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Railway applications — Technical documents

Part 4: Data exchange

National foreword

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Contents

Page

European foreword.....	4
Introduction	5
1 Scope	6
2 Normative references.....	6
3 Terms and definitions	6
4 Symbols and abbreviated terms	7
5 Administration of distributed information	7
5.1 General.....	7
5.2 Parties	7
5.3 Transfer organization	8
5.3.1 General.....	8
5.3.2 Configuration Management.....	9
5.3.3 Rules for Data	9
5.4 Protocol	9
5.5 Shipment review.....	10
6 Data Model.....	10
6.1 General.....	10
6.1.1 Structure of Data Model.....	10
6.1.2 Units	13
6.1.3 Dates	14
6.1.4 Languages	14
6.1.5 Organization identification	14
6.2 Data tables	14
6.2.1 General.....	14
6.2.2 Shipment (Data Table A)	15
6.2.3 Shipment additional data (Data Table A1)	15
6.2.4 Document structure (Data Table B)	15
6.2.5 Document structure additional data (Data Table B1)	16
6.2.6 Item structure (Data Table C)	16
6.2.7 Item structure additional data (Data Table C1).....	16
6.2.8 Item (Data Table D)	16
6.2.9 Item additional data (Data Table D1)	17
6.2.10 Item-Document relation (Data Table E)	17
6.2.11 Document (Data Table F)	17
6.2.12 Document additional data (Data Table F1)	17
6.2.13 File (Data Table F2)	17
6.3 Additional data fields.....	17
6.3.1 General.....	17
6.3.2 Application	18
6.3.3 Identifier for additional data	18
6.3.4 Additional data fields by agreement.....	19
6.4 Modular data exchange.....	19
6.5 Transfer structure	19
6.5.1 General.....	19
6.5.2 XML.....	19

6.5.3	CSV.....	20
6.5.4	Checksum.....	21
7	Data quality.....	21
7.1	General	21
7.2	Rules Data Table B/B1.....	21
7.3	Rules Data Table C/C1.....	22
7.4	Rules Data Table D/D1	22
7.5	Rules Data Table E.....	22
7.6	Rules Data Table F/F1/F2.....	23
	Annex A (normative) Data tables and related appendices	24
A.1	General	24
A.2	Shipment (Data Table A).....	24
A.3	Shipment additional data (Data Table A1).....	26
A.4	Attributes for the Shipment additional data (Appendix A1)	27
A.5	Document structure (Data Table B).....	28
A.6	Document structure additional data (Data Table B1).....	29
A.7	Attributes for the Document structure additional data (Appendix B1)	30
A.8	Item structure (Data Table C)	30
A.9	Item structure additional data (Data Table C1)	33
A.10	Attributes for the Item structure additional data (Appendix C1).....	34
A.11	Item (Data Table D).....	35
A.12	Item additional data (Data Table D1).....	40
A.13	Attributes for the Item additional data (Appendix D1)	41
A.14	Item-Document relation (Data Table E)	45
A.15	Document (Data Table F)	46
A.16	Document additional data (Data Table F1).....	49
A.17	Attributes for the Document additional data (Appendix F1)	50
A.18	File (Data Table F2).....	52
	Annex B (normative) Data schema XSD	53
	Annex C (informative) Legacy data.....	71
C.1	Removed tables	71
C.2	Item type mapping	72
C.3	Mapping of EN 15016-4:2006.....	72
	Annex D (informative) Use Cases	85
	Bibliography	87

European foreword

This document (EN 15016-4:2023) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2023, and conflicting national standards shall be withdrawn at the latest by December 2023.

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

This document supersedes EN 15016-4:2006.

The main changes compared to the previous edition are listed below:

- The scope has been changed to rolling stock because this is the typical application field.
- The data model has been completely revised to simplify the data exchange by focusing on the necessary data. Data tables for additional data have been introduced to enable a scalable use of the data model.
- The purpose of the data model is the structured exchange of item data. The same data model now also supports the structured exchange of technical document data.
- Rules have been specified to ensure and to check the consistency of the data model.
- A detailed application guide has been incorporated to ensure an easy implementation.
- Because the data exchange is handled by data processing systems an example for layout for a table of documents and an example for entries in a table of documents is superfluous and has therefore been deleted.

This document is part of the standard series “Railway applications — Technical documents”, which consists of the following parts:

- EN 15016-1: General principles;
- EN 15016-2: Parts lists;
- EN 15016-3: Handling of modifications of technical documents;
- EN 15016-4: Data exchange.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

In railway business, the parties require, as part of a contract, bill of material and technical documents. To support co-operation and effective data exchange of information between customers, suppliers and partners, it is necessary to have the data exchange precisely defined.

In European directives, the term “Technical Files” is mainly used to summarize types of documents, drawings, data, reports, etc.

Three main classes of data can be distinguished:

- a) technical data and documents;
- b) maintenance data and documents;
- c) authorization documents, reports, assessments, and safety data.

This document will support the exchange of bill of material and technical documents between two parties.

The aim of this document is to improve cooperation with respect to time, quality, and costs for the whole railway sector (e.g. railway users, manufacturers, rail system operators, entities in charge of maintenance).

This document covers exclusively the specification of the data model of the data exchange process between two parties. Common project management or contractual arrangements aspects like data content or the handling of change management are not covered.

This document refers to EN, ISO or IEC standards dealing with data fields. In cases where ISO or IEC standards are not sufficiently precise, this document gives specific details. These additions to EN, ISO and IEC standards facilitate the exploitation and the administration of the data exchange.

These requirements have been drawn up in order to accommodate:

- the large variety of users;
- ease of transfer of documents;
- any specific series of documentation related to rolling stock.

1 Scope

This document specifies the data exchange of technical documents such as bill of material, technical drawings and other related technical documents for rolling stock.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 17343:2020, *Railway applications - General terms and definitions*

EN 15016-1:2023¹, *Railway applications - Technical documents - Part 1: General principles*

ISO 639-1, *Codes for the representation of names of languages — Part 1: Alpha-2 code*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 17343:2020, EN 15016-1:2023¹ and the following apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 item

subject being considered

Note 1 to entry: The item may be an individual part, component, device, functional unit, equipment, subsystem, or system.

Note 2 to entry: The item may consist of hardware, software or any combination thereof.

[SOURCE: IEC 60050-192:2015, 192-01-01, modified — Note 3 to Note 5 to entry have been deleted, in Note 2 the term people has been deleted.]

3.2 bill of materials BOM

documented formal hierarchical tabulation of the physical assemblies, subassemblies, and components needed to fabricate a product

Note 1 to entry: The BOM consists of items and therefore may include software.

[SOURCE: ISO/IEC/IEEE 24765:2017, 3.378, modified — Note 1 to entry added]

¹ Under preparation. Stage at the time of publication: prEN 15016-1:2023.

4 Symbols and abbreviated terms

OEM original equipment manufacturer

5 Administration of distributed information

5.1 General

This clause describes the organizational and administrative basics of data exchange according to this document.

Typically, the source of and target to store the exchanged data are:

- PDM (Product Data Management);
- and PLCS (Product Life Cycle Support).

Methods and tooling for retrieving the exchanged data into the receiver repository (like import tool, required mappings, etc.) are not described in this document.

5.2 Parties

From the origin of the data (OEM) to the final recipient (final customer) there can be a complex chain of multiple data shipments, in different levels (tiers) along the value chain. Within this chain there are 4 types of parties (2 dynamic and 2 static):

Static - OEM:	The original equipment manufacturer of an item/the legal owner of a document. Only one OEM is possible per item/document. If this field is empty, this is automatically the Data Supplier.
Static - Final customer:	The final recipient of the item/document (e.g. the operator of the rolling stock). It is an optional attribute, that can be added between the submissions and need to be defined by contract. The final customer is the same for all items/documents of one shipment.
Dynamic - Data Supplier:	The party that supplies the shipment Item independent shipment information
Dynamic – Data Recipient:	The party that receives the submission Item independent shipment information

Figure 1 shows examples of data shipments between four parties.

Table 1 shows the allocation of the shipment parties to the party types for the examples in Figure 1.

Party 1 is the OEM.

Party 4 the final customer.

Party 2 receives data from the OEM (shipment 1), adds the final customer information.

Party 3 receives the data from Party 2 (shipment 2).

The final customer receives data from Party 3 (shipment 4) including data from Party 2 and the OEM.

The shipment 3 shows a cyclic data exchange between party 2 and 3 with bidirectional shipments.

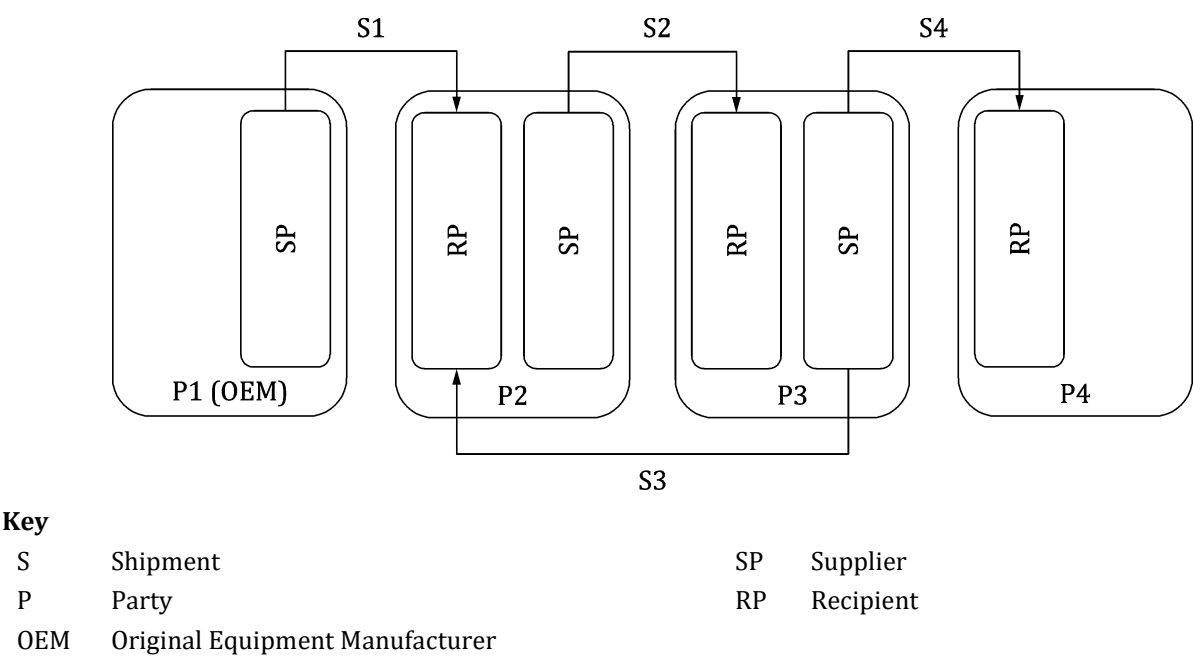


Figure 1 — Examples of shipments

Table 1 — Examples of data shipments

		Shipment 1	Shipment 2	Shipment 3	Shipment 4
Static	OEM	Party 1	Party 1	Party 1	Party 1
	Final Customer	-	Party 4	Party 4	Party 4
Dynamic	Supplier	Party 1	Party 2	Party 3	Party 3
	Recipient	Party 2	Party 3	Party 2	Party 4

5.3 Transfer organization

5.3.1 General

This exchange method is a snapshot of the contents of the design. There are no requirements about history of change management (only the valid version of each piece of information is required).

Before exchanging data, the parties should accept the scope of the exchange on each project:

- Data supplier (Organization ID);
- Data recipient (Organization ID);
- Configuration Data (Applicability);
- Technical Scope (components, sub-system, vehicles, unit, etc.);
- Languages of documents;
- Organization for document repository (Directory, media, authorized formats, etc.);
- Planning of submission;

- Identifier for parts (Numbering schemes and unicity rules);
- Common description for items;
- Data review process;
- Request for Change Management.

5.3.2 Configuration Management

The data exchanged here should be classed in as “Design Data” with the following parameters:

- Contract Identification;
- Class of Rolling Stock;
- Sub Class of Rolling Stock (if applicable);
- Effectivity (if applicable).

5.3.3 Rules for Data

This exchange data model is versatile. Extra fields may be added in the provided data tables (see 6.3).

Written rules should be exchanged between parties:

- to agree on the use of data fields with the “importance” values R (recommended) or I (informative), see 6.2.1;
- to ensure a consistent model on the non-standard requirements.

5.4 Protocol

To track every shipment, besides the data in the Shipment Data Table (see 6.2.2), a handover protocol (e.g. in pdf format) may be added to it. The format of the exchange protocol can be company specific and should contain at least the following information if applicable:

- Org ID data Supplier;
- Org ID data Recipient;
- Title of Submission;
- Top Item/ Document in Data Table B/C/D;
- Contract Reference;
- Vehicle reference;
- Date of Snapshot/ data extraction;
- Languages 1, 2, 3;
- Modules included;
- Number of files in Data Table F.

5.5 Shipment review

When the recipient checks and or imports the exchanged data, errors or quality issues can occur. Then a request for clarification\error correction can be submitted to the data supplier.

Request for clarification (RfC) should contain:

- a) Organization identification of data recipient;
- b) Request Identification (Unique Identifier of data recipient);
- c) Contract identification;
- d) Shipment date;
- e) Document identification;
- f) Document Version;
- g) Document Date;
- h) Shipment error class;
- i) Request Description.

If the data supplier accepts the RfC, the two fields (Organization Identification and Request identification) should be noted in the new data (if needed) and delivered in the relevant fields (depending on the class of notification).

Shipment error class shall contain:

- 1) Import errors;
- 2) Documents analysis and review;
- 3) Documents Breakdown analysis and review;
- 4) Items Breakdown analysis and review;
- 5) Missing items;
- 6) Missing Documents;
- 7) Shipment Consistency in table.

6 Data Model

6.1 General

6.1.1 Structure of Data Model

Starting point for the exchange model is the principle that the design of the rolling stock is represented by a structured list of items down to its most basic (i.e. lowest level) items necessary to maintain, repair or overhaul the rolling stock during its complete lifetime. This structured list of items is called the (engineering) Bill of Materials (BOM). In this document the materials are referred to as items (to not mix them up with the term material used to define the substance/raw material an item is made of).

In the data model this BOM is represented by a so-called Parent-Child relation. This means that each record of the BOM consists of a Child and its Parent. If a Parent has more than one Child, then there are as many records with that Parent as there are Children of that Parent. A Parent needs to have at least one Child. Each Child thereafter can be the Parent for a deeper level in the structure, until the lowest level in the structure is reached. So, the top of the structure is always a Parent and the lowest level is always a Child. Table 2 shows an example of a table with a Parent-Child relation. Figure 2 shows this relation in a graphical representation.

Table 2 — Example of Parent – Child relations

Parent	Child
Train set	Rail vehicle 1
Train set	Rail vehicle 2
Rail vehicle 1	Bogie 1
Rail vehicle 1	Bogie 2
Rail vehicle 2	Bogie 1
Rail vehicle 2	Bogie 2
Bogie 1	Axle 1

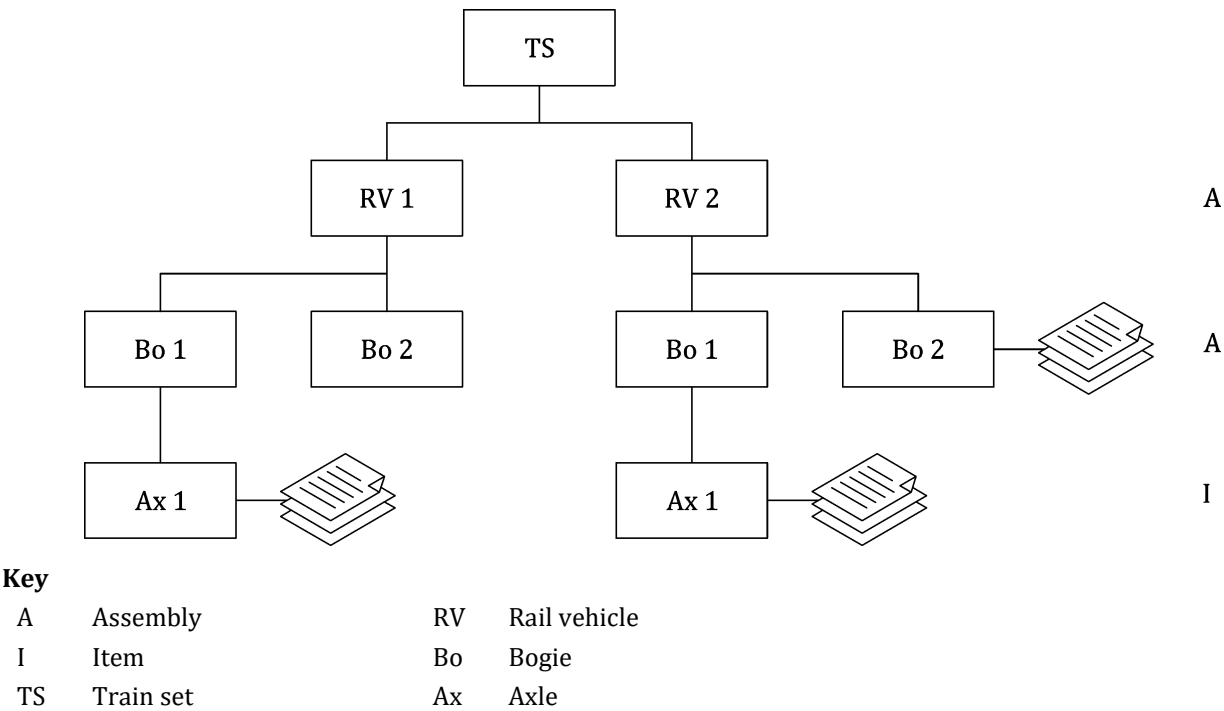


Figure 2 — Examples of Parent – Child relations

Each level in the structure shall be specified. This specification consists of features (meta data) and/or documents that are linked to the item. Each document shall be linked to the item on the level it describes e.g. the drawing of the complete assembly of the bogie shall be linked to the item for the complete bogie and the production drawing for the wheelset axle shall be linked to the item for the bare axle (see Figure 2).

However sometimes there is a need to also exchange document structures. Therefore, the model also supports this type of exchange.

Not supported is the exchange of combined structures (items and documents in one single structure) because documents can be linked to an item rather than adding them as a position in the structure. However, by exchanging both an item structure and one or more document structure(s) and linking the Parent documents to items, a relation can be built between the item structure and one or more document structure(s).

The exchange model is designed in such a way that it can enable the supplier of the data to break down the configuration out of his own data systems into logical data tables and enable the receiver of the data to rebuild the configuration in his own data systems, without loss of information.

To minimize the amount of repetitive data, the data are split up in several data tables that are linked through key-field (see Figure 3 and Figure 4).

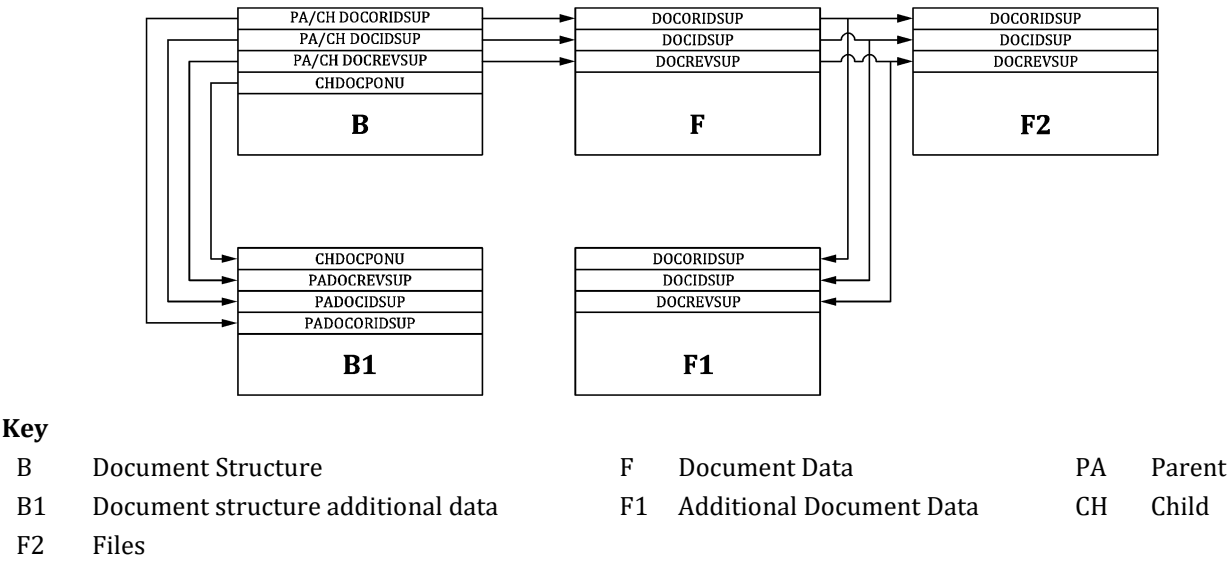


Figure 3 — Links for document structure

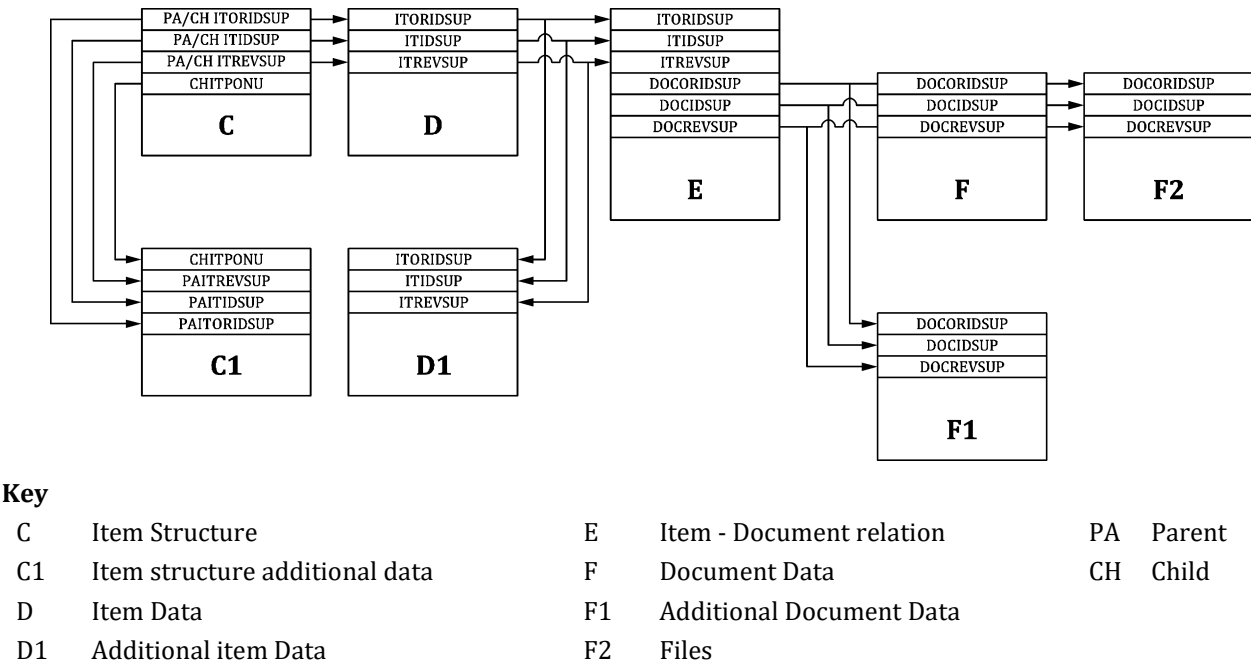


Figure 4 — Links for item structure

Also, extra attributes can be added to the different objects in the different data tables by means of additional data tables, linked to each main data table (e.g. Table A.2 (Data Table A1) with additional attributes for Table A.1 (Data Table A)).

In 6.2 all the separate data tables are described in detail.

6.1.2 Units

Basic units and their multiples for unit attributes are listed in Table 3.

If different units are required/used, these needs to be converted into/from the ones in the table in the import/export interface.

Table 3 — Basic Units and Multiples

Basic unit (short form)	Valid Multiples [m – milli; c – centi ; k – kilo]
gram (g)	mg; g; kg
meter (m)	mm; cm; m; km
litre (l)	ml; cl; l
square meter (m ²)	mm ² ; cm ² ; m ²
cubic meter (m ³)	mm ³ ; cm ³ ; m ³
piece (pcs)	pcs

6.1.3 Dates

Descriptions of the different date attributes are listed in Table 4.

Table 4 — Description of date attributes

Date	Description
Prepared Date	Date of the preparation of the document revision
Checked Date	Date of the review of the document revision (if more than one reviewer is available, the most significant one needs to be chosen)
Approved Date	Date of the content approval of the document revision
Revision Date	Date from which on the document revision is applicable and the previous revision becomes invalid. This is the only date that is kept for each party.

6.1.4 Languages

The data model can carry up to 3 languages for metadata defined in Table A.1 (Data Table A). Files and additional data can be added in languages different from the defined ones. All language codes shall consist of 2 digits according to ISO 639-1.

6.1.5 Organization identification

Each party, as defined in 5.2, shall be identified by an organization identification (ORID) in the different data tables. By means of these ORID it is possible to combine the data of several companies within a consortium without the need to use a new ITEM number from the company that is merging all the data into one shipment. In the shipment table (Data Table A) only the organization identification of the responsible data supplier for the data exchange within the consortium is specified (SHORIDSUP).

6.2 Data tables

6.2.1 General

Each data table describes the fields used to define the data of that data table. To describe these fields each data table has the same structure with several columns (see Table 5).

Table 5 — Structure of data tables

Column	Description
Field number	Number to identify a data field within a certain data table
Key field	Indicator for the fields that are used as key-field to uniquely identify a record in the data table
Field identifier	Coding to uniquely identify a field
Field name	Short description of the field in the English language
Data type	Coding for the data type of a field: C = alphanumerical, D = date and/or time, N = decimal, I = integer
Data length	Maximum length of the data in number of characters
Value space/pattern	Description of the value pattern of the data
Value source	Source for the value space/pattern
Language dependent	Indicator for language dependency of the data field Y = Yes, N = No
Importance	Indicator for the importance of a data field: C = compulsory, R = recommended, I = informative
Remark	additional information to explain the use of the data field if necessary

All data tables and their details can be found in Annex A.

6.2.2 Shipment (Data Table A)

This data table contains the delivery statistics for each data delivery. Purpose is to enable the receiver to check the completeness of the data.

For each shipment there is only one record in Table A.1 (Data Table A) with only one data supplier (the data supplier that is responsible for the shipment, other data suppliers however can be used in the different data tables, see 6.1.5), one data recipient (party receiving the shipment) and one final customer. The parties in the data exchange are defined in 5.2. For details, see Table A.1.

6.2.3 Shipment additional data (Data Table A1)

This data table is used to specify additional attributes for the shipment information in Data Table A. Each record in this data table consists only of one attribute. For each shipment there can be several records in this data Table (1:n relation with Table A.1 (Data Table A)). The data are linked to Data Table A by the Shipment Date (SHDAT). For details, see Table A.2.

In the related Appendix A1 (for details, see Table A.3) some possible attributes are described. Besides these attributes this data table also gives the possibility to add more attributes that are part of the contract between supplier and customer.

6.2.4 Document structure (Data Table B)

This data table contains the information to build a document structure. It is based on the Parent-Child structure as explained in 6.1.1. To uniquely identify the Parent and Child in the structure they are identified by their ORID, ID and Revision. Each record also contains information that is specific to that position in the structure (Position number and designation code). For details, see Table A.4.

This is in contrast to the information that is specific for the document itself, which can be found in Table A.14 (Data Table F) and Table A.15 (Data Table F1).

It is possible to exchange separate structures in one shipment in Data Table B. In that case all the top nodes of the different structures need to be defined in Table A.2 (Data Table A1: Shipment additional data) by means of the top node attribute in Appendix A1 (for details, see Table A.3).

6.2.5 Document structure additional data (Data Table B1)

This data table is used to specify additional attributes for document structures. It is intended for attributes that are only valid for certain documents structure records. Each record in this data table consists only of one attribute. For each document structure record there can be several records in this data Table (1:n relation with Table A.4 (Data Table B)). The data are linked to Data Table B by the Parent ORID, ID, the Revision and the Child Position number. For details, see Table A.5.

In the related Appendix B1 some possible attributes are described (for details, see Table A.6). Besides these attributes this data table also gives the possibility to add more attributes that are part of the contract between supplier and customer.

6.2.6 Item structure (Data Table C)

This data table contains the information to build the Bill of Materials (BOM, actually: the bill of items within the terminology of this document). It is also based on the Parent-Child relation. To uniquely identify the Parent and Child in the structure they are identified by their ORID, ID and Revision. At a certain level, the list of subordinated children is also often referred to as the parts list for an assembly (the parent). Each record also contains information that is specific to that position in the structure (e.g. Position number or designation code). This in contrast to the information that is specific for the part itself, which can be found in Table A.10 (Data Table D) and Table A.11 (Data Table D1).

Normally within a parts list, the position number is unique. However, in case of an interchangeable part, these parts can have the same position number within the Parent-Child relation (parts list). Interchangeable parts are parts that are, for practical purposes, identical. They are made to specifications that ensure that they are so nearly identical that they will fit into any assembly (Parent) of the same type. One such part can freely replace another, without any custom fitting (Form Fit Function equally). For details, see Table A.7.

It is possible to exchange separate structures in one shipment in Table A.7 (Data Table C). In that case, all the top nodes of the different structures need to be defined in the Table A.2 (Data Table A1) (Shipment additional data) by means of the top node attribute in Appendix A1. For details, see Table A.3.

6.2.7 Item structure additional data (Data Table C1)

This data table is used to specify additional attributes for item structures. It is intended for attributes that are only valid for certain item structure records. Each record in this data table consists only of one attribute. For each item structure record there can be several records in this data Table (1:n relation with Table A.7 (Data Table C)). The data are linked to Data Table C by the Parent ORID, ID, the Revision and the Child Position number. For details, see Table A.8.

In the related Appendix C1 (for details, see Table A.9) some possible attributes are described. Besides these attributes this data table also gives the possibility to add more attributes that are part of the contract between supplier and customer.

6.2.8 Item (Data Table D)

This data table contains all the relevant metadata for each item that is used in the item structure (Data Table C). Purpose of the metadata are to uniquely identify and specify an item. Each item revision can only have one occurrence in the data table. Furthermore, each item revision in this table should have at least one occurrence in the BOM (Data Table C). For details, see Table A.10.

An important field in this data table is the Item Type (field 18). The value in this field determines for some attributes in this data table if they are compulsory and also for some additional attributes from Appendix D1 (for details see Table A.12) if they are compulsory to be filled in in the Data Table D1 (Item addition data).

6.2.9 Item additional data (Data Table D1)

This data table is used to specify additional attributes for items. It is intended for attributes that are only valid for certain items. Each record in this data table consists only of one attribute. For each item therefor there can be several records in this data Table (1:n relation with Table A.10 (Data Table D)). The data are linked to Data Table D by the ORID, ID and revision of the item. For details, see Table A.11.

Some attributes are mandatory for certain types of items, based on the item type for the item (ITTY in Data Table D). In the related Appendix D1 (for details see Table A.12) the relation between the item type and the mandatory attributes can be found.

Besides the attributes of Table A.12 (Appendix D1) this data table also gives the possibility to add more attributes that are part of the contract between supplier and customer.

6.2.10 Item-Document relation (Data Table E)

This data table links the documents of Table A.14 (Data Table F) to the items of Table A.10 (Data Table D). The document and the item are identified by their ORID, ID and Revision. For details, see Table A.13.

6.2.11 Document (Data Table F)

This data table contains all the relevant metadata for each document that is used in the document structure (Data Table B) or the Item-Document relation (Data Table E). This metadata should be consistent with the information on the physical drawings as specified in EN 15016-1¹. Purpose of the metadata are to uniquely identify and specify the document. Each document shall only have one occurrence in Table A.14 (Data Table F). Furthermore, each document in this data table should have at least one occurrence in the document structure (n:1 relation to Table A.4 (Data Table B)) or item-document relation (n:1 relation to Table A.13 (Data Table E)). For details, see Table A.14.

6.2.12 Document additional data (Data Table F1)

This data table is used to specify additional attributes for documents. It is intended for attributes that are only valid for certain documents. Each record in this data table consists only of one attribute. For each item therefor there can be several records in this data Table (1:n relation with Table A.14 (Data Table F)). The data are linked to Data Table F by the ORID, ID and Revision of the document. For details, see Table A.15.

In Appendix F1 (for details see Table A.16) some possible attributes are described. Besides these attributes this data table also gives the possibility to add more attributes that are part of the contract between supplier and customer.

6.2.13 File (Data Table F2)

This data table contains all the information to specify the physical files for the documents defined in Table A.14 (Data Table F). The relation to Data Table F is made by the ORID, ID and Revision of the document. It is a 1:n relation as there can be more files (e.g. several languages or file types) linked to one document. For details, see Table A.17.

6.3 Additional data fields

6.3.1 General

To enable scalable use of the data model, flexible elements are provided that can be filled with additional data fields. These are data tables that store data as a key-value pair.

There is an Appendix for each of these flexible data tables (Appendices A1, B1, C1, D1 and F1 in Annex A). The contents of these fields can optionally be included. It is also possible to define and add further data fields. In this way, new or special requirements for a shipment can be provided. The uniqueness of the attribute key within one data table is compulsory. Within different data tables the identifier can be the same if the meaning is identical.

6.3.2 Application

For each of the data tables A, B, C, D and F there is a data table for the flexible data fields and an additional Appendix with the description of the data fields that can be used. Together, these three elements form a set.

Example:

- Data Table B (Document structure): Containing the default data fields to be supplied;
- Data Table B1 (Document structure additional data): Containing the additional data fields to be supplied;
- Appendix B1 (attributes for the Document structure additional data): Description of the data that can be supplied with the data Table B1 (Document structure additional data).

The structure of the data table for the flexible data fields is always the same:

- The first fields are used to identify the data set;
- The last four fields represent the value to be transferred and are always:
 - attribute identifier (the key of the value to be transferred);
 - language code;
 - attribute value (the value to be transferred);
 - line number.

Comment: The line number can be used for transferring text lines as additional data, but also for more than one value for a certain additional attribute (e.g. Several applicable standards, or certificates).

6.3.3 Identifier for additional data

The identifiers which can be used are described in Appendices for each data table. Structure of Appendices:

- field identifier: The key name for the value to be transmitted;
- field name: Name of the field identifier;
- data type: Coding for the data type of a field: C = alphanumeric, D = date and/or time, N = decimal, I = integer;
- data length: Maximum field length for the value to be transmitted;
- value space/pattern: description of the value pattern of the data;
- value source;

- language dependent: Boolean (Y/N), whether the value to be transmitted is language-dependent;
- definition/remark: specifications and additional information if necessary.

6.3.4 Additional data fields by agreement

To transfer further data fields not previously considered in standard series EN 15016, the appendix can be optionally expanded in agreement with data supplier and data recipients. To do this, another line according to the pattern (see 6.3.3) in the Appendix related to the respective data table for additional data shall be added.

6.4 Modular data exchange

The data exchange model is generally modular, this means all combinations that are logically linked by linking attributes are allowed. It shall be agreed by contract, which modules shall be submitted. Shipment Data Table A shall always be part of the shipment (see also Annex D).

Data Table B1, Data Table C1, Data Table D1 and Data Table F1 may be left out if there no entries.

6.5 Transfer structure

6.5.1 General

The logical structure of the data model, the transferable attributes, and the description of the values to be transferred therein are organized in data tables (see Annex A). To exchange the data, these data tables shall be transformed into a transfer format. The transfer format specifies how the data shall be delivered to the recipient. The result is a data export from the suppliers' data processing system, which can be imported in the recipient's data processing system. To ensure a data exchange across data processing systems and enabling the implementation of possible interfaces between data processing systems, XML and additionally CSV are defined as a transfer format.

6.5.2 XML

XML is a text-based data format that transports the information within marked areas (tags).

A tag always starts and ends with a pointed bracket. The closing tag is preceded by a slash to the first bracket. In between is the associated value.

- Example: <datafieldname>my data value</datafieldname>

Empty fields are simply transferred without a data value or marked directly as an empty field.

- Example: <datafieldname></datafieldname> or <datafieldname/>

This allows XML data to be opened in an editor and read and edited by people. Computers can also read and write the XML format.

Tags can also be nested in each other. In this way, hierarchy is mapped.

If necessary, a tag can have one or more parameters.

- For example, < tag parameter1 = "P1" parameter2 = "P2" > Data Value</tag>.

Parameters always consist of a name and a value. The value is enclosed with a double quotation mark and assigned with an equal sign.

Parameters are additional information for processing the data value passed in this tag.

The structure of the XML is described in the corresponding XSD file, with which different systems can automatically recognize and process the XML structure to be depicted.

Alternatively, the XML can also be constructed using the documentation in the Annex B.

The allowed values and formats within the tags are included in the documentation of the data tables in the Annex A.

XML is described as an exchange format XSD in Annex B.

6.5.3 CSV

In addition to XML, the structure of CSV is also defined as a transfer format.

The data exchange as CSV requires a separate TXT file to be created for each data table.

It is recommended to transfer empty tables if no flexible data fields are to be transferred. This clearly shows that no data are to be expected in this table.

The used character set is shown in Table A.1 (Data Table A: Shipment) in the SHCTSET field.

The allowed values and formats within the data fields are included in the documentation of the data tables in Annex A.

To enable the recipient to assign the files automatically, the following naming is recommended:

- Data Table A: < Own Prefix > _TabA.txt;
- Data Table A.1: < Own Prefix > _TabA1.txt;
- Data Table B: < Own Prefix > _TabB.txt;
- Data Table B.1: < Own Prefix > _TabB1.txt;
- Data Table C: < Own Prefix > _TabC.txt;
- Data Table C.1: < Own Prefix > _TabC1.txt;
- Data Table D: < Own Prefix > _TabD.txt;
- Data Table D.1: < Own Prefix > _TabD1.txt;
- Data Table E: < Own Prefix > _TabE.txt;
- Data Table F: < Own Prefix > _TabF.txt;
- Data Table F.1: < Own Prefix > _TabF1.txt;
- Data Table F.2: < Own Prefix > _TabF2.txt.

Each file is the image of its corresponding data table with columns and rows.

Separate lines / records with a line break (values 13 and 10 in ISO/IEC 8859-1).

The first line consists of the list of the corresponding “Field identifier”.

In the order of “Field No.”, separated by tab (value 09 in ISO/IEC 8859-1).

With the second line, the data to be transferred follows.

In order according to the corresponding “field identifier” from the first line, separated by tab (value 09 in ISO/IEC 8859-1).

Empty fields should be generated without value but with tab (value 09 in ISO/IEC 8859-1).

6.5.4 Checksum

The checksum is a value that can be used to verify the integrity of data after data exchange. Basically, a checksum is a value calculated from the initial data that allows to detect at least one-bit error in the data. The calculated checksum is transmitted by the supplier together with the data. The recipient can now determine the checksum from the received data using the same procedure and compare it with the expected checksum of the supplier. If both checksums differ, there is a transmission error. If the two checksums are the same, the message is likely to have been transmitted correctly.

There are several methods for determining checksums (e.g. MD5). If the supplier provides the recipient with a checksum, it can announce the selected method in the SHCSME field of Data Table A1 (Shipment additional data). The determined checksum can optionally be transferred in the SHCSSH field of the same Data Table A1 or separately.

7 Data quality

7.1 General

To ensure the consistency of the data the following rules shall be followed.

7.2 Rules Data Table B/B1

Data Table B:

- B.1 Every parent document (PADOCORID-PADOCID-PADOCREV combination) also shall be a child document (CHDOCORID-CHDOCID-CHDOCREV combination) on a higher level, except for the top document(s) of the structure(s), defined as the top nodes attribute in the shipment additional data (Data Table A1).
- B.2 Every unique document (PADOCORID-PADOCID-PADOCREV combination and CHDOCORID-CHDOCID-CHDOCREV combination) also shall exist in Data Table F.
- B.3 The position number (CHDOCPONU) for a Child document within a Parent shall be unique.
- B.4 The position number (CHDOCPONU) shall not be empty.

Data Table B1:

- B1.1 Every Document-Position number (PADOCORID-PADOCID-PADOCREV-PONU combination) in Data Table B1 shall exist in Data Table B.

7.3 Rules Data Table C/C1

Data Table C:

- C.1 Every parent item (PAITORID-PAITID-PAITREV combination) also shall be a child (CHITORID-CHITID-CHITREV combination) on a higher level, except for the top item(s) of the structure(s), defined as the topnodes attribute in the shipment additional data (Data Table A1).
- C.2 Every unique item (PAITORID-PAITID-PAITREV combination and CHITORID-CHITID-CHITREV combination) also shall exist in Data Table D
- C.3 The position number (CHITPONU) for a Child item within a Parent shall be unique for non-interchangeable parts. Parts with the same position number shall be interchangeable (Form Fit Function, see 6.2.6.).
- C.4 Generally, the position numbers in the item structure submitted in Data Table B and Data Table C shall match with information in files (physical document) submitted with Data Table F.

For special purposes (e.g. spare parts allocation to a certain system/ component) on lowest level (see 6.1.1), following exceptions are allowed:

- Metadata are not existing for non-relevant parts, even though they are mentioned on the file (physical document);
- Parts that are not mentioned on the file (physical document) can be added to the item structure with a position number not being present on the file (physical document).

Data Table C1:

- C1.1 Every Item-Position number (PAITORID-PAITID-PAITREV-PONU combination) in Data Table C1 shall exist in Data Table C.

7.4 Rules Data Table D/D1

Data Table D:

- D.1 Every item (ITORIDSUP-ITIDSUP-ITREVSUP combination) in Data Table D shall exist in the structure in Data Table C (Child or top Parent).
- D.2 Every item (ITORIDSUP-ITIDSUP-ITREVSUP combination) shall only have one occurrence in Data Table D.

Data Table D1:

- D1.1 Every item (ITORIDSUP-ITIDSUP-ITREVSUP combination) in Data Table D1 shall exist in Data Table D.

7.5 Rules Data Table E

Data Table E:

- E.1 Every item (ITORIDSUP-ITIDSUP-ITREVSUP combination) in Data Table E shall exist in Data Table D.
- E.2 Every document (DOCORIDSUP-DOCIDSUP-DOCREVSUP combination) in Data Table E shall exist in Data Table F.

7.6 Rules Data Table F/F1/F2

Data Table F:

- F.1 Every document (DOCORIDSUP-DOCIDSUP-DOCREVSUP combination) in Data Table F shall be part of the structure in Data Table B (when used) or Data Table E (when used).
- F.2 Every document (DOCORIDSUP-DOCIDSUP-DOCREVSUP combination) shall only have one occurrence in Table F.

Data Table F1:

- F1.1 Every document (DOCORIDSUP-DOCIDSUP-DOCREVSUP combination) in Data Table F1 shall exist in Data Table F.

Data Table F2:

- F2.1 Every document (DOCORIDSUP-DOCIDSUP-DOCREVSUP combination) in Data Table F2 shall exist in Data Table F.
- F2.2 Data on file shall be the same as in the metadata.
- F2.3 Every filename (FLNM) shall only have one occurrence in Data Table F2

Annex A (normative)

Data tables and related appendices

A.1 General

This annex provides the detailed documentation of the data tables and the detailed documentation of the appendices for the data tables for additional data described in 6.2.

The Field identifiers are based on the Field name in the English language. To maintain the exchangeability of the data model the Field identifiers and names need to be kept in the English language. In the translated versions of this document, the translations are therefore added between brackets after the English text.

Table A.1 to Table A.17 show all details of the data tables described in 6.2.

A.2 Shipment (Data Table A)

Table A.1 — Shipment (Data Table A)

A_Shipment										
Field no.	Key field	Field identifier	Field name	Data type	Data length	Value space / pattern	Value source	Language dependent	Importance	Remark
1		SHORIDSUP	Shipment organization identification of data supplier	C	78	4 "/" 35 ["/" 35 "/" 1]	ISO/IEC 6523-1	N	C	The 2 elements ICD and OID with together max. 40 characters are compulsory.
2		SHORIDRCP	Shipment organization identification of data recipient	C	78	4 "/" 35 ["/" 35 "/" 1]	ISO/IEC 6523-1	N	C	See field no 1
3		SHORIDFC	Shipment organization identification of final customer	C	78	4 "/" 35 ["/" 35 "/" 1]	ISO/IEC 6523-1	N	C	See field no 1
4		SHCOID	Shipment Contract identification	C	20			N	I	Contract or project no. of the order (customer)
5	x	SHDAT	Shipment date	D	15	YYYYM MDDT hhmm ss	ISO 8601-1	N	C	
6		SHNUADSH	Shipment number of additional shipment records	I	7			N	C	number of data sets in Data Table A1

A_Shipment										
Field no.	Key field	Field identifier	Field name	Data type	Data length	Value space / pattern	Value source	Language dependent	Importance	Remark
7		SHNUDOCST	Shipment number of document structures records	I	7			N	C	number of data sets in Data Table B
8		SHNUADDOCS	Shipment number of additional document structures data records	I	7			N	C	number of data sets in Data Table B1
9		SHNUITST	Shipment number of item structures records	I	7			N	C	number of data sets in Data Table C
10		SHNUADDITS	Shipment number of item structures additional data records	I	7			N	C	number of data sets in Data Table C1
11		SHNUIT	Shipment number of item records	I	7			N	C	number of data sets in Data Table D
12		SHNUADIT	Shipment number of additional item data records	I	7			N	C	number of data sets in Data Table D1
13		SHNUDOCITRL	Shipment number of document-item relation records	I	7			N	C	number of data sets in Data Table E
14		SHNUDOC	Shipment number of documents records	I	7			N	C	number of data sets in Data Table F
15		SHNUADDOCS	Shipment number of additional document data records	I	7			N	C	number of data sets in Data Table F1
16		SHNUFL	Shipment number of file records	I	7			N	C	number of data sets in Data Table F2
17		SHCTSET	Shipment character set	C	25		EN 82045-2:2005, A.4.25.10	N	C	predefined value of character set
18		SHDECSI	Shipment decimal sign	C	1	“,”; “.”	EN ISO 80000-1	N	C	Either comma on the line or point on the line