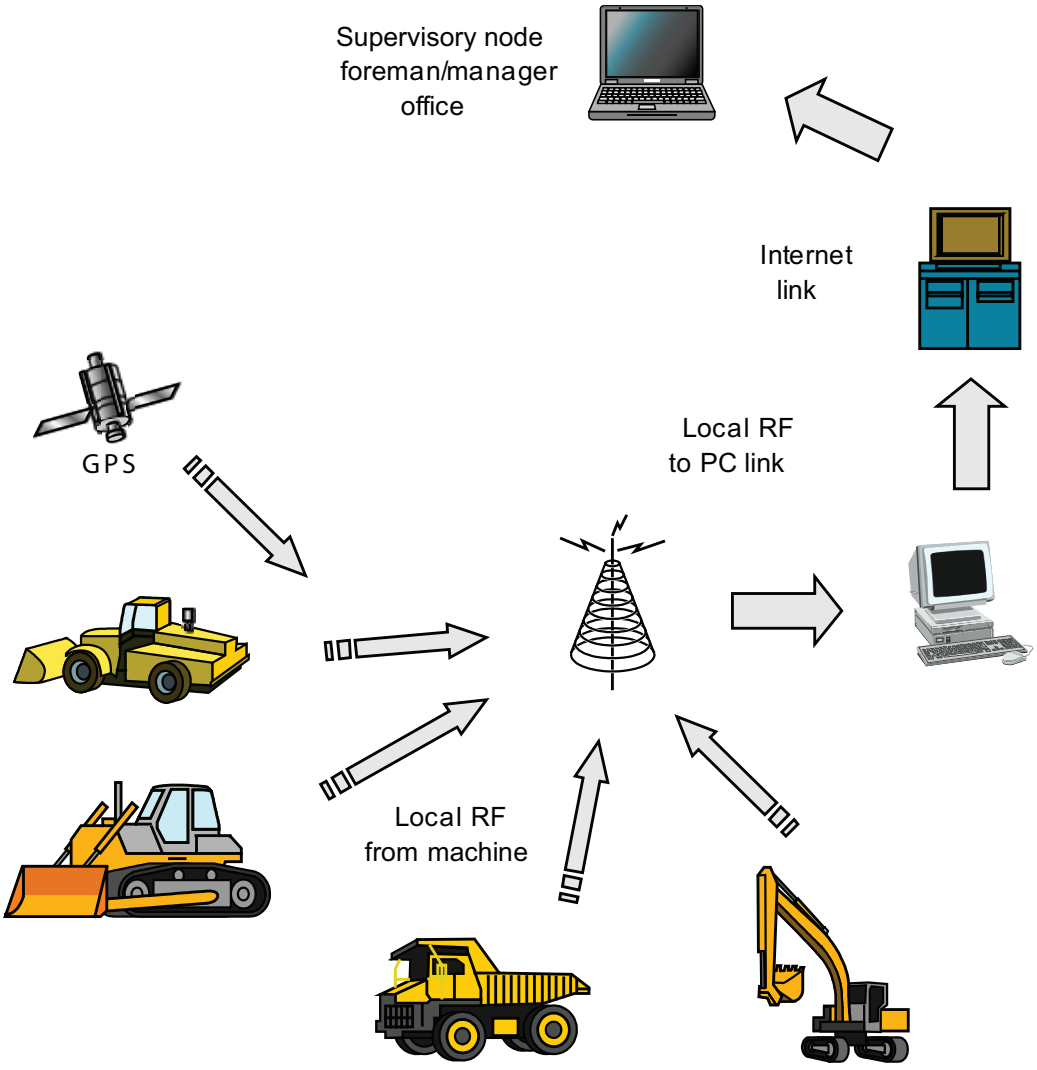
Real-time remote reporting system diagram

See Figure C.1.

— Real-time remote reporting

— Continuous data transfer

— Cumulative histograms



Key

GPS global positioning system

RF radio frequency

Figure C.1 — Machine management information

C.3.2 Batch remote reporting

a) Periodic and lifetime machine utilization

   1) Periodic fuel level

   2) Formatted histographic data vs. date and time

      i) Operator ID

      ii) Task ID

      iii) Hydraulic functions

      iv) Tram rates and directions

      v) Position

b) Periodic and lifetime machine health vs. date and time

   1) Logged error codes

   2) Logged fluid/charge parameters

      i) Pressure/voltage

      ii) Temperature

      iii) Level

   3) Logged shift parameters

   4) Logged engine speed parameters

Scenario description

Purpose

The intent of this scenario is to provide batch mode sampled and formatted data from a mobile construction machine to a remote location for after-action review of histographic plots.

Architecture

This system assumes a periodically operating wireless communication path or hand-carried storage medium between the mobile machine and a remote data review location. Data originating on the machine will be tabulated with respect to the date and time, potentially reviewed on the machine and ultimately transferred to a remote node via a hand-carried medium or wireless link. Data transfer would be periodic, not continuous.

Data origin

The data will originate with the machine operator, machine sensors and the on-board machine network.

Data consumer

The data will be used by the operator and remote supervisory personnel for after-action periodic review. Cumulative data will be compiled and formatted on the machine for periodic maintenance scheduling and resale-oriented documentation.

Batch reporting system diagram

— Periodic batch reporting

— Wireless or hand-carried transfer in batch mode

— On-machine histographic data compilation

Bibliography

[1] ISO 31 (all parts), *Quantities and units*

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ICS 35.240.99; 53.100

Price based on 59 pages