| VDA | RFID for tracking - parts/components in the automotive industry | 5510 |
|---|---|---|

The present non-binding recommendation is the more developed version of VDA 5005 and describes processes and methods for tracking and tracing of vehicle parts and certification of original parts using RFID.

The recommendation is divided into two parts.

- a generally valid description of the processes for implementing the tracking and tracing of parts and parts identification
- possible technical procedures for implementation

The present non-binding VDA recommendation is connected with the following objectives:

- Standardization of the use of RFID components for tracking parts and assemblies in the car industry
- Support for protection against copies
- Standardization of the data to be stored on the transponder
- Standardization of the RFID technology used by VDA partners

**Project group RFID for tracking and tracing of parts and components in the automotive industrie**

Publisher: Association of the German Automotive Industry
Westendstraße 61
Postfach 17 05 63
60079 Frankfurt
Telefon 069/97507-284
Telefax 069/97507-300
Internet: www.vda.de



VDA | Verband der Automobilindustrie

## Disclaimer of liability

The VDA-guidelines are recommendations which may be applied by everyone. The person using this guideline must however ensure the right application for each case. They consider the state of technological development at the time of the respective version. No one can be exempted of responsibility for his own actions by using the VDA recommendations. This means that everyone acts at their own risk. A liability for the VDA and for the ones involved in the VDA recommendations is excluded.

Anyone who notices any errors or possible mis-interpretations while using these guidelines is asked to inform the VDA immediately so that action can be taken.

## Table of contents

# 1 Introduction

## 1.1 Positioning of RFID in the VDA environment

Radio Frequency IDentification (RFID) is playing an increasingly important role in many enterprises. For some processes in the VDA environment, radio-based identification is – with regard to process efficiency and quality criteria – already superior compared to other identification techniques, such as the barcode. Other areas of application will be soon economically usable because of price degression and rapid technological development. An essential benefit of the new technology is that unlike before only object classes (e.g., parts with the same material number, containers of one type), but also single instances of an object class (e.g., air bag module with material number 123 and serial number 234 or wire mesh crate of the type 4711 with load carrier identification 4712) become distinguishable individually. Through more accurate differentiation, processes can be controlled more precisely and in tighter control loops. In the car industry, RFID technology has been used for decades predominantly in closed loop systems - applications which exclusively serve winding up enterprise-internal processes. These "Closed-loop-RFID-Applications" are limited in number or as a sub process of an actually open process chain, they show only the beginnings of the potential which RFID technology offers for the whole value-added chain of the car industry. Further potential appears if the decentralised data processing over different branches of a value-added chain with the same standards and technologies (open loop systems)

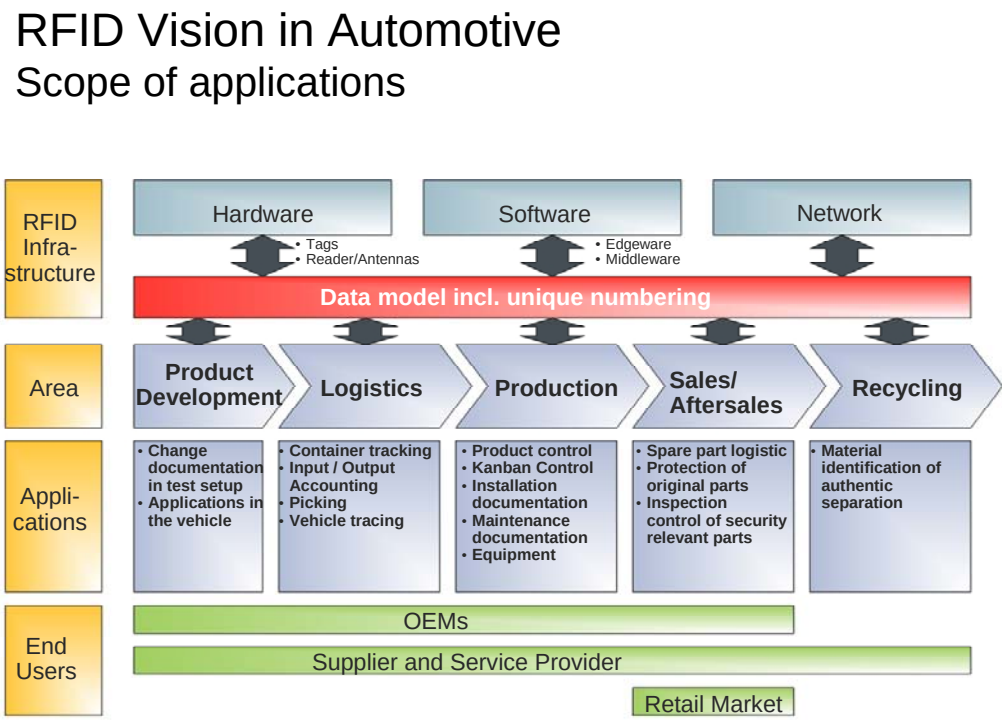



**Figure 1:** RFID vision in the automotive industry

The use of a transponder across several process steps is interesting. Thus a transponder at a part can support, for example, the following functions:

Production control and manufacturing documentation with the supplier

"Marriage" of material number or order number with the transport container which is tracked through the following logistics processes.

If an internal sequence is produced, the order number can be assigned to the part.

During assembly in the vehicle, correct installation is guaranteed by comparing article number / order number with the vehicle order

With the installation of the parts, parts identification numbers can be recorded automatically together with the vehicle data and stored

If problems are discovered later in the production batch from which the part comes, specific recalls are possible with reduced public awareness.

In a warranty case, it can be checked whether the original part from the manufacturer's factory is still installed or the defective part was also delivered

Use within the whole spare parts delivery chain for process control and process optimisation

With inspections, it is conceivable, that the presence of even hidden safety-relevant parts can be detected in one reading from a very short distance

Follow-up of the parts installed in the vehicle after replacement by the service organisation in the documentation systems at the vehicle manufacturer

In recycling companies, a data material description can be called which simplifies the sorting process

Nevertheless, co-operative teamwork within the whole value-added chain can be realised only if the required hardware components, transfer protocols, interfaces and data structures can be operated between the process partners involved following jointly defined and applied standards

- This recommendation describes content and formal requirements for external labeling of car parts. The coded data is used for documentation and traceability of the build stages (“parts recording”) and / or for line worker guidance within the
  customer order process (“installation check / logistics”).

Note: The recommendation must not be used, if the parts labeling is not connected to the above mentioned applications.

This recommendation is directed at:

- Engineers who specify the parts marking;
- Quality assurance staff who have to approve sample parts;
- Purchasers who have to evaluate and negotiate the costs for parts marking
- Suppliers who produce vehicle parts and equip them with transponders
- Suppliers of complex assemblies (ZSB) who must assemblies
- Logistics experts who have to control material flows
- Production planners who plan the procedures for parts identification and installation checks
- Persons responsible for IT who ensure the technical implementation of the system
- Those responsible for aftermarket who have to create the conditions for installation documentation

### 1.1.1 Traceability

The back tracking of vehicle build stages at the individual part level requires a unique differentiation of every component. An identification marking contains in principle the following data:

- Manufacturer´s code
- Part number (article number)
- Serial number (to differentiate the same kind of components from one manufacturer)

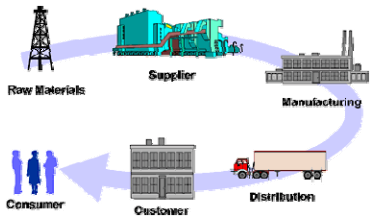
The parts data are collected by individual car and filed long-term. They allow, in combination with recall, warranty or compensation cases, an exact determination of those vehicles in which a certain quantity of parts was installed. The supplier (or manufacturer) has to make sure that the data record of a part observed over its life cycle (>15 years) is and remains unique. All detailed information about this part from the manufacturer (e.g.: batch of raw materials used, manufacturers of the parts supplied, test results, set values, manufacturing site and manufacturing equipment) are to be documented and archived, so that, when required, evidence is available on the functional, manufacturing and material quality of the parts quickly and unambiguously.

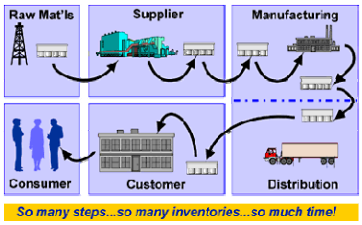
### 1.1.2 Support in protection against copies

In the public perception, the subject of RFID is primarily one of the automatic identification of objects (e.g., containers, individual parts, vehicles, clothing, drugs, etc.) Increasingly more attention is being paid to the requirement for counterfeiting security to protect product and brand authenticity. To use the benefits of RFID technology, automatic identification should ideally be combined with protection against copies. Basically, two different approaches which can be also combined are possible:

- System-side security
- Object-oriented security

## System-related security: Enhance supply chain transparency




## Object-related security: Make authentication secure

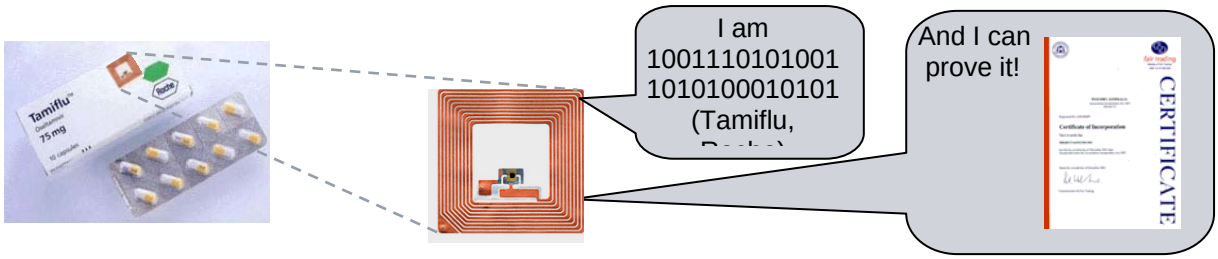





Figure 2: Variations on copy protection

The system-side approach to protection against copies is achieved by increased transparency in the supply chain. In this case, the reading events generated for the respective marked component are collected by production and logistical processes. In their totality they combine into an electronic product life file. Using plausibility tests, discrepancies can be discovered and potential counterfeits can be identified more easily and the source can be contained more tightly.
A high hurdle is created for counterfeiters to circulate copies plausibly. Because the individual reading events are dispersed at the enterprises involved and not made available as a whole, a complete, plausible product history can hardly ever be faked or only with massive effort. Indeed, this approach assumes a high degree of system integration. Applications which should assess the likelihood of a forgery need

standardised access to the reading events in big parts right up to the whole chain of delivery. The standardised exchange of event data is also being examined within the scope of the LAENDmarKS project.
Object-oriented protection against copies is aimed at protecting the identification of a product and possible additional user data directly on the RFID tag by encoding. Then only authorised parties can decipher these data.
Experts speak of symmetrical and asymmetrical cryptic procedures. Highly simplified, it can be said that symmetrical procedures are easier to implement at the chip level, however, they require an IT infrastructure and are more susceptible to external attacks. Asymmetrical procedures can check the original identity on site, however, they require more chip surface (more processor power, more memory, and therefore more expensive) and will not be realised in the near future on a UHF basis. If encoding procedures are used in parts marking, from the point of view of the users the asymmetrical (On Site Identification) is preferable to the symmetrical (Network Identification).
Which approach to plagiarism protection is more logical, has no blanket answer. Taking into account costs and availability, interim steps are also possible.

### 1.1.3 Concepts (in connection with this recommendation)

**Component**
Vehicle component with parts number, which precisely references its technical execution.. The part number is for example the basis for assembly control.

**Assembly (ZSB)**
An assembly is made up of several components and can only be referenced in its precise technical execution by naming several part numbers. The list of the parts numbers is, if necessary, a basis for assembly control

**Complex assembly**
An assembly which contains several components (e.g., a seat ZSB: contains seat frame, armbackrest frame, side air bag, air bag armrest seatback cover, sensor mat, belt lock with sensor). In the completed state, the data of the individual components are not readable any more, they have to be identified and filed beforehand

## 1.2 Objective of this VDA recommendation

The main emphasis of this document lies on the description of an RFID-supported process for tracking parts and assemblies in the car industry. The necessary data structures are described incl. the identification system used, as well as requirements for the RFID technology. The purpose of this VDA recommendation is the definition of uniform interfaces for the exchange of information between the different systems for parts and components handling of the partners integrated in the process. Essentially, the RFID-specific functionalities and the common data necessary in addition are looked at. The emphasis lies in this document because of the task very heavily on the automated identification of parts and assemblies in all forms conceivable in the automotive area. However, many considerations are easily transferable afterwards to other objects, like vehicles or logistic processes. Only after everything has been considered can the consequences and opportunities from the

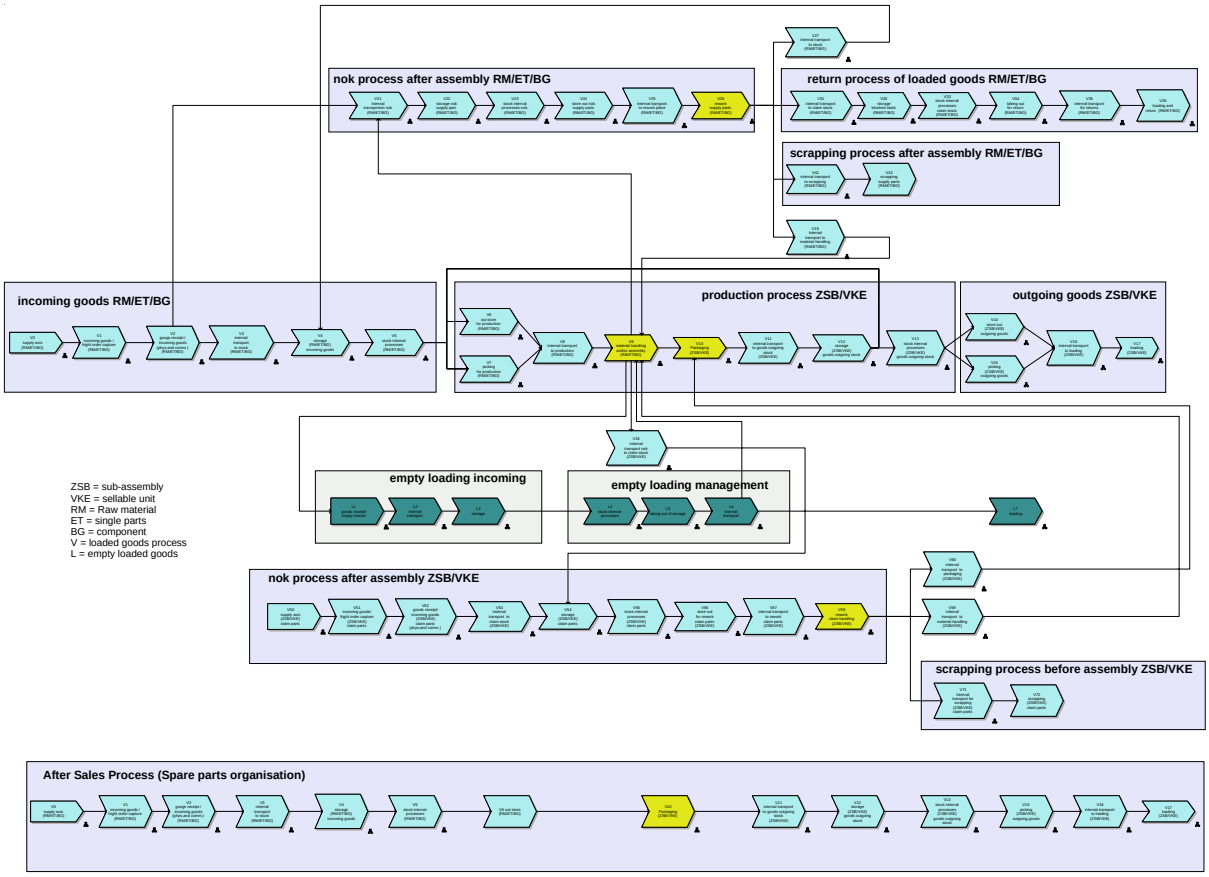
new technology "RFID" be fully assessed and supported with concrete introductory steps. In addition, because of the increasingly global orientation of the car industry, coordination should be sought in the European car association Odette and, in addition, with as many other car asociations as possible. This recommendation can serve as a basis for these tasks still ahead. RFID provides the car industry with a technology which operates exclusively in material and control flow, i.e. it serves the synchronous representation of material flow and the flow of information. Precisely when a part / assembly is physically available, the accompanying information is also available and vice versa. This is why RFID cannot substitute permanently for the use of backend systems and their linking via EDI processes. EDI data streams "hurry ahead of the product" and can also be used for planning, backend systems ensure a central view of the data. Therefore, particulary in the exchange between the partners in the supply chain, even with the use of RFID technology, EDI information in parallel with the RFID-supported material flow cannot be abandoned for the foreseeable future. That means, the necessary adaptation to the EDI document for the RFID-supported process must still be determined and approved in the responsible standardisation committees after approval of this recommendation.

## 1.3 Approach and structure of this recommendation

For the structure of this recommendation, parts processes and assembly processes between the partners involved in the process were looked at. The individual processes were described within the scope of the ‘LAENDmarKS' project promoted by the Federal Ministry of Economics and Technology on the basis of process characteristics and RFID potential in these processes are identified. With the help of a data matrix, the data which are needed in these processes were presented.
The contents were transferred to this recommendation:
In the chapter "Data Structure" the data fields to be stored on the transponder are described. Special attention was directed to the required numbering system, as well as the requirements for the transponders and reader technology. In the appendix, essential changes are described for the processes of the supply chain in the sequences looked at.

# 2 Reference process

The figure is the overview of the processes as they were identified in the LAENDmarKS project.




Source: LAENDmarKS project supplemented by the aftersales area
Comment: Detailed description in the process descriptions beginning with chapter 10

**Figure 3:** Reference process

# 3 Basic RFID application variations

Three basically different versions of the process creation with RFID support can be identified from the data structures on the transponder described below,which place different requirements on the overall system. We understand by overall system in this context all resources required for these processes, consisting of tag, reader, net, middleware, applications, organisations etc...

The versions differ in the way data is used on the tag:
In the following matrix, the 3 resulting versions are described:

| | | Write on Tag | |
|---|---|---|---|
| | | No | Yes |
| User Data used | No | Version 1: Tag contains only parts ID | - |
| | Yes | Version 2: Read access to user data | Version 3: Write access to user data |

**Illustration 4:** Matrix of versions studied

In the version definitions described below, mention is made of the "parts identity". The exact representation of this concept is explained in the chapter "Data Structures on the Transponder" (4.1). “User data” are defined as user data additionally stored on the tag.

## 3.1 Version 1: Tag contains exclusively the parts identity

The only data field which is used on the tag, is the parts identity concept which is assigned as a globally unambiguous name to every part / assembly. This parts identity is protected by defined protective procedures against overwriting. Access to this parts identity on the transponder occurs in all process steps except reading. All additionally required information must be selected via the respective backend system or other data bases. This version shows the most secure and most efficient possibility of access to RFID data on the transponder (i.e. on the "air interface"), because the exclusive access to the parts identity concept is clearly possible more quickly in the ISO-18000-6C-Modell for technical reasons, than the access to all other data (cf. version 2 and 3). This can be decisively important with bulk reading in automated collection processes (e.g., recording of several parts / assemblies when passing a gate). In this case, other user data must be read through the backend from the data base.

## 3.2 Version 2: Tag contains also user data – read only access

In addition to the parts identity of version 1, in this version the tag in the user data area contains data which will be written to the tag at the same time with the parts identity.
This data is protected against overwriting too, that means they can be written only once and after that can only be read.This data has the character of master file data. Access to the transponder data is only readable in all process steps. All information required in addition must be read out through the respective backend system. In comparison to version 1, the reading process is slowed down with the access to the transponder data. The solution can be helpful in isolated cases if (master) data which have more than the parts identity can be used off-line without having to use the organisationally clearly more complicated write process with it immediately.

## 3.3 Version 3: Tag also contains user data – write/read access

The parts identity is protected against overwriting, the user data can be changed in the process (e.g., time stamp). Which data must be delivered by the exchange of information in the supply chain as user data is to be defined between the partners bilaterally. Warning: according to ISO-18000-6C, the differentiation of the writing rights up to now is possible only for the complete user data area MB11 and not at single field level. In addition, there is also no role concept which allows a "user-related" write access to the tag data.

# 4 Data structures

The presentation of the information should be analogous to ISO / IEC 15434 and ISO / IEC 15418 (which refer to ANSI MH 10.8.3 M and ANSI MH 10.8.2), data format 06 "Data using data identifier". The AIAG B4 standard refers to the ANSI MH standards.

## 4.1 Data structure on the transponder

### 4.1.1 Reasons for and use of the data structure

The data structure described forms the existing logistics and IT processes within the car industry and its available standards. It contains data fields which in the different processes described are written, read or changed.
Single data fields can be encoded and be locked with write/read rights. The remaining data fields can be often overwritten within the process chain as often as needed, so that individual data can be updated block-wise.

### 4.1.2 Data organisation according to EPC Gen.2 / ISO 18000-6C

The fundamental structure of the data on the transponder was defined and approved in the so-called "air interface" according to ISO / IEC 18000-6c. If user data are stored on the transponder, this should be indicated on the transponder according to the expanded "AIAG B11 / EPC harmonisation suggestion" which was worked out for tyres and wheels. ISO 18000-6c starts from a logical subdivision of the tag memory into 4 data segments which are shown in the following:

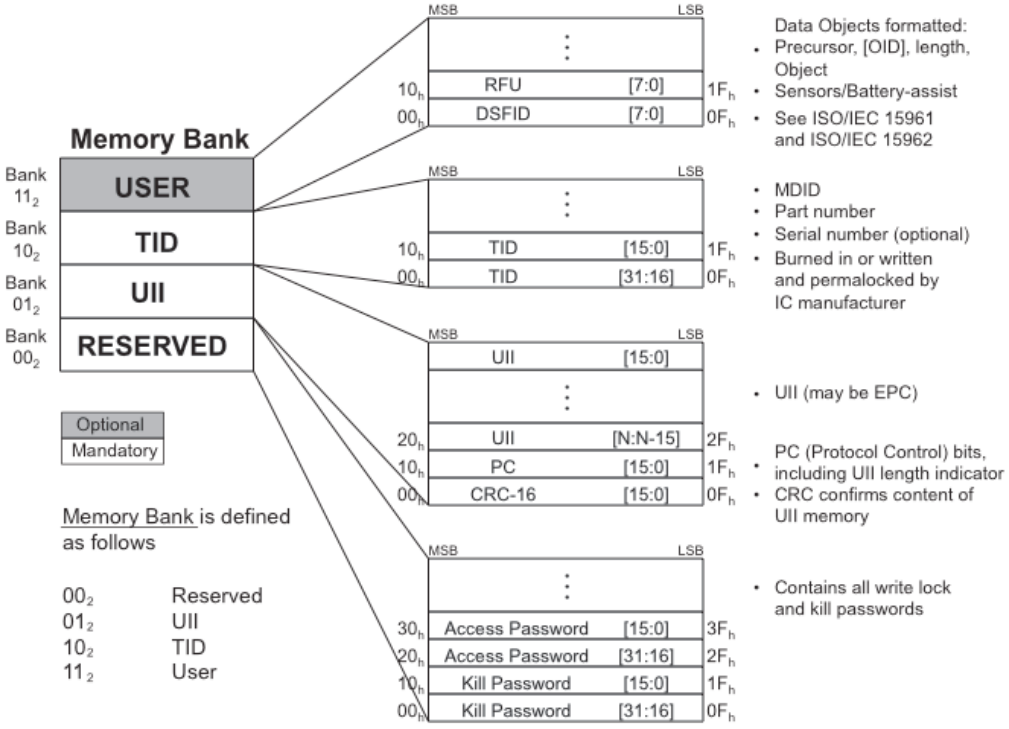



**Figure 5:** Memory structure of EPC Class1 Gen2 tag

The essential contents of these segments are:

$MB00_2$ = password management

Access password

Kill password

$MB01_2$ = UII (Unique Item Identifier):

CRC: calculated test sum on the tag for data verification

PC: Contains several data fields, including:

Length of UII-Field

Characteristic of AFI-Field (Application Family Identifier)

Switch, whether an EPC or an ISO number stands in the following UII field

Switch, whether user data are stored in $MB11_2$ or not

The EPC-Identifier within the UII-Field consists of the data fields:

Header
Definition of the so-called coding scheme in which structure and length of the real EPC identifier are defined (e.g., SSCC, GRAI, SGTIN.)

Filter value (3Bit)
Allows (according to coding scheme) a filtering of certain EPC identifiers by the reader

Partition field (3Bit)
Determines length of the EPC manager

Real load carrier identity consisting of:

EP manager (= manufacturer)

Parts / assemblies serial number (using the coding scheme "GRAI")

The structure of the UII in the AFI field is described in ISO 15961

According to the expanded “AIAG B11 / EPC harmonisation suggestion“ the following four states can be configured in $MB01_2$ according to the state of the bits $15_{hex}$ and $17_{hex}$:

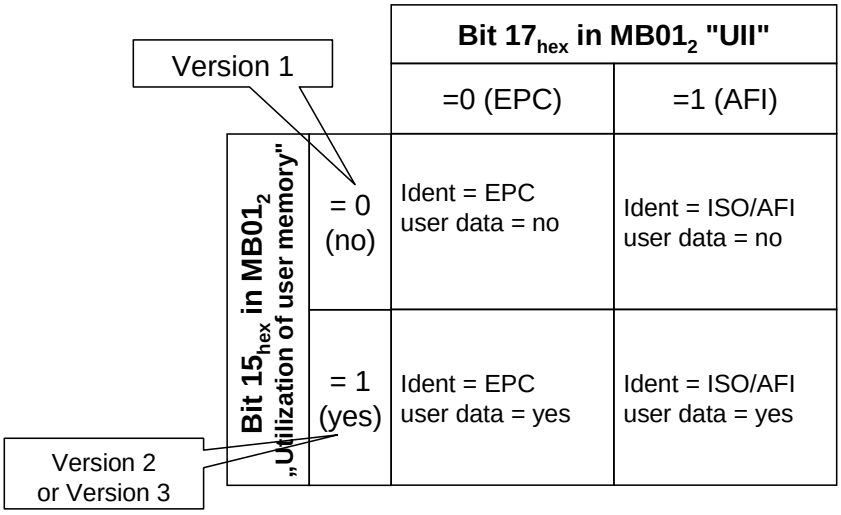



**Figure 6:** "B11-suggestion"– Use of the $MB11_2$ in ISO 18000-6C

$MB10_2$ = TID (tag ID):

Unambiguous parts and serial number of the tag

Permanently locked by the tag manufacturer

$MB11_2$ = User (User data):

Area freely writable and organised by users

Data organisation according to the following data structure

The data structure to be filed per part in this area should contain different fields with different names and contents. All fields are optional fields, i.e. use is regulated by the specific regulations between customer (OEM) and supplier. In the following data structure, these fields are explained in detail.

## 4.2 Data structure and memory splitting

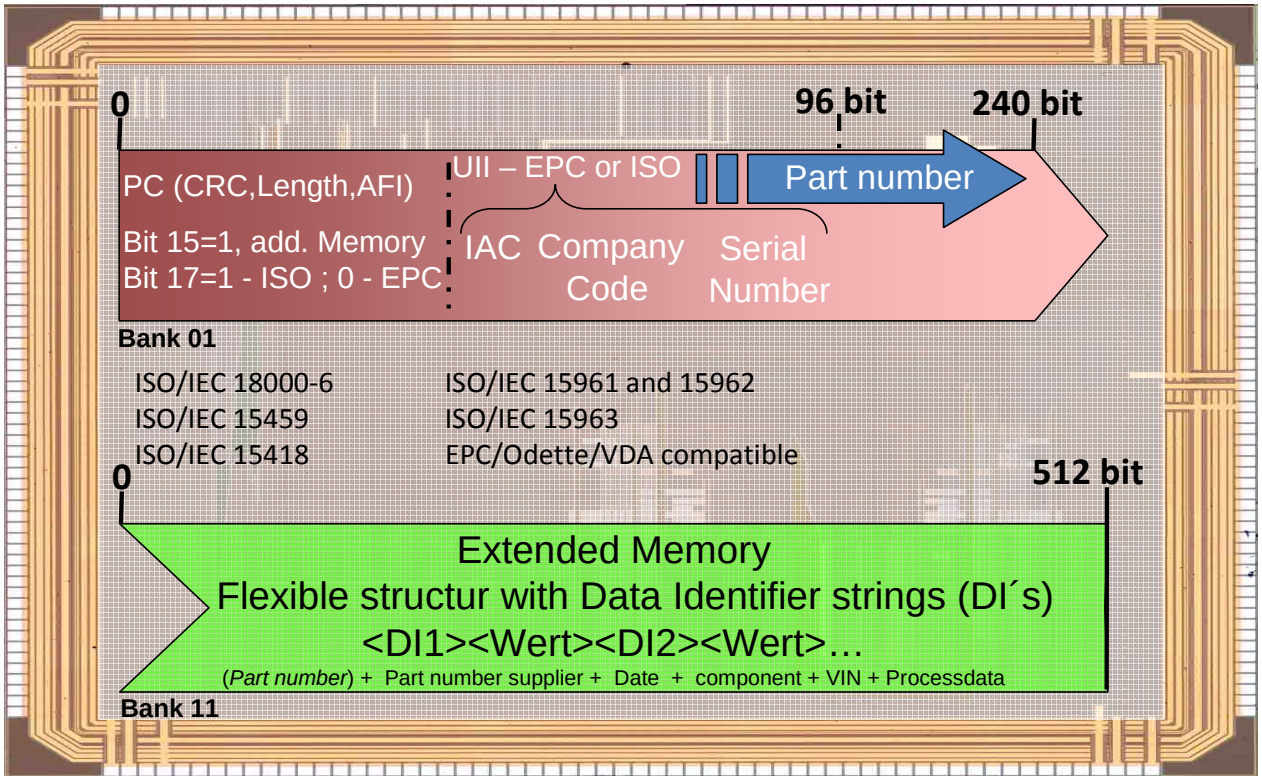



**Illustration 7:** Data structure and memory splitting of an EPC Class1 Gen2 tag

The memory blocks 00 and 10 are not looked at here, because they are not used at present in the processes.

**Data organisation in user data area**

Organisational procedures

On the transponder an unambiguous identity term must be saved as a minimum requirement. This is always in the data segment "MB01 - UII".in the subordinated ISO-data organisation model (see above).

In addition, in the application versions 2 and 3 (cf. chapter 2) as required and coordinated between the involved process partners, other user data are used which are shown and explained in detail in the following data table.

These user data are stored according to the ISO data organisation model in "MB11 – User Memory".

In most cases, not all data from this user area will have to be written or selected, but only the part required in the particular process context.

The data fields described in the following are written consecutively together with their data identifiers (DI) in the user memory: <DI1> <value> <DI2> <value> …

Storage on fixed, data fields to be given physically on bit position is not planned. Through the use of DIs, a fixed sequence of the fields is not absolutely necessary, however, it should be agreed upon bilaterally, so that the fields are arranged by importance and reading of the entire user memory can thereby be avoided.

The data structure on the transponder described in the following with regard to the field names, field description and field attributes borrows wherever possible from GTL (Global Transport Label) or the VDA goods tag VDA 4902. The model was extended by other fields, in particular for empties management and the more precise specification of data fields which are formally specified in GTL only in a generally valid manner.

The data identifiers are structured according to ISO 15418.

To achieve flexibility towards changes in this data structure, a two-digit version number is filed with the DI symbol ## from which the currently used data structure can be recognised as the first data field in the user's area.

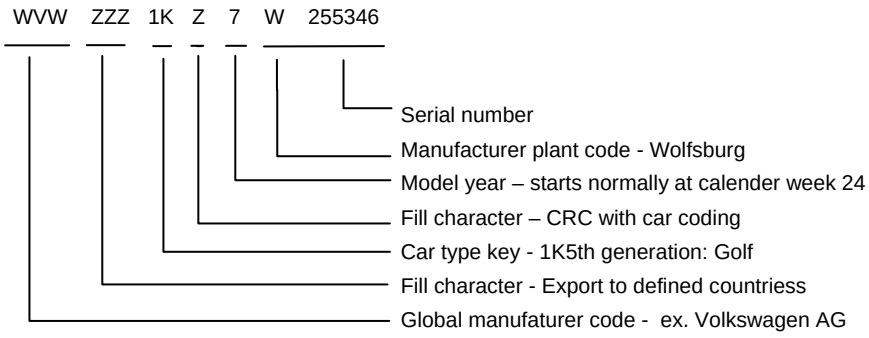
# Example of a data structure of an EPC globally compliant 512 bit tag

| Bank | Content (technical) | Bit avail. | Bit used with DI's | Usage | DI | Numbers (binary) | ASCII-character | Sepa-rator |
|---|---|---|---|---|---|---|---|---|
| 00 | Reserved | 80 | 80 | Kill + Password + Lock-Bits | | | | |
| | | | | Factory settings | | | | |
| 10 | TID | 32 | 32 | Tag ID (ROM) | | | | |
| 01 | EPC memory | 16 | 16 | CRC (internal to the chip) | | | | |
| | | 16 | 16 | PC (Protocol control bits) | | | | |
| | | | | | | | | |
| | EPC / ISO code | 96 | 8 | Header | | | | |
| | | | 3 | Filter | | | | |
| | | | 3 | Partition | | | | |
| | | | | **Part identity** | | | | |
| | | | 37 | Companycode | | 11 | | |
| | | | 45 | Seria lnumber | | 14 | | |
| 11 | Free memory | 224 | 7 | Message-Header | []> / . | | 1 | |
| | | | 7 | Format separator | | | 1 | RS |
| | | | 0 | Format-Header | 06 | 0 | | |
| | | | 0 | Separator | | | 0 | GS |
| | | | 0 | | Z | | 0 | |
| | | | 0 | IAC Company code (= UN) | | | 0 | |
| | | | 0 | Separator | | | 0 | GS |
| | | | 7 | | P | | 1 | |
| | | | 98 | Part number customer VW (15 / 22) | | | 14 | |
| | | | 7 | Separator | | | 1 | GS |
| | | | 7 | | D | | 1 | |
| | | | 21 | Production date format YYMMDD | | 6 | | |
| | | | 7 | Separator | | | 1 | GS |
| | | | 7 | | W | | 1 | |
| | | | 7 | Process data | | 2 | | |
| | | | 7 | Separator | | | 1 | GS |
| | | | 21 | First Level (Customer-assigned) | 20P | | 3 | |
| | | | 14 | Component group (3+1) | | 3 | | |
| | | | 0 | Format trailer | | | 0 | RS |
| | | | 7 | Message trailer | | | 1 | EOT |
| | | | | | | | | |
| | total | 464 | 464 | | | | | |

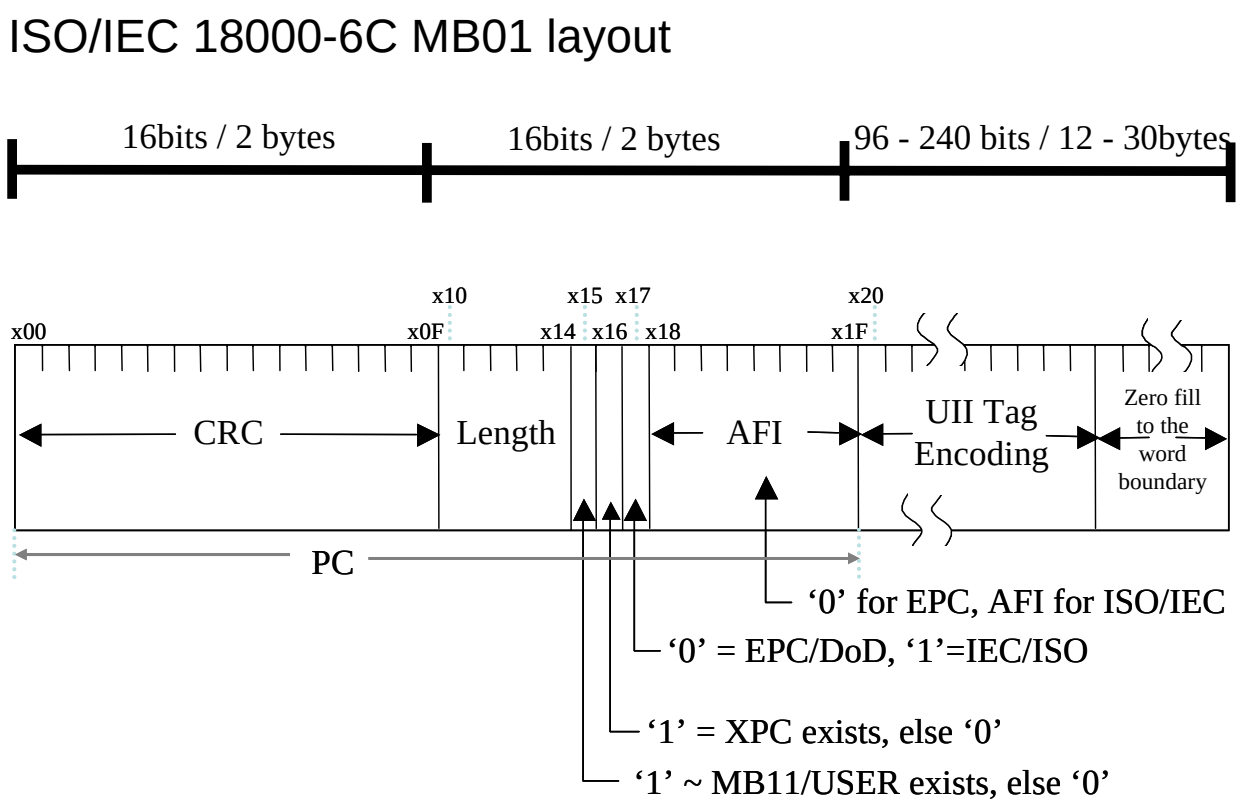
# Example of a data structure with an EPC globally compliant 1024 bit tag

| Bank | Content (technical) | Bit avail. | Bit used with DI's | Usage | DI | Numbers (binary) | ASCII-character | Sepa-rator |
|---|---|---|---|---|---|---|---|---|
| 00 | Reserved memory | 32 | 32 | Kill password | | | | |
| | | 32 | 32 | Access password | | | | |
| | | 16 | 16 | Lock bits | | | | |
| | | | | Factory settings | | | | |
| 10 | TID memory | 64 | 64 | Tag ID (ROM) | | | | |
| 01 | EPC memory | 16 | 16 | CRC (Chip internal) | | | | |
| | | 16 | 16 | PC (Protocol control bits) | | | | |
| | | 16 | 16 | NSI | | | | |
| | EPC/ISO code | 240 | 8 | Header | | | | |
| | | | 3 | Filter | | | | |
| | | | 3 | Partition | | | | |
| | | | | **Part identity** | | | | |
| | | | 37 | Company code | | 11 | | |
| | | | 45 | Serial number | | 14 | | |
| | | | 144 | Free | | | | |
| 11 | User memory | 512 | 7 | Message header | []> / . | | 1 | |
| | | | 7 | Format-Separator | | | 1 | RS |
| | | | 0 | Format header | 06 / nn | | 0 | |
| | | | 0 | Separator | | | 0 | GS |
| | | | 7 | | Z | | 1 | |
| | | | 14 | IAC Company code (= UN) | | | 2 | |
| | | | 7 | Separator | | | 1 | GS |
| | | | 7 | | P | | 1 | |
| | | | 105 | Part number customer VW (15 / 22) | | | 15 | |
| | | | 7 | Separator | | | 1 | GS |
| | | | 7 | | D | | 1 | |
| | | | 21 | Production datefformat YYMMDD | | 6 | | |
| | | | 7 | Separator | | | 1 | GS |
| | | | 21 | First Level (Customer assigned) | 20P | | 3 | |
| | | | 14 | Component group (3+1) | | 3 | | |
| | | | 7 | Separator | | | 1 | GS |
| | | | 7 | | W | | 1 | |
| | | | 7 | Process data | | 2 | | |
| | | | 7 | Separator | | | 1 | GS |
| | | | 14 | | 1P | | 2 | |
| | | | 105 | Part number supplier (15 / 22) | | | 15 | |
| | alternative | | 7 | Separator | | | 1 | GS |
| | | | 0 | | I | | | |
| | | | 0 | Car VIN (17 altern. 10 St. int. Nr.) | | | 0 | |
| | | | 0 | Format trailer | | | 0 | RS |
| | | | 7 | Message trailer | | | 1 | EOT |
| | | | | | | | | |
| | total | 944 | 824 | | | | | |

Car identification number = VIN




UII using the ISO scheme




Source: ISO/IEC CD 18000-6 rev1.2, 2007-07-31, sect 9.3.2.1.2.2

**Figure 8:** Data structure with ISO/IEC for the UII (MB 01)

MB01

| Data element | Value | Size | Description |
|---|---|---|---|
| PC bit 15H | 1 | 1bit | 1 = MB11 exists and may be used |
| PC bit 16H | 0 | 1bit | 0 = No use of extended PC word |
| PC bit 17H | 1 | 1bit | 1 = ISO interpretation of data |
| AFI | A1H | 1byte | Application Family Identifier (c.f. ISO/IEC 15691), indicating Item use |
| DSFID | 04H | 1byte | Data Storage Format Identifier (c.f. ISO/IEC 15459), giving the most efficient means for data encoding. 15459-4 deals with Items |
| Precursor | 44H | 1byte | Here we primarily define the encoding of data, setting it to “Upper case ASCII” |
| Length | 02D | 1byte | Indicates the length of the encoded/compacted data |
| IAC | “UN” | 2bytes | Issuing Agency, in this case DUNS |
| Precursor | 24H | 1byte | Following data field is binary encoded (most efficient) |
| Length | 05D | 1byte | In 5 bytes we can encode 12 decimal digits |
| Company Code | 12 digits | 5bytes | The code may use12 digits. |
| Precursor | 24H | 1byte | Following data is binary encoded |
| Length | 05D | 1byte | In 5 bytes we can encode 12 decimal digits |
| Item Serial Number | 12 digits | 5bytes | Values: 0 - > 999.999.999.999 |
| Padding | 00H | 1byte | Mandatory for word alignment |
| Unused memory | | | 10bytes, can be defined for extra/new use. |
| Bytes used: | | 20 | excluding the PC word |

MB11

| Data element | Value | Size | Description |
|---|---|---|---|
| DSFID | 04H | 1byte | Data Storage Format Identifier (c.f. ISO/IEC 15459), giving the most efficient means for data encoding. 15459-4 deals with Items |
| Precursor | 44H | 1byte | Here we primarily define the encoding of data, setting it to “Upper case ASCII” |
| Length | 17D | 1byte | Indicates the length of the encoded/compacted data |
| Item Type/Article Number | 22 alpha numerical characters | 17Bytes | 22 alphanumeric article identifier |
| used | T.B.D | Depends on | Tag MB11 size |
| Bytes used: | | 20 | |

This recommendation is based on the ISO/IEC standards:

- ISO/IEC 18000-6 Describes the logical memory structure of an RFID tag
- ISO/IEC 15961 and 15962 Decoding recommendation of an RFID tag
- ISO/IEC 15459 Description of object identification in logistics etc.

**Data structures**

Accompanying the RFID data on the part / assembly EDI should be sent in any case - i.e. even with the use of the whole data structure - to the customer and if necessary to the forwarding agent. This serves in particular the plausibility check. With the acquisition of the RFID parts identities, the goods recipient can thus check whether everything or the right parts / assemblies have been delivered and, in the event of discrepancies, draw the attention of the goods recipient at the customer or the unloader with the forwarding agent with suitable problem reports. To support all conceivable types of delivery in procurement logistics in the car industry, the delivery notification must be able to show the following networked relations: These messages must be still adapted by suitable definitions in DESADV or similar to the requirements of the RFID process. This definition should occur in the VDA-KIT (communications and information technology).

## 4.3 Paper documents

According to the current state of knowledge, the following present VDA paper documents can be affected by these adaptations:

- Document accompanying data telecommunication (VDA 4912)
- Goods label (VDA 4902)
- Global Transport Label

# 5 Processes to assure pre-tracking and traceability of car components

## 5.1 Documentation process

The documentation processes most current in the car industry of tracking and tracing based on:

- Individual parts marking
- Package marking
- Delivery notice documentation

Depending on the alternative selected, different degrees of precision in classification result.

## 5.2 Coordination of the documentation processes applied within the supply chain

Customer and supplier / manufacturer select the documentation process for their interface.
Thus it is possible that different documentation processes are used across the entire supply chain.

## 5.3 Contents of labeling for traceability and their use

The contents of the labeling is a reference which itself contains no quality data and/or process data. The supplier / manufacturer establishes via the reference / labeling of the product a relationship to his quality data and production data. This relationship is documented and archived. The customer produces with the help of the reference / labeling of the delivered product a relationship to his end product in which it was incorporated. This relationship is documented and archived. Therefore, the labeling forms the reference between the quality data and production data (e.g.: batch of xraw materials used, manufacturers of parts supplied, test results, set values, manufacturing place and manufacturing equipment...) of the products delivered by the suppliers and the end product of the customer. The contents of the labeling must be unambiguous for the agreed period within the customer- supplier relationship. The custody of the stored data on the supplier's side and the customer side should be handled according to the legal regulations of the different countries in which the products are sold. The custody time of the data is to be contractually agreed between customer and supplier.

In a case of damage, the customer or the service organisation with the supplier / manufacturer exchanges the necessary references to allow a cause analysis and to pursue damage minimisation.

## 5.4 Steps in the case of complaints

In the event of a production or process error recognised by the supplier himself, he communicates the references to affected products to the customer.

The customer informs the supplier if he discovers defective components (in his plant or at his customer). The supplier carries out the necessary investigations with the help of his own tracking system to inform the customer of the reference of the affected products.
In both cases the supplier and the customer / service organisation exchange the following data, including:

- The references of the defective components (originating from the bill of lading, from the package or from the individual part)
- The article numbers, the type of defect and the number of the affected parts

# 6 Identifiability of parts

The product is described unambiguously by the article number (also called material number / parts number) and the change index / change number (also called change state). Several aload carriercle numbers are necessary to identify more complex assemblies. If no unequivocal article number exists, the need exists, in addition to the article number, to have a raw part number, a sort number, a generation number, a group number, a dimension group, a weight group or a control number.
So that the supplier / manufacturer and customer can identify the product, it is advisable to note the article number / serial number of the supplier as well as the article number of the customer, if necessary incl. the respective change index on the product, the package unit or the bill of lading.

## 6.1 Use duration of the marking

During the production process, all marking information mentioned remains attached to the individual part / group up to installation in the next higher group (on the individual part itself through the package unit with package number / license plate in which the part lies or through the bill of lading number which is on the packaging in which the part lies). After assembly, a separation of the marking of the product, if legally possible, is allowed, so that backtracking can be ensured only through the end product. Besides, it is important that with assemblies made up of the components the proof is preserved. This is important because the aftermarket parts supply has a different data resolution than the production area.

## 6.2 Miscellaneous

### 6.2.1 Labeling as a quality feature

Labeling is a quality feature to be supervised.
Important aspects include:

- Type and legibility of the coding
- Correct contents of the data sequence
- Attatchment of the labeling

### 6.2.2 Definition

The tracking procedure and necessary details for carrying out the labeling for individual parts is an obligatory component in the RFQ specification (specification sheet) of the customer to the supplier / manufacturer, so that he can take into consideration the procedure selected in product design and industrialisation. In the choice of the package procedure or bill of lading procedure, this choice is to be documented at the signing of the contract between customer and supplier / manufacturer (logistics - agreements).

# 7 Possible technical solutions for implementation

## 7.1 Content of the label

**Contents of pre-tracking and traceability of car parts / components**
Depending on the documentation processes chosen (see above) the informational contents are to be selected which allow an unambiguous reference to the process data and quality data. The necessary information contents per documentation process are shown in the following tables.

### 7.1.1 Table1 – Content of label after documentation process

| Documentation-process / Content | **Indidvidual part marking** | **Package marking** | **Bill of lading-documentation** |
|---|---|---|---|
| **Mandatory contents** | | | |
| Supplier number (unambiguous worldwide ) | Supplier code | | |
| Serial number of the supplier | | | |
| unambiguous | serial number per part | package number | Bill of lading number |
| ambiguous | group serial number. | batch number | |
| Article code | Article code of the customer | | |

Other fields are possible – see ANSI MH 10.8.2 (DIs) for that

Tables 2 to 8 describe the labeling contents selected.

### 7.1.2 Table 2 - Description of the globally unambiguous supplier code:

Supplier code in conformance with ISO / IEC 15418 and ISO / IEC 15459-1,-2

| Data field | Content | DI | Data string |
|---|---|---|---|
| | | | |
| DUNSsupplier number | DUNSNumber =zzzzzzzzz | 13V | 13Vzzzzzzzzz<br>z=9 digits / 13 digits |

DI = Data Identifier, means the data field in short form and is prefixed to the actual use date (see data string). By adding on different DI´s + action data the result is a data string whose contents can be accessed selectively in a simple way. See chapter 7.3.

General COMMENT on the DIs**:** Every DI should be used only once (exception: see Appendix 1: "Direct access to the reference of a subsupplier" - DIs in conjunction with the DI: " F ")

### 7.1.3 Table 3 – Description of the serial number for parts

| Data field | Content | DI | Data string |
|---|---|---|---|
| **3 Alternatives** | | | |
| Serial number<br>- unambiguous | Serial number xxxxxx... | S | Sxxxxxx… |
| Serial number<br>- group | Group serial number yyyyyy... | 1T | 1Tyyyyyy… |
| License plate with DUNS<br>- unambiguous | DUNS code = „UN“ | 25S | 25SUNzzzzzzzzzkkkkkk....<br>z=9 digits / 13 digits |
| | DUNS supplier code. = zzzzzzzzz | | |
| | Serial number = kkkkkk... | | |

**COMMENT 1 on Serial number:** The serial number is to be chosen by the supplier in such a way that it is unambiguous in combination with the supplier's number and the article number. Absence of ambiguity is to be ensured for the documentation period.

**COMMENT 2 on group serial number:** The group serial number represents in the broadest sense the batch number with which every single component of the batch is marked. See also comments on the serial number.

**COMMENT 3 on license plate:** License Plate combines the supplier code and a serial number into a serial number. Therefore it is not necessary to have the supplier number and the serial number separately. See also comments on the serial number.

License Plate is to be understood as the unambiguous marking of a load carrier for transport between source and sink. It is not the code of a load carrier with the features unique to it such as type, owner etc.

### 7.1.4 Table 4- Description of a serial number for package labeling

| Data field | Content | DI | Data string |
|---|---|---|---|
| **3 Alternatives** | | | |
| Package number<br>- unambiguous | Package number | 3S | 3Sxxxxxx… |
| Batch number on the package<br>- ambiguous | Batch number yyyyyy. | 1T | 1Tyyyyyy... |
| License plate with DUNS<br>- unambiguous | DUNS code UN“ | 1J oder 6J | 1JUNzzzzzzzzzkkkkkk...<br><br>z=9..13 digits |
| | DUNS-supplier number=zzzzz…. | | |
| | Package number ….. | | |

**COMMENT 4 on the license plate identifier:** 1J describes a unit which is not divisible any more. 6J describes packaging which can contain smaller units (the same article number).

**COMMENT 5 on unambiguousness:** The package numbers, the batch numbers and the License Plate must be unambiguous within a supplier for the agreed documentation period.

Table 5 – Description of the serial number for the shipping note documentation

| Data field | Content | DI | Data string |
|---|---|---|---|
| | | | |
| Shipping note | Shipping note number xxxxxx... | 2K | 2Kxxxxxx… |

**COMMENT 6 on shipping note:** The shipping note numbers must be unambiguous within a supplier for the agreed documentation period.

### 7.1.6 Table 6 – Description of article number 1

| Data field | Content | DI | Data string |
|---|---|---|---|
| **Alternative or together** | | | |
| Article number of the part defined by the customer | Article number: xxxxxx... | P | Pxxxxxx… |
| Software article number of the part defined by the customer | Software article number: wwwwww... | 21P | 21Pwwwwww… |

The software article number can be also be given in addition to a hardware article number

**COMMENT 7 on softwarerticle number:** The contents of this recommendation are only applicable if the software article number / version is to be a feature to be labeled externally. In this case the labeling contents are to be updated with software update (Flash ROM) accordingly. If the software article number and its version is kept only in ROM / Flash-ROM, this recommendation is not applicable for the pre-tracking and traceability of software.

**COMMENT 8 on the article number:** A globally unambiguous reference can be generated by the combination of the globally unambiguous supplier number and the article number of the supplier for the technical version of the component.

**Contents for the identification of the technical version**
Depending on demand and the arrangement between customer and supplier, one or more article numbers and change indices for the same component are a component of the labellng (e.g., customer and supplier article number)

### 7.1.5 Table 7 – Description of article number 2

| Data field | Content | DI | Data string |
|---|---|---|---|
| **Article number for the technical description of the part** | | | |
| Article number of the part defined by the customer | Article number: xxxxxx... | P | Pxxxxxx… |
| Article number of the part defined by the supplier | Article number: yyyyyy... | 1P | 1Pyyyyyy… |
| Software Article number of the part defined by the customer | Article number: wwwww... | 21P | 21Pwwwwww… |
| Software Article number of the part defined by the supplier | Article number: zzzzzz... | 31P | 31Pzzzzzz… |

### 7.1.6 Table 8 – Description of the change index

| Data field | content | DI | Data string |
|---|---|---|---|
| **Change index to concretise the article number** | | | |
| Change index of the part defined by the customer | Change index: xx... | 20P | 20Pxx… |
| Change index of the part defined by the supplier | Change index: yy... | 30P | 30Pyy… |
| Software change index of the part defined by the customer | Change index: ww... | 22P | 22Pww… |
| Software change index of the part defined by the supplier | Change index: zz... | 32P | 32Pzz... |

**COMMENT 9 on article number and change index**: If the change index is a component of the article number, it is updated as such.

**COMMENT 10 on the DI´s 20P, 21P, 22P, 30P, 31P, 32P (generally freely definable DI´s):** These should be replaced after official definition with precisely specified DI´s in the ISO / IEC 15418.

It must agreed between customer and supplier

- which of the coded informational contents must be shown, in addition, in plain text
- where the marking on the component is to be attached.
- how the marking is to be carried out (label, direct mark, follower, RFID tag, … .)

The marking of the products relevant to the vehicle can take place only insofar as its composition and shape as well as size permit. Any resultant limitations on the marking are to be agreed between the customer and suppliers / manufacturers. Indispensable condition for the restriction is the guarantee of the unlimited pre-tracking and traceability of the products with the help of the limited information.

## 7.2 Direct access to the refence of a subsupplier

If documention of components which are already pre-installed by a supplier is necessary (e.g. airbag in seats), the following procedure can be used: In conformance with ANSI FACT-ISO/IEC 15418, a hierarchical code is used. At the first level, the module reference is transferred. At the second level (as a successor to the module), the references of the subsupplier parts are passed on. The data identifier "F" can be used to organise the hierarchy.

## 7.3 Use of Data Identifiers

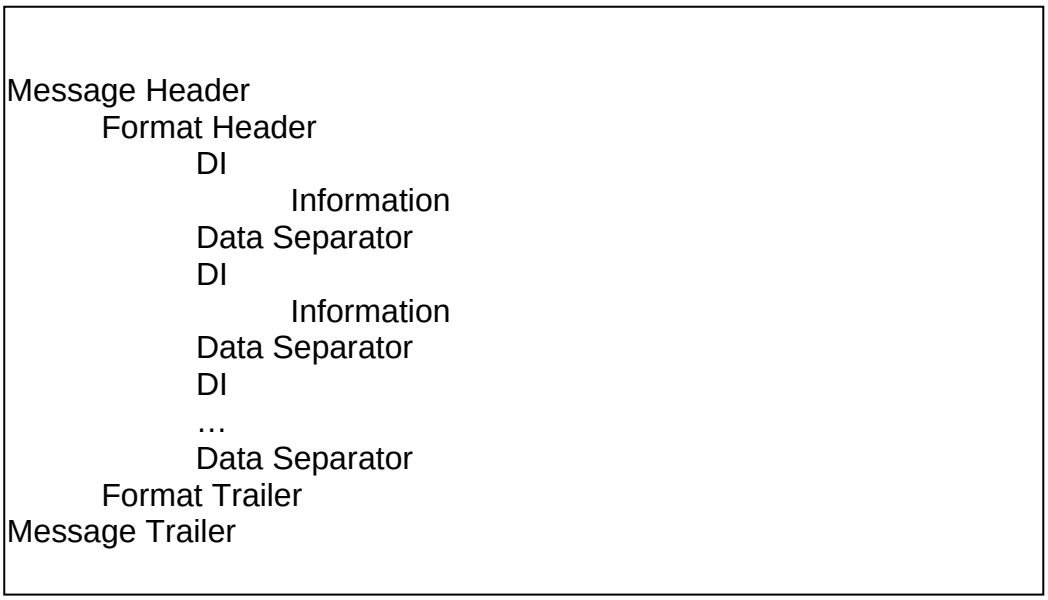
The following description is an excerpt from the standards mentioned above and shows how the information can be structured:

The marking system is based on a description of the contents as a data string, to every piece of information a Data Identifier (DI) is added as a prefix and a Data Separator / as a suffix. Individual data can be separated by DI and separator from each other and their contents can be interpreted. The string can be put together individually based on the need for information to be transmitted.

Besides the information, the DIs and the Data separator, there is a Message Header as well as a Message Trailer which mark beginning and end of the message. In addition, a format Header and a format Trailer is given in the ANSI standarad to indicate by which standard the character string (i.e. DI´s) is to be interpreted.

### 7.3.1 Basic information structure

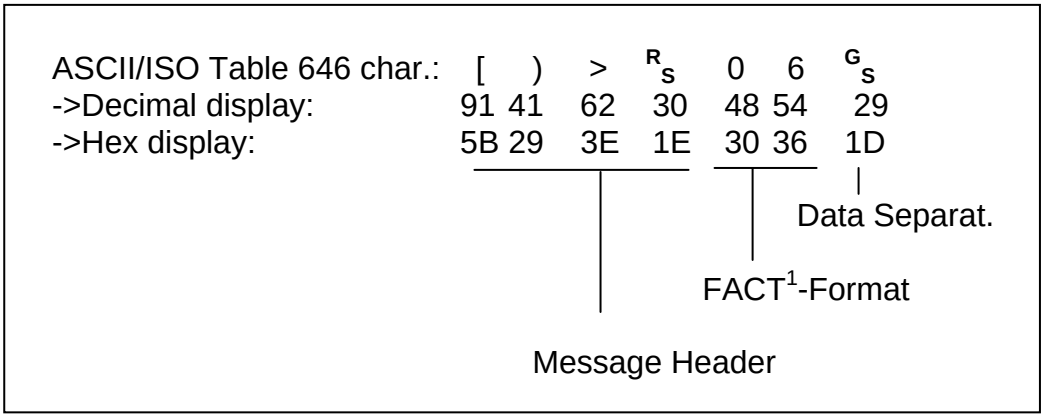
Structure of the information




### 7.3.2 Message format

Selected formats

- Always the same Message Header and Format Header (7 characters)




[1] FACT: Federation of Automatic Coding Technology: Development of Data Identifiers (DIs) in 1989 described in ANSI MH10.8.2 – ISO/IEC 15418

- Always the same Format Trailer + Message Trailer (2 characters)

| | | |
|---|---|---|
| ASCII/ISO Table 646 characters: | $^{R}_{S}$ | $E_{OT}$ |
| -> Decimal displaya | 30 | 04 |
| -> Hex display | 1E | 04 |

Information Trailer

Trailer

- Note

  $^{R}_{S,}$ **E**$_{OT}$ and $^{G}_{S}$ are the type characters from table 646 of ASCII/ISO. These letters are used by the software developers to extract the different data elements in a data chain.

- For identification and tracking and tracing, recommended characters in Data Identifier can be taken from this document. Every DI may be used in a string only once. Which DIs should be used depends on the information which should be shown specifically. The character set to be used is an ASCII/ISO table 646.

### 7.3.3 Character stock user data

The following characters are allowed as user data

| | |
|---|---|
| 0 to 9 | ASCII decimal 48 to 57 |
| A bis Z | only upper case charaters ASCII decimal 65 to 90 |
| - | ASCII decimal 45 |
| . | ASCII decimal 46 |
| $ | ASCII decimal 36 – avoid, because in Code 39 not displayable |
| / | ASCII decimal 47 – avoid, because in Code 39 not displayable |
| + | ASCII decimal 43 – avoid, because in Code 39 not displayable |
| % | ASCII decimal 37 – avoid, because in Code 39 not displayable |
| blank | ASCII decimal 32 |

- Always the same data separator (1 character)

| | |
|---|---|
| ASCII/ISO 646 Letter: | $^{G}_{S}$ |
| ---> Decimal display | 29 |
| ---> Hex display | 1D |
| | \| |
| | Trailer |

### 7.3.4 Label example

Supplier number: 999 999 999 given by Dun&Bradstreet
Part number (given by customer): 0POS-40
Serial number: 123456

Production date: **2003-07-30**
=>Code:

[)>$^{R}_{S}$**06**$^{G}_{S}$**13V999999999**$^{G}_{S}$**P0POS-40**$^{G}_{S}$**D030730**

$^{G}_{S}$ **S123456**$^{R}_{S}$ $^{E}_{OT}$

If, in addition, the reference of a subsupplier component is to be transmitted to the customer, the DI "F" is used.

e.g.: Subsupplier code: **888 888 888**

e.g.: Part number of the subsupplier part: **sub 123**

e.g.: Serial number: 67891011

=> the code would appear as follows:

[)>$^{R}_{S}$**06**$^{G}_{S}$ **F01001F** $^{G}_{S}$**13V999999999**$^{G}_{S}$**P0POS-40**
$^{G}_{S}$**D030730**$^{G}_{S}$ **S123456** $^{G}_{S}$**F02010F** $^{G}_{S}$ **13V888888888**
$^{G}_{S}$**PSub123 S67891011**$^{R}_{S}$ $^{E}_{OT}$

# 8 Technical Specification

The specifications described below show the requirements from a process view of the involved member enterprises and, therefore, should be kept for a generally valid applicable RFID system.

## 8.1 Frequency and read/write operating distances

- With parts as well as with assemblies, UHF technology (860 - 960 MHz) should be used, however for process reasons the HF technology (13.56 Mhz) can be also used.
- Air interface according to ISO 18000-6C (EPC Gen2) with UHF
- For parts / assemblies, a minimum reading distance of 4 m in one direction, or 7 m when passing gates with illumination on both sides must be guaranteed.
- Bulk reading should be possible according to the EPC requirement with up to 500 parts / assemblies.
- For disturbance -free operation at close range, the read and write range of the readers must be scaleable to match the field of application.
- As soon as the ISO guidelines 18047-6 (conformity test of the air interface) and 18046 (performance test of a RFID system) are approved, their adoption in the guideline as standardised testing methods can be checked.

## 8.2 Transponder types

In the application variation the data fields in the process can change. Therefore, use of a R/W transponder is mandatory. The part ID, as well as the user data in the case of application version 2 may not be changeable after unique allocation any more. To the extent that (semi-) active transponders are used, it must be ensured that these can be read with the same infrastructure as passive transponders.

## 8.3 Relative speed passing read gates

The relative speed gives the maximum permissible speed difference between transponders and antennas. To ensure identification at read gates, a perfect reading (100 %-read rate) is to be guaranteed at relative speeds of 0 to 6 m/s.[2]

## 8.4 Anti-collision mechanism

The technical report of the European Telecommunications Standards Institute (ETSI) TR 102 436 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Installation and commissioning of RFID systems operating at UHF" is to be followed.

[2] In the UHF-area a maximum data transfer rate from 40-80 KBit/s is realistic.
The higher the speed, the sooner the problems of read mistakes from " blind spots " in the acquisition field arise.

If reading from two sides, it must be ensured by antenna multiplexing that data is acquired on both sides according to ISO 18000-6C.
In addition, when the system is installed the following is to be observed: To exclude mutual interference from several UHF readers in a narrow space, the recommendations of the ETSI are to be followed.

## 8.5 Life cycle of transponders

Passive transponder should have a minimum useful life of 15 years.

## 8.6 Environmental conditions:

Type of protection
To ensure the ability to function in the industrial-logistic environment for transponders which are exposed to the weather, at least protection class IP 54 is necessary

- Complete protection of the transponder from contact and dust entry
- -40° to +70° Celsius (for use outside)
- Suitable action must be ensured when dealing with snow and ice to ensure readability.
- Contact with oil mist, drilling emulsion, steam etc must be examined in individual cases.

# 9 Processes in the supply-chain

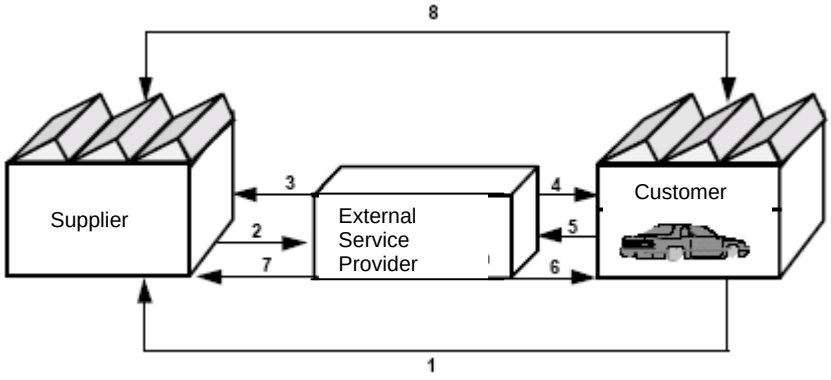



**Figure 9:** Supply chain from VDA 4913

Support for the processes in the supply chain using RFID is only feasibly efficient if they can be used consistently by all partners involved in the supply chain. They include specifically:

- Parts manufacturer
- Forwarding agent
- External service providers – EDL
- Customer – OEM
- Parts supply
- Service organisation

In the following process descriptions, only the process steps and functions which are changed by the introduction of RFID technology compared with the conventional process without RFID support are described. The inbound / outbound processes are examined.

Internal processes (production processes or internal logistics processes) are not described here, these must be configured according to requirements by supplier or customer.

## 9.1 Process description of full load

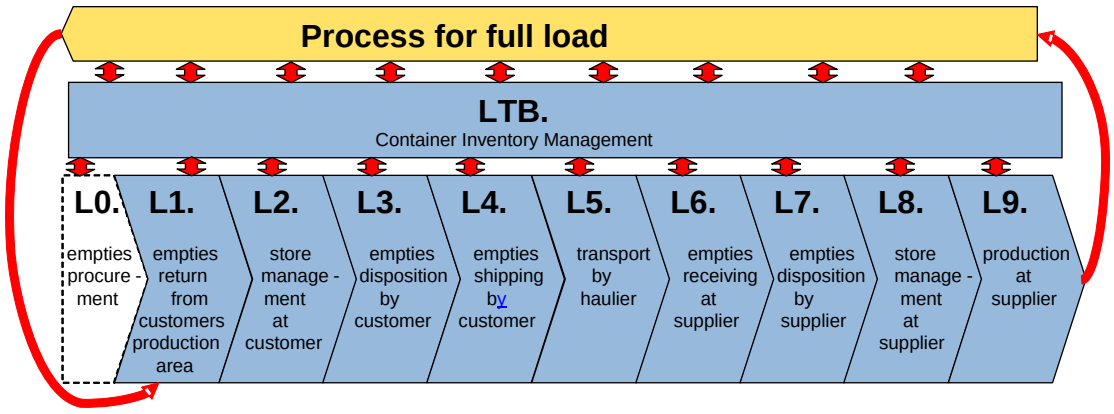



**Figure 10:** Full load process description

## 9.2 Process-description – supply chain production

The following processes of the supply chain will be described regardless of the RFID version actually used (cf. Chapter 3).
Therefore, in some cases a sequence can result which is changed in comparison to the process described here in particular with the application of the sequence version 3.

Opportunities using RFID:
- Increased transparency in parts tracking
- Improved determination of original part identity
- Reduction of incorrect installation and reduction of production and recall costs

**Physical receipt of the parts/components at the loading zone of the customer**

Opportunities using RFID:
- Automated package control (elimination of manual activities)
- Elimination of paper documents (shipping note, unloading list)
- Wrong unloadings are avoided
- Express deliveries can be identified while unloading
- Sample deliveries can be identified while unloading without system binding (field: quality state)
- Less system dependence through decentralised readout of actual data on transponder

Requirements for the RFID process:
- Identification of the packages with RFID + read out of all relevant data fields while unloading
- Check against the reference unloading list

Combination with data objects (examples):
- Supplier notification
- Supplier call
- Receivng transaction with reference data from the transponder

**Storage of the packages at the customer**

Opportunities using RFID:
- Incorrect storage can be avoided by cross checking the actual data on the tag
- Manual scan processes can be dispensed with
- Conveyors do not need to be connected online for the identification of the storage area if the updated destination was saved on the transponder
- Decentralised control of minimum expiration date data (next MED reached – next removal)

Requirements for the RFID process:

- Acquisition of the package to be stored either at a gate or on the move from a fork lift
- System-supported allocation of the storage location
- Online information to the fork lift driver in the event of incorrect storage
- If necessary, automated feedback after storage

Linking with data objects (examples):
- Stock management
- Fork lift control system

**Production supply at the customer**
**Production call for parts/components**

Opportunities using RFID:
- PULL: Automatic material call by the removal of a full load container from the full load buffer area (inventory at the production line)
- Elimination of manual scan procedures
- Quarantining of full load due to transponder data or on the basis of the transponder data read out

Requirements for the RFID process:
- Acquisition of the material inventory at the production line by readers at the buffer areas

Linking with data objects (examples):
- Kanban
- Material call or removal from storage
- Quality quarantine

**Removing full good from storage and preparing for production line**

Opportunities using RFID:
- System-technical monitoring of stock removal and automatic notification of the driver in the event of incorrect removal from stock (prevention of incorrect removal from stock).
- System-technical supervision of the delivery and automatic notification in the event of incorrect delivery (prevention of incorrect delivery).
- Ellimination of manual scanning
- Booking errors are avoided
- Elimination of paper documents
- More differentiated inventory account
- Check the expire date (given by supplier) and impose a quality quarantine if exceeded

Requirements for the RFID process:

- Recording of the package to be removed from storage/provided ideally in storage and preparation area or at gates or on the move from the fork lift

- Overwrite destination
- Check of the field " minimum use-by date"
- If necessary overwrite quality status due to transport damages and similar.

Linking with data objects (examples):
- Fork lift control system
- Stock removal jobs
- Material calls
- Production control

**Full good order collation for production supply**
Opportunities using RFID**:**
- Prevent wrong collation (over- or under-delivery, use of wrong containers) possible without system connection (comparison collation order with actual data on the transponder)
- If necessary, prevention of faulty set assembly without system connection possibly (comparison collation order with actual data on the transponder)
- Decentralised check + set quality status without system connection, system comparison in the batch run
- Potentially processing without paper

Requirements for the RFID process:
- Acquistion of packages and parts provided and collated from stock
- Readout of relevant data fields with packages provided and collated from stock
- Overwrite destination
- If necessary overwrite quality status due to transport damage or similar

Linking with data objects (examples):
- Removal order
- Collation order (production order)
- Stock management

**Providing full good to the production lines**
Opportunities using RFID:
- Prevention of wrong delivery by comparing destination from the transponder and transit or receipt zone without system connection, subsequent update in the batch run.
- Manual scan processes can be eliminated
- In automatic conveyor systems the destination can be used to control systems.

Requirements for the RFID process:
- Recording of the package to be stored either at a gate (access line aisle) or on the move from the fork lift
- Reading of relevant data fields from the transponder at the production line

Linking with data objects (examples):
- Transport order
- Production control
- Empties control

**Special process JIS – sequential delivery**
Opportunities using RFID:

- Early recognition of disruptions in the container and parts sequence or missing containers or parts by RFID acquistion at the supplier, forwarding agent and goods receiving at the customer
- Automatic rack order check (for containers) possible.
- Unloading by lorry driver is audit-proof (by automated package check in goods receiving at the time of unloading)
- Increased efficiency during loading and unloading by RFID identification
- Automated load carrier reservation at load carrier ident level increases transparency about load carrier supplies and provides overview of load carriers currently used in the process

Requirements for the RFID process:

- RFID recording of outgoing goods at the supplier leads to notification of the shipment at the customer
- Transmission of the production numbers delivered, rack order numbers, transponder data and if necessary serial numbers with the notice of delivery from the supplier to the customer
- Automated recording of transponder data at goods receiving at the customer and comparison with the delivery notification (recording at the fork lift)
- Write production sequence number and JIS container sequence in production of the supplier
- Forwarding agent must be able to process RFID technically and organisationally according to this VDA recommendation
- Automated recording of the production sequence number and JIS container sequence at goods receiving at the customer and comparison with the delivery notification
- Overwrite quality status e.g. with damage in transit

Linking with data objects (examples):

- Delivery lorry (combined shipment number), bill of lading, aload carriercle numbers, production numbers/production sequence numbers, rack orders and if necessary serial numbers per transponder data from delivery notification
- Load carrier status (where is which load carrier?)
- Installation documentation

**Special process CKD supply**
**In the CKD process there are some specific features compared with standard supply**
Opportunities using RFID:

- More efficient package tracking and / or parts tracking across the entire chain by automated acquisition and readout of relevant transponder data
- If necessary simplified customs handling by reading relevant transponder data
- Simplified collation in correct assembly order
- Missing parts and quantity control

- Decentralised control by reading destination possible
- More flexibility for the globally distributed CKD partners through decentralised data (access to central data base not always a given)
- Decentralised check + setting of quality status without system connection (damage in transit)

Requirements for the RFID-process:

- Support transfer of cargo from lorry / railway waggon to sea container at the logistics service provider to receive an error-free content overview of the sea container efficiently at the time of transfer to the sea container
- Support acquisition of the transponder data with the consolidator and deconsolidator to track the sea containers on their way to the CKD destination
- Support transfer process from lorry / railway waggon to sea container at logistics service provider with decentralised actual data from the transponder to receive an error-free content overview of the sea container efficiently
- Write respectively read relevant data with the consolidator and deconsolidator to track the sea containers on their way to the CKD destination
- Forwarding agent must be able to process RFID technically and organisationally according to this VDA recommendation
- Overwrite quality status e.g. with damage in transit

Linking with data objects (examples):

- Delivery notification with reference to the packages
- Container reference at the consolidator
- Order reference at the deconsolidator

# 10 Data definitions

Reference process according to LANDmarKS

In the following, the process sheets from the project **LANDmarKS** are shown. The descriptions include the logistic processes at suppliers, OEMs and in the parts area at the plant and wholesale level (NSC). After receiving load carriers with material in the parts area, they are not usually identified any longer with the license plate but with the package number or load carrier ID. In addition, specific company adaptations are necessary if the potentials of RFID are to be used.

The installation of parts in the service organisation is not examined in the descriptions

## 10.1 Data definitions of full good process

| Data definitions of full good process | |
|---|---|
| **Out of storage document** | - License Plate<br>- package number<br>- part article number<br>- quantity<br>- load carrier ID |
| **Unloading list** | - License Plate<br>- unloading zone ID<br>- package ID<br>- package serial number<br>- bill of lading number<br>- quantity<br>- freight carrier-ID (e.g. VIN -number) |
| **Freight carrier data** | - forwarding agent-ID<br>- carrier-ID (z.B. VIN -number)<br>- combined shipment number (delivery process ID according to VDA)<br>- time frame/time frame number<br>- gate in-/gate out (time stamp) |
| **Load carrier data** | - LOAD CARRIER ID<br>- current location (last gate)<br>- gates passed (history)<br>- cycle time supply chain<br>- status (full/empty)<br>- clearance status (quarantined, free)<br>- type of load carrier<br>- repair flag |

| | |
|---|---|
| **Supplier call order data** | - order ID<br>- part article number<br>- quantity<br>- location neede<br>- date and time |
| **Delivery notification (acc. VDA 4913)** | - load carrier positions<br>- supplier number (given by customer)<br>- supplier location<br>- bill of lading number<br>- bill of lading positions<br>- serial number<br>- bill of lading date |
| **Bill of lading data** | - consignee<br>- supplier numbers<br>- shipping order numbers<br>- package numbers<br>- License Plates<br>- order no../call no.<br>- load-date/time<br>- difference list (package numbers) |
| **Material call data (KANBAN)** | - order ID<br>- part article number<br>- quantity<br>- location needed |
| **Material call data (call specific)** | - part article code<br>- quantity<br>- location neede<br>- date and time of the production order |
| **Material call data (JIS and JIT)** | - production order position<br>- sequence number of the assembly line<br>- master ID<br>- parts article number<br>- needs location<br>- date and time of the production order |
| **Transport order data** | - License Plate<br>- package number<br>- collaction location<br>- destination<br>- quantity<br>- part article number<br>- load carrier ID |
| **(preliminary) Accompanying document** | - License Plate<br>- package number<br>- part article number<br>- quantity<br>- date and time<br>- load carrier ID |
| **Material tags** | - consignee accord. VDA 4902<br>- shipping order numbers<br>- package number<br>- order/call number<br>- load date/time<br>- batch number |

## 10.2 Data definition of empty good processs

| Data definition empty good process | |
|---|---|
| **Remove from stock document (empty)** | - load carrier ID<br>- quantity<br>- load carrier type |
| **Freight medium data** | - forwarding company-ID<br>- freight medium-ID (z.B. car license plate)<br>- combined shipment number (delivery process ID acc. to VDA)<br>- time frame/time frame number<br>- gate in/gate out (time stamp) |
| Load carrier **data** | - load carrier ID<br>- current location (last gate)<br>- gates passed (history)<br>- cycle time supply chain<br>- status (full/empty)<br>- clearance status (quarantined, free)<br>- type of load carrier<br>- repare flag |
| **Delivery order data (empty load)** | - order ID<br>- load carrier type<br>- quantity<br>- location needed<br>- date and time |
| **Shipping note data (empty load)** | - consignee<br>- supplier number<br>- bill of lading number<br>- order/call number<br>- load carrier ID<br>- quantity<br>- load carrier type<br>- load date/time<br>- difference list (load carrier ID) |
| **Transport order data (empty load)** | - load carrier ID<br>- collection locationt<br>- destination<br>- quantity<br>- load carrier type |

## 10.3 Full good processes

### 10.3.1 supply avis (V0, V50)

| Process-description | |
|---|---|
| **V0, V50** | |
| **Supply noitification (e.g. remote data transmissioin, Fax)** | |
| **Target description** | - record the supply notification in the ERP system |
| **Purpose** | - Disposition support (Status MAT: Material at conveyance)<br>- avoidance of double recording with the supplier<br>- pre-identification of suspect parts, suspect loads (quick response time) |
| **Potential by using RFID** | none |
| **Input Data (Key data)** | - supplier notification: supplier number given by the customer, supplier's location, bill of lading number, bill of lading positions (batch number), container positions, serial number, bill of lading date (according to VDA 4913)<br>- optional data according to VDA 4921 (relation to the freight carrier) |
| **Output Data** | - status change MAT in the ERP system with the acceptance of the bill of lading: Material on transport<br>- other data for the delivery notification, which are not key data, but relevantfor the following processes. |

### 10.3.2 Incoming goods / freight data acquisition (V1, V51)

| Process-description | |
|---|---|
| **V1, V51** | |
| **Incoming goods / freight data acquistion** | |
| **Target description** | - combining supply notification with freight carrier data<br>- or recording the bill of lading of the freight carrier (e.g. lorry, swap-body platform) and combination with freight carrier data<br>- recording the haz-mat class and checking compliance with the storage quantity allowed<br>- creating the unloading list (one list per unloading location) |
| **Purpose** | - To afford and asure of tracking and tracing of the load carrier s and their content<br>- lorries have to be send to the right loading location<br>- bottleneck material should be given preference |
| **Potential by using RFID** | - automatic delivery data acquisition which are stored on the freight carrier RFID (accord. VDA frreight carrier documentation) |
| **Input Data (Key data)** | - freight carrier data: combined shipment number (delivery process ID acc. to VDA)<br>- delivery notification: bill of lading number & supplier number given by customer & supplier location & shipment date = unique<br>- haz-mat class |
| **Output Data** | - storage permission yes/no<br>- unloading list<br>- MAT status change in ERP: Material in house |

### 10.3.3 Receiving / goods receiving (Phys. and Kfm.) (V2)

| Process description | |
|---|---|
| **V2** | |
| **Receiving / goods receiving (Phys. and Kfm. )** | |
| **Target description** | unload and deposit at the unloading area<br>- record load carrier ID (absolute tag ID) at the unloading area (container management)<br>- if necessary break down mixed containers into individual positions (see storage internal processes b<br>- visual check: incoming goods check for (transport) damage<br>- if load carrier defective: Info QA<br>- QA: load carrier /Part is OK - continue with V3<br>- QA: load carrier /Partl is not OK – continue with V21<br>- check correct allocation part to part number and to packaging<br>- in case of wrong allocation: special treatment<br>- if necessary quality check (Qx):<br>- OK - continue with V3<br>- not OK – continue with V21<br>- finding stock location/-place<br>- generate transport order<br>- compare the bill of lading data with actual delivery data and if necessary correct<br>- record unpacked/wrongly packed product and if necessary record and quarantine (supplement, return, scrap<br>- if necessary check on entire VKE and if necessary. record as opened container and quarantine (supplement, return, scrapping)<br>- check for authenticity (visually and data comparison), quarantine copies scrap<br>- after incoming goods recorded:<br>- record "License Plate" of the subpallet which has reference to the individual package numbers received by remote data tranmission |
| **Purpose** | - ensure completeness and correctness of the delivery<br>- container check by visual inspection<br>- possibility to determine locatioin of the load carriers and their content in the unloading area<br>- Enable and ensure the traceability of the load carriers and their content |
| **Potential by using RFID** | - dispense with in-house documents by direct use of the supplier's documents<br>- economic efficiency: deletion of paper documents (transport document) in connection with transport guide system<br>- automatic check authenticity (data comparison), corresponding. technical solution necessarily |
| **Input Data (Key data)** | - bill of lading data<br>- load carrier data (tag)<br>- unloading list |
| **Output Data** | - package data (supplier side)<br>- bundle data (supplier side)<br>- License Plate<br>- transport order<br>- load carrier data (tag) (if necess., status change)<br>- tag number of checked parts<br>- MAT status change in the ERP: Material in goods receiving |

### 10.3.4 Interal transport (V3, V8, V11, V16, V18, V19, V21, V25, V27, V31, V35, V41, V53, V57, V59, V60, V71)

*) in spare parts organisation load carrier /part ID

| Process description | |
|---|---|
| **V3, V8, V11, V16, V18, V19, V21, V25, V27, V31, V35, V41, V53, V57, V59, V60, V71** | |
| **Interal transport** | |
| **Target description** | - record the load carriers'*) ID (tag ID)<br>- Record the License Plate to identify the containers to be transported and comparison with the transport order<br>- comparison with the transport order data<br>- transport to destination (also crossdocking)<br>- confirmation of the transport order with the commissioning process |
| **Purpose** | - possibility of determining location of the load carriers *) and their content during the in-plant transport and preparation<br>- secure proper transport and proper preparation<br>- enable and ensure traceability of the load carriers and load carrier content |
| **Potential by using RFID** | - automatic compariosn |
| **Input Data (Key data)** | - transport order<br>- load carrier (tag) |
| **Output Data** | - load carrier data (tag) (if necess. status change for the container management)<br>- part-ID<br>- message confirming the transport process |

### 10.3.5 Storage (V4, V12, V22, V32, V54)

*) in spare parts organisation load carrier /Part ID

| Processdescription | |
|---|---|
| **V4, V12, V22, V32, V54** | |
| **Storage** | |
| **Target description** | - record container *) ID (tag ID) with stock entry<br>- record of "License Plate" of the load carrier<br>- inbound stock booking in the ERP system: Booking of the load carrier and its content at stock (kfm).<br>- generation of the transport order to the bin location<br>- store load carrier<br>- comparision bin location |
| **Purpose** | - possibility of determing location of the load carrier and its content in stock area -<br>- enable and ensure the traceability of the load carrier and its content |
| **Potential by using RFID** | - economic efficiency: elimination of paper documents (storage document) in conjunction with transport guidance system |
| **Input Data (Key data)** | - packages pieces / bundle structure notified (License Plate)<br>- load carrier data (Tag-ID) |
| **Output Data** | - load carrier data (tag) (if necess., status change)<br>- Transport order to new location (bin location)<br>- MAT status change in ERP: material in stock |

### 10.3.6 Stock internal process (V5, V13, V23, V33, V55)

*) at spare part organisation container-/Part-ID

| Process description | |
|---|---|
| **V5, V13, V23, V33, V55** | |
| **Stock internal process** | |
| **Target description** | a) Relocation / supplies<br>- record the load carrier *)ID (tag ID)<br>- record the „License Plate“ of the load carrier<br>- if necessary prepare an in-plant transport order<br>- assign new storage site<br>b) Transfer/division (1 in n containers → e.g. GLT in KLT)<br>- record load carrier ID (tag ID) of the outgoing container<br>- record the “License Plate“ of the outgoing container<br>- allocation of new container<br>- record new container ID<br>- record the part ID of the parts to be tranferred and link to container ID of the target container<br>- generate new License Plate for new load carriers<br>- initialise and check the load carrier tag status field (at RFID)<br>c) Transfer of generally same batch (n in 1 container → e.g.. KLT in GLT)<br>- if necessary allocation of new container<br>- record the container-ID (tag-ID) of the target container<br>- record the part ID of the parts to be transfered and linking with container ID of the target container<br>- if necessary generate a new License Plate for target container<br>- record "License Plate" of the outgoing containers<br>- if necess.,initialise and check the load carrier tag status field (in RFID<br>- if outgoing container is empty → status change to “empty „<br>d) Inventory: to be described company-specific<br>- return, rework, scrap<br>- Record of the current status and comparison with TR system<br><br>e) damaged product in storage<br>- record container / parts-ID and quarantine containers / parts<br>- return, rework, scrap<br><br>f) Exceeding maximum storage time<br>- record container / parts-ID and quarantine containers / parts<br>- return, rework, scrap |
| **Purpose** | - Enable and ensure the traceability of the load carriers and load carrier content<br>- quarantining and separation of defective and expired parts<br>- optimisation of the container management process |

| | |
|---|---|
| **Potential by using RFID** | - economic efficiency: to minimize paper documents (storage document) in conjunction with transport guidance system (handling and printing costs)<br>- higher level of automation in tracking |
| **Input Data (Key data)** | a)<br>- Load carrier data (tag ID): if necess., reenter Q-status<br>- part ID of the relocated parts<br>- License Plate<br>- if necess., new storage bin (if not automatically given by system)<br>b)<br>- Load carrier data (tag ID)<br>- part ID of the transferred parts<br>- License Plate of the outgoing container<br>c)<br>- Load carrier data (tag-ID)<br>- part ID of the relocated parts<br>- License Plate of the target container(if container is already available)<br>- License Plate of the outgoing container<br>e) f) Load carrier data (tag-ID)<br>- part ID of the damaged /expired parts |
| **Output Data** | a)<br>- Load carrier data (tag) (if necess., status change in container management)<br>- transport order<br>b)<br>- License Plate of new containers<br>- load carrier data (tag) (if necess., status change in container management)<br>c)<br>- License Plate of target container (if container is new)<br>- Load carrier data (tag) (if necess., status change in container management)<br>e)f) release status (container/part): quarantined |

### 10.3.7 Store out (V6, V14, V24, V34, V56)

| Process description | |
|---|---|
| **V6, V14, V24, V34, V56** | |
| **Removal from storage** | |
| **Target description** | - trigger event: incoming material call (e.g., KANBAN) or parts are ready for delivery<br>- create transport order<br>- remove container from storage place<br>- record container ID (tag ID) with outgoing stock<br>- record License Plate with outgoing stock<br>- create a removal from stock document<br>- booking change to load carrier and load carrier content to rotating stock (kfm.)<br>- reconcilation of the removal |
| **Purpose** | - Just in time material preparation<br>- Possibility of determining locationof the container and its content during the removal from stock process<br>- ensuring the correct removal process<br>- enable and ensure the traceability of the container and its content |
| **Potential by using RFID** | - economic efficiency: elemination of paper documents (storage document) in conjunction with transport guidance system |
| **Input-Data (Key data)** | - material call data<br>- load carrier (tag ID)<br>- License Plate |
| **Output Data** | - load carrier data (tag) (if necess. status change)<br>- MAT status change in ERP: Material on the way<br>- Transport order to new destination (e.g.. collating area, installation area, reworkarea, outgoing goods)<br>- out of storage document |

### 10.3.8 Picking (V7, V15)

| Process description | |
|---|---|
| **V7, V15** | |
| **Collating** | |
| **Target description** | Trigger event: arrival of material call, if necess. product-related<br>a) single-product specific<br>- confirmation of the receipt for the commissioning process<br>- single-product specfic assembly of the collation scope (JIS / shopping basket (internal delivery) and JIT (external delivery)<br>- writing of transport order<br>- prepare empty load carriers and initialisee with new License Plate<br>- linking of the new License Plate to the License Plate of the material to be delivered<br>- record load carrier ID (tagID) of the new load carrier<br>b) call-specific<br>- confirmation of receipt for the commisioning process<br>- call-specific asembly of the collation scope (total of individual products) (also for aftersales)<br>- write the transport order<br>- supply empty containers and initialise with new License Plate<br>- link the new License Plate with the License Plate of the material to be delivered<br>- record load carrier ID (tag) of the new load carrier<br>- record the part ID of the parts to be collated and link with load carrier ID of the target load carrier (with coll. at part level) |
| **Purpose** | - possibility of determing location of the load carrier and its content during the collation process<br>- ensure correct collation process<br>- enable and ensure the traceability of the load carrier and its content |
| **Input-Data (Key data)** | - material data call (JIS and JIT data: production order position, sequence number of the assembly line, master ID, e.g., chassis number), part article number, destination, date and time of the manufacturing order)<br>- License Plates removal load carrier<br>- container data (tag)<br>- part-ID of the too picking parts |
| **Output-Data** | - License Plates of the collating container<br>- load carrier data (tag) (if necess.status change)<br>- confirmation of receipt for the commissioning process<br>- transport order |

### 10.3.9 Material handling and assembly (RM/ET/BG) (V9)

| Process description | |
|---|---|
| **V9** | |
| **Material handling and installation** | |
| **Target description** | - record License Plate and load carrier ID (tag) before the first part removal for traceability<br>- inspection of release status of the load carrier → if load carrier is quarantined, then set tag status to "quarantined" → continue with V21<br>- removal parts from load carrier<br>- with removal of the last part, load carrier status must be changed to "empty" → processing of material call<br>a) Batchn tracking: Linking of the batchIDs of the installed parts to the master ID of the component<br>or<br>b) Serial linking of the serial number of the installed parts to the master ID of the component<br>or<br>c) Container tracking: Linking the License Plate of the container of the installed parts with the master ID of the component<br>- check of the assembly, if quality faults are present:<br>a) Supplier part is not OK:<br>- set status of the assembly to "quarantined"<br>- create transport document for reworking parts<br>- continue with process step V21 (in-plant transport to the rework area)<br>- create reorder with JIT<br>b) Production error:<br>- set status of the assembly to "quarantined"<br>- create transport document for rework parts<br>- continue with process step V18 (in-plant transport to the rework place)<br>- if assembly is OK→ if necess. pass on.build status documentation to the customer (with JIT processes) |
| **Purpose** | - production process valildation:<br>- installtion of the right parts<br>- no installation of not OK parts<br>- if necess. ensure that assembly is OK.<br>- enable and ensure traceability of the installed parts |
| **Potential by using RFID** | - automatic build status documentation → if possible do away with barcode label<br>- automatic adjustment with material flow control (sequence adjustment) |
| **InputData (Key data)** | - Data of production order: JIS and JIT data:<br>production order position, sequence number of the production line, master-ID (e.g. chassis/VIN number ), part materialnumber, destination, date and time of the production order<br>- parts data (component, part): serial number<br>- container data: License Plate and tag ID<br>- Batch data: batch number |

| | |
|---|---|
| **Output-Data** | - at quality check before part installation: part status “quarantine“ if quality problems) and Q data<br>- Relation between the parts data of the component and the parts data or batch data or container data of the installed part<br>- if necessary transport order for the not OK products |

### 10.3.10 Packaging (ZSB/VKE) (V10)

| Process description | |
|---|---|
| **V10** | |
| **Packaging (ZSB/VKE)** | |
| **Target description** | a) Packing in load carrier<br>- supply container<br>- load carriertags (with RFID) check and initialize the status fields<br>- record load carrier-ID at packaging<br>- bring assemblies from production into the load carrier, recording and linking the serial number or batch ID of the component to the load carrier ID<br>- create (temporary) accompanying goods document<br>- create the transport order for storage<br>b) Packaging/re-packaging (e.g. aftersales), not in load carrierL<br>- pack the individual part in sales packaging according to specification (incl. packaging stages)<br>- if necessary marking with tag |
| **Purpose** | - possibility of determining locationof the load carrierand its content<br>- enable and ensure traceability of the load carrierand its content |
| **Input Data (Key data)** | - parts data (assembly)<br>- load carrier data |
| **Output Data** | - Relation between the load carrier ID, the parts data (component) and the (temporary) document accompanying goods<br>- (temporary) document accompanying goods<br>- load carrierdata<br>- transport order |

### 10.3.11 Shipment (V17, V36)

| Process-description | |
|---|---|
| **V17, V36** | |
| **Shipment** | |
| **Target description** | - assign shipping unit to ramp<br>- shipment scope put together<br>- record of load carrier IDs and License Plates and linking to shipping unit ID<br>- create bill of lading<br>- create consignment note<br>- production and attachment of goods tags<br>- rebook the load carrierand the load carrier content(kfm.)<br>- load shipping unit<br>- ensure right loading by comparing dispatch data with delivery data<br>- comparison loaded packages with loading list<br>- send bill of lading by remote data transmission to recipient |
| **Purpose** | - possibility of determining location of the load carrierand its content during loading and transport process<br>- outgoing goods check (prevention of wrong deliveries)<br>- enable and ensure traceability of the load carrierand its content |
| **Potential by using RFID** | - economic efficiency: simplified handling by possible automation of the recording processes |
| **Input-Data (Key data)** | - delivery call data<br>- shipping unit -data<br>- dispatch data<br>- load carrier data (tag ID)<br>- License Plates |
| **Output-Data** | - bill of lading (remote data transmission<br>- relation between delivery dates and cargo bearer-data<br>- container data<br>- goods tag<br>- consignment note |

### 10.3.12 Rework (RM/ET/BG) (V26)

| Process-description | |
|---|---|
| **V26** | |
| **Rework (RM/ET/BG)** | |
| **Target description** | Check of rework possibility<br>a) in case rework is possible:<br>- Record load carrier ID and License Plate of the container and perhaps serial number (if available)<br>- description of the rework process<br>- set release status of the load carrier and the parts to "released"<br>- put reworked parts put into load carrier, record and link the serial number of the part to the load carrier ID and License Plate<br>- create document for in-plant transport<br>- rebook the reworked parts (kfm.)<br>- reworked parts back to material process or assembly → continue with V19<br>b) If rework is not possible:<br>- reorder for JIT parts<br>i) Disposal<br>- create disposal order<br>- supply load carrier<br>- check load carrier tags (with RFID) and initialize the status field (change release status to “quarantine“)<br>- record load carrier ID und License Plate at the rework site<br>- put defective parts into load carrier, record and link the serial number of the part with the load carrier ID<br>- rebook the not OK parts (kfm.)<br>ii) return<br>- supply container<br>- check load carrier tags (with RFID) and initialize the status field (change release status to “quarantine“)<br>- record container-ID und License Plate at the rework place<br>- put defective parts into load carrier, record and link the serial number of the part with the load carrier ID<br>- create document for in-plant transport<br>- rebook the not OK parts (kfm.) |
| **Purpose** | - possibility of determining location of the load carrier and the parts in the rework area<br>- enable and ensure traceability of reworked and not OK parts |
| **Potential by using RFID** | - reduction of manual handling by automation of recording<br>- possibility of the process locking |
| **Input Data (Key data)** | - parts data (for not OK parts)<br>- load carrier data (tag ID)<br>- License Plate |

| | |
|---|---|
| **Output Data** | - parts status “quarantined“ (for not OK parts)<br>- parts status “released“ (for reworked parts)<br>- data for internal transport<br>- load carrier data<br>- reasons for rework and cause of defects<br>- reorder request<br>- disposal order |

### 10.3.13 receiving / goods receiving department (Reclamation) (Phys. und Kfm.) (V52)

| Process-description | |
|---|---|
| **V52** | |
| **Appropriation / goods receiving (cusomter complaint) (Phys. and Kfm.) (V52) (phys. and Kfm. ) (ZSB/VKE)** | |
| **Target description** | - Unload and deposit in unloading zone<br>- record container-ID (absolute tag ID) in unloading area (container management)<br>- create transport order<br>- comparison of bill of lading data with actual delivery datas and if necessary correction<br>- after recoreding receipt of goods:<br>  - record "License Plate" of the subpalette which has reference to the single package numbers via remote data transmission |
| **Purpose** | - ensure completeness of the delivery<br>- possibility of determining location of the load carriers and content in the unloading area.<br>- enable and ensure traceability of the container and its content |
| **Potential by using RFID** | - dispense with the inhouse documents due to direct use of the supplier documents<br>- economic efficiency: dispense with paper documents (shipment notes) in conjunction with transport guidance system |
| **Input Data (Key data)** | - bill of lading data<br>- container data (tag)<br>- unload list |
| **Output-Data** | - package data (from supplier)<br>- handling unit data (from supplier)<br>- License Plate<br>- transport order<br>- load carrier data (tag) (if ness. status change)<br>- MAT status change in ERP: Material in-house |

### 10.3.14 Rework (Reclamation) (ZSB/VKE) (V58)

| Process description | |
|---|---|
| **V58** | |
| **Rework (complaint) (ZSB/VKE)** | |
| **Target description** | - Check the possibility of reworking<br>a) If rework is possible:<br>- record load carrier ID and License Plate and perhaps serial number (if available)<br>- description of the rework process<br>- set release status of the load carrier and component to "released"<br>- put reworked parts put into load carrier, record and link the serial number of the component and the load carrier ID<br>- create document for in-plant transport<br>- rebook the reworked components (kfm.)<br>- bring reworked parts to material processing(for internal complaint) or packaging (for external complaint) → continue with V59 or V60<br>b) if rework is not possible:<br>- repeat order for JIT parts<br>i) Disposal<br>- create disposal order<br>- createt production for in-plant transport<br>- supply container<br>- check container tags (with RFID) and initialize the status fields (set release status set to “quarantined“)<br>- record load carrier ID and License Plate at rework site<br>- put defective parts into load carrier, record and link the serial number of the parts to the load carrier ID<br>- change booking of not OK parts (kfm.) |
| **Purpose** | - possibility of determining location of load carrier and the assemblies in the rework area<br>- enable and ensure traceability of the reworked components and scrapped parts |
| **Input Data (Key data)** | - parts data (for not OK components)<br>- load carrier data |
| **Output-Data** | - data for internal transport<br>- disposal order (for scrap parts)<br>- parts status “release“ (for OK components)<br>- load carrier data<br>- reorder<br>- reasons for rework and cause of defects |

## 10.4 Return of empties

### 10.4.1 Receiving / return of empties (L1)

| Process description | |
|---|---|
| **L1** | |
| **Receiving / return of empties** | |
| **Target description** | - receipt of empties notification by EDI<br>- record the delivery notification<br>- record load carrier ID<br>- quantity check<br>- book the load carrier (kfm.)<br>- confirmation correct containers and perhaps send empties receipt confirmation (VDA 5007)<br>- check for absence of damage<br>a) container is damaged<br>- set the repair flag<br>- change booking of the container<br>- dispose of load carrier or return or repair<br>b) container not damaged<br>- clean and sort the load carriers<br>- prepare document for in-plant transport |
| **Purpose** | - possibility of determining location of the load carriers<br>- ensure the arrival / return of the correct load carriers<br>- identify and dispatch damaged load carriers<br>- enable and ensure traceability of the load carriers |
| **Potential by using RFID** | - automatic recording of delivery and container data → reduced expense by discontinuation of manual bookings<br>- automatic recognition of incorrect / quarantined load carriers |
| **Input Data (Key data)** | - delivery data<br>- load carrier data |
| **Output Data** | - load carrier data<br>- data for internal transport |

### 10.4.2 Internal Transport (L2, L6)

| Process description | |
|---|---|
| **L2, L6** | |
| **Internal transport** | |
| **Target description** | - record load carrier ID<br>- compare with the transport order data<br>- transport to destination<br>- confirmation of the transport order in the assigning process |
| **Purpose** | - possibility of determing location of the load carrier during the in-plant transport and supply process<br>- ensure correct transport and correct supply<br>- enable and ensure traceability of the load carriers |
| **Potential by using RFID** | - automatic recording and comparison of the container data |
| **Input Data (Key data)** | - data for internal transport<br>- load carrier data |
| **Output Data** | - load carrier data<br>- confirmation message for transport process |

### 10.4.3 Storage (L3)

| Process description | |
|---|---|
| **L3** | |
| **Storage** | |
| **Target description** | - record load carrier ID (tag ID) when entering storage<br>- book enttry into storage in the ERP system: book the load carriers as in storage (kfm.)<br>- create the transport order to the storage site<br>- store load carriers<br>- reconcile storage site |
| **Purpose** | - possibility of determining location of the load carriers in the storage area<br>- ensure the correct storage locations for the load carriers<br>- enable and ensure traceability of the load carriers |
| **Potential by using RFID** | - automatic recording of the container data<br>- economic efficiency: elimination of paper documents (storage document) in conjunction with the transport guidance system<br>- automatic recording of incorrect / quarantined parts |
| **Input Data (Key data)** | - load carrier data |
| **Output Data** | - load carrier data (if necessary status change)<br>- data for internal transport |

### 10.4.4 Internal storage processes (L4)

| Process description | |
|---|---|
| **L4** | |
| **Internal storage processes** | |
| **Target description** | a) Transfer within the plant area<br>- record container ID (tag ID)<br>- create document for in-plant transport<br>b) Transfer to other company locations<br>- record container ID (tag ID)<br>- rebook the load bearers to new locations (Kfm.)<br>- create document for in-plant transport to shipment area<br>c) Inventory<br>- record actual status and reconcile with the traceability-system<br>d) disposal of load carriers no longer usable<br>- write the disposal order<br>- record containe ID (tag ID)<br>- rebook the load carriers (Kfm.)<br>- create document for in-plant transport to disposal area |
| **Purpose** | - possibility of determing location of the load bearers in the storage area<br>- ensure correct storage locations for the load carriers<br>- enable and ensure traceability of the load carriers<br>- quarantine and separate defective load carriers<br>- optimisation of the container management process<br>- reduction of container inventory or fewer container bottlenecks in the empties |
| **Potential by using RFID** | - economic efficiency: elimination of paper documents (storage document) in conjunction with transport guidance system (handling and print costs)<br>- higher degree of automation in tracking<br>- automatice recording of internal processes<br>- simplification of the inventory record through mobile devices<br>- automatic detection of incorrect / quarantined load carrier |
| **Input Data (Key data)** | - load carrier data |
| **Output Data** | - load carrier data<br>- disposal order<br>- data for internal transport |

### 10.4.5 Removal from storage (L5)

| Process description | |
|---|---|
| **L5** | |
| **Removal from storage** | |
| **Target description** | - trigger event: incoming empties call<br>- create document for in-plant transport<br>- remove load carriers from the storage site<br>- record load carrier ID with the stock exit<br>- create the document for removal from storage<br>- rebook the load carriers (kfm.)<br>- reconcile removal |
| **Purpose** | - supply empties on time<br>- possibility of determining location of the load carrier during the removal from storage procedure<br>- ensure correct removal from storage procedure<br>- enable and ensure traceability of the load carriers<br>- optimisation of the container management process<br>- reduction of container supplies or fewer container bottlenecks in the empties |
| **Potential by using RFID** | - automatic record of load carrier data<br>- economic efficiency: elemination of paper documents (storage document) in conjunction with transport guidance system<br>- automatic detection of incorrect / quarantined load carriers |
| **Input Data (Key data)** | - data for empties call<br>- load carrier data |
| **Output Data** | - data for internal transport<br>- load carrier data<br>- removal from storage document |

### 10.4.6 Shipment (L7)

| Process description | |
|---|---|
| **L7** | |
| **Shipment** | |
| **Target description** | - assign shipping units to ramp<br>- compile shipment scope<br>- record load carrier IDs and link to shipping unit ID<br>- create bill of lading<br>- create consignment note<br>- rebook the load carriers (kfm.)<br>- load shipping units<br>- ensure correct loading by comparing shipment data with delivery data<br>- link delivery data to shipping unit data<br>- send bill of lading remote data transmission to recipient |
| **Purpose** | - possibility of determining location of the load carriers during the shipment and transport process<br>- ensure corect loading procedure<br>- enable and ensure traceability of the load carriers |
| **Potential by using RFID** | - economic efficiency: simplified handling through possibility of automatic recording procedures<br>- automatic detection incorect / quarantined load carriers |
| **Input Data (Key data)** | - delivery call data (empties)<br>- Transportation unit data<br>- shipment data<br>- load carrier data |
| **Output-Data** | - bill of lading (DFÜ)<br>- Shipping note<br>- relation between delivery dates and cargo bearer-data<br>- container data |

# 11 Definitions

Other terms which are used in the automobile supply and transport process are explained in VDA 5002.

| | |
|---|---|
| Avis | Notification of incoming goods in written or electronic form |
| Backend | Database management, enterprise applications and attendant infrastructures |
| BG | Subassembly |
| CKD | Completely Knocked Down: Complete disassembly, e.g., of a vehicle into component sets in the country of origin and subsequent assembly in the destination country |
| Coding schema | Algorithm which defines the allocation of the MB01 in accord. with ISO 18000 whenthe air interface is used . In particular the length of the EPC-Identterm and its interpretation is fixed with it. |
| Data Identifier | Object identification for data |
| DESADV | Engl. abbr. for DESpatch ADVice – shipping note |
| DFÜ | Long-distance data transmission |
| DUNS / UPIK | Globally unambiguous supplier numbers system |
| EDI | EDI stands for Electronic Data Interchange and is a general term for the electronic exchange of commercial documents |
| EDL | External service provider |
| ERP | An abbreviation for Enterprise Resource Planning; a software tool for the planning of the efficient application of different resources in the company |
| Package | Packages are packaging containers combined into a transport unit (e.g., 12 small load carriers on a defined palette with a defined cover and if necessary inserts) |
| GRAI | Global Returnable Asset Identifier:<br>Coding scheme based on EPC for identification of returnable load carriers with RFID. Possible forms: GRA96 or GRAI170; these differ only in the fact that GRAI170 admits an alphanumeric serial number, GRAI96 on the other hand only a numerical one. |
| Inbound | Goods receiving process |
| KLT | Small load carrier |
| Load carrier | Load carriers are returnable packaging with a specific designation of the type which is used for packaging management |
| License Plate | Provides a globally unambguous, unmistakeable marking of dispatch units and serves also a reference for electronic data communication (ISO EN 1572 – Unique Identifier for Transport Units) |

| | |
|---|---|
| Middleware | Application-neutral software/hardware layer |
| NDS | User data memory, memory for user data on the transponder |
| NVE | Number of the shipping unit:<br>Unambiguous number of a package for identification in dispatch (cf. also "SSCC")<br>NVE has already been used up to now as a bar code or 2D code system particularly in the haulage industry |
| Outbound | External logistics |
| Pull System | Requirement of the packaging (material) by the suppliers due to the current inventory situation. |
| Push-System | Supply provision of packaging (or in general material) on the basis of needs which the customer calculates for the supplier, i.e. without call by the suppliers. The responsibilit for the packaging / material supply lies with the sender. |
| Reader | Engl. for reader |
| RFID | Radio Frequency Identification is a technology for the contactless identification of any kind of object by means of radiowaves. |
| RM | Raw material |
| SSCC | Serial Shipment Container Code:<br>Coding scheme based on EPC for identification of dispatch containers with RFID. In contrast to the coding scheme GRAI, the SSCC is only important for one shipping procedure, therefore it does not permanently describe the name of the container, but one process with the help of a container. SSCC represents a counterpart to the VDA package. In the German-speaking area, one also speaks of "NVE" (number of the dispatch unity) |
| SGTIN | Serialized Global Trade Item Number<br>Coding scheme based on EPC for identification of individualised parts to a particular type with RFID.<br>The coding is so constructed that existing GS1 GTIN can be shown together with a serial number on one tag. |
| Supply Chain | Logistics process between customer and supplier; also multistage, i.e. the chain of all suppliers up to completion of the end product. |
| Tag/ Transponder | Electronic data device / system for contactless reading of data |
| VKE | Saleable unit |
| WEB-basierend | Internet based application |
| ZSB | Abbr. for assembly |

# 12 Normative references


| | |
|---|---|
| AIAG B-4:2003-02 | Parts Identification and Tracking Application Standard |
| AIAG B-16: 2002-11 | Global Transport Label; Standard for the Automotive Industry (Odette, AIAG, JAMA, JAPIA) |
| AIAG B-17:2003-02 2D | Direct Parts Marking Guideline |
| ANSI MH10.8.2: 1995 | Data Application Identifier Standard |
| ANSI MH10.8.3M: 1996 | Unit Loads and Transport Packages – Two-Dimensional Symbols |
| ISO/FDIS 22742:2004-10 | Packaging – Linear barcode und two dimensional symbols for product packaging |
| ISO/IEC 15415:2004-06 | Automatical identification and data acquisition process Specification for checking print quality – Two dimensional symbols |
| ISO/IEC 15417:2000-06 | Automatica identification and data acquisition process barcode-symbol-spezification - Code 128 |
| ISO/IEC 15418:1999-12 | EAN/UCC data identifier and FACT data identifier and their updating |
| ISO/IEC 15434:1999-10 | Transfer syntax for media for automatical data acquisiton with high capacity |
| ISO 1800-6c | Air Interface 860-960 MHZ |
| VDA 4902 | Goods tags (barcode-capable) |
| VDA 4912 | Remote data transmission accompanying documentation |
| VDA 5005 | Pre-tracking and traceability of car parts/components and their technical construction |
| VDA 5501 | RFID in supply chain container management |