

Datenaustauschrichtlinie

Data Exchange Guideline
of the Department Mechanical Design

Part 1: Basis Document

Procedures for machine construction internal / external

Document Information

Rev.-status	Created	Date	Change / Comment
0	R. Lotz	07.01.2013	---
A	R. Lotz	28.02.2013	Page 3: Introduction not to apply, two columns in the chart escaped
B	R. Lotz	26.11.2015	div. text adaptations in the document / amendments in the chapters: 6.2, 6.5, 8 / chapter 9.1 added

Responsibility

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Relevant Documents

- Design Guideline (KRL of the Department Mechanical Design)

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1 General

1.1 Preamble

The data exchange guideline, referred to as DARL, describes the minimum requirements, which GSI, hereinafter referred to as customer, makes to design data. It serves for the coordination between the parties and shall ensure, that the transfer of design data from the field of mechanical engineering is unified and standardised. The communication processes shall be optimised in a way, that reworking can be avoided or reduced to a minimum. The aim is to reach a high data quality in a homogeneous form (e.g. for master data, data formats, etc.), and to form the processes comprehensible, e.g. approvals.

Area of Application

The modalities, described here, are valid for the field of design of mechanical engineering; they are valid for the customer and the contractor likewise.

1.2 Basics and Requirements

In the field of design of mechanical engineering the whole development of components is based on the creation of 3D-models (see design guideline). In order to use incoming documents effectively at GSI, it is necessary to have a minimum of master data of each 3D-model, each derived 2D-model, parts list and other documents, as well as their release status. It is premised, that the contractor is able to create and to deliver neutral-formats of the models and of all other documents, which must be substituted. The delivery of the data in the respective native-format and in the neutral formats, which are claimed in part 2 of this guideline, is part of the minimum requirements, which have to be fulfilled.

When information, models, drawings and other documents, which have been passed from the contractor to the customer, are marked as „approved“, they are binding.

In line with the assigned matter the contractor must inform the customer about the intermediate results (status: “for information“). It must be agreed upon, which information to which point of time must be forwarded as intermediate results by the contractor.

2 Project Management

Each project member has the responsibility for the quality of his work results. The contractor has to make sure, that all delivered data and documents fulfil the minimum requirements. These minimum requirements must be taken from the document at hand, applicable specifications, norms and guidelines, the design guideline and, if so, other necessary papers.

2.1 Administrative Data

In order to have a reliable communication, the customer lists relevant persons in charge and their contact details. Analogue to this the relevant persons in charge of the contractor have to be named.

Further information should be taken from part 2 of this guideline.

Note

If there are any problems, the relevant persons in charge have to be contacted directly. The contractor commits himself to inform the customer directly about changes in contact persons, timetables and other administrative data.

2.2 Project Language

The common project language is "German" in general. Deviances from this must be agreed upon in written form, which can be done in part 2 of this guideline.

The agreed project language is valid for the intermediate results of the technical documentation (calculations, tests, etc.) and for all administrative information, all further documents and for the communication respectively correspondence between the parties.

Note

Master data, parts lists, models and deduced drawings, as well as the final project documentation have to be made in the agreed project language.

2.3 Proofs and Explanations

The contractor has to care self-dependent for all necessary and/or agreed proofs and explanations (e.g. CE-declaration of conformity, risk assessment, etc.). He has to deliver the proofs respectively explanations to the customer with the transmission of the released design data at the latest.

2.4 Norms / Guidelines / Conditions

Due to judicial basic conditions, the parties must adhere to/consider different norms, guidelines and conditions, amongst others accordant to the state of the art.

The selection and purchase of the documents, that have to be considered, is the task of the contractor.

In case of doubt the contractor must arrange things with the customer.

3 Partner Models

There are different partner models between customer and contractor. Relevant for the data exchange, described here, are partners (contractors) with documentations and data from the field of mechanical engineering like:

► service providers for design

Scope of delivery: Complete design- data/papers according to design guideline
(interchange format and native data)

Partner: Engineering office or contractors with comparable business activities

► production company incl. services for design

Scope of delivery: Complete design- data/papers, documentation of production (etc.) according to design guideline (interchange format and native data) and relevant components

Partner: Providers, who design and produce specific components, if so in the function of a “general contractor” with relevant sub-contractors or with a comparable business activity

In-kind providers in the context of the FAIR project are allocated to one of the partner models above, according to their contribution.

4 Project Phases

The information and documents, that have to be exchanged, are dependent on the current project phase, in which the cooperation is just now.

Below the project phases up to the implementing are shown schematically. The presentation makes no claim to be complete. It just serves for orientation and classification of the requirements for data exchange and requirements for documents.

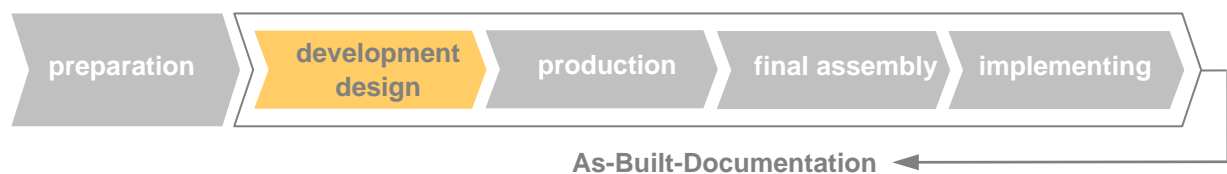


Figure 1 Project Phases and Documentation

In the preparatory stage the customer chooses and authorises the contractor. Besides the concept development and the cost evaluation, the communication incl. the data exchange according to the data exchange guideline at hand is made in this phase.

The development phase and design phase (mechanical engineering) form the focus, as defined by the data exchange guideline at hand.

In the phase of production respectively factory assembly the production of the components is made according to the compiled data and documents.

After delivery and approval of the components the final assembly is made. An anew quality test ensures the interaction of the originated assemblies before the final inspection and implementing.

As-Built-Documentation

The As-Built-Documentation is potentially differing from the „original-/ideal-planning“. But because this represents the real situation locally, it is a very important and necessary step of the documentation.

During the phases of production, installation and the following operation all changes have to be determined and transferred into the As-Built-Documentation. This documentation may include new/more essential approvals, which are necessary for a sure and permitted operation.

Depending on the individual assignment, the contractor must generate an As-Built-Documentation on the basis of the state of approval of the craft, which has to be generated.

5 Document Requirements

The document requirements are listed below, which are necessary for an efficient data exchange between the parties and which ensure the further processing at the customer.

5.1 Master Data Sheets of the Documents

It is necessary for the realization of the internal processes to inscribe all master data into the corresponding master data sheets of the document. The master data sheets of the document, which have to be generated by the contractor, must be filled completely. That means, that some information, which partly has already been enlisted in parts lists (e.g.), have to be specified again in a summarised form. Without the relevant master data sheet of the document the design data and documents cannot be accepted by the customer. In that case the complete transferred documents will be rejected, in order to complete the papers. Thus the master data sheet of the document is sort of a "bill of delivery" of the documents, papers and their files. For the contractor it also serves as a check list to control the completeness and the status of the scope of delivery. For the customer the master data sheet of the document is amongst others the basis for adding the scope of delivery into the internal systems.

Note

In addition to the data exchange one has to keep in mind, that documents, which have been released by the customer, must be given to the customer as a signed print-out (single copy), for the internal approval.

You can take further information to the scope of delivery of the papers in hardcopy form from the current design guideline.

The following figure shows the basic structure of the master data sheet of the document.

► master data sheet of the document: see the following side

The following information must be enlisted into the master data sheet of the document:

<ul style="list-style-type: none"> ▪ The complete address of the contractor and his contact details ▪ Recipient and contact person at the customer ▪ Responsible contact person at the contractor concerning questions ▪ Order number of the customer ▪ Date of delivery of the data files 															
Nr.	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	Remark
1.							PDF/A								
2.							PDF/A								
3.							PDF/A								

- ① **Document type** (drawing / parts lists / instruction manual / declaration of incorporation / ...)
- ② **Document number / drawing number**
- ③ **Rev.-status** (change index) of the document
- ④ **Name** (drawing- / component- / document-name)
- ⑤ **Type of component** (individual component or assembly)
- ⑥ **Foliation** ... of the drawing / parts list / instruction manual / declaration of incorporation / ...
- ⑦ **Delivered format of handing over** (files)
(shared check list data exchange guideline part 2 >>> native format and neutral format)
- ⑧ **Release status** of the documents / files
(state of delivery at the contractor: ONLY FOR INFORMATION or RELEASED)
- ⑨ **Draftsman** (person in charge at the contractor)
- ⑩ **Processing date** (at the contractor)
- ⑪ **Inspector** (optional/testing person at the contractor)
- ⑫ **Test date** (optional)
- ⑬ **Approving authority** (authorised, approving person at the contractor)
- ⑭ **Date of release** (date of the release by the approving person at the contractor)

Figure 2 master data sheet of the documents – basic structure

If it is relevant, you have still to do the following inscriptions bindingly:

- Change number (number of the notification of change)
- Weight of the component (at least if it is relevant for mounting or transport)

All details for carrying out the master data sheets of the documents must be agreed upon between contractor and customer at the beginning of the collaboration.

5.2 Execution of the Parts List

The contractor has to deliver parts lists to the customer for every assembly. Parts lists are administered as additional documents to the CAD-models by the customer. It is not allowed to deliver the parts lists integrated for use in the drawing. The parts list must always be administered carefully and has to be consistent with the corresponding 3D-model / the 2D-drawing. The file formats (native / neutral), to be maintained here, have to be taken from chapter 8.

5.3 Numbering of the Document / Drawing

In assigning drawing numbers there are different possibilities:

► System of Drawing Numbers of the Customer (GSI)

Internally the customer uses a system of drawing numbers for design drawings, which is based upon a system. As the generation of these drawing numbers takes place dependent from a system, the use is not possible autarkical. Those contractors, who work at the customer, are allowed to use this system as a guest. Further information concerning this system of drawing numbers is to be taken from the design guideline (KRL).

► System of Drawing Numbers of the Contractor

If the contractor can show an appropriate own system of drawing numbers and if this shall be applied, the clear description of the system must be presented to the customer for testing and approval.

► Customized Solutions

If there is no appropriate system of drawing numbers available at the contractor, customized solutions may be arranged. Thus the customer can e.g. provide a system of drawing numbers or the drawing number of the "delivery component" (complete assembly). Furthermore the contractor can be committed to work out a functional system of drawing numbers and to present it to the customer for testing and approval.

Note

Before starting the activities it must be agreed upon in written form between the customer and the contractor, which solution is to be used in individual cases.

6 Data Exchange Process

The exchange of data takes place according to modalities, which must be defined between customer and contractor. Regardless of this the contractor has to inform the customer always about every progress, all deviations (e.g. geometrical), interfaces to other components, and every temporal delay. He must do this self-contained.

In this chapter common requirements for the transfer of information, that is relevant for the project, are described. In particular it is about the documents (files), which are constructional relevant.

6.1 Method of the Data Transfer

Up to an implementation of a data exchange platform (or the like) the transfer of design data and production data/documents takes place according to a data exchange process, which must be fixed in written form between contractor and customer analogous to the principle as follows:

Recommended Sequence

1. Preparation of the data

- Create the master data sheet of the document
- Complement the documents with master data and information about level of maturity
- Conversion of the data into the allowed neutral formats
- Internal quality test of the data
- Check of the documents for viruses

2. Transmission to the customer

- Transmission according to the agreed transmission method

3. Transfer and logging

- Logging of the data transfer and information about the data input by the customer (There must be agreed upon a process up to the implementation of a data exchange platform.)

4. Quality test

- Testing the data quality and the completeness according to agreements and if necessary sending a protocol of faults to the partner

5. "Download"

- Carried out and accounted for by the customer
- Download respectively checking in of the data at the customer

6. Test and approval

- Test of the data concerning quality and the possibility for installation
- When the test was successful, the approval of the data is done by the customer.

Analog, the transfer of the documents from the customer to the contractor is carried out.

6.2 Data Exchange Platform

You find the schematically shown data exchange process below:

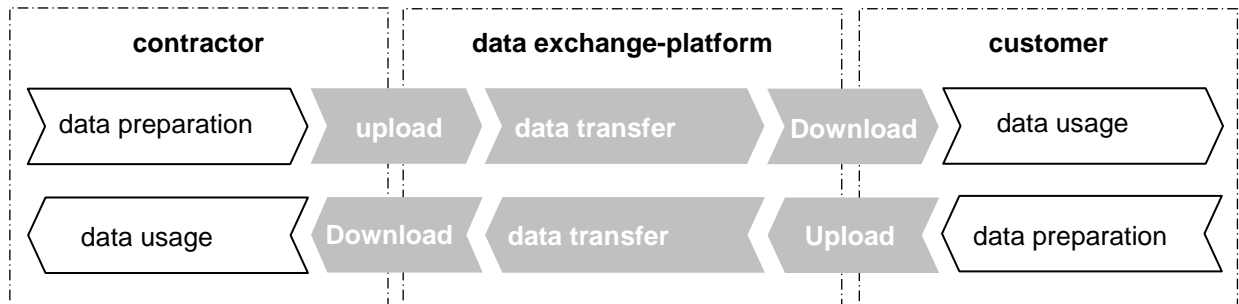


Figure 3 data exchange process (schematical)

“EDMS“ (Cern Engineering and Equipment Data Management Service) is applied as data exchange platform at GSI / FAIR. At the beginning of order the necessary modalities for data exchange will coordinate with customer.

6.3 Medium of the Data Transfer

The transfer of information and design data is generally done digitally in the specified formats encoded (HTTPS) via internet (TCP/IP-protocol).

Drawings in paper mould, in CDs, DVDs, or other media are only allowed according to prior agreement in special cases and always just in addition to a digital exchange via portal.

6.4 Test Data Exchange

Before the transfer of the first active data according to the agreed processes, test data are generally transferred appropriate to individual agreements. In doing so also the functionality of the quality assurance system and the conversion mechanism are firstly tested by means of test data.

6.5 Release Labeling

All documents and components, which are transferred to the contractor, must always be labeled as “approved“ or not approved (“for information“) clearly. The labeling is done in (on) the documents and in the document of the master data sheets. After the papers are labeled as approved by the contractor, they run through an internal process of order approval and of release at the customer.

Data files, which are only transferred for information (e.g. agreed intermediate results), do not underlie any explicit approval and serve for the common coordination in the process of development and design. In case of repeated data import, the files, which are in work (not released), are overwritten. Thus the contractor has to add a list, which clearly shows, which files were modified.

6.6 Quality Control

Quality criteria for the data of development partners are agreed upon on conclusion of the contract. The contractor is bound to carry out appropriate steps for quality assurance in order to keep agreed quality criteria. This has to be done self-reliant before the transfer of data to the customer. In case of insufficient quality after (and before) the data conversion, the contractor is bound to provide the data again, immediately and with the agreed quality. The customer informs the contractor immediately about deficient quality of the data. The information contains the notes for the reasons of the refusal.

Examples for deficient quality, which can cause a refusal:

- forbidden file formats
- file names do not meet the guideline (see chapter 9)
- missing parts lists, drawings, master data
- missing neutral formats
- missing respectively incompatible conversions
- default of appropriate demands from the design guideline (KRL)

6.7 Change Process

The contractor is informed about change processes separately.
The revision status of the data and documents must be documented comprehensibly.

7 Tools und Systems

The preferred systems of the customer and the details of the contractor, which are described in this chapter, serve for mutual information. If tools and systems deviate, necessary consulting and adaptations, as well as potential error sources, become apparent quickly. The customer does not provide any systems in principle. An exception may be the provision of a data exchange platform (portal).

The tools and systems, which are applied currently by the contractor, must be named according to part 2 of this guideline.

7.1 Means of Communication

The common means of communication for mutual agreements are e-mails, fax and telephone. According to part 2 of this guideline both the customer and the contractor have to name their e-mail-addresses, fax- and telephone-numbers to the contact persons.

7.2 CAD-Systems

The customer works with CATIA V5 of the company Dassault Systèmes. Preferably this CAD-system is to be used for the design of mechanical engineering also at the contractor.

For the operation of CATIA V5 the customer can provide starting models. These starting models must then be used obligatory at the contractor.

In those cases, when CATIA V5 cannot be worked with, other 3D-CAD-systems can be used. The CAD-systems, which are deployed by the contractor, are binding during the period of the project. Deviations require the approval of the customer. If a change of the version or an update is planned, the customer must be informed early enough before the change, and the further proceeding must be agreed upon.

Note

The customer uses EPLAN for the electrical/electronical design.

7.3 CAE-Systems

The customer works with ANSYS for the field of FEM. If the contractor needs information about further CAE tools (simulation, calculations, tests), which are used at the customer, he can ask for these. In particular this is the case, when information from such systems must be delivered by the contractor.

7.4 PLM-System (mySAP™ PLM / SAP-CDI)

The customer uses SAP CDI as PLM-system for design data internally.

7.5 Other Software

For further information like texts, spreadsheets, simple calculations, presentations, etc, MS-office-products are used at the customer. In order to guarantee a frictionless access to such information, the applied office-software must be fixed. In addition the operating systems, which are used at the contractor, must be notified for information. In the case of problems this information is mainly needed to exclude mistakes and to clarify error sources.

7.6 Network and Security

In order to safeguard the data traffic, statements about the elected transmission method and band width must be made. The contractor must make sure, that the safety of the data transfer is guaranteed. That includes the application of an up-to-date firewall, an antivirus software and the accurate handling of the access data. Before the transmission via e-mail or via other media every file has to be checked by an up-to-date antivirus software. If files are afflicted with damaged data, these elements must be deleted. The customer has to be informed immediately about the steps, which have been done. If it may be necessary in exceptional circumstances to send confidential and/or security-relevant information via e-mail or other media, one has to use certificates and cryptographic techniques. This must be agreed upon with the customer (contact person IT/data exchange). In order to provide for a safe e-mail-correspondence, the customer must be informed about used blacklists and constrictions in the size of incoming e-mails.

8 Exchange Formats and Accuracy

For the approval of a design the contractor always has to send native- and neutral-formats to the customer.

The contractor has to provide native files, even if these cannot be used by the customer directly. In order to document the status of information concerning data transfer, one has to deliver neutral-formats in addition, even if the native-data can be used directly at the customer.

An overview of the native and neutral formats is given in part 2 of this guideline.

Note

- All documents must be generated so that the data volume is minimized.
- Files must not be compressed.

While generating design-relevant documents/data, you must strictly mind, that you use file-formats, which can be handled by the customer in further process steps. In order to enable a further use of big models, e.g. in Digital-Mock-Up-processes, the models must possibly be generated and sent in several levels of abstraction (tessellations).

Examples for design-relevant documents and data:

- 3D-models
- drawings
- parts lists
- master data
- assembly instructions, production instructions
- certificates
- test protocols
- calculations
- NC-data

Where necessary, further documents, if this was contractually agreed or if it is mandatory on the basis of statutory regulations.

For checking the completeness of the documentation, the check list of part 2 of this guideline has to be used.

While files are exported from the system of the customer, parameters for recognition are written into the CATIA-models and into the subsequent STEP-files. These parameters must not be deleted or changed by the customer.

8.1 Native Formats

Native file formats are system specific, originary (mostly proprietary) formats. They can only be used in another system than the originary one after being converted (normally via neutral formats).

8.1.1 3D-Models

The customer uses CATIA V5. Thus in the native 3D-format only CAT part-files for components and CAT product files for assemblies can be provided to the contractor.

The design guideline of GSI must be considered, when generating CAD-models, if the system at the contractor allows it.

8.1.2 Parts Lists

A separate parts list, which is not integrated into the drawing, must be generated for every assembly. According to the original the contractor must generate the parts lists as MS Excel sheet. They must be transferred in any case as MS Excel-file as well as in the neutral format together with the related 3D-model and the suitable drawing.

8.1.3 Drawings

Drawings must be delivered always together with the related 3D-models. Drawings must be generated by projection of 3D-models, at which the contact between model and projection must be preserved.

The customer uses CATIA V5. Thus in the native 2D-format only CAT drawing files can be provided to the contractor.

8.1.4 Office-Documents

Written documentations must be available editable (descriptions, instructions, etc.). The same applies to relevant tables. In order to generate relevant documents, the customer uses MS Office. Office-documents must always be formatted so that they can be printed on DIN A4 or DIN A3 without adjustment.

8.1.5 CAE, Calculations, Tests

Calculations, tests, and simulation results are generally represented sufficiently, when they are transferred in a not-editable form and in the neutral format. In other cases one has to agree upon formats separately.

8.1.6 NC-Data

Modalities for the generation of NC-data und their formats must be agreed upon separately.

8.2 Neutral Interchange Formats

In either case (especially for 3D-models and parts lists) one additionally has to use neutral, i.e. standardized and unfolded file formats for the data exchange. Neutral formats must always be delivered as an addition of 3D-models, drawings, office-documents, and parts lists. Documents, which are not to be edited by the customer (e.g. certificates, papers) must be transferred only in the neutral format. Neutral formats make it possible to handle information within the systems, which are used by the customer, and they ensure the availability of information over a long period (e.g. electronic verification/ long-term backup).

The conversion into these neutral formats are taken over and answered for by the relevant originator respectively owner of a document.

8.2.1 3D-Models

See part 2 of this guideline

8.2.2 Parts Lists

See part 2 of this guideline

8.2.3 Drawings

See part 2 of this guideline

8.2.4 Office-Documents

See part 2 of this guideline

8.2.5 CAE, Calculations, Tests

See part 2 of this guideline

8.2.6 NC-Data

The generation of NC-data and their format must be looked at separately.

8.2.7 Print Data

See part 2 of this guideline

8.3 Accuracy of the Models

The contractor must always transfer the component geometry in an accurate form, which is not abstracted. In doing so the contractor must maintain accuracies, which are fixed in part 2 of this guideline. By no means the functionality of the designed components may be restricted by inaccuracies in the model, neither should the geometry deviate in a way, that interfaces cannot be used or components cannot mounted, like they were calculated.

Steps for the reduction of the amount of data must be agreed upon demand-oriented between customer and contractor.

9 Document Number Systems and Drawing Number Systems

All documents must be provided with a suitable and clearly specified numbering system. Numbering systems of the contractor or the customer can be applied here. In order to fix, which solution shall be taken, you must use part 2 of this guideline. When the method of numbering has been chosen, it must be followed for all technical documents, as long as nothing explicit differing was arranged. The contractor is in charge of the application and adherence.

Naming of the Documents

Documents, which are transferred to the customer, must generally be named clearly and descriptive. Only Latin characters are permitted. The naming²⁾ must not exceed 40 characters. The maximum length of the file naming must not exceed 100 characters. No umlaut, special character and space character may be used.

Examples of forbidden characters in the file naming: ä ü ö . : / () # \$ “ ° ! % & * ∅ ‘ ß ...

The characters at the right end of the maximum 100 characters long string are reserved for the file extensions after a „.” (dot). The allowed file extension can be taken from part 2 of this guideline.

9.1 Syntax File Naming

1	2	3	4
1 2 3 ... 25	1 2 3	1 2 3 ... 40	1 2 ... 29
1 2 3 ... 25	26 27 28 29 30	31 32 33 ... 70	71 72 73 ... 100
max. 25 characters	max. 3 char	max. 40 characters	max. 29 characters

1	Drawing Number
2	Rev. Status (change index)¹⁾
3	Naming²⁾
4	File Extension

The Syntax must always be indicated completely. The underscore (_) merely serves for separating the single blocks and may not be used otherwise.

¹⁾ Corresponds to the SAP-data field “Version“ at GSI

²⁾ Corresponds to the name of the document (naming of the drawing / description)

Example

Drawing Number	K95714-9000-000
Rev. Status	00A
Naming (Description)	Adjust-System
File Extension	CATProduct

Result of the correct file naming:

K95714-9000-000_00A_Adjust-System.CATProduct

Syntax File Naming of Parts Lists

Parts lists get the same file naming as the corresponding drawing. But it is mandatory to put an **S_** in front of the name.

S .

Example

Drawing Number	K95714-9000-000
Rev. Status	00A
Naming (Description)	Adjust-System
File Extension	xls (or, xlsx or pdf for the neutral format)

Result of the correct file naming of the excel parts list:

S_K95714-9000-000_00A_Adjust-System.xls

Note

When importing the same assembly several times, the file names must always be identical.
Exception: new rev. status (e.g. 000, 00A, 00B, ...)

10 Norms Standards Guidelines

File-Formats und Specifications:

- ASCII specification (ANSI)
- IGES 5.3 specification (ANSI)
- PDF/A specification (ISO 19005-1:2005)
- PDF/E specification (ISO/PRF 24517-1, publication expected in 2008)
- STEP AP214 specification (ISO 10303-214:2003)

11 Trademarks

Microsoft Windows[®], Microsoft Word[®], Microsoft Excel[®] and Microsoft PowerPoint[®] are registered trademarks of the Microsoft Cooperation.

CATIA[®] is a registered trademark of Dassault Systéms.

AutoCAD[®] is a registered trademark of the Autodesk Inc.

ANSYS[®] is a registered trademark of the Ansys Inc.

SAP[®] is a registered trademark of the SAP-AG.

All further (registered) trademarks are in possession of the respective owner.

12 Space for Notes

A series of horizontal dotted lines providing space for notes.

