


VDA	<p>Long-Term Archiving (LTA) of digital Product Data, which are not based on technical drawings</p> <p>Part 1: Overview, Requirements and General Recommendations</p>	4958
<p>This recommendation serves to establish basic, common requirements regarding the processes, data and organization of the long-term archiving of digital product data generated during product development.</p> <p>It is the result of the project carried out by the VDA “Long-Term Archiving” project group, which is part of the VDA “CAD/CAM” working group. The VDA recommends its appliance.</p> <p>Part 1 identifies requirements relating to the long-term archiving of product data that exists in digital form only and summarizes certain legal and technical aspects. Part 1 provides the basis for the other parts of the recommendation.</p> <p>Part 2 describes typical application scenarios and provides recommendations for designing the processes used to prepare the data for long-term archiving, the archiving of the data itself, and the process steps required to access and reprocess the archived data. The primary goal is safeguarding the quality of the data and the documents.</p> <p>Part 3 defines the minimum requirements to be satisfied by the archived information regarding the information in the 3D CAD representations and product structure descriptions from the user’s point of view and concerning the process definition.</p> <p>Part 4 provides recommendations for the verification of reliable LTA workflows and data quality as a crucial part of any LTA architecture.</p> <p>Work on Parts 3 ff. is currently in progress. They will be published once this work has been completed. Therefore modifications are possible.</p> <p style="text-align: center;">Edition 1 from June 2005</p>		
VDA working group “CAD/CAM”		
<p>Published by: Verband der Automobilindustrie Westendstraße 61 Postfach 17 05 63 60079 Frankfurt Phone 069/97507-284 Fax 069/97507-300 Internet: www@vda.de</p>		<p>Copyright: Copies and any other duplications must include a correct citation of the source.</p>
		<p>Verband der Automobilindustrie</p>

Disclaimer

The VDA recommendations “Long-Term Archiving (LTA) of digital Product Data, which are not based on technical drawings” are recommendations that are available for anyone to use. Anyone using these recommendations is responsible for ensuring that they are used correctly.

The VDA recommendations give due consideration to the prevailing state-of-the-art at the time of publication. Use of the VDA recommendations does not allow a person to avoid assuming responsibility for his or her actions. In this respect, everyone acts at their own risk. The VDA and the parties involved in drawing up the VDA recommendations assume no liability whatsoever.

We request that anyone encountering an error or the possibility of an incorrect interpretation when using the VDA recommendations contact the VDA immediately so that any errors can be rectified.

The document is a translated version of the German edition. Therefore the German of the document represents the original and shall be referenced in the case of discrepancies. Due to the translation it might be possible that the English text gives place for interpretations, because terms are grounded often deep in the original language and therefore it is not possible in any case to translate them uniquely into another language.

Contents

1	OBJECTIVE	4
2	SCOPE OF APPLICATION AND ACCOUNTABILITY	4
3	REGULATORY CONSTRAINTS	5
4	ABBREVIATIONS, DEFINITIONS	5
4.1	Abbreviations	5
4.2	Definitions	5
5	LTA REQUIREMENTS	6
5.1	LTA of Digital Documents	6
5.2	Retention Periods	7
5.3	Process Reliability	8
5.3.1	Accountability of Manufacturers and Suppliers	8
5.3.2	Unique Identification of the Documents	8
5.3.3	Unique Identification of Author and Responsible Party	8
5.3.4	Change and Conversion Processes	8
5.4	Other Technical Constraints	9
5.4.1	Electronic Signatures	9
5.4.2	Archive Formats	10
6	SUMMARY	10

1 Objective

The introduction of digital technology throughout the lifecycle of an automobile has brought about fundamental changes in the handling of product data. These changes also affect the long-term archiving of digital product data in particular.

Up until now, the long-term archiving (LTA) of product data involved the creation and storage of 2D drawings. Administrative and organizational product data (PDM/PLM data) was archived as part of the 2D drawing (e.g. in the title block) and/or in other documents.

Today, an entire product model can be described using a 3D master model or a combination of 3D model and 2D information in what is referred to as a simplified or reduced drawing. Relevant product structure information from PDM/PLM systems is also taken into consideration if, for example, individual uses and geometrical relationships of the model are to be viewed in the overall context.

This fundamental change in the way in which product models are described and the introduction of digital technology in the design, production, assembly and data exchange processes used in the automotive industry mean that the established and certified principles of long-term archiving need to be redesigned and/or extended so that they can still be used even when technical product information is only available in the form of digital documents.

The objective of the VDA recommendation is to describe requirements and draw up recommendations for the LTA of digital product data (e.g. 3D CAD models and relevant model structures, as well as part master data) and safeguard legal requirements and obligations. Another objective of the recommended processes and methods is to ensure the reproducibility of the product data, e.g. for spare parts. With regard to long-term archiving and availability, the recommendation deals with the processes and methods used to prepare, archive, store and retrieve data, as well as reconstruct and use product data that is only available in digital form. The recommendations are intended to supplement today's practice involving archiving paper documents.

2 Scope of Application and Accountability

The existing recommendations are relevant for development and documentation processes, if 3D representations (3D master models) are the only basis for the development and documentation and if the established 2D archiving processes are not longer applicable due to economic or technical aspects.

The recommendations describe requirements relating to the archiving processes and procedures including their documentation. Within the framework of the development and production of the products, these recommendations serve

- to safeguard data as a means of providing proof in the event of legal disputes
- as proof that due diligence was exercised, as documentation of the accuracy of organizational aspects, and as proof that safety regulations in effect at the time were applied and observed
- as proof that state-of-the-art technology was used
- to ensure the quality and long-term availability of the data and company know-how.

The VDA recommendation is intended for manufacturers and suppliers in the automotive industry, including accessory manufacturers and tuning specialists. Development service providers are involved in the long-term archiving processes via their customers and, under certain circumstances, may be consulted during legal proceedings for the purpose of providing proof or exoneration. The recommendation is intended for management executives, those responsible for product documentation and archiving, as well as the heads of development, and IT system managers.

3 Regulatory Constraints

If the authorities have questions or if there is a legal dispute, a manufacturer must be able to present documents that prove that all regulations in effect at the time that its products (vehicles) were being developed and manufactured were observed, such as

- general regulations and laws
- safety and emissions standards
- manufacturer's technical requirements
- other applicable regulations such as, for example, the End-of-Life Vehicle Act

It must also be possible to provide proof that due diligence was exercised when the documentation was created.

4 Abbreviations, Definitions

4.1 Abbreviations

2D	two-dimensional
3D	three-dimensional
CAD	Computer Aided Design
CAX	Computer Aided technologies such as CAD, CAM (Computer Aided Manufacturing), CAE (Computer Aided Engineering) and CAT (Computer Aided Testing)
IT	Information Technology
LTA	Long-Term Archiving
OEM	Original Equipment Manufacturer
PDM	Product Data Management
PLM	Product Life Cycle Management
TIFF	Tagged Image File Format
UML	Unified Modeling Language

4.2 Definitions

2D drawing: is a two-dimensional representation of product data in a form that can be read by humans (paper or digital) and in which, for example, the physical and functional requirements are represented in graphical and text form.

3D model: is a three-dimensional representation of product data in digital form, which primarily defines the shape of the product.

Archiving: Certified processes for writing, saving/storing and reusing information in an archive.

Digital engineering signature: is a digital signature which is normally used to confirm the correctness of the contents of a document. Vital to the signature is the reference to the person affixing the signature.

Digital time signature: is normally an automatically generated, digital signature that seals a document. Vital to the signature is the time stamp documenting when the signature was affixed.

Document: A document is a container for (in this context) any type of product data. A document can be assigned to a component or other object (e.g. project, change request) and exists in either physical (paper, microfiche) or digital form.

File: is an individual container containing digital data on a computer storage medium.

Master model (also 3D master): is the primary 3D model representation of a product and for the most part contains a detailed description of the geometric shape, but can also include dimensions, tolerances and other product data. A master model is normally used as the basis for deriving other documents that describe a product.

Microfiche (also microfilm card): is a piece of film containing written information in a tiny format. Microfiche can only be read using a special device.

Product data: represents the information about a product in a formal way so that this information can be communicated, interpreted and processed by people or computers.

TIFF: is a widely recognized industry standard for raster graphics (digital images).

Version: A version represents a specific level of maturity of, for example, a part, document or geometry model.

5 LTA Requirements

The following sections provide information on the specifics of archiving 3D CAD documents and PDM data as an extension of present archiving methods involving 2D-oriented product documentation. Statements made regarding general requirements, such as, for example, constraints and retention periods stipulated by law, can also be applied to other digital product data and documents. The requirements examined here refer mainly to the specification and definition of technical aspects.

The statements made in this section are informative by nature but do not claim to be exhaustive and do not relieve any person of their responsibility to comply with laws and regulations in force at the time. If other requirements (e.g. longer terms of liability) exist in other target markets, these requirements must be taken into consideration.

5.1 LTA of Digital Documents

The LTA of digital documents allows manufacturers to document the status of their products during development and production and serves as proof that these products complied with standards and regulations and/or the state-of-the-art valid at the time they were “put into circulation”. These documents can include, for example, design drawings, change documentation, safety-related information, and documentation of all the materials used inasmuch as they are referenced in the design documentation.

The list of the documents that need to be archived can vary depending on the product involved and the methodology used to describe the product. The manufacturer must archive at least all the data and documents that provide proof that

- all regulations applicable at the time a product was developed and put into circulation were observed (e.g. emissions standards, safety standards, design guidelines)
- due diligence was exercised with regard to documentation
- the product left the company as described in the documentation

There are fundamental differences between the LTA of digital documents, including ensuring their authenticity over the long-term, and the LTA of paper documents.

Paper documents:

- represent data that is inseparable from the carrier medium (in this case, paper)
- are accessed directly by means of visual inspection
- can be individualized by handwritten signatures
- are available as originals (first copy)

Digital documents:

- represent data that is not a physical entity but rather a sequence of numbers stored today in the form of electromagnetic states or burned in by laser
- cannot be viewed/interpreted without the use of appropriate aids (hardware software)
- cannot be individualized
- have no original in the present sense of paper documents since each visualization of the digital data represents the creation of a new first product, i.e. digital data can be copied and duplicated any number of times.

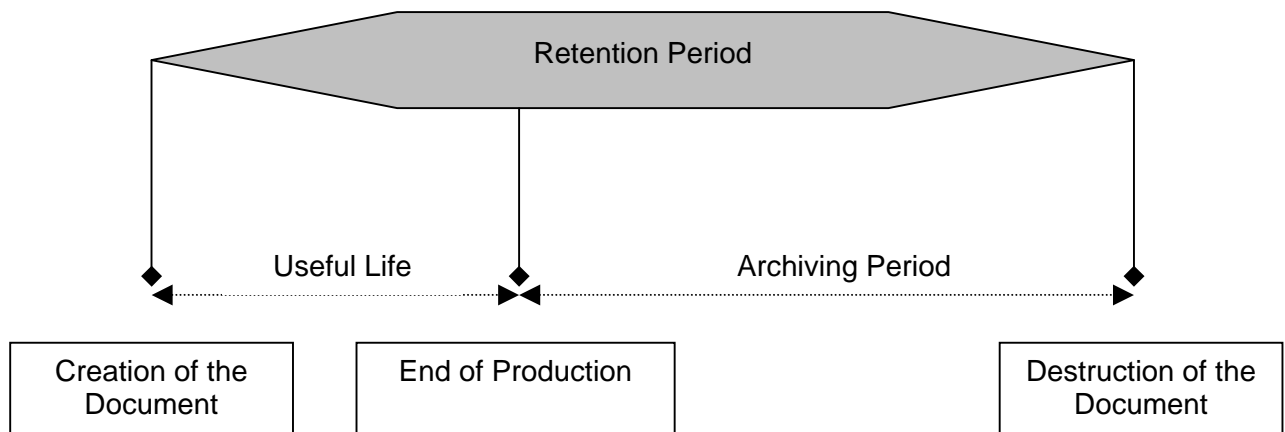
LTA ensures the safe-keeping of documents and the information described in the documents. In the case of data that has been stored electronically, additional measures must be taken with regard to outputting these documents to a screen or printer. These measures should make it easier to verify that the statements made by the sender in the documents are authentic and that the data in the document is correct and complete (integrity). This means that proof can be provided that this data is identical to the data stored earlier. Otherwise, what exists is a visualization of the currently stored data without any information as to whether the data has been modified in the mean time.

One possible precaution would be to link the electronic data with an electronic (time) signature in accordance with the Digital Signatures Act.

References to other, further applicable and/or supplementary documents are permitted. They should, however, be conform to the referencing document with regard to availability and immutability. References should be kept to a minimum for reasons of efficiency especially with regard to the reconstruction of the documents and data.

5.2 Retention Periods

With regard to the retention period of a document, a distinction must be made between the useful life of a document and the archiving period, i.e. the period during which the document is stored in the archive.



The archiving period starts with the milestone “end of production”, which is approximately the same time at which the product is put into circulation for the last time. Assuming a 10-year period during which product liability claims can be made and a recommended safety buffer of an additional 2 years, archiving-relevant product data (including 3D CAD and PDM data) should be retained for at least 12 years after the “end of production” milestone has been reached.

If longer retention periods are required in other target markets, e.g. because of longer liability claim periods, these as well as any other legal requirements valid at the time must be given due consideration.

Manufacturers are free to archive documents for longer periods of time – especially documentation for more important parts (e.g. parts relevant to safety, certification, environmental protection).

Once the retention periods have expired, the data and/or documents can be deleted and/or destroyed. This does not, however, apply to documents relevant to any ongoing or impending legal proceedings if doing so would make it impossible for the opposing party to obtain legitimate access to these documents.

5.3 Process Reliability

This section describes the basic requirements for safeguarding the archiving process from the time the data and documents are prepared through to the time they are reconstructed and reused. The ability to uniquely identify the documents and ascertain accountability are prerequisites for certifying the LTA process.

5.3.1 Accountability of Manufacturers and Suppliers

Both manufacturers and suppliers are responsible for the LTA of their respective product data. It is recommended that the appropriate responsibilities be stipulated in a contract between manufacturer (OEM, vendor) and supplier.

5.3.2 Unique Identification of the Documents

The fundamental basis of any LTA is the unique identification of all documents and versions in the archive. Unique identification is described in Part 3 of the recommendation.

Which intermediate stages of product documentation should be archived over the long term is left to the discretion of the manufacturer. At the very least, all released versions of documents for parts that have been produced and put into circulation must be archived. Draft documents do not necessarily have to be archived.

5.3.3 Unique Identification of Author and Responsible Party

An important aspect of uniquely identifying archived documents is being able to determine the author and the party responsible for the document as a whole. This has the following consequences:

- From a legal point of view, the manufacturing company and not the individual author is primarily responsible to third parties.
- Verification of the author and/or the responsible parties in the document itself can, however, prove useful with regard to substantiating the documentation, as well as proving that capable (qualified and authorized) persons created and/or checked the document.

In other words, it is sufficient if the author and/or responsible party/parties can be uniquely identified. A signature, e.g. a digital engineering signature, on CAD and PDM data is not mandatory. It is, however, recommended that the documents be sealed (using a digital time signature or other appropriate method).

5.3.4 Change and Conversion Processes

Generally speaking, documents in the LTA must not be changed. Conversion to a new type of representation (see 5.4.2) required in special cases (see also Part 2 of the LTA recommendation) inevitably results in a new archive document. Conversions performed in the archive must be logged and reasons for this conversion given.

If a document has been sealed, the integrity of the seal must be examined when it is converted or read out of the archive to ensure the authenticity of the digital document. Only then is it possible to prove later that the contents of the archived document have not been changed in any way. If, however, the archived document was not sealed when it was first stored (e.g. old archive), it is recommended that the document be sealed when it is read out and before it is used so that

subsequent process steps, right up to the user of the archived data, are safeguarded. Furthermore, the number of persons who have access to the archive should be restricted.

Since the document versions stored in the archive cannot be changed, a new set of documents is stored in the long-term archive each time a new change/version is released for a part/document. Reference can be made to predecessor documents; these documents, however, remain unchanged in the archive.

The deletion of documents in the long-term archive must also be treated like a change procedure (cf. 5.2). It must also be possible to lock documents that were archived incorrectly (e.g. in the case of formal errors during archiving). In any case, all data movements in the archive must be logged and information provided on at least the date, reason and identification the person who performed the action.

Other applicable, referenced documents must be retained until all the documents that reference these documents have been deleted. If these referenced documents are internationally or nationally recognized standards, it can be assumed that the appropriate standardization organizations are responsible for the long-term archiving of these standards.

The aim is to design the archive in such a way that a company cannot be accused of manipulation in the event of a dispute or litigation. The more complete the logging and description of data movements, the more credible the archived material.

5.4 Other Technical Constraints

This section describes specific requirements that serve primarily to safeguard the integrity of the documents and which concern problems that can occur when the storage formats are processed or updated.

5.4.1 Electronic Signatures

An electronic signature seals an electronic document with a private key that has been assigned exclusively to a single person or institution (signature key holder) and which

- the signature key holder can keep under his sole control
- enables identification of the signature key holder
- is linked to data in such a manner that any subsequent change to the data can be detected
- enables determination of the time at which the signature was given

The integrity check is performed exclusively by means of a public key that is made available to the receiver.

In order to facilitate its use as proof, digital data should be sealed with a qualified signature in accordance with the Digital Signatures Act or using another appropriate certified procedure. A digital signature is in compliance with the Digital Signatures Act if the following conditions have been satisfied:

1. Secure signature creation device
to safeguard against forgery and falsification and as protection against unauthorized access
2. Qualified signature application components
which ensure that it is clear to which data the signature relates, indicate the integrity of the data and identify the signature key holder.
3. Qualified products
for state-of-the-art electronic signatures. An officially recognized authority must establish the reliability of these products.
4. Qualified certification services
Notification of the certification service provider used to the appropriate public authority or (voluntary) accreditation by the appropriate authority.

5. Assignment of a qualified electronic signature
for the electronic signature procedure in compliance with a formalized application procedure.
6. Certification directory
Issue of a certificate for the signature key holder and entry in a public directory

Doubt can only be cast on the authenticity of a digital signature created under these conditions if there is a serious suspicion that the signature was created without the consent of the signature holder. To reduce the risk within the context of providing proof, it is therefore necessary that great care be taken with the storage procedure.

The integrity of the data can be assured by means of electronic signatures. The signature allows the following aspects to be checked:

- the integrity of the electronic document
- unique identification of the person signing
- time at which the signature was affixed

5.4.2 Archive Formats

There are no special archiving formats proscribed by law. However, storing documents in proprietary data formats for periods of 12 years and longer could prove to be extremely difficult technically and/or cost intensive. Any loss of data, among other things, could be interpreted in a way detrimental to the manufacturer. To ensure LTA capability, the archiving of proprietary data formats and/or binary data should therefore be avoided.

Product data is converted from a native (proprietary) source format to a standardized, LTA-conform, neutral archive format in accordance with this recommendation. Contrary to expectations, it may turn out that, during a very long retention period (e.g. > 30 years), even a standardized LTA format can no longer be supported. This means that conversion to a new LTA format is required. In such a case, the previous versions of the converted documents can be deleted from the archive, provided that proof can be furnished that conversion was performed without error and without any loss of data. Certified processes that include complete logging of the conversions in accordance with the recommendations in section 5.3.4 (and Part 2) are the recommended means for providing such proof.

The archiving software should comply with international software standards. Certification of the software components involved in the archiving process is recommended. It must be ensured that the decision regarding the software to be used and the use of the software itself is both documented and well founded.

The subsequent parts of the recommendation will provide information on suitable archiving formats that have been tailored to the specific requirements of the various types of product data.

6 Summary

At the very least, the following basic recommendations must be applied to the LTA of digital product data to ensure that the requirements from Section 2 are satisfied:

- Unique identification of each document
- Unique identification of the author and/or persons responsible (for the content)
- At least all the released document versions for parts that have been produced and put into circulation must be archived
- When a document is archived in the LTA, it must be ensured that the document is protected by a qualified, electronic time signature according to the Digital Signatures Act or by sealing it using an appropriate procedure

- It must be possible to reproduce the document and its data over a defined period of at least 12 years after the “end of production” milestone has been reached
- Once the required archiving period has expired, an archived document can be removed from the archive provided that this action is documented
- Generally speaking, documents in the LTA cannot be changed
- Subsequent changes to the data in a document must be precluded
- It must be possible to detect any manipulation of the archived data and any such manipulation must be clearly documented
- Any conversions that become necessary, e.g. conversions into new formats, result in a new, derived archive document
- The source document of a converted document can only be deleted from the archive if irrefutable proof can be provided, within the framework of given quality criteria, that conversion was performed without error and without loss of data
- All data movements in the archive must be logged and, if necessary, annotated
- It must be possible to produce process and/or procedure instructions that prove that due diligence was exercised with regard to the creation and operation of the documentation storage system
- It is recommended that certified and/or certifiable archiving and reconstruction processes be used for this purpose, as well as auditing and test procedures that ensure the quality of the data and documents

Furthermore, customary state-of-the-art organizational and technical requirements relating to long-term archiving must be satisfied. This includes, for example, the use of secure and long-term storage media, the execution of regular refresh operations and/or required migrations of the storage media, as well as ensuring access protection. It is recommended that the systems used for the LTA data and processes and the organization of this data and these processes be examined and analyzed at regular intervals. Both the lists of LTA-relevant data and their retention periods as well as the LTA processes and methods must be brought into line with currently valid legal practice and/or legal requirements whenever this becomes necessary and must be applied from this time to all archiving processes performed.