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Road vehicles — Implementation of WWH-OBD communication requirements —

Part 2: Common emissions-related data dictionary

Véhicules routiers — Mise en application des exigences de communication WWH-OBD —

Partie 2: Dictionnaire de données liées aux émissions communes

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/PAS 27145-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

ISO/PAS 27145 consists of the following parts, under the general title *Road vehicles — Implementation of WWH-OBD communication requirements*:

— *Part 1: General information and use case definition*

— *Part 2: Common emissions-related data dictionary*

— *Part 3: Common message dictionary*

— *Part 4: Connection between vehicle and test equipment*

NOTE ISO/PAS 27145-4 will be extended as necessary due to introduction of additional communication media.

Introduction

This document set includes the communication between the vehicle's OBD systems and test equipment implemented across vehicles within the scope of the WWH-OBD GTR (World Wide Harmonized On-Board Diagnostics Global Technical Regulations).

It has been established in order to apply the unified diagnostic services (specified in ISO 14229-1) to WWH OBD systems.

To achieve this, it is based on the Open Systems Interconnection (OSI) Basic Reference Model in accordance with ISO/IEC 7498-1 and ISO/IEC 10731, which structures communication systems into seven layers. When mapped on this model, the services specified by ISO/PAS 27145 are broken into:

— Application layer (layer 7), specified in ISO/PAS 27145-3;

— Presentation layer (layer 6), specified in ISO/PAS 27145-2;

— Session layer services (layer 5), specified in ISO/PAS 27145-4;

— Transport layer services (layer 4), specified in ISO/PAS 27145-4;

— Network layer services (layer 3), specified in ISO/PAS 27145-4;

— Data link layer (layer 2), specified in ISO/PAS 27145-4; and

— Physical layer (layer 1), specified in ISO/PAS 27145-4;

in accordance with Table 1.

Table 1 — Enhanced and legislated OBD diagnostic specifications applicable to the OSI layers

Applicability	OSI 7 layers	Implementation of WWH-OBD communication requirements, e.g. emissions-related UDS
Seven layers according to ISO/IEC 7498-1 and ISO/IEC 10731	Application (layer 7)	ISO/PAS 27145-3 / ISO 14229-1
	Presentation (layer 6)	ISO/PAS 27145-2
	Session (layer 5)	ISO/PAS 27145-4
	Transport (layer 4)	
	Network (layer 3)	
	Data link (layer 2)	
	Physical (layer 1)	

Road vehicles — Implementation of WWH-OBD communication requirements —

Part 2:
Common emissions-related data dictionary

1 Scope

ISO/PAS 27145 is intended to become the single communication standard for access to OBD-related information. To allow for a smooth migration from the existing communication standards to this future worldwide standardized communication standard, the initial communication concept will be based on CAN. In a second step, ISO/PAS 27145 will be extended to define the world-wide harmonized OBD communication standard based on existing industry communications standards (e.g. Internet Protocol) over Ethernet. Due to the usage of standard network layer protocols, future extensions to optional physical layers (e.g. wireless) are possible.

This part of ISO/PAS 27145 defines all regulatory emissions-related data elements of ISO/PAS 27145. A new part may be added in the future upon availability of new legislated WWH-OBD GTR modules. The data elements are used to provide the external test equipment with the diagnostic status of the emissions-related system in the vehicle. All data elements are communicated with the unified diagnostic services as defined in ISO/PAS 27145-3. Data elements are Diagnostic Trouble Codes (DTCs), Parameter Identifiers (PIDs), Monitor Identifiers (MIDs), Test Identifiers (TIDs)/Routine Identifiers (RIDs) and InfoType Identifiers (ITIDs).

This part of ISO/PAS 27145 defines three (3) different sets of data elements:

a) A legacy (backward compatible) data set as defined in SAE J1939-71/-73 and ISO 15031-5/ISO 15031-6;

b) A unified data set (new data definition according to ISO/PAS 27145-2); and

c) A manufacturer data set (defined by manufacturer).

Each set of data elements uses its own scaling and encoding scheme. Legacy data elements are scaled and encoded according the definitions in SAE J1939-71/-73 and ISO 15031-5/ISO 15031-6. Unified data elements are scaled and encoded according to the definitions in ISO/PAS 27145-2. Manufacturer data elements are recommended to be scaled and encoded according to the definitions of the unified data set. This will ease the transfer of manufacturer defined data elements into the standardized (unified) data range.

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 7498-1, *Information technology — Open Systems Interconnection — Basic Reference Model — Part 1: The Basic Model*

ISO/IEC 10731, *Information technology — Open Systems Interconnection — Basic Reference Model — Conventions for the definition of OSI services*

ISO 14229-1, *Road vehicles — Unified diagnostic services (UDS) — Part 1: Specification and requirements*

ISO/TS 15031-2, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 2: Terms, definitions, abbreviations and acronyms*

ISO 15031-5, *Road vehicles — Communication between vehicle and external test equipment for emissions-related diagnostics — Part 5: Emissions-related diagnostic services*

ISO 15031-6, *Road vehicles — Communication between vehicle and external test equipment for emissions-related diagnostics — Part 6: Diagnostic trouble code definitions*

ISO/PAS 27145-1, *Road vehicles — Implementation of WWH-OBD communication requirements — Part 1: General information and use case definition*

ISO/PAS 27145-3, *Road vehicles — Implementation of WWH-OBD communication requirements — Part 3: Common message dictionary*

ISO/PAS 27145-4, *Road vehicles — Implementation of WWH-OBD communication requirements — Part 4: Connection between vehicle and test equipment*

SAE J1939-21, *Recommended Practice for a Serial Control and Communication Vehicle Network — Data link layer*

SAE J1939-71, *Recommended Practice for a Serial Control and Communication Vehicle Network — Vehicle application layer*

SAE J1939-73, *Recommended Practice for a Serial Control and Communication Vehicle Network — Application layer — Diagnostics*

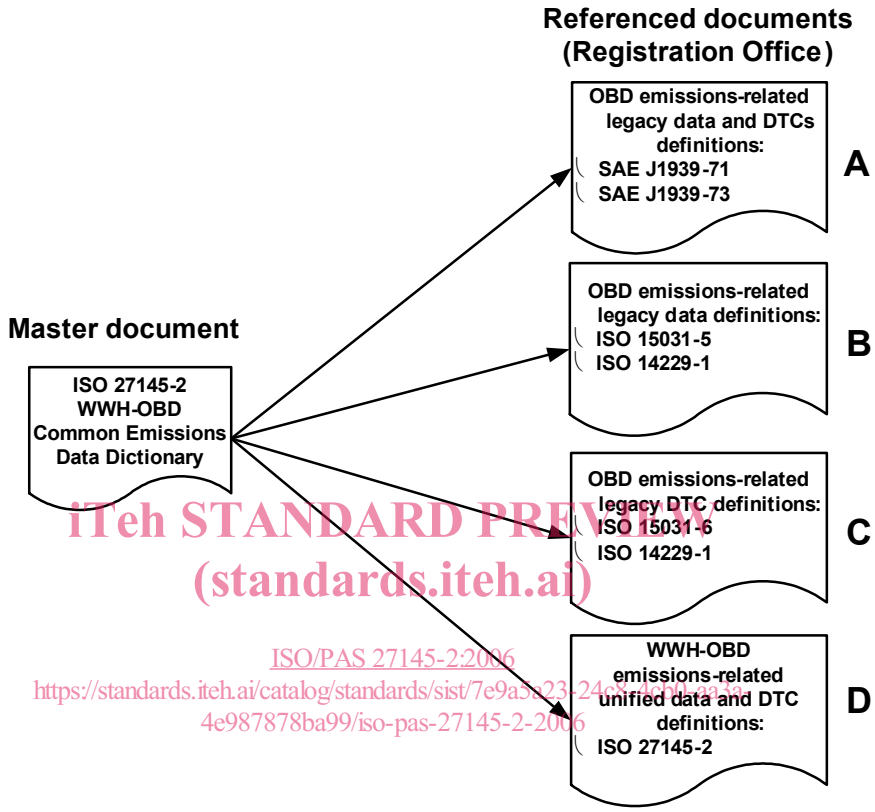
OBD_E_LDATA, *OBD emissions-related data definitions*

OBD_E_LDTC, *OBD emissions-related diagnostic trouble code definitions*

WWH-OBD_E_UDATA_UDTC, WWH-OBD emissions-related unified data and DTC definitions

Figure 1 — WWH-OBD external document reference concept illustrates a master document (ISO/PAS 27145-2) and the reference to existing standards (legacy emissions data and DTCs) as well as the reference to new documents which define the Unified Data Identifiers and Unified DTCs based on the requirements deriving from the WWH-OBD GTR.

The ISO/PAS 27145-2 referenced documents are available via download through a so-called Registration Office Web Site. See Clause 2 for referenced document file names.



Key

A External document “SAE J1939-71 and SAE J1939-73” defines emissions-related SPNs, DTCs and PGNs.

B External document “OBD emissions-related legacy data definitions” defines emissions-related data based on ISO 15031-5 and ISO 14229-1.

C External document “OBD emissions-related legacy diagnostic trouble code definitions” defines emissions-related DTCs based on ISO 15031-5 and ISO 14229-1.

D External document “WWH-OBD emissions-related Unified Data definitions” defines WWH-OBD emissions-related unified data identifiers and DTCs required by the WWH-OBD GTR.

Figure 1 — WWH-OBD external document reference concept

See Annex A for detailed document location and content description.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/PAS 27145-1 and the following apply.

3.1
Analogue Parameter
AP
signal e.g. PID which is sensed from an Analogue to Digital Converter

3.2
ContinueList
CL
continuation of data records within a UPID_DataRecord[]

3.3
Discrete Parameter
DP
signal ,e.g. status signal, included in a PID which represents at least two digital states, e.g. on/off

3.4
DataFlow
concatenation of DataRecords for one UPID_DataRecord

NOTE Values are ContinueList and EndOfList.

3.5
DataLength
DL
length of a data item

3.6
DataType
DT
identifies in the context of this specification either an “Analogue” or “Discrete” parameter included in the data record

3.7
EndOfList
EOL
termination (last data record) of data records within a UPID_DataRecord[]

3.8
Legacy Diagnostic Trouble Code
LDTC
Diagnostic Trouble Code which is already defined in a published standard, e.g. ISO 15031-6

3.9
Legacy Monitor Identifier
LMID
OBD Monitor Identifier which is already defined in a published standard, e.g. ISO 15031-5

3.10
Legacy Monitor Test Identifier
LMTID
OBD Monitor Test Identifier which is already defined in a published standard, e.g. ISO 15031-5

3.11
Legacy Routine Identifier
LRID
Routine Identifier which is already defined in a published standard, e.g. ISO 15031-5

3.12
Legacy InfoType Identifier
LITID
InfoType Identifier which is already defined in a published standard, e.g. ISO 15031-5

3.13
Malfunction Indicator
MI
indicator which clearly informs the driver of the vehicle in the event of a malfunction

NOTE Additional detail is included in the WWH-OBD GTR.

3.14
Parameter Group Number
PGN
group of SPNs

3.15
SignalAttribute
SA
DataType, DataFlow, DataLength and Validity of the data parameters included in the data record referenced by the Unified Data Identifier of the transmitted data from the vehicle's server(s)

3.16
Suspect Parameter Number
SPN

used to identify a least repairable subsystem that has failed, to identify subsystems and or assemblies that may not have hard failures but may be exhibiting abnormal system operating performance, to identify a particular event or condition that will be reported and to report a component and non-standard failure mode

3.17
Supported Unified Data Identifiers
SUDID
data identifier specified in a reserved range to be used to reference a list of Unified Data Identifiers and additional Supported Unified Data Identifiers to be supported by the server

3.18
Unified Control Identifier
UCID
references a control function, e.g. Input/Output in the server

NOTE The value of the control identifier is “Unified”, which is defined as a unique number standardized for the specific control function.

3.19
Unified Diagnostic Trouble Code
UDTC
value which references a specific fault in a system implemented in the server

NOTE The value of the diagnostic trouble code is “Unified”, which is defined as a unique number standardized for the specific fault.

3.20
Unified InfoType Identifier
UITID
references identification information, e.g. Calibration Identifier in the server

NOTE The value of the InfoType identifier is “Unified”, which is defined as a unique number standardized for the specific identification information.

3.21
Unified Monitor Identifier
UMID
references an OBD Monitor function, e.g. Misfire Monitor in the server

NOTE The value of the OBD Monitor identifier is “Unified”, which is defined as a unique number standardized for the specific OBD Monitor function.

3.22
Unified Parameter Identifier
UPID
references a control function, e.g. Input/Output in the server

NOTE The value of the control identifier is “Unified”, which is defined as a unique number standardized for the specific control function.

3.23
Unified Routine Identifier
URID
references a routine function, e.g. Evaporation Monitor routine in the server

NOTE The value of the routine identifier is “Unified”, which is defined as a unique number standardized for the specific control function.

3.24
Uniform Resource Locator
URL
Uniform Resource Identifier which, in addition to identifying a resource, provides a means of locating the resource by describing its primary access mechanism (e.g. its network location)

3.25
Validity
V
indicates the validity of the data signals included in the data record referenced by a Parameter Identifier when reported by the server

4 Symbols and abbreviated terms

AP	Analogue Parameter
CALID	Calibration Identification
CGW	Central Gateway
CL	ContinueList
CVN	Calibration Verification Number
DF	Data Format
DID	Data Identifier

DL	Data Length
DP	Discrete Parameter
DT	DataType
DTC	Diagnostic Trouble Code
ECM	Engine Control Module
ECU	Electronic Control Unit
EOL	EndOfList
GTR	Global Technical Regulation
ITID	InfoType Identifier
LDTC	Legacy Diagnostic Trouble Code
LMID	Legacy Monitor Identifier
LITID	Legacy InfoType Identifier
LMTID	Legacy Monitor Test Identifier
LPID	Legacy Parameter Identifier
LRID	Legacy Routine Identifier
MI	Malfunction Indicator
MID	Monitor Identifier
MTID	Monitor Test Identifier
N/A	Not Applicable
PID	Parameter Identifier
PGN	Parameter Group Number
RID	Routine Identifier
SA	Signal Attribute
SPN	Suspect Parameter Number
SUDID	Supported Unified Data Identifiers
UCID	Unified Control (input/output) Identifier
UDTC	Unified Diagnostic Trouble Code
UITID	Unified InfoType Identifier
UMID	Unified Monitor Identifier
UPID	Unified Parameter Identifier

URID	Unified Routine Identifier
URL	Uniform Resource Locator
V	Validity
VA	Validity Attribute
VIN	Vehicle Identification Number
VOBD	Vehicle On-Board Diagnostics
WWH-OBD	Word Wide Harmonized On-Board Diagnostics

5 Conventions

ISO/PAS 27145 is based on the conventions discussed in the O.S.I. Service Conventions (ISO/IEC 10731:1994) as they apply for diagnostic services.

6 Common data dictionary

This part of the standard specifies a data range layout which considers three (3) data sets in the overall life cycle of an automotive vehicle and its electronic systems.

These data sets are:

a) A “legacy” data set which includes all standardised data and DTCs used in electronic systems required to be compliant to legislation prior to the applicability of GTR modules. Legacy data is not defined in this standard (see Figure 2 — Overview of BaseDTC and DID ranges Page 0 and 1).

b) A “unified” data set which includes all standardised data and DTCs used in electronic systems required to be compliant to an applicable GTR module. Unified data is defined in this standard (see Figure 2 — Overview of BaseDTC and DID ranges Page 2).

c) A “manufacturer” data set which reserves a certain range for all vehicle and system supplier defined data and DTCs used in electronic systems to meet the manufacturer's system life cycle requirements. Manufacturer data is not defined in this standard but is recommended to be scaled as unified data (see Figure 2 — Overview of BaseDTC and DID ranges Page 10).

Figure 2 — Overview of BaseDTC and DID ranges provides the layout of available data ranges.

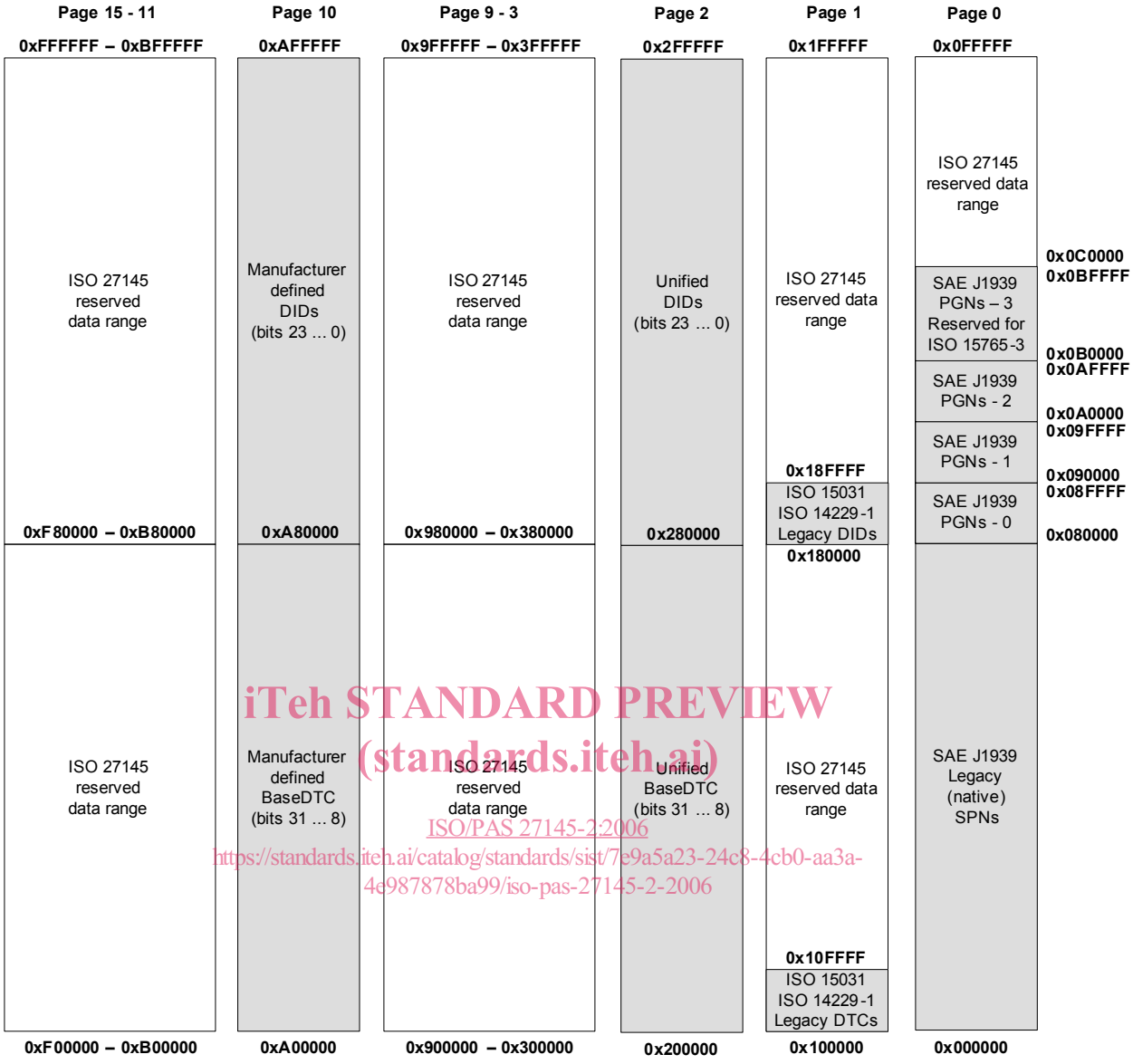


Figure 2 — Overview of BaseDTC and DID ranges

The data range layout is based on a Unified Data and Component (DTC) Identifier concept which uses the identical page select encoding and differentiation between “BaseDTC” and “DataID” category.