Specification

EBICS

(Electronic Banking Internet Communication Standard)

Version 2.5

Final Version, May 16th 2011

This specification is valid from July 1st 2012.

Amendment history

The following table provides an overview of the significant amendments that were made from the revision document 2.4.2 to the full version 2.5.

Chapter	Type*	Description	Effective from
3.1.4 and several XML examples in the document	A	Up to schema version H003 (up to EBICS version 2.4.x) the target namespace was an http-address. As usually the xsd's are stored in a local directory it is only important to provide the schema on the website for an initial download (www.ebics.org). From schema version H004 (EBICS 2.5) on the target namespace is defined as an urn-address ("urn:org:ebics:H004") to underline that it is a symbolic name. The xsd files are renamed as _H004 (hence the include-definitions also have to be updated). Note: No rename/changes for signature.xsd (S001) and hev.xsd (H000)	2.5
Several sections; especially in chapter 4, 5, 8 and 9	A	To ensure that a unique order number (orderID) is assigned to each order the orderIDs will be assigned by the server from EBICS version 2.5 on (instead of client-based assignment). The rule to check orderId and order attributes was reworked (Chapter 5.5.1.2.1, I.e.c)	2.5
Several sections ; especially 4.4.1.1; 4.4.1.3 (new chapter)	Ext	Specification of a new order type H3K: All public keys can be sent in one step (H3K-request) using a certificate issued by a CA for the authorisation key. INI- and HIA-letter are not necessary in this case.	2.5
4.4.2.1	C	Addition of a reference that the client has to check the validity of certificates which he intends to use.	2.5
8.3.1	Ext	Integration of an optional attribute "isCredit" into the HVZ-response (identical to HVT)	2.5
8, 9.3	Ext	The response of HKD and HTD contains the order type. In the case of FUL/FDL the additional information about the file format will be provided now. By reason of consistency the following structures also get the optional element "FileFormat" HV*OrderParams (for * = D, T; E and S) and HV*ResponseOrderData (for * = U and Z)	2.5
10, 13	A	The specification of the customer acknowledgement PTK which is only used in Germany is replaced by the specification of an XML based customer acknowledgement HAC.	2.5

* E = Error; A = Amendment; C = Clarification; Ext = Extension; D = Deletion

Chapter	Type*	Description	Effective from
Annex 1	Ext / A	New return code EBICS_CERTIFICATES_VALIDATION_ERROR (Number 091219) for H3K request Update of several return code descriptions (caused by the assignment of the orderId by the bank)	2.5
Schema files within H004		1. Target namespace for H004 urn-address: urn:org:ebics:H004 2. New xsd-names for all schema files within H004 (e.g. ebics_request_H004) 3. HVZResponseOrderData: Definition of an optional attribute “isCredit” for TotalAmount 4. UserPermissionType (used for HKD and HTD): Definition of an optional element “FileFormat” 5. Definition of the element group H3KResponseOrderData (in ebics_orders_H004.xsd) with several new types “…CertificateInfoType” (in ebics_types_H004.xsd) 6. Integration of the element “OrderID” in ebics_keymgmt_response_H004.xsd (defined as mandatory) and ebics_response (defined as optional) 7. Change of 6 optional attributes (which have an default) into mandatory and which are used within the canonicalisation of X002 signature: a. In ebicsRequest/header/mutable and ebicsResponse/header/mutable: 1+2) /SegmentNumber/lastSegment b. In ebicsRequest/header/static/OrderDetails/HVTOrderParams 3)/OrderFlags/completeOrderData 4)/OrderFlags/fetchLimit 5)/OrderFlags/fetchOffset c. ebicsRequest/header/static/OrderDetails/*OrderParams 6)/Parameter/Value/Type 8. By reason of consistency the following structures also get the optional element “FileFormat” HV*OrderParams (and * = D, T; E and S) HV*ResponseOrderData (and * = U and Z)	2.5 = schema H004

Contents

The XML schema (H004, H000 and S001) can be found on the Internet:
http://www.ebics.org.(see "Specification")

1 Overview and objectives of EBICS

1.1 Objective of the cooperation

The German banking sector represented by Zentraler Kreditausschuss (ZKA) and the French banking sector represented by Comité Français d'Organisation et de Normalisation Bancaires (CFONB) founded a company (EBICS SCRL) on the joint use of EBICS.
EBICS was originally developed by the German banking industry and enables corporate clients to conduct their banking business flexibly, securely and efficiently and to select the most suitable services provider for their individual needs. EBICS also has “multi-bank capability”, meaning that corporate clients in both countries can reach any bank in Germany and France in future using the same software.
This document describes the common specification of French and German banks.
Principally, this specification applies to both countries unless an instruction is specified for a particular country relating to a special application of the specification.
Any optional functionality can be supported in one country (and rendered mandatory) and, at the same time, not supported in another country.
The specific use of optional functionalities is described in detail in a common Implementation Guide (chapter 3 of this guide).

1.2 General objectives of EBICS

This EBICS (“Electronic Banking Internet Communication Standard”) detailed specification expands the existing “DFÜ Abkommen” (Remote Data Transmission Agreement) of 15.03.2005 with the functionality of multi-bank capable, secure communication via the Internet and henceforth comprises Appendix 1 of the agreement under the title “Specification for the EBICS connection”. After the practical introduction of EBICS, the FTAM process that had hitherto been solely valid within the framework of the “DFÜ Abkommen” will be supported in parallel to EBICS for a period of time that is still to be fixed by the Zentraler Kreditausschuss (ZKA), and comprises Appendix 2 in the current Version 2.0 of the “DFÜ Abkommen”, valid from 03.11.2005, under the title “Specification of the FTAM connection”. The bank-technical data formats that must be used for all communication processes within the framework of the “DFÜ Abkommen” comprise Appendix 3 of the “DFÜ Abkommen” under the title “Specification of data formats”. The actual version of Appendix 3 and the above-mentioned Appendix 2 can be downloaded on www.ebics.de („Spezifikation“).

The application-oriented elements of the FTAM process, i.e. the multi-bank capability, the transmission of data in bank-specific formats using order types and the defined security processes for electronic signatures (ES), are retained in their entirety for EBICS. The order types defined in the Appendix (Chapter 13) and the document “EBICS Annex 2 Order Types” are supported. The FTAM process order types that are no longer supported in EBICS are listed in Chapter 3.10. Electronic signatures are supported in Version A004 and above, if applicable.

EBICS does not present any special requirements of the concrete architecture of the customer's systems; stand-alone desktop applications can be connected just as easily as e.g. client/server applications or applet solutions.

At the application level, the process "Remote data transmission with customer" is augmented by the concept of Distributed Electronic Signature (VEU), which allows chronologically and spatially-independent authorisation of orders from all customers.

The fundamental features of the EBICS standard are:

- Transmission of professional data (commercial transactions) via order types using established bank-specific formats
- Expansion of the "DFÜ Abkommen" with the possibility of the "Distributed Electronic Signature (VEU)"
- Specification of the EBICS-specific protocol elements in XML
- Transmission of messages via http ("Internet-based"); utilisation of TLS for basic transportation security between the customer's and the bank's systems, using TLS server authentication
- Cryptographic safeguarding of each individual step of a transaction via encryption and digital signatures at the application level.

The EBICS detailed specification is the basis for the development of customer and bank systems that communicate using the EBICS protocol. As such, it contains manufacturer-independent process descriptions and thereby guarantees interaction between customer and bank systems from different manufacturers.

This detailed specification incorporates the EBICS protocol description and all details relating to code management, VEU and the XML schemas for the order data of the new EBICS order types. The complete XML schemas are stored as separate HTML documents.

The detailed specification only limits the processing freedom of the customer and bank systems with specifications and provisions where this is necessitated by security considerations or processes beyond the scope of the EBICS communication. In contrast to the EBICS Implementation Guide, implementation alternatives will not be indicated in the detailed specification.

Nota Bene, all descriptions relating to FTAM will not apply to the French implementation.

2 Definitions

2.1 Terms

The following terms in small capitals have a special meaning in the protocol definition:

- **MUST:** denotes a compelling requirement; only those implementations that fulfil this requirement are deemed to be EBICS-conformant.
- **SHALL/SHOULD:** denotes requirements that are to be followed under normal circumstances; however, individual exceptions are possible for technical or professional reasons.
- **CAN/MAY:** denotes unbinding recommendations or optional features.

Functionalities or features of the EBICS protocol are designated as **optional** if they do not have to be supported by the financial institution. Customers do not have a legal claim to the corresponding functionality from the financial institutions.

Functionality or features of the EBICS protocol in a particular version are designated as **planned** if they are being prepared for subsequent versions but may not yet be used in the present version.

2.2 Notation

2.2.1 XML

2.2.1.1 XML schema

The following symbology is used for graphical representation of XML schemas:

- Elements are placed in rectangles.
- Attributes are also placed in rectangles and are surrounded by an “attributes” box.
- Elements, attributes and other declarations that belong to a complex type are surrounded by a dashed box that is highlighted in yellow.
- A “branch” (corresponds to `choice` in XML schema) is shown as an octagon containing a switch symbol for three possible switch positions. The connecting lines to the possible alternatives branch out on the right of the symbol.
- A “sequence” (corresponds to `sequence` in XML schema) is shown as an octagon containing a line symbol with three points on it. The connecting lines to the individual sequence elements branch out on the right of the symbol.
- Symbols with solid edges denote mandatory use, and in the XML schema correspond to the attribute `minOccurs="1"` for elements or `use="required"` for attributes.
- Dashed symbols denote optional use, and in the XML schema correspond to the attribute minOccurs="0" for elements or use="optional" for attributes.

- Crossed-out symbols denote planned usage, and in the XML schema correspond to the attribute combination `minOccurs="0" maxOccurs = "0"` for elements or `use="prohibited"` for attributes
- "m..n" in the right lower corner of an element symbol restrict the use of the element to m- to n-times occurrence, and in the XML schema correspond to `minOccurs="`*m*`" maxOccurs="`*n*`"`; correspondingly, where "m..∞" `minOccurs="`*m*`" maxOccurs="unbounded"`
- Element groups are represented by octagons, and correspond to the `group` declaration in the XML schema
- Attribute groups are surrounded by boxes with the respective group names and correspond to the `attributeGroup` declaration in the XML schema.

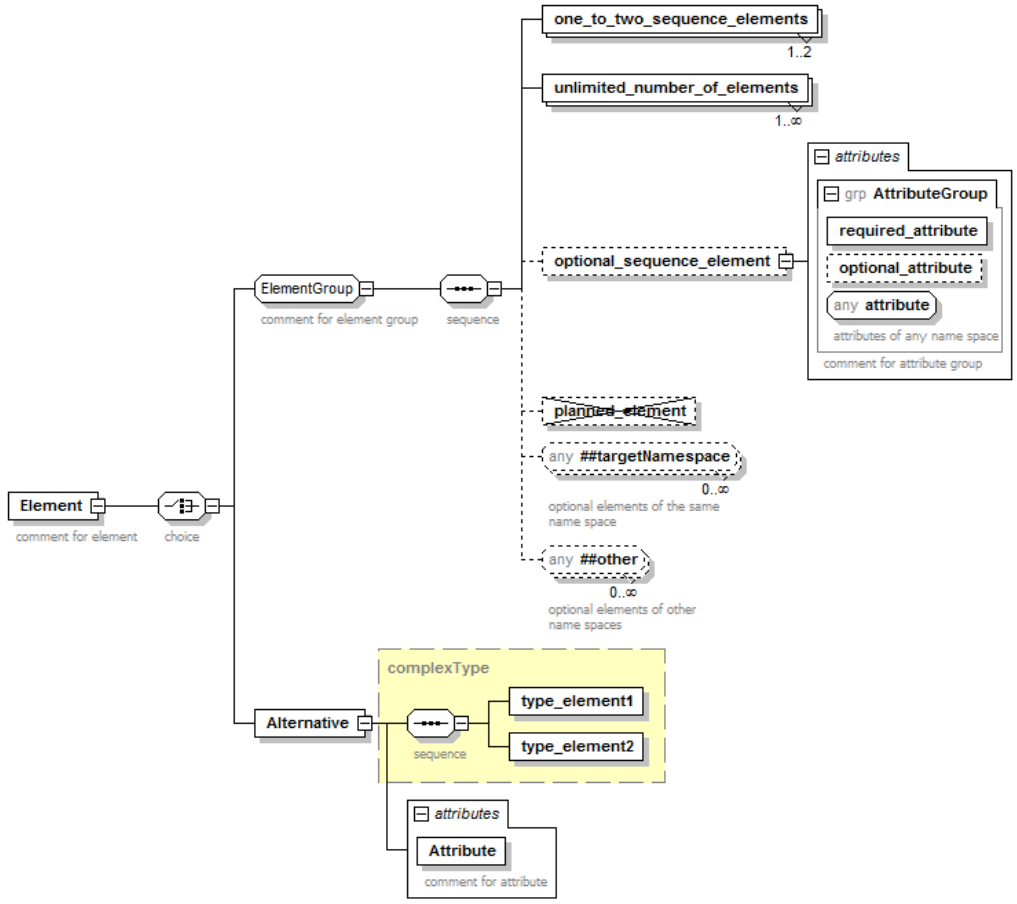


Diagram 1: XML schema symbols

2.2.1.2 XML documents

Individual code segments are shown in the Courier font.
If an element name or type does not fit completely onto a line, the symbol » is used to direct the reader to the next line.

```
Complete examples of code are shown in Courier 8pt and are surrounded by a frame.
```

2.2.2 Flow diagrams

Processes are represented with the help of UML 2.0 activities. In this document they receive a start and an end node. A start node is the starting point of a process, the end node marks the end of an entire process.

For the sake of simplicity, activities will be nested within one another. Actions that contain an activity will be marked with a fork symbol. Activity A in Diagram 2 comprises three process steps (actions). Step_2 is itself an activity comprising 2 process steps. Hence the activity Step_2 is called up within activity A, i.e. run through from the start node of Step_2 to the end node of Step_2.

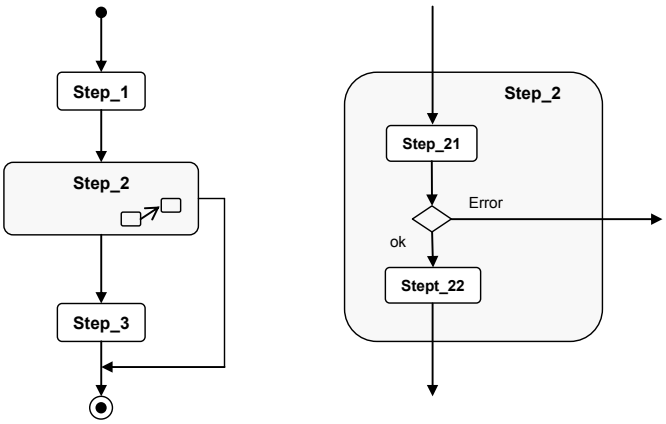


Diagram 2 Nesting of activities

2.2.3 Other notation

In the naming of new order types, the appended tag “[mandatory]” denotes that the financial institution MUST support this order type. On the other hand, the appended tag “[optional]” means that the financial institution CAN support this order type.

Similarly, the tag “[planned]” is appended to planned features or functions.

2.3 Data types

The XML schema defines a set of primitive and derived data types that can be used to form your own data types.

The following primitive data types are primarily used in conjunction with EBICS:

- **string**: string of characters with unrestricted length and structure
- **boolean**: boolean truth value with the characteristics “true” (=1) or “false” (=0)
- **decimal**: decimal numbers to any degree of accuracy
- **dateTime**: time stamp with date and time in accordance with ISO 8601
  The structure is as follows: YYYY-MM-DDTHH:MM:SS.sss**Z**. The character Z indicates that date and time have been converted to UTC. If the date string does not correspond to this structure, the EBICS message has to be declined or the ES verification has to be rated as negative, respectively.
- **date**: date in accordance with ISO 6801
- **hexBinary**: hexadecimal value with unrestricted length
- **base64Binary**: data type to record base64-coded binary data
- **anyURI**: uniform resource locator (e.g. URL, IP address).

The following pre-defined data types are derived from primitive data types and are used in the EBICS standard:

- **normalizedString**: string of characters that has spaces (blanks) removed at the start and end
- **token**: a normalizedString that contains no line feeds and no multiple spaces in succession
- **language**: nationality label in accordance with RFC 1766
- **nonNegativeInteger**: non-negative integer values
- **positiveInteger**: positive integer values.

With the help of the aforementioned data types, new data types are defined in the EBICS schema:

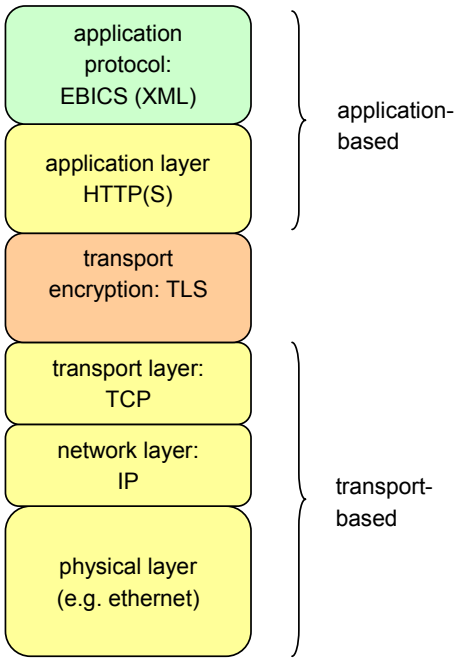
- **simple data types** merely define restrictive or expanding characteristics with regard to the value range of an existing primitive or derived data type, i.e. they derive from an existing data type
- **complex data types** define new structures composed of fields and attributes of different (simple or complex) data types.

3 Design decisions

This chapter will point out decisions that had a decisive influence on the design of the EBICS protocol. It includes network-specific details as well as specifications of a professional and technical nature.

3.1 OSI model from EBICS perspective

simplified OSI model including specialisations for the EBICS protocol



3.1.1 TCP/IP as package-orientated transmission layer

TCP/IP is used as a transport protocol. The data that is to be exchanged is transmitted as packages via IP (Internet Protocol). This package transfer is monitored by TCP (Transmission Control Protocol) as a transmission monitoring protocol.

Communication is established using a URL (Uniform Resource Locator). Alternatively, an IP address belonging to the respective financial institution can also be used. The URL or IP address together with the EBICS host ID is required for establishing a connection to the bank computer and is given to the customer upon conclusion of the contract with the financial institution.

3.1.2 TLS as transport encryption

TLS was developed by the Transport Layer Security work group in IETF's Security Area. It is an open standard for secure transmission of package-orientated data, originally developed by Netscape (initially under the name SSL). TLS aims to guarantee data security on levels above TCP/IP. The protocol allows data encryption, authentication of servers and message integrity for TCP/IP communication.

It combines the following basic characteristics:

1. The TLS connection is confidential: With the TLS handshake, a common, secret key is agreed using asymmetric encryption (RSA, in the case of EBICS) that serves as a symmetric key (AES or 3DES, in the case of EBICS) in the rest of the TLS session.
2. The integrity of the TLS connection is assured: The message transport contains a message integrity verification via so-called Message Authentication Codes (MACs). Secure hash functions (SHA-1 in the case of EBICS) are used for the MAC evaluations.
3. The identity of the financial institution is attested by the use of server certificates and electronic signatures; the messages from the financial institution are authenticated by means of this TLS server authentication.
4. TLS contains mechanisms to protect against man-in-the-middle attacks on the TLS connection between customer and bank systems. To this end, it uses internal counters and "shared secrets", and additionally secures the handshake against such an attack with signed summaries of the data exchanged thus far.

A TLS connection is established between the customer system and the bank system for transmission of the EBICS messages between these two systems.

TLS 1.0 with X.509v3 server certificates is used, i.e. the server MUST authenticate itself via certificate. The type of certificate MUST be suitable for the key exchange algorithm of the selected key.

EBICS dispenses with TLS client authentication in Version H004 to promote better market acceptance. Later expansion to include TLS client authentication capability (and the associated issue of X.509v3 client certificates for TLS to customer systems) is not excluded.

The terms client and server are used as synonyms for TLS client and TLS server in the next two subchapters. Here, the customer system assumes the role of the TLS client, and the bank system that of the TLS server.

3.1.2.1 Pre-distribution and verification of the trust anchors

The issuer of the TLS server certificates can be both public and non-public (i.e. bank-internal) CAs. It is the responsibility of the credit institute to ensure that a public CA is only

authorised as the issuer of its TLS certificate if this CA guarantees adequate verification of the identity of the certificate owner.

It is the task of the financial institution to supply subscribers that wish to communicate with the financial institution via EBICS with a trustworthy CA certificate via the certification path of the TLS server certificate. To do this, the following two possibilities apply:

- Delivery of the CA certificate to the customer / subscriber:

  This applies to both public and non-public CAs.

- Delivery of a CA certificate (Bridge CA) with the help of which a list of trustworthy non-public CA certificates have been signed.

  The CA certificate of the financial institution is a constituent of this list. The advantage of such a signed list is brought to bear for the subscriber when the list contains the CA certificates of a number of financial institutions that wish to grant bank-technical orders to the subscriber via EBICS.

Delivery of the CA certificates to customers / subscribers SHOULD take place via electronic means. Possible delivery methods include dispatch via email or delivery as a component of the customer's software, or as updates for the customer's software.

In addition to the CA certificate, the financial institution CAN also deliver the TLS server certificate itself to the customer / subscriber. In this case, the TLS certificate can be used as a trust anchor during server authentication in the course of establishment of the TLS connection.

In addition to the delivery of certificates, the financial institution MUST ensure that the subscriber can verify the received certificate via a second, independent, communication channel. For example, this can take place via publication of these certificates and their fingerprints on the Internet.

In return, the subscriber is responsible for verification of the certificates that have been received via different communication channels.

3.1.2.2 Server authentication

The server transmits its certificate to the client within the framework of the TLS handshake. Successful verification of of the server certificate by the client is a prerequisite for establishment of a TLS connection between client and server.

In this case, it is an X.509v3 certificate. Verification of X.509v3 certificates in general is defined in RFC 3280, the particulars of verifying TLS server certificates within the framework of the HTTPS handshake are described in RFC 2818.

The subscriber is responsible for using customer software that verifies the TLS certificate in accordance with these specifications. They are also responsible for using customer software

that uses the CA certificate or TLS server certificate that had been received in advance from the financial institution as a trust anchor in the course of this verification.

3.1.3 HTTP(S) as a technical basic protocol

The Hypertext Transfer Protocol (HTTP) is a stateless data exchange protocol for the transmission of data. HTTP is predominantly used in the “World Wide Web” (WWW) for the transmission of websites.

The combination of HTTP and TLS as transport encryption is also referred to as “HTTPS” (HTTP Secure). Port 443 (SSL) is reserved for this purpose and can be used in an unrestricted manner by the majority of firewall configurations.

In the case of the EBICS protocol, the statelessness of HTTP forces the use of its own session parameters that logically combine several communication steps into one transaction.

Communication between the customer and the financial institution takes place in a classical manner via client/server roles. As before, the financial institution also takes on the (passive) server role and the customer takes on the (active) client role. With this communications schema, the client sends a request to the server via HTTP request; the server replies with an HTTP response. The request can generally be made as a GET request (additional data coded in the URL) or a POST request (additional data appended to the HTTP header); in the context of EBICS, POST is used exclusively.

With EBICS, HTTP 1.1 MUST be used by both the client and the server.

3.1.4 XML as an application protocol language

The EBICS application protocol uses the HTTP(S) technical base protocol. XML (Extensible Markup Language) has been selected as the protocol language on the application level. The following reasons are given for this decision:

1. XML uses readable tags. Tag names/attributes can be selected in such a way that their meaning is obvious even without documentation.
2. Freeware XML parsers are available for common operating systems and programming languages.
3. XML messages can easily be expanded with additional elements and attributes. It is not necessary to adapt the existing message sections to maintain the syntactic correctness (“well-formedness”) of the message as a whole.
4. XML schema is available as a standardised definition language for validation of XML messages.

UTF-8 MUST be used for character encoding within the EBICS XML message. UTF-8 is supported by all XML parsers and codes backwards compatible to ASCII.

The syntax of the XML messages is set with the help of so-called XSD files (XML Schema Definition). The following XSD files have been defined for EBICS and can be downloaded from http://www.ebics.org (see “Specification”):

- “ebics_request_H004.xsd”
  contains the XML schema for requests from the customer system
- “ebics_response_H004.xsd”
  defines the XML schema for responses from the bank system
- “ebics_orders_H004.xsd” contains order-specific data structures
- “ebics_types_H004.xsd” lists simple EBICS type declarations.

In addition to these main schemas, the following specific variants for transactions that relate particularly to key management can also be found at the same place:

- “ebics_keymgmt_request_H004.xsd“ defines the XML schema for requests from the customer system within the framework of key management.
- “ebics_keymgmt_response_H004.xsd“ contains the XML schema for responses from the bank system within the framework of key management.

The target namespace is defined as “urn:org:ebics:H004”

The schema "ebics_signature.xsd" has been defined for submitting the ES in structured form. It can also be downloaded from http://www.ebics.org (see “Specification”), schema target location http://www.ebics.org/S001:

- This schema has been defined as an independent one in order that it can be applied outside the EBICS domain. The import of the aforementioned name space is required for use of the ES in EBICS. It features the prefix "esig".
- The schema "ebics_signature" (not renamed/no changes for EBICS 2.5) references structures of the XML signature standard of the W3C (see chapter 3.8). This schema is stored at the same place under the name "xmldsig-core-schema.xsd".

Each of the four XSD files with the extension "_request_H004" or "_response_H004" defines one or more types of EBICS XML messages each of which possesses a different XML root element with an unambiguous name.

For Standard EBICS messages "ebics_request.xsd“ defines the root element `ebicsRequest` for customer system requests whereas "ebics_response_H004.xsd“ defines the root element `ebicsResponse` for responses of the bank system. For transactions of the key management "ebics_keymgmt_request_H004.xsd“ contains three additional XML messages for customer requests with the root elements `ebicsUnsecuredRequest`, `ebicsUnsignedRequest`, and `ebicsNoPubKeyDigestsRequest`. For key management "ebics_keymgmt

response_H004.xsd“ defines the root element `ebicsKeyManagementResponse` for responses of the bank system.

„ebics_H004.xsd“ includes these four XML schema files and therefore contains the whole range of definitions of the EBICS schema version “H004”. It can also be downloaded from http://www.ebics.org (see “Specification”). Its target namespace is also “urn:org:ebics:H004”: By means of this file can be verified that all global definitions in the EBICS namespace (elements and types) have unambiguous names. This feature of the EBICS XML protocol facilitates the processing of EBICS XML messages with the help of standard XML tools because the declaration of the XML root element and the EBICS namespace are already sufficient to determine the allowed format for the complete XML message. A standard XML parser, for example, is able to recognize by this XML fragment against which definition in the EBICS XSD files the whole document has to be vaildated:

```
<ebicsRequest xmlns="urn:org:ebics:H004" Version="H004">
```

The Schema Location consists of one pair of references, separated by a blank. The first member of the pair is the namespace name, and the second member is a hint describing where to find an appropriate schema document for that namespace, e.g. local file name ebics_request_H004.xsd:

```
 <ebicsRequest xmlns="urn:org:ebics:H004" Version="H004"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation=
"urn:org:ebics:H004 ebics_request_H004.xsd">
```

By means of the following example taken from the XML schema file "ebics_request_H004.xsd" the referencing of EBICS XML elements and attributes for the EBICS root structure regarding standard requests of the customer system (root element `ebicsRequest`and its sub-elements) is illustrated:

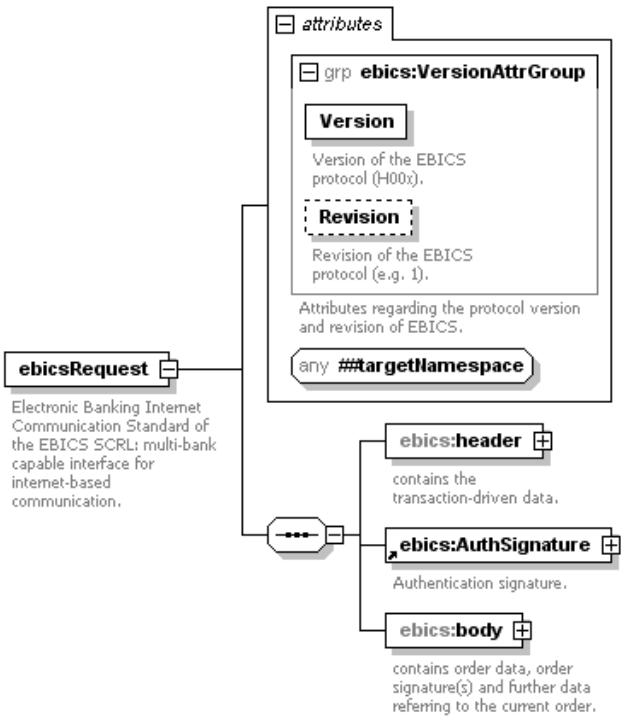


Diagram 3: Root structure of the EBICS protocol

The XML root element for standard EBICS messages containing requests of the customer system is called `ebicsRequest`. It contains some attributes with fundamental information that are required for parsing the message as a whole (attribute group `VersionAttrGroup`):

- `Version` for the EBICS protocol version (e.g. “H004”)
- `Revision` for the EBICS protocol revision: This attribute SHOULD also be sent to allow technical differentiation between several (compatible) revisions of the same protocol version.

The following elements form the direct sub-structure of `ebicsRequest`:

- `header`: The XML tag contains technical information (so-called “technical control data”) in the subtags:
  - `static` for the technical control data that remains constant throughout the entire transaction.
  - `HostID` for the EBICS host ID for the identification of the bank's EBICS computer system. The element `HostID` is contained in all EBICS request messages of the customer system (for standard transactions as well as system-related transactions). The EBICS host ID does not have to be identical with the host ID for the FTAM process and is communicated to the customer by the financial institution.
  - `mutable` for the mutable technical control data.

Both subtags of `header` MUST appear in the above sequence.

- `AuthSignature`: The identification and authentication signature according to the “XML Signature” standard is disposed in this element. The XML tag MUST appear in all messages with the exception of the order types INI, HIA, HSA and HPB (these order types use their own XML schemas; see Chapter 4.4).
- `body` contains the actual order data, signatures (ES’s) and other data that is directly related to the order or that is required for its evaluation.

The XML requests from the subscribers to the financial institutions are designated as EBICS requests, the XML replies from the financial institutions are designated as EBICS responses. The HTTP binding of an EBICS request and the associated EBICS response is: the EBICS request is embedded in an HTTP POST request, the EBICS response is embedded in the corresponding HTTP response.

A typical HTTP request appears as follows in EBICS (extract):

```
POST /ebics HTTP/1.1
Host: www.die-bank.de
Content-Type: text/xml; charset=UTF-8
Content-Length: 800

<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest xmlns="http://urn:org:ebics:H004"
       xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd”
       Version="H004" Revision="1">
  <header authenticate="true">
    <static>
      <HostID>EBIXHOST</HostID>

      …
    </static>
    <mutable>
      …
    </mutable>
  </header>
  <AuthSignature>
    …
  </AuthSignature>
  <body>
    …
  </body>
</ebicsRequest>
```

A corresponding possible HTTP response is shown in the following extract:

```
HTTP/1.1 200 OK
Content-Type: text/xml; charset=UTF-8
```

```
Content-Length: 1538

<?xml version="1.0" encoding="UTF-8"?>
<ebicsResponse xmlns="urn:org:ebics:H004"
       xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xsi:schemaLocation="urn:org:ebics:H004 ebics_response_H004.xsd"
       Version="H004" Revision="1">
  <header authenticate="true">
    <static>
      …
    </static>
    <mutable>
      …
    </mutable>
  </header>
  <AuthSignature>
    …
  </AuthSignature>
  <body>
    …
  </body>
</ebicsResponse>
```

Further details on the structure of EBICS protocol messages and transaction details can be found in Chapter 5. The formats of the XML messages for the standard responses of the bank system and the system-related messages of the key management use different root elements the structure of which is widely analogous to the standard request. The complete XML schemas can be found in the separate HTML schema documentation.

The schema "ebics_hev.xsd" (also not renamed/updated for EBICS 2.5) which is used for requests of EBICS versions supported by the bank is provided at http://www.ebics.org (see „Specification“, see also chapter 9.5).

3.2 Compression, encryption and coding of the order data

EBICS handles bank-technical order data in a transparent manner. This means: independent of the specific data structure of different order types, order data is handled as a binary block and is embedded in the XML structure. To this end, this order data MUST initially always be ZIP-compressed before transmission, then hybrid encrypted (in accordance with process E002) and the result finally base64-coded. Exceptions: In the case of key management order types INI, HIA, H3K and HSA, transmission is unencrypted (see Chapter 4.4.1.2.5.1 for INI, HIA and H3K, and Chapter 4.8.2 for HSA). The standards that define the ZIP algorithm and base64 format that are valid in EBICS are specified in the Appendix (Chapter 16).

The data representation generated in this way is then to be set, for example, in the XML element `ebicsRequest/body/DataTransfer/OrderData` without any further character conversion.

The ZIP compression serves to reduce the data volume that is to be transmitted.

The actual data is symmetrically encrypted in the case of hybrid encryption. The transaction key that is used for this purpose is again asymmetrically encrypted and is appended, for example, in the form of the XML element `ebicsRequest/body/DataTransfer/DataEncryptionInfo/»TransactionKey` (see Chapter 6.2).

Encryption of the order data takes place in addition to TLS transport encryption. This ensures that the order data is protected from unauthorised read access both on its way via public networks (in addition to TLS) as well as on the other side of the TLS-protected connection path.

For coding the binary stream, base64 only uses printable ASCII characters and thus ensures that the order data reaches its destination in an unadulterated manner and can be evaluated there as authentic.

3.3 Segmentation of the order data

Segmentation means the separation of large data volumes into smaller, individual transmission segments.

With EBICS, segmentation of the order data takes place at the application protocol layer. Order data may only be transmitted in an individual EBICS message if it does not exceed the specified fixed size of 1 MB in compressed, encoded and base64-coded form. This applies equally to transmit and download orders. If the 1 MB limit is exceeded, the compressed, encrypted and base64-coded order data MUST be separated into segments, wherein the size of each of these does not exceed the fixed segment size of 1 MB. The segments are then transmitted in consecutive order in individual EBICS messages.

Further details on segmentation of order data can be found in Chapter 7.

3.4 Recovering the transmission of order data (recovery) [optional]

Recovery allows the transmission of an order to be continued after the occurrence of a transport or processing error without necessitating the re-transmission of all order data segments that have already successfully been transmitted.

EBICS defines a recovery process at the XML application protocol layer that is based on the sequence of transmission of order data in several fixed, pre-determined steps. It is an optimistic recovery process that dispenses with a separate synchronisation step since the customer’s system generally knows the step from which transmission of the order in question is to be continued.

Details relating to recovery can be found in Chapter 5.4.

3.5 Electronic signature (ES) of the order data

The "**E**lectronic **S**ignature" (ES) of the order data ensures the authenticity of the order data on the other side of the TLS transmission path, independent of the compression, encryption, coding and segmentation of the order data.

In the case of upload orders this is the deliberate signature of a subscriber that documents the content commitment of the subscriber, in the case of download orders it is the signature of the financial institution.

ES's are generated in accordance with the Appendix (see Chapter 14), in EBICS Version "H004" a minimum requirement is support of ES Version "A004" (see Appendix (Chapter 14)).

3.5.1 Subscriber's ES

The order data of upload orders MUST be signed before delivery, i.e. provided with at least one ES. Exceptions are the key management order types INI and HIA, which are not signed in a bank-technical manner.

According to the signature process used and, regarding EBICS, supported by the bank, the bank system can extract the hash value of the signed order data from a subscriber's ES with the help of the signatory's public signature key.

The following **signature classes** are defined for the ES's of subscribers, listed here in order of reducing strength ("E" is the strongest and "T" is the weakest signature class):

- Single signature (type "E")
- First signature (type "A")
- Second signature (type "B")
- Transport signature (type "T")

An authorisation model for ES's is defined within the financial institution by the assignment of signature classes to subscribers. For example, subscribers with signature class A are entitled to provide first signatures for orders. Detailed authorisation models CAN be defined individually for institutions, wherein the signature authorisation of a subscriber can be parameterised with regard to the order type and/or the amount limit and/or the account used.

The signature class of a subscriber's given ES is the strongest class that can be assigned to this ES in the authorisation model of the corresponding financial institution.

Signature authorisations of type “T” are assigned globally to subscribers or (in detailed authorisation models) to subscribers in combination with certain order types. However, they are not dependent on accounts or amount limits.
Transport signatures are not used for bank-technical authorisation of orders, but rather merely for their (authorised) submission to the bank system.

Bank-technical ES’s are deemed to be ES’s of type “E”, “A” or “B”. Bank-technical ES’s are used for the authorisation of orders. Orders can require several bank-technical ES’s, which MUST then be supplied by different subscribers. Subscribers of different customers can also be the signatory of an order.

A **minimum number of required bank-technical ES’s** will be agreed between the financial institution and the customer for each supported order type.

Details on the format of the ES and its application for order authorisation are given in the Appendix (Chapter 11.2).

3.5.2 Financial institution’s ES [planned]

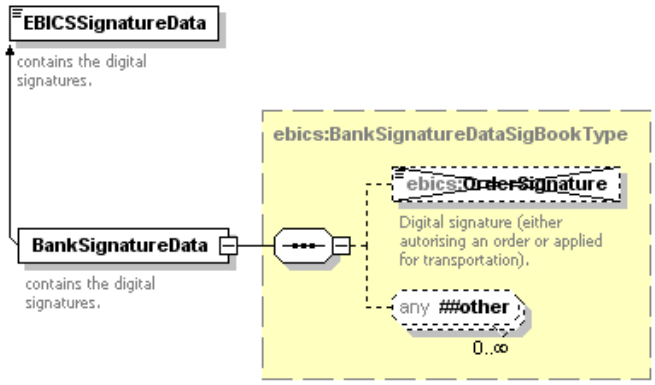
The ES of the financial institution is a *planned* functionality of EBICS. The prerequisite for the use of this function is a definitive legal view relating to it.

Preparations have been made both in this detailed concept and also in the EBICS XML schema files that will facilitate the implementation of the following stipulations in future versions of EBICS:

- mandatory ES of the hash value and the display file of the order that is to be signed in the case of order type HVD (see Chapter 8.3.2.2).
- optional ES of download data in the case of download orders
  For each subscriber and order type, it is configurable as to whether the subscriber has to request the corresponding download data with or without the ES of the financial institution.
  See Chapter 3.12, Chapter 5.5.1.2.1 (process step “Verify file attribute”) and Chapter 5.6.1.1.1.
- Download of the financial institution’s public bank-technical key via order type HPB
  See Chapter 4.4.2.2
- Verification of the hash value of the financial institution’s public bank-technical key within the framework of transaction initialisation.
  It is a component of each transaction initialisation to verify that the financial institution’s public key that has been made available to the subscriber. Exceptions are the key management order types INI, HIA, HPB, HSA, as well as the order type HEV for the request of EBICS versions supported by the bank.
  See Chapter 4.6.2 and Chapter 11.1.2.
- Binary format for the financial institution’s ES is analogous to the subscriber’s ES
  See Appendix (Chapter 11.2.2).

3.5.3 Representation of the ES's in EBICS messages

The ES's of an order are represented with the help of the XML elements `BankSignatureData` (for the bank ES; planned feature which is defined in the schema file "ebics_orders_H004.xsd") and `UserSignatureData` (for the subscriber ES, which is defined in the schema file "ebics_signature.xsd"). Each of these substitutes the abstract element `EBICSSignatureData`. Diagram 4 contains the graphical representation of `EBICSSignatureData`: in case of the signature process A004, the individual ES's are contained in an element of the type `OrderSignature`. In case of the processes A005/A006, these are contained in `OrderSignatureData`. ES's are configured in accordance with the Appendix (Chapter 14). `OrderSignature` contains the base64 coding of the corresponding ES file. Since ES files of the signature process A004 do not contain customer IDs, in the case of subscriber ES's, the attribute `PartnerID` must also be filled out with the customer ID of the signatory (= submitter). In the structured format `OrderSignatureData` for signature processes from A005/A006 on, the customer ID is already contained in the element `PartnerID`. The declaration of a differing customer ID for the ES distributed among a number of customers is only possible with order type HVE by way of special order parameters. The financial institution's bank-technical ES is configured analogously to the known subscriber's bank-technical ES (see Appendix (Chapter 11.2.2) in comparison with Appendix (Chapter 14)), wherein the attribute `PartnerID` is dispensed with in this case.



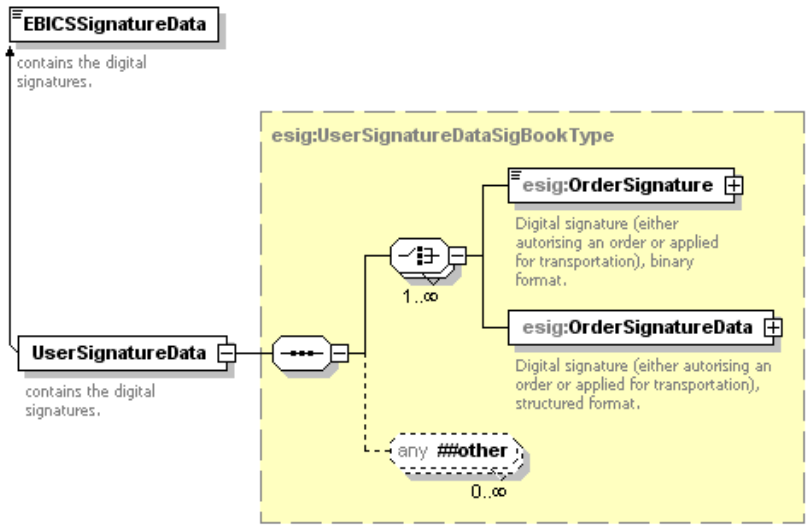


Diagram 4: XML structures BankSignatureData and UserSignatureData for the ES's of an order, both in binary and structured format

The following steps are necessary to embed the ES's of an order in EBICS messages:

- Issue of an instance document to ebics_orders_H004.xsd or ebics_signature.xsd that only comprises the element `BankSignatureData` (bank ID) or `UserSignatureData` (subscriber ID).
- ZIP compression, encryption, base64-coding of the instance document
  Encryption takes place with the transaction key `TransactionKey` from the XML branch `ebicsRequest/body/DataTransfer/DataEncryptionInfo` (see Chapter 6.2).
- The result is set in the element `SignatureData` in the branch `DataTransfer` of the EBICS body (see Chapter 3.1.4).

3.6 Preliminary verification [optional]

In the case of upload orders, the subscriber CAN send information in a first transaction step that the bank system CAN use for prevalidation of the order – insofar as it supports this functionality. Prevalidation can comprise one or more of the following checks: Account authorisation verification, limit verification, ES verification. If (technical) errors occur during prevalidation, it is pointless to continue transmission of the order – particularly since the order cannot be carried out.

Subscribers can discover whether a financial institution generally supports prevalidation via the bank parameter query (order type HPD, returned XML structure `HPDResponseOrderData`, attribute `ProtocolParams/PreValidation@supported`). Supplied parameters for prevalidations that are not supported by a financial institution are ignored by the financial institution.

More details on order type HPD can be found in Chapter 9.2. See Chapter 5.3 for details on prevalidation.

3.7 Technical subscribers

EBICS customer systems can in turn be set up as client-server systems, so-called multi-user systems. In this case, the server takes on the part of the EBICS client within the communication with the bank system and as such is responsible for the transmission of orders in accordance with the EBICS specification.

Towards the bank system, this customer-sided server acts as a "technical subscriber" which essentially is administrated within the bank system like a (human) subscriber.

EBICS requests of a technical subscriber and a human subscriber differ from each other only in the point that for all EBICS requests, the technical subscriber allocates his subscriber identification to the field SystemID and generates the identification and authentication signature for the EBICS request.

EBICS responses for the technical subscriber are always encrypted with the technical subscriber's public encryption key.

The following applies to the technical subscriber:

- On principle, the technical subscriber's identification is assigned to the field SystemID (in addition to the fields PartnerID and UderID) in the EBICS request. By the presence of the field SystemID, the bank system detects that the request has been sent by a technical subscriber.
- The technical subscriber issues the identification and authentication signature for the EBICS request (except of the order types which do not require an identification and authentication signature).
- The technical subscriber can execute all EBICS requests for the subscriber who is stated in the field UserID.
- The technical subscriber cannot issue a bank-technical signature.
- The technical subscriber can submit files with a particular transport signature (D file or submission to the VEU).
- The technical subscriber can submit files with bank-technical signatures of human subscribers. In this case, the technical subscriber does not have to issue a transport signature.

The following applies to the bank system's verification:

- The verification of the identification and authentication signature of the EBICS request issued by the technical subscriber is performed on the basis of the contents of the field SystemID.

- The order authorisation is verified by the contents of the fields PartnerID and UserID. The content of the field SystemID is not relevant.
  Only if the technical subscriber performs EBICS requests under his own name (the field UserID contains the technical subscriber's identification), the according order authorisation is required for the bank system.
- An account verification is not performed for technical subscribers.
- As usual, the electronic signature is verified independently of the contents of the fields SystemID and UserID.

3.8 Identification and authentication signature

Identification and authentication of the subscriber or the customer system and the financial institution is necessary in each transaction step to prevent the use of resources by unauthorised persons at the bank's end and to prevent unauthorised state alteration of orders or data.

The identification and authentication signature represents an integral component of the EBICS protocol as a main XML branch between the EBICS header and body data. It is generated in accordance with the XML signature standard and has a number of tasks to fulfil:

1. Identification and authentication of the (technical) subscriber: With the help of the identification and authentication signature, the bank system MUST convince itself of the correctness of the (technical) subscriber identification of known subscribers or customer systems.
2. Integrity of the control data/ES(s): Changes – even on the other side of the TLS transmission path - to the ES(s) as well as the technical and order-related data (with the exception of order data that is not acquired from the identification and authentication signature but rather from the bank-technical signature) are detected with the help of the identification and authentication signature as long as the XML structure of the signed data remains unchanged.

The identification and authentication signature (in contrast to the ES that signs the order data) is configured via the control data and via the ES(s) and MUST be supplied by both the customer system and the bank system in every transaction step of each order type (with the exception of the system-related order types INI, HIA, H3K, HSA and HPB, see Chapter 4.4). Identification and authentication of the bank-technical ES(s) connects the order data that is signed with this/these ES(s) to the remaining protocol information and thus prevents the unauthorised exchange of orders together with their ES(s) within an EBICS transaction.

Details on the identification and authentication signature algorithms that are used can be found in Chapter 11.1. It is also stipulated here that a canonisation process (C14N) transmits the data in standardised format before generation and verification of the signature.
In addition to the XML signature's inherent structures, precisely those elements (and their substructures) that possess the attribute marker `@authenticate="true"` MUST go into the

identification and authentication signature for signature configuration. The occurrence of these attribute markers are stipulated in the XML schema.

The identification and authentication signature of each EBICS message MUST be verified by the respective message recipient.

If the identification and authentication signature of an EBICS request cannot be successfully verified, the bank system cannot assume that the EBICS request actually originates from the corresponding (technical) subscriber.

In this event, the sender of the EBICS request will receive a corresponding error code (EBICS_AUTHENTICATION_FAILED). Further details can be found in Chapters 5.5.1.2.1 and 5.5.1.2.2, in each case under the sub-heading “Verifying the authenticity of EBICS requests”.

If, on the other hand, the identification and authentication signature of the EBICS response cannot be successfully verified, the customer system cannot assume that the EBICS response originates from the expected bank system. In this event, the relevant EBICS transaction MUST be aborted by the customer system.

The settings of the customer’s software that is used to establish the connection to the bank system, complying with the requirements of Chapter 3.1.2.2, MUST then be verified at the customer’s end. Furthermore, it MUST be verified whether the financial institution’s public keys are up-to-date (see also Chapter 5.5.1.2.1, sub-heading “Verifying the hash values of the bank keys”).

3.9 X.509 data

For cryptographic algorithms (i.e. for identification and authentication, encryption, signature), Version H004 of the EBICS protocol uses public keys as standard that have been exchanged within the framework of subscriber initialisation between subscriber and financial institution (for key management see Chapter 4)

However, wildcards are already provided for X.509 data (e.g. certificates, serial numbers, distinguished names, etc.) in successor versions to EBICS Version “H004”. The structures of the W3C are referenced directly.
The optional field for this is located in the EBICS XML schemas “ebics_request_H004.xsd” and “ebics_keymgmt_request_H004.xsd”, for example in the path `ebicsRequest/body/X509Data`. The type definition uses the specification from the XML signature (see Diagram 5).

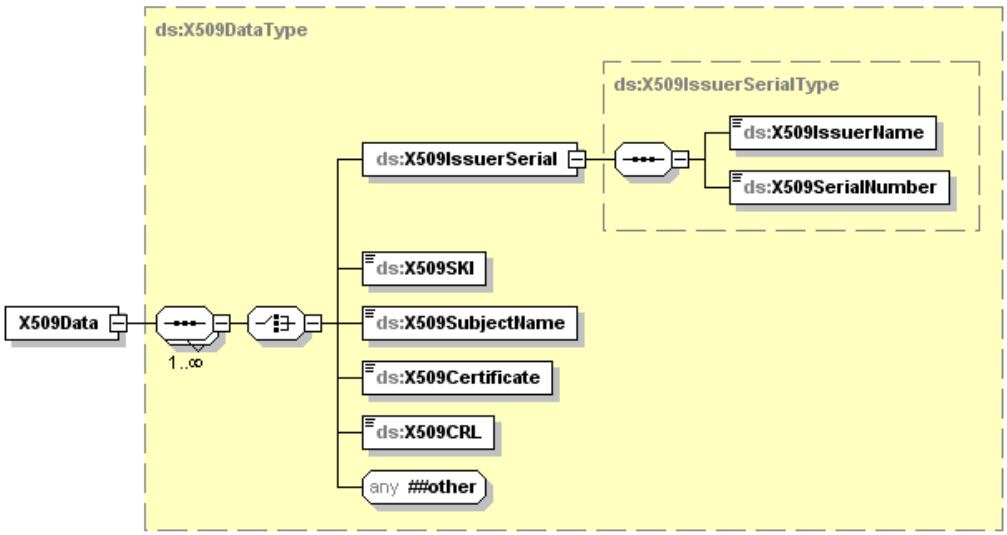


Diagram 5: X509DataType

This cannot be used in standard requests yet. No business related specifications have yet been set for filling out or evaluating this field.
In EBICS schema version H004, order types of the key management allow additional X.509 data to be transmitted optionally together with public keys like certificates.
Information as to whether X.509 data is already supported by the financial institution is given in order type HPD (download bank parameter) with the field `ProtocolParams/X509Data`. See Chapter 9.2 for details.

3.10 Supported order types

All standardised, system-related and reserved order types in accordance with the complete list (see Appendix Chapter 13) are supported by transparent embedding of the order data into the XML structure.

The following hitherto-known order types are no longer supported, with the following reasons (**exceptions**):

- BPD (download bank parameter file) has been replaced by the new mandatory order type HPD (download bank parameter). However, the original BPD structure can still be found in the XML return data (XML element `BankParameters`) for the optional order types HKD (download customer's customer and subscriber data) and HTD (download subscriber's customer and subscriber data). For further details see Chapters 9.3 and 9.4.
- PWA (send password amendment): Passwords are not used with EBICS. For this reason, PWA is dropped without replacement.
- VPB (download financial institution's public encryption key) has been integrated into the new order type HPB (download public bank key).

- VPK (send customer's public encryption key) has been integrated into the new order type HIA (send subscriber's public encryption and identification and authentication key). In addition, the keys are now no longer generated per customer but rather per subscriber of a customer.

The **newly-added order types**

- FUL (upload file with any format)
- FDL (download file with any format)
- HAA (download retrievable order types)
- HCA (amendment of the subscriber keys for identification and authentication and encryption)
- HCS (amendment of the subscriber keys for ES, identification and authentication and encryption)
- HEV (download supported EBICS versions)
- HIA (transmission of the subscriber keys for identification and authentication and encryption within the framework of subscriber initialisation)
- HSA (transmission of the subscriber keys for identification and authentication and encryption within the framework of subscriber initialisation for subscribers that have remote access data transmission via FTAM)
- HKD (download customer's customer and subscriber data)
- HPB (transfer of the public bank keys)
- HPD (download bank parameter)
- HTD (download subscriber's customer and subscriber data)
- HVD (retrieve VEU state)
- HVE (add VEU signature)
- HVS (VEU cancellation)
- HVT (retrieve VEU transaction details)
- HVU (download VEU overview)
- H3K (transfer of all public keys (subscriber, for identification and authentication and encryption) for initialisation in case of certificates)

are described in detail in Chapters 8 and 9 (HIA/H3K: Chapter 4.4.1, HCA/HCS: Chapter 4.6.1, HSA: Chapter 4.8.2).
Information on the support on the part of the bank (mandatory, optional, conditional) see chapter 13.

3.11 Order parameters

The element `OrderParams` has been integrated into the fixed control data (under `ebicsRequest/header/static/OrderDetails`) for the transmission of order parameters that are not part of the order data. Depending on the order type, this abstract element has a specific concrete characteristic (see also Diagram 6):

- `HVDOrderParams` in the case of order parameters for order type HVD
- `HVEOrderParams` in the case of order parameters for order type HVE
- `HVSOrderParams` in the case of order parameters for order type HVS
- `HVTOrderParams` in the case of order parameters for order type HVT
- `HVUOrderParams` in the case of order parameters for order type HVU
- `FULOrderParams` in the case of order parameters for order type FUL
- `FDLOrderParams` in the case of order parameters for order type FDL
- `StandardOrderParams` in the case of order parameters for order types from the Appendix Chapter 13 or document “EBICS Annex 2 Order Types”, that transmit a date range (e.g. STA, except FDL)
- `GenericOrderParams` in the case of order parameters for all other order types that have a requirement for transmission of additional information from the customer system to the bank system.

The structures of the order parameters for order types HVD, HVE, HVS, HVT and HVU are explained in greater detail in Chapter 8.3. The structures for order types FUL and FDL are explained in greater detail in Chapter 9.6.

The `StandardOrderParams` define a date range via the optional element `DateRange` and the subelements `Start` and `End` (both of type `date`).

With the `GenericOrderParams`, any number of `Name-Value` pairs can be specified via the optional element `Parameter`, wherein the type of the value has to be fixed with the attribute `Type` (Recommendation for a default is `string`).

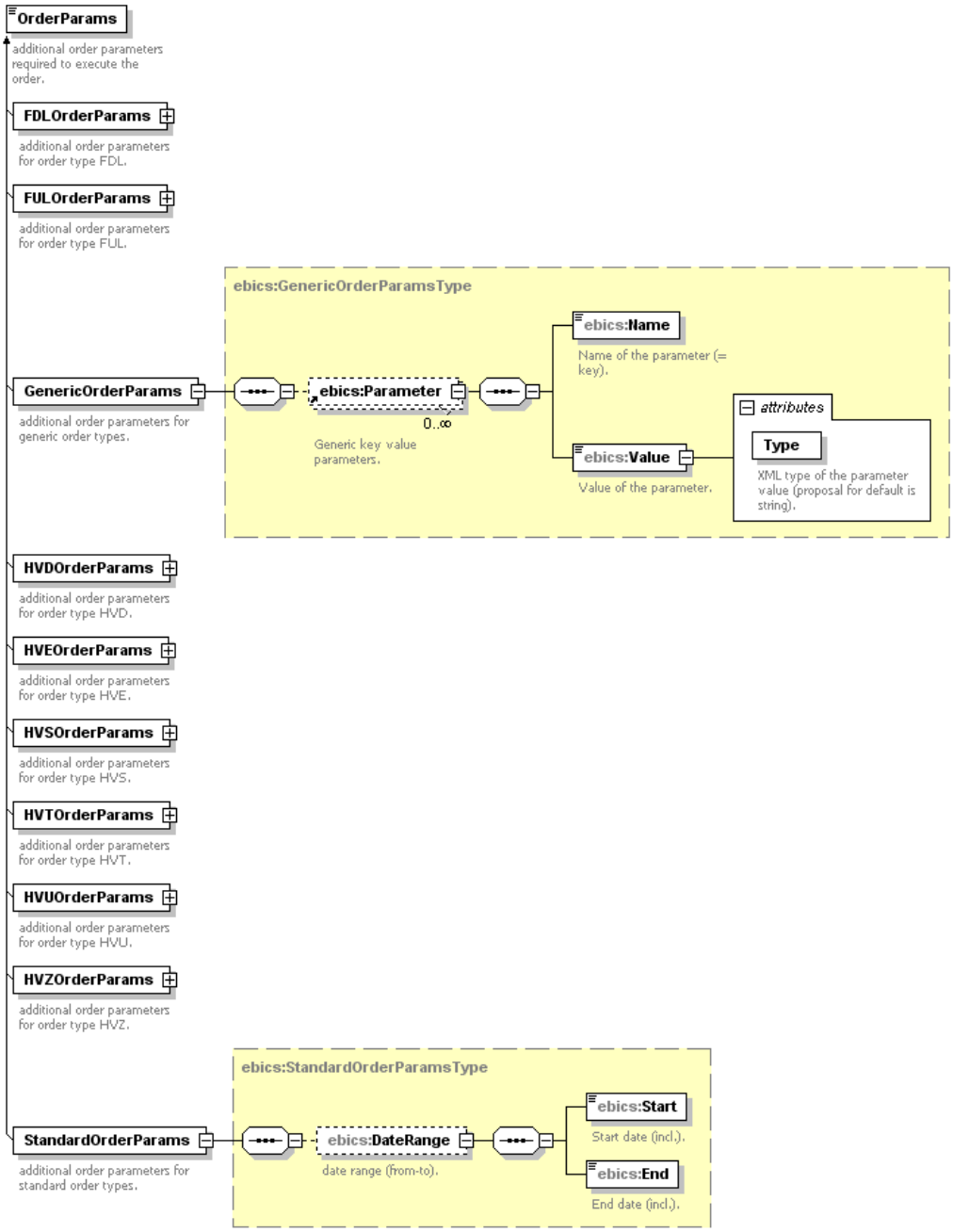


Diagram 6: Possible characteristics for the order parameters (OrderParams)

3.12 Flow of the EBICS transactions

This chapter contains a simplified description of the protocol sequence for the transmission of a remote data transmission order via EBICS that allows for the stipulations in the previous chapter.

The transmission takes place in an EBICS transaction that can comprise several transaction steps. A transaction step is a pair, comprising an EBICS request and the corresponding EBICS response.

The first transaction step is the transaction initialisation step. Subscriber-related authorisation verifications are carried out in this step, such as e.g. the verification of order type authorisation. Successful authorisation verification is a prerequisite for continuation of the transaction. Furthermore, the ES's of the order are transmitted in this transaction step: in the case of upload orders, the ES's of the signatory are transmitted in the EBICS request; in the case of download orders, possibly the financial institution's bank-technical ES is transmitted in the EBICS response.

After transaction initialisation, a number of transaction steps usually follow in which the segments of order data are transmitted sequentially and in consecutive order.

Upload orders that are sent to the bank system via EBICS can be authorised using two different methods:

Method 1: Authorisation by means of one or more bank-technical ES

The bank-technical ES's of an order file must be given by different subscribers. In case of the VEU, these subscribers may in special cases belong to different customers (customer-ID-spanning signature). The ES's can be submitted to the financial institution by way of three different order types, while every ES submitted with a single EBICS transaction originates from the same customer.

1. Submission of the order data together with one or more ES's by way of an upload order with the order attributes "**OZHNN**".
   All ES's that are submitted in this manner originate from the customer of the party that submitted the order. If the transmitted ES's are not sufficient for the bank-technical approval, the order is transferred to the VEU. In this case, several options for a subsequent authorisation exist:

2. Submission of further bank-technical ES's in an independent EBICS transaction with the order attributes "UZHNN" to the same order type and order number
   For this EBICS transaction the transaction steps for the transmission of the order data segments are omitted.
   ES's that are subsequently submitted in this manner originate from the customer of the party that submitted the order.

3. Submission of outstanding bank-technical ES's with the help of order type **HVE**
   If an ES is submitted via an HVE transaction, this ES has to originate from the customer of the party that submitted the HVE transaction:
   HVE permits the special case of the customer-ID-spanning signature because the ES's submitted via HVE do not necessarily have to originate from the customer of the party that submits the orders.

Method 2: Authorisation by means of an accompanying note signed by hand
For the transmission of the order file the order attributes of the upload order are set to "**DZHNN**".
Within the framework of the EBICS transaction, an ES of signature class "T" is transmitted together with the data of the order. The order is not passed on to the VEU but directly to the bank-specific post-processing.
If the submitting subscriber possesses the authorisation for issuing a bank-technical ES in the bank system and signatures are submitted with order attributes "DZHNN" these signatures are strictly assessed only as transport signatures. The order must not be passed to the VEU either.

The meaning and admissible settings of the order attributes are described in the Appendix (Chapter 12.3).

Transmission of an upload order with a (compressed, encoded and base64-coded) order data volume of 3 MB is represented by way of example with the help of the sequence diagram in Diagram 7. The EBICS transaction relating to an upload order is terminated as soon as the last order data segment has been successfully transmitted to the financial institution.

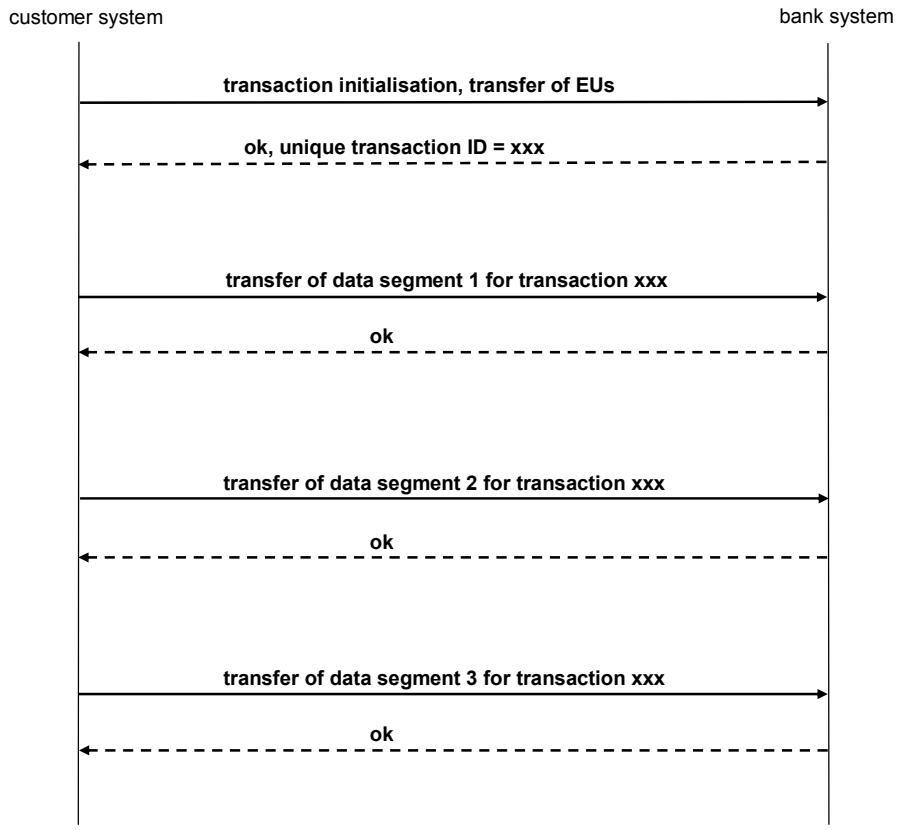


Diagram 7: Example of the sequence of an EBICS transaction for an upload order

Transmission of a download order with a (compressed, encoded and base64-coded) order data volume of 3 MB is represented by way of example with the help of the sequence diagram in Diagram 8. The subscriber should set the order attributes as equal to

- "OZHNN"
  if he wants to request the download data with the bank-technical ES of the financial institution.
  In Version "H004" of EBICS the ES of the financial institutions is only planned (see Chapter 3.5.2).
- "DZHNN"
  when requesting the download data without the bank-technical ES of the financial institution.

In the case of download orders, receipt of the download data is confirmed with an acknowledgement step. After this, the EBICS transaction for the download order is terminated.

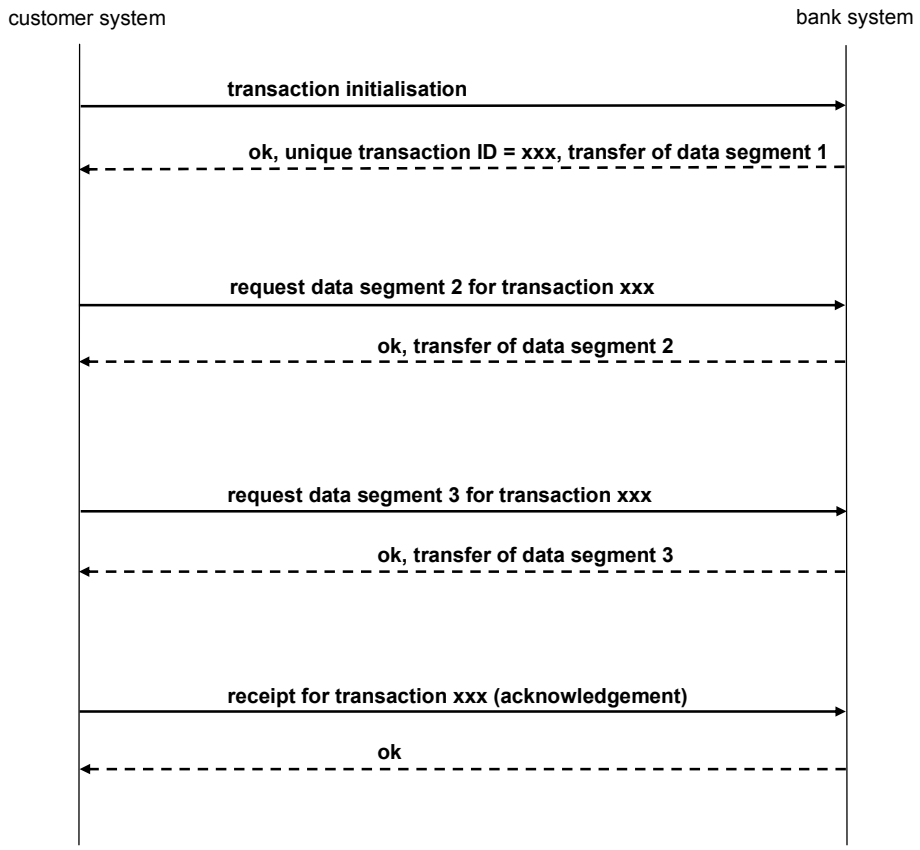


Diagram 8: Example of the sequence of an EBICS transaction for a download order

Further details on the sequence of EBICS transactions can be found in Chapter 5.

4 Key management

4.1 Overview of the keys used

The EBICS protocol provides three RSA key pairs for each subscriber. These are used for the following purposes:

- bank-technical/technical ES of the order data that the subscriber/client system sends to the bank system
- identification and authentication of the subscriber by the bank system via identification and authentication signature
- decryption of the (symmetrical) transaction key used to encrypt the order data that the subscriber retrieves from the bank system.

Based on their use, one also talks of

- public / private bank-technical keys
- public / private identification and authentication keys
- public / private encryption keys

EBICS allows the use of three different key pairs per subscriber. In doing this, EBICS promotes the use of at least two different key pairs for each subscriber:

- One key pair is used exclusively for the bank-technical electronic signature.
- The use of one single key pair is allowed for identification and authentication of the subscriber by the bank system AND decryption of transaction keys.

Analogously to the subscriber keys, EBICS provides three different RSA key pairs for the bank system. These are used for the following purposes:

- bank-technical ES of the order data that is retrieved by a subscriber from the bank system
  In EBICS Version “H004” the financial institution’s bank-technical ES is only planned (see Chapter 3.5.2).
- identification and authentication of the financial institution by the subscriber via identification and authentication signature
- Decryption of the (symmetrical) transaction key to encrypt bank-technical order data sent by a subscriber to the financial institution.

The same restrictions as for the subscriber keys apply with regard to the use of an RSA key pair for different purposes.

The subscriber's keys are connected to processes that the subscriber would like to use for generation/verification of the ES, for generation/verification of the identification and authentication signature and for the encryption of order data. These processes are identified by unambiguous Versions so that different subscribers can use e.g. different processes for the ES. A prerequisite of EBICS is that the respective processes are administrated in the bank system for each subscriber.

Version "H004" of the EBICS protocol allows for the use of the following processes:

- "X002" for the identification and authentication signature
- "A004","A005", or "A006" for the ES
- "E002" for the encryption.

Details of these processes can be found in the Appendix (Chapter 11.1, Chapter 11.2 and Chapter 11.3).

Subscribers of the same customer generally use the same processes for identification and authentication signature, encryption and ES.

A subscriber's orders can be delivered by a technical subscriber if both subscribers use the same processes for identification and authentication signature, encryption and bank-technical signature. In this case, administration of the public bank keys for all subscribers that wish to work with the same processes can be centralised at the customer's end.

4.2 Representation of the public keys

EBICS defines the new order types HIA, HCA, HSA, HCS and HPB, whose bank-technical order data constitutes public keys of the financial institution or the subscriber. For these order types, embedding of the public keys in EBICS messages takes place using newly-defined types based on the XML schema (see schema definition file ebics_types_H004.xsd). These types are contained in the following table:

Key type	XML type
Identification and authentication key	`AuthenticationPubKeyInfoType`
Bank-technical key	`SignaturePubKeyInfoType`
Encryption key	`EncryptionPubKeyInfoType`

The graphical representation of the XML types `AuthenticationPubKeyInfoType`, `SignaturePubKeyInfoType`, `EncryptionPubKeyInfoType` is contained in Diagram 9, Diagram 10, and finally Diagram 11.

The XML structures are composed in a similar manner to one another: They contain the value of the public key as a combination of exponent and modulus. In addition, information relating to an X.509 certificate can be provided. Moreover, the version of the process for

configuration/verification of the identification and authentication signature (see element `AuthenticationVersion`) is a component of the identification and authentication key. Analogously, the version of the encryption process is a component of the encryption key and the version of the bank-technical ES is a component of the bank-technical key.

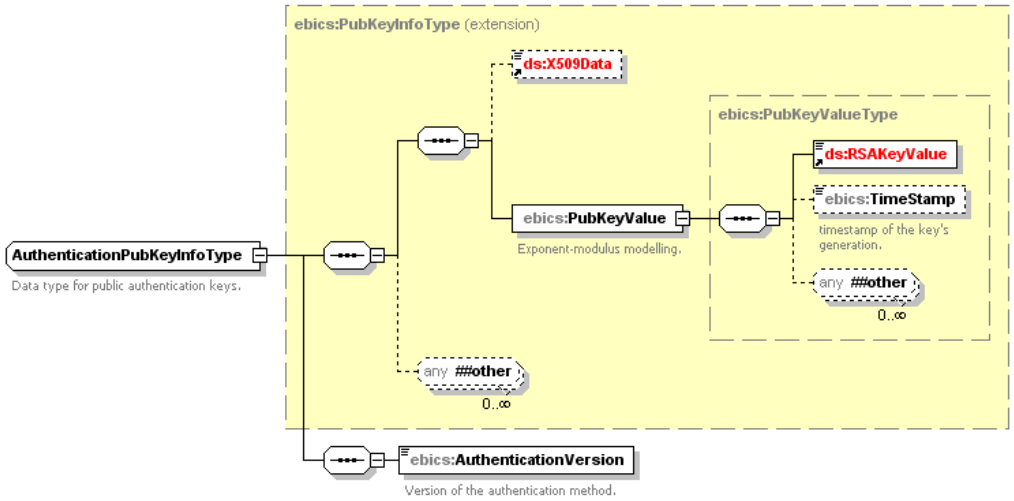


Diagram 9: Definition of the XML schema type AuthenticationPubKeyInfoType

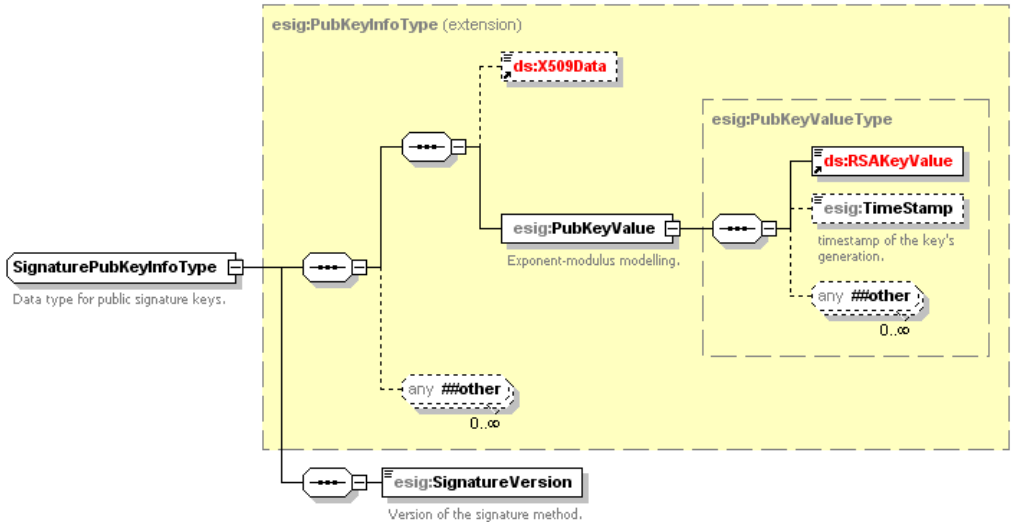


Diagram 10: Definition of the XML schema type SignaturePubKeyInfoType

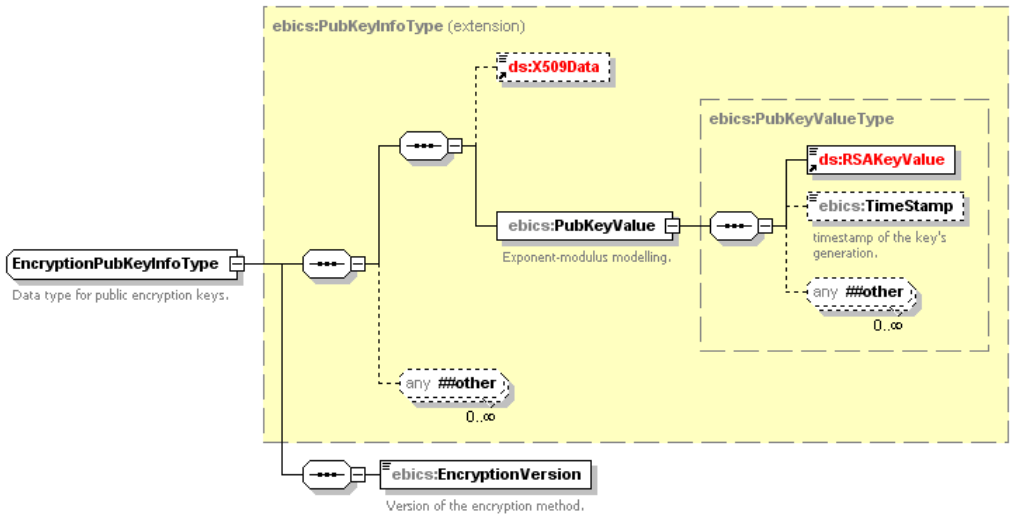


Diagram 11: Definition of the XML schema type EncryptionPubKeyInfoType

4.3 Actions within key management

Actual processing of the key management upload orders must take place synchronously to their transmission via EBICS. Hence processing must be completed before the final EBICS response of this transmission is sent to the subscriber.

This requirement applies in the case of INI and HIA as well as H3K (see Chapter 4.4.1) as well as HSA (see Chapter 4.8) so that execution of subscriber initialisation is not delayed unnecessarily. It also applies equally in the case of SPR (see Chapter 4.5) so that the subscriber revocation is immediately activated. Subsequently-initialised EBICS transactions for the transmission of a bank-technical order are rejected at EBICS protocol level until the subscriber has again attained the state “Ready”. (Subscriber ES’s that have been successfully verified before the suspension also remain valid after the suspension. Such an ES can continue to be used for authorisation of an open order within the framework of the VEU).

Finally, this requirement also applies for all PUB, HCS, and HCA (see Chapter 4.6.1) to allow successful processing of immediately-following EBICS transactions from the relevant subscriber that already use the updated keys. (Subscriber ES’s that have been successfully verified before execution of PUB or HCS, respectively, also remain valid after the processing of PUB or HCS and the associated amendment of the bank-technical subscriber key. Such an ES can continue to be used for authorisation of an open order within the framework of the VEU).

4.4 Initialisation

A range of prerequisites must be fulfilled by the subscriber of a customer in order for them to be able to implement bank-technical EBICS transactions with a particular financial institution.

The basic prerequisite is the conclusion of a contract between customer and financial institution. In this contract it will be agreed as to which business transactions (bank-technical order types) the customer will conduct with the financial institution, which accounts are concerned, which of the customer's subscribers work with the system and the authorisations that these subscribers will possess.

If the customer does not yet have access to a corresponding customer product, they will receive the client software and the financial institution's access data (bank parameters) after conclusion of the contract. The financial institution will set up the customer and subscriber master data in the bank system in accordance with the contractual agreements. In doing this, the individual subscribers will receive the state "**New**".

Details of the contractual agreements are not a subject of this standard, they are to be arranged individually between the customer and the financial institution.

Other prerequisites are successful subscriber initialisation and download of the financial institution's public keys by the subscriber. The necessary steps that must be taken by the financial institution, the customer and the subscriber and the chronological dependencies of these steps are contained in Diagram 12. Diagram 13 shows an example of a process by way of a sequence diagram. The state of the public bank keys at the subscriber's end is shown on the life-line of the subscriber system. Correspondingly, the state of the public subscriber keys at the bank's end and the state of the subscriber themselves are shown on the lifeline of the bank system. Details of these diagrams are explained in the following chapters.

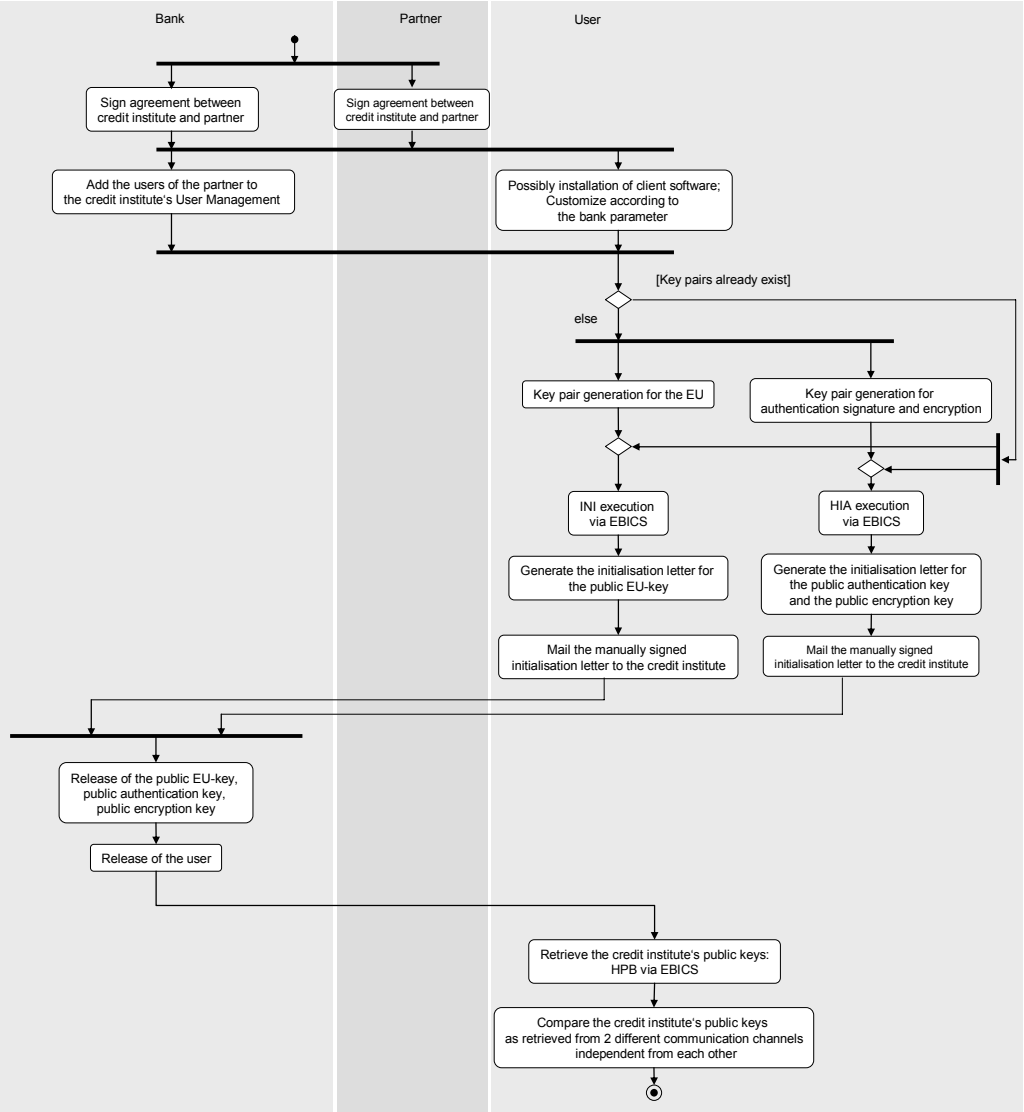


Diagram 12: Necessary steps prior to actual processing of business transactions via EBICS (using INI / HIA)

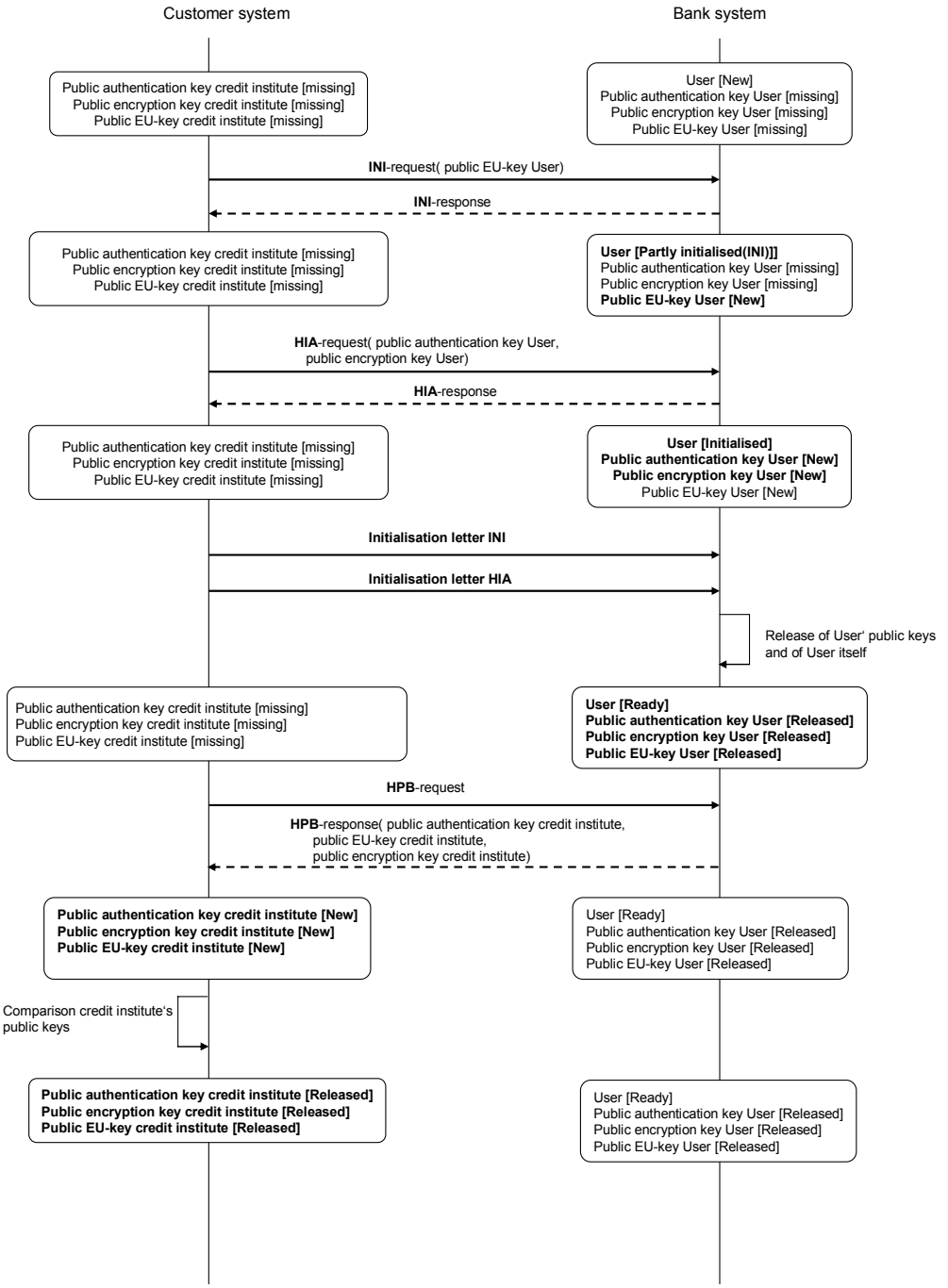


Diagram 13: Process example: Subscriber initialisation followed by download and verification of of the bank keys (using INI / HIA)

4.4.1 Subscriber initialisation

4.4.1.1 General description

Transmission of the subscriber's public keys to the bank system is necessary for initialisation of the subscriber with the financial institution. The supported versions for the ES, the encryption and the identification and authentication signature are components of the bank parameters. The subscriber's bank-technical key must be newly generated if the subscriber does not have a suitable bank-technical key or does not wish to use an existing bank-technical key for the new bank connection. The same applies for the encryption key and the identification and authentication key.
The subscriber transmits his public keys to the financial institution as follows:

Alternative 1 (by two independent communication paths):

- via EBICS by means of the following system-related order types:
  - **INI**: send the public bank-technical key (key for the ES / authorisation key).
  - **HIA**: send the public identification and authentication key and the public encryption key.

Transmission of the public subscriber keys to the financial institution via INI and HIA is referred to as **subscriber initialisation**

- by post with initialisation letters signed by the subscriber.

The use of signed initialisation letters permits the financial institution to:

- verify the authenticity of the public subscriber's keys transmitted via EBICS as a prerequisite for the activation of subscribers
- guarantee the reproducibility of subscribers' key histories by storing the initialisation letters.

The sequence for processing of INI and HIA is not fixed, but within the framework of subscriber initialisation precisely one INI order and precisely one HIA order will be implemented. Transmission of the public subscriber keys via two separate orders in any order requires definition of the subscriber states "**Partially initialised(INI)**" and "**Partially initialised(HIA)**". Within the framework of subscriber initialisation, the subscriber takes on the corresponding state depending on whether the first successful order is INI or HIA.

This initialisation procedure (alternative 1) is always admissible: for RSA keys without certificates as well as with certificates. However, it is assumed that in each case initialisation letters are used for alternative 1. The public keys of the subscriber/user have still to be sent to the bank by the order types INI (public bank-technical key) and HIA (public identification and authentication key as well as the public encryption key). However, in order to guarantee the authenticity of the subscriber's (user's) public keys, it must be ensured that the bank receives the public bank keys via a second, independent communication path (initialisation letter for INI and for HIA, respectively). Having received the keys via different communication paths, the bank first compares the keys before approving them.

Alternative 1 can also be used if alternative 2 fails.
For details and workflow concerning alternative 1, see chapter 4.4.1.2

Alternative 2 (in one step):
This alternative is only possible in case of using certificates and only permissible under special conditions: Only if the bank-technical (authorisation) key is based on a certificate issued by a CA, the authenticity of this particular public key is guaranteed by a CA as long as customer and bank have agreed to use this certain certificate and as long as it is valid. In this case, the initialisation letter is not necessary.

- via EBICS by means of the order type:
  - **H3K**: send the public keys for the bank-technical signature (signature for authorisation; ES), and identification and authentication as well as encryption keys.

For the initialisation via certificates, the order type H3K simplifies the workflow:

1. All public keys can be sent in one step (H3K-request) using a certification issued by a CA for the bank-technical (ES) key.
2. INI and HIA letters are not necessary.

Details and workflow see chapter 4.4.1.3

4.4.1.2 Initialisation via INI and HIA

4.4.1.2.1 INI

Processing of INI is permissible if the state of the respective subscriber is “New”, “Suspended” or “Partially initialised(HIA)”. INI comprises a single EBICS request/response pair. The following applies for the EBICS request of INI:

- it does not require an identification and authentication signature since the subscriber’s public identification and authentication key has not yet been activated by the financial institution and hence cannot be used for verification.
- it does not contain a bank-technical signature, since the subscriber’s public bank-technical key is being transmitted for the first time in this request. This bank-technical key cannot be used by the financial institution to verification the bank-technical signature since its authenticity has not yet been ascertained.
- it contains the order data, i.e. the subscriber’s public bank-technical key in unencrypted form since the subscriber does not yet have the financial institution’s public encryption key (at least in the event of first initialisation).

The flow diagram in Diagram 14 represents the processing at the bank’s end that takes place on receipt of an INI request. Error situations that result from an invalid combination of customer/subscriber ID or an inadmissible subscriber state are not passed directly to the sender of the INI request. Instead, the sender receives the technical error code EBICS_INVALID_USER_OR_USER_STATE. INI does not give any errors of the type “Unknown subscriber” or “Inadmissible subscriber state” so that potential attackers are not given precise information about the validity of subscriber IDs or the state of subscribers. On

the other hand, internal documentation must take place on the part of the financial institution to record the precise reason for the error.

The flow diagram provides verification of the subscriber state so that INI requests are rejected on the EBICS level if the subscriber state is inadmissible for INI. Admissible states for INI are: “New”, “Suspended” and “Partially initialised(HIA)”. Here, the state of the subscriber is verified from the header data of the request. The order data of the INI request (see Chapter 4.4.1.2.5.1) merely contains the subscriber whose bank-technical key is to be transmitted. For this reason, the subscriber from the header data should correspond with the subscriber from the order data. The EBICS protocol does not provide a verification for this correspondence. However, before actual processing of the order the state of the subscriber is verified (again) which is a part of the order data of INI.

Processing of an INI order can return the following error codes:

- EBICS_KEYMGMT_UNSUPPORTED_VERSION_SIGNATURE
  This business related error occurs when the order data contains an inadmissible version of the bank-technical signature process
- EBICS_KEYMGMT_KEYLENGTH_ERROR_SIGNATURE
  This business related error occurs when the order data contains a bank-technical key of inadmissible length
- EBICS_INVALID_ORDER_DATA_FORMAT
  This business related error occurs when the order data does not correspond with the designated format (see Chapter 4.4.1.2.5.1)
- EBICS_INVALID_USER_OR_USER_STATE
  This technical error occurs when the order data contains a subscriber that is either unknown or whose state is inadmissible for INI. The following subscriber states are admissible: New, Suspended, Partially initialised (HIA).
- For Return codes relating to certificates, refer to Annex 1

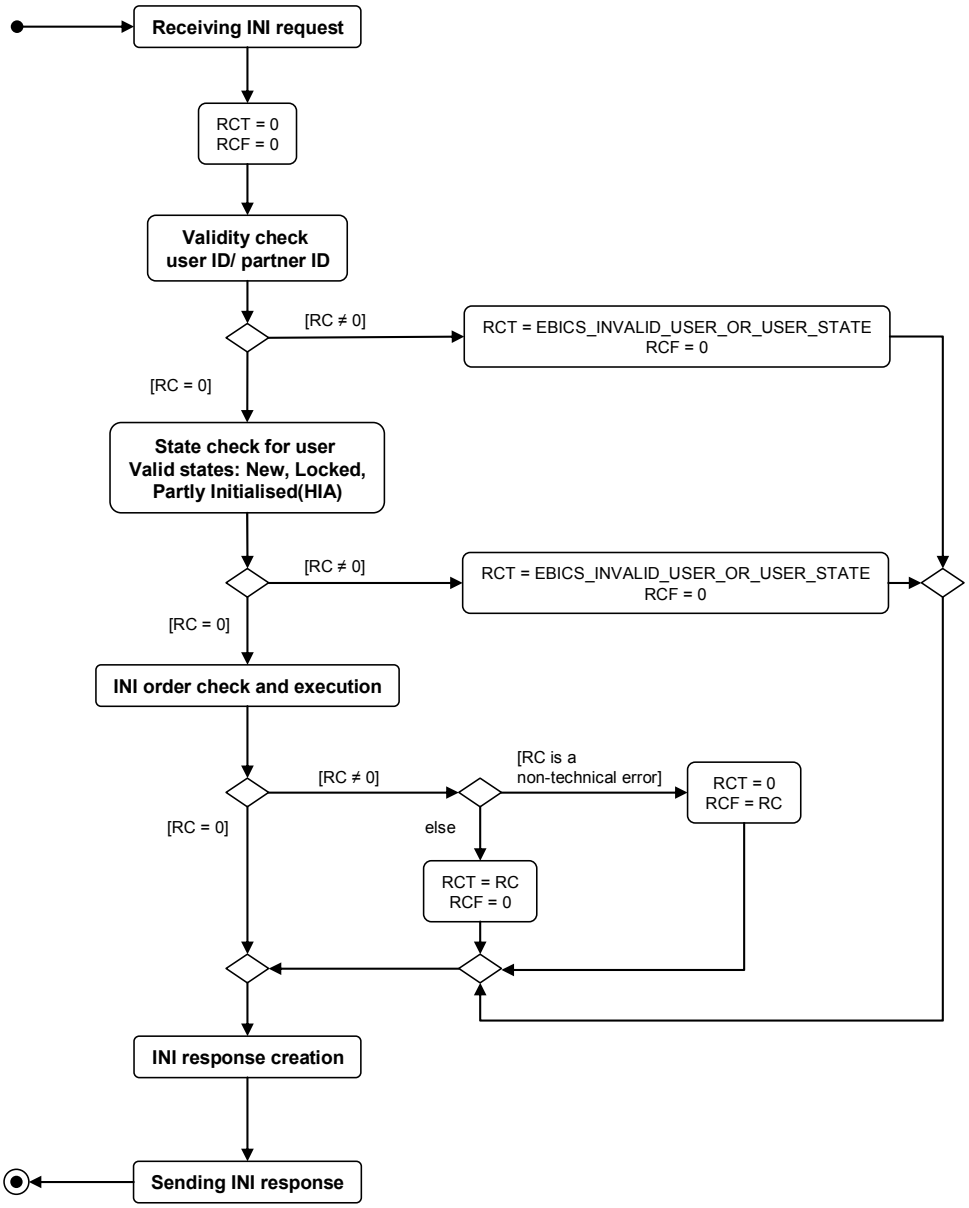


Diagram 14: Processing of an INI request at the bank's end

The EBICS response for INI does not contain an identification and authentication signature of the financial institution since the subscriber does not yet have the financial institution's public identification and authentication key with which they can carry out a verification.

In Diagram 13 INI is carried out before HIA, and correspondingly the subscriber changes from the state “New” to the state “Partially initialised(INI)”. The state “Partially initialised(INI)” means:

- The subscriber’s bank-technical key is available to the bank system, although it has not yet been activated
- The bank system does not (yet) have the subscriber’s public identification and authentication key or public encryption key.

In this state, the subscriber can only carry out one of the following two actions:

- Implement order type HIA and then transfer into the state “Initialised”:
  Orders that are not equal to HIA that are submitted by the subscriber in this state are rejected by the bank system. Bank-technical signatures of the subscriber relating to existing orders are evaluated as invalid if the subscriber has the state “Partially initialised(INI)” at the time of verification.
- Have themselves suspended by the financial institution via telephone call:
  Following this, the only option is re-initialisation of the subscriber.

After the successful processing of INI, the subscriber sends a signed initialisation letter for INI. See Chapter 4.4.1.2.3 for details of the content of the initialisation letter.

4.4.1.2.2 HIA

Processing of HIA is permissible if the state of the subscriber is “New”, “Suspended” or “Partially initialised (INI)”. HIA comprises a single EBICS request/response pair. The following applies for the EBICS request of HIA:

- it does not contain an identification and authentication signature, since the subscriber’s public identification and authentication key is being sent for the first time in this request. This subscriber’s public identification and authentication key cannot be used by the financial institution to verify the identification and authentication signature since its authenticity has not yet been ascertained.
- it does not contain a bank-technical signature since the subscriber’s public bank-technical key has not yet been activated by the financial institution and hence cannot be used for verification.
- it contains the order data, i.e. the subscriber’s public encryption key and public identification and authentication key in unencrypted form since the subscriber does not yet have the financial institution’s public encryption key (at least on the event of first initialisation).

The flow diagram in Diagram 15 represents the processing at the bank’s end that takes place on receipt of an HIA request. In an analogous manner to INI, error situations that result from an invalid combination of customer/subscriber ID or an inadmissible subscriber state are also here not passed directly to the sender of the HIA request. Instead, the sender receives the technical error code EBICS_INVALID_USER_OR_USER_STATE. HIA does not give any

errors of the type “Unknown subscriber” or “Inadmissible subscriber state” so that potential attackers are not given precise information about the validity of subscriber IDs or the state of subscribers. Also analogously to INI, internal documentation must take place on the part of the financial institution to record the precise reason for the error.
The flow diagram provides verification of the subscriber state so that HIA requests are rejected on the EBICS level if the subscriber state is inadmissible for HIA. Admissible states for HIA are: “New”, “Suspended” and “Partially initialised(INI)”. Here, the state of the subscriber is verified from the header data of the request. The order data of the HIA request (see Chapter 4.4.1.2.5.1) merely contains the subscriber whose identification and authentication key and encryption key are to be sent. For this reason, the subscriber from the header data should correspond with the subscriber from the order data. The EBICS protocol does not provide a verification for this correspondence. However, before actual processing of the order the state of the subscriber is verified (again) which is a part of the order data of HIA.

Processing of an HIA order can return the following error codes:

- EBICS_KEYMGMT_UNSUPPORTED_VERSION_ENCRYPTION
  This business related error occurs when the order data contains an inadmissible version of the encryption process
- EBICS_KEYMGMT_UNSUPPORTED_VERSION_AUTHENTICATION
  This business related error occurs when the order data contains an inadmissible version of the identification and authentication signature process
- EBICS_KEYMGMT_KEYLENGTH_ERROR_ENCRYPTION
  This business related error occurs when the order data contains an encryption key of inadmissible length
- EBICS_KEYMGMT_KEYLENGTH_ERROR_AUTHENTICATION
  This business related error occurs when the order data contains an identification and authentication key of inadmissible length
- EBICS_INVALID_ORDER_DATA_FORMAT
  This business related error occurs when the order data does not correspond with the designated format (see Chapter 4.4.1.2.5.1)
- EBICS_INVALID_USER_OR_USER_STATE
  This technical error occurs when the order data contains a subscriber that is either invalid or whose state is inadmissible for HIA. The following subscriber states are admissible: New, suspended, Partially initialised (INI).
- EBICS_KEYMGMT_NO_X509_SUPPORT
  This business related error occurs when a public key of type `ds:X509Data` has been sent but the financial institution only supports type `ebics:PubKeyValueType`.
- For Return codes relating to certificates, refer to Annex 1

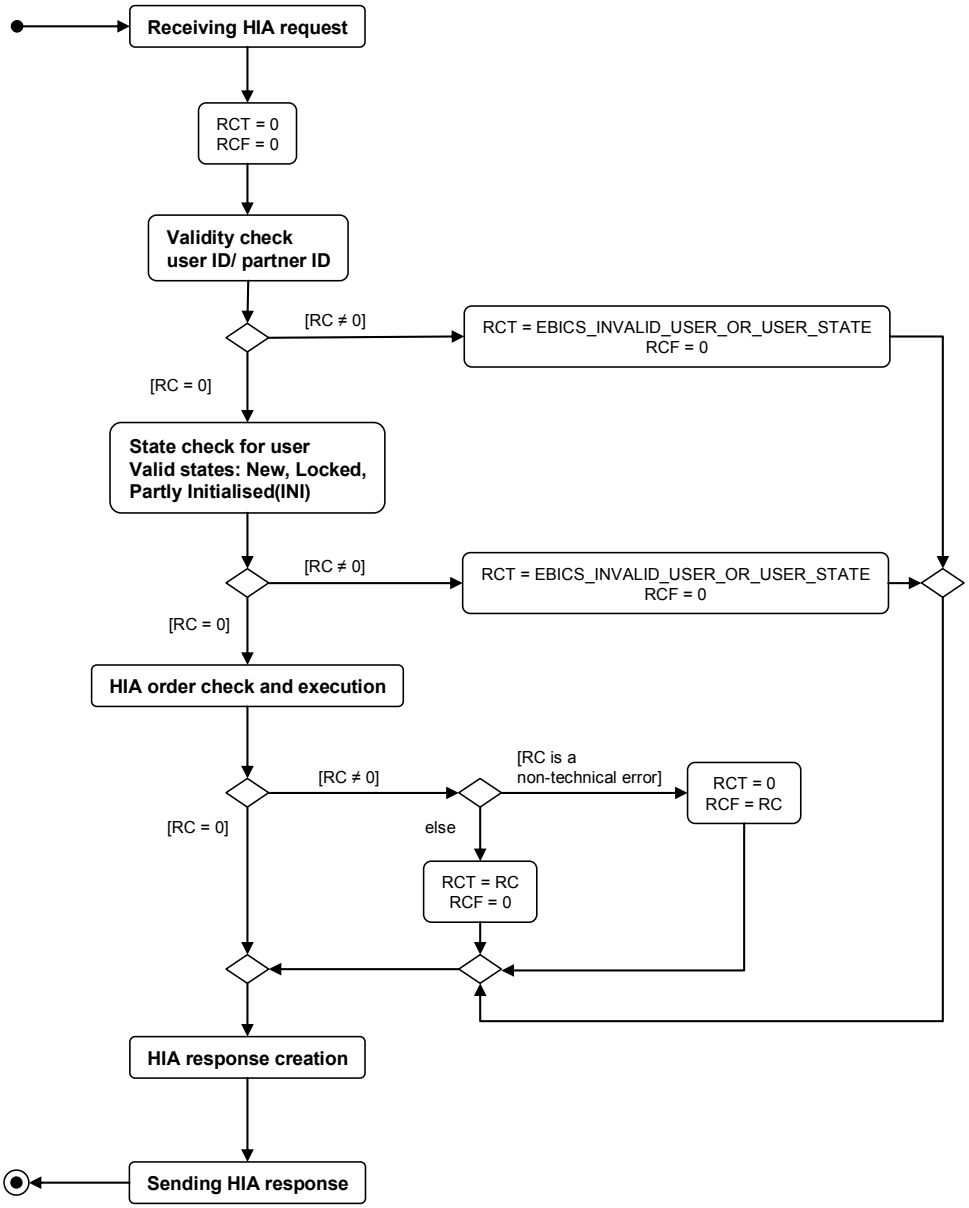


Diagram 15: Processing an HIA request at the bank's end

The EBICS response for HIA does not contain an identification and authentication signature of the financial institution since the subscriber does not yet have the financial institution's public identification and authentication key with which they can carry out a verification.

The meaning of the state “Partially initialised (HIA)“, that has not been taken into consideration in Diagram 13 is as follows:

- The bank system has the subscriber’s public identification and authentication key and public encryption key. Neither of these have been activated by the bank system
- The bank system does not (yet) have the subscriber’s public bank-technical key.

In this state, the subscriber can only carry out one of the following two actions:

- Carry out order type INI:
  Orders that are not equal to INI that are submitted by the subscriber in this state are rejected by the bank system. Bank-technical signatures of the subscriber relating to existing orders are evaluated as invalid if the subscriber has the state “Partially initialised(HIA)” at the time of verification.
- Have themselves suspended by the financial institution via telephone call:
  Following this, the only option is re-initialisation of the subscriber.

After the successful processing of HIA, the subscriber sends a signed initialisation letter for HIA to the financial institution. See Chapter 4.4.1.2.3 for details of the content of the initialisation letter.

4.4.1.2.3 Initialisation letters

Initialisation letters for INI contain the public bank-technical subscriber key, initialisation letters for HIA contain the subscriber’s public identification and authentication key and the subscriber’s public encryption key. In addition to the public subscriber keys, the initialisation letters contain the following data:

- User name (optional): customer software-internal subscriber’s name
- Date: Date of processing of the corresponding EBICS order
- Time: Time of processing of the corresponding EBICS order
- Recipient bank
- Subscriber ID
- Customer ID.

In addition to the public subscriber key, the initialisation letter contains the following data:

- Purpose of the public subscriber key:
  - Bank-technical electronic signature
  - Identification and authentication signature
  - Encryption.

- Processes:
  - Bank-technical electronic signature process: A004, A005, or A006
  - Identification and authentication signature process: X002
  - Encryption process: E002.
- Exponent length specification
- Exponent of the public key in hexadecimal representation
- Modulus length specification
- Modulus of the public key in hexadecimal representation
- Hash value of the public key in hexadecimal representation
  - The initialisation letter for INI contains the RIPEMD-160 hash value of the public bank-technical key (in the case of A004) or the SHA-256 hash value of the public key (in the case of A005 or A006, respectively). The composition of the hash value is described in chapter 14 for both processes.
  - The initialisation letter for HIA contains the SHA-256 hash value of the public identification and authentication key and the SHA-256 hash value of the public encryption key. The SHA-256 hash values of the public keys X002, E002 as well as of the A005 and A006 keys are composed by concatenating the exponent with a blank character and the modulus in hexadecimal representation (using lower case letters) without leading zeros (as to the hexadecimal representation). The resulting string has to be converted into a byte array based on US ASCII code.

Initialisation letters for INI contain the public bank-technical subscriber key of the user, initialisation letters for HIA contain the subscriber's public identification and authentication key and the subscriber's public encryption key. Examples of initialisation letters can be found in the Appendix (Chapter 11.5.1).

4.4.1.2.4 Activation of the subscriber by the financial institution

After successful processing of INI and HIA, the subscriber is initially set to the state "**Initialised**": the bank system has all necessary public keys for the subscriber, but it will not have activated them yet. Subscribers that are set to the state "Initialised" cannot submit orders or signatures via EBICS: all attempts to do so will be rejected by the bank system.

After successful verification of the initialisation letters by the financial institution, the public subscriber keys are activated and the subscriber's state is set to "**Ready**" in the bank system. The state "Ready" means that the bank has all of the information necessary for the subscriber to successfully implement submission of orders or signatures. See also Diagram 13. The subscriber can also especially download the financial institution's so-called bank parameters via the order type HPD (see Chapter 9.2).

Diagram 16 clarifies once again the state transitions of a subscriber as described above. Deletion of subscribers from bank systems' subscriber administration databases is not covered in this standard. For this reason, a further state "Deleted" and an end state will not be displayed.

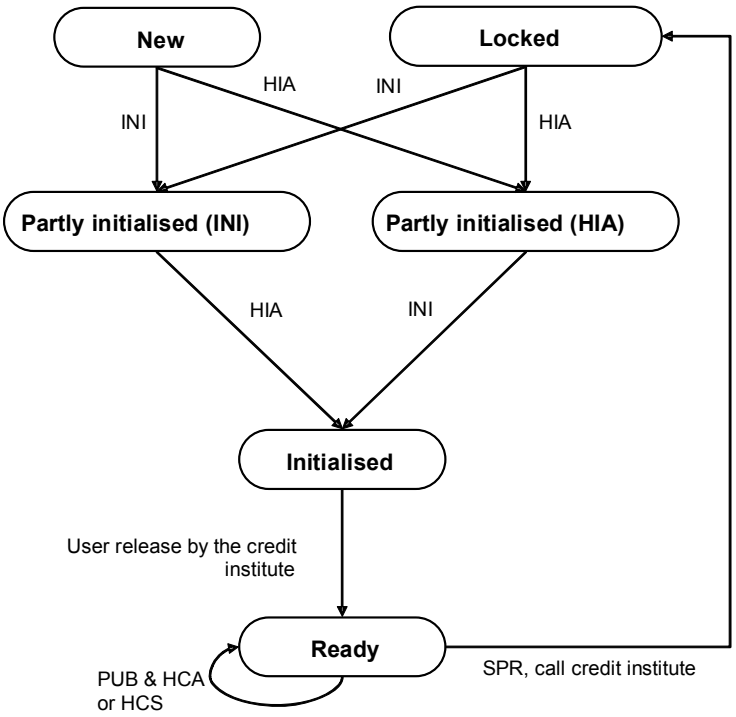


Diagram 16: State transition diagram for subscribers

The (renewed) processing of INI or HIA is not admissible in the subscriber state "Ready". This is to prevent unintentional transfer of the subscriber from the state "Ready" to the state "Partially initialised(INI)" or "Partially initialised(HIA)". The result of this would be that the affected subscriber would not be able to implement any further bank-technical orders for the time being.

Subscribers that are set to the state "Ready" must firstly suspend their remote access data transmission to the bank system before they can carry out renewed subscriber initialisation. Details on the suspension of subscribers can be found in Chapter 4.5.

4.4.1.2.5 Description of the EBICS messages

4.4.1.2.5.1 Format of the order data

Furthermore, for reasons of compatibility with the FTAM process, during signature process A004 INI supports the data structure (public key file) that has been defined for INI files (see Chapter 14.2.5.4) in the “Specification for FTAM connection” (Appendix 2 of the “DFÜ-Abkommen”).
When using the ES in structured form (from signature process A005/A006 on) the order data for INI is an instance document that conforms with ebics_signature.xsd and comprises the top-level element `SignaturePubKeyOrderData`.
`SignaturePubKeyOrderData` is defined as follows via the XML schema:

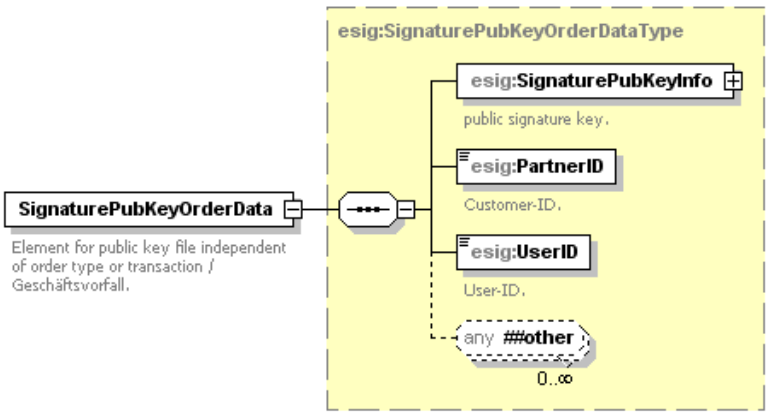


Diagram 17: Definition of the XML schema element SignaturePubKeyOrderData for INI order data (identical to PUB, see respective chapter)

The order data for HIA is an instance document that conforms with ebics_orders_H004.xsd and comprises the top-level element `HIARequestOrderData`. `HIARequestOrderData` is defined as follows via the XML schema:

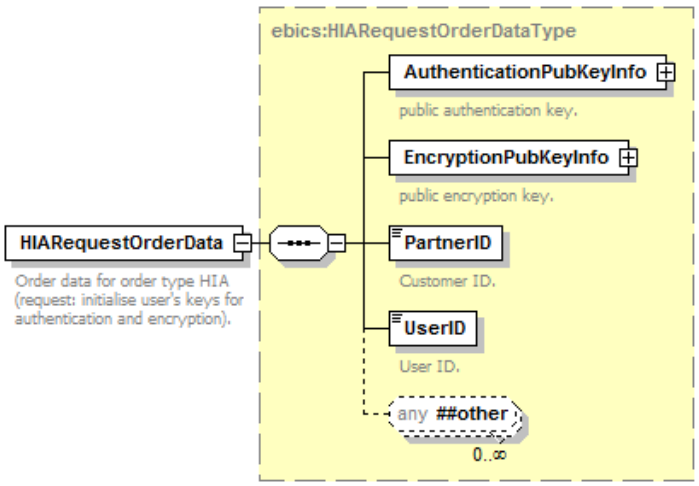


Diagram 18: Definition of the XML schema element HIARequestOrderData for HIA order data

The order data for INI and HIA are each compressed and base64-coded and embedded into the corresponding EBICS request.

4.4.1.2.5.2 Description and example messages

This chapter describes the EBICS messages for order types INI and HIA. INI and HIA requests are instance documents that conform with ebics_keymgmt_request_H004.xsd with the top-level element `ebicsUnsecuredRequest`. INI and HIA responses are instance documents that conform with ebics_keymgmt_response_H004.xsd with the top-level element `ebicsKeyManagementResponse`.

The data that is a component of these messages is listed here. The corresponding XML elements are given in brackets in XPath notation. The following conventions apply:

- Data that is fundamentally optional is marked “(optional)”.
- Data that may only be missing under certain conditions is instead marked “(conditional)”.
- Optional XML elements of the EBICS messages that are missing in the description may not appear in the EBICS message.
- Optional XML elements in the EBICS messages that appear in the description without the designation “(optional)” or “(conditional)” must always be placed in accordance with the description.

This description is supplemented by examples.

- Transmission of the following data in the INI request (see example in Diagram 19)
  Host ID of the EBCIS bank computer system
  (`ebicsUnsecuredRequest/header/static/HostId`)
  Subscribers (`ebicsUnsecuredRequest/header/static/PartnerID`,

ebicsUnsecuredRequest/header/static/UserID) whose public bank-technical key is to be sent to the financial institution
(Optional) technical subscribers (ebicsUnsecuredRequest/header/static/PartnerID, ebicsUnsecuredRequest/header/static/SystemID)
SystemID can be contained in the message if the customer system is a multi-user system. Since INI requests do not contain an identification and authentication signature and the order data is unencrypted, declaration of the SystemID is optional.
- (Optional) information on the customer product (ebicsUnsecuredRequest/header/static/Product)
- Order type (ebicsUnsecuredRequest/header/static/OrderDetails/OrderType) set to "INI"
- Order attributes (ebicsUnsecuredRequest/header/static/OrderDetails/OrderAttribute) set to "DZNNN"
- Security medium for the subscriber's bank-technical key (ebicsUnsecuredRequest/header/static/SecurityMedium)
The admissible settings are listed in the Appendix (Chapter 12.4)
- Order data (ebicsUnsecuredRequest/body/DataTransfer/OrderData).

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsUnsecuredRequest
 xmlns="urn:org:ebics:H004" xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_keymgmt_request_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
   <HostID>EBIXHOST</HostID>
     <PartnerID>CUSTM001</PartnerID>
     <UserID>USR100</UserID>
     <OrderDetails>
       <OrderType>INI</OrderType>
       <OrderAttribute>DZNNN</OrderAttribute>
     </OrderDetails>
     <SecurityMedium>0200</SecurityMedium>
   </static>
   <mutable/>
 </header>
 <body>
   <DataTransfer>
     <!--INI file according to chapter 14.2.5.4, compressed and base64 encoded -->
     <OrderData>
       …
     </OrderData>
   </DataTransfer>
 </body>
</ebicsUnsecuredRequest>
```

Diagram 19: EBICS request for order type INI

- **Transmission of the following data in the INI response** (see example in Diagram 20)
  - Bank-technical return code (ebicsKeyManagementResponse/body/ReturnCode)

- Order number (`ebicsKeyManagementResponse`/header/mutable/OrderID)

  This number is assigned by the bank server automatically.

- Technical return code
  (`ebicsKeyManagementResponse`/header/mutable/ReturnCode)
- Technical report text (`ebicsKeyManagementResponse`/header/mutable/ReportText)
- (Optional) time stamp for the last updating of the bank parameters
  (`ebicsKeyManagementResponse/body/TimestampBankParameter`).

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsKeyManagementResponse
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_keymgmt_response_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static/>
   <mutable>
     <OrderID>A101</OrderID>
     <ReturnCode>000000</ReturnCode>
     <ReportText>[EBICS_OK] OK</ReportText>
   </mutable>
 </header>
 <body>
   <ReturnCode authenticate="true">000000</ReturnCode>
 </body>
</ebicsKeyManagementResponse>
```

Diagram 20: EBICS response for order type INI

- **Transmission of the following data in the HIA request** (analogous to INI, see example in Diagram 21)
  - Host ID of the EBICS bank computer system
    (`ebicsUnsecuredRequest/header/static/HostId`)
  - Subscribers (`ebicsUnsecuredRequest/header/static/PartnerID`, `ebicsUnsecuredRequest/header/static/UserID`) whose public identification and authentication key as well as public encryption key are to be sent to the financial institution
  - (Optional) technical subscribers
    (`ebicsUnsecuredRequest/header/static/PartnerID`, `ebicsUnsecuredRequest/header/static/SystemID`)
    `SystemID` can be contained in the message if the customer system is a multi-user system. Since HIA requests do not contain an identification and authentication signature and the order data is unencrypted, declaration of `SystemID` is optional.
  - (Optional) information on the customer product
    (`ebicsUnsecuredRequest/header/static/Product`)
  - Order type
    (`ebicsUnsecuredRequest/header/static/OrderDetails/OrderType`)
    set to “HIA”

- Order attributes
  (`ebicsUnsecuredRequest/header/static/OrderDetails/OrderAttribute`) set to “DZNNN”
- Security medium for the subscriber’s bank-technical key (`ebicsUnsecuredRequest/header/static/SecurityMedium`) set to “0000”.
  The security medium for the subscriber’s bank-technical key is set to “0000” since HIA orders neither transmit bank-technical keys nor contain ES’s.
- Order data (`ebicsUnsecuredRequest/body/DataTransfer/OrderData`).

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsUnsecuredRequest
 xmlns=" urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_keymgmt_request_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
     <HostID>EBIXHOST</HostID>
     <PartnerID>CUSTM001</PartnerID>
     <UserID>USR100</UserID>
     <OrderDetails>
       <OrderType>HIA</OrderType>
       <OrderAttribute>DZNNN</OrderAttribute>
     </OrderDetails>
     <SecurityMedium>0000</SecurityMedium>
   </static>
   <mutable/>
 </header>
 <body>
   <DataTransfer>
     <!-- XML instance document using root element HIARequestOrderData in accordance with
ebics_orders_H004.xsd, compressed and base64 encoded -->
     <OrderData>
       …
     </OrderData>
   </DataTransfer>
 </body>
</ebicsUnsecuredRequest>
```

Diagram 21: EBICS request for order type HIA

- **Transmission of the following data in the HIA response** (analogous to INI, see example Diagram 22):

  - Bank-technical return code (`ebicsKeyManagementResponse/body/ReturnCode`)
  - Order number (`ebicsKeyManagementResponse/header/mutable/OrderID`)

  This number is assigned by the bank server automatically.

  - Technical return code
    (`ebicsKeyManagementResponse/header/mutable/ReturnCode`)
  - Technical report text
    (`ebicsKeyManagementResponse/header/mutable/ReportText`)

- (Optional) time stamp for the last updating of the bank parameters (`ebicsKeyManagementResponse/body/TimestampBankParameter`).

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsKeyManagementResponse
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_keymgmt_response_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static/>
   <mutable>
     <OrderID>A101</OrderID>
     <ReturnCode>000000</ReturnCode>
     <ReportText>[EBICS_OK] OK</ReportText>
   </mutable>
 </header>
 <body>
   <ReturnCode authenticate="true">000000</ReturnCode>
 </body>
</ebicsKeyManagementResponse>
```

Diagram 22: EBICS response for order type HIA

4.4.1.3 Initialisation via H3K

If the bank-technical (authorisation) key is based on a self-signed certificate or an RSA key without certificate, the public keys of the subscriber/user are still sent to the bank by the order types INI and HIA.
In order to guarantee the authenticity of the subscriber's (user's) public keys, it must be ensured that the bank receives the public bank keys via a second, independent communication path (initialisation letter for INI and for HIA, respectively). The bank first compares the keys having received via different communication paths before approving them.

When using certificates the process for H3K is now the following:

1) The certificate for the bank-technical signature (ES) must be issued by a CA. In this case, a letter is not necessary for the initialisation of this key.
   However, the certificates for encryption as well as identification and authentication can be self-signed certificates as well as certificates issued by a CA.
2) As to the upload of the public keys for encryption and authentication, these can be signed by an ES. A letter for the initialisation of these keys is not necessary.
3) The necessary checks on the bank's side (before applying the keys for the first time) are:
   a. Does an agreement for the use of the certificate exist?
   b. Are the administration steps for the customer/user finalised at the EBICS server and is the user known at the EBICS server?
   c. Is the certificate valid?
4) Taking into consideration 1) to 3), a new order type H3K can be defined:
   a. It combines INI and HIA (transport of three public keys, all keys base on certificates); for the ES key, the certificate must be issued by a CA.
   b. It already contains an ES (via certificate issued by a CA)

This concept requires a high level of authenticity for the certificates used in this H3K process (which serve as ES keys) and also for the Certification Authority (CA) which issues these certificates:

- Issuing of the certificate:
  - Strong identification requirements for the identification (regarding the person and the organisation requesting the certificate)
  - All data in the certificate have been thoroughly validated by a registration authorithy.
- Naming rules:
  - For the name in the certificate (SubjectName) there must be a fix schema, which allows a unique (automatic) assignment of the natural person to the company.
- Cryptographic requirements:
  - E.g. length of the keys
- Validation requirements:
  - Actuality and availability of revocation list

For the electronic initialisation (without INI letter) of new EBICS users with the order type H3K the usage of certificates is mandatory.
When the certificate is not issued by the bank itself, a necessary prerequisite for the electronic initialisation is that the new EBICS user has notified his certificate for the ES including his unique subject name/CA name and the relevant CA root certificate to his bank. The new EBICS user must use his certificate for the ES to notify the certificates for authentication and encryption to his bank.
The requirements that have to be fulfilled in the certificate policy are agreed bilaterally between customer and bank. The interoperability of different trust domains can be achieved only, if appropriate technical, organisational and legal requirements are defined. These requirements are not addressed in the EBICS specification as they are not relevant for the communication standard itself.

In the schema file ebics_orders_H004.xsd, the element group `H3KRequestOrderData` contains three certificates. In the schema file ebics_keymgmt_request_H004 the structure ebics:UnsignedRequest contains `H3KRequestOrderData` (compressed/base-64 encoded) and a signature.
In the schema file ebics_ types_H004.xsd the type (needed for sending a X509 Certificate) `SignatureCertificateInfoType` is defined.
`AuthenticationCertificateInfoType` and `EncryptionInfoType` are extensions of this type and each of these types is used in `H3KOrderData`.

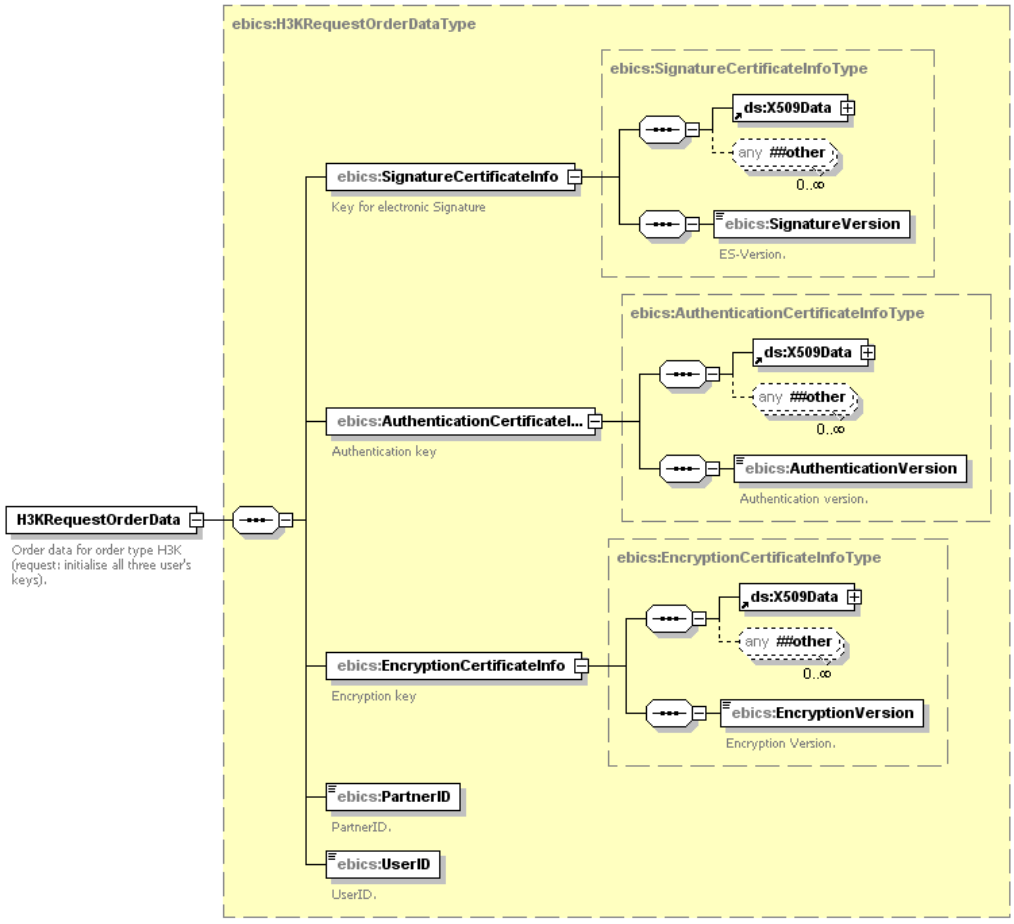


Diagram 23: Definition of the XML schema element H3KRequestOrderData for H3K order data

When initialising a user, the check process on the bank's side is as follows:

1- Check the structure of `H3KRequestOrderData` and extract the certificate for authorisation (ES).

2- Check if this certificate was delivered by a valid Certificate Authority (CA).

3- Check if the signature in SignatureData corresponds to the public ES key in `H3KRequestOrderData`.

4- Check if the information in the certificate (`ebicsUnsignedRequest` → `body` → `DataTransfer`) matches the previously declared information on the client.
Note: The Bank is free to choose the means and the kind of information necessary for the match. For example, it can be declared in a contract or by a process of uploading certificates published on the bank's web site.

a. If it matches, the server returns EBICS_OK (code 000000). The state of the user is automatically switched to '**Ready**'. The user doesn't need to send initialisation letters (or rather no other process of validation is necessary)

b. If the server is unable to match the certificate (ES key) with the previously declared information, the server sends a reject response and the H3KRequest is aborted. The server returns
EBICS_CERTIFICATES_VALIDATION_ERROR (code 091219)
The state of the user remains the same ("**New**"). The user has two possibilities to go on:

   i. Process a H3K request again with a correct certificate (for the ES) issued by a CA

   ii. Or process INI and HIA for initialisation
(INI/HIA is especially usable as a backup process)

The signing certificate (ES) must be valid (and, above all, not expired). Otherwise the customer has to update/ declare the new certificate (issued by a CA).

Furthermore, all error codes related to the key management can be returned in the H3K process.

4.4.2 Download of the financial institution's public keys

4.4.2.1 General description

The subscriber downloads all public keys from the financial institution by means of a specially-provided system-related order type (HPB). Download of the public bank keys necessitates the subscriber state "Ready", only then can the processes be established that the subscriber wishes to implement for the identification and authentication signature, bank-technical signature and encryption.

Processing of HPB merely requires a single EBICS request / response pair. The EBICS request of HPB contains the subscriber's identification and authentication signature itself, or that belonging to a technical subscriber of the same customer, via the control data.

Diagram 24 represents the processing at the bank's end that takes place on receipt of an HPB request. The replay test takes place in the same way as with the bank-technical order types (see Chapter 11.4). Thus HPB returns the technical error EBICS_TX_MESSAGE_REPLAY when the HPB request is a recovered message. In the same way, in the case of bank-technical order types, verification of the customer/subscriber ID, the subscriber state and the identification and authentication signature takes place within the process step "Verifying authenticity of the EBICS request" (see Chapter 5.5.1.2.1, Diagram 47).

This can produce the following error codes:

- EBICS_AUTHENTICATION_FAILED
  This technical error occurs when the subscriber's (or the technical subscriber's) identification and authentication signature could not be verified successfully
- EBICS_USER_UNKNOWN
  This technical error occurs when the technical user's identification and authentication signature could be successfully verified but the (non-technical) subscriber is unknown to the financial institution
- EBICS_INVALID_USER_STATE
  This technical error occurs when the technical user's identification and authentication signature could be successfully verified and the (non-technical) subscriber is known to the financial institution but does not have the state "Ready".

After successful processing of the "Message authenticity verification", the actual processing of the HPB order does not produce any further specific technical or bank-technical errors.

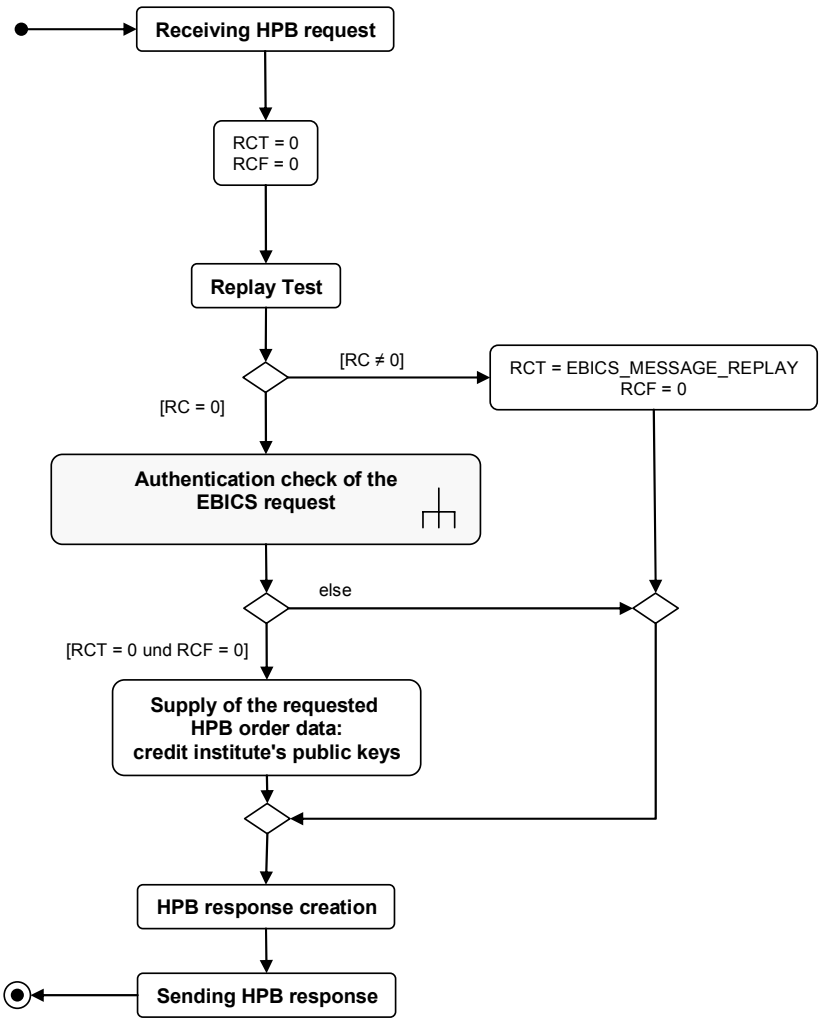


Diagram 24: Processing of an HPB request at the bank's end

The following applies in the case of the EBICS response:

- it does not contain an identification and authentication signature, since the financial institution's public identification and authentication key is being transmitted for the first time in this response. This financial institution's public identification and authentication key cannot be used by the subscriber to verify the identification and authentication signature since its authenticity has not yet been ascertained.
- it does not contain a bank-technical electronic order data signature, i.e. the public bank key, since the financial institution's bank-technical key is being transmitted for the first time in this response. This public bank-technical key cannot be used by the subscriber to verify the bank-technical ES since its authenticity has not yet been ascertained.
- it contains the order data, i.e. the public bank key, in encrypted format since the subscriber's public encryption key has already been activated by the financial institution.

The subscriber has all necessary public bank keys after successful processing of HPB, although they must verify them before they are used: as shown in Diagram 13 the state of these keys at the subscriber's end is set to "New". When they are set to the state "New", bank keys may not be used for communication via EBICS since their authenticity is not ensured.

In order to guarantee the authenticity of the bank keys, the financial institution must ensure that the subscriber receives the public bank keys and/or the hash-values via a second, independent, communication channel (e.g. via the financial institution's website). The subscriber is responsible for verification of the bank keys. The process for verification of the bank keys is not a part of this standard. If the bank provides certificates (issued by a CA), the client has to check the validity of the certificates (for annotation, please refer to the Common Implementation Guide). It is dependent on the implementation of the EBICS client systems that ensure that subscribers only use the public keys after they have been successfully verified.

After successful verification, the state of the public bank keys at the subscriber's end changes from "New" to "Activated". This state change is also shown in Diagram 13 Only those bank keys that have the state "Activated" may be used for communication via EBICS.

In EBICS Version "H004" the ES of the financial institutions is only planned (see Chapter 3.5.2). Diagram 13 takes into account the state of the bank's public bank-technical key at the subscriber's end in preparation for future EBICS versions.

4.4.2.2 Description of the EBICS messages

4.4.2.2.1 Format of the order data

The order data for HPB is an instance document that conforms with ebics_orders_H004.xsd and comprises the top-level element `HPBResponseOrderData`. `HPBResponseOrderData` is defined as follows via the XML schema:

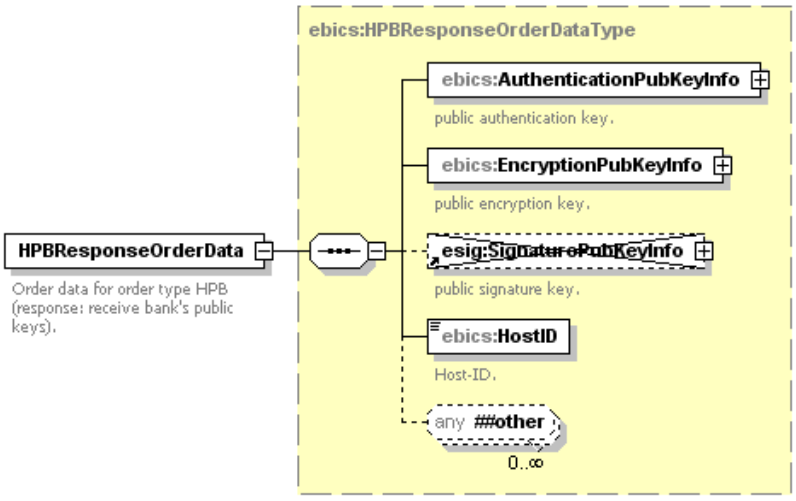


Diagram 25: Definition of the XML schema element HPBRequestOrderData for HPB order data

In Version “H004” of the EBICS protocol the ES of the financial institutions is only planned (see Chapter 3.5.2). The element `SignaturePubKeyInfo` is defined in preparation for future versions with maximum frequency (maxOccurs) being equal to 0.

The order data is compressed, encrypted and base64-coded, and embedded into the corresponding HPB response.

4.4.2.2.2 Description and example messages

This chapter describes the EBICS messages for order type HPB. HPB requests are instance documents that conform with ebics_keymgmt_request_H004.xsd with the top-level element `ebicsNoPubKeyDigestsRequest`. On the other hand, HPB responses are instance documents that conform with ebics_keymgmt_response_H004.xsd with the top-level element `ebicsKeyManagementResponse`.

The data that is a component of these messages is listed here. The corresponding XML elements are given in brackets in XPath notation. The following conventions apply:

- Data that is fundamentally optional is marked “(optional)”.
- Data that may only be missing under certain conditions is instead marked “(conditional)”
- Optional XML elements of the EBICS message that are missing in the description may not be present in the EBICS message
- Optional XML elements in the EBICS messages that appear in the description without the designation “(optional)” or “(conditional)” must always be placed in accordance with the description.

This description is supplemented with an example of an EBICS request / response pair for order type HPB.

- **Transmission of the following data in the HPB request** (see example in Diagram 26):
  - Host ID of the EBCIS bank computer system (`ebicsNoPubKeyDigestsRequest/header/static/HostId`)
  - Combination of Nonce and Timestamp, necessary to avoid replaying old EBICS messages (`ebicsNoPubKeyDigestsRequest/header/static/Nonce`, `ebics/header/static/Timestamp`)
  - Subscribers (`ebicsNoPubKeyDigestsRequest/header/static/PartnerID`, `ebics/header/static/UserID`) who initiates the HPB request
  - (Conditional) technical subscribers (`ebicsNoPubKeyDigestsRequest/header/static/PartnerID`, `ebics/header/static/SystemID`)
    `SystemID` must be present if the customer system is a multi-user system. The

technical subscriber is responsible for the generation of the EBICS requests (including the identification and authentication signatures) that belong to orders that are submitted or bank-technically signed by the subscriber.

- (Optional) information on the customer product (`ebicsNoPubKeyDigestsRequest/header/static/Product`)
- Order type (`ebicsNoPubKeyDigestsRequest/header/static/OrderDetails/OrderType`) set to “HPB”
- Order attributes (`ebicsNoPubKeyDigestsRequest/header/static/OrderDetails/OrderAttribute`) set to “DZHNN”
- Security medium for the subscriber’s bank-technical key (`ebicsNoPubKeyDigestsRequest/header/static/SecurityMedium`) set to “0000”.
  The security medium for the subscriber’s bank-technical key is set to “0000” since HPB orders neither require ES’s nor transmit bank-technical subscriber keys.
- Identification and authentication signature of the technical subscriber, if such is available, otherwise the identification and authentication signature of the subscriber themselves (`ebicsNoPubKeyDigestsRequest/AuthSignature`)
  The identification and authentication signature includes all XML elements of the EBICS request whose attribute value for `@authenticate` is equal to “true”. The definition of the XML schema “ebics_keymgmt_request_H004.xsd“ guarantees that the value of the attribute `@authenticate` is equal to “true” for precisely those elements that must be signed

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsNoPubKeyDigestsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_keymgmt_request_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
     <HostID>EBIXHOST</HostID>
     <Nonce>234AB2340FD2C23035764578FF3091FA</Nonce>
     <Timestamp>2005-01-30T15:40:45.123Z</Timestamp>
     <PartnerID>CUSTM001</PartnerID>
     <UserID>USR100</UserID>
     <OrderDetails>
       <OrderType>HPB</OrderType>
       <OrderAttribute>DZHNN</OrderAttribute>
     </OrderDetails>
     <SecurityMedium>0000</SecurityMedium>
   </static>
   <mutable/>
 </header>
 <AuthSignature>
   <ds:SignedInfo>
     <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
     <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256"/>
     <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
       <ds:Transforms>
```

```
          <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
        </ds:Transforms>
        <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmldenc#sha256"/>
        <ds:DigestValue>…here hash value authentication...</ds:DigestValue>
      </ds:Reference>
    </ds:SignedInfo>
    <ds:SignatureValue>…here signature value authentication...</ds:SignatureValue>
  </AuthSignature>
  <body/>
</ebicsNoPubKeyDigestsRequest>
```

Diagram 26: EBICS request for order type HPB

- **Transmission of the following data in the EBICS response for HPB** (see example in Diagram 27):
  - Bank-technical return code (`ebicsKeyManagementResponse/body/ReturnCode`)
  - Technical return code (`ebicsKeyManagementResponse/header/mutable/ReturnCode`)
  - Technical report text (`ebicsKeyManagementResponse/header/mutable/ReportText`)
  - (Conditional) information for encryption of the order data and possibly the ES of the order data (`ebicsKeyManagementResponse/body/DataTransfer/DataEncryptionInfo`), if no errors of a technical or bank-technical nature have occurred.
    In particular, `DataEncryptionInfo` also contains the asymmetrically-encrypted transaction key (`ebicsKeyManagementResponse/body/DataTransfer/DataEncryptionInfo/TransactionKey`)
  - (Conditional) the order data (`ebicsKeyManagementResponse/body/DataTransfer/OrderData`), if no errors of a technical or bank-technical nature have occurred
  - (Optional) time stamp for the last updating of the bank parameters (`ebicsKeyManagementResponse/body/TimestampBankParameter`).

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsKeyManagementResponse
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_keymgmt_response_H004.xsd”
 Version="H004" Revision="1">
 <header authenticate="true">
   <static/>
   <mutable>
     <ReturnCode>000000</ReturnCode>
     <ReportText>[EBICS_OK] OK</ReportText>
   </mutable>
 </header>
 <body>
   <DataTransfer>
     <DataEncryptionInfo authenticate="true">
```

```
      <EncryptionPubKeyDigest Version="E002"
Algorithm="http://www.w3.org/2001/04/xmlenc#sha256">..here hash value of public key for
encryption ..</EncryptionPubKeyDigest>
      <!-- asymmetricly encrypted transaction key -->
      <TransactionKey>…</TransactionKey>
      </DataEncryptionInfo>
    <!-- XML instance document using root element HPBResponseOrderData in accordance with
ebics_orders_H004.xsd, compressed and base64 encoded -->
    <OrderData>
      …
    </OrderData>
  </DataTransfer>
  <ReturnCode authenticate="true">000000</ReturnCode>
 </body>
</ebicsKeyManagementResponse>
```

Diagram 27: EBICS response for order type HPB

4.5 Suspending a subscriber

4.5.1 Alternatives

If there is any suspicion that subscriber keys have been compromised, the subscriber MUST suspend their access authorisation to all bank systems that use the compromised key/s.

Subscribers that wish to suspend their remote access data transmission to a bank system can do this in two ways:

- The SPR transaction is a standard upload transaction transmitting the ES file exclusively containing the signature of the subscriber who is to be suspended with the help of a dummy file. The dummy file contains one blank character only and is not being transmitted. The corresponding EBICS request not only has to contain this signature but also an identification and authentication signature. The identification and authentication signature may also be provided by a technical subscriber.
  The SPR order does not comprise any additional order data and hence does not contain any order file either.
- In addition, the subscriber has the possibility of instigating the suspension via a second communication channel, e.g. by telephone via a specific contact of the financial institution. If a subscriber key gets lost or damaged, only this alternative is selectable.

After successful execution of the suspension, the subscriber has the state “Suspended” and renewed initialisation of the subscriber is required.

4.5.2 Revoking a subscriber via SPR

SPR is a regular upload transaction. See Chapter 5.5 for a detailed description of the flow of the transaction (including its behaviour in cases of errors). Subsequently, only differences and supplements are given.

As for SPR only an ES file is transmitted, the customer system sends only a request with the order attribute UZHNN. Processing is already being executed during the phase of initialisation, i.e. the bank system provides no transaction ID with the response.

The bank system has to ensure that the SPR request contains the identification and authentication signature of the subscriber who is to be revoked, or of the technical subscriber, respectively.
Verification of the customer/subscriber ID, the subscriber state and the identification and authentication signature takes place within the process step “Verifying authenticity of the EBICS request” (see Chapter 5.5.1.2.1, Diagram 47).

The ES file has to contain a valid electronic signature of the subscriber who is to be suspended by way of a file containing one blank character only.

The subsequent actual synchronous suspension of the subscriber does not return any further specific technical or bank-technical errors.

4.6 Key changes

4.6.1 Changing the subscriber keys

With EBICS 2.3 and earlier versions, keys had to be changed by means of the order types PUB (change of the bank-technical key) and HCA (change of the identification and authentication key as well as the encryption key). These changes could be executed independently. In order to simplify the key management at the customer's as well as the bank's end, with EBICS 2.4 the order type HCS is introduced allowing all three keys of a single transaction to be modified. Therefore, order type HCS comprises PUB and HCA.
HCS – as well as PUB and HCA – require the bank-technical ES of the respective subscriber in the ES version supported in each case (e.g. A004, A005, A006), but not the additional dispatch of initialisation letters. For reasons of compatibility, the order types PUB and HCA can still be used as alternatives to HCS.
Depending on their state, the subscriber has two possibilities for updating their public subscriber keys on the bank system:

- With the state “Suspended”, subscriber initialisation MUST fundamentally be carried out so that bank-technical orders can be transmitted via EBICS. Hence suspension of access authorisation followed by subscriber initialisation is an alternative for activation of subscriber keys. Subscriber initialisation takes place using order types INI and HIA, and requires the additional sending of initialisation letters. The subscriber initialisation process is described in Chapter 4.4.1. Information on the subject of suspension of a subscriber’s access authorisation can be found in Chapter 4.5.
- When they have the state “Ready”, subscribers can update their public subscriber keys using the two system-related order types PUB, HCS and HCA without having to go the long way round with subscriber initialisation. In each case, PUB, HCS and HCA require the ES of the respective subscriber but not the additional dispatch of initialisation letters. On the one hand, this simplifies the key change process but on the other hand it removes

the possibility of using initialisation letters to document a subscriber's key history. It is the responsibility of the financial institution to document the key change via PUB, HCS and HCA so that it remains verifiable.

The subject of this chapter is the detailed description of key changing via PUB, HCS and HCA.

4.6.1.1 General description

Subscribers with the state "Ready" can update their public subscriber keys by using one of the following system-related order types:

- **PUB**: update the public bank-technical key
- **HCA:** update the public identification and authentication key and the public encryption key
- **HCS:** update the public bank-technical subscriber key, the public identification and authentication key and the public encryption key

PUB, HCS and HCA are regular upload transactions whose sequence (including behaviour in error situations) is described in detail in Chapter 5.5. Contained therein is Diagram 52 which describes the sequence of EBICS request handling by the bank during the data transfer phase of an upload request. A part of this procedure is the process step "Verifying and processing of the order". This step returns the following error codes for the order type PUB:

- EBICS_KEYMGMT_UNSUPPORTED_VERSION_SIGNATURE
  This business related error occurs when the order data contains an inadmissible version of the bank-technical signature process
- EBICS_KEYMGMT_KEYLENGTH_ERROR_SIGNATURE
  This business related error occurs when the order data contains a bank-technical key of inadmissible length
- EBICS_INVALID_ORDER_DATA_FORMAT
  This business related error occurs when the order data does not correspond with the designated format (see Chapter 4.4.1.2.5.1)
- EBICS_USER_UNKNOWN
  This technical error occurs when the subscriber that is a component of the PUB order data is not a registered subscriber
- EBICS_UNKNOWN_USER_STATE
  This technical error occurs when the subscriber that is a component of the PUB order data does not have the state "Ready"
- EBICS_SIGNATURE_VERIFICATION_FAILED
  This business related error occurs when the ES of the subscriber in question could not be successfully verified.
- For Return codes relating to certificates, refer to Annex 1

For HCA, the process step "Examination and processing of the order" returns the following error codes:

- EBICS_KEYMGMT_UNSUPPORTED_VERSION_ENCRYPTION
  This business related error occurs when the order data contains an inadmissible version of the encryption process
- EBICS_KEYMGMT_UNSUPPORTED_VERSION_AUTHENTICATION
  This business related error occurs when the order data contains an inadmissible version of the identification and authentication signature process
- EBICS_KEYMGMT_KEYLENGTH_ERROR_ENCRYPTION
  This business related error occurs when the order data contains an encryption key of inadmissible length
- EBICS_KEYMGMT_KEYLENGTH_ERROR_AUTHENTICATION
  This business related error occurs when the order data contains an identification and authentication key of inadmissible length
- EBICS_INVALID_ORDER_DATA_FORMAT
  This business related error occurs when the order data does not correspond with the designated format (see Chapter 4.4.1.2.5.1)
- EBICS_USER_UNKNOWN
  This technical error occurs when the subscriber that is a component of the HCA order data is not a registered subscriber
- EBICS_UNKNOWN_USER_STATE
  This technical error occurs when the subscriber that is a component of the HCA order data does not have the state “Ready”
- EBICS_KEYMGMT_NO_X509_SUPPORT
  This business related error occurs when a public key of type `ds:X509Data` has been transmitted but the financial institution only supports type `ebics:PubKeyValueType`.
- EBICS_SIGNATURE_VERIFICATION_FAILED
  This business related error occurs when the ES of the subscriber in question could not be successfully verified.
- For Return codes relating to certificates, refer to Annex 1

HCS being a combination of PUB and HCA, all error codes in process step "Verifying and processing of the order" listed under PUB and HCA can be reported.

Either PUB and HCA or HCS must be submitted by the subscriber whose keys are to be updated. Each order type PUB, HCS, and HCA require precisely one ES that must be supplied by the subscriber whose keys are to be updated. The signature class of this ES is irrelevant.

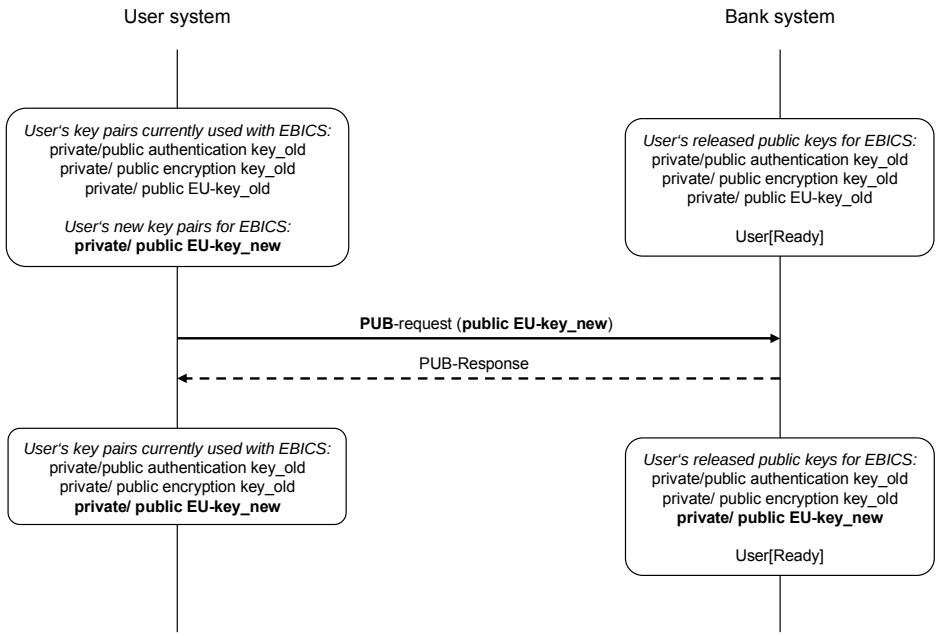


Diagram 28: Changing the bank-technical subscriber key via PUB

Diagram 28 represents the state of the public subscriber keys and the subscriber before and after processing of PUB. The following applies to the processing of PUB:

- The order data, i.e. the subscriber's new public bank-technical key, is compressed, encrypted and finally base64-coded, and is embedded into the EBICS messages.
- The order data is signed via ES by the subscriber whose public bank-technical key is to be updated. The subscriber's old bank-technical key (that is activated at this point) is used for this ES.

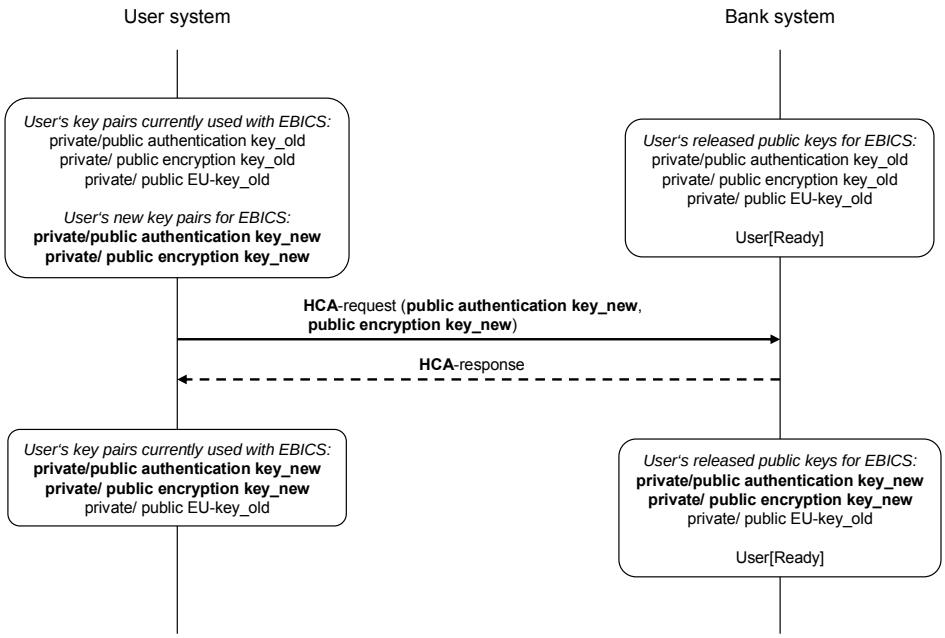


Diagram 29: Changing the authentication key and encryption key via HCA

Diagram 29 shows the state of the subscriber keys and the subscriber before and after the processing of HCA. In addition, the following applies to the processing of HCA:

- The order data, i.e. the subscriber's new public identification and authentication key and new public encryption key, is compressed, encrypted and finally base64-coded, and is embedded into the EBICS messages.
- HCA requests contain the identification and authentication signature of the affected subscriber or a technical subscriber. The identification and authentication signature of the affected subscriber is generated with the old identification and authentication signature (that is activated at this point). The financial institution's EBICS responses contain the financial institution's identification and authentication signature.

By using HCS all keys are changed. The order type HCS can be regarded as an alternative to PUB and HCA which allow the keys for the bank-technical electronic signature (PUB) and for the identification and authentication signature and encryption (HCA) only to be changed separately.
Therefore, the process looks like follows:

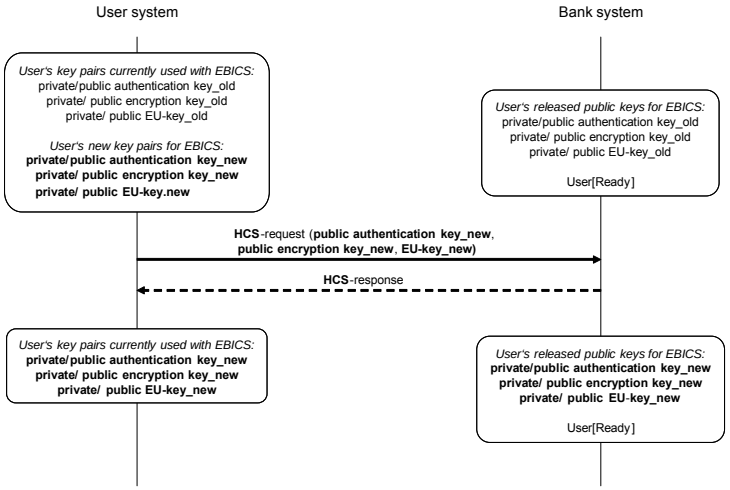


Diagram 30: Changing the bank-technical subscriber key, the authentication key, and encryption key via HCS

4.6.1.2 Format of the order data

PUB and HCS support the data structure for INI files (or the public key file, see Chapter 14.2.5.1).
When using the ES in structured form (from signature process A005/A006 on), the order data for PUB is an instance document that conforms with ebics_signature.xsd and comprises the top-level element `SignaturePubKeyOrderData` (in compliance with INI, XML scheme representation see in chapter 4.4.1.2.5)

`SignaturePubKeyOrderData` is defined as follows via the XML schema:

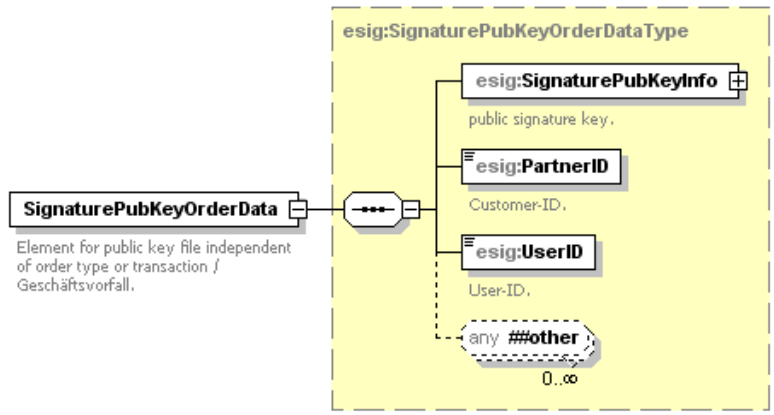


Diagram 31: Definition of the XML schema element SignaturePubKeyOrderData for PUB order data (identical to INI, see own chapter)

The order data for HCA is an instance document that conforms with ebics_orders_H004.xsd and comprises the top-level element `HCARequestOrderData`. `HCARequestOrderData` is defined as follows via the XML schema:

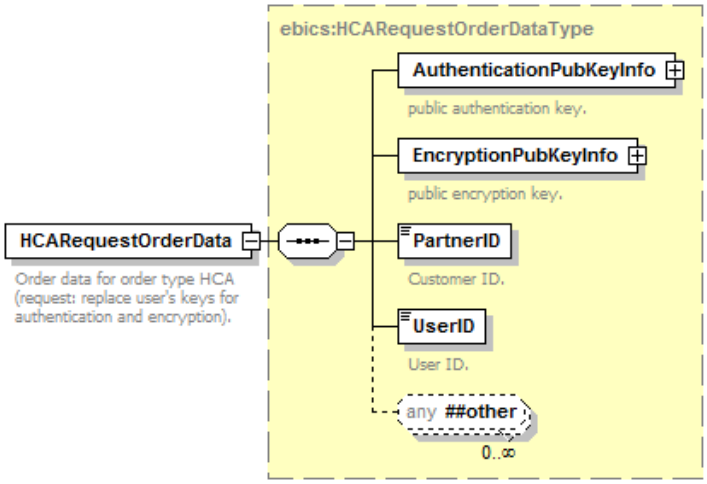


Diagram 32: Definition of the XML schema element HCARequestOrderData for HCA order data

The order data for HCS is an instance document that conforms with ebics_orders_H004.xsd and comprises the top-level element `HCSRequestOrderData`. `HCSRequestOrderData` is defined as follows via the XML schema:

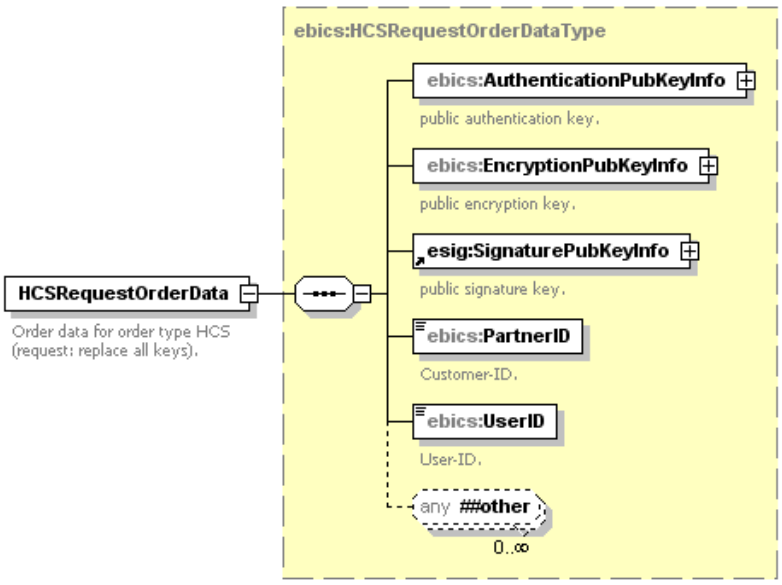


Diagram 33: Definition of the XML schema element HCSRequestOrderData for HCS order data

The order data for PUB, HCS, and HCA are compressed, encrypted and base64-coded, and embedded into the corresponding EBICS request.

4.6.2 Changing the bank keys

The process for updating bank keys is not a part of this standard. The duration of validity of the bank keys is not part of the EBICS interface. From the point of view of the EBICS protocol, one set of currently-valid bank keys exist at any time and for any admissible combination of processes for the identification and authentication signature, encryption and the ES. In Version H004, this consists of precisely the following keys:

- Private/public encryption key for process E002
- Private/public identification and authentication key for process X002
- Private/public bank-technical key for process A004, A005 or A006.

In EBICS there are no transition periods where more than one key is valid for the same process. Keys changed at the bank's end are immediately valid in EBICS.

The subscriber is responsible for download of the respective current bank keys via HPB. After processing of HPB, the state of the bank keys at the subscriber's end is equal to "New". The bank keys may not (yet) be used for communication via EBICS while they have this

state. The financial institution MUST make the new keys accessible by means of a second, independent, communication channel. As with initial download of the bank keys, the subscriber MUST carry out a comparison of the keys and/or its hash-values received via the different communication channels immediately after initialisation. After successful verification of the bank keys, their state is “activated” at the subscriber’s side. When they have the state “activated”, the bank keys can be used for communication via EBICS.

In order to ensure that the subscriber has the current bank keys, the sequence of an EBICS transaction (with the exception of INI, HIA, HPB, HSA) in the first EBICS request provides for the transmission of the hash value of the financial institution’s public keys (XML structure `ebicsRequest/header/static/BankPubKeyDigests`) with which the subscriber has been provided. The bank system verifies whether the these keys are up-to-date and returns the result of the verification to the subscriber. If one of these is no longer current, the transaction is terminated with the technical return code EBICS_BANK_PUBKEY_UPDATE_REQUIRED. The subscriber must then download the bank keys with HPB.

In Version “H004” of the EBICS protocol the ES of the financial institutions is only planned (see Chapter 3.5.2). In preparation for future versions of EBICS, the XML structure `BankPubKeyDigests` contains the hash value of the public bank-technical key with the maximum frequency being equal to 0. Further details on verifying the hash value can be found in Chapter 5.5.1.2.

4.7 Change-over to longer key lengths

The key lengths must continually be increased to guarantee the security of the RSA process. See the regular publications of the “Übersicht über geeignete Algorithmen” from the Regulierungsbehörde für Telekommunikation und Post.

The subject of this chapter is the transition to keys of greater length in EBICS.

In Version “H004”, the length of the bank-technical keys is implicitly fixed at 1024 for signature process A004 due to the support of formats existing before the specification of EBICS. These are:

- **The format of the A004 file.** See Chapter 14.2.5.3 for details. As long as only the format of the A004 file is used, only bank-technical keys of length 1024 can be used.
- **The format of the INI file.** See Chapter 14.2.5.4.
  This format continues to be used in EBICS “H004” for INI, PUB and HCS, as long as the process A004 is applied only bank-technical keys of length 1024 can be used.

If bank-technical keys of length > 1024 are used,,the structured form of the ES is required (see also chapter 14.2).

In Version “H004”, EBICS sets a minimum length of 1024 bits (= 1 Kbit) and a maximum length of 16 Kbit for identification and authentication keys and encryption keys. The minimum

length must be changed when keys of this length are no longer to be used for security reasons. The maximum length must be changed when keys that are longer than this maximum length are allowed to be supported.

The order data formats of the new key management order types HIA, HPB, HCA, and HCS permit key lengths of any size. This means that these order data formats will not require adaptation after the key lengths have been increased.

New public identification and authentication keys or encryption keys of greater length will be transmitted to the bank systems via HIA, HCS, or HCA in exactly the same way as new identification and authentication keys of consistent length.

In the same way, the financial institution's new public keys will be downloaded via HPB irrespective of whether the length of the financial institution's identification and authentication key or encryption key has changed.

4.8 Migration of remote data transmission to EBICS via FTAM

4.8.1 General description

As an alternative to the initial state "New", subscribers to the EBICS subscriber administration can be added with the state "New_FTAM" if the following conditions are met:

- Due to their remote access data transmission for FTAM, the subscriber already has a valid bank-technical key that has been activated by the financial institution
- The existing bank-technical key should be retained in the course of the migration from FTAM to EBICS.

In addition to subscriber initialisation in accordance with Chapter 4.4.1 via INI and HIA, subscriber initialisation can take place in the state "New_FTAM" with the help of order type HSA. Analogously to HIA, a subscriber's public identification and authentication key and encryption key can be transmitted to a financial institution via HSA. In contrast to HIA, the subscriber's ES is also sent via the order data with HSA. The signature class of this ES is irrelevant, but it must be supplied by the subscriber whose keys are being transmitted. HSA does not require additional dispatch of an initialisation letter since the authenticity of the transmitted keys is ensured by the ES of the subscriber in question. It is the responsibility of the financial institution to document subscriber initialisation via HSA in such a way that the subscriber's key history can be traced.

After successful processing of HSA, the subscriber in question takes on the state "Ready". The subsequent necessary steps for download and verification of the bank keys are carried out in accordance with Chapter 4.4.2.

Analogously to Diagram 13, the sequence diagram in Diagram 34 shows an example of the flow of subscriber initialisation via HSA and subsequent download of the bank keys. The

diagram simultaneously shows the state of the public bank keys at the subscriber's end and the state of the subscriber, and the state of the public subscriber keys at the bank's end.

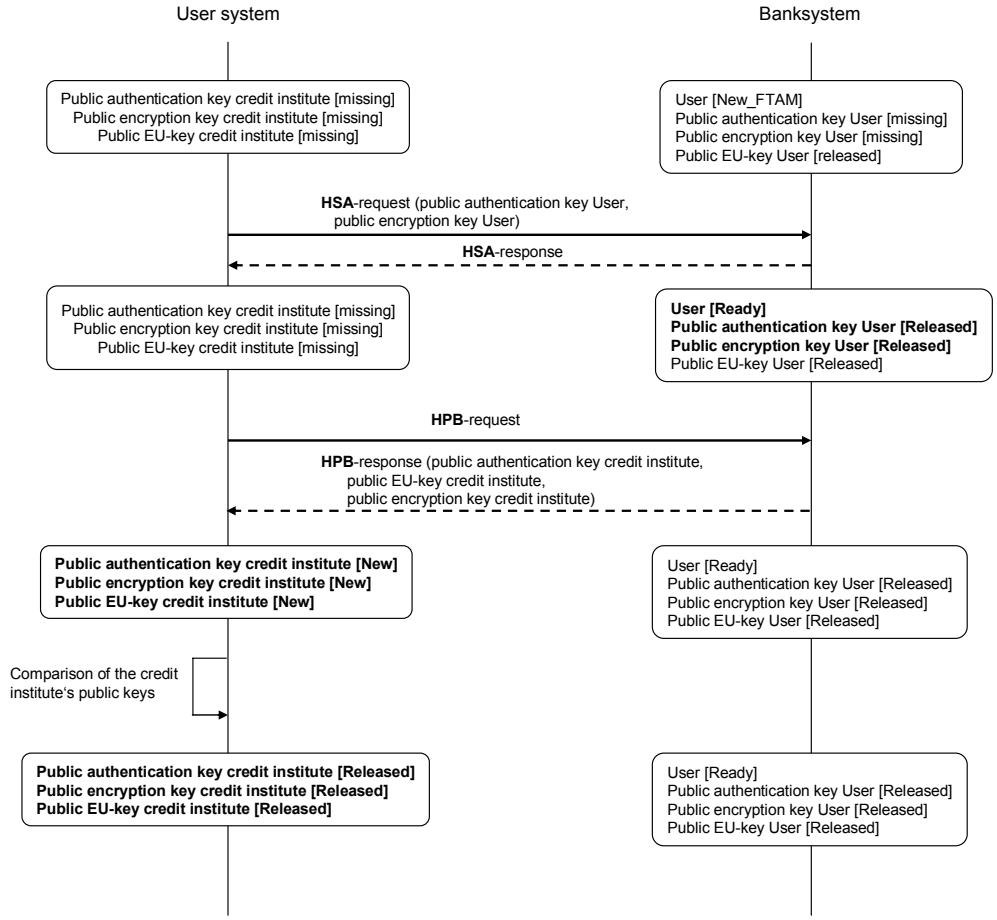


Diagram 34: Process example: Subscriber initialisation with HSA, followed by download and verification of the bank keys

Diagram 35 shows the expansion of the subscriber's state diagram to include the initial state "New_FTAM". It can be seen from this that subscriber initialisation of subscribers in the state "New_FTAM" can be carried out via both INI and HIA and also via HSA.

It is optional for the financial institutions to support HSA.

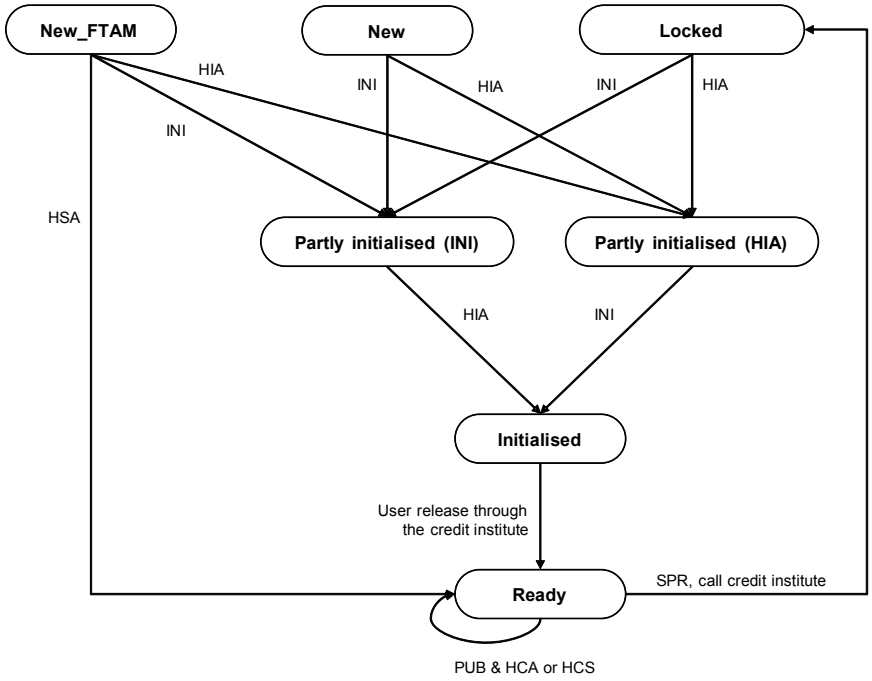


Diagram 35: Expanded state transition diagram for subscribers

4.8.2 HSA [optional]

Processing of HSA is admissible when the state of the subscriber in question is "New_FTAM". Transmission of HSA orders takes place via a single EBICS request / response pair. The following applies for the EBICS request of HSA:

- The HSA request does not contain an identification and authentication signature, since the subscriber's public identification and authentication key is being transmitted for the first time in this request.
- The HSA request contains the order data, i.e. the subscriber's public encryption key and public identification and authentication key in unencrypted form since the subscriber does not yet have the financial institution's public encryption key.

The flow diagram Diagram 36 in represents the processing at the bank's end that takes place on receipt of an HSA request. In an analogous manner to HIA, error situations that result from an invalid combination of customer/subscriber ID or an inadmissible subscriber state are also here not passed directly to the sender of the HSA request. Instead, the sender receives the technical error code EBICS_INVALID_USER_OR_USER_STATE. HSA does not provide any errors of the type "Unknown subscriber" or "Inadmissible subscriber state" so that potential attackers are not given precise information about the validity of subscriber IDs

or the state of subscribers. Also analogously to HIA, internal documentation must take place on the part of the financial institution to record the precise reason for the error.

The flow diagram provides verification of the subscriber state so that HSA requests are rejected on the EBICS level if the subscriber state is inadmissible for HSA. The sole admissible state for HSA is “New_FTAM”. Here, the state of the subscriber is verified from the header data of the request. The order data of the HSA request (see Chapter 4.8.3.1) merely contains the subscriber whose identification and authentication key and encryption key are to be transmitted. For this reason, the subscriber from the header data should correspond with the subscriber from the order data. The EBICS protocol does not provide a verification for this correspondence. However, before actual processing of the order the subscriber’s state is verified (again) which is a part of the order data of HSA.

Verifying and processing of an HSA order can return the following error codes:

- EBICS_KEYMGMT_UNSUPPORTED_VERSION_ENCRYPTION
  This business related error occurs when the order data contains an inadmissible version of the encryption process
- EBICS_KEYMGMT_UNSUPPORTED_VERSION_AUTHENTICATION
  This business related error occurs when the order data contains an inadmissible version of the identification and authentication signature process
- EBICS_KEYMGMT_KEYLENGTH_ERROR_ENCRYPTION
  This business related error occurs when the order data contains an encryption key of inadmissible length
- EBICS_KEYMGMT_KEYLENGTH_ERROR_AUTHENTICATION
  This business related error occurs when the order data contains an identification and authentication key of inadmissible length
- EBICS_INVALID_ORDER_DATA_FORMAT
  This business related error occurs when the order data does not correspond with the designated format (see Chapter 4.8.3.1).
- EBICS_INVALID_USER_OR_USER_STATE
  This technical error occurs when the order data contains a subscriber that is either invalid or whose state is inadmissible for HSA. Only the subscriber state “New_FTAM” is admissible: New, Suspended, Partially initialised (INI).
- EBICS_KEYMGMT_NO_X509_SUPPORT
  This business related error occurs when a public key of type `ds:X509Data` has been transmitted but the financial institution only supports type `ebics:PubKeyValueType`.
- EBICS_INVALID_SIGNATURE_FILE_FORMAT
  This business related error occurs when the submitted ES file does not conform to the defined format.
- EBICS_SIGNATURE_VERIFICATION_FAILED
  This business related error occurs when the ES of the subscriber in question could not be successfully verified.

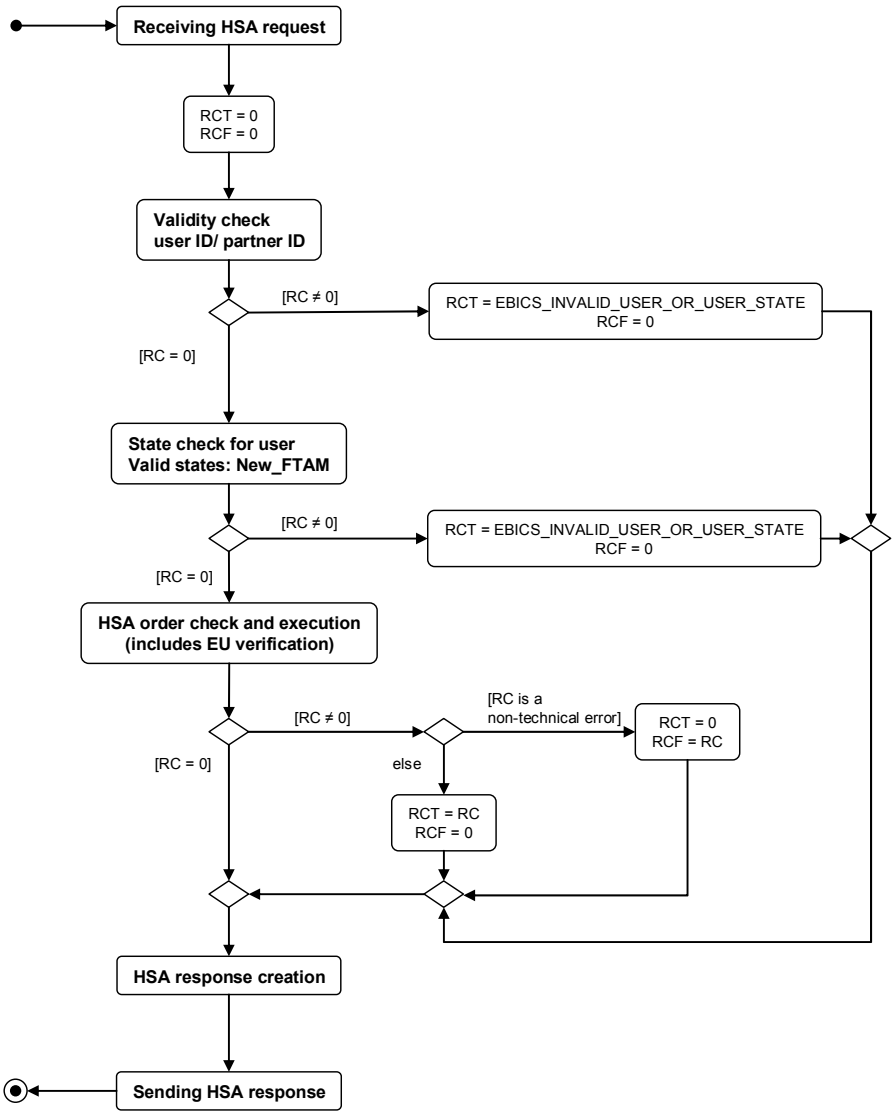


Diagram 36: Processing of an HSA request at the bank's end

The EBICS response for HSA does not contain an identification and authentication signature of the financial institution since the subscriber does not yet have the financial institution's public identification and authentication key with which they can carry out a verification.

HSA orders must be submitted and signed via ES by the subscriber whose keys are to be transmitted. This is a component of the HSA order data. In each case, HSA requires precisely one ES; the signature class of this ES is irrelevant.

Diagram 34 shows the state of the subscriber keys and the subscriber before and after processing of HSA.

4.8.3 Description of the EBICS messages for HSA

4.8.3.1 Format of the order data

The HSA order data has the same structure as the HIA order data and is defined via XML schema as follows:

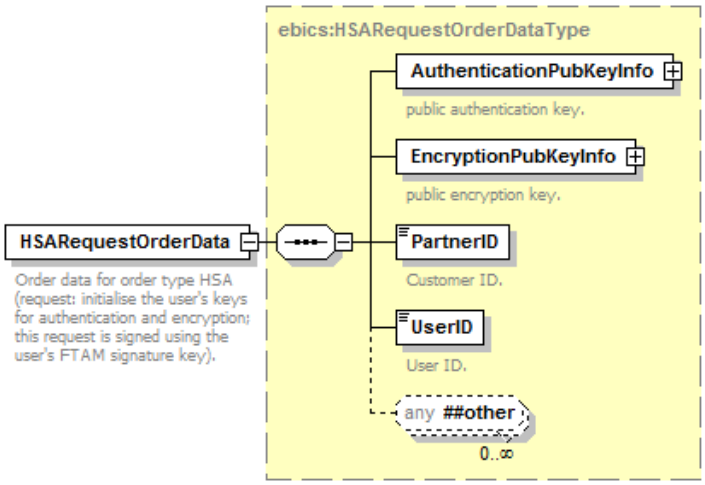


Diagram 37: Definition of the XML schema element HSARequestOrderData for HSA order data

The order data for HSA is an instance document that conforms with ebics_orders_H004.xsd and comprises the top-level element `HSARequestOrderData`. It is compressed and base64-coded, and embedded in the corresponding EBICS request.

4.8.3.2 Description and example messages

This chapter describes the EBICS messages for order type HSA. HSA requests are instance documents that conform with ebics_keymgmt_request_H004.xsd comprising the top-level element `ebicsUnsignedRequest`. HSA responses are instance documents that conform with ebics_keymgmt_response_H004.xsd comprising the top-level element `ebicsKeyManagementResponse`.

- Transmission of the following data in the HSA request (analogous to INI, see example in Diagram 21):
  - Host ID of the EBICS bank computer system (`ebicsUnsignedRequest/header/static/HostId`)
  - Subscribers (`ebicsUnsignedRequest/header/static/PartnerID`, `ebicsUnsignedRequest/header/static/UserID`) whose public

identification and authentication key and public encryption key are to be transmitted to the financial institution

- (Optional) technical subscribers
  (`ebicsUnsignedRequest/header/static/PartnerID`, `ebicsUnsignedRequest/header/static/SystemID`)
  `SystemID` can be contained in the message if the customer system is a multi-user system. Since HSA requests do not contain an identification and authentication signature, declaration of `SystemID` is optional.
- (Optional) information on the customer product
  (`ebicsUnsignedRequest/header/static/Product`)
- Order type
  (`ebicsUnsignedRequest/header/static/OrderDetails/OrderType`) set to “HSA”
- Order attributes
  (`ebicsUnsignedRequest/header/static/OrderDetails/OrderAttribute`) set to “OZNNN”
- Security medium for the subscriber’s bank-technical key (`ebicsUnsignedRequest/header/static/SecurityMedium`)
- Order data ES
  (`ebicsUnsignedRequest/body/DataTransfer/SignatureData`).
- Order data (`ebicsUnsignedRequest/body/DataTransfer/OrderData`).

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsUnsignedRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_keymgmt_request_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
     <HostID>EBIXHOST</HostID>     <PartnerID>CUSTM001</PartnerID>
     <UserID>USR100</UserID>
     <OrderDetails>
       <OrderType>HSA</OrderType>
       <OrderAttribute>OZNNN</OrderAttribute>
     </OrderDetails>
     <SecurityMedium>0000</SecurityMedium>
   </static>
   <mutable/>
 </header>
 <body>
   <DataTransfer>
     <!-- XML instance document using root element UserSignatureData in accordance with
ebics_orders_H004.xsd, compressed and base64 encoded -->
     <SignatureData>
       …
     </SignatureData>
     <!-- XML instance document using root element HSARequestOrderData in accordance with
ebics_ordersH004.xsd, compressed and base64 encoded -->
     <OrderData>
       …
     </OrderData>
```

```
    </DataTransfer>
  </body>
</ebicsUnsignedRequest>
```

Diagram 38: EBICS request for order type HSA

- Transmission of the following data in the HSA response (analogous to HIA, see example in Diagram 22):
  - Bank-technical return code (`ebicsKeyManagementResponse/body/ReturnCode`)
  - Order number (`ebicsKeyManagementResponse/header/mutable/OrderID`)

  This number is assigned by the bank server automatically.
  - Technical return code
    (`ebicsKeyManagementResponse/header/mutable/ReturnCode`)
  - Technical report text
    (`ebicsKeyManagementResponse/header/mutable/ReportText`)
  - (Optional) time stamp for the last updating of the bank parameters
    (`ebicsKeyManagementResponse/body/TimestampBankParameter`).

Kommentar [w1]:
CR No. EB-10-05

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsKeyManagementResponse
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_keymgmt_response_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static/>
   <mutable>
     <OrderID>A201</OrderID>
     <ReturnCode>000000</ReturnCode>
     <ReportText>[EBICS_OK] OK</ReportText>
   </mutable>
 </header>
 <body>
   <ReturnCode authenticate="true">000000</ReturnCode>
 </body>
</ebicsKeyManagementResponse>
```

Diagram 39: EBICS response for order type HAS

4.9 Summary

The following table summarises the most important features of the system-related key management order types:

Order type	Order data format	Order attribute	Identification and authentication signature subscriber / financial institution	Order data ES
INI	INI file (in accordance with Chapter 14)	DZNNN	no/no	no

HIA	ebics: HIARequestOrder» Data	DZNNN	no/no	no
HSA	ebics: HSARequestOrder» Data	OZNNN	no/no	yes
HPB	ebics: HPBRequestOrder» Data	DZHNN	yes/no	no
PUB	see INI	OZHNN	yes/yes	yes
HCA	ebics: HCARequestOrder» Data	OZHNN	yes/yes	yes
HCS	ebics: HCSRequestOrder» Data	OZHNN	yes/yes	yes
H3K	ebics: H3KRequestOrder» Data	OZNNN	no/no	yes (certificate)
SPR	--	UZHNN	yes/yes	yes

5 EBICS transactions

The descriptions and stipulations in this chapter apply to all order types with the exception of the following system-related key management order types: INI, HIA, HSA, HPB, PUB, SPR, HCA, H3K and HCS.

5.1 General provisions

5.1.1 EBICS transactions

EBICS transactions serve for the transmission of orders to the bank-technical target system. Corresponding to the subdivision of orders into transmit and download orders, EBICS differentiates between upload and download transactions: Upload transactions transmit bank-technical order data and/or bank-technical signatures to the bank-technical target system; conversely, with a download transaction bank-technical order data and/or bank-technical signatures are downloaded from the bank-technical target system.

5.1.2 Transaction phases and transaction steps

Each EBICS transaction passes through different transaction phases. The phases of an upload transaction are initialisation and data transfer, the phases of a download transaction are initialisation, data transfer and finally acknowledgement. A transaction phase can comprise one or more connected transaction steps, wherein a transaction step is deemed to denote a pair comprising an EBICS request and an associated EBICS response. In this way, initialisation comprises the first initialisation step, but on the other hand data transfer can extend over several transaction steps, in each of which one order data segment is transmitted.

EBICS transactions can comprise one single transaction step, for example when they just transmit the bank-technical electronic signature for an order.

5.1.3 Processing of orders

5.1.3.1 Chronological dependencies between transmission and processing of upload orders

EBICS supports the chronological decoupling of the submission of bank-technical upload orders via EBICS from their actual processing on the back-end systems of the financial institution. The ES's and order data segments that are submitted within an EBICS transaction are firstly pre-processed. This **pre-processing** is not a component of EBICS, it is dependent on the implementation of the bank system, for example the intermediate storage of the order data segments is a part thereof. After transmission of the last order data segment the entire order data, order parameters and ES's are firstly passed on to a component of the bank system that is responsible for the **management of pending orders**. Realisation is dependent on the implementation of the bank system, it is not a component of EBICS.

In contrast to the bank-technical upload orders, it is required that **processing** of the upload orders of system-related order types MUST be completed before transmission of the last EBICS response of the upload transaction. In addition to the key management order types, this requirement also applies to download orders of VEU order types so that the distributed ES process can be handled as efficiently as possible and the involved subscribers can be given the must up-to-date state of the distributed ES's of an order.

5.1.3.2 Chronological dependencies between transmission and processing of download orders

The download data is a component of the financial institution's EBICS response. The bank system makes a further order data segment available with each EBICS transaction step. In order to accelerate the download process, the download data can be generated by the bank system in advance (such as e.g. in the case of account statements) or can not be generated until required.

5.1.4 Transaction administration

Control of the development of an EBICS transaction is normally incumbent on the customer system, the individual transaction steps of an EBICS transaction are each initiated by the customer system. In special cases, the bank system can also control the development of a transaction, e.g. in that it informs the customer system of a possible recovery point in the event of a recovery.

The EBICS transactions must also be administrated in the bank system to allow the following:

- Assignment of the individual transaction steps to a specific EBICS transaction.
- recording of the process of the EBICS transaction for administration of the transaction states with the objective of ensuring the progress of the EBICS transaction.
- Recovery of an EBICS transaction.

This produces the following responsibilities for the bank system's EBICS transaction administration:

- Generation of EBICS transactions during transaction initialisation. See Chapter 5.2 for details.
- Aborting EBICS transactions if continuation is not expedient or not possible due to the occurrence of error situations
- Termination of EBICS transactions if it has been possible to carry out all transaction steps successfully
- Verifying the process of EBICS transactions to ensure their sequence in accordance with Chapter 5.5.1.

- Supporting the process for recovering EBICS transactions in accordance with Chapter 5.5.2 and 5.6.2 if the bank system supports recovery.

5.2 Assignment of EBICS request to EBICS transaction

The first phase of every EBICS transaction is the initialisation phase. It is triggered by the first EBICS request of the transaction, and comprises:

- Verifications, wherein the successful execution of these verifications is a necessary prerequisite for acceptance of the order by the financial institution
- Further processing steps that are necessary for acceptance of EBICS transactions that comprise more than one transaction step into the transaction administration system

Examples of such verifications are checks on the state and the order type authorisation of the subscriber that has submitted the order. The precise scope of these verifications/process steps is described in Chapter 5.5.1.2.1 for upload transactions and in Chapter 5.6.1.2.1 for download transactions .

If all necessary verifications have been successfully carried out and if the transaction comprises several transaction steps, the bank system's transaction administration generates an EBICS transaction with a transaction ID that is unambiguous within the bank system (details on generation of the transaction ID can be found in the Appendix (Chapter 11.6). The subscriber is notified of this via the financial institution's reply message. The bank system's transaction administration permanently assigns this transaction the following data, which is a component of the header data of the EBICS request:

- Customer ID, subscriber ID/technical subscriber ID
- Order type
- Order attributes
- Order parameters
- Order number

The order number is only present if a file is transmitted to the bank relating to an order with already existing order number (transmission of an ES file with order attributes UZHNN) for matching files with the same order number.
Basically the order number is a component of the header data of the EBICS response (in uploads). It is assigned by the bank server automatically.

This data is permanently assigned to the transaction and cannot be changed in the course of the transaction.

Outside of the initialisation process, EBICS requests contain these transaction IDs for assignment to suitable EBICS transactions. As a whole, they contain the following elements that identify the transaction step:

- Transaction ID that is unambiguous throughout the bank system

- Transaction phase (initialisation, data transfer, acknowledgement) within the transaction
- Serial number of the data segment of bank-technical data, if in the data transfer transaction phase.

A detailed description of the structure of EBICS requests for upload and download transactions can be found in Chapters 5.5.1.1 and 5.6.1.1.

5.3 Preliminary verification of orders [optional]

The bank system CAN optionally support preliminary verification functionality to avoid the possibility of subscribers transmitting large quantities of data to the bank system, wherein it is only discovered by the bank after the transmission has taken place that the signatory of the upload order did not have the necessary authorisation. The information as to whether a bank system supports preliminary verification is contained in its retrievable bank parameters (see Chapter 12.2). If preliminary verification of upload orders is supported, determination of the scope of the preliminary verification is the responsibility of the individual financial institution. Support of one or more of the following verifications is possible:

- **Account authorisation verification**
  The account authorisation verification ensures that the following condition is complied with for each signatory:
  - The signatory is authorised to provide an ES of at least type “B” for orders of the specified order type for each of the order party accounts in a given order.
- **Limit verification**
  The limit verification ensures that the following condition is complied with for each signatory :
  - The signatory is authorised to provide an ES of at least type “B” for orders of the specified order type and to the respective amount for each of the order party accounts in a given order.
- **ES verification**
  The ES verification verifies the ES of the signatory of the order and checks in each case as to whether the ES’s originate from different subscribers.

For a successful preliminary verification the subscriber requires one of the signature classes "E", "A", or "B". If orders are submitted only (i.e. signature class "T") the preliminary verification is not run through. The return code "EBICS SIGNATURE VERIFICATION FAILED" is returned if signature is not valid.

If the order at hand has already been signed the return code "EBICS DUPLICATE SIGNATURE" is returned.

Preliminary verification of an upload order is a part of the first transaction step within the framework of the corresponding upload transaction. The results of the preliminary verification are given in the bank-technical return code in the corresponding EBICS response of the first transaction step. Preliminary verification takes place before transmission of the order’s order data, based on information from the customer system about the order data that is still

outstanding. It does not replace the corresponding verifications that are based on the actual order data after its transmission to the bank system.

The customer system CAN further limit the scope of the preliminary verifications. The account authorisation, limit or bank-technical ES preliminary verifications are only carried out by the bank if the data necessary for their execution is made available by the customer system. The preliminary verification data is transmitted in the first EBICS request of an upload transaction via the (optional) element `ebicsRequest/body/PreValidation` (see ebics_request_H004.xsd), the type definition of which is shown in Diagram 40. This type is called `PreValidationRequestType` (see ebics_types_H004.xsd) and comprises a list of the following optional elements:

- `DataDigest`
  - This element contains the hash value of the order data that has been signed by the order signatories via transport signature or bank-technical ES. During preliminary verification of an order, the ES's are verified solely on the basis of this hash value, the correctness of which cannot be verified at the time of verification.
    For the signature process used by the order signatories (and, relating to EBICS, supported by the bank) a hash value can be set which is to be calculated by the hash function of the respective signature process. The appropriate signature process is identified by means of the attribute `SignatureVersion`. `DataDigest` may occur multiple times if the signatories use different signature versions (this is the case if not every subscriber of a customer signs using the same signature process). This is the reason why the correct setting of the attribute `SignatureVersion` is so important for each `DataDigest` (default A004).
- `AccountAuthorisation`
  This element contains an order party account for the given order. For this account, the account number (`AccountAuthorisation/AccountNumber`) is given in German and/or international format and the bank code (`AccountAuthorisation/BankCode`) is given in German and/or international format. As an option, the account holder (`AccountAuthorisation/AccountHolder`) can also be provided. This account information is required by the account authorisation and limit verifications. In addition, the limit verification requires specification of the total for the individual orders relating to the given order party account. This amount is contained in the (optional) element `AccountAuthorisation/Amount`. The currency of the amount is the value of optional attribute `AccountAuthorisation/Amount@Currency`, if this is available. Otherwise the currency is the value of attribute `AccountAuthorisation@Currency`, which contains the currency of the account.

The individual preliminary verifications require the subscriber ID/ customer ID of each individual signatory. These are a component of the XML type OrderSignature that is used to represent individual ES's. See Chapter 3.5 for further details on embedding ES's into EBICS messages.

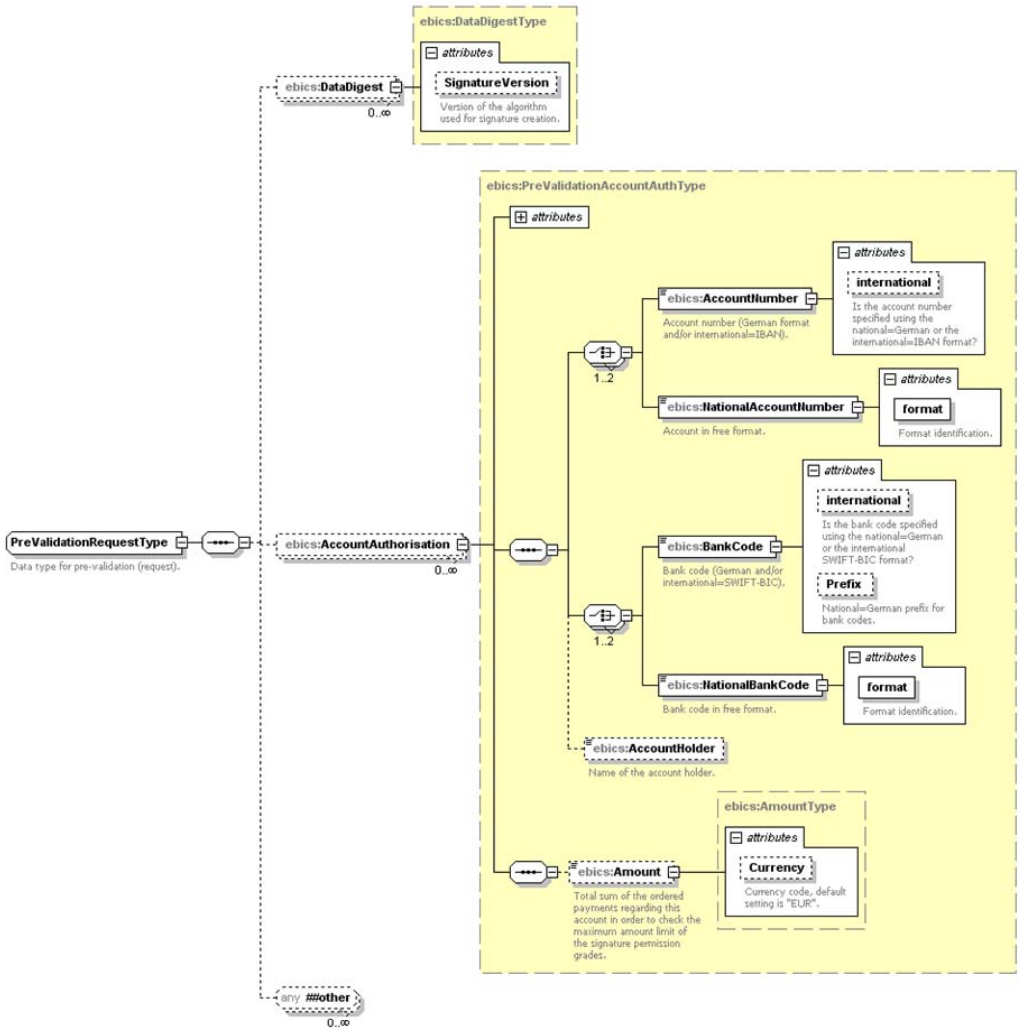


Diagram 40: XML schema type definition for the transmission of data for preliminary verification of an order

5.4 Recovery of transactions [optional]

This chapter describes the basic principles of the recovery procedure that apply to both upload and download transactions.

The EBICS recovery mechanism means that a transaction's order data that has already been received by the customer or bank system does not have to be re-transmitted if one of the following error situations occurs:

- Transport error

- Processing error in the EBICS message that contains the order data:
  In the case of upload transactions these are EBICS request processing errors that can occur at the bank's end, in the case of download transactions they are EBICS response processing errors that occur at the customer's / subscriber's end. For example, errors can occur during (intermediate) storage of order data.

Recovery is an important aspect of the protocol, since the size of the order data can certainly reach a magnitude of several hundred megabytes.

The mechanism requires knowledge of the transaction ID of the EBICS transaction in question, and is based on the definition of transaction **recovery points**:

- In the case of upload transactions, the recovery point is the last transaction step in the transaction whose EBICS request has been successfully received by the bank system and whose EBICS response has been successfully transmitted. The recovery point is determined by the state of the transaction in the bank system.
- In the case of download transactions, there may be several recovery points. These are all of the previous transaction steps in the transaction in question whose EBICS request has been successfully received by the bank system and whose EBICS response has been successfully transmitted.

After transport or processing errors have occurred, a recovery point can be used to continue transactions from the transaction step that follows this recovery point in the transaction step sequence.

All EBICS requests relating to an open transaction that do not match the state of this transaction are evaluated by the bank system's EBICS transaction administration as recovery attempts.

In order to guarantee progress of the EBICS transactions, the number of possible recovery attempts per transaction MUST be limited by a maximum value. The bank system's transaction administration is responsible for administration of the corresponding counter for each transaction. Transactions whose counter exceeds the permitted limit will be terminated by the bank system's transaction administration. In addition, the bank system CAN limit the number of open transactions with a positive recovery counter for each subscriber by setting a maximum value. The counter for recovery attempts that have already been initiated for each transaction and/or the counter for the pending transactions in recovery mode for each subscriber and also the permitted maximum numbers are not a part of the EBICS messages. Instead, they are a part of the processing of the EBICS transaction administration at the bank's end.

Analogously, the customer system's transaction control limits the number of attempts made to successfully carry out a particular transaction step in an EBICS transaction. In this case, counters and permitted maximum numbers are not part of the EBICS messages but are merely part of the processing of transaction control at the customer's end.

Details on recovery of upload and download transactions are given in Chapters 5.5.2 and 5.6.2.

5.5 Upload transactions

5.5.1 Sequence of upload transactions

The sequence of an upload transaction is shown in Diagram 41 by means of a flow diagram. Transmission of the order data segments takes place within a loop that is broken off when the last order data segment has been transmitted (note partial expression “[last data segment has been transmitted]” from the termination conditions). The sequence clarifies that order data does not necessarily also have to be transmitted within an upload transaction note partial expression “[OrderAttribute == “UZHNN”]” from the termination conditions). This is the case when only bank-technical ES’s relating to an existing order are transmitted within the framework of the upload transaction.

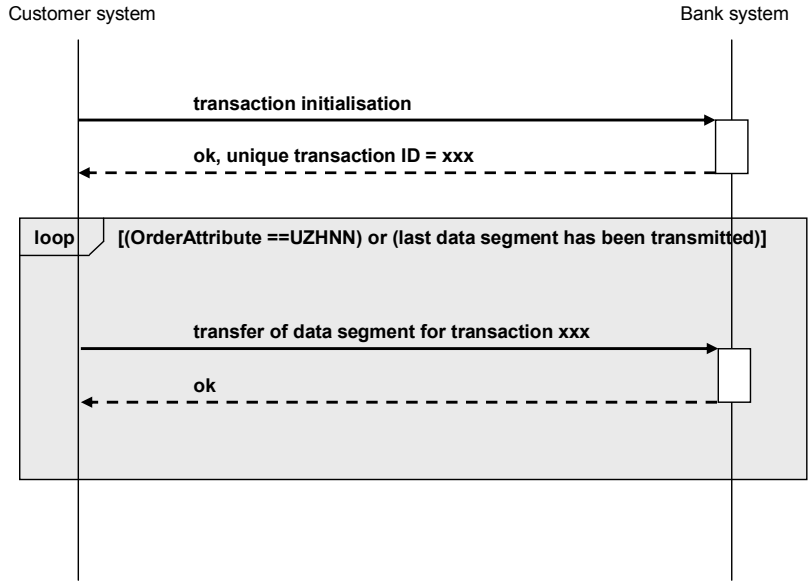


Diagram 41: Error-free sequence of an upload transaction

5.5.1.1 Description of the EBICS messages

For clarification purposes, the following description of the transaction steps in an upload transaction use example messages for the processing of an order of type IZV. It refers to elements of these example messages, using XPath notation.

The following chapters describe the messages in the individual transaction phases. The data that is a component of these messages is listed here. Data that is fundamentally optional is marked “(optional)”. Data that may only be missing under certain conditions is instead marked “(conditional)”. Optional XML elements that are missing in the description of an EBICS message relating to a specific transaction phase may not be present in this EBICS message. Optional XML elements that are present in the description of an EBICS message

relating to a specific transaction phase MUST always be placed correspondingly in this EBICS message.

EBICS requests for upload transactions are (XML) instance documents that conform to ebics_request_H004.xsd and comprise the top-level element `ebicsRequest` which is declared in ebics_request_H004.xsd. EBICS responses for upload transactions are instance documents that conform to ebics_response_H004.xsd and comprise the top-level element `ebicsResponse` which is again declared in ebics_response_H004.xsd.

5.5.1.1.1 EBICS messages in transaction initialisation

- Transmission of the following data in the EBICS request (see Diagram 42):
  - Host ID of the EBICS bank computer system (`ebicsRequest/header/static/HostID`)
  - Transaction phase (`ebicsRequest/header/mutable/TransactionPhase`) with the setting “Initialisation”
    - Combination of Nonce and Timestamp, necessary to avoid replaying old EBICS messages (`ebicsRequest/header/static/Nonce`, `ebicsRequest/header/static/Timestamp`)
  - Number of data segments to be transmitted (`ebicsRequest/header/static/NumSegments`)
  - Subscriber (`ebicsRequest/header/static/PartnerID`, `ebicsRequest/header/static/UserID`) that is submitting a new order or that is providing bank-technical ES’s for an existing order.
  - (Conditional) technical subscribers (`ebicsRequest/header/static/PartnerID`, `ebicsRequest/header/static/SystemID`)
    SystemID must be present if the customer system is a multi-user system. The technical subscriber is responsible for the generation of the EBICS request (including the identification and authentication signatures) that belong to orders that are submitted or bank-technically signed by the subscriber.
  - (Optional) information on the customer product (`ebicsRequest/header/static/Product`)
  - Order type (`ebicsRequest/header/static/OrderDetails/OrderType`)
  - (Conditional) Order number (`ebicsRequest/header/static/OrderDetails/OrderID`)
    OrderID is only present if a file is transmitted to the bank relating to an order with an already existing order number
  - Order attributes (`ebicsRequest/header/static/OrderDetails/OrderAttribute`).
    If the value of OrderAttribute is equal to “UZHNN”, only the bank-technical ES’s of an order will be transmitted within the current transaction, and the value of `ebicsRequest/header/static/NumSegments` has to be „0“. The value “OZHNN” means that order data (segments) will be transmitted in addition to the ES’s: The file is passed to the VEU if these ES’s are insufficient. If the value is

"DZHNN", the order is bank-technically activated via a manually-signed accompanying note: The order data is signed with a transport signature, and after it has been successfully verified the order is sent directly for bank-specific follow-up processing (and not passed to the VEU).

- Order parameters
  (`ebicsRequest/header/static/OrderDetails/OrderParams`);
  the characteristics of the order parameters are dependent on the order type (see also Chapter 3.11)
- Hash values of the financial institution's public keys that are available to the subscriber (ebicsRequest/header/static/BankPubKeyDigests/Authentication, ebicsRequest/header/static/BankPubKeyDigests/Encryption, ebicsRequest/header/static/BankPubKeyDigests/Signature).
  Both the utilised hash algorithm and the version of the corresponding identification and authentication, encryption and signature process will be specified for each of these hash values.
  The SHA-256 hash values of the financial institution's public keys for X002 and E002 are composed by concatenating the exponent with a blank character and the modulus in hexadecimal representation (using lower case letters) without leading zero (as to the hexadecimal representation). The resulting string has to be converted into a byte array based on US ASCII code.
  In Version "H004" of the EBICS protocol the ES of the financial institutions is only planned (see Chapter 3.5.2). The element `BankPubKeyDigests/Signature` is already contained in this description in preparation for future versions of EBICS, but in Version "H004" its maximum frequency (maxOccurs) is set to 0.
- Security medium for the subscriber's bank-technical key(`ebicsRequest/header/static/SecurityMedium`)
- Identification and authentication signature of the technical subscriber, if such is available, otherwise the identification and authentication signature of the subscriber themselves (`ebicsRequest/AuthSignature`)
  The identification and authentication signature includes all XML elements of the EBICS request whose attribute value for `@authenticate` is equal to "true". The definition of the XML schema "ebics_request_H004.xsd" guarantees that the value of the attribute `@authenticate` is equal to "true" for precisely those elements that also need to be signed.

- (Optional) data for preliminary verification of the order
  (`ebicsRequest/body/PreValidation`)
- Information for encryption of the ES's and order data
  (`ebicsRequest/body/DataTransfer/DataEncryptionInfo`) which especially also contains the asymmetrically-encrypted transaction key
  (`ebicsRequest/body/DataTransfer/DataEncryptionInfo/TransactionKey`)
- ES's of the order's order data
  (`ebicsRequest/body/DataTransfer/SignatureData`) SignatureData

contains an instance document that conforms to “ebics_orders_H004.xsd” and contains UserSignatureData as a top-level element. This instance document has been compressed with ZIP, encrypted for the financial institution and finally base64-coded before being embedded into the EBICS request (see Appendix (Chapter 11.2.2)). Diagram 43 contains an example of such an instance document that contains a single ES. The setting for the attribute `PartnerID` in the document `UserSignatureData` must be identical to the submitter's customer ID in the element `ebicsRequest/header/static/PartnerID`.

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
xmlns="urn:org:ebics:H004"
xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
Version="H004" Revision="1">
  <header authenticate="true">
    <static>
      <HostID>EBIXHOST</HostID>
      <Nonce>BDA2312973890654FAC9879A89794E65</Nonce>
      <Timestamp>2005-01-30T15:30:45.123Z</Timestamp>
      <PartnerID>CUSTM001</PartnerID>
      <UserID>USR100</UserID>
      <Product Language="en" InstituteID="Institute ID">Product Identifier</Product>
      <OrderDetails>
        <OrderType>IZV</OrderType>
        <OrderAttribute>OZHNN</OrderAttribute>
        <StandardOrderParams/>
      </OrderDetails>
      <BankPubKeyDigests>
        <Authentication Version="X002"
Algorithm="http://www.w3.org/2001/04/xmlenc#sha256">1H/rQr2Axe9hYTV2n/tCp+3UIQQ=</Authenticati
on>
        <Encryption Version="E002"
Algorithm="http://www.w3.org/2001/04/xmlenc#sha256">2lwiueWOIER823jSoiOkjl+woeI=</Encryption>
      </BankPubKeyDigests>
      <SecurityMedium>0000</SecurityMedium>
      <NumSegments>2</NumSegments>
    </static>
    <mutable>
      <TransactionPhase>Initialisation</TransactionPhase>
    </mutable>
  </header>
  <AuthSignature>
    <ds:SignedInfo>
      <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
      <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256">
      </ds:SignatureMethod>
      <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
        <ds:Transforms>
          <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
        </ds:Transforms>
        <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
        <ds:DigestValue>…here hash value authentication..</ds:DigestValue>
      </ds:Reference>
    </ds:SignedInfo>
    <ds:SignatureValue>…here signature value authentication..</ds:SignatureValue>
  </AuthSignature>
  <body>
```

```
    <PreValidation authenticate="true">
      <DataDigest SignatureVersion="A004">bTTeUGiVqOUjVfJviMo97LHEDmQ=</DataDigest>
    </PreValidation>
    <DataTransfer>
      <DataEncryptionInfo authenticate="true">
        <EncryptionPubKeyDigest Version="E002"
Algorithm="http://www.w3.org/2001/04/xmlenc#sha256">..here hash value of the public bank key
for encryption..</EncryptionPubKeyDigest>
        <TransactionKey>EIGI4En6KEB6ArEzw+iq4N1wm6EptcyxXxStA…</TransactionKey>
        <HostID>EBIXHOST</HostID>
      </DataEncryptionInfo>
      <SignatureData authenticate="true">n6KEB6ArEzw+iq4N1wm6EptcyxXxStAO…</SignatureData>
    </DataTransfer>
  </body>
</ebicsRequest>
```

Diagram 42: EBICS request for transaction initialisation for order type IZV

```
<?xml version="1.0" encoding="UTF-8"?>
<UserSignatureData
xmlns="http://www.ebics.org/S001"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.ebics.org/S001 http://www.ebics.org/S001/ebics_signature.xsd">
<UserSignatureData>
    <OrderSignatureData>
       <SignatureVersion>A005</SignatureVersion>
       <SignatureValue>EUXkQa……</SignatureValue>
       <PartnerID>PARTNER1</PartnerID>
       <UserID>User1</UserID>
    </OrderSignatureData>
</UserSignatureData>
```

Diagram 43: XML document that contains the ES's of the signatory of the IZV order

- Transmission of the following data in the EBICS response (see also example in Diagram 44)

  - Bank-technical return code (`ebicsResponse/body/ReturnCode`)
  - Order number (`ebicsResponse/header/mutable/OrderId`)
  - Technical return code (`ebicsResponse/header/mutable/ReturnCode`)
  - Technical report text (`ebicsResponse/header/mutable/ReportText`)
  - (Conditional) Transaction ID that is unambiguous throughout the bank system (`ebicsResponse/header/static/TransactionID`), if the following conditions are met:
    - No errors of a technical or bank-technical nature have occurred during transaction initialisation
    - Within the current transaction, order data segments are transmitted in further subsequent transaction steps, i.e. the order attributes are "OZHNN" or DZHNN".
  - Transaction phase (`ebicsResponse/header/mutable/TransactionPhase`) with the setting "Initialisation"
  - Identification and authentication signature of the financial institution (`ebicsResponse/AuthSignature`)
    The identification and authentication signature includes all XML elements of the EBICS response whose attribute value for `@authenticate` is equal to "true". The

definition of the XML schema “ebics_response_H004.xsd“ guarantees that the value of the attribute `@authenticate` is equal to “true” for precisely those elements that must be signed

- (Optional) time stamp for the last updating of the bank parameters (`ebicsResponse/body/TimestampBankParameter`).

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsResponse
xmlns="urn:org:ebics:H004"
xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:org:ebics:H004 ebics_response_H004.xsd"
Version="H004" Revision="1">
  <header authenticate="true">
    <static>
      <TransactionID>ABCDEF41394644363445313243ABCDEF</TransactionID>
    </static>
    <mutable>
      <TransactionPhase>Initialisation</TransactionPhase>
      <OrderId>OR01</OrderId>
      <ReturnCode>000000</ReturnCode>
      <ReportText>[EBICS_OK] OK</ReportText>
    </mutable>
  </header>
  <AuthSignature>
    <ds:SignedInfo>
      <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
      <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256"/>
      <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
        <ds:Transforms>
          <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
        </ds:Transforms>
        <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
        <ds:DigestValue>…here hash value authentication..</ds:DigestValue>
      </ds:Reference>
    </ds:SignedInfo>
    <ds:SignatureValue>…here signature value authentication..</ds:SignatureValue>
  </AuthSignature>
  <body>
    <ReturnCode authenticate="true">000000</ReturnCode>
  </body>
</ebicsResponse>
```

Diagram 44: EBICS response for transaction initialisation for order type IZV

5.5.1.1.2 EBICS messages in the phase data transfer of a order data segment

- Transmission of the following data in the EBICS request (see example in Diagram 45):
  - Host ID of the EBICS bank computer system (`ebicsRequest/header/static/HostID`)
    Data for identification of the current transaction step:
    - Transaction ID (ebicsRequest/header/static/TransactionID)
    - Transaction phase (`ebicsRequest/header/mutable/TransactionPhase`) with the setting “Transfer”

- Serial number of the order data segment
  (`ebicsRequest/header/mutable/SegmentNumber`)
  The attribute
  `ebicsRequest/header/mutable/SegmentNumber@lastSegment`
  specifies whether this is the last data segment.

- Identification and authentication signature of the technical subscriber, if such has been defined for the current transaction, otherwise the identification and authentication signature of the submitting subscriber themselves
  (`ebicsRequest/AuthSignature`)
  The identification and authentication signature includes all XML elements of the EBICS request whose attribute value for `@authenticate` is equal to “true”. The definition of the XML schema “ebics_request_H004.xsd“ guarantees that the value of the attribute `@authenticate` is equal to “true” for precisely those elements that also need to be signed
- The actual order data segment
  (`ebicsRequest/body/DataTransfer/OrderData`)
  (see Chapter 3.3 and Chapter 7 for details on the segmentation of order data).

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
     <HostID>EBIXHOST</HostID>
     <TransactionID>ABCDEF41394644363445313243ABCDEF</TransactionID>
   </static>
   <mutable>
     <TransactionPhase>Transfer</TransactionPhase>
     <SegmentNumber lastSegment="true">4</SegmentNumber>
   </mutable>
 </header>
 <AuthSignature>
   <ds:SignedInfo>
     <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
     <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256">
     </ds:SignatureMethod>
     <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
       <ds:Transforms>
         <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
       </ds:Transforms>
       <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
       <ds:DigestValue>…here hash value authentication..</ds:DigestValue>
     </ds:Reference>
   </ds:SignedInfo>
   <ds:SignatureValue>…here signature value authentication..</ds:SignatureValue>
 </AuthSignature>
 <body>
   <DataTransfer>
     <OrderData>RUJJQ1MtUmVxdWVzdCBm/HIgZGllINxiZXJ0…</OrderData>
   </DataTransfer>
 </body>
</ebicsRequest>
```

Diagram 45: EBICS request for transmission of the last order data segment for order type IZV

- Transmission of the following data in the EBICS response (see also example in Diagram 46)

Bank-technical return code (`ebicsResponse/body/ReturnCode`)

Order number (`ebicsResponse/header/mutable/OrderId`)

Technical return code (`ebicsResponse/header/mutable/ReturnCode`)

Technical report text (`ebicsResponse/header/mutable/ReportText`)

Data for identification of a transaction step:
If the technical return code has the value EBICS_TX_RECOVERY_SYNC, this transaction step identifies the recovery point of the upload transaction. However, if neither technical nor specialist errors have occurred in this example, this transaction step reflects the current transaction step.

- Transaction ID (`ebicsResponse/header/static/TransactionID`)
- Transaction phase (`ebicsResponse/header/mutable/TransactionPhase`)
- (Conditional) Serial number of the order data segment (`ebicsResponse/header/mutable/SegmentNumber`), if the value of `TransactionPhase` is not equal to “Initialisation”.
  The attribute `ebicsResponse/header/mutable/SegmentNumber@lastSegment` specifies whether this is the last data segment.
- Identification and authentication signature of the financial institution (`ebicsResponse/AuthSignature`)

The identification and authentication signature includes all XML elements of the EBICS response whose attribute value for `@authenticate` is equal to “true”. The definition of the XML schema “ebics_response_H004.xsd“ guarantees that the value of the attribute `@authenticate` is equal to “true” for precisely those elements that also need to be signed.

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsResponse
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_response_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
     <TransactionID>ABCDEF41394644363445313243ABCDEF</TransactionID>
   </static>
   <mutable>
     <TransactionPhase>Transfer</TransactionPhase>
     <SegmentNumber lastSegment="true">4</SegmentNumber>
     <OrderId>OR01</OrderId>
     <ReturnCode>000000</ReturnCode>
     <ReportText>[EBICS_OK] OK</ReportText>
```

```
    </mutable>
  </header>
  <AuthSignature>
    <ds:SignedInfo>
      <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
      <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256"/>
      <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
        <ds:Transforms>
          <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
        </ds:Transforms>
        <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
        <ds:DigestValue>…here hash value authentication..</ds:DigestValue>
      </ds:Reference>
    </ds:SignedInfo>
    <ds:SignatureValue>…here signature value authentication..</ds:SignatureValue>
  </AuthSignature>
  <body>
    <ReturnCode authenticate="true">000000</ReturnCode>
  </body>
</ebicsResponse>
```

Diagram 46: EBICS response for transmission of the last order data segment for order type IZV

5.5.1.2 Processing of EBICS messages

Chapter 5.5.1.1 describes the contents of the EBICS messages that are exchanged within the framework of an upload transaction. The subject of this chapter is the processing of these EBICS messages at the bank's end. Action sequences are pointed out in the flow diagram in Diagram 41, the course of which is described here in greater detail.

In order to simplify the description of the processes, it is assumed that every processing step produces a return code (RC) whose value is equal to 0 ("000000", EBICS_OK) if it has been possible to successfully complete this step. The technical return code (RCT) and the bank-technical return code (RCF) are set depending on the RC, and their values then flow into the EBICS messages.

The validity of the EBICS request is verified on the basis of the XML schema definition file "ebics_request_H004.xsd", and with due regard to the restrictions that have been specified for the individual requests in Chapter 5.5.1.1. The validity verification usually takes place in parallel and/or interlocked with the other process steps in processing the EBICS request. The following processes dispense with representation of a process step of type "EBICS request validity verification" in favour of the simplest possible representation. In consequence, these processes can be terminated by the following additional technical errors:

- EBICS_INVALID_XML
  The received EBICS XML message does not conform to the specifications of the XML schema in view of syntax. The XML code is not well-formed or, according to the schema, not valid. For example, if the upload request does not contain the element `HostId` (that the schema requires).

- EBICS_INVALID_REQUEST
  The received EBICS XML message does not conform to the EBICS specifications in view of syntax, for example, if the upload request does not contain the element `NumSegments` (which is optional according to the XML schema, but required according to chapter 5.5.1.1.1).

- EBICS_INVALID_REQUEST_CONTENT
  The received EBICS XML message does not conform to the EBICS specifications in view of semantics although being correct according to the schema. For example, if an upload request contains `OrderAttribute` "UZHNN" and `NumSegments` > 0 (which is valid according to the schema but not valid according to chapter 5.5.1.1.1)

5.5.1.2.1 Processing in the initialisation phase

Diagram 50 shows processing at the bank's end of the EBICS request which is transferred from the customer system to the bank system in the initialisation stage of an upload transaction. The individual processing steps are explained in greater detail in the following text:

I. Generation of an EBICS transaction (see Diagram 49)

This processing step is relevant for both upload and download transactions. The following description takes both transaction types into consideration so that the following chapters on the subject of download transactions will be able to refer to this description.

I.a. Verifying the order type

Verification of the order type returns the technical return code EBICS_INVALID_ORDER_TYPE in the case of an invalid order type, or the technical return code EBICS_UNSUPPORTED_ORDER_TYPE in the case of a valid but optional order type that is not supported by the bank system.

I.b. Replay test

The replay test returns the following return code EBICS_TX_MESSAGE_REPLAY if the EBICS request is a replayed request. Details on replay avoidance can be found in the Appendix (Chapter 11.4).

I.c. Verifying the authenticity of the EBICS request (see Diagram 47):

The identification and authentication signature is provided by a technical subscriber, if such is a component of the control data. Otherwise the identification and authentication signature is generated by a (non-technical) subscriber of the EBICS transaction who submits the order or, subsequently, bank-technical ES's that relate to an existing order. In order to be able to verify the identification and authentication signature of a subscriber (technical or non-technical), the corresponding combination of customer and subscriber ID must be registered in the bank system and the state of the subscriber must be set to "Ready". In error situations that result from an invalid

combination of customer ID / subscriber ID or an inadmissible subscriber state, the sender receives the technical return code EBICS_AUTHENTICATION_FAILED.

Verification of the identification and authentication signature contains:

- A verification as to whether all required elements of the EBICS message have been signed with the identification and authentication signature: These are all XML elements of the EBICS request whose attribute value for `@authenticate` is equal to “true”.
- Verification of the identification and authentication signature itself.

This processing step terminates with the technical error EBICS_AUTHENTICATION_FAILED if the identification and authentication signature cannot be successfully verified.

If the successfully-verified signature originates from a technical subscriber, the validity and the state of the (non-technical) subscriber is also verified. Errors that result from an invalid combination of customer ID/ subscriber ID or an inadmissible subscriber state are communicated to the sender of the EBICS request with the help of the technical error codes EBICS_USER_UNKNOWN and EBICS_INVALID_USER_STATE.
Reason: If the identification and authentication signature cannot be successfully verified, the EBICS request potentially originates from an attacker. In this event, errors such as “Unknown subscriber” or “Inadmissible subscriber state” are not forwarded to the sender of the EBICS request so that potential attackers are not given precise information on the validity of subscriber IDs or the state of subscribers. However, after the identification and authentication signature of the technical subscriber has been successfully verified, the errors EBICS_USER_UNKNOWN and EBICS_INVALID_USER_STATE, which relate to the non-technical subscriber of the EBICS transaction, are forwarded to the authenticated sender.

I.d. Verifying the hash value of the bank keys

This verification is intended to prevent a subscriber from submitting orders when they are not in possession of the financial institution’s current public keys. In Version “H004” of EBICS the ES of the financial institutions is only planned (see Chapter 3.5.2). For this reason, only the hash values of the public identification and authentication key and the public encryption key are verified in Version “H004”. In this processing step, subsequent EBICS versions that support the financial institution’s ES must also verify the hash value of the financial institution’s public bank-technical key. For this reason, the subscriber transfers the hash values of the financial institution’s public key with which they have been provided. The bank system verifies these hash values. If they do not match the hash values of the current public keys, transaction initialisation is terminated with the technical return code EBICS_BANK_PUBKEY_UPDATE_REQUIRED.

If the subscriber does not have the financial institution’s current identification and authentication they cannot successfully verify the identification and authentication signature of the financial institution’s EBICS response. Nevertheless, when the error EBICS_BANK_PUBKEY_UPDATE_REQUIRED occurs it should be verified as to

whether the bank keys are up-to-date, and if necessary the latest keys should be downloaded with the help of the system-related order type HPB.

I.e. Subscriber-related order verifications (see Diagram 48)

I.e.a. Verifying order type authorisation

This verifiess as to whether the subscriber is entitled to submit the order type in question. If this verification fails, transaction initialisation is terminated with the business related error EBICS_AUTHORISATION_ORDER_TYPE_FAILED.

In the case of upload orders, order type authorisation is successful if the subscriber has at least ES authorisation of class “T” for the order type in question.

Note: The ES authorisation of the actual signatory of the order is not verified here. This verification is a part of the (optional) preliminary verification of an order.

In the case of download orders, the order type authorisation is not coupled to an ES authorisation. It is verified as to whether the subscriber is authorised for the order type in question.

I.e.b. Bank-technical preliminary verification

This verification only affects upload orders, details of the preliminary verification are given in Chapter 5.3.

If the optional preliminary verification of orders is principally not supported by the financial institution, but the EBICS request contains data for preliminary verification of the order, the information EBICS_NO_ONLINE_CHECKS is returned.

This technical information has no influence on the ongoing transaction. The order is continued.

The bank-technical preliminary verification of an upload order returns the following business related return codes in the event of an error:

- EBICS_SIGNATURE_VERIFICATION_FAILED
  This business related error occurs when the ES of the order signatory could not be successfully verified

- EBICS_INVALID_SIGNATURE_FILE_FORMAT
  The submitted ES data do not conform to the specified format.

- EBICS_ PARTNER_ID_MISMATCH
  The partner ID (=customer ID) of the ES file differs from the partner ID (=customer ID) of the submitter.

- EBICS_ACCOUNT_AUTHORISATION_FAILED
  This business related error code is returned when the account authorisation verification fails for one of the signatories

- EBICS_AMOUNT_CHECK_FAILED
  This business related error occurs when the limit verification fails for one of the signatories

- EBICS_SIGNER_UNKNOWN
  This business related error occurs when one of the signatories is not a valid subscriber

- EBICS_INVALID_SIGNER_STATE
  This business related error occurs when the state of one of the signatories is not equal to “Ready”.

- For Return codes relating to certificates, refer to Annex 1.

I.e.c. Order attributes and order number verification

The following verifications only relate to bank-technical upload orders:
An order with the order attributes "DZHNN" is only permitted without an order number.
An order with the order attributes "OZHNN" is only permitted without an order number and has to be submitted before a (possible) corresponding signature file with attributes “UZHNN”.
An upload request with order attributes “UZHNN” is only permitted with order number unless the order type is “SPR”.
An SPR upload request has always the order attributes "UZHNN" and is only permitted without an order number
Hence the possible error codes for upload requests are:

- For an upload request with order attributes “DZHNN” or “OZHNN” which is submitted with an order number, the code EBICS_INCOMPATIBLE_ORDER_ATTRIBUTE is returned

- For an upload request with order attributes “UZHNN” which is submitted without an order number, the code EBICS_INCOMPATIBLE_ORDER_ATTRIBUTE is returned unless the order type is “SPR”

- For an upload request with order attributes “UZHNN” which is submitted with an order number that has already been assigned to an order with order attributes “DZHNN”, the code EBICS_INCOMPATIBLE_ORDER_ATTRIBUTE is returned

- For an SPR upload request which is submitted with an order number, the code EBICS_INVALID_REQUEST_CONTENT is returned

- For an upload request with order attributes “UZHNN” which is submitted with an unknown order number, the code EBICS_ORDER_ID_UNKNOWN is returned

- For an upload request with order attributes “UZHNN” which is submitted with an order number that has already been assigned to a matching order with order attributes “OZHNN” which has an invalid processing state (because the order has already been fully authorized or rejected) the code EBICS_ORDER_ID_ALREADY_EXISTS is returned. This is both valid for orders which are administrated within the VEU or not

Rule for an upload response: Every upload response contains TransactionID and OrderId assigned by the server (also in the case of an error)

The following verifications only relate to bank-technical download orders.

If the subscriber sets the order attributes to “DZHNN” they request the download data without the financial institution’s ES. Transaction initialisation is terminated with the business related error EBICS_DOWNLOAD_SIGNED_ONLY if it has been agreed

that the subscriber may retrieve download data for the given order type only with the financial institution's ES.

If the subscriber sets the order attributes to "OZHNN" they request the download data with the financial institution's ES. Transaction initialisation is terminated with the business related return code EBICS_DOWNLOAD_UNSIGNED_ONLY if it has been agreed that the subscriber may retrieve download data for the given order type only without the financial institution's ES.
In the EBICS protocol the ES of the financial institutions is only planned (see Chapter 3.5.2). For this reason, only order attributes "DZHNN" are permitted for download orders in Version "H004". The setting "OZHNN" is only taken into consideration here in preparation for future EBICS versions.

I.f. Generation of a new EBICS transaction with unambiguous transaction ID

When all of the previous verifications have been successfully carried out and more transaction steps follow, the EBICS transaction administration generates a new EBICS transaction at the bank's end with a transaction ID that is unambiguous throughout the bank system. Details on generation of the transaction ID are given in the Appendix (Chapter 11.6).

II. Pre-processing

Here, pre-processing relates to the transmitted ES's and the order parameters of orders with the order attributes "DZHNN" or "OZHNN". Pre-processing is not a component of the EBICS specification and is thus dependent on bank system implementation. For example, intermediate storage of ES's and order parameters is a part of this pre-processing.

III. Forwarding to managment of pending orders

If the order attributes are equal to "UZHNN", that is, if only ES's relating to a given order are transmitted, the EBICS transaction comprises a single request/response pair. In this case the transmitted order parameters and ES's are forwarded directly to the management of pending orders and the transaction is terminated. The component 'management of pending orders' is not a part of the EBICS standard.

IV. Generation of the EBICS response

This processing step generates the EBICS response that is afterwards sent to the customer system. In the event of an error, this EBICS message contains the corresponding technical or business related error code of preceding process steps. The contents of this EBICS message are described in greater detail in Chapter 5.5.1.1.1.

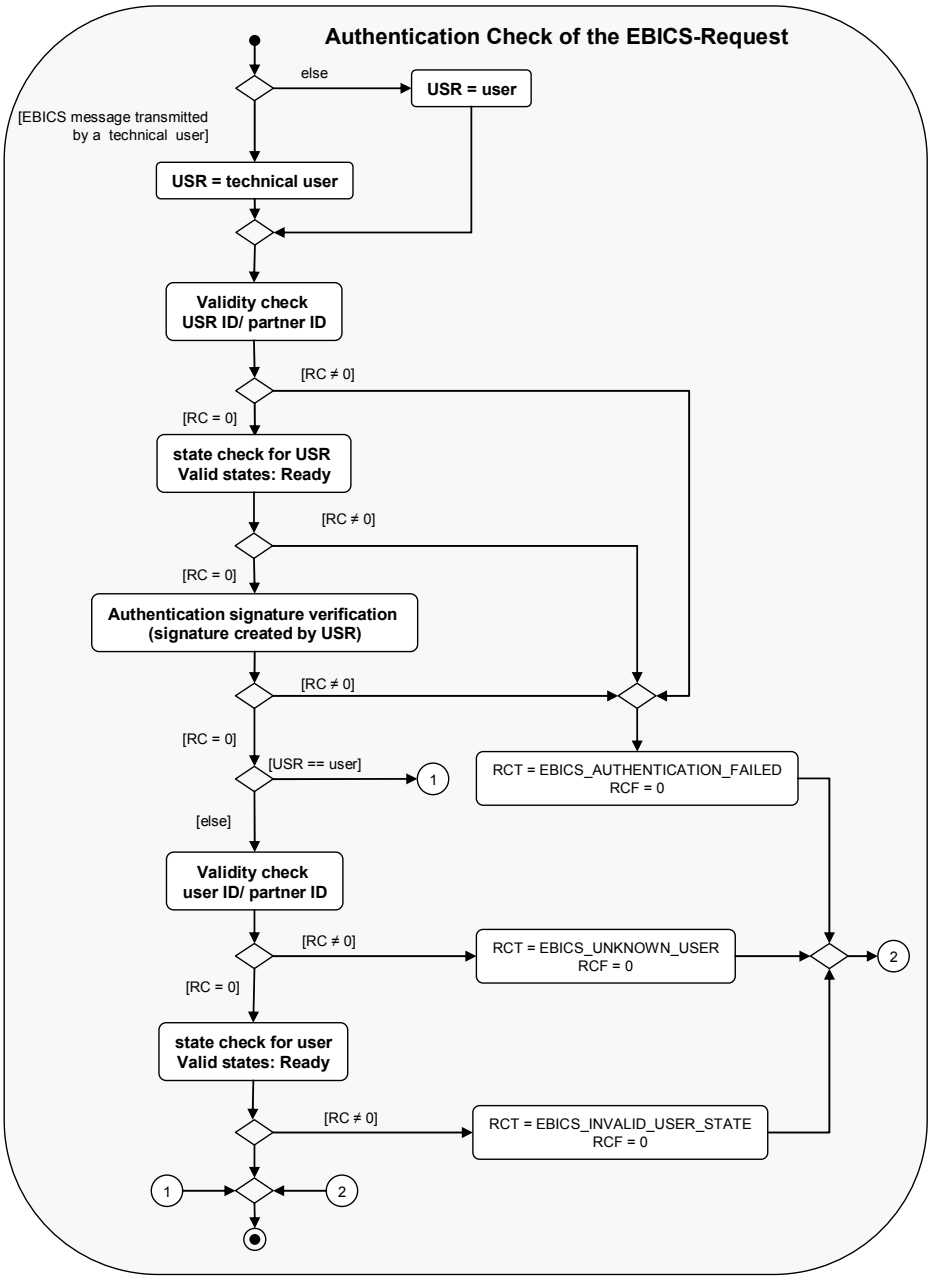


Diagram 47: Detailed description of the process step "Authentication check of the EBICS request"

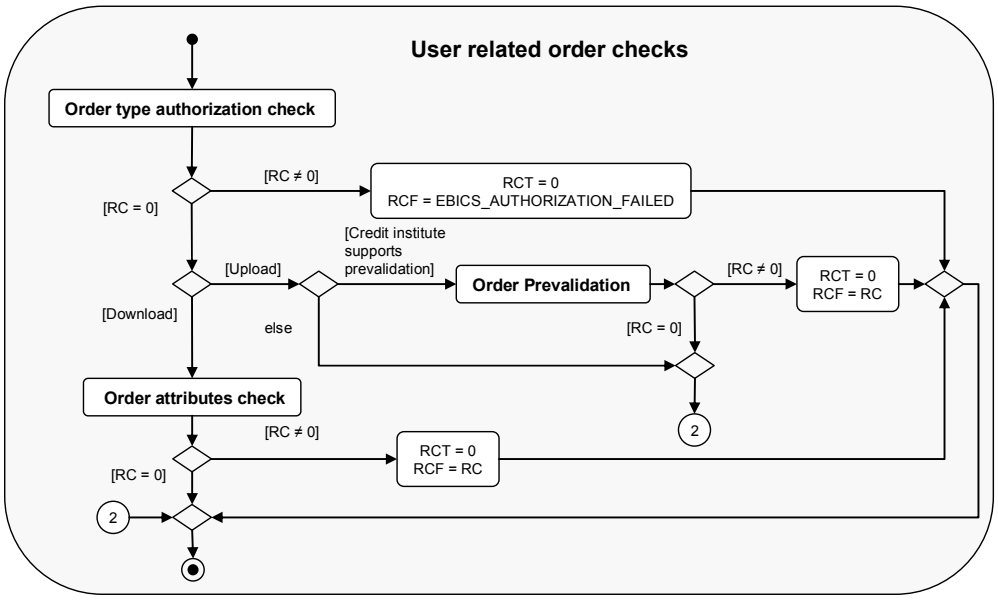


Diagram 48: Detailed description of the process step “User related order checks”

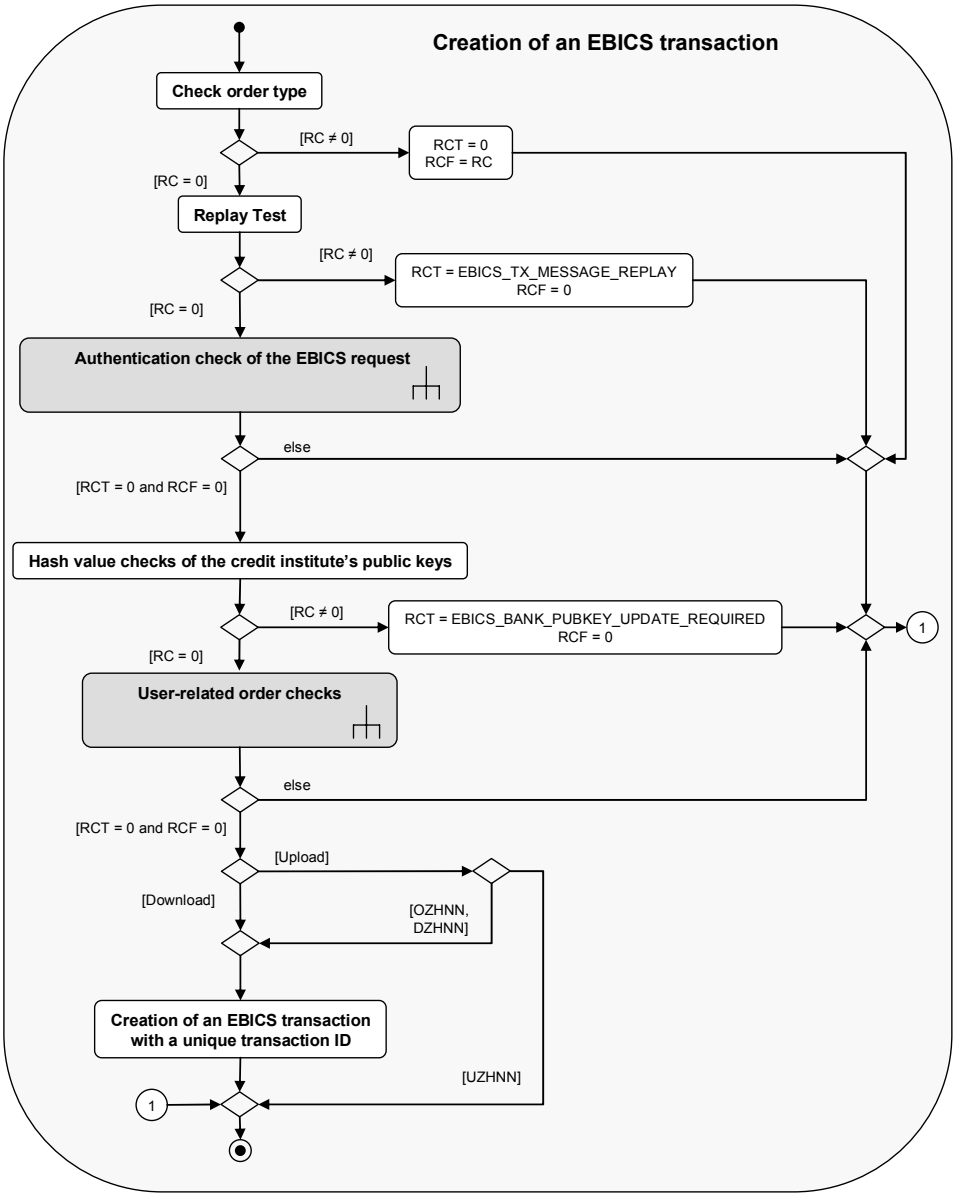


Diagram 49: Detailed description of the process step "Creation of an EBICS transaction"

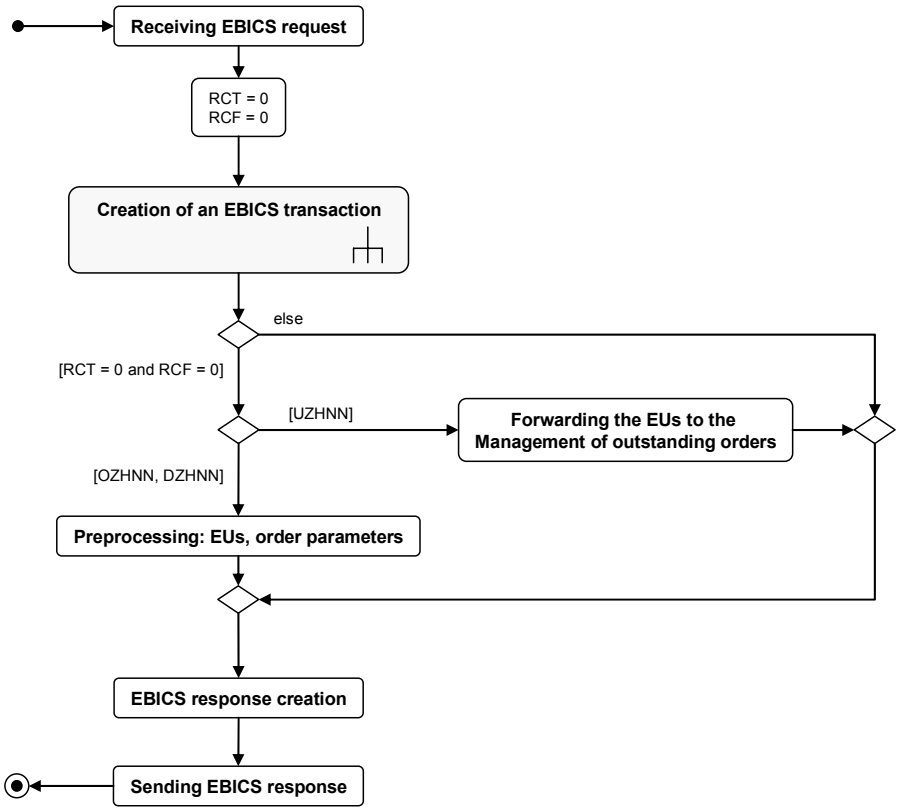


Diagram 50: Processing the EBICS request from transaction initialisation

5.5.1.2.2 Processing in the data transfer phase

The processing at the bank's end of the EBICS request that is transmitted in the data transfer phase from the customer's system to the bank's system is represented in Diagram 52 and Diagram 53. The individual processing steps are explained in greater detail in the following text:

I. Verifying the EBICS transaction (see Diagram 51)

This processing step is relevant for both upload and download transactions. The following description takes both transaction types into consideration so that the following chapters on the subject of download transactions will be able to refer to this description.

I.a. Verifying the transaction ID

A verification is carried out as to whether the EBICS transaction with the corresponding ID exists as an open, not yet completed, transaction in the bank system's EBICS transaction administration system. If this is not the case, the technical error code EBICS_TX_UNKNOWN_TXID is returned to the sender of the EBICS request.

I b. Verifying the authenticity of the EBICS request (see Diagram 47)

This EBICS request authenticity verification takes place in exactly the same way as in the initialisation phase of the transaction (see Chapter 5.5.1.2.1, I.c) – apart from the fact that the required data (e.g. customer/subscriber ID) is not part of the header data of the EBICS request but is stored in the financial institution's transaction administration with the transaction ID in question. If the verification cannot be carried out successfully the EBICS response contains a corresponding error code in accordance with the sequence shown in Diagram 47. This is one of the errors EBICS_AUTHENTICATION_FAILED, EBICS_USER_UNKNOWN or EBICS_INVALID_USER_STATE. Unauthenticated requests do not have any effect on the state of the transaction in the bank system's transaction administration. Data that has an effect on the state of a transaction such as e.g. the next expected transaction step or the current recovery counter, is not changed. This prevents attackers from being able to have any effect on a transaction with the help of unauthenticated EBICS requests. The transaction can be continued by the subscriber as if the EBICS request with the invalid identification and authentication signature had not been received.

I c. Verifying TxPhase/ TxStep from the EBICS request

At this point, a verification is carried out as to whether the transaction step from the EBICS request matches the current state of the EBICS transaction in the bank system if one assumes a specific sequential order for the transaction steps.

In the case of an upload transaction, the sequential order according to Diagram 41 is assumed. Verificationing of the transaction phase / transaction step is successful when:

- The last transaction step initialised by the subscriber has been successfully completed, i.e. initialisation and transmission of the n^{th} data segment was successful.
- The transaction step from the EBICS request is the next transaction step in the sequential order of transaction steps, i.e. it is the transmission of the 1^{st} or the $(n+1)^{th}$ data segment.

The normal sequential order of transaction steps of a download transaction is shown in Diagram 57. The transaction phase / transaction step is deemed to have been successfully verified when the following two conditions are met:

- The last transaction step initiated by the subscriber has been successfully implemented, i.e. the initialisation (and hence transmission of the first data segment, or the request of the n^{th} data segment within the framework of the data transfer were successful.
- The transaction step from the EBICS request is the next transaction step in the sequential order of the transaction steps, i.e. it is the request for the $(n+1)^{th}$ data segment or acknowledgement of the downloaded data where n represents the last data segment.

II. Evaluation of the EBICS transaction verification results

If the transaction step verification was unsuccessful, then:

- A verification is carried out as to whether the upload transaction can be recovered, if the bank system supports the recovery of transactions. This verification is carried out in accordance with the description in Chapter 5.5.2. The technical error code EBICS_TX_RECOVERY_SYNC is returned if the transaction can be recovered, otherwise the transaction is terminated with the technical error code EBICS_TX_ABORT.
- The upload transaction is terminated with the business related error code EBICS_RECOVERY_NOT_SUPPORTED if the bank system does not support transaction recovery. If MAX is set to 0, the flow diagram also considers the case where recovery is not supported.

III. Verifying segment number and segment size

The serial number of the transmitted order data segment (`ebicsRequest/header/mutable/SegmentNumber`) must be less than or equal to the total number of data segments that are to be transmitted. If the number of transmitted order data segments matches the total number, the value of attribute `ebicsRequest/header/mutable/SegmentNumber@lastSegment` must also be equal to “true”. If one of these two conditions is not fulfilled, the transaction is terminated with the technical error code EBICS_TX_SEGMENT_NUMBER_EXCEEDED.

If the serial number of the transmitted order data segment is less than the total number of the order data segments that are to be transmitted and the value of attribute `ebicsRequest/header/mutable/SegmentNumber@lastSegment` is nevertheless “true”, then technical return code EBICS_TX_SEGMENT_NUMBER_UNDERRUN of error class “Note” is returned.

The size of the transmitted order data segment may not exceed the segment size of 1 MB that has been firmly specified for EBICS “H004”. Otherwise the transaction is terminated with the technical error code EBICS_SEGMENT_SIZE_EXCEEDED.

IV. Pre-processing

Here, pre-processing relates to the transmitted order data segment. Pre-processing of order data segments is not part of the EBICS specification. It is dependent on the bank system implementation, intermediate storage of the order data segment may be a part of pre-processing.

V. Forwarding to management of pending orders

If the transmitted order data segment was the last one, and the matter at hand is a bank-technical upload order, all of the order parameters, ES’s and order data transmitted within the framework of the EBICS transaction are forwarded to the management of pending orders. Following this, the EBICS transaction can be terminated.
The component ‘management of pending orders’ is not a part of the EBICS standard.

VI. Verifying and implementing the order

If the transmitted order data segment was the last one, and if the order is a system-related upload order, it is synchronously verified and implemented on the basis of the transmitted order data. The returned technical or business related error codes are dependent on the order type and are defined in the chapters in which these order types are described.

VII. Generation of the EBICS response

This processing step generates the EBICS response that is afterwards sent to the customer system. In the event of an error, this EBICS message contains the corresponding technical / business related error code of the preceding process steps. The contents of this EBICS message are described in greater detail in Chapter 5.5.1.1.2.

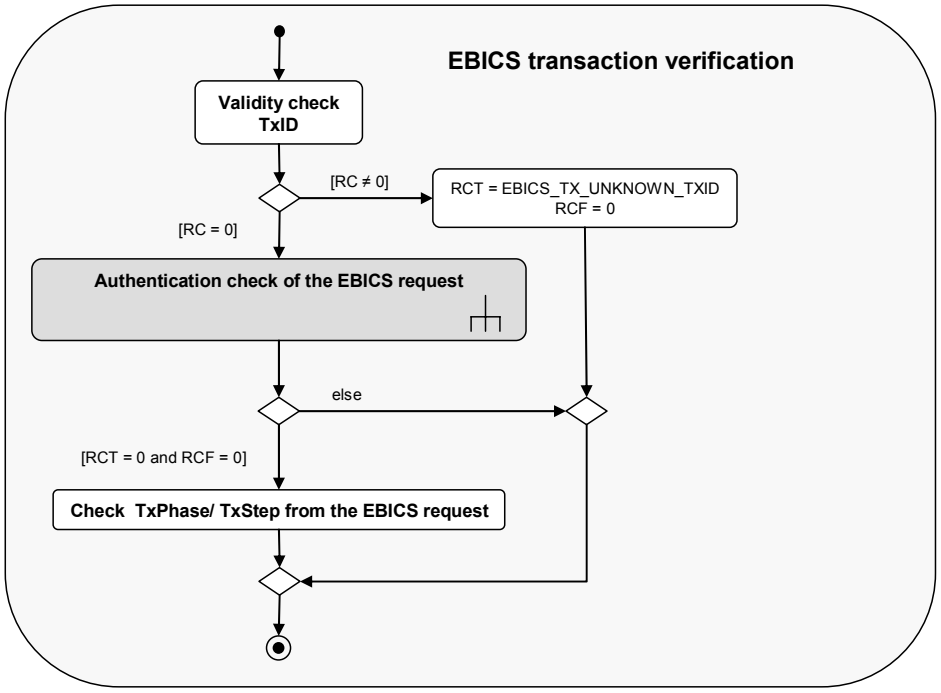


Diagram 51: Detailed description of the process step “EBICS transaction verification”

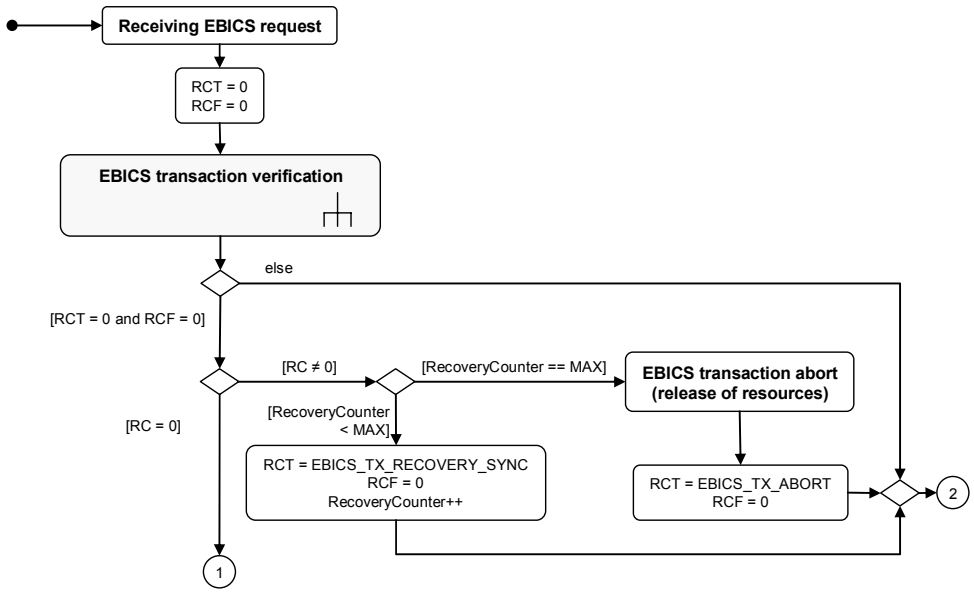


Diagram 52: Processing an EBICS request for transmission of an order data segment (part 1)

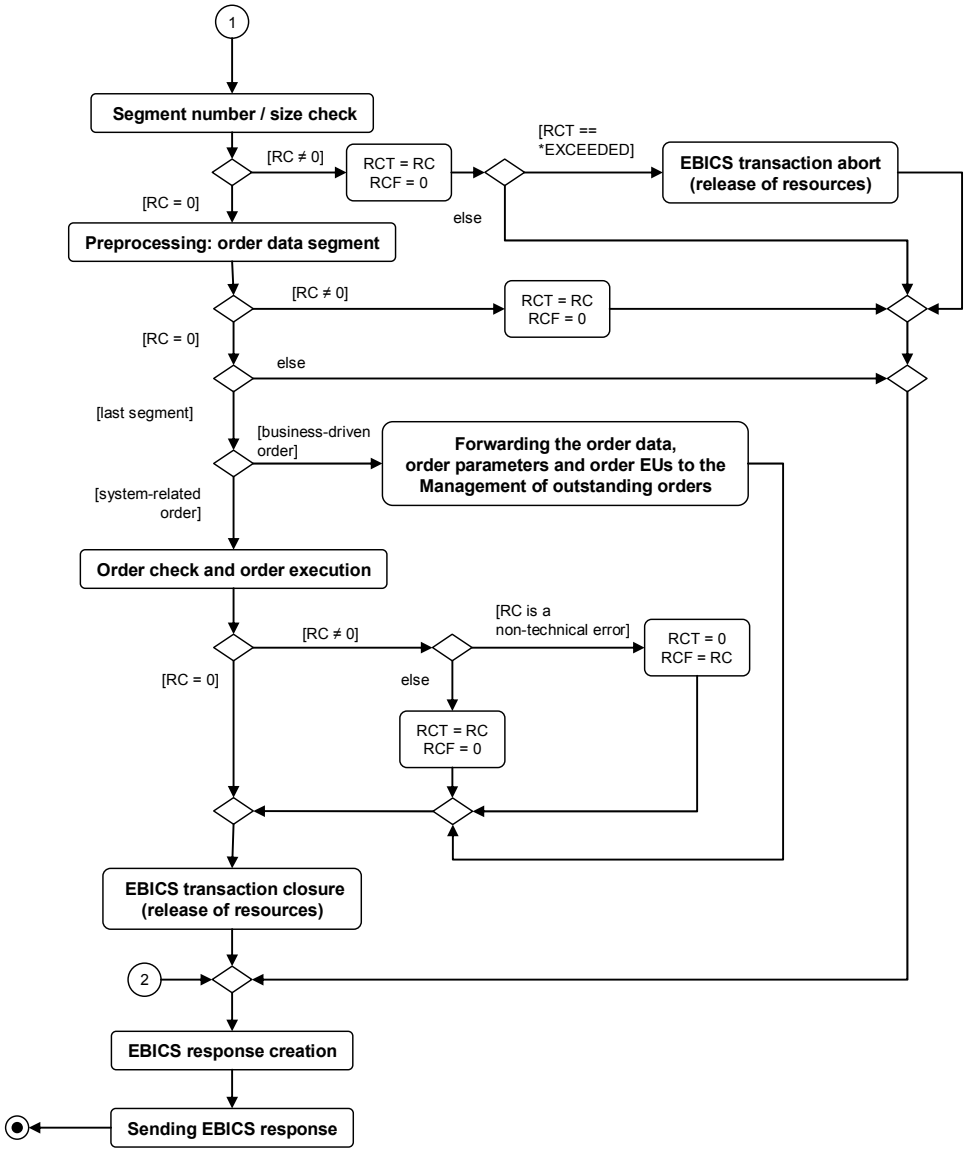


Diagram 53: Processing an EBICS request for transmission of an order data segment (part 2)

5.5.2 Recovery of upload transactions

The customer system can initiate the recovery mechanism when one of the following error situations occurs:

- Transport error during transmission of an EBICS request in the data transfer phase of the transaction
- Timeout or transport error when receiving an EBICS transaction in the data transfer phase of the transaction
- Loss of the transaction state at the subscriber's end.

Incorrect processing of an EBICS request at the bank's end during the data transfer phase, caused by e.g. errors in the pre-processing of a transmitted order data segment, may require renewed transmission of this request. This is a special recovery case, since the customer system does not recognise the necessity for repetition of the transmission without further action. This special case can be dealt with by the EBICS recovery mechanism.

EBICS uses an optimistic approach when recovering an upload transaction and dispenses with a separate synchronisation step with the bank system. If one of the above error situations occurs, the customer system initially assumes knowledge of the transaction's recovery point due to the transaction data stored (possibly in a sustained manner) in the customer system.

If the customer system assumes that the recovery point is the transmission of the n^{th} order data segment, then the next initiated transaction step is transmission of the $(n+1)^{th}$ order data segment. EBICS requests within the framework of the recovery of upload transactions do not differ from the EBICS request of a normal, error-free flow of an upload transaction.

By way of example, the flow of a transaction that repeatedly necessitates recovery is shown in Diagram 54. In each case, the recovery takes place without explicit synchronisation between the customer system and the bank system. The 2^{nd} order data segment is transmitted three times since the customer system could not receive the corresponding EBICS response due to a timeout or a transport error. On the second and third transmission of the 2^{nd} order data segment, the customer system assumes that the recovery point is transmission of the 1^{st} order data segment. The value of the recovery counter is equal to 2 after the third and successful transmission of the 2^{nd} order data segment, since the last two transmissions of the 2^{nd} order data segment were evaluated as recovery attempts by the bank system. The transaction finally fails due to the number of recovery attempts being too high.

If the assumption regarding the recovery point is false, the EBICS response for transmission of the $(n+1)^{th}$ data segment receives the actual recovery point of the transaction in addition to the technical return code EBICS_TX_RECOVERY_SYNC. For example, if this recovery point is the transmission of order data segment k, the transaction can easily be resumed after this synchronisation with transmission of segments k+1, k+2, etc.

Diagram 55 shows the successful flow of a transaction that contains a recovery of the transaction after an explicit synchronisation between the customer system and the bank system. Here, the customer system transmits order data segment 1 in a state in which the bank system actually expects segment 3. The financial institution's EBICS response (see Diagram 56) thus contains the recovery point of the transaction, which in this case is transmission of the 2nd order data segment. Following this, the customer system continues with transmission of order data segment 3 and ends the transaction with the transmission of the last segment 4.

Independent of whether a customer system detects errors in the flow of a transaction, the bank system can force renewed transmission of an EBICS request. Analogously to the above recovery situations, this is achieved by the associated EBICS response containing the technical return code EBICS_TX_RECOVERY_SYNC as well as the recovery point of the transaction.

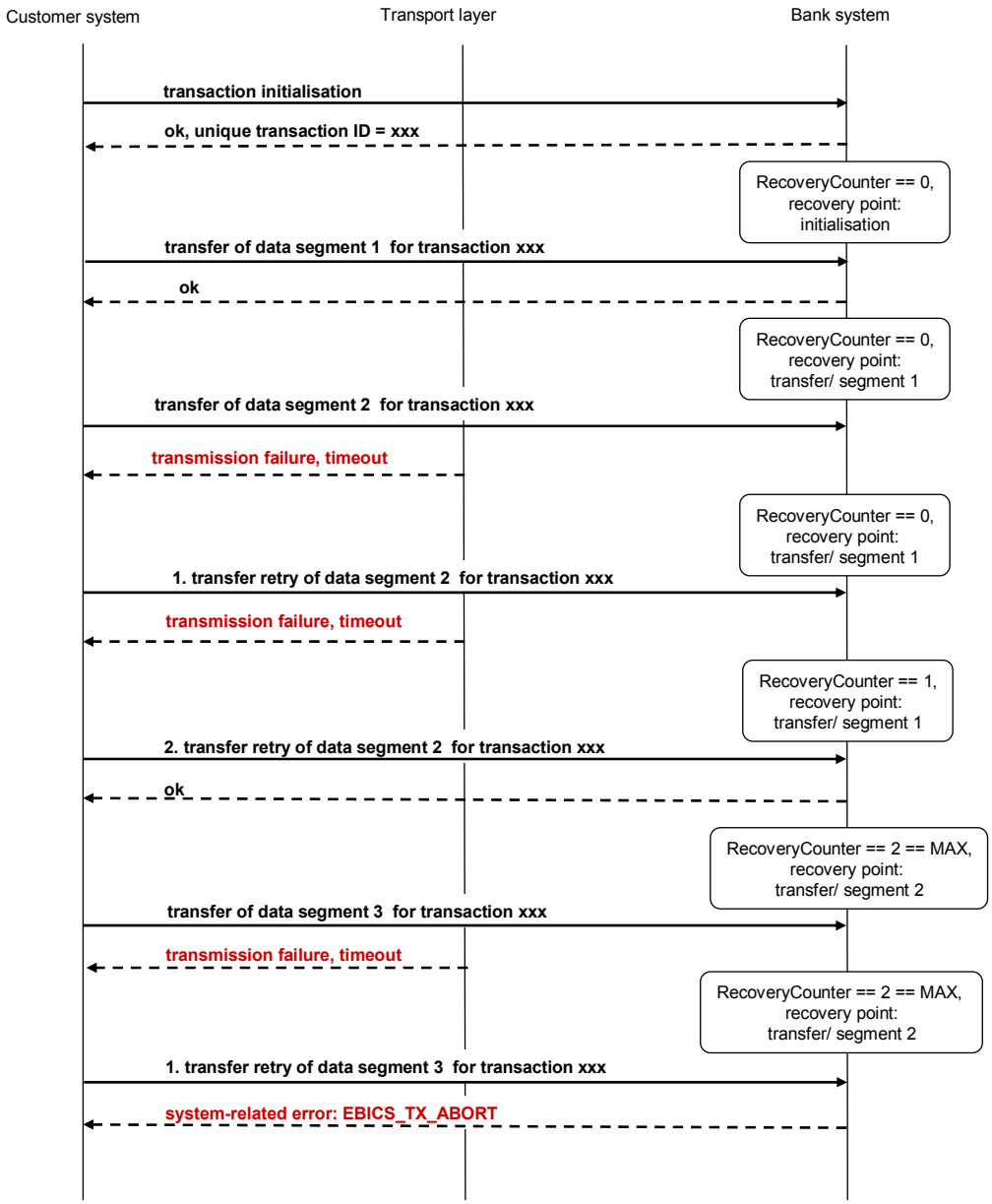


Diagram 54: Termination of the recovery of an upload transaction due to the maximum number of recovery attempts being exceeded

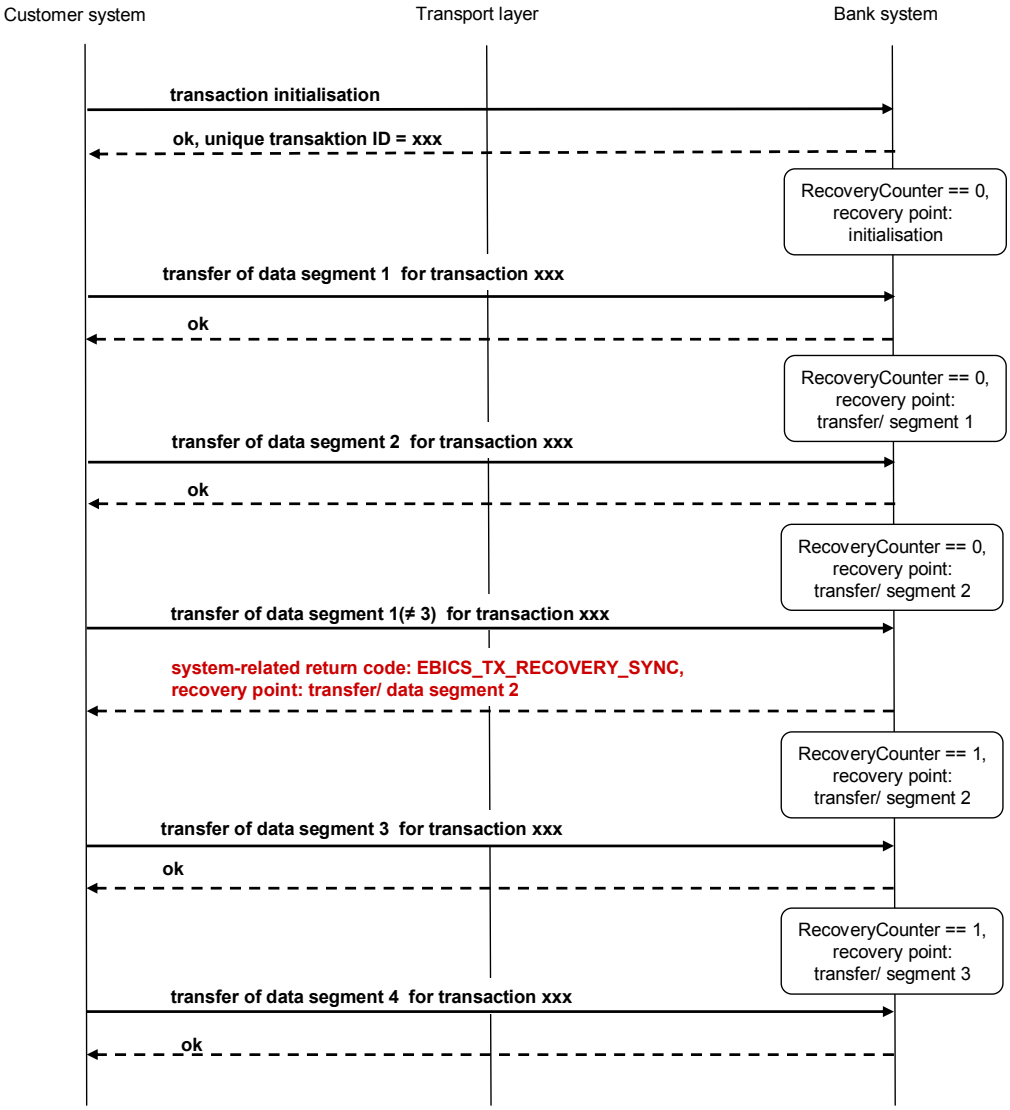


Diagram 55: Recovery of an upload transaction with explicit synchronisation between customer system and bank system

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsResponse
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_response_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
     <TransactionID>ABCDEF413946443634453132 43ABCDEF</TransactionID>
   </static>
   <mutable>
     <TransactionPhase>Transfer</TransactionPhase>
```

```
      <SegmentNumber>2</SegmentNumber>
      <OrderId>OR01</OrderId>
      <ReturnCode>061101</ReturnCode>
      <ReportText>[EBICS_TX_RECOVERY_SYNC] Synchronisation necessary</ReportText>
    </mutable>
  </header>
  <AuthSignature>
    <ds:SignedInfo>
      <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
      <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256"/>
      <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
        <ds:Transforms>
          <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
        </ds:Transforms>
        <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
        <ds:DigestValue>.. here hash value authentication ..</ds:DigestValue>
      </ds:Reference>
    </ds:SignedInfo>
    <ds:SignatureValue>.. here siganture value authentication ..</ds:SignatureValue>
  </AuthSignature>
  <body>
    <ReturnCode authenticate="true">000000</ReturnCode>
  </body>
</ebicsResponse>
```

Diagram 56: EBICS response with technical error EBICS_TX_RECOVERY_SYNC

5.6 Download transactions

5.6.1 Sequence of download transactions

The sequence of a download transaction is shown in Diagram 57 by means of a flow diagram. This sequence diagram shows the exchange of EBICS messages in the individual phases of a download transaction. The first order data segment is contained in the EBICS response of the transaction initialisation. All other order data segments are transmitted in a loop that breaks off as soon as the last data segment has been received by the customer system. (see loop break-off condition “[last data segment has been received]”). Finally, the successful receipt of all order data segments is acknowledged by the customer system.

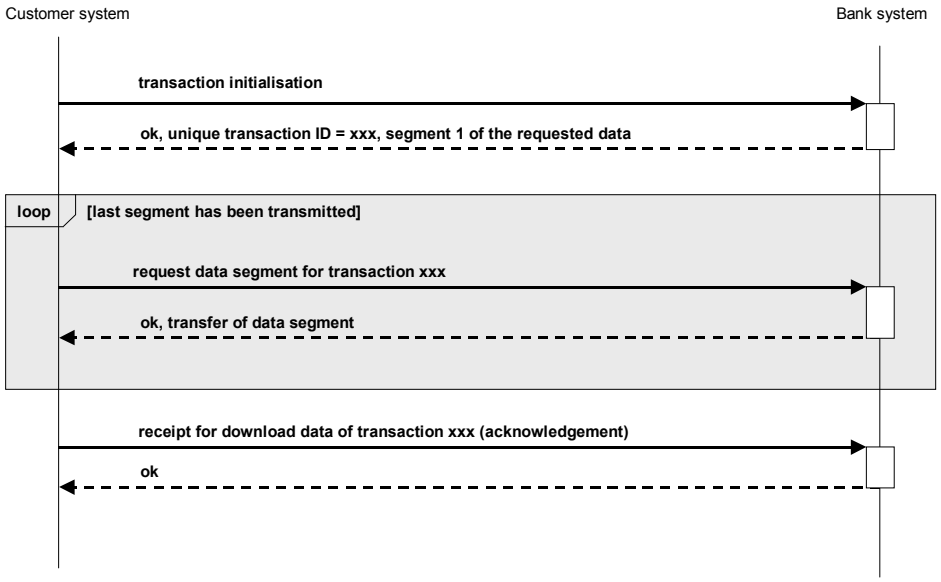


Diagram 57: Error-free sequence of a download transaction

5.6.1.1 Description of EBICS messages

For clarification purposes, the following description of the transaction steps in a download transaction use example messages for the processing of an STA order. It refers to elements of these example messages, using XPath notation.

The following chapters describe the EBICS messages in the individual phases of a download transaction. The data that is a component of these messages is listed here. Data that is fundamentally optional is marked “(optional)”. Data that may only be missing under certain conditions is instead marked “(conditional)”. Optional XML elements that are missing in the description of an EBICS message relating to a specific transaction phase may not be present in this EBICS message. Optional XML elements that are present in the description of an EBICS message relating to a specific transaction phase MUST always be placed correspondingly in this EBICS message.

EBICS requests for download transactions are (XML) instance documents that conform to ebics_request_H004.xsd and comprise the top-level element `ebics` which is declared in ebics_request_H004.xsd. EBICS responses for download transactions are instance documents that conform to ebics_response_H004.xsd and comprise the top-level element `ebics` which is again declared in ebics_response_H004.xsd.

5.6.1.1.1 EBICS messages in transaction initialisation

- Transmission of the following data in the EBICS request (see example in Diagram 58):

- Host ID of the EBICS bank computer system
  (`ebicsRequest/header/static/HostID`)
- Transaction phase (`ebicsRequest/header/mutable/TransactionPhase`) with the setting “Initialisation”
- Combination of Nonce and Timestamp to avoid replaying old EBICS messages
  (`ebicsRequest/header/static/Nonce`,
  `ebicsRequest/header/static/Timestamp`)
- Subscriber (`ebicsRequest/header/static/PartnerID`,
  `ebicsRequest/header/static/UserID`) that is submitting an order or that is providing bank-technical ES’s for an existing order.
- (Conditional) technical subscriber (`ebicsRequest/header/static/PartnerID`,
  `ebicsRequest/header/static/SystemID`)
  `SystemID` must be present if the customer system is a multi-user system. The technical subscriber is responsible for the generation of the EBICS requests (including the identification and authentication signatures) that belong to orders that are submitted or bank-technically signed by the subscriber.
- (Optional) information on the customer product
  (`ebicsRequest/header/static/Product`)
- Order type (`ebicsRequest/header/static/OrderDetails/OrderType`)
- Order attributes
  (`ebicsRequest/header/static/OrderDetails/OrderAttribute`)
  If the subscriber sets the order attributes to “DZHNN” they request the download data without the financial institution’s ES. On the other hand, if they set the order attributes to “OZHNN” they request the download data with the financial institution’s ES.
- Order parameters
  (`ebicsRequest/header/static/OrderDetails/StandardOrderParams`)
  The characteristics of the order parameters are dependent on the order type. For STA, the order parameters are of type `StandardOrderParamsType`
- Hash values of the financial institution’s public keys that are available to the subscriber
  (`ebicsRequest/header/static/BankPubKeyDigests/Authentication`,
  `ebicsRequest/header/static/BankPubKeyDigests/Encryption`,
  `ebicsRequest/header/static/BankPubKeyDigests/Signature`).
  Both the utilised hash algorithm and the version of the corresponding identification and authentication, encryption and signature process will be specified for each of these hash values.
  In Version “H004” of the EBICS protocol the ES of the financial institutions is only planned (see Chapter 3.5.2). The element `BankPubKeyDigests/Signature` is already contained in this description in preparation for future versions of EBICS, but in Version “H004” its maximum frequency (`maxOccurs`) is set to 0.
- Security medium for the subscriber’s bank-technical key (`ebicsRequest/header/static/SecurityMedium`)

- Identification and authentication signature of the technical subscriber, if such is available, otherwise the identification and authentication signature of the subscriber themselves (`ebicsRequest/AuthSignature`)
  The identification and authentication signature includes all XML elements of the EBICS request whose attribute value for `@authenticate` is equal to “true”. The definition of the XML schema “ebics_request_H004.xsd“ guarantees that the value of the attribute `@authenticate` is equal to “true” for precisely those elements that also need to be signed.

.

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
     <HostID>EBIXHOST</HostID>
     <Nonce>98498A65465C645E645F64565462C645</Nonce>
     <Timestamp>2005-01-30T15:40:45.123Z</Timestamp>
     <PartnerID>CUSTM001</PartnerID>
     <UserID>USR001</UserID>
     <Product Language="en" InstituteID="Institute ID">Product Identifier</Product>
     <OrderDetails>
       <OrderType>STA</OrderType>
       <OrderAttribute>DZNNN</OrderAttribute>
       <StandardOrderParams>
         <DateRange>
           <Start>2005-01-01</Start>
           <End>2005-01-30</End>
         </DateRange>
       </StandardOrderParams>
     </OrderDetails>
     <BankPubKeyDigests>
       <Authentication Version="X002"
Algorithm="http://www.w3.org/2001/04/xmlenc#sha256">1H/rQr2Axe9hYTV2n/tCp+3UIQQ=</Authenticati
on>
       <Encryption Version="E002"
Algorithm="http://www.w3.org/2001/04/xmlenc#sha256">2joEROI3092OIFP394+WOIer2WI=</Encryption>
     </BankPubKeyDigests>
     <SecurityMedium>0000</SecurityMedium>
   </static>
   <mutable>
     <TransactionPhase>Initialisation</TransactionPhase>
   </mutable>
 </header>
 <AuthSignature>
   <ds:SignedInfo>
     <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
     <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256"/>
     <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
       <ds:Transforms>
         <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
       </ds:Transforms>
       <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
       <ds:DigestValue> …here hash value for authentication..</ds:DigestValue>
     </ds:Reference>
   </ds:SignedInfo>
```

```
    <ds:SignatureValue> …here authentication signature..</ds:SignatureValue>
  </AuthSignature>
  <body/>
</ebicsRequest>
```

Diagram 58: EBICS request for transaction initialisation for order type STA

- Transmission of the following data in the EBICS response (see example in Diagram 59)
  - Bank-technical return code (`ebicsResponse/body/ReturnCode`)
  - Technical return code (`ebicsResponse/header/mutable/ReturnCode`)
  - Technical report text (`ebicsResponse/header/mutable/ReportText`)
  - (Conditional) Transaction ID that is unambiguous throughout the bank system (`ebicsResponse/header/static/TransactionID`), if no technical errors have occurred during the transaction initialisation
  - Transaction phase (`ebicsResponse/header/mutable/TransactionPhase`) with the setting “Initialisation”
  - (Conditional) Total number of order data segments to be transmitted (`ebicsResponse/header/static/NumSegments`), if no technical or bank-technical errors have occurred
  - (Conditional) Serial number of the order data segment transmitted in this response (`ebicsResponse/header/mutable/SegmentNumber`), if no technical or bank-technical errors have occurred.
    `SegmentNumber` is always set to 1 in the initialisation phase. The attribute `ebicsResponse/header/mutable/SegmentNumber@lastSegment` specifies whether it is the last data segment
  - Identification and authentication signature of the financial institution (`ebicsResponse/AuthSignature`)
    The identification and authentication signature includes all XML elements of the EBICS response whose attribute value for `@authenticate` is equal to “true”. The definition of the XML schema “ebics_response_H004.xsd“ guarantees that the value of the attribute `@authenticate` is equal to “true” for precisely those elements that also need to be signed.
  - (Conditional) information for encryption of the order data and possibly the ES of the order data (`ebicsResponse/body/DataTransfer/DataEncryptionInfo`), if no errors of a technical or bank-technical nature have occurred.
    In particular, `DataEncryptionInfo` also contains the asymmetrically-encrypted transaction key (`ebicsResponse/body/DataTransfer/DataEncryptionInfo/TransactionKey`)
  - (Conditional) The first order data segment (`ebicsResponse/body/DataTransfer/OrderData`), if no errors of a technical or bank-technical nature have occurred
  - (Conditional) The bank-technical ES of the order data from the financial institution (`ebicsResponse/body/DataTransfer/SignatureData`), if no errors of a

technical or bank-technical nature have occurred and if the order attributes are equal to “OZHNN”.
In the EBICS protocol the ES of the financial institutions is only planned (see Chapter 3.5.2). The setting “OZHNN” is not valid in EBICS Version “H004” and hence the condition for the presence of element `SignatureData` is not fulfilled.
The element `SignatureData` is nevertheless contained in this description in preparation for future versions of EBICS

- (Optional) time stamp for the last updating of the bank parameters (`ebicsResponse/body/TimestampBankParameter`).

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsResponse
xmlns="urn:org:ebics:H004"
xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:org:ebics:H004 ebics_response_H004.xsd"
Version="H004" Revision="1">
<header authenticate="true">
  <static>
    <TransactionID>FEDCBA4139464436344531324 3FEDCBA</TransactionID>
    <NumSegments>2</NumSegments>
  </static>
  <mutable>
    <TransactionPhase>Initialisation</TransactionPhase>
    <SegmentNumber>1</SegmentNumber>
    <ReturnCode>000000</ReturnCode>
    <ReportText>[EBICS_OK] OK</ReportText>
  </mutable>
</header>
<AuthSignature>
  <ds:SignedInfo>
    <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
    <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256">
    </ds:SignatureMethod>
    <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
      <ds:Transforms>
        <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
      </ds:Transforms>
      <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
      <>
    </ds:Reference>
  </ds:SignedInfo>
    <ds:SignatureValue> …here authentication signature..</ds:SignatureValue>
</AuthSignature>
<body>
  <DataTransfer>
    <DataEncryptionInfo authenticate="true">
      <EncryptionPubKeyDigest Version="E002"
Algorithm="http://www.w3.org/2001/04/xmlenc#sha256">..here hash value of the public bank key
for encryption..</EncryptionPubKeyDigest>
      <TransactionKey>En6KEB6ArEzw+iq4N1wm6Eptcyx…</TransactionKey>
      <HostID>EBIXHOST</HostID>
    </DataEncryptionInfo>
    <OrderData>…</OrderData>
  </DataTransfer>
```

```
  <ReturnCode authenticate="true">000000</ReturnCode>
</body>
</ebicsResponse>
```

Diagram 59: EBICS response for transaction initialisation for order type STA

5.6.1.1.2 EBICS messages in the data transfer phase

- Transmission of the following data in the EBICS request (see example in Diagram 60):

  Host ID of the EBICS bank computer system (`ebicsRequest/header/static/HostID`)

  Data for identification of the current transaction step:

  - Transaction ID (`ebicsRequest/header/static/TransactionID`)
  - Transaction phase (`ebicsRequest/header/mutable/TransactionPhase`) with the setting “Transfer”
  - Serial number of the order data segment that is to be downloaded in this transaction step (`ebicsRequest/header/mutable/SegmentNumber`)
    Attribute `ebicsRequest/header/mutable/SegmentNumber@lastSegment` has no meaning for this EBICS request

  Identification and authentication signature of the technical subscriber, if such is available, otherwise the identification and authentication signature of the subscriber themselves (`ebicsRequest/AuthSignature`)
  The identification and authentication signature includes all XML elements of the EBICS request whose attribute value for `@authenticate` is equal to “true”. The definition of the XML schema “ebics_response_H004.xsd“ guarantees that the value of the attribute `@authenticate` is equal to “true” for precisely those elements that also need to be signed.

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
     <HostID>EBIXHOST</HostID>
     <TransactionID>FEDCBA4139464436344531324 3FEDCBA</TransactionID>
   </static>
   <mutable>
     <TransactionPhase>Transfer</TransactionPhase>
     <SegmentNumber>2</SegmentNumber>
   </mutable>
 </header>
 <AuthSignature>
   <ds:SignedInfo>
     <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
     <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256">
     </ds:SignatureMethod>
     <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
       <ds:Transforms>
```

```
          <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
        </ds:Transforms>
        <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
        <ds:DigestValue>… here hash value for authentication…</ds:DigestValue>
      </ds:Reference>
    </ds:SignedInfo> <ds:SignatureValue> …here authentication signature..</ds:SignatureValue>
  </AuthSignature>
  <body/>
</ebicsRequest>
```

Diagram 60: EBICS request for transmission of the next order data segment for order type STA

- Transmission of the following data in the EBICS response (see example in Diagram 61)

  - Bank-technical return code (`ebicsResponse/body/ReturnCode`)
  - Technical return code (`ebicsResponse/header/mutable/ReturnCode`)
  - Technical report text (`ebicsResponse/header/mutable/ReportText`)
  - Data for identifying a transaction step
    If the technical return code has the value EBICS_TX_RECOVERY_SYNC, this transaction step identifies the last recovery point of the download transaction. However, if no technical or business related errors have not occurred in this example, this transaction step reflects the current transaction step:
  - Transaction ID (`ebicsResponse/header/static/TransactionID`)
  - Transaction phase (`ebicsResponse/header/mutable/TransactionPhase`)
  - Serial number of the order data segment (`ebicsResponse/header/mutable/SegmentNumber`).
    This is the number of the order data segment that has been requested in the EBICS request or, in the event of the error EBICS_TX_RECOVERY_SYNC, the number of the last order data segment that has been successfully transmitted to the customer system by the bank system. In the event of the error EBICS_TX_RECOVERY_SYNC, the value of `SegmentNumber` is always equal to 1 if the value of `TransactionPhase` is “Initialisation”.
    The attribute `ebicsResponse/header/mutable/SegmentNumber@lastSegment` specifies whether it is the last order data segment.
  - Identification and authentication signature of the financial institution (`ebicsResponse/AuthSignature`)
    The identification and authentication signature includes all XML elements of the EBICS response whose attribute value for `@authenticate` is equal to “true”. The definition of the XML schema “ebics_response_H004.xsd“ guarantees that the value of the attribute `@authenticate` is equal to “true” for precisely those elements that also need to be signed.
  - (Conditional) The requested order data segment (`ebicsResponse/body/DataTransfer/OrderData`), if no errors of a technical or bank-technical nature have occurred.

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsResponse
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_response_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
     <TransactionID>FEDCBA4139464436344531324 3FEDCBA</TransactionID>
   </static>
   <mutable>
     <TransactionPhase>Transfer</TransactionPhase>
     <SegmentNumber lastSegment="true">2</SegmentNumber>
     <ReturnCode>000000</ReturnCode>
     <ReportText>[EBICS_OK] OK</ReportText>
   </mutable>
 </header>
 <AuthSignature>
   <ds:SignedInfo>
     <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
     <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256">
     </ds:SignatureMethod>
     <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
       <ds:Transforms>
         <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
       </ds:Transforms>
       <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
       <ds:DigestValue>… here hash value for authentication …</ds:DigestValue>
     </ds:Reference>
   </ds:SignedInfo>
   <ds:SignatureValue>…here authentication signature… </ds:SignatureValue>
 </AuthSignature>
 <body>
   <DataTransfer>
     <OrderData>…</OrderData>
   </DataTransfer>
   <ReturnCode authenticate="true">000000</ReturnCode>
 </body>
</ebicsResponse>
```

Diagram 61: EBICS response for transmission of the last order data segment for order type STA

5.6.1.1.3 EBICS- messages in the acknowledgement phase

- Transmission of the following data in the EBICS request (see example in Diagram 62)

  - Host ID of the EBICS bank computer system (`ebicsRequest/header/static/HostID`)
  - Data for identification of the current transaction step:
    - Transaction ID (`ebicsRequest/header/static/TransactionID`)
    - Transaction phase (`ebicsRequest/header/mutable/TransactionPhase`) with the setting “Receipt”
  - Identification and authentication signature of the technical subscriber, if such is available, otherwise the identification and authentication signature of the

subscriber themselves (`ebicsRequest/AuthSignature`)
The identification and authentication signature includes all XML elements of the EBICS request whose attribute value for `@authenticate` is equal to “true”. The definition of the XML schema “ebics_request_H004.xsd“ guarantees that the value of the attribute `@authenticate` is equal to “true” for precisely those elements that also need to be signed

- Acknowledgement (`ebicsRequest/body/TransferReceipt/ReceiptCode`):
The value of the acknowledgement is 0 (“positive acknowledgement”) if download and processing of the order data was successful. Otherwise the value of the acknowledgement is 1 (“negative acknowledgement”).

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
     <HostID>EBIXHOST</HostID>
     <TransactionID>FEDCBA4139464436445313243FEDCBA</TransactionID>
   </static>
   <mutable>
     <TransactionPhase>Receipt</TransactionPhase>
   </mutable>
 </header>
 <AuthSignature>
   <ds:SignedInfo>
     <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
     <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256">
     </ds:SignatureMethod>
     <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
       <ds:Transforms>
         <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
       </ds:Transforms>
       <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
       <ds:DigestValue>…here hash value for authentication …</ds:DigestValue>
     </ds:Reference>
   </ds:SignedInfo>
   <ds:SignatureValue>… here authentication signature…</ds:SignatureValue>
 </AuthSignature>
 <body>
   <TransferReceipt authenticate="true">
     <ReceiptCode>0</ReceiptCode>
   </TransferReceipt>
 </body>
</ebicsRequest>
```

Diagram 62: EBICS request for the acknowledgement of download data

- Transmission of the following data in the EBICS response (see example in Diagram 63)
  - Bank-technical return code (`ebicsResponse/body/ReturnCode`)
  - Technical return code (`ebicsResponse/header/mutable/ReturnCode`)
  - Technical report text (`ebicsResponse/header/mutable/ReportText`)

- Data for identification of a transaction step:
  If the technical return code has the value EBICS_TX_RECOVERY_SYNC, this transaction step identifies the last recovery point of the download transaction. However, if no technical or business related errors have occurred, this transaction step reflects the current transaction step, i.e. acknowledgement of the download data:
  - Transaction ID (`ebicsResponse/header/static/TransactionID`)
  - Transaction phase (`ebicsResponse/header/mutable/TransactionPhase`)
  - (Conditional) Serial number of the order data segment (`ebicsResponse/header/mutable/SegmentNumber`) if the error EBICS_TX_RECOVERY_SYNC has occurred and consequently the value of `TransactionPhase` is “Initialisation” or “Transfer”.
    This is the number of the order data segment that, from the bank system’s perspective, was the last one to have been successfully transmitted to the customer system. The value of `SegmentNumber` is always equal to 1 if the value of `TransactionPhase` is “Initialisation”.
    The attribute `ebicsResponse/header/mutable/SegmentNumber@lastSegment` specifies whether it is the last order data segment.
- Identification and authentication signature of the financial institution (`ebicsResponse/AuthSignature`)
  The identification and authentication signature includes all XML elements of the EBICS response whose attribute value for `@authenticate` is equal to “true”. The definition of the XML schema “ebics_response_H004.xsd“ guarantees that the value of the attribute `@authenticate` is equal to “true” for precisely those elements that also need to be signed.

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsResponse
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_response_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>
     <TransactionID>FEDCBA4139464436344531324 3FEDCBA</TransactionID>
   </static>
   <mutable>
     <TransactionPhase>Receipt</TransactionPhase>
     <ReturnCode>011000</ReturnCode>
     <ReportText>[EBICS_POSTPROCESS_DONE] positive receipt received </ReportText>
   </mutable>
 </header>
 <AuthSignature>
   <ds:SignedInfo>
     <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
     <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256">
     </ds:SignatureMethod>
     <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
       <ds:Transforms>
         <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
```

```
        </ds:Transforms>
        <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
        <ds:DigestValue>… here hash value for authentication</ds:DigestValue>
      </ds:Reference>
    </ds:SignedInfo>
    <ds:SignatureValue>… here authentication signature…</ds:SignatureValue>
  </AuthSignature>
  <body>
    <ReturnCode authenticate="true">000000</ReturnCode>
  </body>
</ebicsResponse>
```

Diagram 63: EBICS response for the acknowledgement of download data

5.6.1.2 Processing the EBICS messages

Chapter 5.6.1.1 describes the contents of the EBICS messages that are exchanged within the framework of a download transaction. The subject of this chapter is the processing of these EBICS messages. Action sequences are pointed out in the flow diagram in Diagram 57, the course of which is described here in greater detail.

In order to simplify the description of the processes, it is assumed that every processing step produces a return code (RC) whose value is equal to EBICS_OK (000000) if it has been possible to successfully complete this step. The technical return code (RCT) and the bank-technical return code (RCF) are set depending on the RC, and their values then flow into EBICS messages.

The validity of the EBICS requests is verified on the basis of the XML schema definition file “ebics_request_H004.xsd”, and with due regard to the restrictions that have been specified for the individual requests in Chapter 5.6.1.1. The validity verification usually takes place in parallel and/or interlocked with the other steps in processing the EBICS request. The following processes dispense with representation of a process step of type “EBICS request validity verification” in favour of the simplest possible representation. In consequence, these processes can be terminated by the following additional technical errors: EBICS_INVALID_XML, EBICS_INVALID_REQUEST, or EBICS_INVALID_REQUEST_CONTENT. For Return codes relating to certificates, refer to Annex 1
.

5.6.1.2.1 Processing in the initialisation phase

Diagram 64 shows processing at the bank’s end of the EBICS request which is sent from the customer system to the bank system in the initialisation stage of a download transaction. The individual processing steps are explained in greater detail in the following text:

I. Generation of an EBICS transaction (see 5.5.1.2.1 Point 1 and Diagram 49)

II. Termination of the EBICS transaction

If the requested download data is not available, the EBICS transaction is terminated with the business related return code EBICS_NO_DOWNLOAD_DATA_AVAILABLE.

III. Provision of data

In this processing step the first order data segment is provided for the purpose of being embedded in the EBICS response. If the financial institution uses the bank-technical ES's for the current order type and the current subscriber (submitter), the financial institution's bank-technical ES's are also provided via the order data.

In Version "H004" of the EBICS protocol the ES of the financial institutions is only planned (see Chapter 3.5.2). They are only taken into consideration here in preparation for future EBICS versions.

The provision of download data is not a part of EBICS, it is dependent on the implementation of the bank system.

IV. Generation of the EBICS response

This processing step generates the EBICS response that is afterwards sent to the customer system. If all previous processing steps have been successful, this EBICS message contains the first order data segment and possibly also the bank-technical signature for the (entire) order data. In the event of an error, this EBICS message contains the corresponding technical or business related error code. The contents of this EBICS message are described in greater detail in Chapter 5.6.1.1.1.

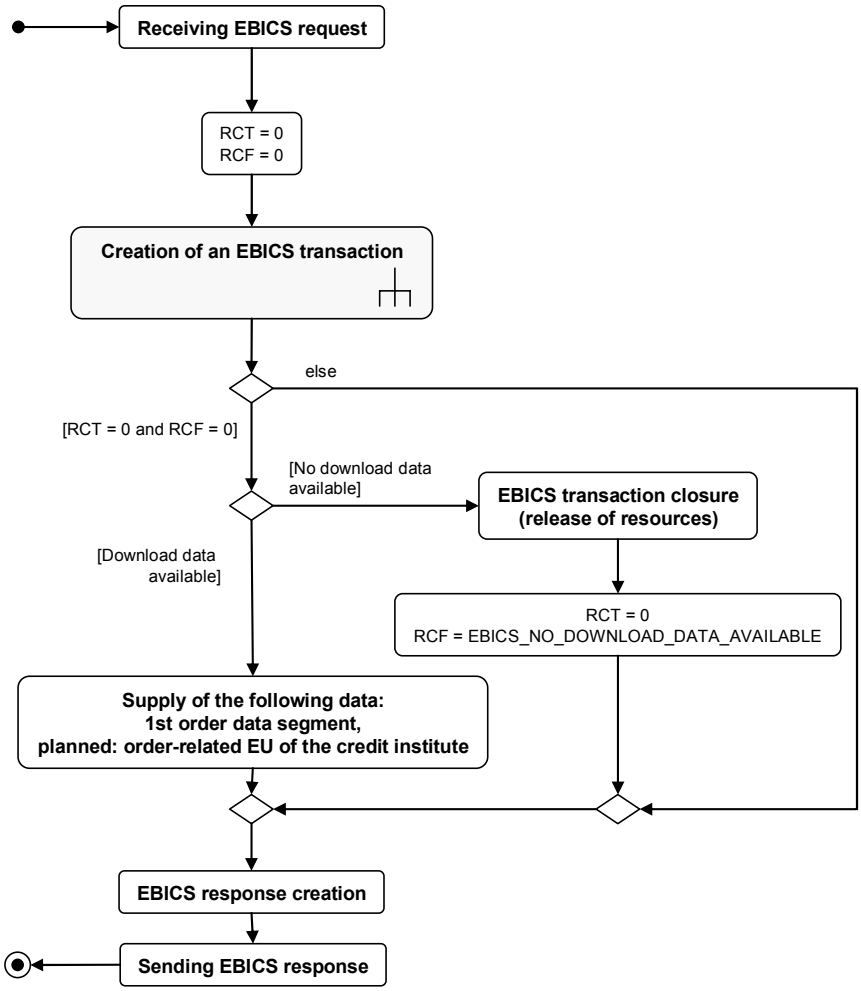


Diagram 64: Processing the EBICS request of the initialisation phase of a download transaction

5.6.1.2.2 Processing in the data transfer phase

Diagram 66 shows processing at the bank's end of the EBICS request which is transferred from the customer system to the bank system in the data transfer stage of an EBICS transaction. The individual processing steps are explained in greater detail in the following text:

I. Verifying the download transaction (see Diagram 65)

I.a. Verifying the EBICS transaction (see 5.5.1.2.2 Point 1 and Diagram 51)

I.b. Evaluation of the EBICS transaction verification results

If the transaction step verification is unsuccessful, then:

- A verification is carried out as to whether the download transaction can be recovered, if the bank system supports the recovery of transactions. This verification is carried out in accordance with the description in Chapter 5.6.2. If the verification is successful, the technical return code EBICS_TX_RECOVERY_SYNC is returned, otherwise the transaction is terminated with the technical return code EBICS_TX_ABORT.

- The download transaction is terminated with the business related error code EBICS_RECOVERY_NOT_SUPPORTED if the bank system does not support transaction recovery. If MAX is set to 0 in the flow diagram, the case is also considered where recovery is not supported.

II. Provision of data

In this processing step the requested order data segment is provided for the purpose of being embedded in the EBICS response. The provision of download data is not a part of EBICS, it is dependent on the implementation of the bank system.

III. Generation of the EBICS response

This processing step generates the EBICS response that is afterwards sent to the customer system. If all previous processing steps have been successful, this EBICS message contains the order data segment that was requested in the corresponding EBICS request. In the event of an error, this EBICS message contains the corresponding technical business related error code. The contents of this EBICS message are described in greater detail in Chapter 5.6.1.1.2.

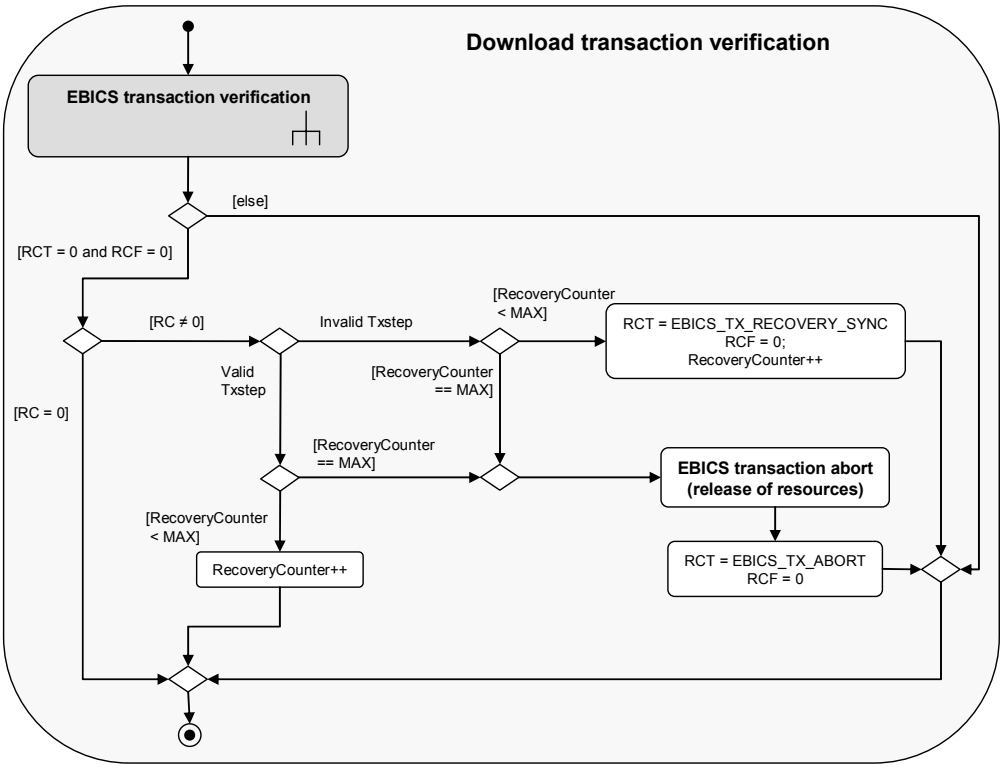


Diagram 65: Detailed description of the process step "Download transaction verification"

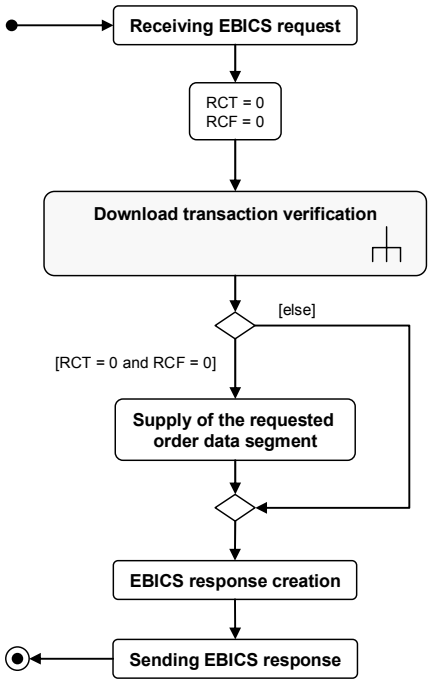


Diagram 66: Processing an EBICS request for requesting a order data segment

5.6.1.2.3 Processing in the acknowledgement phase

Diagram 67 shows processing at the bank's end of the EBICS request which is transferred from the customer system to the bank system in the acknowledgement stage of an EBICS transaction.

The individual processing steps are explained in greater detail in the following text:

I. Verifying the download transaction (see description in Chapter 5.6.1.2.2, Point 1)

II. Download post-processing

Positive acknowledgement means that it was possible to successfully download and process the order data from the customer system. In contrast to negative acknowledgement, the consequence of this is that finishing-off activities can now be carried out on the bank system such as e.g. marking the order data as "downloaded". The EBICS transaction is terminated by the bank system, independent of the type of acknowledgement.

III. Termination of the EBICS transaction

IV. Generation of the EBICS response

This processing step generates the EBICS response that is afterwards sent to the customer system. In the event of positive acknowledgement, the technical return code EBICS_DOWNLOAD_POSTPROCESS_DONE is returned, in the event of negative

acknowledgement the technical return code EBICS_DOWNLOAD_POSTPROCESS_SKIPPED is returned. In the event of an error, this EBICS message contains the corresponding technical or business related error code. The contents of this EBICS message are described in greater detail in Chapter 5.6.1.1.3.

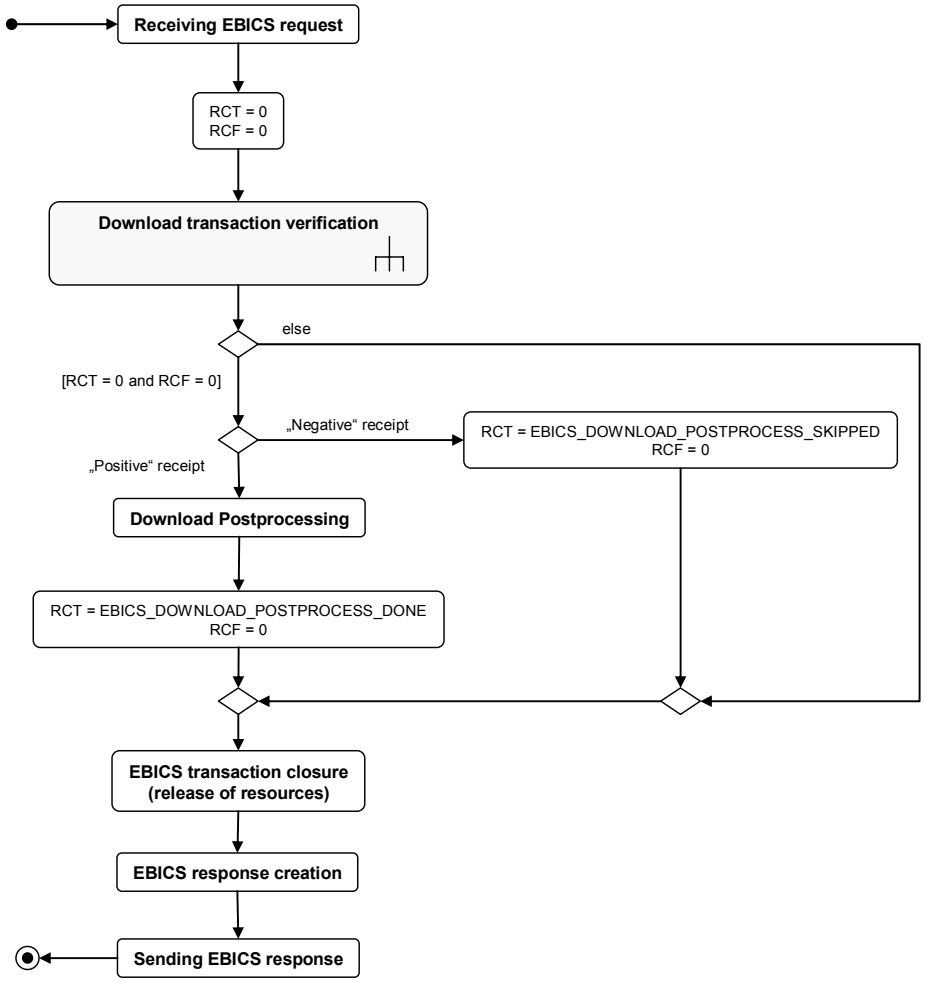


Diagram 67: Processing of an EBICS request for acknowledgement within the framework of a download transaction

5.6.2 Recovery of download transactions

Recovery of download transactions is always initiated by the customer system. The reasons for a recovery are analogous to those of upload transactions:

- Transport error during transmission of an EBICS request in the data transfer or acknowledgement phase of the transaction

- Timeout or transport error when receiving an EBICS transaction in the data transfer or acknowledgement phase of the transaction
- Loss at the subscriber's end of order data segments that have already been received
- Temporary error in the processing of a received EBICS response that necessitates renewed transmission.

If one of the above error situations occurs, the customer system selects a suitable recovery point depending on the number of available order data segments at the subscriber's end. If the selected recovery point is the request for the n^{th} order data segment, then the next transaction step initiated by the subscriber is the request for the $(n+1)^{th}$ order data segment or acknowledgement of the download of all order data segments if n is the last order data segment. EBICS requests within the framework of the recovery of download transactions do not differ from the EBICS request of a normal, error-free flow of a download transaction.

By way of example, the flow of a transaction that repeatedly necessitates recovery is shown in Diagram 68. In each case, the recovery takes place without explicit synchronisation between the customer system and the bank system. The 3^{rd} order data segment is requested three times since the customer system could not receive the corresponding EBICS response due to a timeout or a transport error. On the second and third request of the 3^{rd} order data segment, the customer system assumes that the recovery point is the request for the 2^{nd} order data segment. The value of the recovery counter is equal to 2 after the third (and successful) request of the 3^{rd} order data segment, since the last two requests of the 3^{rd} order data segment were evaluated as recovery attempts by the bank system. The transaction finally fails due to the number of recovery attempts being too high.

If the selected recovery point is not valid from the viewpoint of the bank system, the EBICS response contains the last possible recovery point of the download transaction in addition to the technical return code EBICS_TX_RECOVERY_SYNC. The valid recovery points of a download transaction are defined in Chapter 5.4. If, for example, the selected recovery point is the request for the order data segment with serial number k, the transaction can be continued with the request for the order data segments with serial numbers I+1, I+2, wherein i <= k must hold. If i < k, the i^{th} order data segment is requested again, then the counter for the number of implemented recovery attempts is incremented by one.

Diagram 69 shows the successful flow of a transaction that contains a recovery of the transaction after an explicit synchronisation between the customer system and the bank system. Here, the customer system requests the 5^{th} order data segment in one state without having previously requested the 4^{th} order data segment. The financial institution's EBICS response (see Diagram 70) thus contains the recovery point of the transaction, which in this case is the request of the 3^{rd} order data segment. Following this, the customer system continues with the request of the 4^{th} order data segment and ends the transaction after receipt of the last segment 5.

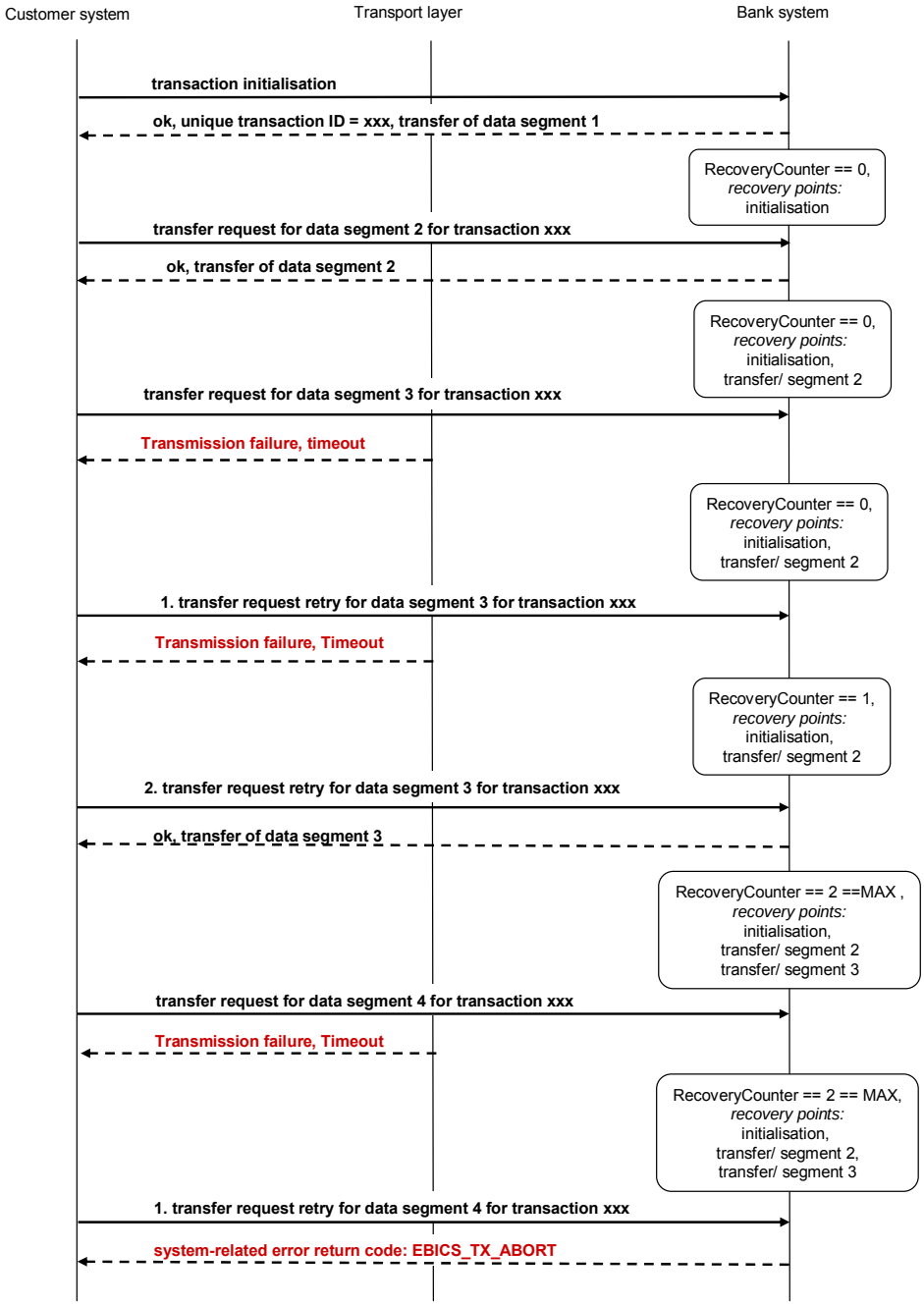


Diagram 68: Termination of the recovery of a download transaction due to the maximum number of recovery attempts being exceeded

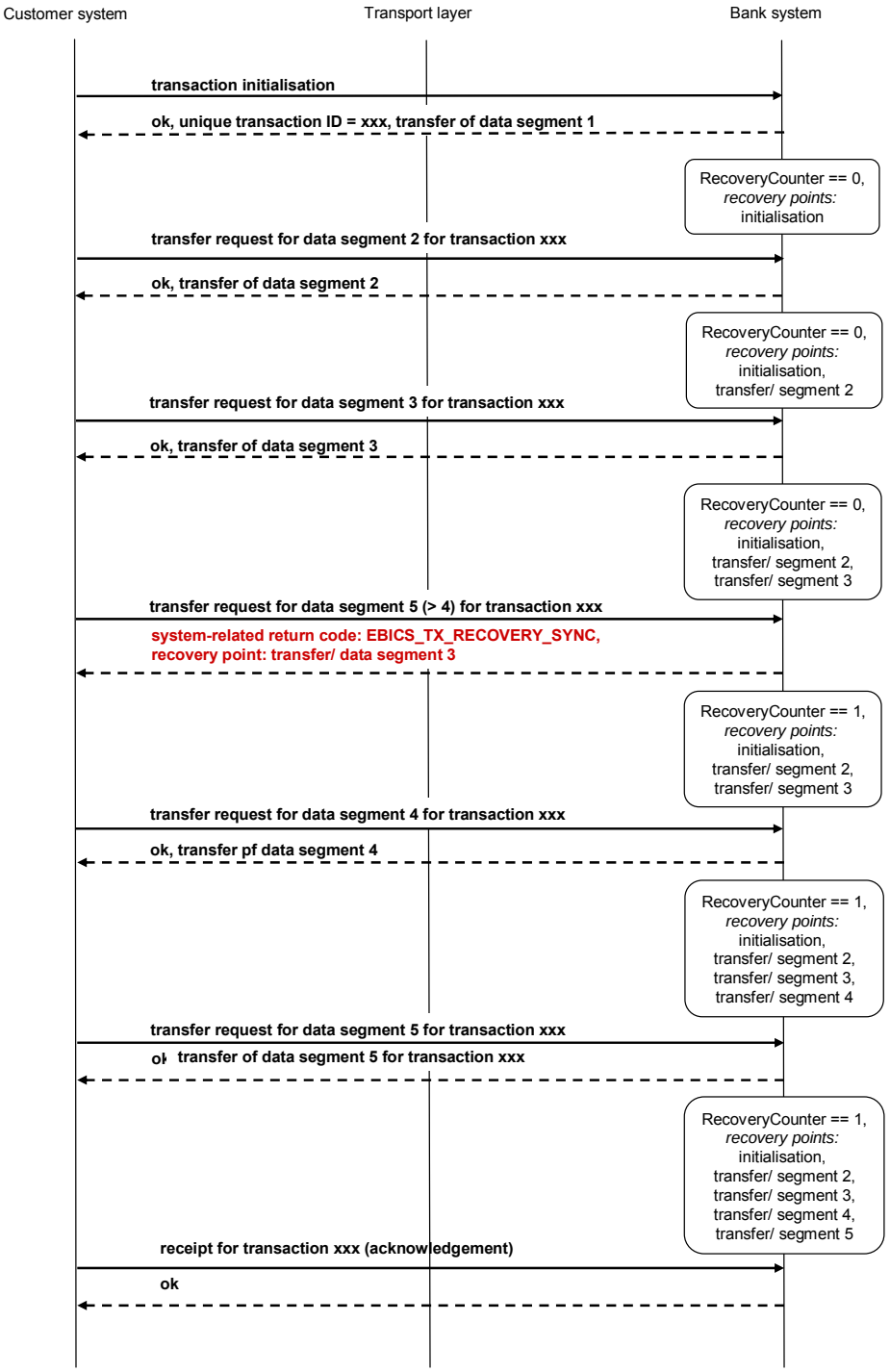


Diagram 69: Recovery of a download transaction with explicit synchronisation between customer system and bank system

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsResponse
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_response_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <static>     <TransactionID>FEDCBA4139464436344531324 3FEDCBA</TransactionID>
   </static>
   <mutable>
     <TransactionPhase>Transfer</TransactionPhase>
     <SegmentNumber>3</SegmentNumber>
     <ReturnCode>061101</ReturnCode>
     <ReportText>[EBICS_TX_RECOVERY_SYNC] Synchronisation necessary</ReportText>
   </mutable>
 </header>
 <AuthSignature>
   <ds:SignedInfo>
     <ds:CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
     <ds:SignatureMethod Algorithm="http://www.w3.org/2001/04/xmldsig-more#rsa-sha256">
     </ds:SignatureMethod>
     <ds:Reference URI="#xpointer(//*[@authenticate='true'])">
       <ds:Transforms>
         <ds:Transform Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
       </ds:Transforms>
       <ds:DigestMethod Algorithm="http://www.w3.org/2001/04/xmlenc#sha256"/>
       <ds:DigestValue>… here hashvalue for authentication …</ds:DigestValue>
     </ds:Reference>
   </ds:SignedInfo>
   <ds:SignatureValue>… here authentication signature …</ds:SignatureValue>
 </AuthSignature>
 <body>
   <ReturnCode authenticate="true">000000</ReturnCode>
 </body>
</ebicsResponse>
```

Diagram 70: EBICS response with technical error EBICS_TX_RECOVERY_SYNC

6 Encryption

EBICS provides encryption on two different protocol levels: On the level of the EBICS XML-based application protocol and on a level between the application and transport level, namely the TLS level.

6.1 Encryption at TLS level

The use of TLS on the external transmission paths between the customer system and the bank system ensures maintenance of the confidentiality and integrity of the EBICS messages on these paths. The cryptographic processes that are used to establish a TLS session between the customer system and the bank system are described in the Appendix (Chapter 11.3.1).

6.2 Encryption at application level

The order data of bank-technical orders are fundamentally deemed to be sensitive and are therefore embedded into EBICS messages in encrypted form. This facilitates maintenance of their confidentiality on the internal paths of the customer system and the bank system on which communication is not necessarily based on TLS.

The order data of system-related key management orders is encrypted as soon as the recipient's (sufficiently verified) encryption key is available to the sender of the order data. The order data of INI, HIA or HSA orders is thus embedded into the EBICS message in an unencrypted form, but the order data of HPB, PUB, HCS, or HCA orders is encrypted.

The order data of system-related Distributed Electronic Signature orders is also embedded in the EBICS message in encrypted form.

Analogous to the order data of bank-technical orders, the electronic signatures of an order, i.e. the transport signature or the bank-technical ES's are always encrypted.

Apart from the order data and the ES's, no further data is encrypted at the application level.

Order data that is to be encrypted and ES's of an order are initially compressed via ZIP, then encrypted and finally base64-coded and embedded in the EBICS message. Here, compression and subsequent encryption of the order data takes place before it is segmented. The implemented encryption process is a hybrid process: The data is symmetrically encrypted, the utilised symmetrical key is passed to the recipient of the data in asymmetrically-encrypted form. Details on the encryption process are given in the Appendix (Chapter 11.3.2).

In the event of an upload transaction, a random symmetrical key is generated in the customer system that is used exclusively within the framework of this transaction both for encryption of the ES's and for encryption of the order data. This key is encrypted

asymmetrically with the financial institution's public encryption key and is transmitted by the customer system to the bank system during the initialisation phase of the transaction.

Analogously, in the case of a download transaction a random symmetrical key is generated in the bank system that is used for encryption of the order data that is to be downloaded and for encryption of the bank-technical signature that has been provided by the financial institution. This key is asymmetrically encrypted and is transmitted by the bank system to the customer system during the initialisation phase of the transaction. The asymmetrical encryption takes place with the technical subscriber's public encryption key if the transaction's EBICS messages are sent by a technical subscriber. Otherwise the asymmetrical encryption takes place with the public encryption key of the non-technical subscriber, i.e. the submitter of the order.

From EBICS 2.4 on, the customer system has to use the E002-hash value of the public bank key in a request. This hash value is generated by the customer system according to the E002 process by means of SHA-256.
The transaction is cancelled and the return code EBICS_INVALID_REQUEST_CONTENT is returned if E001 is still used in a request.

7 Segmentation of the order data

7.1 Process description

In Version H004 of the EBICS standard, order data that requires more than 1 MB of storage space in compressed, encrypted and base64-coded form MUST be segmented before transmission, irrespective of the transfer direction (upload/download).

The following procedure is to be followed with segmentation:

1. The order data is ZIP compressed
2. The compressed order data is encrypted in accordance with Chapter 6.2
3. The compressed, encrypted order data is base64-coded.
   In doing this, only the 65 printable characters of the base64 alphabet from RFC 2045 are permitted in EBICS in the resulting coded data block. In particular, so-called “white-space characters” such as spaces, tabs, carriage returns and line feeds (“CR/LF”) are not permitted
4. The result is to be verified with regard to the data volume:

4i. If the resulting data volume is below the threshold of 1 MB = 1,048,576 bytes, the order data can be sent complete as a data segment within one transmission step

4ii. If the resulting data volume exceeds 1,048,576 bytes the data is to be separated sequentially and in a base64-conformant manner into segments that each have a maximum of 1,048,576 bytes.

Step 4i ensures that even order data that does not exceed the permitted maximum segment size of 1 MB when in compressed, encrypted and coded form is handled uniformly within the framework of segmentation.

The recipient executes the algorithmic computations in reverse order to recovere the original order data:

1. The data segment that has just been received is appended (concatenated) to the already-received data segments
2. The complete data block is base64-decoded
3. The results of the base64-decoding are decrypted in accordance with Chapter 6.2
4. The results of the decryption are ZIP expanded to reveal the original order data.

7.2 Implementation in the EBICS messages

The sender of the order data numbers the data segments that are generated in accordance with Chapter 7.1 sequentially in ascending order, beginning with 1.

The server terminates the connection with the technical error code EBICS_TX_SEGMENT_NUMBER_EXCEEDED if the client in an **upload transaction** has specified the total number of segments that are to be transmitted, as stated in the initialisation phase, too low in the field `ebics/header/static/NumSegments`, i.e. if the following applies to the current transaction step:

- `ebicsRequest/header/mutable/SegmentNumber = ebicsRequest/header/static/NumSegments` (from the initialisation phase) and `ebicsRequest/header/mutable/SegmentNumber@lastSegment≠"true"`, or
- `ebicsRequest/header/mutable/SegmentNumber > ebicsRequest/header/static/NumSegments` (from the initialisation phase).

The server terminates the transaction in a regular manner with the technical return code of severity level 'info' EBICS_TX_SEGMENT_NUMBER_UNDERRUN if the client in an **upload transaction** has specified the total number of segments that are to be transmitted, as stated in the initialisation phase, too high in the field `ebicsRequest/header/static/NumSegments`, i.e. if the following applies to the current transaction step:

- `ebicsRequest/header/mutable/SegmentNumber < ebicsRequest/header/static/NumSegments` (from the initialisation phase) and `ebicsRequest/header/mutable/SegmentNumber@lastSegment="true"`.

The server terminates the transaction with the technical error code EBICS_SEGMENT_SIZE_EXCEEDED if the client in an **upload transaction** has exceeded the permitted segment size of 1 MB in the current transaction step.

In the case of **download transactions**, it is the responsibility of the customer system to respond to irregularities regarding the number or size of segments:

- If the actual number of transmitted segments up until attribute setting `ebicsRequest/header/mutable/SegmentNumber@lastSegment="true"` is lower than the specification in the initialisation stage on the part of the server, the client SHOULD nevertheless duly continue the current transaction with the acknowledgement phase.
- If the server exceeds the total number of segments postulated in the initialisation phase, the client CAN nevertheless continue the transaction by requesting further segments. Alternatively, or in the event of a disproportionately-large deviation between the actual segment number and the specified number, the client CAN interrupt the transaction by sending no further requests.
- If the server exceeds the permitted segment size of 1 MB, the client SHOULD terminate the transaction.

8 Distributed Electronic Signature (VEU)

Support by the bank for the Distributed Electronic Signature is compulsory for EBICS-conformant implementation, i.e. all financial institutions MUST offer VEU. Information as to whether the financial institution supports the optional VEU order type “HVT” (Retrieve VEU transaction details) is contained in the bank parameters (see Chapter 9.2.2, Parameter “DistribSigTransactionDetails”).
From EBICS version 2.4, only German financial institutions are mandatorily obliged to support the order types of the Distributed Electronic Signature (VEU) .

8.1 Process description

The Distributed Electronic Signature (VEU) allows orders to be authorised by multiple subscribers, even from different customers, independently of location and time. Here, an order remains stored in the VEU processing system until via the VEU orders either the necessary number of signatures with suitable authorisation have been received, a time limit set by the bank’s computer system has been exceeded or the order is cancelled. Hence the VEU process is not just an alternative to customer-internal subsequent submission of ES’s relating to an existing order, it also offers a distributed ES among a number of customers with comprehensive possibilities for information on the VEU state and the order.

Authorised signatories of a customer can use signature processes deviating from each other which may support different hash processes resulting in different hash values. In the case of the VEU process, the hash value of the order data is provided when the order types HVD and HVZ are executed. This hash value is derived from the signature version which the subscriber executing HVZ and HVD uses. The hash value is provided with the signature version used as an attribute.

A complete VEU order process generally proceeds as follows:

1. The order party initiates the order (e.g. IZV) by transmitting the order data in an EBICS transaction with the order attributes “OZHNN”. For the signature, the order party can either immediately bank-technically sign the order (signature class A, B or E) or can initially carry out the transmission by means of a transport signature (signature class T).
2. The bank system analyses the order type and signatures that have already been submitted, including their class. If further signatures are necessary for processing of the order, it is stored intermediately for the VEU process together with its hash value. The bank system extracts the hash value of the order data from the ES using the signatory’s public signature key.
3. If another subscriber wants to use the VEU process for this order, they have possibly already received the data necessary for authorisation – hash value of the order, order type and order number – outside of EBICS (via a third

communication path). In this event, the process continues from Point 4. On the other hand, if they still need the order data they can proceed as follows:

3i. Firstly, they inquire via order type HVU or HVZ to find out which orders they are authorised to sign within the framework of VEU. The response contains, among other things, information on the order type, order number, the number of signatures required and already provided (including a note as to whether their own signature is still required or has already been provided), on the original order party and on the size of the uncompressed order data. The HVZ response contains additional information, especially the hash value of the order data. If HVZ is applied, step 3ii may be skipped.

3ii. Next they ascertain via order type HVD the state of one of these orders, e.g. the IZV order placed within the framework of the VEU. In addition to the hash value of the order data that the bank system has extracted from the order signatory's ES and an accompanying note, they receive a list of the previous signatories together with their authorisation class.

3iii. The subscriber can download additional order details via order type HVT: Depending on the request parameters, they receive either information on the individual order transactions (account data, amount information, processing date, utilisation data and other descriptions) or the complete order data.

4. The subscriber now has all information needed to sign or cancel the original order:

4i. If they want to add a signature to the original order, they will use order type HVE. For this, they sign the hash value of the order data received via HVD or worked out themselves from the complete order data via HVT. The HVE control data contains the order parameters for the original order (e.g. the IZV order).

4ii. If they want to cancel the original order they would use order type HVS. As with HVE, authorisation is confirmed by the bank-technical signature via the hash value of the order data, but in the case of HVS the signature applies as confirmation of the cancellation, not confirmation of the order itself. As with HVE, the HVS control data contains the order parameters of the original order (that is to be cancelled).

Diagram 71 documents the processes when using VEU. The diagram shows the logical concatenation of the VEU order types wherein pure communications connections (e.g. data transmission from bank system to customer system on retrieval of VEU details via HVD), occurrences of errors and the acquisition of information via alternative communication channels (e.g. order hash value by email from the submitter instead of via HVD) are not shown for reasons of clarity.

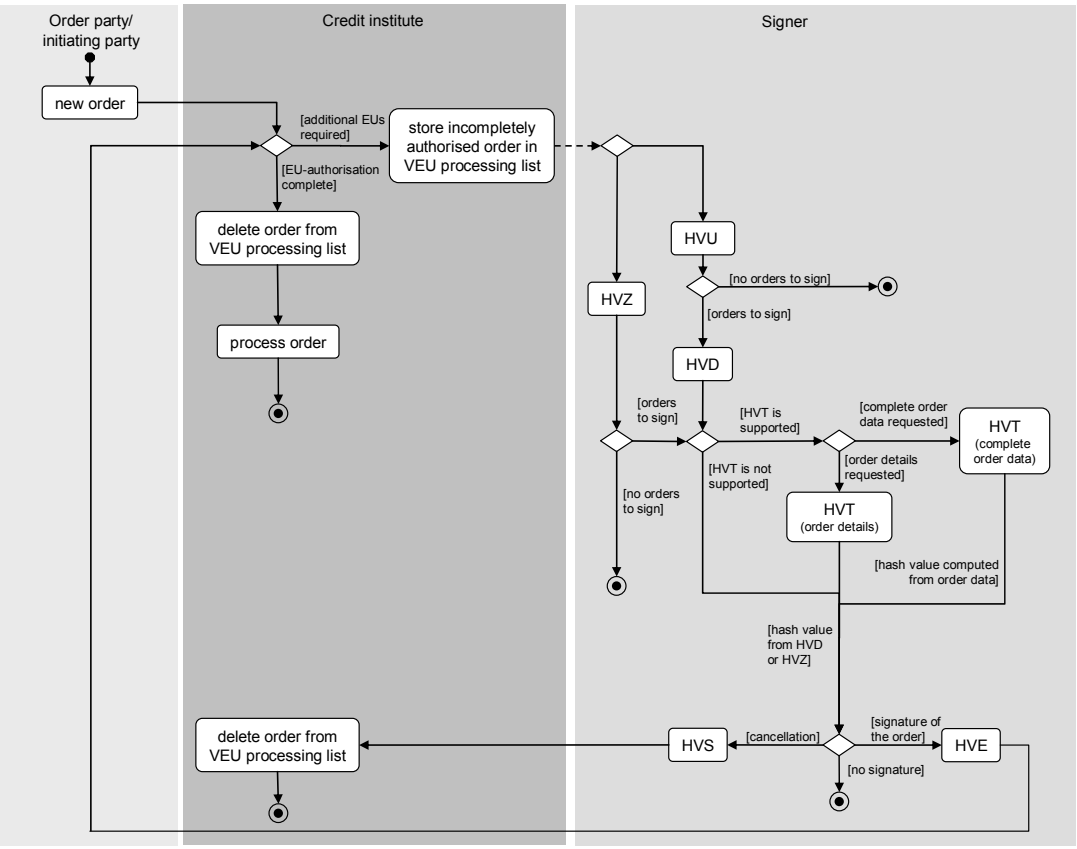


Diagram 71: Flow diagram for VEU

8.2 Technical implementation of the VEU

- A subscriber initiates VEU processing by submitting an order with an insufficient number of bank-technical signatures of the necessary authorisation class. The order is submitted in an EBICS transaction with order attributes “OZHNN”. In all cases, this order must be submitted with a signature (either with a bank-technical signature of class “A”, “B” or “E”, or with a transport signature of signature class “T”).

- The bank system first verifies the supplied ES(s) and the authorisation of the subscribers for the order type in question. It then compares the number and signature class of the supplied ES(s) with the locally-deposited ES requirements for the order type in question. If signatures are still outstanding, the order is placed in VEU processing together with the ES’s that have already been provided.

- Information on orders that are currently in VEU processing can be retrieved via VEU order types “HVU” , “HVZ”, “HVD” and “HVT”. Necessary parameters to demarcate the original orders are transmitted via the additional order parameters `HVUOrderParams`, `HVZOrderParams`, `HVDOrderParams` or `HVTOrderParams`, which are part of the

control data for these order types. “HVU”, , “HVZ” “HVD” and “HVT” are download transactions wherein the reply information is transparently embedded into the order data field in the form of XML documents. “Transparent” means: The XML structures are interpreted in binary and are compressed, encoded and coded before transmission just like the order data of other order types.

- In the case of order types HVE/HVS, a subscriber can retrieve the necessary data for identification of the original order (hash value of the order, order type, order number) in the following ways:

  - HVU & HVD: With HVU, they retrieve the order type and order number, with HVD the hash value of the order. Here, the hash value originates from the ES of the subscriber that submitted the order.
  - HVZ as an alternative of HVU & HVD: With HVZ, the subscriber retrieves the order type and order number as well as the hash value of the order. The hash value originates from the submitter's ES of the order.
  - HVU & HVT: With HVU, the subscriber retrieves the order type and order number as in the case of „HVU & HVD". With HVT, they can set the switch `completeOrderData="true"` in the request (`HVTOrderParams`) and thus receive the complete order file. They can work out the hash value themselves from this.
  - HVZ & HVT: With HVZ, the subscriber retrieves the order type and order number as well as the hash value of the order as described above. HVT allows him to set the switch `completeOrderData="true"` with the request (`HVTOrderParams`), thus giving him the opportunity to obtain the complete order file.
  - Via an alternative communication channel: The subscriber is at liberty to acquire the information without the help of the EBICS interface. If they already know the order type and the order number, they can dispense with retrieval via HVU. If they also have the correct hash value for the order, retrieval via HVD, HVT or HVZ respectively can also be dispensed with.

- New ES’s can be assigned to the order via the VEU order type HVE. Here, identification of the original order takes place via the additional order parameters `HVEOrderParams`, which are components of the control data for an HVE order. The ES that is to be supplied for the order data of the original order is transmitted during the initialisation step. HVE contains one or more ES(s) but no order data, and is hence to be marked with the order attribute “UZHNN”.

- As soon as the required number of ES’s with suitable authorisation has been submitted for the order type in question, the original order is released from VEU processing and forwarded for further order processing. In this way, the order no longer appears in the return list of orders to be signed when “HVU” (or HVZ) is next implemented.

- VEU cancellation can be initiated via order type HVS. As with HVE, identification of the original order takes place via the additional order parameters (here `HVSOrderParams`), which are components of the control data for an HVS order. As with HVE, the authorising ES for the cancellation via order data of the original order is transmitted in the initialisation step. HVS also contains one or more ES(s) but no order data, and is hence to be marked with the order attribute “UZHNN”.
  An order cancellation is effective immediately, and always requires one single authorised

signature of class “E”, “A” or “B”. A cancelled order is removed from the VEU processing; it is not forwarded for further order processing. Furthermore, it is no longer contained in the list of orders to be signed in the event of a repeated release of “HVU” (or HVZ).

8.3 Detailed description of the VEU order types

This chapter will exclusively cover the differences and additions in comparison with EBICS standard orders (see Chapter 5). No more process flows will be explained (see Chapter 8.1 and 8.2), instead syntax and semantics for each individual VEU order type (request and response) will be defined for the relevant elements and attributes of the XML schema, and these will be explained by way of examples.

Definition of the VEU order elements (VEU order parameters and VEU order data) is given in the XML schema “ebics_orders_H004.xsd”. Type definitions are given, in part, in the XML schema “ebics_types_H004.xsd”. With the textual representations, the relevant passages from “ebics_orders_H004.xsd” and “ebics_types_H004.xsd” are listed in summary.

8.3.1 HVU (download VEU overview) and HVZ (Download VEU overview with additional information)

A subscriber can use HVU to list the orders for which they are authorised as a signatory. As a filter criterion, they can restrict the list in “request” to specific order types (`OrderTypes`). In addition to the order designation, the “response” also contains the size of the order data, signature conditions and information on the initiating party and the previous signatories (`OrderDetails`).

Apart from all information of HVU the response message of the order type HVZ also contains data of HVD. Therefore, the order type HVZ ("Download VEU overview with additional information") may be compared to a combination of HVU with 1 to n HVDs.

HVU and HVZ are order types of the type “download”.

8.3.1.1 HVU request

In the HVU request, the subscriber optionally submits a list of order types as a filter criterion. Only orders whose order type is contained in the submitted list are returned. If the subscriber does not submit an order type list as a restriction, they will receive a list of all order types for which they are authorised as a signatory.

Characteristics of `OrderParams` (order parameters) for HVU: `HVUOrderParams`

8.3.1.1.1 XML schema (graphical representation)

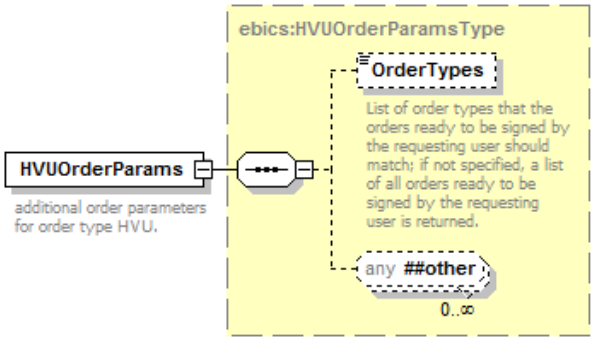


Diagram 72: HVUOrderParams

8.3.1.1.2 XML schema (textual representation)

```
<element name="HVUOrderParams" type="ebics:HVUOrderParamsType"
substitutionGroup="ebics:OrderParams">
   <annotation>
     <documentation xml:lang="en">additional order parameters for order type
HVU.</documentation>
   </annotation>
 </element>
<complexType name="HVUOrderParamsType">
   <annotation>
     <documentation xml:lang="en">Data type for additional order parameters regarding order
type HVU.</documentation>
   </annotation>
   <sequence>
     <element name="OrderTypes" type="ebics:OrderTListType" minOccurs="0">
       <annotation>
         <documentation xml:lang="en">List of order types that the orders ready to be signed
by the requesting user should match; if not specified, a list of all orders ready to be signed
by the requesting user is returned.</documentation>
       </annotation>
     </element>
     <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </sequence>
 </complexType>
```

8.3.1.1.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
HVUOrderParams	ebics:HVUOrderParamsType (complex)	1	Order parameters for order type HVU	- (complex)

OrderTypes	ebics:OrderTListType (→list<ebics:OrderTBaseType> →list<token, length=3, pattern="[A-Z0-9]{3}">)	0..1	List of order types for which orders available for signature are to be retrieved; if not specified, all orders are retrieved for which the subscriber is authorised as a signatory	"IZV"

8.3.1.1.4 Example XML (abridged)

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
 Version="H004" Revision="1">
  <header authenticate="true">
    <static>
      <!-- […] -->
      <OrderDetails>
        <OrderType>HVU</OrderType>
        <OrderAttribute>DZNNN</OrderAttribute>
        <HVUOrderParams>
          <OrderTypes>IZV</OrderTypes>
        </HVUOrderParams>
      </OrderDetails>
      <!-- […] -->
    </static>
    <!-- […] -->
  </header>
  <!-- […] -->
</ebicsRequest>
```

8.3.1.2 HVU response

In the HVU response, the subscriber is given information as to the orders for which they are authorised as signatories.

Characteristics of the (decoded & decrypted & decompressed) `OrderData` (order data) for HVU: `HVUResponseOrderData`

8.3.1.2.1 XML schema (graphic representation)

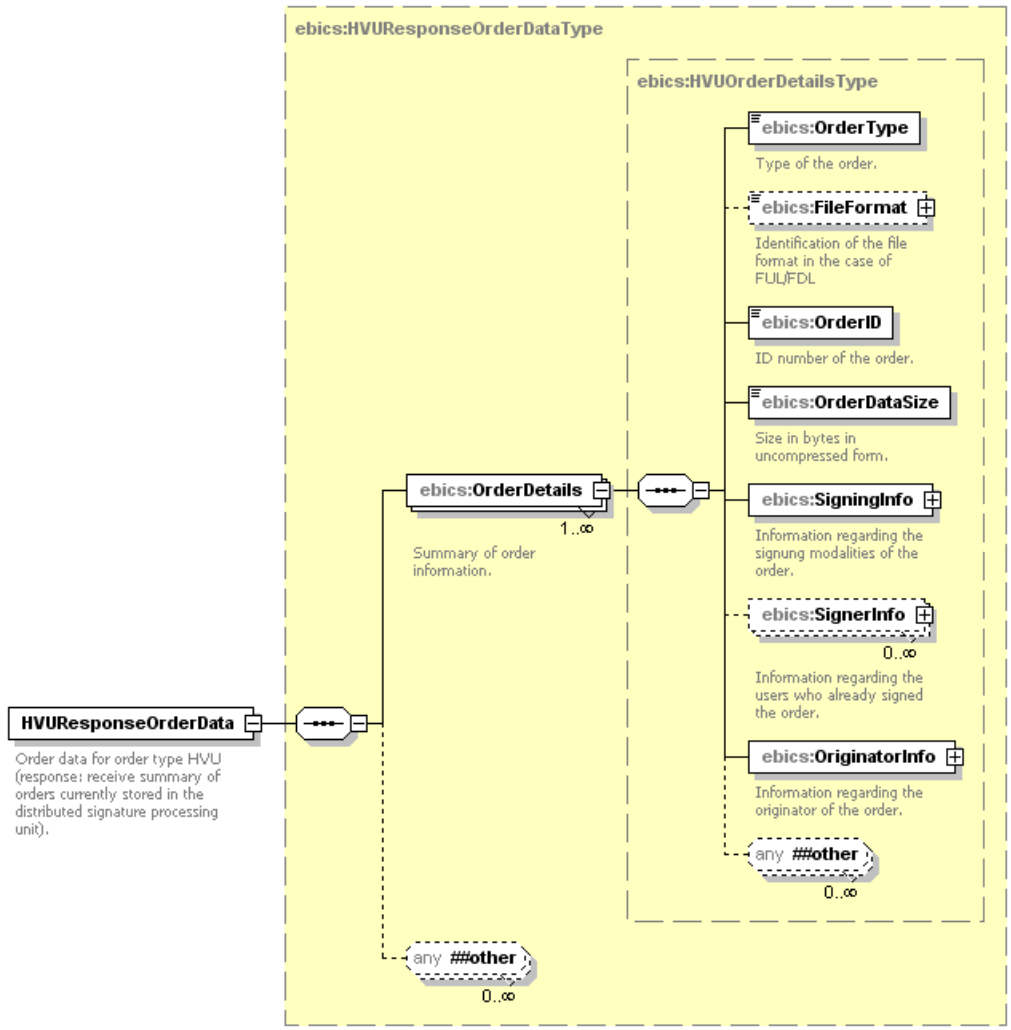


Diagram 73: HVUResponseOrderData

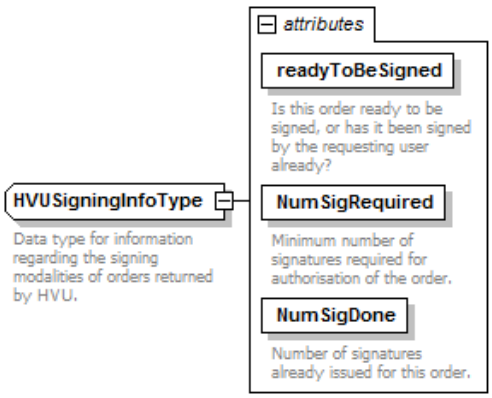


Diagram 74: HVUSigningInfoType (to SigningInfo)

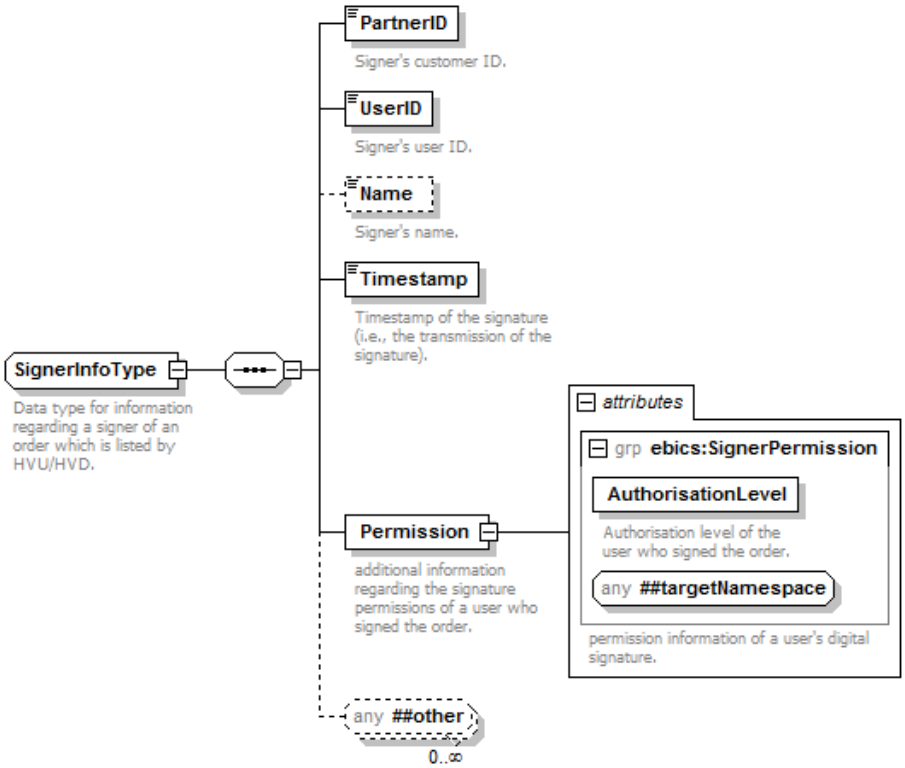


Diagram 75: SignerInfoType (to SignerInfo)

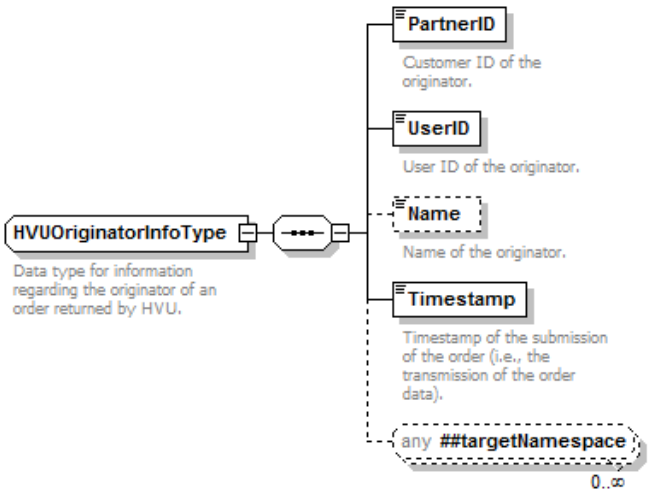


Diagram 76: HVUOriginatorInfoType (to OriginatorInfo)

8.3.1.2.2 XML schema (textual representation)

```
 <element name="HVUResponseOrderData" type="ebics:HVUResponseOrderDataType"
substitutionGroup="ebics:EBICSOrderData">
   <annotation>
     <documentation xml:lang="en">Order data for order type HVU (response: receive summary of
orders currently stored in the distributed signature processing unit).</documentation>
   </annotation>
 </element>
 <complexType name="HVUResponseOrderDataType">
   <annotation>
     <documentation xml:lang="en">Data type for order data regarding order type HVU (response:
receive summary of orders currently stored in the distributed signature processing
unit).</documentation>
   </annotation>
   <sequence>
     <annotation>
       <documentation xml:lang="de"/>
     </annotation>
     <element name="OrderDetails" type="ebics:HVUOrderDetailsType" maxOccurs="unbounded">
       <annotation>
         <documentation xml:lang="en">Summary of order information.</documentation>
       </annotation>
     </element>
     <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </sequence>
 </complexType>
 <complexType name="HVUOrderDetailsType">
   <annotation>
     <documentation xml:lang="en">Data type for order details regarding order type
HVU.</documentation>
   </annotation>
   <sequence>
     <element name="OrderType" type="ebics:OrderTBaseType">
       <annotation>
         <documentation xml:lang="en">Type of the order.</documentation>
       </annotation>
     </element>
```

```
      <element name="OrderID" type="ebics:OrderIDType">
        <annotation>
          <documentation xml:lang="en">ID number of the order.</documentation>
        </annotation>
      </element>
      <element name="OrderDataSize" type="positiveInteger">
        <annotation>
          <documentation xml:lang="en">Size in bytes of the order in uncompressed
form.</documentation>
        </annotation>
      </element>
      <element name="SigningInfo" type="ebics:HVUSigningInfoType">
        <annotation>
          <documentation xml:lang="en">Information regarding the signing modalities of the
order.</documentation>
        </annotation>
      </element>
      <element name="SignerInfo" type="ebics:SignerInfoType" minOccurs="0"
maxOccurs="unbounded">
        <annotation>
          <documentation xml:lang="en">Information regarding the users who already signed the
order.</documentation>
        </annotation>
      </element>
      <element name="OriginatorInfo" type="ebics:HVUOriginatorInfoType">
        <annotation>
          <documentation xml:lang="en">Information regarding the originator of the
order.</documentation>
        </annotation>
      </element>
      <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
  </complexType>
  <complexType name="HVUSigningInfoType">
    <annotation>
      <documentation xml:lang="en">Data type for information regarding the signing modalities
of orders returned by HVU.</documentation>
    </annotation>
    <attribute name="readyToBeSigned" type="boolean" use="required">
      <annotation>
        <documentation xml:lang="en">Is this order ready to be signed, or has it been signed by
the requesting user already?</documentation>
      </annotation>
    </attribute>
    <attribute name="NumSigRequired" type="positiveInteger" use="required">
      <annotation>
        <documentation xml:lang="en">Minimum number of signatures required for authorisation of
the order.</documentation>
      </annotation>
    </attribute>
    <attribute name="NumSigDone" type="nonNegativeInteger" use="required">
      <annotation>
        <documentation xml:lang="en">Number of signatures already issued for this
order.</documentation>
      </annotation>
    </attribute>
  </complexType>
  <complexType name="SignerInfoType">
    <annotation>
      <documentation xml:lang="en">Data type for information regarding a signer of an order
which is listed by HVU/HVD.</documentation>
    </annotation>
    <sequence>
      <element name="PartnerID" type="ebics:PartnerIDType">
```

```
        <annotation>
          <documentation xml:lang="en">Signer's customer ID.</documentation>
        </annotation>
      </element>
      <element name="UserID" type="ebics:UserIDType">
        <annotation>
          <documentation xml:lang="en">Signer's user ID.</documentation>
        </annotation>
      </element>
      <element name="Name" type="ebics:NameType" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Signer's name.</documentation>
        </annotation>
      </element>
      <element name="Timestamp" type="ebics:TimestampType">
        <annotation>
          <documentation xml:lang="en">Timestamp of the signature (i.e., the transmission of
the signature).</documentation>
        </annotation>
      </element>
      <element name="Permission">
        <annotation>
          <documentation xml:lang="en">additional information regarding the signature
permissions of a user who signed the order.</documentation>
        </annotation>
        <complexType>
          <attributeGroup ref="ebics:SignerPermission"/>
        </complexType>
      </element>
      <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
  </complexType>
  <complexType name="HVUOriginatorInfoType">
    <annotation>
      <documentation xml:lang="en">Data type for information regarding the originator of an
order returned by HVU.</documentation>
    </annotation>
    <sequence>
      <element name="PartnerID" type="ebics:PartnerIDType">
        <annotation>
          <documentation xml:lang="en">Customer ID of the originator.</documentation>
        </annotation>
      </element>
      <element name="UserID" type="ebics:UserIDType">
        <annotation>
          <documentation xml:lang="en">User ID of the originator.</documentation>
        </annotation>
      </element>
      <element name="Name" type="ebics:NameType" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Name of the originator.</documentation>
        </annotation>
      </element>
      <element name="Timestamp" type="ebics:TimestampType">
        <annotation>
          <documentation xml:lang="en">Timestamp of the submission of the order (i.e., the
transmission of the order data).</documentation>
        </annotation>
      </element>
      <any namespace="##targetNamespace" processContents="strict" minOccurs="0"
maxOccurs="unbounded"/>
    </sequence>
  </complexType>
```

```
 <attributeGroup name="SignerPermission">
   <annotation>
     <documentation xml:lang="en">permission information of a user's digital
signature.</documentation>
   </annotation>
   <attribute name="AuthorisationLevel" type="ebics:AuthorisationLevelType" use="required">
     <annotation>
       <documentation xml:lang="en">Authorisation level of the user who signed the
order.</documentation>
     </annotation>
   </attribute>
   <anyAttribute namespace="##targetNamespace" processContents="strict"/>
 </attributeGroup>
```

8.3.1.2.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
HVUResponse» OrderData	ebics:HVUResponse» OrderDataType (complex)	1	XML order data for order type HVU	- (complex)
OrderDetails	ebics:HVUOrder» DetailsType (complex)	1..∞	Order information for order type HVU	- (complex)
OrderType	ebics:OrderTBaseType (→token, length=3, pattern="[A-Z0-9]{3}")	1	Order type of the order submitted for VEU	“IZV”
FileFormat	FileFomatType (complex) (→token)	0..1	File format of the order Annotation: To be used if OrderType = “FUL” or “FDL”	
FileFormat» @CountryCode	CountryCodeType (→token, length=2, pattern= " [A-Z]{2,2}")		Information on the format's field of application (e.g. country-specific formats)	“FR”…
OrderID	ebics:OrderIDType (→token, fixLength=4)	1	Order number of the order submitted for VEU	“OR01”
OrderDataSize	positiveInteger	1	Size of the uncompressed order data of the order submitted for VEU in bytes	123456
SigningInfo	ebics:HVUSigning» InfoType (complex)	1	Information on the signature modalities	- (complex)
SigningInfo» @readyToBeSigned	boolean	1	Is the order ready for signature (true) or already signed by the subscriber (false)?	“true”
SigningInfo» @NumSigRequired	positiveInteger	1	Total number of ES’s required for activation	4
SigningInfo» @numSigDone	nonNegativeInteger	1	Number of ES’s already provided	2

SignerInfo	ebics:SignerInfo» Type (complex)	0..∞	Information on previous signatories	- (complex)
PartnerID (in SignerInfo)	ebics:PartnerIDType (→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})	1	Customer ID of the signatory	"CUSTM001"
UserID (in SignerInfo)	ebics:UserIDType (→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})	1	Subscriber ID of the signatory	"USR100"
Name (in SignerInfo)	ebics:NameType (→normalizedString)	0..1	Signatory's name	"John Doe"
Timestamp (in SignerInfo)	ebics:TimestampType (→dateTime)	1	Time stamp of the signature (i.e. transmission of the signature)	"2005-01-31T» 16:30:45.123Z"
Permission	– (complex)	1	Additional authorisation information relating to the subscriber that acted as signatory	- (complex)
Permission» @Authorisation» Level	ebics:Authorisation» LevelType (→token, length=1: "E", "A", "B", "T")	1	Signature authorisation of the subscriber that acted as signatory	"A"
OriginatorInfo	ebics:HVUOriginator» InfoType (complex)	1	Information on the initiating party	- (complex)
PartnerID (in OriginatorInfo)	ebics:PartnerIDType (→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})	1	Customer ID of the initiating party	"CUSTM001"
UserID (in OriginatorInfo)	ebics:UserIDType (→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})	1	Subscriber ID of the initiating party	"USR300"
Name (in OriginatorInfo)	ebics:NameType (→normalizedString)	0..1	Name of the initiating party	"Ophelia Originator"
Timestamp (in OriginatorInfo)	ebics:TimestampType (→dateTime)	1	Time stamp of the submission (i.e. transmission of the order file)	"2005-01-30T» 15:30:45.123Z"

8.3.1.2.4 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<HVUResponseOrderData
 xmlns="urn:org:ebics:H004"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_orders_H004.xsd">
 <OrderDetails>
   <OrderType>IZV</OrderType>
   <OrderID>OR01</OrderID>
   <OrderDataSize>123456</OrderDataSize>
```

```
    <SigningInfo NumSigRequired="4" readyToBeSigned="true" NumSigDone="2"/>
    <SignerInfo>
      <PartnerID>CUSTM001</PartnerID>
      <UserID>USR100</UserID>
      <Name>John Doe</Name>
      <Timestamp>2005-01-31T16:30:45.123Z</Timestamp>
      <Permission AuthorisationLevel="A"/>
    </SignerInfo>
    <SignerInfo>
      <PartnerID>CUSTM002</PartnerID>
      <UserID>USR200</UserID>
      <Name>Jackie Smith</Name>
      <Timestamp>2005-01-31T17:30:45.123Z</Timestamp>
      <Permission AuthorisationLevel="B"/>
    </SignerInfo>
    <OriginatorInfo>
      <PartnerID>CUSTM001</PartnerID>
      <UserID>USR300</UserID>
      <Name>Ophelia Originator</Name>
      <Timestamp>2005-01-30T15:30:45.123Z</Timestamp>
    </OriginatorInfo>
  </OrderDetails>
</HVUResponseOrderData>
```

8.3.1.3 HVZ request

In the HVZ request, the subscriber optionally submits a list of order types as a filter criterion. Only orders whose order type is contained in the submitted list are returned. If the subscriber does not submit an order type list as a restriction, they will receive a list of all order types for which they are authorised as a signatory.

Characteristics of `OrderParams` (order parameters) for HVZ: `HVUOrderParams`

8.3.1.3.1 XML schema (graphical representation)

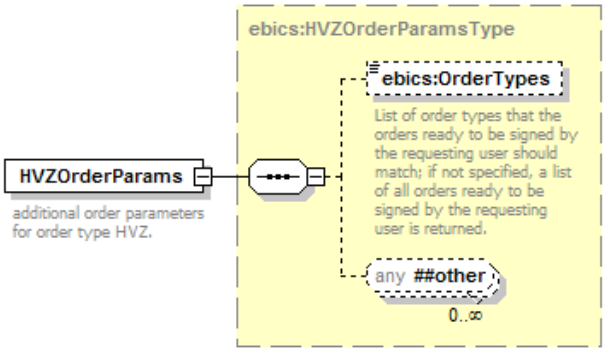


Diagram 77: HVZOrderParams

8.3.1.3.2 XML schema (textual representation)

```
<element name="HVZOrderParams" type="ebics:HVZOrderParamsType"
substitutionGroup="ebics:OrderParams">
   <annotation>
     <documentation xml:lang="en">additional order parameters for order type
HVZ.</documentation>
   </annotation>
 </element>
<complexType name="HVZOrderParamsType">
   <annotation>
     <documentation xml:lang="en">Data type for additional order parameters regarding order
type HVZ.</documentation>
   </annotation>
   <sequence>
     <element name="OrderTypes" type="ebics:OrderTListType" minOccurs="0">
       <annotation>
         <documentation xml:lang="en">List of order types that the orders ready to be signed
by the requesting user should match; if not specified, a list of all orders ready to be signed
by the requesting user is returned.</documentation>
       </annotation>
     </element>
     <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </sequence>
 </complexType>
```

8.3.1.3.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
HVZOrderParams	ebics:HVZOrderParamsType (complex)	1	Order parameters for order type HVZ	- (complex)
OrderTypes	ebics:OrderTListType (→list<ebics:OrderTBaseType> →list<token, length=3, pattern="[A-Z0-9]{3}">)	0..1	List of order types for which orders available for signature are to be retrieved; if not specified, all orders are retrieved for which the subscriber is authorised as a signatory	"IZV"

8.3.1.3.4 Example XML (abridged)

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
 Version="H004" Revision="1">
  <header authenticate="true">
    <static>
      <!-- […] -->
      <OrderDetails>
        <OrderType>HVZ</OrderType>
        <OrderAttribute>DZNNN</OrderAttribute>
        <HVZOrderParams>
          <OrderTypes>IZV</OrderTypes>
        </HVZOrderParams>
```

```
      </OrderDetails>
      <!-- […] -->
    </static>
    <!-- […] -->
  </header>
  <!-- […] -->
</ebicsRequest>
```

8.3.1.4 HVZ response

In the HVZ response, the subscriber is given information as to the orders for which they are authorised as signatories.

HVZResponseOrderData contains the complete information of HVUResponseOrderData and HVDResponseOrderData with the exception of the element "DisplayFile" containing the file display. As with HVD, the order's hash value is extracted from the ES of the first signatory of the order and is recalculated if the subscriber executing HVZ uses a different signature process. In order to make this evident, the hash value is provided with an attribute containing the signature process used.
Only for payment orders additional information of the file display is returned if available:

- total transaction amount for all logical files
- total transaction number for all logical files
- currency (only if identical across all transactions, skip otherwise)

For DTAUS/DTAZV: Ordering party, account number / IBAN and bank code / BIC of the first transaction of the first logical file
Characteristics of the (decoded & decrypted & decompressed) `OrderData` (order data) for HVZ: `HVZResponseOrderData`

8.3.1.4.1 XML-Schema (graphic representation)

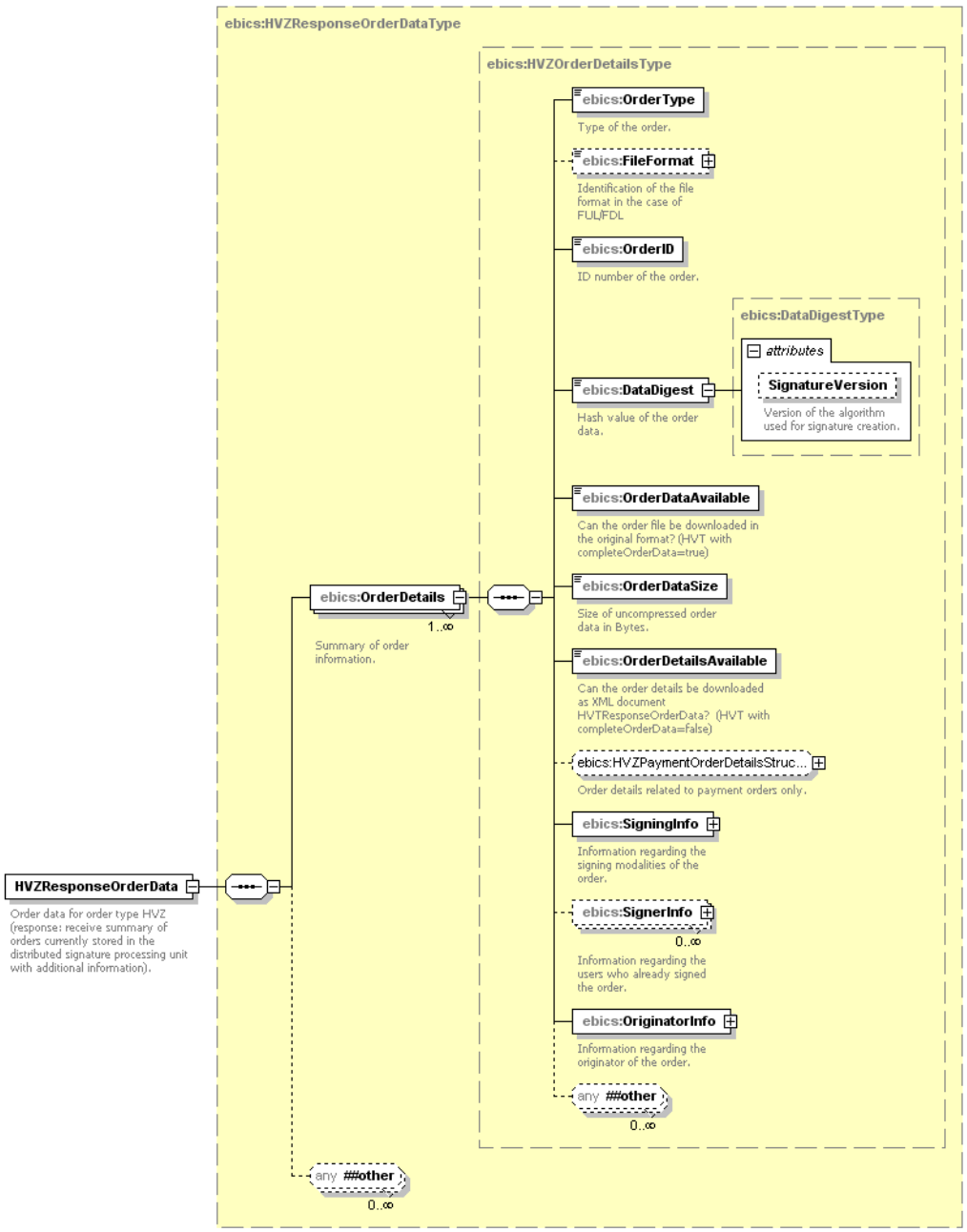


Diagram 78: HVZResponseOrderData

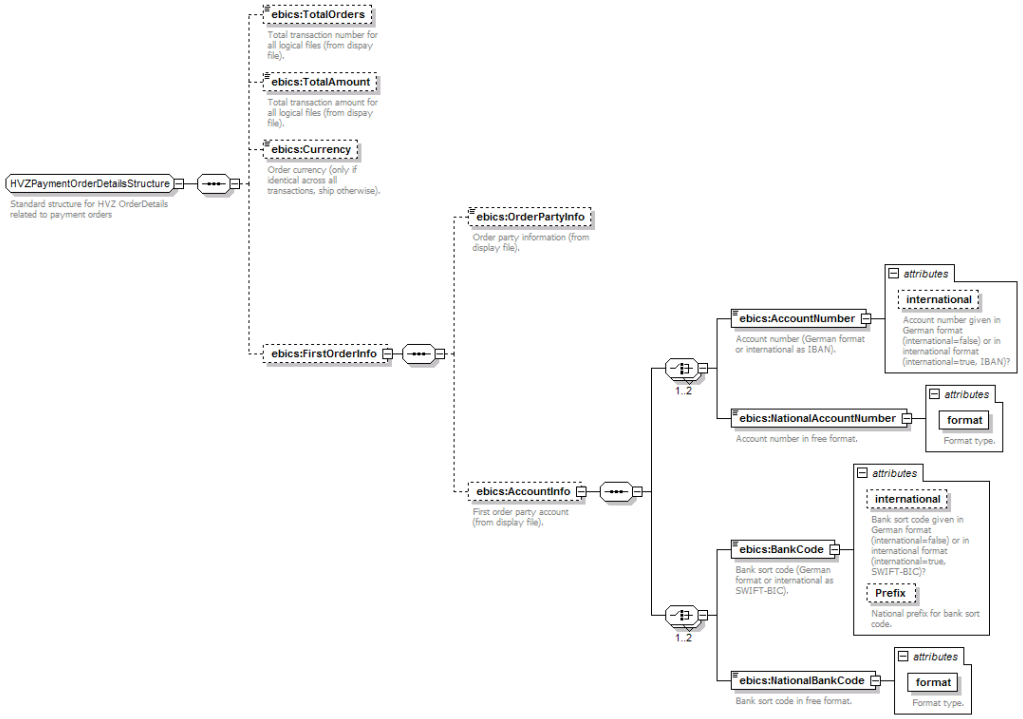


Diagram 79 HVZPaymentOrderDetailsStructure

8.3.1.4.2 XML schema (textual representation)

```
 <element name="HVZResponseOrderData" type="ebics:HVZResponseOrderDataType"
substitutionGroup="ebics:EBICSOrderData">
   <annotation>
     <documentation xml:lang="en">Order data for order type HVZ (response: receive summary of
orders with additional informations currently stored in the distributed signature processing
unit).</documentation>
   </annotation>
 </element>
 <complexType name="HVZResponseOrderDataType">
   <annotation>
     <documentation xml:lang="en">Data type for order data regarding order type HVZ (response:
receive summary of orders with additional informations currently stored in the distributed
signature processing unit).</documentation>
   </annotation>
   <sequence>
     <annotation>
       <documentation xml:lang="en"/>
     </annotation>
     <element name="OrderDetails" type="ebics:HVZOrderDetailsType" maxOccurs="unbounded">
       <annotation>
         <documentation xml:lang="en">Summary of order information.</documentation>
       </annotation>
     </element>
     <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </sequence>
```

```
 </complexType>
 <complexType name="HVZOrderDetailsType">
   <annotation>
     <documentation xml:lang="en">Data type for order details regarding order type
HVZ.</documentation>
   </annotation>
   <sequence>
     <element name="OrderType" type="ebics:OrderTBaseType">
       <annotation>
         <documentation xml:lang="en">Type of the order.</documentation>
       </annotation>
     </element>
     <element name="OrderID" type="ebics:OrderIDType">
       <annotation>
         <documentation xml:lang="en">ID number of the order.</documentation>
       </annotation>
     </element>
     <element name="DataDigest" type="ebics:DigestType">
         <annotation>
            <documentation xml:lang="en">
               Hash value of the order data.
            </documentation>
         </annotation>
      </element>
      <element name="OrderDataAvailable" type="boolean">
         <annotation>
            <documentation xml:lang="en">
               Can the order file be downloaded in the original format? (HVT with
completeOrderData=true).
            </documentation>
         </annotation>
      </element>
      <element name="OrderDataSize" type="positiveInteger">
         <annotation>
            <documentation xml:lang="de">
               Size of the uncompressed order data (byte count).
            </documentation>
         </annotation>
      </element>
      <element name="OrderDetailsAvailable" type="boolean">
         <annotation>
            <documentation xml:lang="en">
               Can the order details be downloaded as XML document HVTResponseOrderData? (HVT
with completeOrderData=false).
            </documentation>
         </annotation>
      </element>
     <group ref="ebics:HVZPaymentOrderDetailsStructure"
         minOccurs="0">
         <annotation>
            <documentation xml:lang="en">
               Order details related to payment orders only.
            </documentation>
         </annotation>
      </group>
      <element name="SigningInfo" type="ebics:HVUSigningInfoType">
         <annotation>
            <documentation xml:lang="en">
               Information regarding the signing modalities of the order.
            </documentation>
         </annotation>
      </element>
      <element name="SignerInfo" type="ebics:SignerInfoType"
         minOccurs="0" maxOccurs="unbounded">
         <annotation>
            <documentation xml:lang="en">
               Information about the already existing signers.
            </documentation>
         </annotation>
      </element>
      <element name="OriginatorInfo"
         type="ebics:HVUOriginatorInfoType">
```

```
         <annotation>
            <documentation xml:lang="en">
               Information regarding the originator of the order.
            </documentation>
         </annotation>
      </element>
      <any namespace="##other" processContents="lax" minOccurs="0"
         maxOccurs="unbounded" />
   </sequence>
</complexType>
<group name="HVZPaymentOrderDetailsStructure">
   <annotation>
      <documentation xml:lang="de">
         Struktur mit zusätzlichen Auftragsdetails in
         HVZResponseOrderData für Zahlungsaufträge.
      </documentation>
      <documentation xml:lang="en">
         Structure with additional order details in HVZResponseOrderData
         related to payment orders.
      </documentation>
   </annotation>
   <sequence>
      <element name="TotalOrders" type="nonNegativeInteger"
         minOccurs="0">
         <annotation>
            <documentation xml:lang="de">
               Anzahl der Zahlungssätze über alle logischen Dateien
               entsprechend Dateianzeige.
            </documentation>
            <documentation xml:lang="en">
               Total transaction number for all logical files (from
               dispay file).
            </documentation>
         </annotation>
      </element>
      <element name="TotalAmount" minOccurs="0">
         <annotation>
            <documentation xml:lang="de">
               Summe der Beträge über alle logische Dateien entsprechend
               Dateianzeige.
            </documentation>
            <documentation xml:lang="en">
               Total transaction amount for all logical files (from
               display file).
            </documentation>
         </annotation>
  <simpleType>
            <restriction base="ebics:AmountValueType" />
         </simpleType>
      </element>
      <element name="Currency" type="ebics:CurrencyBaseType"
         minOccurs="0">
         <annotation>
            <documentation xml:lang="de">
               Auftragswährung (nur bei sortenreinen Zahlungen, sonst
               keine Angabe).
            </documentation>
            <documentation xml:lang="en">
               Order currency (only if identical across all
               transactions, skip otherwise).
            </documentation>
         </annotation>
      </element>
      <element name="FirstOrderInfo" minOccurs="0">
         <annotation>
            <documentation xml:lang="de">
               Informationen aus Dateianzeige der ersten logischen
               Datei.
            </documentation>
            <documentation xml:lang="en">
               Order details from display file for first logical file.
            </documentation>
         </annotation>
         <complexType>
            <sequence>
               <element name="OrderPartyInfo" type="normalizedString"
```

```
                minOccurs="0">
                <annotation>
                   <documentation xml:lang="de">
                      Auftraggeber entsprechend Dateianzeige.
                   </documentation>
                   <documentation xml:lang="en">
                      Order party information (from display file).
                   </documentation>
                </annotation>
             </element>
             <element name="AccountInfo" minOccurs="0">
                <annotation>
                   <documentation xml:lang="de">
                      Erstes Auftraggeberkonto entsprechend
                      Dateianzeige.
                   </documentation>
                   <documentation xml:lang="en">
                      First order party account (from display file).
                   </documentation>
                </annotation>
                <complexType>
                   <sequence>
                      <choice maxOccurs="2">
                         <element name="AccountNumber">
                            <annotation>
                               <documentation xml:lang="de">
                                  Kontonummer (deutsches Format oder
                                  international als IBAN).
                               </documentation>
                               <documentation xml:lang="en">
                                  Account number (German format or
                                  international as IBAN).
                               </documentation>
                            </annotation>
                            <complexType>
                               <simpleContent>
                                  <extension
                                     base="Q1:AccountNumberType">
                                     <attribute name="international"
                                        type="boolean" use="optional"
                                        default="false">
                                        <annotation>
                                           <documentation
                                              xml:lang="de">
                                              Ist die Kontonummer im
                                              deutschen Format
                                              (international=false)
                                              oder im internationalen
                                              Format
                                              (international=true,
                                              IBAN) angegeben?
                                           </documentation>
                                           <documentation
                                              xml:lang="en">
                                              Account number given in
                                              German format
                                              (international=false) or
                                              in international format
                                              (international=true,
                                              IBAN)?
                                           </documentation>
                                        </annotation>
                                     </attribute>
                                  </extension>
                               </simpleContent>
                            </complexType>
                         </element>
                         <element name="NationalAccountNumber">
                            <annotation>
                               <documentation xml:lang="de">
                                  Kontonummer im freien Format.
                               </documentation>
                               <documentation xml:lang="en">
                                  Account number in free format.
                               </documentation>
                            </annotation>
```

```
                <complexType>
                   <simpleContent>
                      <extension
                         base="Q1:NationalAccountNumberType">
                         <attribute name="format"
                            type="token" use="required">
                            <annotation>
                               <documentation
                                  xml:lang="de">
                                  Formatkennung.
                               </documentation>
                               <documentation
                                  xml:lang="en">
                                  Format type.
                               </documentation>
                            </annotation>
                         </attribute>
                      </extension>
                   </simpleContent>
                </complexType>
             </element>
          </choice>
          <choice maxOccurs="2">
             <element name="BankCode">
                <annotation>
                   <documentation xml:lang="de">
                      Bankleitzahl (deutsches Format oder
                      international als SWIFT-BIC).
                   </documentation>
                   <documentation xml:lang="en">
                      Bank sort code (German format or
                      international as SWIFT-BIC).
                   </documentation>
                </annotation>
                <complexType>
                   <simpleContent>
                      <extension base="Q1:BankCodeType">
                         <attribute name="international"
                            type="boolean" use="optional"
                            default="false">
                            <annotation>
                               <documentation
                                  xml:lang="de">
                                  Ist die Bankleitzahl im
                                  deutschen Format
                                  (international=false,
                                  BLZ) oder im
                                  internationalen Format
                                  (international=true,
                                  SWIFT-BIC) angegeben?
                               </documentation>
                               <documentation
                                  xml:lang="en">
                                  Bank sort code given in
                                  German format
                                  (international=false) or
                                  in international format
                                  (international=true,
                                  SWIFT-BIC)?
                               </documentation>
                            </annotation>
                         </attribute>
                         <attribute name="Prefix"
                            type="ebics:BankCodePrefixType"
                            use="optional">
                            <annotation>
                               <documentation
                                  xml:lang="de">
                                  nationales Präfix für
                                  Bankleitzahlen.
                               </documentation>
                               <documentation
                                  xml:lang="en">
                                  National prefix for bank
                                  sort code.
                               </documentation>
```

```
                                    </annotation>
                                </attribute>
                            </extension>
                        </simpleContent>
                    </complexType>
                </element>
                <element name="NationalBankCode">
                    <annotation>
                        <documentation xml:lang="de">
                            Bankleitzahl im freien Format.
                        </documentation>
                        <documentation xml:lang="en">
                            Bank sort code in free format.
                        </documentation>
                    </annotation>
                    <complexType>
                        <simpleContent>
                            <extension
                                base="Q1:NationalBankCodeType">
                                <attribute name="format"
                                    type="token" use="required">
                                    <annotation>
                                        <documentation
                                            xml:lang="de">
                                            Formatkennung.
                                        </documentation>
                                        <documentation
                                            xml:lang="en">
                                            Format type.
                                        </documentation>
                                    </annotation>
                                </attribute>
                            </extension>
                        </simpleContent>
                    </complexType>
                </element>
            </choice>
        </sequence>
    </complexType>
</element>
</sequence>
</complexType>
</element>
</sequence>
</group>
```

8.3.1.4.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
`HVZResponse» OrderData`	`ebics:HVZResponse» OrderDataType` (complex)	1	XML order data for order type HVZ	- (complex)
`OrderDetails`	`ebics:HVUOrder» DetailsType` (complex)	1..∞	Order information for order type HVZ	- (complex)
`OrderType`	`ebics:OrderTBaseType (→token, length=3, pattern="[A-Z0-9]{3}")`	1	Order type of the order submitted for VEU	“IZV”
`FileFormat`	`FileFomatType` (complex) `(→token)`	0..1	File format of the order Annotation: To be used if `OrderType` = “FUL” or “FDL”	
`FileFormat» @CountryCode`	`CountryCodeType (→token, length=2, pattern=`		Information on the format's field of	“FR”…

	" [A-Z]{2,2}")		application (e.g. country-specific formats)	
OrderID	ebics:OrderIDType (→token, maxLength=4)	1	Order number of the order submitted for VEU	"OR01"
DataDigest	ebics:DigestType (→dsig:DigestValue» Type →base64Binary)	1	Hash value from the ES for the signature process used by the subscriber according to the Request-Element User-ID	- (base64 data)
DataDigest» @SignatureVersion	ebics:Signature»Version Type (→token, length=4, pattern="A\d{3}"		Version of the signature process used by the subscriber according to the Request-Element UserID	e.g. „A005"
OrderDataAvailable	boolean	1	Can the order file be downloaded in the original format? (HVT with completeOrderData= true)	true
OrderDataSize	positiveInteger	1	Size of the uncompressed order data of the order submitted for VEU in bytes	123456
OrderDetails» Available	boolean	1	Can the order details be downloaded as XML document HVTResponseOrderData ? (HVT with completeOrderData= false)	true
TotalOrders	nonNegativeInteger	0..1	Total transaction number for all logical files (from dispay file).	15
TotalAmount	ebics:AmountValue» Type (→decimal, totalDigits=24, fractionDigits=4)	0..1	Total transaction amount for all logical files (from dispay file).	129.00
TotalAmount» @isCredit	boolean	0..1	Flag for differentiation between credit notes (isCredit="true") and debit notes (isCredit="false"). (optional use; usable if identical across all transactions, skip otherwise).	"false"

Currency	ebics:CurrencyBase»Type (→token, length=3, pattern="[A-Z]{3}")	0..1	Order currency (only if identical across all transactions, skip otherwise).	„USD“
FirstOrderInfo	(complex)	0..1	Order details from display file for first logical file.	- (complex)
OrderPartyInfo	normalizedString	0..1	Order party information (from display file).	„Arnold Smith“
AccountInfo	complex	0..1		- (complex)
-	-	1..2	Information about the account number: AccountNumber and/or NationalAccountNumber	-
AccountNumber	ebics:AccountNumber»Type (→token, maxLength=40, pattern="\d{3,10}|([A-Z]{2}\d{2}[A-Za-z0-9]{3,30}")	1	Account number (German format or international format = IBAN)	„12345678“
AccountNumber»@international	boolean	0..1	Account number given in German format (international=false) or in international format (international=true, IBAN)? Default="false"	„false“
NationalAccount»Number	ebics:National»AccountNumberType (→token, maxLength=40)	1	Account number in free format (neither German nor IBAN)	„1234567890123456“
NationalAccount»Number@format	token	1	format type	„other“
-	-	1..2	Information about Bank sort code: BankCode and/or NationalBankCode	-
BankCode	ebics:BankCodeType (→token, maxLength=11, pattern="\d{8}|([A-Z]{6}[A-Z0-9]{2}([A-Z0-9]{3})?)")	1	German Format or international format (= SWIFT-BIC).	„50010060“
BankCode»@international	boolean	0..1	Bank sort code given in German format (BankCode»@international="false") or in international format (BankCode»	„false“

			@international="true", SWIFT-BIC)? Default="false"	
NationalBankCode	ebics:National» BankCodeType (→token, maxLength=30)	1	Bank sort code in free format (neither German format nor SWIFT-BIC)	„123456789012“
NationalBankCode» @format	token	1	format type	„other“
SigningInfo	ebics:HVUSigning» InfoType (complex)	1	Information on the signature modalities	- (complex)
SigningInfo» @readyToBeSigned	boolean	1	Is the order ready for signature (true) or already signed by the subscriber (false)?	“true”
SigningInfo» @NumSigRequired	positiveInteger	1	Total number of ES’s required for activation	4
SigningInfo» @numSigDone	nonNegativeInteger	1	Number of ES’s already provided	2
SignerInfo	ebics:SignerInfo» Type (complex)	0..∞	Information on previous signatories	- (complex)
PartnerID (in SignerInfo)	ebics:PartnerIDType (→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})	1	Customer ID of the signatory	“CUSTM001”
UserID (in SignerInfo)	ebics:UserIDType (→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})	1	Subscriber ID of the signatory	“USR100“
Name (in SignerInfo)	ebics:NameType (→normalizedString)	0..1	Signatory’s name	“John Doe“
Timestamp (in SignerInfo)	ebics:TimestampType (→dateTime)	1	Time stamp of the signature (i.e. transmission of the signature)	“2005-01-31T» 16:30:45.123Z“
Permission	– (complex)	1	Additional authorisation information relating to the subscriber that acted as signatory	- (complex)
Permission» @Authorisation» Level	ebics:Authorisation» LevelType (→token, length=1: "E", "A", "B", "T")	1	Signature authorisation of the subscriber that acted as signatory	“A“
OriginatorInfo	ebics:HVUOriginator» InfoType (complex)	1	Information on the initiating party	- (complex)
PartnerID (in OriginatorInfo)	ebics:PartnerIDType (→token, maxLength= 35, pattern="[a-zA-Z0-9,=]{1,35})	1	Customer ID of the initiating party	“CUSTM002”
UserID (in	ebics:UserIDType	1	Subscriber ID of the	“USR300“

OriginatorInfo)	(→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})		initiating party	
Name (in OriginatorInfo)	ebics:NameType (→normalizedString)	0..1	Name of the initiating party	"Ophelia Originator"
Timestamp (in OriginatorInfo)	ebics:TimestampType (→dateTime)	1	Time stamp of the submission (i.e. transmission of the order file)	"2005-01-30T» 15:30:45.123Z"

8.3.1.4.4 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<HVZResponseOrderData xmlns="urn:org:ebics:H004"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="urn:org:ebics:H004 ebics_orders_H004.xsd">
   <OrderDetails>
      <OrderType>IZV</OrderType>
      <OrderID>OR01</OrderID>
      <DataDigest SignatureVersion="A004">9H/rQr2Axe9hYTV2n/tCp+3UIQQ=</DataDigest>
      <OrderDataAvailable>true</OrderDataAvailable>
      <OrderDataSize>123456</OrderDataSize>
      <OrderDetailsAvailable>true</OrderDetailsAvailable>
      <TotalOrders>22</TotalOrders>
      <TotalAmount>500.00</TotalAmount>
      <Currency>EUR</Currency>
      <FirstOrderInfo>
         <OrderPartyInfo>Arnold Auftraggeber</OrderPartyInfo>
         <AccountInfo>
            <AccountNumber international="true">
               DE68210501700012345678
            </AccountNumber>
            <BankCode international="false" Prefix="DE">
               21050170
            </BankCode>
         </AccountInfo>
      </FirstOrderInfo>
      <SigningInfo NumSigRequired="4" readyToBeSigned="true"
         NumSigDone="2" />
      <SignerInfo>
         <PartnerID>PARTNER1</PartnerID>
         <UserID>USER0001</UserID>
         <Name>Max Mustermann</Name>
         <Timestamp>2005-01-31T16:30:45.123Z</Timestamp>
         <Permission AuthorisationLevel="A" />
      </SignerInfo>
      <SignerInfo>
         <PartnerID>PARTNER2</PartnerID>
         <UserID>USER0002</UserID>
         <Name>Maxime Musterfrau</Name>
         <Timestamp>2005-01-31T17:30:45.123Z</Timestamp>
         <Permission AuthorisationLevel="B" />
      </SignerInfo>
      <OriginatorInfo>
         <PartnerID>PARTNER1</PartnerID>
         <UserID>USER0001</UserID>
         <Name>Erich Einreicher</Name>
         <Timestamp>2005-01-30T15:30:45.123Z</Timestamp>
      </OriginatorInfo>
```

```
   </OrderDetails>
</HVZResponseOrderData>
```

8.3.2 HVD (retrieve VEU state)

With HVD, a subscriber can retrieve the state of an order that is currently in VEU processing and for which the subscriber is authorised as a signatory. They receive information about the order in the form of an electronic accompanying note (`DisplayFile`) and the order hash value (`DataDigest`) as well as the previous signatories (`SignerInfo`). The bank system has extracted the order's hash value from the ES of the first signatory of the order or it is recalculated if the subscriber executing HVD is using a different signature process. The data of the accompanying note MUST correspond in terms of contents with the order data, the hash value of which is also delivered.

The bank system has to verify whether the subscriber possesses a bank-technical authorisation of signature (signature class E, A or B) for the order on hand and the order is still in the signature folder. If the authorisation is missing, the transaction has to be cancelled and the error code EBICS_DISTRIBUTED_SIGNATURE_AUTHORISATION_FAILED is issued.

- In case of some underlying order types / business transactions, detailed information on a specific order in the VEU processing system cannot be retrieved by means of the transaction HVT. Whether this is possible for the ongoing order or not, is signalized in the HVD response by the bank system.

- Before the execution of HVD, the bank system verifies whether the order is currently located in the VEU processing system and, in case of an error, terminates the transaction returning the business related error code EBICS_ORDERID_UNKNOWN.

HVD is an order type of type "download".

8.3.2.1 HVD request

In the HVD request, the subscriber transfers the relevant data for identification of the order for which they want to retrieve the VEU state.

Characteristics of `OrderParams` (order parameters) for HVD: `HVDOrderParams`

8.3.2.1.1 XML schema (graphical representation)

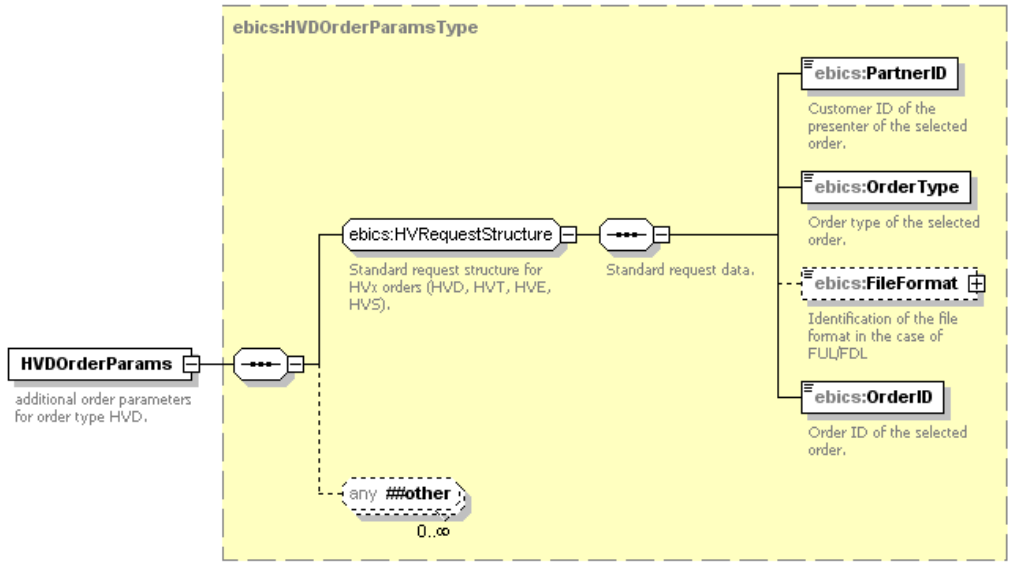


Diagram 80: HVDOrderParams

8.3.2.1.2 XML schema (textual representation)

```
 <element name="HVDOrderParams" type="ebics:HVDOrderParamsType"
substitutionGroup="ebics:OrderParams">
   <annotation>
     <documentation xml:lang="en">additional order parameters for order type
HVD.</documentation>
   </annotation>
 </element>
 <complexType name="HVDOrderParamsType">
   <annotation>
     <documentation xml:lang="en">Data type for additional order parameters regarding order
type HVD.</documentation>
   </annotation>
   <sequence>
     <group ref="ebics:HVRequestStructure"/>
     <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </sequence>
 </complexType>
 <group name="HVRequestStructure">
   <annotation>
     <documentation xml:lang="en">Standard request structure for HVx orders (HVD, HVT, HVE,
HVS).</documentation>
   </annotation>
   <sequence>
     <annotation>
       <documentation xml:lang="en">Standard request data.</documentation>
     </annotation>
     <element name="PartnerID" type="ebics:PartnerIDType">
       <annotation>
         <documentation xml:lang="en">Customer ID of the presenter of the selected
order.</documentation>
```

```
      </annotation>
    </element>
    <element name="OrderType" type="ebics:OrderTBaseType">
      <annotation>
        <documentation xml:lang="en">Order type of the selected order.</documentation>
      </annotation>
    </element>
    <element name="OrderID" type="ebics:OrderIDType">
      <annotation>
        <documentation xml:lang="en">Order ID of the selected order.</documentation>
      </annotation>
    </element>
  </sequence>
</group>
```

8.3.2.1.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
HVDOrderParams	ebics:HVDOrderParamsType (complex)	1	Order parameters for order type HVD	- (complex)
PartnerID	ebics:PartnerIDType (→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})	1	Customer ID of the initiating party	"CUSTM001"
OrderType	ebics:OrderTBaseType (→token, length=3, pattern="[A-Z0-9]{3}")	1	Order type of the order submitted for VEU	"IZV"
FileFormat	FileFomatType (complex) (→token)	0..1	File format of the order Annotation: To be used if OrderTypes = "FUL" or "FDL"	
FileFormat» @CountryCode	CountryCodeType (→token, length=2, pattern= " [A-Z]{2,2}")		Information on the format's field of application (e.g. country-specific formats)	"FR"…
OrderID	ebics:OrderIDType (→token, fixLength=4)	1	Order number of the order submitted for VEU	"OR01"

8.3.2.1.4 Example XML (abridged)

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
 Version="H004" Revision="1">
  <header authenticate="true">
    <static>
      <!-- […] -->
      <OrderDetails>
        <OrderType>HVD</OrderType>
        <OrderAttribute>DZNNN</OrderAttribute>
        <HVDOrderParams>
```

```
          <PartnerID>PARTNER1</PartnerID>
          <OrderType>IZV</OrderType>
          <OrderID>OR01</OrderID>
        </HVDOrderParams>
      </OrderDetails>
      <!-- […] -->
    </static>
    <!-- […] -->
  </header>
  <!-- […] -->
</ebicsRequest>
```

8.3.2.2 HVD response

The HVD response contains VEU information relating to the order that the subscriber has requested in the HVD request. In particular, the hash value of the order data is returned from the ES of the first signatory, along with the accompanying note. In addition, the information is contained whether the bank system supports the transaction HVT for the particular order. The following distinction is made:

- `OrderDataAvailable` : Download of the complete order file with HVT and `completeOrderData=true` possible?
- `OrderDetailsAvailable` : Download of the edited order details in XML format with HVT and `completeOrderData=false` possible?

The HVD response provides the subscriber with all data that they require for acknowledgement of the order via HVE or cancellation via HVS.

Characteristics of the (decoded & decrypted & decompressed) `OrderData` (order data) for HVD: `HVDResponseOrderData`

8.3.2.2.1 XML schema (graphical representation)

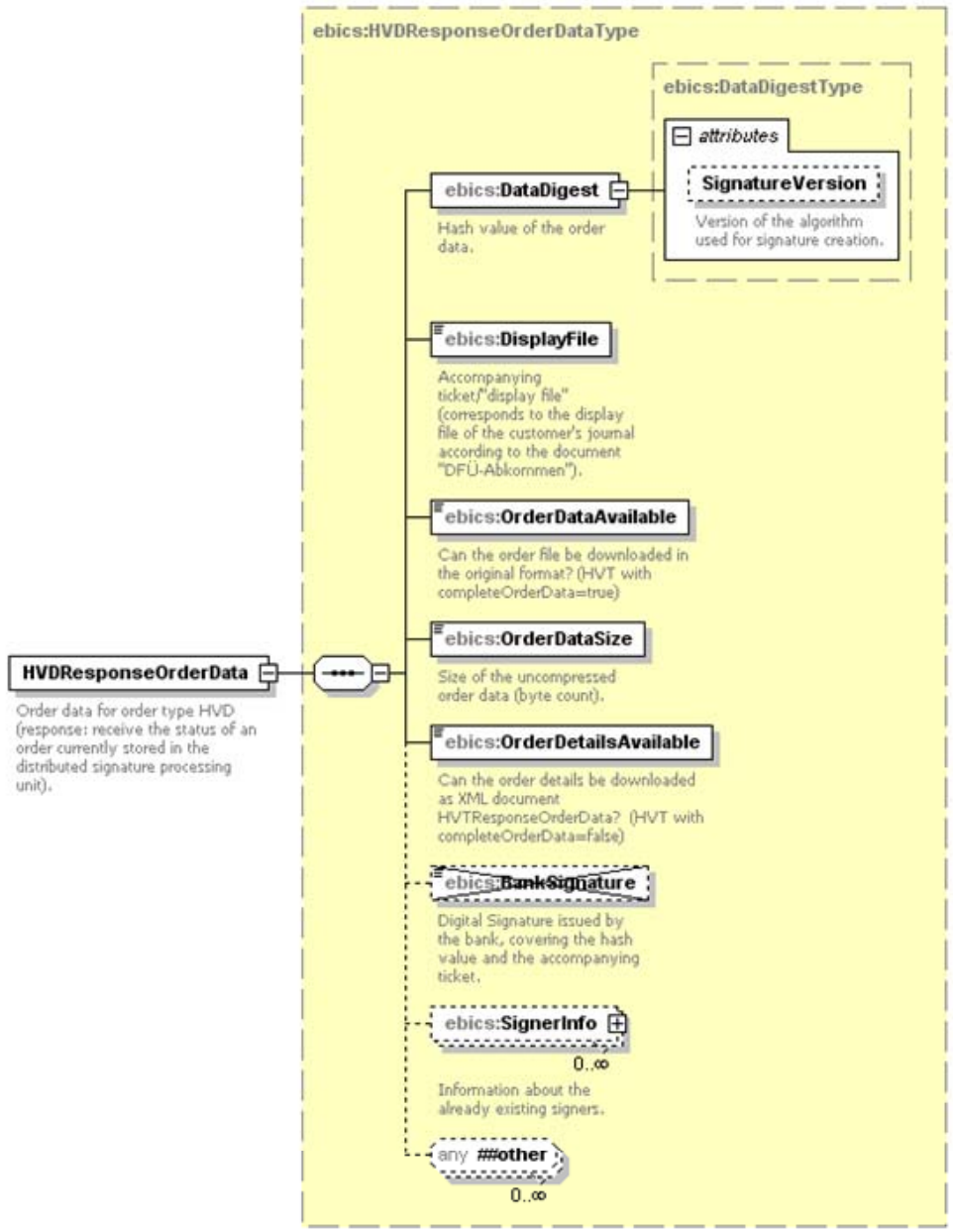


Diagram 81: HVDResponseOrderData

8.3.2.2.2 XML schema (textual representation)

```
 <element name="HVDResponseOrderData" type="ebics:HVDResponseOrderDataType"
substitutionGroup="ebics:EBICSOrderData">
   <annotation>
```

```
      <documentation xml:lang="en">Order data for order type HVD (response: receive the status
of an order currently stored in the distributed signature processing unit).</documentation>
    </annotation>
  </element>
  <complexType name="HVDResponseOrderDataType">
    <annotation>
      <documentation xml:lang="en">Data type for order data of type HVD (response: receive the
status of an order currently stored in the distributed signature processing
unit).</documentation>
    </annotation>
    <sequence>
      <element name="DataDigest" type="ebics:DigestType">
        <annotation>
          <documentation xml:lang="en">Hash value of the order data.</documentation>
        </annotation>
      </element>
      <element name="DisplayFile" type="base64Binary">
        <annotation>
          <documentation xml:lang="en">Accompanying ticket / "display file" (corresponds to the
display file of the customer's journal according to the document "DFÜ-
Abkommen").</documentation>
        </annotation>
      </element>
      <element name="OrderDataAvailable" type="boolean">
        <annotation>
          <documentation xml:lang="de">Can the order file be downloaded in the original format?
(HVT with completeOrderData=true)</documentation>
        </annotation>
      </element>
      <element name="OrderDataSize" type="positiveInteger">
        <annotation>
          <documentation xml:lang="de">Size of the uncompressed order data (byte
count)</documentation>
        </annotation>
      </element>
      <element name="OrderDetailsAvailable" type="boolean">
        <annotation>
          <documentation xml:lang="de">Can the order details be downloaded as XML document
HVTResponseOrderData? (HVT with completeOrderData=false)</documentation>
        </annotation>
      </element>
      <element name="BankSignature" type="ebics:SignatureType" minOccurs="0" maxOccurs="0">
        <annotation>
          <documentation xml:lang="en">Digital signature issued by the bank, covering the hash
value and the accompanying ticket.</documentation>
        </annotation>
      </element>
      <element name="SignerInfo" type="ebics:SignerInfoType" minOccurs="0"
maxOccurs="unbounded">
        <annotation>
          <documentation xml:lang="en">Information about the already existing
signers.</documentation>
        </annotation>
      </element>
      <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
  </complexType>
```

8.3.2.2.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example

HVDResponseOrderData	ebics:HVDResponse» OrderDataType (complex)	1	XML order data for order type HVD	- (complex)
DataDigest	ebics:DigestType (→dsig:DigestValue» Type →base64Binary)	1	Hash value of the order for the signature process used by the subscriber according to the Request-Element UserID	- (base64 data)
DataDigest» @SignatureVersion	ebics:Signature»VersionType (→token, length=4, pattern="A\d{3}"		Version for the signature process used by the subscriber according to the Request-Element UserID	e.g. „A006“
DisplayFile	base64Binary	1	Accompanying note/“display file“ for submitted order	- (base64 data)
OrderDataAvailable	boolean	1	Can the order file be downloaded in the original format? (HVT with completeOrderData=true)	true
OrderDataSize	positiveInteger	1	Size of the uncompressed order data (byte count)	1280
OrderDetailsAvailable	boolean	1	Can the order details be downloaded as XML document HVTResponseOrderData? (HVT with completeOrderData=false)	true
BankSignature	ebics:SignatureType (→base64Binary)	0	ES of the financial institution via hash value and accompanying note, planned feature	- (base64 data)
SignerInfo	ebics:SignerInfo» Type (complex)	0..∞	Information on previous signatories	- (complex)

For the remaining XML elements and attributes: See order type HVU (Chapter 8.3.1.2).

8.3.2.2.4 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<HVDResponseOrderData
 xmlns="urn:org:ebics:H004"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_orders_H004.xsd">
 <DataDigest SignatureVersion="A004">9H/rQr2Axe9hYTV2n/tCp+3UIQQ=</DataDigest>
 <DisplayFile>…</DisplayFile>
 <OrderDataAvailable>true</OrderDataAvailable>
 <OrderDataSize>1280</OrderDataSize>
 <OrderDetailsAvailable>true</OrderDetailsAvailable>
 <SignerInfo>
```

```
    <PartnerID>CUSTM001</PartnerID>
    <UserID>USR100</UserID>
    <Name>John Doe</Name>
    <Timestamp>2005-01-31T16:30:45.123Z</Timestamp>
    <Permission AuthorisationLevel="A"/>
  </SignerInfo>
  <SignerInfo>
    <PartnerID>CUSTM002</PartnerID>
    <UserID>USR200</UserID>
    <Name>Jackie Smith</Name>
    <Timestamp>2005-01-31T17:30:45.123Z</Timestamp>
    <Permission AuthorisationLevel="B"/>
  </SignerInfo>
</HVDResponseOrderData>
```

8.3.3 HVT (retrieve VEU transaction details)

HVT provides the subscriber with detailed information about an order from VEU processing for which the subscriber is authorised as a signatory. Depending on the request (`OrderFlags@completeOrderData`), they either receive the complete order file or account details, implementation deadline, amounts and other descriptions (`OrderInfo`).

The subscriber can transmit other filter criteria (e.g. for selection of individual orders within an overall order) via request in the generic key value structure (`Parameter`).

In the case of some order types / business transactions, it is not possible to retrieve detailed information by means of `OrderFlags@completeOrderData="false"`. In this case, the bank system returns the business related error code EBICS_UNSUPPORTED_REQUEST_FOR_ORDER_INSTANCE. With `OrderDataAvailable` and `OrderDetailsAvailable` in the HVD response, the bank system signals if an HVT transaction for a specific order within the VEU administration can be executed.
Before the execution of HVT, the bank system verifies whether the order is currently located in the VEU processing system and, in case of an error, terminates the transaction returning the business related error code EBICS_ORDERID_UNKNOWN.

The bank system has to verify whether the subscriber possesses a bank-technical authorisation of signature (signature class E, A or B) for the order on hand and the order is still in the signature folder. If the authorisation is missing, the transaction has to be cancelled and the error code EBICS_DISTRIBUTED_SIGNATURE_AUTHORISATION_FAILED is issued.

HVT is an order type of the type “download”.

8.3.3.1 HVT request

In the HVT request, the subscriber specifies the order for which they want to retrieve the VEU transaction details. In addition, they decide whether they want to have order details (`completeOrderData="false"`) or the complete order file (`completeOrderData="true"`) as a response by setting the OrderFlag `completeOrderData`.

If `completeOrderData="false"`, the customer system may limit the number of order details that the bank system is to provide. By means of the attribute `fetchLimit` for the element `OrderFlags` the maximum number of order details to be transmitted can be defined (a proposal for that is `fetchLimit`=100). If `fetchLimit`=0, all order details of an order are requested.
By means of the attribute `fetchOffset` the customer system is able to define an offset position in the original order file. From this position onwards the order details are returned. If `fetchOffset=0`, order details are requested from the starting point of the order file.
If the value for `fetchOffset` is higher than the total number of order details, the business related error EBICS_INVALID_ORDER_PARAMS is returned.

The generic key value structure (`Parameter`) is available for further filter criteria.

Characteristics of `OrderParams` (order parameters) for HVT: `HVTOrderParams`

8.3.3.1.1 XML schema (graphical representation)

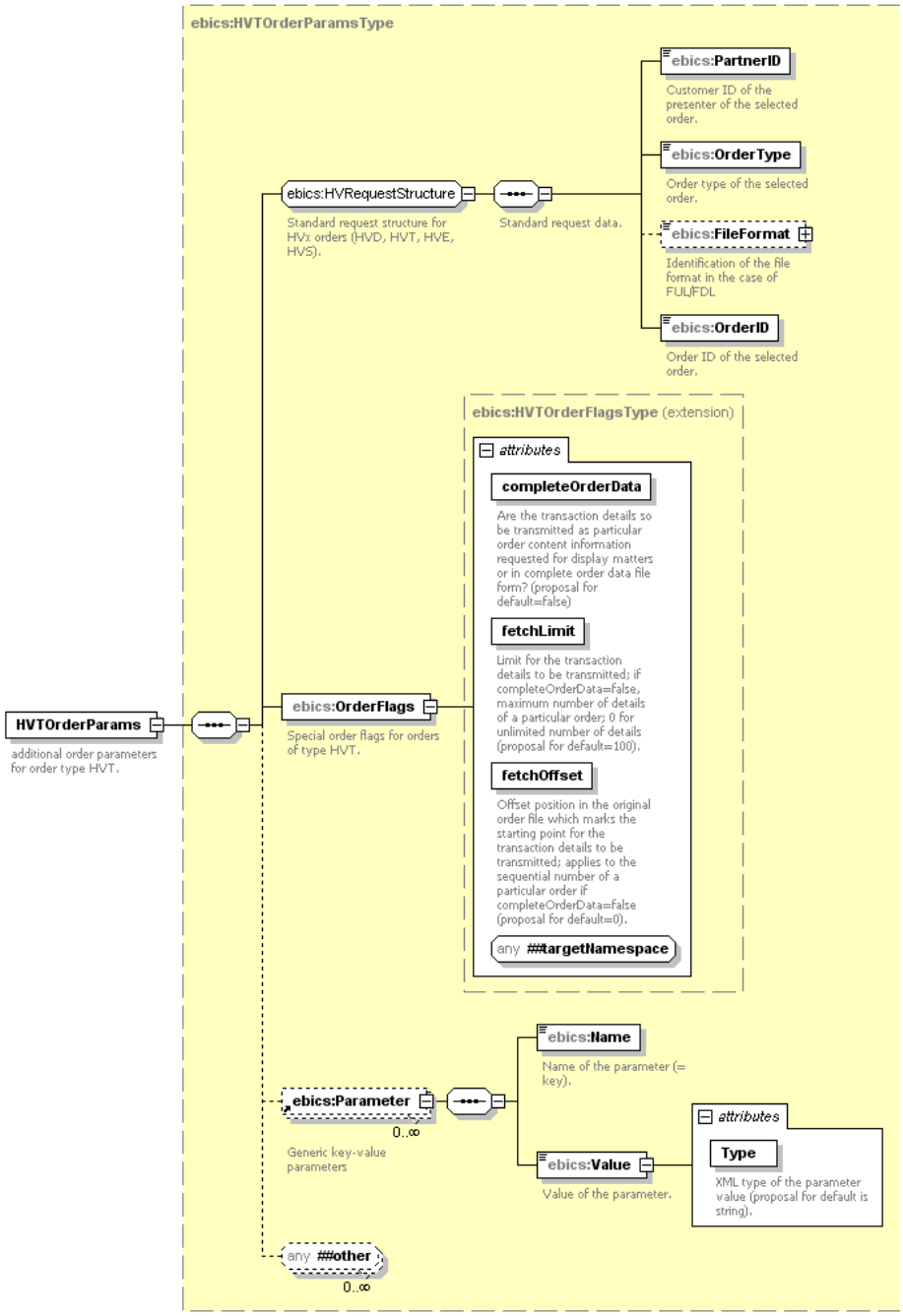


Diagram 82: HVTOrderParams

8.3.3.1.2 XML schema (textual representation)

```
 <element name="HVTOrderParams" type="ebics:HVTOrderParamsType"
substitutionGroup="ebics:OrderParams">
   <annotation>
     <documentation xml:lang="en">additional order parameters for order type
HVT.</documentation>
   </annotation>
 </element>
 <complexType name="HVTOrderParamsType">
   <annotation>
     <documentation xml:lang="en">Data type for additional order parameters regarding order
type HVT.</documentation>
   </annotation>
   <sequence>
     <group ref="ebics:HVRequestStructure"/>
     <element name="OrderFlags" type="ebics:HVTOrderFlagsType">
       <annotation>
         <documentation xml:lang="en">Special order flags for orders of type
HVT.</documentation>
       </annotation>
     </element>
     <element ref="ebics:Parameter" minOccurs="0" maxOccurs="unbounded"/>
     <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </sequence>
 </complexType>
 <group name="HVRequestStructure">
   <annotation>
     <documentation xml:lang="en">Standard request structure for HVx orders (HVD, HVT, HVE,
HVS).</documentation>
   </annotation>
   <sequence>
     <annotation>
       <documentation xml:lang="en">Standard request data.</documentation>
     </annotation>
     <element name="PartnerID" type="ebics:PartnerIDType">
       <annotation>
         <documentation xml:lang="en">Customer ID of the presenter of the selected
order.</documentation>
       </annotation>
     </element>
     <element name="OrderType" type="ebics:OrderTBaseType">
       <annotation>
         <documentation xml:lang="en">Order type of the selected order.</documentation>
       </annotation>
     </element>
     <element name="OrderID" type="ebics:OrderIDType">
       <annotation>
         <documentation xml:lang="en">Order ID of the selected order.</documentation>
       </annotation>
     </element>
   </sequence>
 </group>
 <complexType name="HVTOrderFlagsType">
   <annotation>
     <documentation xml:lang="en">Data type for special order flags regarding order type
HVT.</documentation>
   </annotation>
   <simpleContent>
     <extension base="ebics:OrderIDType">
       <attribute name="completeOrderData" type="boolean" use="required">
         <annotation>
```

```
          <documentation xml:lang="en">Are the transaction details to be transmitted as
particular order content information requested for display matters, or in complete order data
file form?</documentation>
        </annotation>
      </attribute>
      <attribute name="fetchLimit" use="required">
        <annotation>
          <documentation xml:lang="de">Limit for the transaction details to be transmitted;
if completeOrderData=false, maximum number of details of a particular order; 0 for unlimited
number of details.</documentation>
        </annotation>
        <simpleType>
          <restriction base="nonNegativeInteger">
            <totalDigits value="10"/>
          </restriction>
        </simpleType>
      </attribute>
      <attribute name="fetchOffset" use="required">
        <annotation>
          <documentation xml:lang="de">Offset position in the orginal order file which marks
the starting point for the transaction details to be transmitted; applies to the sequential
number of a particular order if completeOrderData=false.</documentation>
        </annotation>
        <simpleType>
          <restriction base="nonNegativeInteger">
            <totalDigits value="10"/>
          </restriction>
        </simpleType>
      </attribute>
      <anyAttribute namespace="##targetNamespace" processContents="strict"/>
    </extension>
  </simpleContent>
 </complexType>
 <element name="Parameter">
  <annotation>
    <documentation xml:lang="en">generic key-value parameters.</documentation>
  </annotation>
  <complexType>
    <sequence>
      <element name="Name" type="token">
        <annotation>
          <documentation xml:lang="en">Name of the parameter (=key).</documentation>
        </annotation>
      </element>
      <element name="Value">
        <annotation>
          <documentation xml:lang="en">Value of the parameter.</documentation>
        </annotation>
        <complexType>
          <simpleContent>
            <extension base="anySimpleType">
              <attribute name="Type" type="NCName" use="required">
                <annotation>
                  <documentation xml:lang="en">XML type of the parameter value (proposal for
default is "string").</documentation>
                </annotation>
              </attribute>
            </extension>
          </simpleContent>
        </complexType>
      </element>
    </sequence>
  </complexType>
```

```
</element>
```

8.3.3.1.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
HVTOrderParams	ebics:HVTOrderParams» Type (complex)	1	Order parameters for order type HVT	- (complex)
PartnerID	ebics:PartnerIDType (→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})	1	Customer ID of the initiating party	"CUSTM001"
OrderType	ebics:OrderTBaseType (→token, length=3, pattern="[A-Z0-9]{3}")	1	Order type of the order submitted for VEU	"IZV"
FileFormat	FileFomatType (complex) (→token)	0..1	File format of the order To be used if OrderTypes = "FUL" or "FDL"	
FileFormat» @CountryCode	CountryCodeType (→token, length=2, pattern= " [A-Z]{2,2}")		Information on the format's field of application (e.g. country-specific formats)	"FR"…
OrderID	ebics:OrderIDType (→token, fixLength=4)	1	Order number of the order submitted for VEU	"OR01"
OrderFlags	ebics:HVTOrderFlags» Type (complex)	1	Specific "switch" for HVT orders	- (complex)
OrderFlags» @complete» OrderData	boolean	1	Should the transaction details be transmitted as individual order detailed information (@completeOrderData= "false") or as a complete order file (@completeOrderData= "true")? (Proposal for default="false")	"false"
OrderFlags» @fetchLimit	nonNegativeInteger	1	Maximum number of order details to be transmitted if @completeOrderData= "false", "0" for unlimited number of details (Proposal for default="100")	10
OrderFlags» @fetchOffset	nonNegativeInteger	1	Offset position in the orginal order file which marks the starting point for the transaction details to be transmitted; applies to the	20

			sequential number of a particular order if completeOrderData=false. (Proposal for default="0")	
`Parameter`	Reference to global element (complex)	0..∞	Structure for generic key value parameters with optional type specification	- (complex)

8.3.3.1.4 Example XML (abridged)

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
 Version="H004" Revision="1">
  <header authenticate="true">
    <static>
      <!-- […] -->
      <OrderDetails>
        <OrderType>HVT</OrderType>
        <OrderAttribute>DZNNN</OrderAttribute>
        <HVTOrderParams>
          <PartnerID>PARTNER1</PartnerID>
          <OrderType>IZV</OrderType>
          <OrderID>OR01</OrderID>
          <OrderFlags completeOrderData="false" fetchLimit="50" fetchOffset="0"/>
        </HVTOrderParams>
      </OrderDetails>
      <!-- […] -->
    </static>
    <!-- […] -->
  </header>
  <!-- […] -->
</ebicsRequest>
```

8.3.3.2 HVT response

Depending on the selection of the attribute `completeOrderData` at the element `OrderFlags` the HVT response contains two different formats for the order specified in the HVT request.

If the flag `completeOrderData=true` is set, the customer system requests the download of order data in the original format. This download is a standard download without any additional embedding of order data into an XML document, i.e. the order data are transmitted to the customer system after having been compressed, encrypted and, if required, segmented.

If the flag `completeOrderData=false` is set, the customer system requests the download of order details in the edited XML format. This comprises an XML document with the root

element `HVTResponseOrderData` that is transmitted to the customer system after having been compressed, encrypted and, if required, segmented. In this case, the response stores the total number of order details of the original order file in the element `NumOrderInfos`.

Characteristics of the (decoded & decrypted & decompressed) `OrderData` (order data) for HVT: `HVTResponseOrderData`

If a subscriber executes HVT, although the bank does not support HVT for the order on hand, the transaction has to be cancelled and the return code EBICS_UNSUPPORTED_REQUEST_FOR_ORDER_INSTANCE is to be issued.

8.3.3.2.1 XML schema (graphical representation)

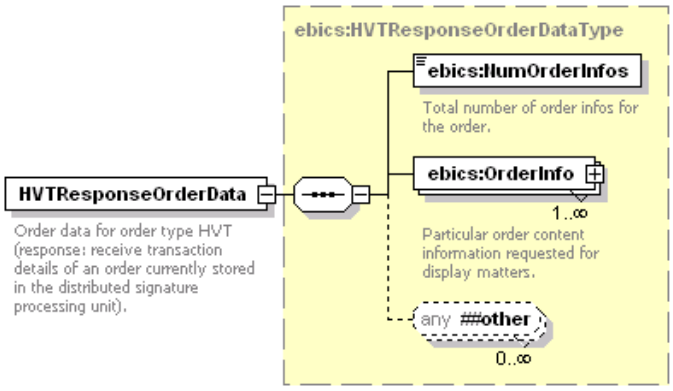


Diagram 83: HVTResponseOrderData

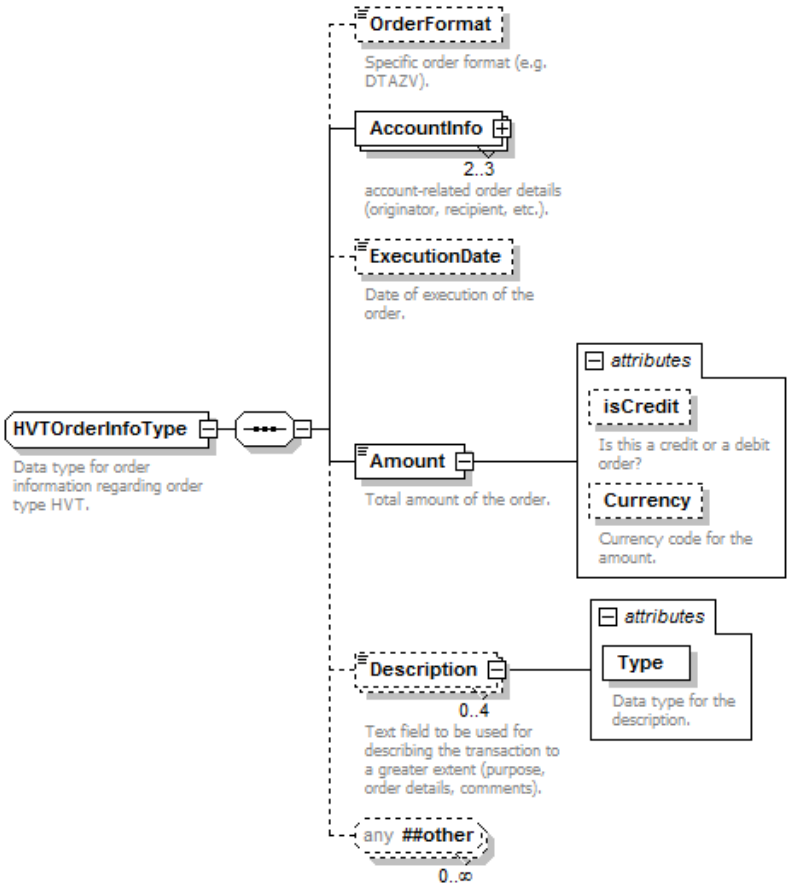


Diagram 84: HVTOrderInfoType (to OrderInfo)

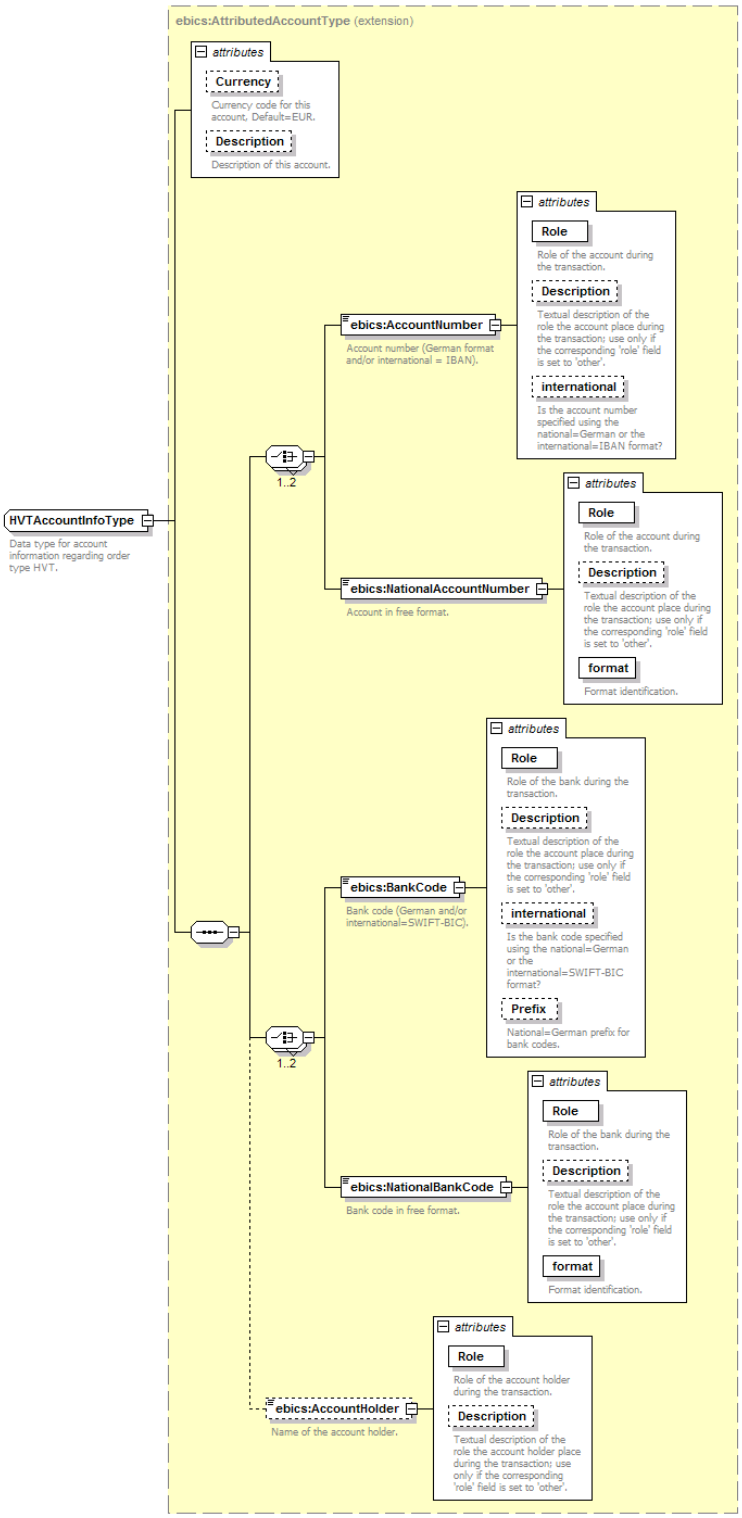


Diagram 85: HVTAccountInfoType (to AccountInfo)

8.3.3.2.2 XML schema (textual representation)

```
 <element name="HVTResponseOrderData" type="ebics:HVTResponseOrderDataType"
substitutionGroup="ebics:EBICSOrderData">
   <annotation>
     <documentation xml:lang="en">Order data for order type HVT (response: receive transaction
details of an order currently stored in the distributed signature processing
unit).</documentation>
   </annotation>
 </element>
 <complexType name="HVTResponseOrderDataType">
   <annotation>
     <documentation xml:lang="en">Data type for response with particular order content
information of type HVT (response: receive transaction details of an order currently stored in
the distributed signature processing unit with completeOrderData="false").</documentation>
   </annotation>
   <sequence>
     <element name="NumOrderInfos" type="ebics:NumOrderInfosType">
       <annotation>
         <documentation xml:lang="en">Total number of order infos for the
order</documentation>
       </annotation>
     </element>
       <element name="OrderInfo" type="ebics:HVTOrderInfoType" maxOccurs="unbounded">
         <annotation>
           <documentation xml:lang="en">Particular order content information requested for
display matters.</documentation>
         </annotation>
       </element>
       <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </sequence>
 </complexType>
 <complexType name="HVTOrderInfoType">
   <annotation>
     <documentation xml:lang="en">Data type for order information regarding order type
HVT.</documentation>
   </annotation>
   <sequence>
     <element name="OrderFormat" type="ebics:OrderFormatType" minOccurs="0">
       <annotation>
         <documentation xml:lang="en">Specific order format (e.g. DTAZV).</documentation>
       </annotation>
     </element>
     <element name="AccountInfo" type="ebics:HVTAccountInfoType" minOccurs="2" maxOccurs="3">
       <annotation>
         <documentation xml:lang="en">account-related order details (originator, recipient,
etc.).</documentation>
       </annotation>
     </element>
     <element name="ExecutionDate" minOccurs="0">
       <annotation>
         <documentation xml:lang="en">Date of execution of the order.</documentation>
       </annotation>
       <complexType>
         <simpleContent>
           <extension base="date"/>
         </simpleContent>
       </complexType>
     </element>
     <element name="Amount">
       <annotation>
         <documentation xml:lang="en">Total amount of the order.</documentation>
       </annotation>
```

```
        <complexType>
          <simpleContent>
            <extension base="ebics:AmountValueType">
              <attribute name="isCredit" type="boolean" use="optional">
                <annotation>
                  <documentation xml:lang="en">Is this a credit or a debit
order?</documentation>
                </annotation>
              </attribute>
              <attribute name="Currency" type="ebics:CurrencyBaseType" use="optional">
                <annotation>
                  <documentation xml:lang="en">Currency code for the amount.</documentation>
                </annotation>
              </attribute>
            </extension>
          </simpleContent>
        </complexType>
      </element>
      <element name="Description" minOccurs="0" maxOccurs="4">
        <annotation>
          <documentation xml:lang="en">Text field to be used for describing the transaction to
a greater extent (purpose,  order details, comments).</documentation>
        </annotation>
        <complexType>
          <simpleContent>
            <extension base="string">
              <attribute name="Type" use="required">
                <annotation>
                  <documentation xml:lang="en">Data type for the description.</documentation>
                </annotation>
                <simpleType>
                  <restriction base="token">
                    <enumeration value="Purpose"/>
                    <enumeration value="Details"/>
                    <enumeration value="Comment"/>
                  </restriction>
                </simpleType>
              </attribute>
            </extension>
          </simpleContent>
        </complexType>
      </element>
      <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
  </complexType>
  <complexType name="HVTAccountInfoType">
    <annotation>
      <documentation xml:lang="en">Data type for account information regarding order type
HVT.</documentation>
    </annotation>
    <complexContent>
      <extension base="ebics:AttributedAccountType"/>
    </complexContent>
  </complexType>
  <complexType name="AttributedAccountType">
    <annotation>
      <documentation xml:lang="en">Data type for detailed account information including the
role assignments present during the transaction</documentation>
    </annotation>
    <sequence>
      <element name="AccountNumber" maxOccurs="2">
        <annotation>
```

```
        <documentation xml:lang="en">Account number (German format and/or
international=IBAN).</documentation>
      </annotation>
      <complexType>
        <simpleContent>
          <extension base="ebics:AccountNumberType">
            <attribute name="Role" type="ebics:AccountNumberRoleType" use="required">
              <annotation>
                <documentation xml:lang="en">Role of the account during the
transaction.</documentation>
              </annotation>
            </attribute>
            <attribute name="Description" type="normalizedString">
              <annotation>
                <documentation xml:lang="en">Textual description of the role the account
plays during the transaction; use only if the corresponding "Role" field is set to
"Other".</documentation>
              </annotation>
            </attribute>
            <attribute name="international" type="boolean" use="optional" default="false">
              <annotation>
                <documentation xml:lang="en">Is the account number specified using the
national=German or the international=IBAN format?</documentation>
              </annotation>
            </attribute>
          </extension>
        </simpleContent>
      </complexType>
    </element>
    <element name="BankCode" maxOccurs="2">
      <annotation>
        <documentation xml:lang="en">Bank code (German and/or international=SWIFT-BIC
format).</documentation>
      </annotation>
      <complexType>
        <simpleContent>
          <extension base="ebics:BankCodeType">
            <attribute name="Role" type="ebics:BankCodeRoleType" use="required">
              <annotation>
                <documentation xml:lang="en">Role of the bank during the
transaction.</documentation>
              </annotation>
            </attribute>
            <attribute name="Description" type="normalizedString">
              <annotation>
                <documentation xml:lang="en">Textual description of the role the bank plays
during the transaction; use only if the corresponding "Role" field is set to
"Other".</documentation>
              </annotation>
            </attribute>
            <attribute name="international" type="boolean" use="optional" default="false">
              <annotation>
                <documentation xml:lang="en">Is the bank code specified using the
national=German or the international=SWIFT-BIC format?</documentation>
              </annotation>
            </attribute>
            <attribute name="Prefix" type="ebics:BankCodePrefixType" use="optional">
              <annotation>
                <documentation xml:lang="en">National=German prefix for bank
codes.</documentation>
              </annotation>
            </attribute>
          </extension>
        </simpleContent>
```

```
        </complexType>
      </element>
      <element name="AccountHolder" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Name of the account holder.</documentation>
        </annotation>
        <complexType>
          <simpleContent>
            <extension base="ebics:AccountHolderType">
              <attribute name="Role" type="ebics:AccountHolderRoleType" use="required">
                <annotation>
                  <documentation xml:lang="en">Role of the account holder during the
transaction.</documentation>
                </annotation>
              </attribute>
              <attribute name="Description" type="normalizedString">
                <annotation>
                  <documentation xml:lang="en">Textual description of the role the account
holder plays during the transaction; use only if the corresponding "Role" field is set to
"Other".</documentation>
                </annotation>
              </attribute>
            </extension>
          </simpleContent>
        </complexType>
      </element>
    </sequence>
    <attribute name="Currency" type="ebics:CurrencyBaseType" use="optional" default="EUR">
      <annotation>
        <documentation xml:lang="en">Currency code for this account. Default is "EUR", if
omitted.</documentation>
      </annotation>
    </attribute>
    <attribute name="Description" type="ebics:AccountDescriptionType">
      <annotation>
        <documentation xml:lang="en">Description of this account.</documentation>
      </annotation>
    </attribute>
  </complexType>
  <complexType name="AmountType">
    <annotation>
      <documentation xml:lang="en">Data type for an amount including a currency attribute
(defaults to "EUR").</documentation>
    </annotation>
    <simpleContent>
      <extension base="ebics:AmountValueType">
        <attribute name="Currency" type="ebics:CurrencyBaseType" use="optional" default="EUR">
          <annotation>
            <documentation xml:lang="en">Currency code, default setting is
"EUR".</documentation>
          </annotation>
        </attribute>
      </extension>
    </simpleContent>
  </complexType>
```

8.3.3.2.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
NumOrderInfos	ebics:NumOrderInfosType	1	Total number of particular orders in the original file	42
OrderInfo	ebics:HVTOrderInfo (complex)	1..∞	Individual order information	- (complex)
OrderFormat	ebics:OrderFormat» Type (→token, maxLength=8)	0..1	Order format	“DTAZV“
AccountInfo	ebics:HVTAccount» InfoType (complex)	2..3	Account-related detailed information on the individual order (order party, recipient, opt. initiating party)	- (complex)
AccountInfo» @Currency	ebics:CurrencyBase» Type (→token, length=3, pattern="[A-Z]{3}")	0..1	Currency code of the account in accordance with ISO 4217; default = “EUR”	“EUR”
AccountInfo» @Description	ebics:Account» DescriptionType (→normalizedString)	0..1	Textual description of the account	“Savings”
ExecutionDate	date	0..1	Implementation date of the individual order in accordance with ISO 8601	2005-01-31
Amount	ebics:AmountValue» Type (→decimal, totalDigits=24, fractionDigits=4)	1	Amount of the individual order	1234.567
Amount» @Currency	ebics:CurrencyBase» Type (→token, length=3, pattern="[A-Z]{3}")	0..1	Currency code of the individual order amount in accordance with ISO 4217	“EUR”
Amount» @isCredit	boolean	0..1	Flag for differentiation between credit note (isCredit="true") and debit note (isCredit="false")	“false“
Description	string	0..4	Text fields for further description of the order transaction (purpose, order details, comment)	“Account no. 2345“
Description» @Type	token: "Purpose", "Details", "Comment")	1	Type of description: „Purpose“=reason for payment, „Details“=order details, „Comment“=comment	“Purpose“
-	-	1..2	Information on the account number: AccountNumber and/or NationalAccountNumber	

AccountNumber	ebics:AccountNumber» Type (→token, maxLength=40, pattern="\d{3,10}|([A-Z]{2}\d{2}[A-Za-z0-9]{3,30}")	1	Account number, either in national (= German) or international format (IBAN)	„12345678“
AccountNumber» @Role	ebics:AccountNumber» RoleType (→token: "Originator", "Recipient", "Charges", "Other")	1	Role of the account within the payment transaction: “Originator”=account of the ordering party, “Recipient”=account of the recipient, “Charges”=account for charges, “Other”= other role (see AccountNumber» @Description)	“Originator“
AccountNumber» @Description	normalizedString	0..1	Textual description of the role of the account within the payment transaction if AccountNumber@Role= "Other" is selected.	“Nostro“
AccountNumber» @international	boolean	0..1	Is the account number specified in national = German (AccountNumber» @international="false") or in international = IBAN format (AccountNumber» @international="true")? Default="false"	“false“
NationalAccount Number		1	Account number in free format (for national account numbers that correspond to neither German nor international standards)	„12345678 90123456“
NationalAccount Number» @Role	ebics:AccountNumber» RoleType (→token: "Originator", "Recipient", "Charges", "Other")	1	Role of the account within the transaction: “Originator”=account of the ordering party, “Recipient”=account of the recipient, “Charges”=account for charges, “Other”= other role (see AccountNumber» @Description)	„Originator“
NationalAccount Number» @Description	normalizedString	0..1	Textual description of the account within the transaction if AccountNumber@Role= "Other" is selected	„Nostro“
National» AccountNumber» @format	token	1	Description of the account number's format	„other“
-	-	1..2	Information on the bank code: BankCode and/or	-

			NationalBankCode	
BankCode	ebics:BankCodeType (→token, maxLength=11, pattern="\d{8}|([A-Z]{6}[A-Z0-9]{2}([A-Z0-9]{3})?)")	1	Bank code, either in national (= German) or international format (SWIFT)	„50010060“
BankCode@Role	ebics:BankCodeRole» Type (→token: "Originator", "Recipient", "Correspondent", "Other")	1	Role of the financial institution within the payment transaction: „Originator”=ordering bank, „Recipient”=receiving bank, „Correspondent”= correspondent bank, „Other“=other role (see BankCode@Description)	“Originator“
BankCode» @Description	normalizedString	0..1	Textual description of the role of the financial institution within the payment transaction, if BankCode@Role="Other" is selected	“Clearing“
BankCode» @international	boolean	0..1	Is the bank code specified in national = German (BankCode» @international= "false") or international = SWIFT format (BankCode» @international="true")? Default="false"	“false“
BankCode@Prefix	token, maxLength=2	0..1	National prefix for bank codes	“DE“
NationalBank» Code	ebics:National» BankCodeType (→token, maxLength=30)	1	Bank code in free format (neither German format nor SWIFT-BIC)	„123456789012“
NationalBank» Code@Role	ebics:BankCodeRole» Type (→token: "Originator", "Recipient", "Correspondent", "Other")	1	Role of the financial institution within the transaction: „Originator”=ordering bank, „Recipient”=receiving bank, „Correspondent”=correspondent bank, „Other“=other role (see BankCode@Description)	„Originator“
BankCode» @Description	normalizedString	0..1	Textual description of the role the financial institution plays within the transaction, if BankCode@Role="Other" is chosen	„Clearing“
NationalBank» Code@format	token	1	Format type	“other”
AccountHolder	ebics:AccountHolder» Type (→normalizedString)	0..1	Name of the account holder	“John Doe“
AccountHolder»	ebics:AccountHolder»	0..1	Role of the account holder	“Originator“

@Role	RoleType (→token: "Originator", "Recipient", "Presenter", "Other")		within the payment transaction: „Originator“=ordering party, „Recipient“=recipient, „Presenter“=submitting party of the order, „Other“=other role (see AccountHolder» @Description)	
AccountHolder» @Description	normalizedString	0..1	Textual description of the role of the account holder within the payment transaction if AccountHolder@Role= "Other" is selected.	“Trustee“

8.3.3.2.4 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<HVTResponseOrderData
 xmlns="urn:org:ebics:H004"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_orders_H004.xsd">
 <NumOrderInfos>42</NumOrderInfos>
 <OrderInfo>
   <AccountInfo Currency="EUR">
     <AccountNumber Role="Originator" international="false">1234567890</AccountNumber>
     <BankCode Role="Originator" international="false" Prefix="DE">50010060</BankCode>
     <AccountHolder Role="Originator">Ophelia Originator</AccountHolder>
   </AccountInfo>
   <AccountInfo Currency="EUR">
     <AccountNumber Role="Recipient" international="false">1122334455</AccountNumber>
     <BankCode Role="Recipient" international="false">50070010</BankCode>
     <AccountHolder Role="Recipient">Ray Recipient</AccountHolder>
   </AccountInfo>
   <ExecutionDate>2005-01-31</ExecutionDate>
   <Amount isCredit="true" Currency="EUR">500.00</Amount>
   <Description Type="Purpose">Test transer</Description>
 </OrderInfo>
</HVTResponseOrderData>
```

8.3.4 HVE (add electronic signature)

With HVE, the subscriber adds a further bank-technical signature for authorisation to an order from VEU processing.

The bank system has to verify whether the subscriber possesses a bank-technical authorisation of signature (not signature class T) for the referenced order. If the authorisation is missing, the transaction has to be cancelled and the existing return code EBICS_AUTHORISATION_ORDER_TYPE_FAILED is issued.

Before HVE is executed, the bank system verifies whether the order is currently located in the VEU processing system and terminates the transaction in case of an error returning the business related error code EBICS_ORDERID_UNKNOWN.

HVE is an order type of type “upload”. The order attribute “OrderAttribute” is to be set to “UZHNN”. Only the ES is transmitted via the hash value of the order from VEU processing (no order data, no ES for the order type HVE itself) whereas only the hash value of the VEU processing is signed.

8.3.4.1 HVE request

With the HVE request, the subscriber specifies the order to which they want to add a bank-technical signature, and supplies this signature in the same request in the XML body element `ebicsRequest/body/DataTransfer/SignatureData` in compressed, encrypted and base64-coded form. An HVE request does not contain any order data, i.e. the XML body element `ebicsRequest/body/DataTransfer/OrderData` remains unfilled.

In order to provide the bank-technical signature, the subscriber needs either the hash value of the original order data (e.g. retrievable via HVD or HVZ) or the order data itself (e.g. via HVT with `completeOrderData="true"`).

Characteristics of `OrderParams` (order parameters) for HVE: `HVEOrderParams`

8.3.4.1.1 XML schema (graphical representation)

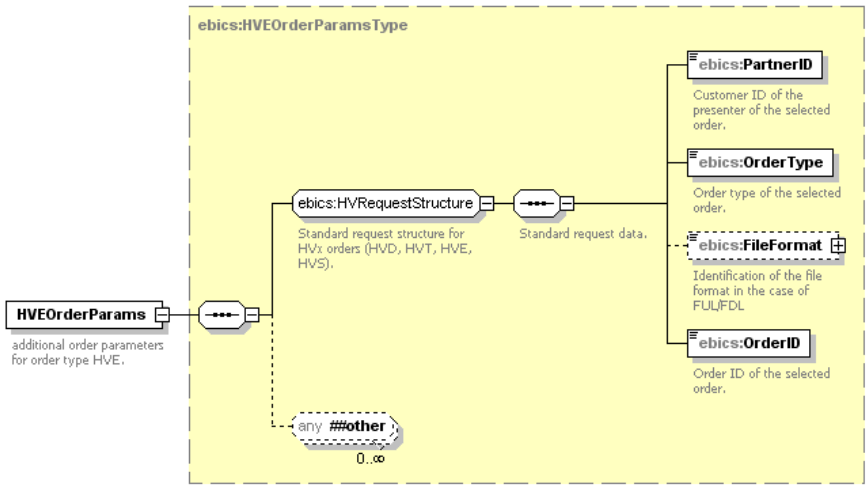


Diagram 86: HVEOrderParams

8.3.4.1.2 XML schema (textual representation)

```
 <element name="HVEOrderParams" type="ebics:HVEOrderParamsType"
substitutionGroup="ebics:OrderParams">
   <annotation>
     <documentation xml:lang="en">additional order parameters for order type
HVE.</documentation>
   </annotation>
 </element>
 <complexType name="HVEOrderParamsType">
   <annotation>
     <documentation xml:lang="en">Data type for additional order parameters regarding order
type HVE.</documentation>
   </annotation>
   <sequence>
     <group ref="ebics:HVRequestStructure"/>
     <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </sequence>
 </complexType>
 <group name="HVRequestStructure">
   <annotation>
     <documentation xml:lang="en">Standard request structure for HVx orders (HVD, HVT, HVE,
HVS).</documentation>
   </annotation>
   <sequence>
     <annotation>
       <documentation xml:lang="en">Standard request data.</documentation>
     </annotation>
     <element name="PartnerID" type="ebics:PartnerIDType">
       <annotation>
         <documentation xml:lang="en">Customer ID of the presenter of the selected
order.</documentation>
       </annotation>
     </element>
     <element name="OrderType" type="ebics:OrderTBaseType">
       <annotation>
         <documentation xml:lang="en">Order type of the selected order.</documentation>
       </annotation>
     </element>
     <element name="OrderID" type="ebics:OrderIDType">
       <annotation>
         <documentation xml:lang="en">Order ID of the selected order.</documentation>
       </annotation>
     </element>
   </sequence>
 </group>
```

8.3.4.1.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
`HVEOrderParams`	`ebics:HVEOrderParamsType` (complex)	1	Order parameters for order type HVE	- (complex)
`PartnerID`	`ebics:PartnerIDType` (→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})	1	Customer ID of the initiating party	“PARTNER1”
`OrderType`	`ebics:OrderTBaseType` (→token, length=3, pattern="[A-Z0-9]{3}")	1	Order type of the order in VEU processing	“IZV”

FileFormat	FileFomatType (complex) (→token)	0..1	File format of the order To be used if OrderTypes = “FUL” or “FDL”	
FileFormat» @CountryCode	CountryCodeType (→token, length=2, pattern= " [A-Z]{2,2}")		Information on the format's field of application (e.g. country-specific formats)	“FR”…
OrderID	ebics:OrderIDType (→token, fixLength=4)	1	Order number of the order in VEU processing	“OR01”

8.3.4.1.4 Example XML (abridged)

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
 Version="H004" Revision="1">
  <header authenticate="true">
    <static>
      <!-- […] -->
      <OrderDetails>
        <OrderType>HVE</OrderType>
        <OrderID>HO04</OrderID>
        <OrderAttribute>UZHNN</OrderAttribute>
        <HVEOrderParams>
          <PartnerID>CUSTM001</PartnerID>
          <OrderType>IZV</OrderType>
          <OrderID>OR01</OrderID>
        </HVEOrderParams>
      </OrderDetails>
      <!-- […] -->
    </static>
    <!-- […] -->
  </header>
  <!-- […] -->
</ebicsRequest>
```

8.3.4.2 HVE response

The HVE response does not contain any VEU-specific data.

8.3.5 HVS (VEU cancellation)

The subscriber uses HVS to permanently cancel an existing order from VEU processing.

Before HVS is executed, the bank system verifies whether the order is currently located in the VEU processing system and terminates the transaction in case of an error returning the business related error code EBICS_ORDERID_UNKNOWN.

HVS is an order type of type “upload”. The order attribute “OrderAttribute” is to be set to “UZHNN”. For cancellation authorisation, the ES is transmitted via the hash value of the order that is to be cancelled (no order data, no ES for the order type HVS itself).

8.3.5.1 HVS request

The subscriber uses the HVS request to specify the order that is to be cancelled and delivers the bank-technical signature that is necessary for the cancellation via the hash value of the order data.

The bank system has to verify whether the subscriber possesses a bank-technical authorisation of signature (not signature class T) for the referenced order. If the authorisation is missing, the transaction will be cancelled and the existing return code EBICS_AUTHORISATION_ORDER_TYPE_FAILED is issued.

The signature is transported in compressed, encrypted and base64-coded form in the XML body element `ebicsRequest/body/DataTransfer/SignatureData` . The order cancellation is permanent, and always requires one single authorised signature of class “E”, “A” or “B”.

In order to provide the bank-technical signature, the subscriber needs either the hash value of the original order data (e.g. retrievable via HVD or HVZ) or the order data itself (e.g. via HVT with `completeOrderData="true"`).

Characteristics of `OrderParams` for HVS: `HVSOrderParams`

8.3.5.1.1 XML schema (graphic representation)

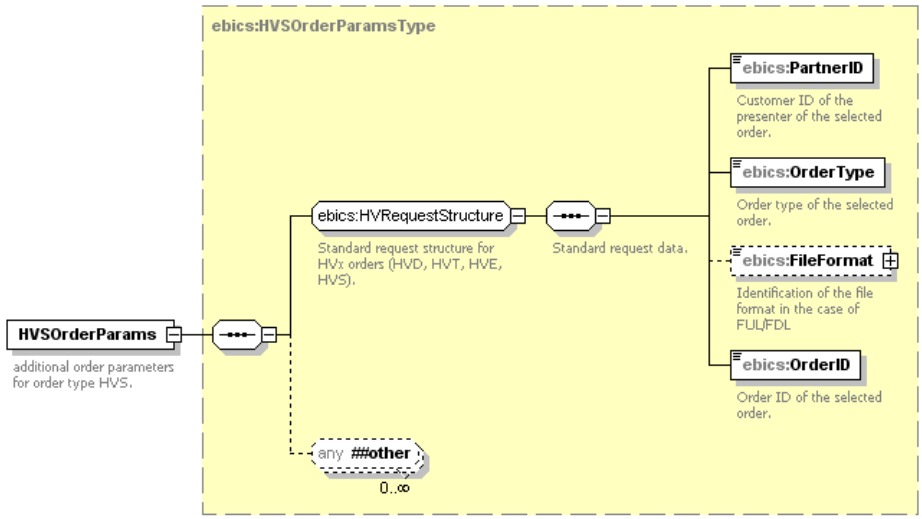


Diagram 87: HVSOrderParams

8.3.5.1.2 XML schema (textual representation)

```
 <element name="HVSOrderParams" type="ebics:HVSOrderParamsType"
substitutionGroup="ebics:OrderParams">
   <annotation>
     <documentation xml:lang="en">additional order parameters for order type
HVS.</documentation>
   </annotation>
 </element>
 <complexType name="HVSOrderParamsType">
   <annotation>
     <documentation xml:lang="en">Data type for additional order parameters regarding order
type HVS.</documentation>
   </annotation>
   <sequence>
     <group ref="ebics:HVRequestStructure"/>
     <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
   </sequence>
 </complexType>
 <group name="HVRequestStructure">
   <annotation>
     <documentation xml:lang="en">Standard request structure for HVx orders (HVD, HVT, HVE,
HVS).</documentation>
   </annotation>
   <sequence>
     <annotation>
       <documentation xml:lang="en">Standard request data.</documentation>
     </annotation>
     <element name="PartnerID" type="ebics:PartnerIDType">
       <annotation>
         <documentation xml:lang="en">Customer ID of the presenter of the selected
order.</documentation>
       </annotation>
     </element>
     <element name="OrderType" type="ebics:OrderTBaseType">
       <annotation>
         <documentation xml:lang="en">Order type of the selected order.</documentation>
       </annotation>
     </element>
     <element name="OrderID" type="ebics:OrderIDType">
       <annotation>
         <documentation xml:lang="en">Order ID of the selected order.</documentation>
       </annotation>
     </element>
   </sequence>
 </group>
```

8.3.5.1.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
`HVSOrderParams`	`ebics:HVSOrderParamsType` (complex)	1	Order parameters for order type HVS	- (complex)
`PartnerID`	`ebics:PartnerIDType` (→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})	1	Customer ID of the initiating party.	“CUSTM001”

OrderType	ebics:OrderTBaseType (→token, length=3, pattern="[A-Z0-9]{3}")	1	Order type of the order that is to be cancelled in VEU processing	"IZV"
FileFormat	FileFomatType (complex) (→token)	0..1	File format of the order Annotation: To be used if OrderTypes = "FUL" or "FDL"	
FileFormat» @CountryCode	CountryCodeType (→token, length=2, pattern= " [A-Z]{2,2}")		Information on the format's field of application (e.g. country-specific formats)	"FR"…
OrderID	ebics:OrderIDType (→token, fixLength=4)	1	Order number of the order that is to be cancelled in VEU processing	"OR01"

8.3.5.1.4 Example XML (abridged)

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
 Version="H004" Revision="1">
  <header authenticate="true">
    <static>
      <!-- […] -->
      <OrderDetails>
        <OrderType>HVS</OrderType>
        <OrderID>HO05</OrderID>
        <OrderAttribute>UZHNN</OrderAttribute>
        <HVSOrderParams>
          <PartnerID>CUST001</PartnerID>
          <OrderType>IZV</OrderType>
          <OrderID>OR01</OrderID>
        </HVSOrderParams>
      </OrderDetails>
      <!-- […] -->
    </static>
    <!-- […] -->
  </header>
  <!-- […] -->
</ebicsRequest>
```

8.3.5.2 HVS response

The HVS response does not contain any VEU-specific data.

9 “Other” EBICS order types

The following sections contain descriptions of the following order types:

- HAA (download retrievable order types)
- HPD (download bank parameter)
- HKD (download customer’s customer and subscriber information)
- HTD (download subscriber’s customer and subscriber information)
- HEV (download supported EBICS versions)
- FUL (upload file with any format)
- FDL (download file with any format)

Information about the support on the part of the bank (mandatory, optional, conditional) see chapter 13.

9.1 HAA (download retrievable order types)

With HAA, the subscriber may retrieve a list of order types for which updated customer data are ready for download in the bank system.

HAA is an order type of type “download”.

9.1.1 HAA request

The HAA request does not contain specific data that goes beyond that named in the general transaction description (see Chapter 5.6.1.1).

9.1.2 HAA response

Characteristics of the (decoded & decrypted & decompressed) `OrderData` (order data) for HAA: `HAAResponseOrderData`

9.1.2.1.1 XML schema (graphic representation)

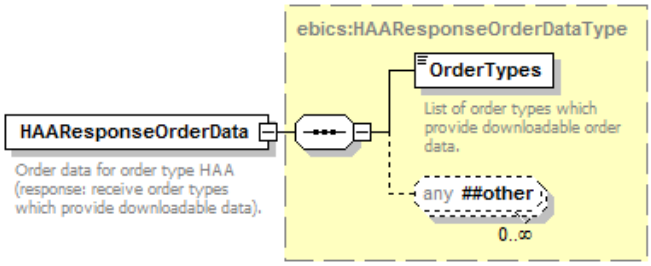


Diagram 88: HAAResponseOrderData

9.1.2.1.2 XML schema (textual representation)

```
 <element name="HAAResponseOrderData" type="ebics:HAAResponseOrderDataType"
substitutionGroup="ebics:EBICSOrderData">
   <annotation>
     <documentation xml:lang="en">Order data for order type HAA (response: receive order types
which provide downloadable data).</documentation>
   </annotation>
 </element>
 <complexType name="HAAResponseOrderDataType">
   <annotation>
     <documentation xml:lang="en">Data type for order data of type HAA (response: receive
order types which provide downloadable data).</documentation>
   </annotation>
   <sequence>
     <element name="OrderTypes" type="ebics:OrderTListType">
       <annotation>
         <documentation xml:lang="en">List of order types which provide downloadable order
data.</documentation>
       </annotation>
     </element>
     <any namespace="##other" minOccurs="0" maxOccurs="unbounded"/>
   </sequence>
 </complexType>
```

9.1.2.1.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
HAAResponse» OrderData	ebics:HAAResponse» OrderDataType (complex)	1	Order data for order type HAA	- (complex)
OrderTypes	ebics:OrderTListType (→list<OrderTBaseType> →list<token, length=3,	1	List of order types for which data is available	"STA PTK"

	pattern="[A-Z0-9]{3}">)			

9.1.2.1.4 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<HAAResponseOrderData
 xmlns="urn:org:ebics:H004"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_orders_H004.xsd">
 <OrderTypes>STA PTK</OrderTypes>
</HAAResponseOrderData>
```

9.2 HPD (download bank parameters)

With HPD, the subscriber can receive information relating to the financial institution's specific access (`AccessParams`) and protocol parameters (`ProtocolParams`).

The access parameters include:

- `URL`: URL or IP address for electronic access to the financial institution. The optional attribute `valid_from` specifies the commencement of validity (timestamp) of the specification
- `Institute`: Designation of the financial institution
- `HostID` (optional): EBICS host ID of the bank system.

In the case of the protocol parameters, the following information is transmitted:

- `Version`: Permitted versions (listed in each case) for EBICS protocol (`Protocol`), identification and authentication (`Authentication`), encryption (`Encryption`) and signature (`Signature`)
- `Recovery` (optional): Support of transaction recovery of (`@supported`)
- `PreValidation` (optional): Support of preliminary verification (`@supported`). If this parameter is set, the financial institution merely ensures that the subscriber can transmit data to the financial institution within the framework of preliminary verification. However, the financial institution is not obliged to comprehensively verify this data.
- `X509Data` (optional): Support for X.509 data such as e.g. certificates (`@supported`) from the XML field `ebicsRequest/body/X509Data`. Furthermore, the financial institution can specify whether it persistently archives the subscriber's X.509 data in the state "Ready" (`@persistent`). In this event, the subscriber does not have to transmit them anew with each transaction initialisation. If not specified, the financial institution does not support persistent X.509 data maintenance.
  For the persistent storage of X.509 data, the financial institution must store the transmitted certificate data within the framework of subscriber initialisation, and make it accessible to the financial institution's own transaction administration.

- `ClientDataDownload` (optional): Support of order types HKD (download customer data) and HTD (download subscriber data) (`@supported`). See Chapter 9.3 (HKD) and 9.4 (HTD)
- `DownloadableOrderData` (optional): Support of order type HAA (download retrievable order types) (`@supported`). See Chapter 9.1 for details.

The following standard procedure is defined for all optional elements of the protocol parameters – insofar as not explicitly stated otherwise:

- If the parameter is missing, the subscriber MUST evaluate this as meaning that the corresponding functionality is not supported, i.e. the result corresponds to *`Parameter`*`@supported="false"`
- If the parameter is specified, but the attribute is missing, the subscriber MUST evaluate this as support of the corresponding functionality, i.e. the result corresponds to *`Parameter`*`@supported="true"`.

This specification simplifies the inter-operability of customer product and bank system: On the one hand, it is ensured that a financial institution that does not support a function does not also have to explicitly state that it is “not supported” in the bank parameters. On the other hand, it is assumed that if a functionality is named then it is also supported, which means that in this case the `@supported` flag can be dispensed with.

HPD is an order type of type “download”.

9.2.1 HPD request

The HPD request does not contain specific data that goes beyond that named in the general transaction description.

9.2.2 HPD response

The HPD response contains the bank parameters, divided into access parameters (`AccessParams`) and protocol parameters (`ProtocolParams`).

Characteristics of the (decoded & decrypted & decompressed) `OrderData` (order data) for HPD: `HPDResponseOrderData`

9.2.2.1.1 XML schema (graphic representation)

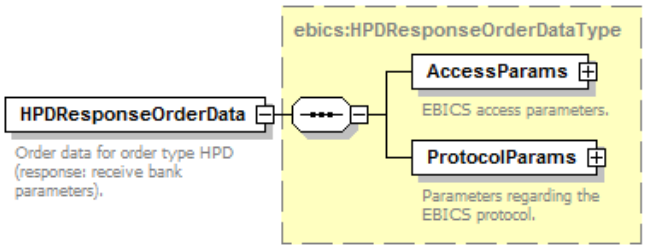


Diagram 89: HPDResponseOrderData

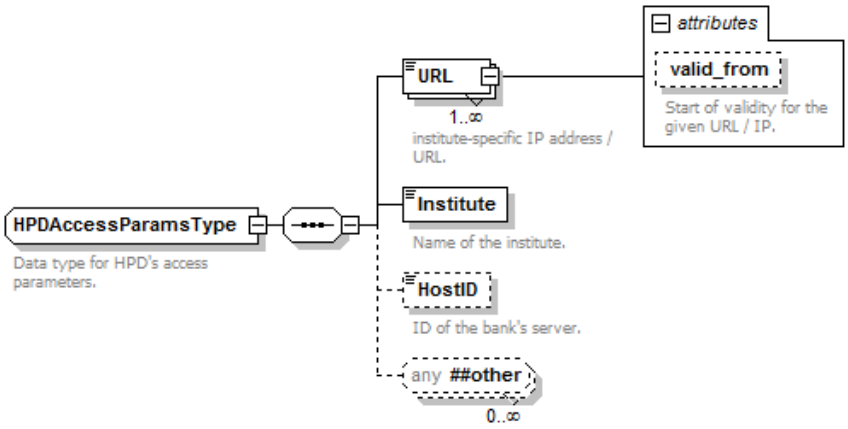


Diagram 90: HPDAccessParamsType (to AccessParams)

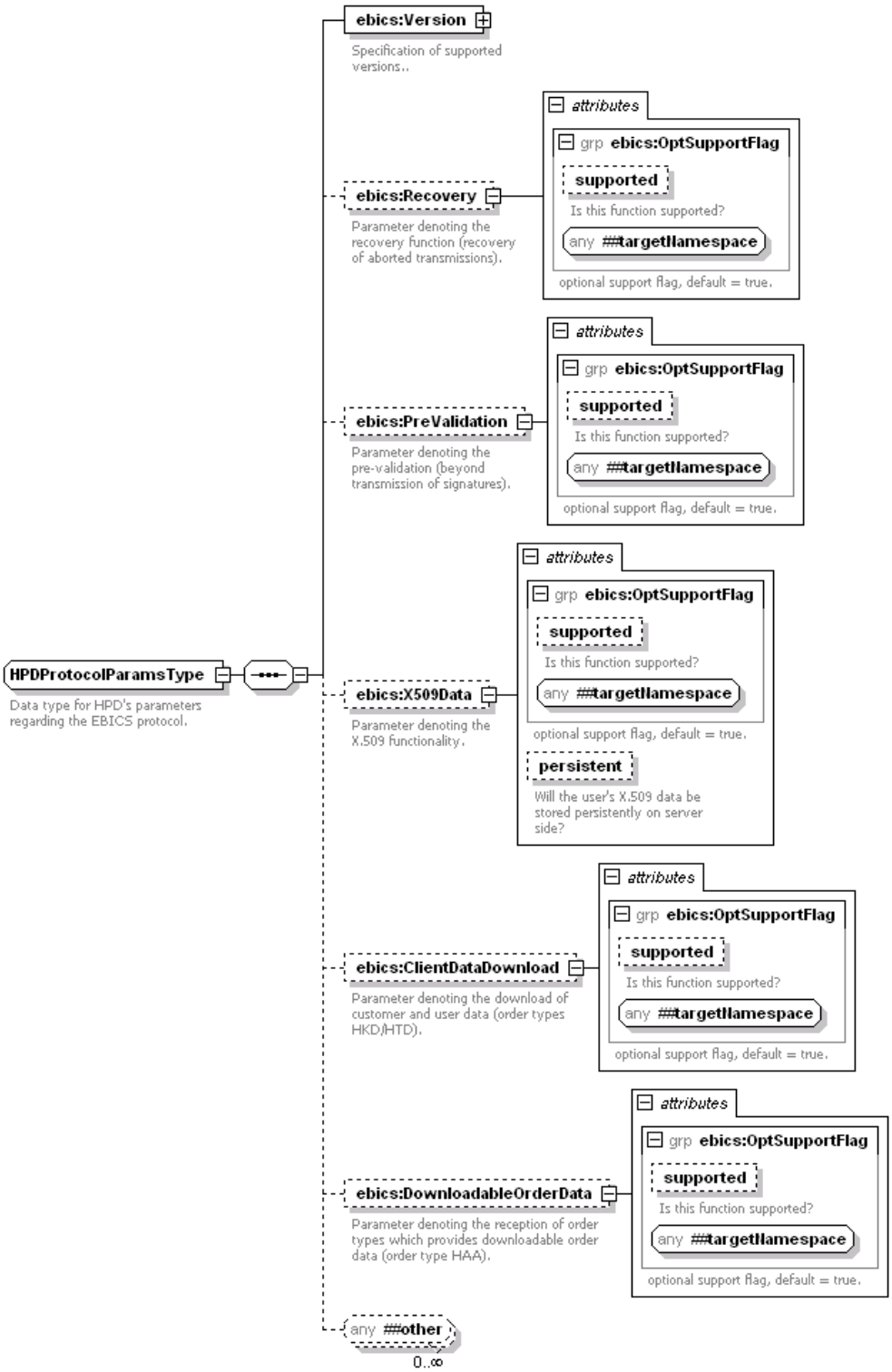


Diagram 91: HPDProtocolParamsType (to ProtocolParams)

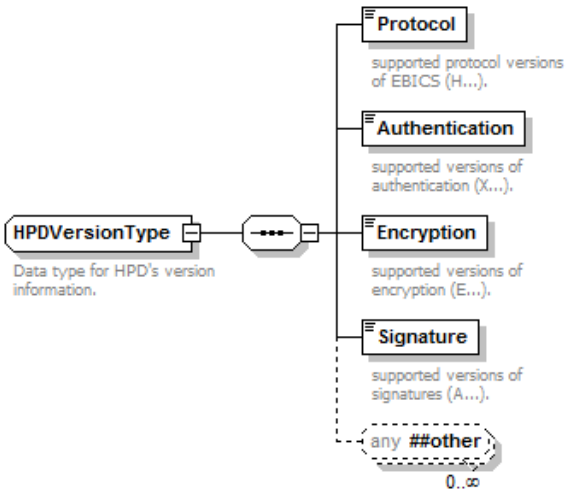


Diagram 92: HPDVersionType (to Version)

9.2.2.1.2 XML schema (textual representation)

```
 <element name="HPDResponseOrderData" type="ebics:HPDResponseOrderDataType"
substitutionGroup="ebics:EBICSOrderData">
   <annotation>
     <documentation xml:lang="en">Order data for order type HPD (response: receive bank
parameters).</documentation>
   </annotation>
 </element>
 <complexType name="HPDResponseOrderDataType">
   <annotation>
     <documentation xml:lang="en">Data type for order data of type HPD (response: receive bank
parameters).</documentation>
   </annotation>
   <sequence>
     <element name="AccessParams" type="ebics:HPDAccessParamsType">
       <annotation>
         <documentation xml:lang="en">EBICS access parameters.</documentation>
       </annotation>
     </element>
     <element name="ProtocolParams" type="ebics:HPDProtocolParamsType">
       <annotation>
         <documentation xml:lang="en">Parameters regarding the EBICS protocol.</documentation>
       </annotation>
     </element>
   </sequence>
 </complexType>
 <complexType name="HPDAccessParamsType">
   <annotation>
     <documentation xml:lang="en">Data type for HPD's access parameters.</documentation>
   </annotation>
   <sequence>
     <element name="URL" maxOccurs="unbounded">
       <annotation>
         <documentation xml:lang="en">institute-specific IP address / URL.</documentation>
       </annotation>
```

```
        <complexType>
          <simpleContent>
            <extension base="anyURI">
              <attribute name="valid_from" type="ebics:TimestampType">
                <annotation>
                  <documentation xml:lang="en">Start of validity for the given URL /
IP.</documentation>
                </annotation>
              </attribute>
            </extension>
          </simpleContent>
        </complexType>
      </element>
      <element name="Institute">
        <annotation>
          <documentation xml:lang="en">Name of the institute.</documentation>
        </annotation>
        <simpleType>
          <restriction base="normalizedString">
            <maxLength value="80"/>
          </restriction>
        </simpleType>
      </element>
      <element name="HostID" type="ebics:HostIDType" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">ID of the bank's server.</documentation>
        </annotation>
      </element>
      <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
  </complexType>
  <complexType name="HPDProtocolParamsType">
    <annotation>
      <documentation xml:lang="en">Data type for HPD's parameters regarding the EBICS
protocol.</documentation>
    </annotation>
    <sequence>
      <element name="Version" type="ebics:HPDVersionType">
        <annotation>
          <documentation xml:lang="en">Specification of supported versions.</documentation>
        </annotation>
      </element>
      <element name="Recovery" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Parameter denoting the recovery function (recovery of
aborted transmissions).</documentation>
        </annotation>
        <complexType>
          <attributeGroup ref="ebics:OptSupportFlag"/>
        </complexType>
      </element>
      <element name="PreValidation" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Parameter denoting the pre-validation (beyond
transmission of signatures).</documentation>
        </annotation>
        <complexType>
          <attributeGroup ref="ebics:OptSupportFlag"/>
        </complexType>
      </element>
      <element name="X509Data" minOccurs="0">
        <annotation>
```

```
          <documentation xml:lang="en">Parameter denoting the X.509
functionality.</documentation>
        </annotation>
        <complexType>
          <attributeGroup ref="ebics:OptSupportFlag"/>
          <attribute name="persistent" type="boolean" use="optional" default="false">
            <annotation>
              <documentation xml:lang="en">Will the user's X.509 data be stored persistently on
server side?</documentation>
            </annotation>
          </attribute>
        </complexType>
      </element>
      <element name="ClientDataDownload" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Parameter denoting the download of customer and user
data (order types HKD/HTD).</documentation>
        </annotation>
        <complexType>
          <attributeGroup ref="ebics:OptSupportFlag"/>
        </complexType>
      </element>
      <element name="DownloadableOrderData" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Parameter denoting the reception of order types which
provide downloadable order data (order type HAA).</documentation>
        </annotation>
        <complexType>
          <attributeGroup ref="ebics:OptSupportFlag"/>
        </complexType>
      </element>
      <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
  </complexType>
  <complexType name="HPDVersionType">
    <annotation>
      <documentation xml:lang="en">Data type for HPD's version information.</documentation>
    </annotation>
    <sequence>
      <element name="Protocol">
        <annotation>
          <documentation xml:lang="en">supported protocol versions of EBICS
(H...).</documentation>
        </annotation>
        <simpleType>
          <list itemType="ebics:ProtocolVersionType"/>
        </simpleType>
      </element>
      <element name="Authentication">
        <annotation>
          <documentation xml:lang="en">supported versions of authentication
(X...).</documentation>
        </annotation>
        <simpleType>
          <list itemType="ebics:AuthenticationVersionType"/>
        </simpleType>
      </element>
      <element name="Encryption">
        <annotation>
          <documentation xml:lang="en">supported versions of encryption (E...).</documentation>
        </annotation>
        <simpleType>
          <list itemType="ebics:EncryptionVersionType"/>
```

```
      </simpleType>
    </element>
    <element name="Signature">
      <annotation>
        <documentation xml:lang="en">supported versions of signatures (A...).</documentation>
      </annotation>
      <simpleType>
        <list itemType="ebics:SignatureVersionType"/>
      </simpleType>
    </element>
    <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </sequence>
</complexType>
<attributeGroup name="OptSupportFlag">
  <annotation>
    <documentation xml:lang="en">optional support flag, default = true.</documentation>
  </annotation>
  <attribute name="supported" type="boolean" use="optional" default="true"/>
  <anyAttribute namespace="##targetNamespace" processContents="strict"/>
</attributeGroup>
```

9.2.2.1.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
HPDResponse» OrderData	ebics:HPDResponse» OrderDataType (complex)	1	Order data for order type HPD	- (complex)
AccessParams	ebics:HPDAccessParams» Type (complex)	1	Access parameters	- (complex)
ProtocolParams	ebics:HPDProtocol» ParamsType (complex)	1	Protocol parameters	- (complex)
URL	anyURI	1..∞	Institute-specific IP address / URL	“www.the-bank.de”
URL@valid_from	ebics:TimestampType (→dateTime)	0..1	Commencement of validity for the specified URL/IP; if not specified, the URL/IP is valid with immediate effect	“2005-02-28T» 15:30:45.123Z“
Institute	normalizedString, maxLength=80	1	Financial institution designation	“The Bank“
HostID	ebics:HostIDType (→token, maxLength=35)	0..1	EBICS bank system ID	“EBIXHOST“
Version	ebics:HPDVersionType (complex)	1	Specification of supported versions	- (complex)
Protocol	list<ebics:Protocol» VersionType> (→list<token, length=4, pattern="H\d{3}">)	1	List of supported EBICS protocol versions	“H004“
Authentication	list<ebics:Authentica» tionVersionType> (→list<token, length=4, pattern= "X\d{3}">)	1	List of supported identification and authentication versions	“X002”

Encryption	list<ebics:Encryption» VersionType> (→list<token, length=4, pattern="E\d{3}">)	1	List of supported encryption versions	“E002”
Signature	list<ebics:Signature» VersionType> (→list<token, length=4, pattern="A\d{3}">)	1	List of supported ES versions	“A004 A005 A006“
Recovery	- (complex)	0..1	Parameters for recovery function (recovery of broken connections); if not specified, the function is not supported.	- (complex)
Recovery» @supported	boolean	0..1	Is recovery supported? (Default=true)	“true”
PreValidation	- (complex)	0..1	Parameters for preliminary verification; if not specified, the function is not supported	- (complex)
PreValidation» @supported	boolean	0..1	Is preliminary verification supported? (Default=true)	“true”
X509Data	- (complex)	0..1	Parameters for X.509 data; if not specified, the function is not supported	- (complex)
X509Data» @supported	boolean	0..1	Is X.509 data supported? (Default=true)	“false“
X509Data» @persistent	boolean	0..1	Is the subscriber’s X.509 data persistently stored at the server end? (Default=false)	“false“
ClientData» Download	- (complex)	0..1	Parameters for downloading customer and subscriber data (HKD/HTD); if not specified, the function is not supported	“true”
ClientData» Download» @supported	boolean	0..1	Are order types HKD/HTD supported? (Default=true)	“true”
Downloadable» OrderData	- (complex)	0..1	Parameters for retrieving order types for which order data is available (HAA); if not specified, the function is not supported	- (complex)
Downloadable» OrderData» @supported	boolean	0..1	Is order type HAA supported? (Default=true)	“true”

9.2.2.1.4 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<HPDResponseOrderData
 xmlns="urn:org:ebics:H004"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_orders_H004.xsd">
 <AccessParams>
   <URL>http://www.the-bank.de</URL>
   <URL valid_from="2005-02-15T15:30:45.123Z">192.168.0.1</URL>
   <Institute>The Bank</Institute>
   <HostID>EBIXHOST</HostID>
 </AccessParams>
 <ProtocolParams>
   <Version>
     <Protocol>H004</Protocol>
     <Authentication>X002</Authentication>
     <Encryption>E001</Encryption>
     <Signature>A004 A005</Signature>
   </Version>
   <Recovery supported="true"/>
   <PreValidation supported="true"/>
   <X509Data supported="false"/>
   < supported="true"/>
   <DownloadableOrderData supported="true"/>
 </ProtocolParams>
</HPDResponseOrderData>
```

9.3 HKD (retrieve customer's customer and subscriber information)

With HKD, the subscriber can retrieve information stored by the bank relating to his company and all associated subscribers (including themselves).

The bank's response contains a list of the accounts of the customer.
An account is only included in the HKD response if at least one of the following conditions is complied with:

1. The customer possesses an agreement on the provision of bank statements for the account.
2. At least one of the customer's subscribers is authorised to sign for the account.

It is not relevant whether the account holder is the same customer the HKD is retrieved for.

HKD is an order type of type "download".

9.3.1 HKD request

The HKD request does not contain specific data that goes beyond that named in the general transaction description.

9.3.2 HKD response

Characteristics of the (decoded & decrypted & decompressed) `OrderData` (order data) for HKD: `HKDResponseOrderData`

9.3.2.1.1 XML schema (graphic representation)

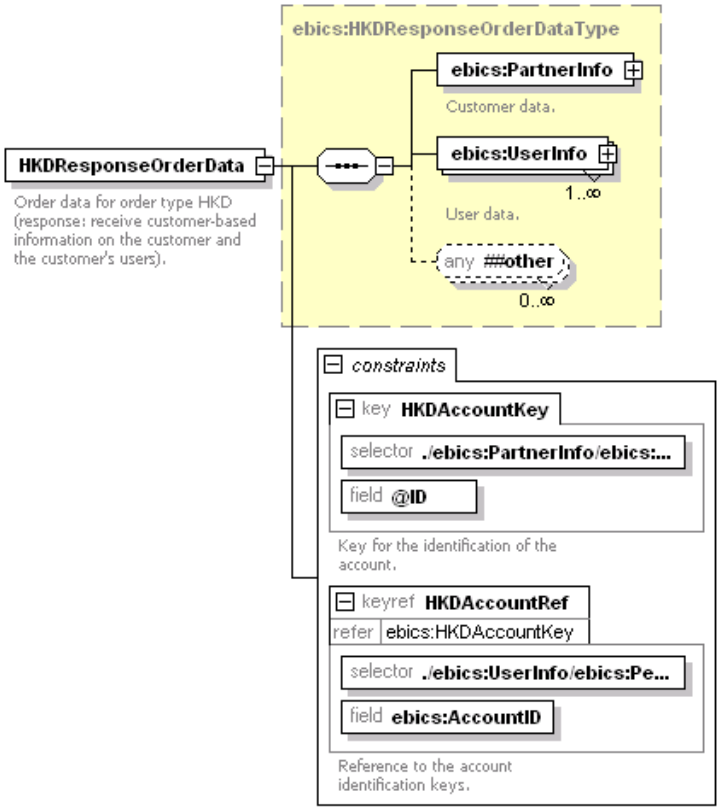


Diagram 93: HKDResponseOrderData

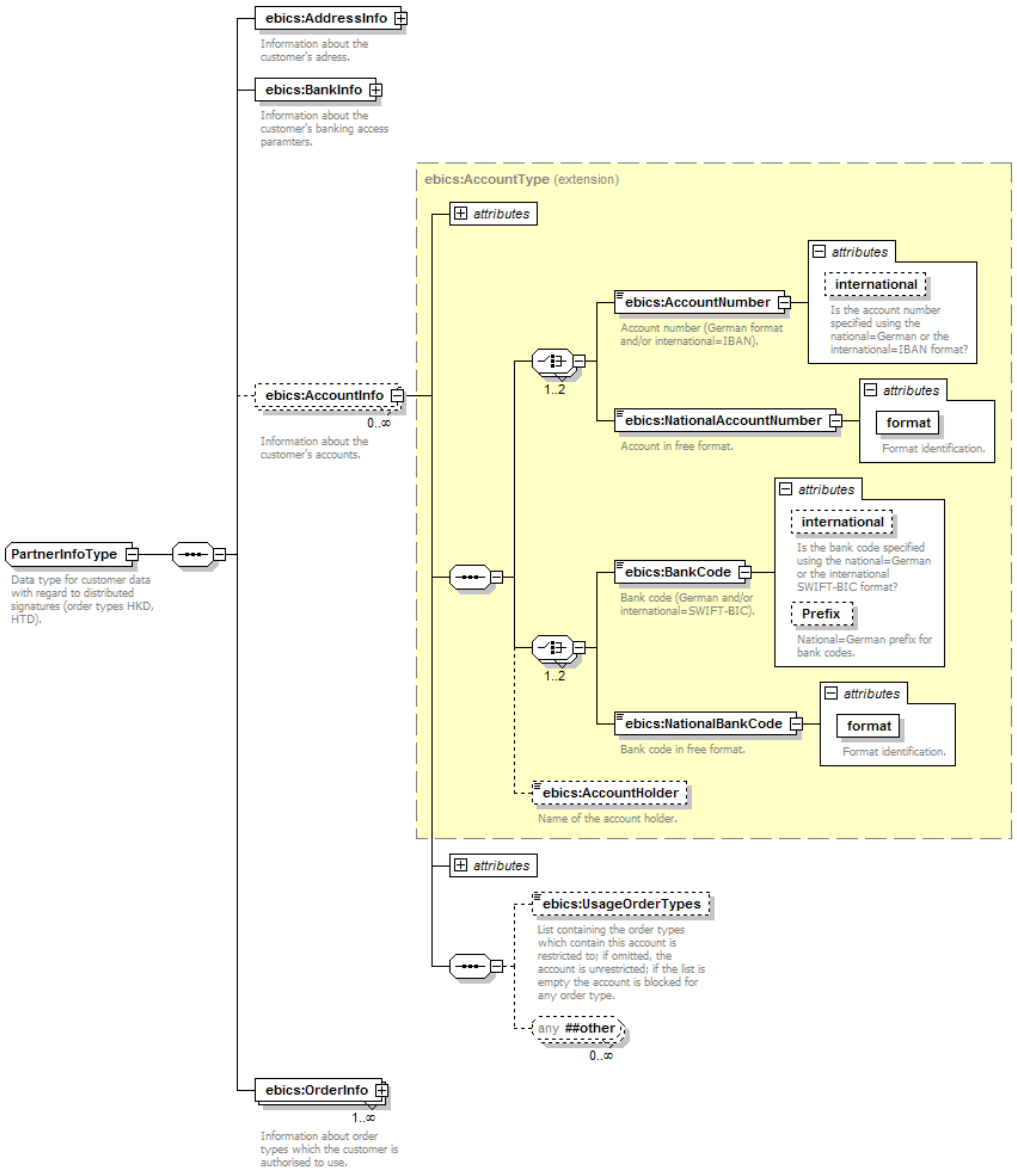


Diagram 94: PartnerInfoType (to PartnerInfo)

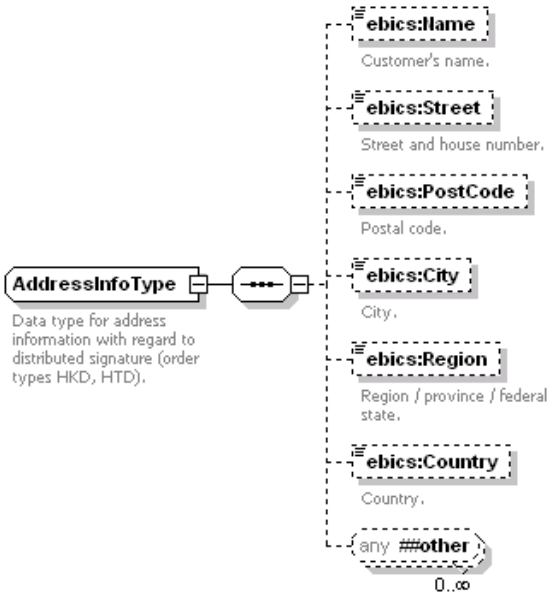


Diagram 95: AddressInfoType (to AddressInfo)

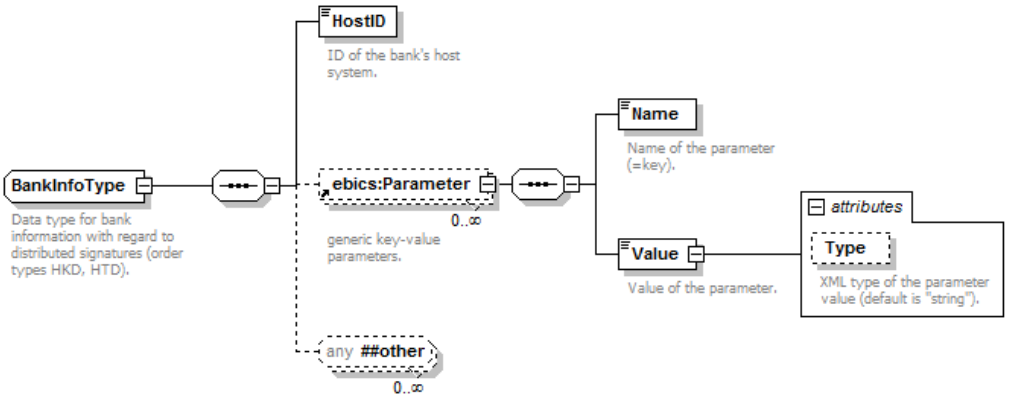


Diagram 96: BankInfoType (to BankInfo)

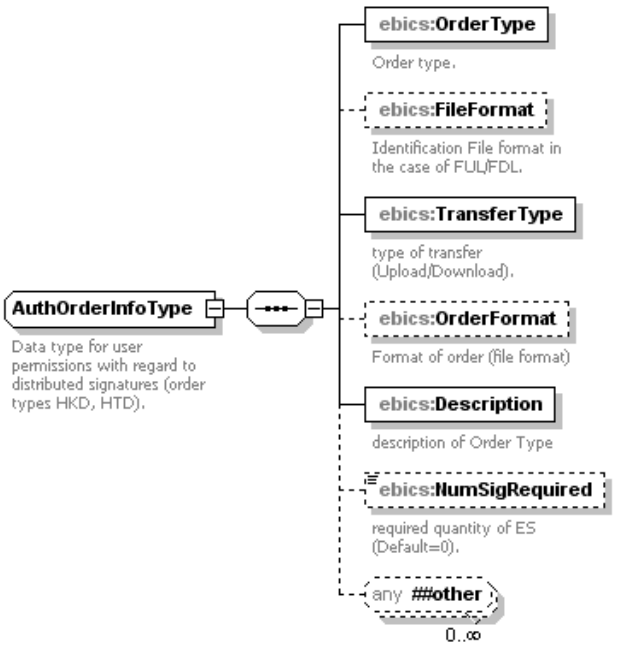


Diagram 97: AuthOrderInfoType (to OrderInfo)

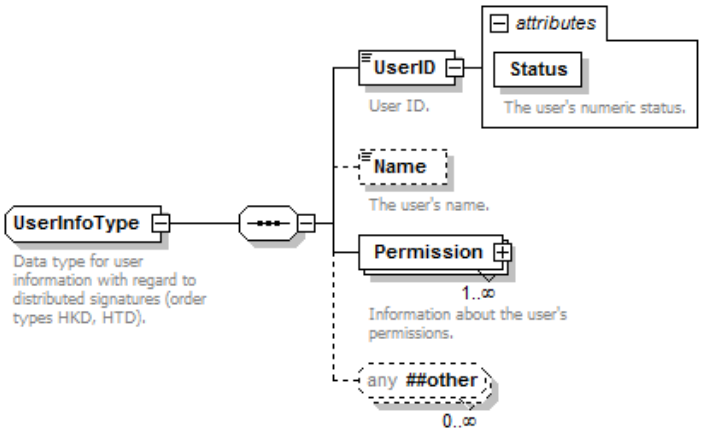


Diagram 98: UserInfoType (to UserInfo)

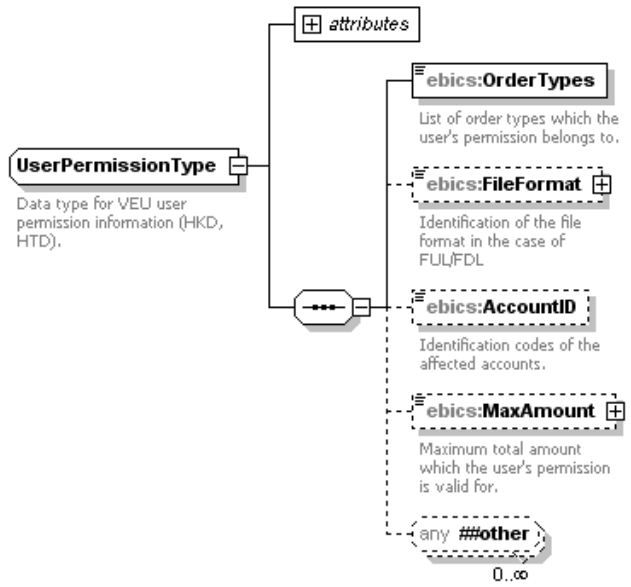


Diagram 99: UserPermissionType (to Permission)

9.3.2.1.2 XML schema (textual representation)

```
 <element name="HKDResponseOrderData" type="ebics:HKDResponseOrderDataType"
substitutionGroup="ebics:EBICSOrderData">
   <annotation>
     <documentation xml:lang="en">Order data for order type HKD (response: receive customer-
based information on the customer and the customer's users).</documentation>
   </annotation>
   <key name="HKDAccountKey">
     <annotation>
       <documentation xml:lang="de">Key  for the identification of the account
</documentation>
     </annotation>
     <selector xpath="./ebics:PartnerInfo/ebics:AccountInfo"/>
     <field xpath="@ID"/>
   </key>
   <keyref name="HKDAccountRef" refer="ebics:HKDAccountKey">
     <annotation>
       <documentation xml:lang="de">Reference to the account identification keys
</documentation>
     </annotation>

     <selector xpath="./ebics:UserInfo/ebics:Permission"/>
     <field xpath="AccountID"/>
   </keyref>
 </element>
 <complexType name="HKDResponseOrderDataType">
   <annotation>
     <documentation xml:lang="en">Data type for order data of type HKD (response: receive
customer-based information on the customer and the customer's users).</documentation>
   </annotation>
   <sequence>
```

```
      <element name="PartnerInfo" type="ebics:PartnerInfoType">
        <annotation>
          <documentation xml:lang="en">Customer data.</documentation>
        </annotation>
      </element>
      <element name="UserInfo" type="ebics:UserInfoType" maxOccurs="unbounded">
        <annotation>
          <documentation xml:lang="en">User data.</documentation>
        </annotation>
      </element>
      <any namespace="##other" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
  </complexType>
  <complexType name="PartnerInfoType">
    <annotation>
      <documentation xml:lang="en">Data type for customer data with regard to distributed
signatures (order types HKD, HTD).</documentation>
    </annotation>
    <sequence>
      <element name="AddressInfo" type="ebics:AddressInfoType">
        <annotation>
          <documentation xml:lang="en">Information about the customer's
address.</documentation>
        </annotation>
      </element>
      <element name="BankInfo" type="ebics:BankInfoType">
        <annotation>
          <documentation xml:lang="en">Information about the customer's banking access
parameters.</documentation>
        </annotation>
      </element>
      <element name="AccountInfo" minOccurs="0" maxOccurs="unbounded">
        <annotation>
          <documentation xml:lang="en">Information about the customer's
accounts.</documentation>
        </annotation>
        <complexType>
          <complexContent>
            <extension base="ebics:AccountType">
              <sequence>
                <element name="UsageOrderTypes" type="ebics:OrderTListType" minOccurs="0">
                  <annotation>
                    <documentation xml:lang="en">List containing the order types which this
account is restricted to; if omitted, the account is unrestricted; if the list is empty, the
account is blocked for any order type.</documentation>
                  </annotation>
                </element>
                <any namespace="##other" processContents="lax" minOccurs="0"
maxOccurs="unbounded"/>
              </sequence>
              <attribute name="ID" type="ebics:AccountIDType" use="required">
                <annotation>
                  <documentation xml:lang="en">Unique identification code for this
account.</documentation>
                </annotation>
              </attribute>
            </extension>
          </complexContent>
        </complexType>
      </element>
      <element name="OrderInfo" type="ebics:AuthOrderInfoType" maxOccurs="unbounded">
        <annotation>
          <documentation xml:lang="en">Information about order types which the customer is
authorised to use.</documentation>
```

```
      </annotation>
    </element>
  </sequence>
</complexType>
<complexType name="AddressInfoType">
  <annotation>
    <documentation xml:lang="en">Data type for address information with regard to distributed
signatures (order types HKD, HTD).</documentation>
  </annotation>
  <sequence>
    <element name="Name" type="ebics:NameType" minOccurs="0">
      <annotation>
        <documentation xml:lang="en">User's name.</documentation>
      </annotation>
    </element>
    <element name="Street" type="ebics:NameType" minOccurs="0">
      <annotation>
        <documentation xml:lang="en">Street and house number.</documentation>
      </annotation>
    </element>
    <element name="PostCode" type="token" minOccurs="0">
      <annotation>
        <documentation xml:lang="en">Postal code.</documentation>
      </annotation>
    </element>
    <element name="City" type="ebics:NameType" minOccurs="0">
      <annotation>
        <documentation xml:lang="en">City.</documentation>
      </annotation>
    </element>
    <element name="Region" type="ebics:NameType" minOccurs="0">
      <annotation>
        <documentation xml:lang="en">Region / province / federal state.</documentation>
      </annotation>
    </element>
    <element name="Country" type="ebics:NameType" minOccurs="0">
      <annotation>
        <documentation xml:lang="en">Country.</documentation>
      </annotation>
    </element>
    <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </sequence>
</complexType>
<complexType name="BankInfoType">
  <annotation>
    <documentation xml:lang="en">Data type for bank information with regard to distributed
signatures (order types HKD, HTD).</documentation>
  </annotation>
  <sequence>
    <element name="HostID" type="ebics:HostIDType">
      <annotation>
        <documentation xml:lang="en">ID of the bank's host system.</documentation>
      </annotation>
    </element>
    <element ref="ebics:Parameter" minOccurs="0" maxOccurs="unbounded"/>
    <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
  </sequence>
</complexType>
<complexType name="AuthOrderInfoType">
  <annotation>
    <documentation xml:lang="en">Data type for order authorisation information with regard to
distributed signatures (order types HKD, HTD).</documentation>
```

```
    </annotation>
    <sequence>
      <element name="OrderType" type="ebics:OrderTBaseType">
        <annotation>
          <documentation xml:lang="en">Order type.</documentation>
        </annotation>
      </element>
      <element name="FileFormat" type="ebics:FileFormatType" minOccurs="0">
        <annotation>
           <documentation xml:lang="en">File format parameter.</documentation>
        </annotation>
      </element>
      <element name="TransferType" type="ebics:TransferType">
        <annotation>
          <documentation xml:lang="en">Transfer type, i.e. direction of the transmission of
order data (upload/download).</documentation>
        </annotation>
      </element>
      <element name="OrderFormat" type="ebics:OrderFormatType" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Format specification of the order data (e.g.
"DTAZV").</documentation>
        </annotation>
      </element>
      <element name="Description" type="ebics:OrderDescriptionType">
        <annotation>
          <documentation xml:lang="en">Short description of the order type.</documentation>
        </annotation>
      </element>
      <element name="NumSigRequired" type="nonNegativeInteger" default="0" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Minimum number of digital signatures needed to authorise
an order of the given type (default is none, if omitted).</documentation>
        </annotation>
      </element>
      <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
  </complexType>
  <complexType name="UserInfoType">
    <annotation>
      <documentation xml:lang="en">Data type for user information with regard to distributed
signatures (order types HKD, HTD).</documentation>
    </annotation>
    <sequence>
      <element name="UserID">
        <annotation>
          <documentation xml:lang="en">User ID.</documentation>
        </annotation>
        <complexType>
          <simpleContent>
            <extension base="ebics:UserIDType">
              <attribute name="Status" type="ebics:UserStatusType" use="required">
                <annotation>
                  <documentation xml:lang="en">The user's numeric status.</documentation>
                </annotation>
              </attribute>
            </extension>
          </simpleContent>
        </complexType>
      </element>
      <element name="Name" type="ebics:NameType" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">The user's name.</documentation>
```

```
        </annotation>
      </element>
      <element name="Permission" type="ebics:UserPermissionType" maxOccurs="unbounded">
        <annotation>
          <documentation xml:lang="en">Information about the user's
permissions.</documentation>
        </annotation>
      </element>
      <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
  </complexType>
  <complexType name="UserPermissionType">
    <annotation>
      <documentation xml:lang="en">Datatype for user permissions with regard to distributed
signatures (order types HKD, HTD).</documentation>
    </annotation>
    <sequence>
      <element name="OrderTypes" type="ebics:OrderTListType">
        <annotation>
          <documentation xml:lang="en">List of order types which the user's permission belongs
to.</documentation>
        </annotation>
      </element>
      <element name="FileFormat" type="ebics:FileFormatType" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">File format parameters which the user's permission
belongs to.</documentation>
        </annotation>
      </element>
      <element name="AccountID" type="ebics:AccountIDType" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Identification codes of the affected
accounts.</documentation>
        </annotation>
      </element>
      <element name="MaxAmount" type="ebics:AmountType" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Maximum total amount which the user's permission is
valid for.</documentation>
        </annotation>
      </element>
      <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
    <attribute name="AuthorisationLevel" type="ebics:AuthorisationLevelType">
      <annotation>
        <documentation xml:lang="en">Authorisation level of the user who signed the order; to
be omitted for orders of type "download".</documentation>
      </annotation>
    </attribute>
    <anyAttribute namespace="##targetNamespace" processContents="strict"/>
  </complexType>
  <complexType name="AccountType">
    <annotation>
      <documentation xml:lang="en">Data type for detailed account information.</documentation>
    </annotation>
    <sequence>
      <element name="AccountNumber" maxOccurs="2">
        <annotation>
          <documentation xml:lang="en">Account number (German format and/or
international=IBAN).</documentation>
        </annotation>
        <complexType>
          <simpleContent>
```

```
            <extension base="ebics:AccountNumberType">
              <attribute name="international" type="boolean" use="optional" default="false">
                <annotation>
                  <documentation xml:lang="en">Is the account number specified using the
national=German or the international=IBAN format?</documentation>
                </annotation>
              </attribute>
            </extension>
          </simpleContent>
        </complexType>
      </element>
      <element name="BankCode" maxOccurs="2">
        <annotation>
          <documentation xml:lang="en">Bank code (German and/or international=SWIFT-BIC
format).</documentation>
        </annotation>
        <complexType>
          <simpleContent>
            <extension base="ebics:BankCodeType">
              <attribute name="international" type="boolean" use="optional" default="false">
                <annotation>
                  <documentation xml:lang="en">Is the bank code specified using the
national=German or the international=SWIFT-BIC format?</documentation>
                </annotation>
              </attribute>
              <attribute name="Prefix" type="ebics:BankCodePrefixType" use="optional">
                <annotation>
                  <documentation xml:lang="en">National=German prefix for bank
codes.</documentation>
                </annotation>
              </attribute>
            </extension>
          </simpleContent>
        </complexType>
      </element>
      <element name="AccountHolder" type="ebics:AccountHolderType" minOccurs="0">
        <annotation>
          <documentation xml:lang="en">Name of the account holder.</documentation>
        </annotation>
      </element>
    </sequence>
    <attribute name="Currency" type="ebics:CurrencyBaseType" use="optional" default="EUR">
      <annotation>
        <documentation xml:lang="en">Currency code for this account.</documentation>
      </annotation>
    </attribute>
    <attribute name="Description" type="ebics:AccountDescriptionType" use="optional">
      <annotation>
        <documentation xml:lang="en">Description of this account.</documentation>
      </annotation>
    </attribute>
  </complexType>
  <complexType name="AmountType">
    <annotation>
      <documentation xml:lang="en">Data type for an amount including a currency attribute
(defaults to "EUR").</documentation>
    </annotation>
    <simpleContent>
      <extension base="ebics:AmountValueType">
        <attribute name="Currency" type="ebics:CurrencyBaseType" use="optional" default="EUR">
          <annotation>
            <documentation xml:lang="en">Currency code, default setting is
"EUR".</documentation>
```

```
        </annotation>
      </attribute>
    </extension>
  </simpleContent>
</complexType>
<element name="Parameter">
  <annotation>
    <documentation xml:lang="en">generic key-value parameters.</documentation>
  </annotation>
  <complexType>
    <sequence>
      <element name="Name" type="token">
        <annotation>
          <documentation xml:lang="en">Name of the parameter (=key).</documentation>
        </annotation>
      </element>
      <element name="Value">
        <annotation>
          <documentation xml:lang="en">Value of the parameter.</documentation>
        </annotation>
        <complexType>
          <simpleContent>
            <extension base="anySimpleType">
              <attribute name="Type" type="NCName" use="optional" default="string">
                <annotation>
                  <documentation xml:lang="en">XML type of the parameter value (default is
"string").</documentation>
                </annotation>
              </attribute>
            </extension>
          </simpleContent>
        </complexType>
      </element>
    </sequence>
  </complexType>
</element>
```

9.3.2.1.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
HKDResponse» OrderData	ebics:HKDResponse» OrderDataType (complex)	1	Order data for order type HKD	- (complex)
PartnerInfo	ebics:PartnerInfoType (complex)	1	Customer data	- (complex)
AddressInfo	ebics:AddressInfoType	1	Customer's address information	- (complex)
Name (in AddressInfo)	ebics:NameType (→normalizedString)	0..1	Customer's name	"John Doe"
Street	ebics:NameType (→normalizedString)	0..1	Customer's street and house number	"Elmstreet 1"
PostCode	token	0..1	Customer's post code	"12345"
City	ebics:NameType (→normalizedString)	0..1	Customer's city	"Smallville"
Region	ebics:NameType (→normalizedString)	0..1	Customer's region / Federal State	"Virginia"

Country	ebics:NameType (→normalizedString)	0..1	Customer's country	"USA"
BankInfo	ebics:BankInfoType (complex)	1	Information on customer's financial institution connection	- (complex)
HostID	ebics:HostIDType (→token, maxLength=35	1	EBICS bank system ID	"EBIXHOST"
Parameter	Reference to global element (complex)	0.. ∞	Structure for generic key value parameters with optional type specification	- (complex)
AccountInfo	ebics:AccountType (complex)	0.. ∞	Information on customer's accounts. An account is only listed in the KHD response if the customer possesses an agreement on the provision for it, OR if at least one of the customer's subscribers is authorised to sign for the account. The account holder does not have to be the same customer as the one the HKD is retrieved for.	- (complex)
AccountInfo» @Currency	ebics:CurrencyBaseType (→token, length=3)	0..1	Currency code for the account in question, according to ISO 4127; if not specified, "EUR" is assumed	"EUR"
Description	ebics:Account» DescriptionType (→normalizedString)	0..1	Textual description of the account	"Giro account"
AccountInfo@ID	ebics:AccountIDType (→token, maxLength=64)	1	Unambiguous account identification code	"ABCDEFG» abcdefg» 1234567890"
-	-	1..2	Information on the account number: AccountNumber and/or NationalAccountNumber	-
AccountNumber	ebics:AccountNumber» Type (→token, maxLength=40, pattern="\d{3,10}| ([A-Z]{2}\d{2} [A-Za-z0-9]{3,30})")	1	Account number (German format or international as IBAN)	„123456789"
AccountNumber» @international	boolean	0..1	Is the account number given in national=German (false, default) or in international=IBAN format (true)?	"false"
National» AccountNumber	ebics:National» AccountNumberType (→token, maxLength=40)	1	Account number in free format (for national account numbers which comply	„1234567890 123456"

			neither to German nor international standards)	
National» Account» Number@format	token	1	Description of the format of the account number	„other“
-	-	1..2	Information on the bank code: BankCode and/or NationalBankCode	-
BankCode	ebics:BankCodeType (→token, maxLength=11, pattern="\d{8}|([A-Z]{6}[A-Z0-9]{2}([A-Z0-9]{3})?)")	1..2	Bank sort code (German format or international as SWIFT-BIC)	„50010070“
BankCode» @international	boolean	0..1	Is the bank sort code given in national=German (false, default) or in international=SWIFT-BIC format (true)?	“false“
BankCode» @Prefix	ebics:BankCodePrefix» Type (→token, length=2)	0..1	National bank sort code prefix	“DE“
NationalBank» Code	ebics:National» BankCodeType (→token, maxLength=30)	1	Bank code in free format (neither German format nor SWIFT-BIC)	„1234567890 12“
NationalBank» Code@format	token	1	Description of the bank code format	“other”
AccountHolder	ebics:AccountHolder» Type (→normalizedString)	0..1	Name of the account holder	“John Doe“
UsageOrder» Types	ebics:OrderTListType (→list<ebics:» OrderTBaseType> →list<token, length=3, pattern= "[A-Z0-9]{3}">)	0..1	List of order restrictions for the account in question; if not specified, there are no restrictions as to order type for the account in question; if the list is empty, the account in question has not been activated for any order types	“STA IZV”
OrderInfo	ebics:OrderInfoType (complex)	1.. ∞	Information on the order types assigned to the customer	- (complex)
OrderType	ebics:OrderTBaseType (→token, length=3, pattern="[A-Z0-9]{3}")	1	The order type assigned to the customer	“IZV”, “FDL”…
FileFormat	FileFomatType (complex) (→token)	0..1	The file format assigned to the customer	“camt.xxx.cfonb120.stm”
FileFormat» @CountryCode	CountryCodeType (→token, length=2, pattern= " [A-Z]{2,2}")		Information on the format's field of application (e.g. country-specific formats)	“FR”…

TransferType	ebics:TransferType (→token: "Upload", "Download")	1	Transfer type (“Upload” = order data from client to server, “Download” = order data from server to client	“Upload“
OrderFormat	ebics:OrderFormatType (→token, maxLength=8)	0..1	Order data format	“DTAUS“
Description	ebics:Order» DescriptionType (→normalizedString, maxLength=128)	1	Textual description of the order type	“Domestic transfer“
NumSig» Required	nonNegativeInteger	0..1	Number of ES’s required for the order type; default=0, unless specified	2
UserInfo	ebics:UserInfoType (complex)	1.. ∞	Subscriber information	- (complex)
UserID	ebics:UserIDType (→token, maxLength=35, pattern="[a-zA-Z0-9,=]{1,35})	1	Subscriber ID	“USR100“
UserID@Status	ebics:UserStatusType (→nonNegativeInteger, maxInclusive=99)	1	Subscriber’s state: 1: Ready: Subscriber is permitted access 2: New: Initial state after establishing the subscriber for EBICS ("established") 3: Partly initialised (INI): Subscriber has sent INI file, yet no HIA 4:Partly initialised (HIA): Subscriber has sent HIA order, but no INI file yet 5: Initialised: Subscriber has sent HIA order and INI file 6: Suspended (several failed attempts), new initialisation via INI and HIA possible) 7: New_FTAM: Subscriber is established for EBICS and for FTAM in the state "Ready" with an EBICS-compliant signature key (A004) 8: Suspended (by the customer's SPR order), new initialisation via INI and HIA possible 9: Suspended (by bank), new initialisation via INI and HIA is not possible, suspension can only be revoked by the bank	1
Name (in UserInfo)	ebics:NameType (→normalizedString)	0..1	Subscriber’s name	“John Doe“
Permission	ebics:PermissionType (complex)	1.. ∞	Information on the subscriber’s authorisations	- (complex)

Permission» @Authorisa» tionLevel	ebics:Authorisation» LevelType (→token, length=1: "E", "A", "B", "T")	0..1	Signature class for which the subscriber is authorised: "E"=Individual signature, "A"=First signature, "B"=Second signature, "T"=Transport signature. Not to be specified in the case of download order types	"A"
OrderTypes	ebics:OrderTListType (→list<OrderTBase» Type> →list<token, length=3, pattern= "[A-Z0-9]{3}">)	1	List of order types for which the subscriber's signature authorisation is valid separated by a blank character	"IZV AZV", "FDL"
FileFormat	FileFomatType (complex) (→token	0..1	File format for which the order type authorisation is valid Annotation: To be used if OrderTypes = "FUL" or "FDL"	"camt.xxx.cfo nb120.stm"
FileFormat» @CountryCode	CountryCodeType (→token, length=2, pattern= " [A-Z]{2,2}")		Information on the format's field of application (e.g. country-specific formats)	"FR"…
AccountID	ebics:AccountIDType (→token, maxLength=64)	0.. ∞	Reference to the identification code of an authorised account	"ABCDEFG» abcdefg» 1234567890"
MaxAmount	ebics:AmountType (→ebics:AmountValue» Type →decimal, totalDigits=24, fractionDigits=4)	0..1	Amount upper threshold up to which the subscriber's signature authorisation is valid (Validity of the reference is enforced by the EBICS XML schema)	5000.00
MaxAmount» @Currency	ebics:CurrencyBaseTyp e (→token, length=3)	0..1	Currency of the maximum amount, according to ISO 4127; if not specified, "EUR" is assumed	"EUR"

Notes on the clarification:

The allocation of account authorisations for the particular subscribers is effected by means of the element UserInfo/Permission in the following way:

If the element AccountID is not transferred with UserInfo/Permission, the order types transferred with UserInfo/Permission apply automatically to *all* accounts of the respective customer.

However, if the element AccountID is transferred with UserInfo/Permission, the order type authorisations transferred with the respective element UserInfo/Permission/OrderTypes apply exclusively to the account IDs referenced via AccountID.

The permissions of FUL and FDL are not allocated as a string order types each separated by a blank: "FUL" and "FDL" are allocated as single permissions combined with the element FileFormat:

```
<UserInfo>
   <UserID Status="1">USR200</UserID>
   <Permission AuthorisationLevel="A">
     <OrderType>FUL</OrderType>
     <FileFormat CountryCode="FR">pain.xxx.cfonb160.dct</ FileFormat >
     <MaxAmount Currency="EUR">6000.00</MaxAmount>
   </Permission>
   <Permission AuthorisationLevel="A">
     <OrderType>FUL</OrderType>
      <FileFormat CountryCode="FR">pain.001.001.02.sct</FileFormat >
      <MaxAmount Currency="EUR">12000.00</MaxAmount>
    </Permission>
    <Permission>
     <OrderType>FDL</OrderType>
     <FileFormat CountryCode="FR">camt.xxx.cfonb120.stm</FileFormat >
   </Permission>
 </UserInfo>
```

9.3.2.1.4 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<HKDResponseOrderData
 xmlns="urn:org:ebics:H004"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_orders_H004.xsd">
 <PartnerInfo>
   <AddressInfo>
     <Name>John Doe</Name>
     <Street>Elmstreet 1</Street>
     <PostCode>12345</PostCode>
     <City>Smallville</City>
     <Region>Virginia</Region>
     <Country>USA</Country>
   </AddressInfo>
   BankInfo
     <HostID>EBIXHOST</HostID>
   </BankInfo>
   <AccountInfo ID="accid01" Currency="EUR" Description="Girokonto">
     <AccountNumber international="false">123456789</AccountNumber>
     <BankCode international="false" Prefix="DE">50010070</BankCode>
     <AccountHolder>John Doe</AccountHolder>
   </AccountInfo>
   <OrderInfo>
     <OrderType>STA</OrderType>
     <TransferType>Download</TransferType>
     <Description>Download SWIFT daily accounts</Description>
   </OrderInfo>
   <OrderInfo>
     <OrderType>IZV</OrderType>
     <TransferType>Upload</TransferType>
     <Description>Send domestic payment transaction order</Description>
     <NumSigRequired>2</NumSigRequired>
   </OrderInfo>
 </PartnerInfo>
 <UserInfo>
   <UserID Status="1">USR100</UserID>
   <Permission>
     <OrderTypes>STA</OrderTypes>
   </Permission>
 </UserInfo>
 <UserInfo>
   <UserID Status="1">USR200</UserID>
```

```
    <Permission AuthorisationLevel="A">
      <OrderTypes>IZV</OrderTypes>
      <AccountID>accid01</AccountID>
      <MaxAmount Currency="EUR">6000.00</MaxAmount>
    </Permission>
    <Permission>
      <OrderTypes>STA</OrderTypes>
    </Permission>
  </UserInfo>
</HKDResponseOrderData>
```

9.4 HTD (retrieve subscriber's customer and subscriber information)

With HTD, the subscriber can retrieve information stored by the bank relating to their company or themselves; however, in contrast to HKD they are not given information on the company's other subscribers.

HTD is an order type of type "download".

9.4.1 HTD request

The HTD request does not contain specific data that goes beyond that named in the general transaction description.

9.4.2 HTD response

Characteristics of the (decoded & decrypted & decompressed) `OrderData` (order data) for HTD: `HTDResponseOrderData`

9.4.2.1.1 XML schema (graphic representation)

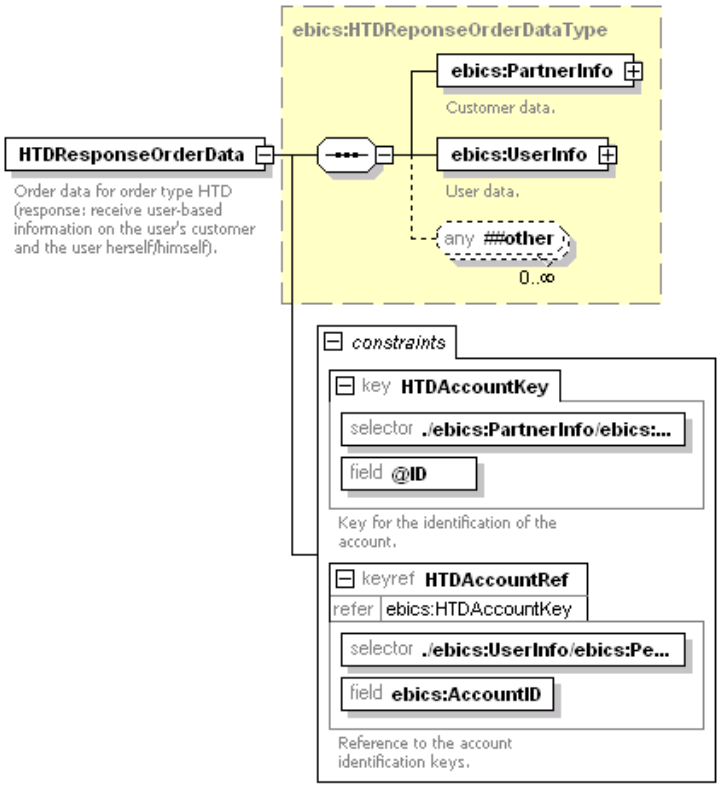


Diagram 100: HTDResponseOrderData

9.4.2.1.2 XML schema (textual representation)

```
 <element name="HTDResponseOrderData" type="ebics:HTDReponseOrderDataType"
substitutionGroup="ebics:EBICSOrderData">
   <annotation>
     <documentation xml:lang="en">Order data for order type HTD (response: receive user-based
information on the user's customer and the user herself/himself).</documentation>
   </annotation>
   <key name="HTDAccountKey">
     <annotation>
       <documentation xml:lang="de">Key  for the identification of the account
</documentation>
     </annotation>

     <selector xpath="./ebics:PartnerInfo/ebics:AccountInfo"/>
     <field xpath="@ID"/>
   </key>
   <keyref name="HTDAccountRef" refer="ebics:HTDAccountKey">
     <annotation>
       <documentation xml:lang="de">Reference to the account identification keys
</documentation>
     </annotation>
     <selector xpath="./ebics:UserInfo/ebics:Permission"/>
```

```
      <field xpath="AccountID"/>
    </keyref>
  </element>
  <complexType name="HTDReponseOrderDataType">
    <annotation>
      <documentation xml:lang="en">Data type for order data of type HTD (response: receive
user-based information on the user's customer and the user herself/himself).</documentation>
    </annotation>
    <sequence>
      <element name="PartnerInfo" type="ebics:PartnerInfoType">
        <annotation>
          <documentation xml:lang="en">Customer data.</documentation>
        </annotation>
      </element>
      <element name="UserInfo" type="ebics:UserInfoType">
        <annotation>
          <documentation xml:lang="en">User data.</documentation>
        </annotation>
      </element>
      <any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </sequence>
  </complexType>
```

9.4.2.1.3 Meaning of the XML elements/attributes

XML element/ attribute	Data type	#	Meaning	Example
HTDResponse» OrderData	ebics:HTDResponse» OrderDataType (complex)	1	Order data for order type HTD	- (complex)
PartnerInfo	ebics:PartnerInfoType (complex)	1	Customer data	- (complex)
UserInfo	ebics:UserInfo (complex)	1	Subscriber information	- (complex)

For the remaining XML elements and attributes: See order type HKD (Chapter 9.3.2.1.3).
The clarification on the allocation of account authorisations itemised in this chapter applies as well.

9.4.2.1.4 Example XML

```
<?xml version="1.0" encoding="UTF-8"?>
<HTDResponseOrderData
 xmlns="urn:org:ebics:H004"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_orders_H004.xsd">
 <PartnerInfo>
   <AddressInfo>
     <Name>John Doe</Name>
     <Street>Elmstreet 1</Street>
     <PostCode>12345</PostCode>
     <City>Smallville</City>
     <Region>Virginia</Region>
     <Country>USA</Country>
   </AddressInfo>
   BankInfo
     <HostID>EBIXHOST</HostID>
```

```
    </BankInfo>
    <AccountInfo ID="accid01" Currency="EUR" Description="Giro account">
      <AccountNumber international="false">123456789</AccountNumber>
      <BankCode international="false" Prefix="DE">50010070</BankCode>
      <AccountHolder>John Doe</AccountHolder>
    </AccountInfo>
    <OrderInfo>
      <OrderType>STA</OrderType>
      <TransferType>Download</TransferType>
      <Description>Download SWIFT daily accounts</Description>
    </OrderInfo>
    <OrderInfo>
      <OrderType>IZV</OrderType>
      <TransferType>Upload</TransferType>
      <Description>Send domestic payment transaction order</Description>
      <NumSigRequired>2</NumSigRequired>
    </OrderInfo>
  </PartnerInfo>
  <UserInfo>
    <UserID Status="1">USR100</UserID>
    <Permission>
      <OrderTypes>STA</OrderTypes>
    </Permission>
    <Permission AuthorisationLevel="A">
      <OrderTypes>IZV</OrderTypes>
      <AccountID>accid01</AccountID>
      <MaxAmount Currency="EUR">6000.00</MaxAmount>
    </Permission>
  </UserInfo>
</HTDResponseOrderData>
```

9.5 HEV (Download of supported EBICS versions)

By means of HEV the subscriber can inform himself of the EBICS versions supported at the bank's end. The bank's response contains a list of supported EBICS versions and the version of the relevant schema.

HEV is an order type of type “download”.

9.5.1 HEV request

The HEV request retrieves only EBICS versions which are supported by the bank. This request can also be executed by subscribers not initialised. Therefore, an identification and authentication signature is not required.
Only the following information is mandatorily transmitted along with the HEV request:

- Host ID of the EBICS bank computer

The transaction is cancelled and the return code EBICS_INVALID_HOST_ID is returned if the transmitted HostID is unknown on the bank’s side.
Note: This return code is only allowed for the HEV request!

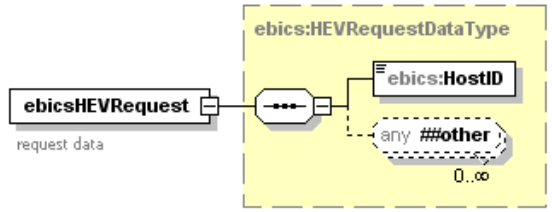
9.5.2 HEV response

The response provides the following information:

- technical return code
- technical report text
- See document “EBICS Annex 1 Return Codes” for the value ranges of both fields. As the EBICS version of the customer system is unknown to the bank system at the time of the HEV request, the bank system assigns values to the fields which are defined in the most updated EBICS version supported at the bank's end. As there is no language-attribute available in the request, the report text is always transmitted in English.
- List of the EBICS versions supported by the bank system and names of the schema versions relevant for these

9.5.3 Schema for HEV request / HEV response

For HEV request und HEV response the neutral schema ebics_hev.xsd is used which is independent of the EBICS versions currently supported by the bank and can be retrieved from http://www.ebics.org (category „Specification“). The schema contains request and response. In the case of a request, ebicsHEVRequest must be filled in, in case of a response, ebicsHEVResponse must be filled in.



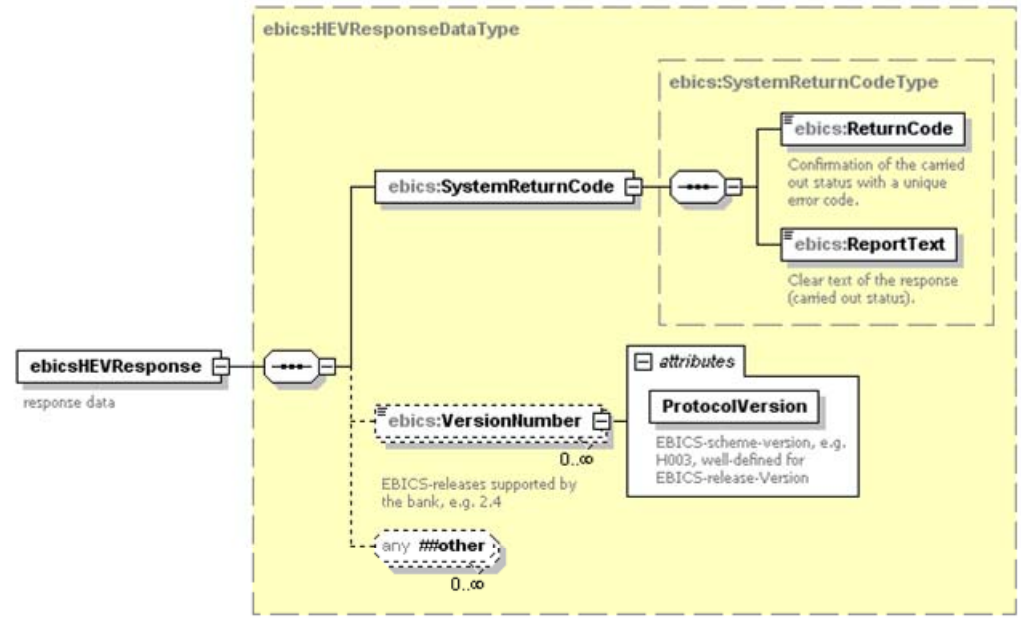


Diagram 101: HEVRequest / HEVResponse

See www.ebics.org for the textual representation of the schema ebics_hev.xsd .

9.5.3.1 Meaning of the XML elements and XML attributes of the HEV response

XML element/ attribute	Data type	#	Meaning	Example
`SystemReturnCode`	`ebics:SystemReturnCodeType` (complex)	1	Technical return code and error message (in English)	Value range for code according to document "EBICS Annex 1 Return Codes"
`VersionNumber`	`ebics:VersionNumberType` (complex) (→`token, length=5, pattern="[0-9]{2}[.][0-9]{2}"`	0..∞	EBICS version supported by the bank	02.40 (complies also to 2.4)
`ProtocolVersion`	`ebics:ProtocolVersionType` (→`token, length=4)`	1	Schema version relevant for the supported EBICS version	H004

9.5.3.2 Example XML for the HEV response

```
<?xml version="1.0" encoding="UTF-8"?>
<ebics:ebicsHEVResponse xsi:schemaLocation="http://www.ebics.org/H000 ebics_hev.xsd"
xmlns:ebics="http://www.ebics.org/H000" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
       <ebics:SystemReturnCode>
              <ebics:ReturnCode>000000</ebics:ReturnCode>
              <ebics:ReportText>EBICS_OK</ebics:ReportText>
       </ebics:SystemReturnCode>
       <ebics:VersionNumber ProtocolVersion="H003">02.40</ebics:VersionNumber>
       <ebics:VersionNumber ProtocolVersion="H004">02.50</ebics:VersionNumber>
</ebics:ebicsHEVResponse>
```

9.6 FUL and FDL (Upload and download files with any format)

FUL is an order type of type “upload”. The standard process is described in chapter 5.5.1. The values of the order parameters (see also 3.11) `ebicsRequest/header/static/OrderDetails`, however, are of the type `FULOrderParams`:

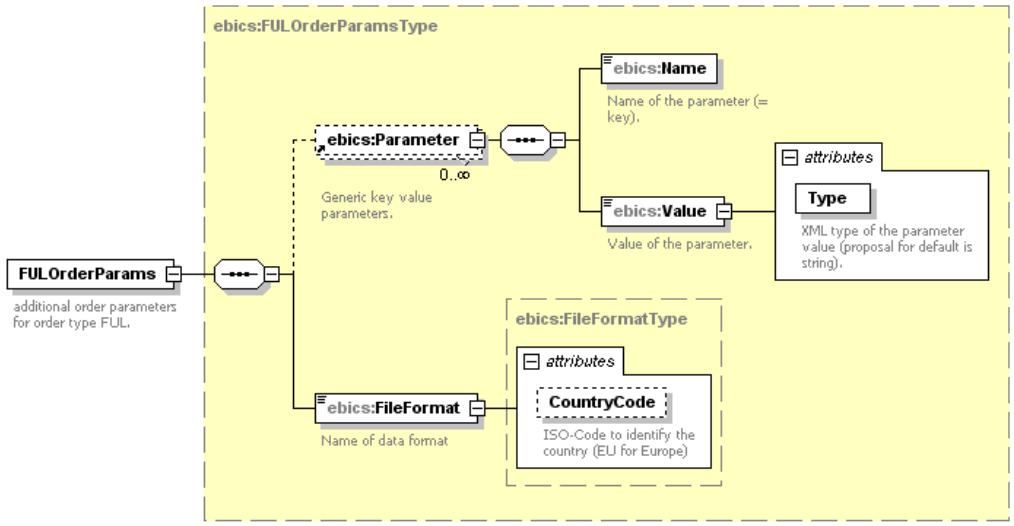


Diagram 102: FULOrderParams

XML element/ attribute	Data type	#	Meaning	Examples
`FileFormat`	`FileFomatType` (complex)	1	Describes the format of the downloaded file	„DTAUS“ , „pain.001.001.02“

	(→token)			
FileFormat» @CountryCode	CountryCodeType (→token, length=2, pattern= " [A-Z]{2,2}")		Information on the format's range of applications (e.g. country-specific formats)	EU, FR, DE …

FDL is an order type of type „Download“. The standard process is described in chapter 5.6.1. The values of the order parameters (see also 3.11) `ebicsRequest/header/static/OrderDetails`, however, are of the type `FDLOrderParams`:

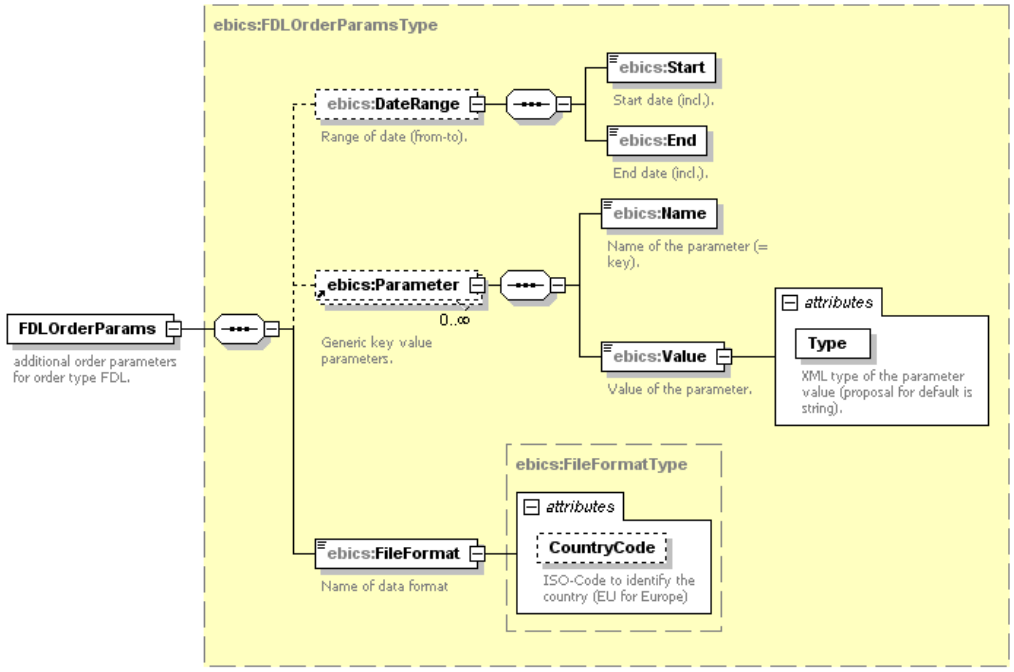


Diagram 103: FDLOrderParams

If FUL or FDL is not supported by the financial institution, the error message EBICS_UNSUPPORTED_ORDER_TYPE is returned.
If the order format specified by `FileFomat` and `CountryCode` is not supported by the financial institution, the error message EBICS_INVALID_ORDER_PARAMS is returned.

10 EBICS Customer acknowledgement (HAC)

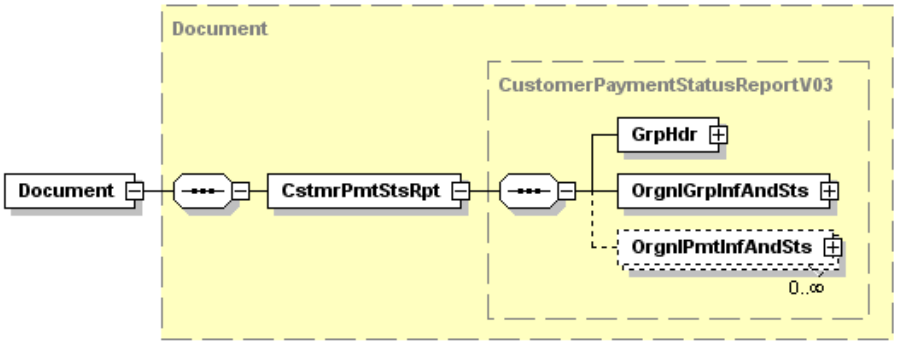
10.1 Preliminary Notes

1. The following stipulations for the allocation of the pain.002 message (ISO Edition 2009) only apply to the EBICS customer acknowledgement (HAC: H label for technical EBICS order type; A = Acknowledgement; C = Customer).
   HAC describes all actions and results that occur while uploading, downloading, or signing files and may give – in addition – information about the content of the order/file (display file).

2. The aim is to use an international standard (schema); we have chosen ISO20022 pain.002
   - Because at present pain.002 is the best alternative although it is not ideal. Furthermore, pain.002 is already used in connection with the EBICS customer acknowledgement in France (but with less allocation rules; in Germany, there are more requirements regarding the protocolling (logging) of EBICS actions). The aim is a common subset of allocation rules for pain.002 in Germany and France (EBICS customer acknowledgement; order type HAC)
   - As a long-term solution, an ISO message especially designed for this purpose should be requested
3. When downloading HAC, the customer receives all status information since the download of the last HAC. It contains all actions and status information of the PartnerID. For this the element group <OrgnlPmtInfAndSts> contains 1..n occurrences. Every occurrence is one protocol step.
   Note: In fact this element group is optional. An essential rule for the EBICS customer acknowledgement is that the element group <OrgnlPmtInfAndSts> occurs at least once.
4. In contrast to the old human readable German PTK, the main focus of the XML-based HAC will be the automatic evaluation (suitable preparation by the client system is necessary).

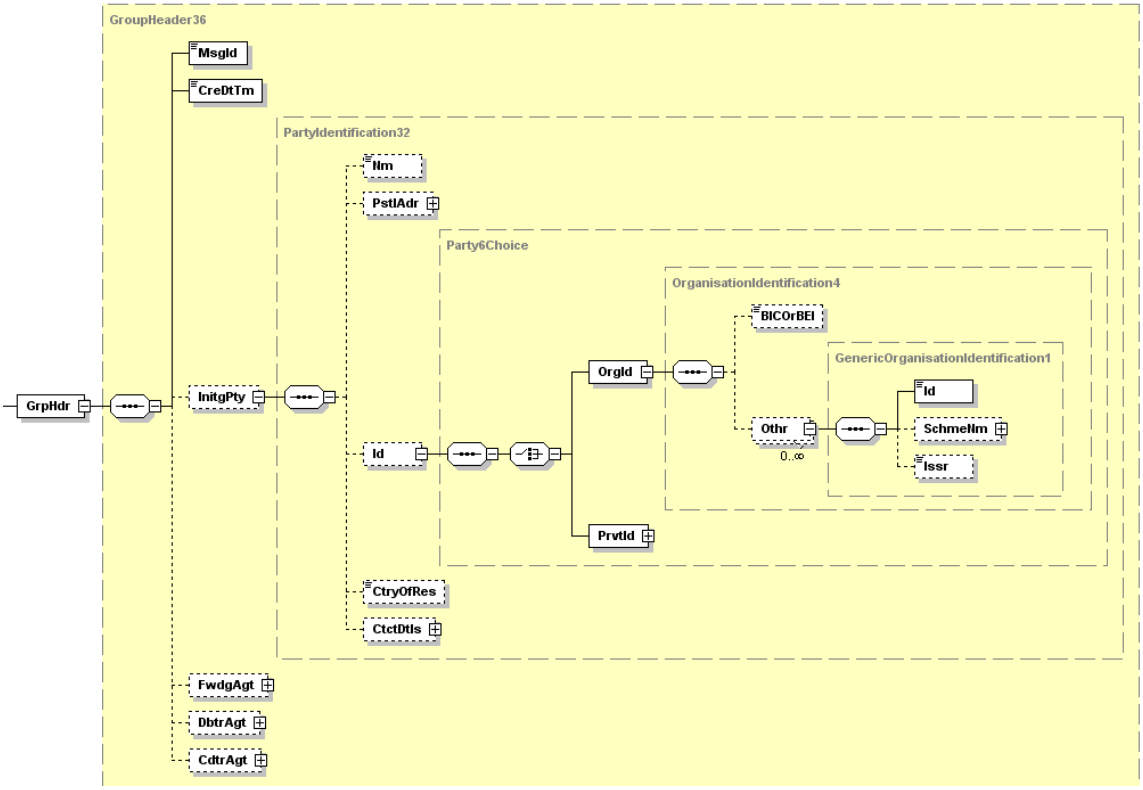
10.2 Allocation of pain.002 for HAC

Complete message – general overview:



10.2.1 Allocation of the element group Group Header

Element group <GrpHdr> - overview:



Stipulations for the allocation:
This element group occurs exactly once.
All elements in <GrpHdr>, which are not mentioned in the list, will never be used in HAC!

Name	XML Tag	Rules for HAC
MessageIdentification	<MsgId>	Mandatory in the ISO schema (and in HAC as well)
CreationDateTime	<CreDtTm>	Mandatory in the ISO schema (and in HAC as well): Creation date/Time of the pain.002 message
InitiatingParty	<InitPty><Id><OrgId>	Element group for the transfer of the HostID (optional in the ISO schema; but mandatory in HAC) HostId (technical ID for the EBICS bank server) to be allocated in <Othr>.

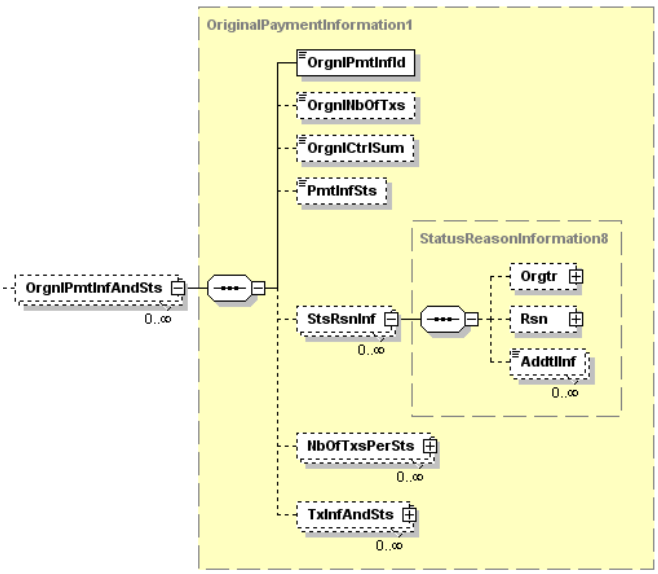
10.2.2 Allocation of the element group Original Group Information and Status

As to ISO this element group occurs exactly once.
There are two mandatory elements: <OrgnlMsgId> and <OrgnlMsgNmId> (both type Max35Text). They state grouping information concerning the original message. By reason that HAC states information on a collection of different orders/actions of a PartnerID, these elements are allocated with the constant „EBICS“.

10.2.3 Allocation of the element group Original Payment Information and Status

This element group is optional in ISO but for HAC it must occur at least once!

Element group <OrgnlPmtInfAndSts> - Overview:



Stipulations for the allocation:
All elements in <OrgnlPmtInfAndSts>, which are not mentioned in the list, will never be used in HAC!

Name	XML Tag	Rules for HAC
OriginalPaymentInforamtionIdentification	<OrgnlPmtInfId>	Mandatory in the ISO schema (and in HAC as well). Information on the type of action; see chapter 10.2.3.1
StatusReasonInformation	<StsRsnInf>	[0..unbounded] in ISO schema, occurrence exactly one time in HAC Information on the order (including all involved users and the timestamp), the result of the action and data for the display file; see chapter 10.2.3.2

10.2.3.1 Type of action

The type of action is allocated in the element <OrgnlPmtInfId>.
The following range of values is defined for that:

HAC – types of action	Meaning	Range of values (Max35Text); codes defined for EBICS
„type of action“ *transmission*		
File submitted to the bank	Each kind of file upload except the upload of an ES file	FILE_UPLOAD
File downloaded from the bank	Each kind of file download except the download of an ES file	FILE_DOWNLOAD
Electronic signature submitted to the bank	Upload of an ES file using file attribute “UZHNN” or the VEU process (Order type HVE)	ES_UPLOAD
Electronic signature downloaded from the bank	Download of an ES file (reserved for later versions)	ES_DOWNLOAD
„type of action“ *postprocessing (VEU etc.)*		
Signature verification	Bank server verifies the transmitted ES	ES_VERIFICATION Code when **no** VEU is used.
Forwarding to VEU	File is stored in the VEU process waiting for the necessary ES’s	VEU_FORWARDING
VEU signature verification	Bank server verifies the transmitted ES within the VEU process	VEU_VERIFICATION Code when VEU is used.
End of VEU signature verification	The verification process in the VEU is finished, because the last ES necessary for authorisation of a payment within the VEU was verified successfully **or** the transmitted ES was not correct.	VEU_VERIFICATION_END
Cancellation of VEU order	Order is cancelled by a authorised user within the VEU process	VEU_CANCEL_ORDER
„type of action“ *additional information*	Provision of additional information from bank to customer using HAC (in <AddtlInf>)	ADDITIONAL

One of the “final indication” types of action has to be provided to indicate that no further protocol steps are due for the corresponding order. For these types of action no reason code (in result of action) is allowed. It is simply a label.

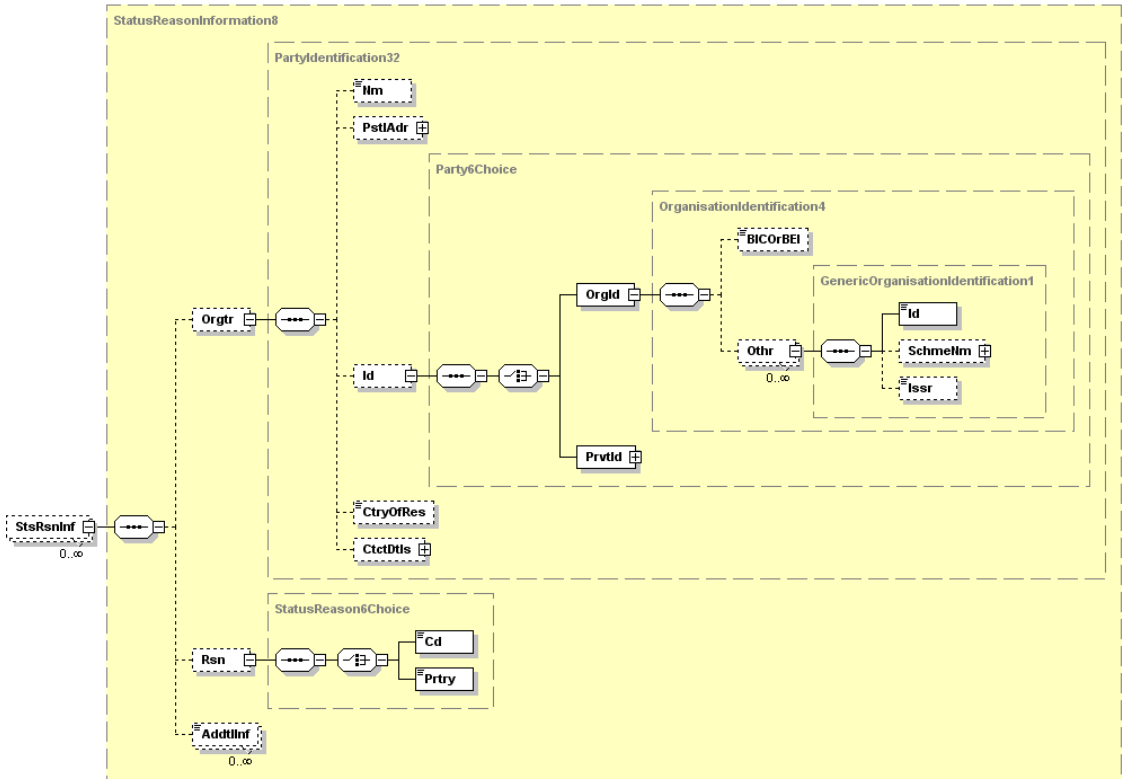
„type of action“ *final indication*		
HAC end of order (positive)	The order was processed on EBICS level completely. No further HAC protocol step will be provided for this order.	ORDER_HAC_FINAL_POS

HAC end of order (negative)	No further HAC protocol step will be provided for this order. It could not be processed on EBICS level completely for several reasons (see codes of results of action in the previous HAC step(s) of this order)	ORDER_HAC_FINAL_NEG

10.2.3.2 Result of action

The result of action is allocated in the element group Status Reason Information.

Element group <StsRsnInf> - Overview:



Stipulations for the allocation:
All elements in <StsRsnInf>, which are not mentioned in the list, will never be used in HAC!

Name	XML Tag	Rules for HAC
Originator / Name	<Orgtr><Nm>	Name of the customer
Originator / Identification / OrganisationIdentification /Other	<Orgtr><Id><OrgId><Othr>	Element group (0..N occurrences) for different identification codes with the following meaning:
	1) <Id>	Identification ID
	2) <SchmeNm><Prtry>	The code in <SchmeNm><Prtry> identifies the kind of ID in the element <Id> (Most of the ID names are already defined in EBICS; in this case they are provided in EBICS notation): ➢ UserID (Identification of the user) ➢ PartnerID (Identification of the client) ➢ SystemID (Identification of the technical user) ➢ OrderID (order number) ➢ OrderType ➢ FileFormat (only used for order types FUL or FDL) ➢ OrderIDRef (If the action refers to another order, the OrderID is allocated here) ➢ OrderTypeRef (If the action refers to another order, the order type is allocated here) ➢ PartnerIDRef (If the action refers to another order AND another Partner, the PartnerID is allocated here) ➢ TimeStamp (Timestamp of the action provided in ISO 8601 format, analogous to chapter 2.3 in the EBICS specification) ➢ DataDigest (Hash value) Note: All IDs noted above have to be provided in HAC in case they are available on the bank server.
Reason	<Rsn>	Result of the action, table see in chapter 10.3. All types of results are defined as ISO reason codes (to be allocated in <Cd>). This element is mandatory for HAC except: The type of action <OrgnlPmtInfAndSts><OrgnlPmtInfId> contains 1) one of the two “final indication” labels (see chapter 10.2.3.1). In this case it is not permitted to provide <Cd>. 2) “ADDITIONAL”. In this case the allocation is optional.

Name	XML Tag	Rules for HAC
AdditionalInformation	<AddtlInf>	In case a file is displayed (display of an extraction of the content of a file) there are 1..n occurrences (see chapter 10.2.3.3) Further free text (Max105Text) is always permitted. The use is optional and repeatable at will (it may be used for free text information for customers)

10.2.3.3 Display file (Use in Germany)

The content for the display file (Information about the file content) is provided in <StsRsnInf><AddtlInf>.
The display file will be delivered with one of the two possible final indication labels (either ORDER_HAC_FINAL_POS or ORDER_HAC_FINAL_NEG; refer to chapter 10.2.3.1).
Note: This also applies to files with file attributes ”DZHNN” meaning that the file is not authorised by ES but by accompanying note signed by hand.
The existing character of the display file can be reused: Each line of the well-known PTK display file is one occurrence of <AddtlInf>.

Name	XML Tag	Rules for HAC
StatusReasonInformation / AdditionalInformation	<StsRsnInf><AddtlInf>	Only used for specific data in free text: 1. Examples for commonly used formats see chapters 10.2.3.3.1, 10.2.3.3.2, 10.2.3.3.3 and 10.2.3.3.4 2. Hash value (only needed for SEPA container file) 3. display file for files without specific format

10.2.3.3.1 Example for DTAUS (domestic German format)

….
<StsRsnInf>
<AddtlInf>G U T S C H R I F T E N</AddtlInf>
<AddtlInf>Bank-Code : 30040000</AddtlInf>
<AddtlInf>Kontonummer : 0822511260</AddtlInf>
<AddtlInf>Auftraggeber : Bank-Verlag</AddtlInf>
<AddtlInf>Erstellungsdatum : 10.05.00</AddtlInf>
<AddtlInf>Anzahl der Zahlungssaetze : 1</AddtlInf>
<AddtlInf>Summe der Betraege (EUR) : 68.672,00</AddtlInf>
<AddtlInf>Summe der Kontonummern : 00000000001234567</AddtlInf>
<AddtlInf>Summe der Bank-Codes : 00000000007654321</AddtlInf>
<AddtlInf>Ausfuehrungstermin : 10.05.2000</AddtlInf>
</StsRsnInf>
….

10.2.3.3.2 Example for SEPA

HAC resulting from a pain.001 message with 3 Payment Information Blocks

<StsRsnInf>

<AddtlInf>G U T S C H R I F T E N</AddtlInf>
<AddtlInf>Datei-ID: 4782647268346</AddtlInf>
<AddtlInf>Datum/Zeit: 28.11.2010/09:30:47</AddtlInf>
<AddtlInf>----------</AddtlInf>
<AddtlInf>Sammlerreferenz : 46573264784</AddtlInf>
<AddtlInf>Bank-Code : WELADEDD</AddtlInf>
<AddtlInf>Kontonummer : DE44300500000054627452</AddtlInf>
<AddtlInf>Auftraggeberdaten : XXX</AddtlInf>
<AddtlInf>Anzahl der Zahlungssaetze : 187</AddtlInf>
<AddtlInf>Summe der Betraege (EUR) : 68.672,00</AddtlInf>
<AddtlInf>Ausfuehrungstermin : 01.12.2010</AddtlInf>
<AddtlInf>----------</AddtlInf>
<AddtlInf>Sammlerreferenz : 46573264783</AddtlInf>
<AddtlInf>Bank-Code : WELADEDD</AddtlInf>
<AddtlInf>Kontonummer : DE44300500000054627452</AddtlInf>
<AddtlInf>Auftraggeberdaten : YYY</AddtlInf>
<AddtlInf>Anzahl der Zahlungssaetze : 165</AddtlInf>
<AddtlInf>Summe der Betraege (EUR) : 354.378,00</AddtlInf>
<AddtlInf>Ausfuehrungstermin : 03.12.2010</AddtlInf>
<AddtlInf>----------</AddtlInf>
<AddtlInf>Sammlerreferenz : 46573264782</AddtlInf>
<AddtlInf>Bank-Code : WELADEDD</AddtlInf>
<AddtlInf>Kontonummer : DE30300500000035351767</AddtlInf>
<AddtlInf>Auftraggeberdaten : XXX</AddtlInf>
<AddtlInf>Anzahl der Zahlungssaetze : 34</AddtlInf>
<AddtlInf>Summe der Betraege (EUR) : 45.100,20</AddtlInf>
<AddtlInf>Ausfuehrungstermin : 01.12.2010</AddtlInf>
</StsRsnInf>
….

10.2.3.3.3 Example for SEPA container

HAC resulting from a container with 2 pain.001 messages

<StsRsnInf>
<AddtlInf>G U T S C H R I F T E N</AddtlInf>
<AddtlInf>Datei-ID: 4782647268346</AddtlInf>
<AddtlInf>Datum/Zeit: 28.11.2010/09:30:47</AddtlInf>
<AddtlInf>----------</AddtlInf>
<AddtlInf>Sammlerreferenz : 46573264784</AddtlInf>
<AddtlInf>Bank-Code : WELADEDD</AddtlInf>
<AddtlInf>Kontonummer : DE44300500000054627452</AddtlInf>
<AddtlInf>Auftraggeberdaten : XXX</AddtlInf>
<AddtlInf>Anzahl der Zahlungssaetze : 187</AddtlInf>
<AddtlInf>Summe der Betraege (EUR) : 68.672,00</AddtlInf>
<AddtlInf>Ausfuehrungstermin : 01.12.2010</AddtlInf>
<AddtlInf>Hash-Wert : 24 AE 87 34 FE BA 22 12</AddtlInf>
<AddtlInf> 34 E4 5A 34 54 33 43 23</AddtlInf>
<AddtlInf> 15 34 55 78 FA F1 33 11</AddtlInf>
<AddtlInf> 93 67 30 03 19 67 BE FA</AddtlInf>
<AddtlInf>G U T S C H R I F T E N</AddtlInf>

<AddtlInf>Datei-ID: 4782647268347</AddtlInf>
<AddtlInf>Datum/Zeit: 28.11.2010/09:30:47</AddtlInf>
<AddtlInf>----------</AddtlInf>
<AddtlInf>Sammlerreferenz : 46573264785</AddtlInf>
<AddtlInf>Bank-Code : WELADEDD</AddtlInf>
<AddtlInf>Kontonummer : DE30300500000035351767</AddtlInf>
<AddtlInf>Auftraggeberdaten : YYY</AddtlInf>
<AddtlInf>Anzahl der Zahlungssaetze : 23</AddtlInf>
<AddtlInf>Summe der Betraege (EUR) : 14.256,00</AddtlInf>
<AddtlInf>Ausfuehrungstermin : 01.12.2010</AddtlInf>
<AddtlInf>Hash-Wert : 29 AE 87 34 FE BA 22 12</AddtlInf>
<AddtlInf> 34 E4 5A 34 54 33 43 23</AddtlInf>
<AddtlInf> 15 34 55 78 FA F1 33 11</AddtlInf>
<AddtlInf> 93 67 30 03 19 67 BE BB</AddtlInf>
</StsRsnInf>
….

10.2.3.3.4 Example for DTAZV (German format used for international payments)

….
<StsRsnInf>
<AddtlInf>G U T S C H R I F T E N</AddtlInf>
<AddtlInf>Bank-Code : 30040000</AddtlInf>
<AddtlInf>Kundennummer : 0000000001</AddtlInf>
<AddtlInf>Auftraggeberdaten : KARL MUSTERMANN</AddtlInf>
<AddtlInf> MUSTERSTR. 1</AddtlInf>
<AddtlInf> 50825 KOELN</AddtlInf>
<AddtlInf>Erstellungsdatum : 10.05.00</AddtlInf>
<AddtlInf>Auftragswaehrung : USD</AddtlInf>
<AddtlInf>Bank-Code : 30040000</AddtlInf>
<AddtlInf>Kontowaehrung : EUR</AddtlInf>
<AddtlInf>Kontonummer : 1234567890</AddtlInf>
<AddtlInf>Ausfuehrungstermin : 10.11.00</AddtlInf>
<AddtlInf>Betrag : 20.000,000</AddtlInf>
<AddtlInf>Anzahl der Datensaetze T : 000000000000001</AddtlInf>
<AddtlInf>Summe der Betraege : 000000000020000</AddtlInf>
</StsRsnInf>
….

10.3 Annex for HAC: External reason codes (result of action)

The following results of action have to be protocolled in the element <Rsn><Cd>.
They are part of the external ISO code list “ExternalStatusReason1Code”:

ISO code	ISO Name	Definition
AM21	LimitExceeded	Transaction amount exceeds limits agreed between bank and client
DS01	ElectronicSignaturesCorrect	The Electronic Signature(s) are correct
DS02	OrderCancelled	An authorized user has cancelled the order
DS03	OrderNotCancelled	The user’s attempt to cancel the order was not successful
DS04	OrderRejected	The order was rejected by the bank side (for reasons concerning content)
DS05	OrderForwardedForPostprocessing	The order was correct and could be forwarded for postprocessing
DS06	TransferOrder	The order was transferred to VEU
DS07	ProcessingOK	All actions concerning the order could be done by the EBICS bank server
DS08	DecompressionError	The decompression of the file was not successful
DS09	DecryptionError	The decryption of the file was not successful
DS10	Signer1CertificateRevoked	The certificate is revoked for the first signer.
DS11	Signer1CertificateNotValid	The certificate is not valid (revoked or not active) for the first signer
DS12	IncorrectSigner1Certificate	The certificate is not present for the first signer
DS13	SignerCertificationAuthority Signer1NotValid	The authority of signer certification sending the certificate is unknown for the first signer
DS14	UserDoesNotExist	The user is unknown on the server
DS15	IdenticalSignatureFound	The same signature has already been sent to the bank
DS16	PublicKeyVersionIncorrect	The public key version is not correct. This code is returned when a customer sends signature files to the financial institution after conversion from an older program version (old ES format) to a new program version (new ES format) without having carried out re-initialisation with regard to a public key change.
DS17	DifferentOrderDataInSignatures	Order data and signatures don’t match
DS18	RepeatOrder	File cannot be tested, the complete order has to be repeated. This code is returned in the event of a malfunction during the signature check, e.g. not enough storage space.
DS19	ElectronicSignatureRightsInsufficient	The user’s rights (concerning his signature) are insufficient to execute the order
DS20	Signer2CertificateRevoked	The certificate is revoked for the second signer
DS21	Signer2CertificateNotValid	The certificate is not valid (revoked or not active) for the second signer
DS22	IncorrectSigner2Certificate	The certificate is not present for the second signer

ISO code	ISO Name	Definition
DS23	SignerCertificationAuthority Signer2NotValid	The authority of signer certification sending the certificate is unknown for the second signer
DS24	WaitingTimeExpired	Waiting time expired due to incomplete order
DS25	OrderFileDeleted	The order file was deleted by the bank server (for multiple reasons)
DS26	UserSignedMultipleTimes	The same user has signed multiple times
DS27	UserNotYetActivated	The user is not yet activated (technically)
DS0A	DataSignRequested	Data signature is required *In EBICS this means that the Electronic Signature(s) have not been sent to the bank server yet or that the number of signatures is insufficient*
DS0B	UnknownDataSignFormat	Data signature for the format is not available or invalid. *In EBICS this means that the Electronic signature(s) are incorrect*
DS0C	SignerCertificateRevoked	The signer certificate is revoked *In EBICS this also means that the user is locked*
DS0D	SignerCertificateNotValid	The signer certificate is not valid (revoked or not active). *In EBICS this means that the public key has not been activated yet or certificate is not valid*
DS0E	IncorrectSignerCertificate	The signer certificate is not present. *In EBICS this means that the public key does not exist or certificate is not present*
DS0F	SignerCertificationAuthority SignerNotValid	The authority of the signer certification sending the certificate is unknown
DS0G	NotAllowedPayment	Signer is not allowed to sign this operation type *In EBICS this means that the user has no authorisation rights*
DS0H	NotAllowedAccount	Signer is not allowed to sign for this account
ID01	CorrespondingOriginalFileStillNotSent	Signature file was sent to the bank but the corresponding original file has not been sent yet.
TA01	TransmissonAborted	The transmission of the file was not successful – it had to be aborted (for technical reasons)
TD01	NoDataAvailable	There is no data available (for download)
TD02	FileNonReadable	The file cannot be read (e.g. unknown format)
TD03	IncorrectFileStructure	The file format is incomplete or invalid
TS01	TransmissionSuccessful	The (technical) transmission of the file was successful.
TS04	TransferToSignByHand	The order was transferred to pass by accompanying note signed by hand

10.4 Annex for HAC: Type/result of action (permitted pairs)

If more than one reason code is suitable the most precise should be chosen.

<OrgnlPmtInfId> (Type of action)	Possible/Permitted values for <Rsn><Cd> (Result of action)	Description of the code (shortened, more details see chapter 10.3)
FILE_UPLOAD	TS01 TA01 DS0C DS08 DS09	Upload successful Upload aborted User locked/certificate revoked Decompression error Decryption error
FILE_DOWNLOAD	TS01 TA01 DS0C DS08 DS09 TD01	Download successful Download aborted User locked/certificate revoked Decompression error Decryption error Not data available for download
ES_UPLOAD	TS01 TA01 DS0C DS08 DS09 ID01	Upload (of ES) successful Upload (of ES) aborted User locked/certificate revoked Decompression error Decryption error Original order file has not been sent before
ES_DOWNLOAD		*In EBICS 2.5 still not in use*

<OrgnlPmtInfId> (Type of action)	Possible/Permitted values for <Rsn><Cd> (Result of action)	Description of the code (shortened, more details see chapter 10.3)
ES_VERIFICATION	AM21 TD02 TD03 TS04 DS01 DS0A DS0B DS0C DS0D DS0E DS0F DS0G DS0H DS10 (DS11; DS12) DS20 (DS21; DS22) DS13/ DS23 DS14 DS15 DS16 DS17 DS18 DS19 DS24 DS25 DS26 DS27 DS08 DS09	Amount exeeds limit File cannot be read The file format is invalid File with attributes “DZHNN” (not ES signed) ES(s) are correct Number of ES(s) insufficient ES(s) are not correct Certificate is revoked / user is locked Certificate is not valid /public key not activated Certificate not present / public key doesn’t exist CA for certificate is unknown Signer not allowed to sign this operation Signer not allowed to sign this account Certificate revoked (not valid; not present) for first signer Certificate revoked (not valid; not present) for second signer CA unknown for first/second signer User (means signer) is unknown on the server The same ES already has been sent to bank Public kexy version not correct order data and ES(s) don’t match Repeat order (file not testable) Signer’s ES rights are unsufficient Waiting time expired and file deleted by bank File deleted by bank (multiple reasons) Same user signed multiple times User (means signer) not yet activated Decompression error Decryption error
VEU_FORWARDING	DS06	Order transferred to the VEU

<OrgnlPmtInfId> (Type of action)	Possible/Permitted values for <Rsn><Cd> (Result of action)	Description of the code (shortened, more details see chapter 10.3)
VEU_VERIFICATION	AM21 TD02 TD03 DS01 DS0B DS0C DS0D DS0E DS0F DS0G DS0H DS10 (DS11; DS12) DS20 (DS21; DS22) DS13/ DS23 DS14 DS15 DS16 DS17 DS18 DS19 DS24 DS25 DS26 DS27	Amount exeeds limit File cannot be read The file format is invalid ES(s) are correct ES(s) are not correct Certificate is revoked / user is locked Certificate is not valid /public key not activated Certificate not present / public key doesn't exist CA for certificate is unknown Signer not allowed to sign this operation Signer not allowed to sign this account Certificate revoked (not valid; not present) for first signer Certificate revoked (not valid; not present) for second signer CA unknown for first/second signer User is unknown on the server The same ES already has been sent to bank Public kexy version not correct order data and ES(s) don't match Repeat order (file not testable) Signer's ES rights are unsufficient Waiting time expired and file deleted by bank File deleted by bank (multiple reasons) Same user signed multiple times User not yet activated
VEU_VERIFICATION_END	DS05	Order was correct, forwarded for postprocessing
VEU_CANCEL_ORDER	DS02 DS03	Order cancelled Order not cancelled
ADDITIONAL	*Optional*	Note: This is not in the scope of EBICS
ORDER_HAC_FINAL_POS	---	
ORDER_HAC_FINAL_NEG	---	

11 Appendix: Cryptographic processes

11.1 Identification and authentication signature

11.1.1 Process

Identification and authentication signatures are based on the RSA signature process. The following parameters determine the identification and authentication signature process: Length of the (secret) RSA key, hash algorithm, padding process, canonisation process.

For the identification and authentication process, EBICS defines the **process "X002"** with the following parameters:

Parameter	Value
Key length in Kbit	>=1Kbit (1024 bit) and <=16Kbit
Hash algorithm	SHA-256
Padding process	PKCS#1
Canonisation process	http://www.w3.org/TR/2001/REC-xml-c14n-20010315

As with X002 the minimum key length has not been changed in comparison to X001, the identification and authentication keys need not to be changed when upgrading from X001 to X002.
The optional XML signature fields "KeyInfo" and "Object" remain unfilled.
From EBICS 2.4 on, the customer system must use the hash value of the public bank key X002 in a request. The transaction is cancelled with return code EBICS_INVALID_REQUEST_CONTENT if X001 is still used in a request.

11.1.2 Format

Identification and authentication signatures are represented in EBICS messages in accordance with the W3C recommendation "Signature Syntax and Processing" ((http://www.w3.org/TR/xmldsig-core/). Hence identifiers of the algorithms for forming the hash value, the signature and the indicator of the canonisation process are components of the identification and authentication signature. Therefore it is not necessary to change the XML interface when a new version of "X00n" is defined with altered parameters. This especially applies for versions that utilise SHA-224, SHA-256, SHA-384 or SHA-512 as a hash function.
When placing the identification and authentication signature in the element `SignatureValue`, it is principally not filled up to the full length of the modulo of the RSA key for generating this signature. .

11.2 Electronic signatures

11.2.1 Process

Electronic signatures are based on the RSA signature process. The processes for generating/verifying electronic signatures are defined in the Appendix (Chapter 14).
As a minimum requirement, EBICS must support Version “A004” of the bank-technical electronic signature.

11.2.2 Format

The XML schema definition file “ebics_orders_H004.xsd” contains the definition of the global elements `BankSignatureData` for embedding the financial institution's electronic signature (As this is an intended feature, the structure has not been updated for signatures in structured form, i.e. `BankSignatureData` still contains an element `OrderSignature` to receive a bank ES in base64 coding (see Diagram 4).
The schema file „ebics_signature.xsd“ contains the element `UserSignatureData` for the signature of the subscriber in EBICS messages. To this end, an instance document is created for “ebics_signature.xsd” that contains `UserSignatureData` for subscriber ES’s as top-level elements. `UserSignatureData` contains a list of elements `OrderSignature` and `OrderSignatureData` respectively for one or more subscriber ES’s (see also Diagram 4).

Signature process A004:
The binary format of the subscriber’s ES corresponds to the format of the signature file in accordance with the Appendix (Chapter 14.2.5.3). The attribute `PartnerID` of `OrderSignature` MUST be filled out with the customer ID of the respective signatory.

The binary format of the ES of a financial institution is specified as follows, based on the format of the signature file from Chapter 14.2.5.3.

In comparison with the customer’s ES file, only the field “User ID” is replaced with the semantically-corresponding field “Host ID”.

The instance document is embedded into the EBICS XML structure `ebicsRequest/body/DataTransfer/Signature` in ZIP-compressed, hybrid-encrypted and base64-coded form.

11.2.3 EBICS authorisation schemata for signature classes

EBICS specifies the authorisation schemata for orders that require one or two bank-technical ES’s. Authorisation schemata for orders that require more than two bank-technical ES’s are not described in this standard, although it is not forbidden to transmit more than two ES’s.

E = single signature, A = first signature, B = second signature, T = transport signature (not bank-technical).

Authorisation schema for orders with a minimum ES quantity = 0:

The minimum quantity ES = 0 applies to orders that are authorised via accompanying notes ("DZHNN") or for key management orders which require only a transport signature for authorisation (ES of class E, A, and B are also possible). Orders authorised by ES ("OZHNN") have to be signed sufficiently. As a bank-technical ES is the minimum requirement, the minimum number of ES = 1 is the rule.

E	A	B	T
☑	☑	☑	☑

Authorisation schema for orders with a minimum ES quantity = 1:

- Authorisation via a single bank-technical ES:
  Authorisation of the order with a single ES can be effected with a single signature.

E	A	B	T
☑	☐	☐	☐

- Authorisation with two bank-technical ES's:
  Authorisation of the order can also take place with 2 ES's of class E, A or B if at least one of these two is a first or a single signature.

first ES → / second ES ↓	E	A	B	T
E	☑	☑	☑	☐
A	☑	☑	☑	☐
B	☑	☑	☐	☐
T	☐	☐	☐	☐

Authorisation schema for orders with a minimum ES quantity = 2:

- With the exception of the combination of two second signatures, authorisation of the order is possible with any combination of two bank-technical ES's.

first ES → / second ES ↓	E	A	B	T
E	☑	☑	☑	☐
A	☑	☑	☑	☐
B	☑	☑	☐	☐
T	☐	☐	☐	☐

In general, the following applies:

- There is no maximum ES quantity defined, but in the case of more than two ES the transmitted signatures have to comply with the rules the authorisation schemas above.
- Individual signatures are fundamentally admissible for authorisation, but are only sufficient in the case of orders where the minimum ES requirement = 0 or ES requirement = 1
- A transport signature never authorises the implementation of an order, it only allows the order to be submitted
- The order in which signatures are submitted is irrelevant
- The bank-technical ES's of an order MUST be supplied by different subscribers (if necessary, also different customers).

11.3 Encryption

11.3.1 Encryption at TLS level

11.3.1.1 Process

The customer system and the bank system MUST agree on the use of one of the following procedures (so-called “cyphersuites”, see RfCs 2246 and 3268) within the framework of the TLS handshake (prioritised in accordance with this order):

- TLS_RSA_WITH_AES_256_CBC_SHA: TLS with certificate type/key exchange process RSA, encryption process AES (key length 256bits, CBC mode) and hash process SHA-1
- TLS_RSA_WITH_AES_128_CBC_SHA: TLS with certificate type/key exchange process RSA, encryption process AES (key length 128bits, CBC mode) and hash process SHA-1
- TLS_RSA_WITH_3DES_EDE_CBC_SHA: TLS with certificate type/key exchange process RSA, encryption process 3-key triple VEU (168bit effective key length, divided in each case into 56bit encryption-decryption-encryption, CBC mode) and hash process SHA-1.

For transmission of the transaction key to the communication partners, the “Specification for the FTAM connection” (Appendix 2 of the DFÜ-Abkommen) defines a particular data structure, the so-called file-header. For compatibility reasons, the information from the file-header is incooperated in EBICS. In addition to the asymmetrically-encrypted symmetrical key, the file-header also contains the hash value of the public RSA key that was used for encryption of the symmetrical key.

The process TLS_RSA_WITH_3DES_EDE_CBC_SHA MUST at least be supported by all financial institution systems and all customer systems.

11.3.2 Encryption at application level

11.3.2.1 Process

The process for encrypting the order data and ES’s of an order is a hybrid process based on the symmetrical encryption process 2-key triple DES and the asymmetrical encryption process RSA.

The order data and ES’s of an EBICS transaction are symmetrically encrypted. For each EBICS transaction, a random symmetrical key (transaction key) is generated by the sender of order data and/or ES’s that is used for encryption of both the order data and the ES’s. The symmetrical key is transmitted to the recipient asymmetrically-encoded.

Based on the encryption process “V001” (see Appendix, Chapter 15) which was specified for the FTAM process, EBICS defines the **encryption process “E002”** as having the following features:

- Symmetrical encryption algorithm (see Appendix, Chapter 15)
  - Generation of the transaction key (see Appendix, Chapter 15)
  - AES-128 (key length 128 bit) in CBC mode
  - ICV (Initial Chaining Value) = 0
  - Padding process in accordance with ANSI X9.23 / ISO 10126-2.
- RSA encryption of the transaction key, key length >= 1Kbit (1024 bits) and <=16Kbit
  - Difference with regard to V001: 768
- Padding process for the RSA encryption: PKCS#1
  - Difference with regard to V001: 0-padding.

As with E002 the minimum key length has not been changed in comparison to E001, the identification and authentication keys need not to be changed when upgrading from E001 to E002.

The **process for asymmetrical encryption** of the transaction key must be adapted for EBICS as follows:

- Minimum length of the (secret) RSA key is 1024
- The padding process conforms with PKCS#1.

Concretely, these adaptations mean:

- The length of PDEK is equal to the length of the RSA key that is used (>= 1024)
- PDEK is generated from DEK via PKCS#1 padding
- EDEK is the result of the RSA encryption of PDEK.

Analogously, the **process for decryption** of the transaction key must also be adapted for EBICS:

- PDEK is the result of the RSA decryption of EDEK
- The 128 lowest-value bits of PDEK form the secret key DEK.

In the context of “E002”, the process SHA-256 is used to **form this hash value of the public RSA key**.

11.3.2.2 Formats

The compressed and encrypted ES’s and order data segments are embedded in the EBICS messages as base64-coded binary data.

Within the EBICS messages, transmission of the asymmetrically-encrypted transaction key takes place within an XML element of type `DataEncryptionInfoType`. This type is defined in the XML schema definition file ebics_types_H004.xsd and its graphical representation is contained in Diagram 104.

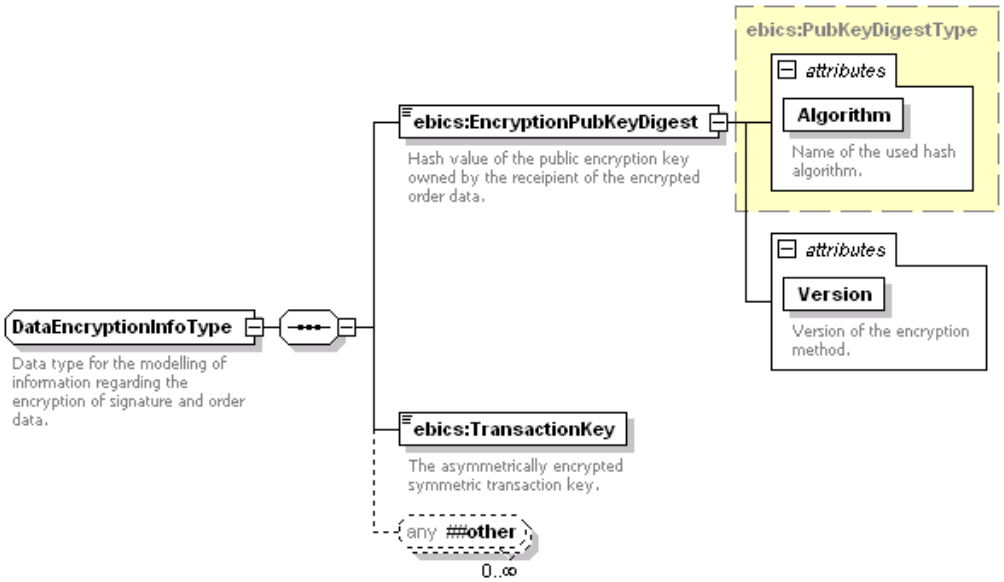


Diagram 104: Definition of the XML schema type DataEncryptionInfoType

The element `ebicsRequest/body/DataTransfer/DataEncryptionInfo` or `ebicsReponse/body/DataTransfer/DataEncryptionInfo`, respectively, of type `DataEncryptionInfoType` is a part of the first EBICS request of an upload transaction (cf. ebics_request_H004.xsd) or the first EBICS response of a download transaction (cf. ebics_response_H004.xsd).

In contrast to the resolution, `DataEncryptionInfoType` does not contain any subscriber details. This is not necessary, since the sender/recipient of the order data is always the initiating party. The subscriber / customer ID of the initiating party is already a component of the control data of the first EBICS request of every EBICS transaction and is firmly assigned to the EBICS transaction.

In addition to the hash value of the public RSA key, the element `EncryptionPubKeyDigest` also contains the version of the encryption process that is used and the identifier of the hash algorithm used.

Therefore it is not necessary to change `DataEncryptionInfoType` when a new version “E00n” is defined with altered parameters. This especially applies for versions that allow SHA-224, SHA-256, SHA-384 or SHA-512 as one or more of the hash functions.

When placing the encrypted transaction key in the element `TransactionKey` it is principally not filled up to the full length of the modulo of the RSA key for the encryption.

11.4 Replay avoidance via Nonce and Timestamp

11.4.1 Process description

The first EBICS request that serves for initialisation of an EBICS transaction contains the elements “**Nonce**” and “**Timestamp”** that are together intended to prevent replaying of this request.

“Nonce“ and “Timestamp“ form a functional unit for the avoidance of replay:

1. The customer system generates a random “Nonce” and sets a “Timestamp” at the current point in time that the message is sent.
2. The bank system compares the received “Nonce” with a locally-stored list of previously-received “Nonce” values. In addition, it verifies the deviation between the “Timestamp” and the current time. If the “Nonce“ that has just been received is present in the stored list or if the deviation of the “Timestamp” is greater than a tolerance period specified by the financial institution, the request is answered with the technical error code EBICS_TX_MESSAGE_REPLAY.
3. If the “Nonce“ and “Timestamp” verification was carried out without errors, the bank system stores the “Nonce” and “Timestamp” pair in the local list and continues with the further processing of the message.

The bank system can delete “Nonce”/”Timestamp” pairs whose time stamps lie outside the tolerance period from its list: Messages that contained such a pair would have already been rejected due to the excessive deviation of the “Timestamp”. Therefore the fixed tolerance period applies equally to the verification of new pairs as well as the deletion process of stored pairs.

With the elements “Nonce” and “Timestamp”, this process guarantees that the first EBICS request of a transaction is unambiguous. This prevents the bank from initialising new EBICS transactions on the basis of old, replayed messages. At the same time, “Timestamp” restricts the chronological necessity of the storage of “Nonce” values by the bank.

11.4.2 Actions of the customer system

11.4.2.1 Generation of “Nonce” and “Timestamp”

The customer system MUST fill out the following fields in the transaction phase “Initialisation”:

- `ebicsRequest/header/static/Nonce` with a cryptographically-strong random number of length 128 bits

- `ebicsRequest/header/static/Timestamp` with the current time stamp for transmission of the EBICS request (date and time in accordance with ISO 8601).

An example of syntactically-correct setting of the values “Nonce” and “Timestamp” is shown in the following XML excerpt:

```
<?xml version="1.0" encoding="UTF-8"?>
<ebicsRequest
 xmlns="urn:org:ebics:H004"
 xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:org:ebics:H004 ebics_request_H004.xsd"
 Version="H004" Revision="1">
 <header authenticate="true">
   <HostID>EBIXHOST<HostID>
   <Nonce>01A56FF768B3B36C5120E9904A7FB035</Nonce>
   <Timestamp>2005-06-22T17:07:34.123+02:00</Timestamp>
   […]
 </header>
 […]
</ebicsRequest>
```

Further information on correct setting of the two XML schema elements can be found under http://www.w3.org/TR/xmlschema-2/#hexBinary (hexBinary) and http://www.w3.org/TR/xmlschema-2/#dateTime (dateTime).

11.4.2.2 Behaviour in the event of error response EBICS_TX_MESSAGE_REPLAY

The bank system uses the technical error code EBICS_TX_MESSAGE_REPLAY to signal that the EBICS message that has just been sent by the client contains a “Nonce” value that corresponds with that stored in the bank system, or that the “Timestamp” lies outside the tolerance period.

When using cryptographically-strong random numbers as “Nonce” and when the financial institution has selected sensible tolerance periods (guideline: a few hours), the likelihood of an accidental collision can be disregarded due to the miniscule possibility of its occurrence.

Therefore after receipt of the report EBICS_TX_MESSAGE_REPLAY, the customer system must take into account the possibility of a replay attack, an intolerably-imprecise clock setting at the customer’s or the bank’s end, or an error in its own transaction management in the assignment of “Nonce” values.

If the subscriber would nevertheless like to successfully transmit the EBICS message in question, they must first regenerate the fields `ebicsRequest/header/static/Nonce` and `ebicsRequest/header/static/Timestamp` in accordance with Chapter 11.4.2.1. The remaining contents can be left unchanged.

11.4.3 Actions of the bank system

11.4.3.1 Verification of “Nonce” and “Timestamp”

When the bank system receives an initial EBICS message from a subscriber, it MUST carry out the following actions to verify for message replay. If these verifications are all passed, there is no message replay.

1. **Matching of received “Timestamp” and local time stamp:** Normalised to UTC, the received “Timestamp” must be within the tolerance period that is stretched around the current time stamp of the bank system. This tolerance period will compensate for differences in precision between the clocks involved in the systems and possibly also early/late changeover to summer/wintertime. At the same time, the tolerance period determines when the bank system can delete stored “Nonce”/”Timestamp” pairs. Messages arriving with a “Timestamp” outside of the tolerance period will not be accepted. “Nonce”/“Timestamp” pairs that have been stored in the past and are now outside of the tolerance period can therefore be deleted.
   The tolerance period must be set as a one-off occurrence by the bank system. Here, large values (= large tolerance periods) increase the storage requirements for valid “Nonce”/“Timestamp” pairs whilst low values (= smaller tolerance periods) increase the risk of rejected EBICS messages as a result of excessive clock differences between customer & bank systems.
   If the received “Timestamp” is not within the tolerance period there is a risk of message replay. Therefore the bank system MUST reply with the technical error code EBICS_TX_MESSAGE_REPLAY.
2. **Comparison of the received “Nonce” with the locally-stored “Nonce” values:** All “Nonce”/“Timestamp” pairs that originate from valid EBICS requests within the tolerance period are stored at the bank’s end. If the received “Nonce” corresponds with a stored “Nonce” the bank system MUST reply with the technical error code EBICS_TX_MESSAGE_REPLAY.

11.5 Initialisation letters

Initialisation letters for INI contain the public bank-technical subscriber key, initialisation letters for HIA contain the subscriber's public identification and authentication key and the subscriber's public encryption key.

11.5.1 Initialisation letter for INI (example)

11.5.1.1 With version A004 of the electronic signature

User name	Hans Mustermann
Date	DD.MM.YYYY
Time	HH:MM:SS
Recipient	Remote data transmission bank
User ID	Xxxxxxxx
Customer ID	Yyyyyyyy
ES version	A004

Public key for the electronic signature

Exponent 1024

00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	01	00	01

Modulus 1024

FF	12	03	26	E6	30	90	A5	06	01	EF	16	10	21	EE	D4
77	23	27	A9	14	17	07	F1	71	25	22	D5	91	00	41	0A
D7	4A	2F	D5	6C	16	4E	C3	2D	82	F3	02	31	CD	FF	FB
45	77	E4	7E	E5	B2	CB	7B	9A	5F	75	7B	32	7C	16	E5
FB	16	41	0B	4A	39	0F	50	47	68	9C	9B	27	D2	A0	9C
CA	23	A8	C3	1C	AB	A5	ED	72	75	9D	0A	B8	9B	37	BA
00	CB	68	BB	AC	C8	D1	C8	D3	35	C8	BF	1F	A3	06	CF
24	5A	DC	EB	84	64	86	D0	97	8F	E4	67	08	78	81	07

Hash	D2	FD	56	F3	1E	5C	76	D2	B8	2C
	0B	1E	4C	6A	13	9E	85	87	E8	D3

I hereby confirm the above public keys for my electronic signature.

_____ _____

Place/date Signature

11.5.1.2 With version A005/A006 of the electronic signature

User name	Hans Mustermann
Date	DD.MM.YYYY
Time	HH:MM:SS
Recipient	Remote data transmission bank
User ID	Xxxxxxxx
Customer ID	Yyyyyyyy
ES version	A005

Public key for the electronic signature:

Exponent 1024

00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	01	00	01

Modulus 1536

9B	86	4D	2E	72	9E	9E	03	94	78	EB	96	41	E6	27	C6
F2	98	B9	B5	4D	AC	B2	B8	99	C6	13	7C	6A	67	A3	93
56	B0	C0	E2	BB	22	D5	F1	4A	4E	3E	B5	E0	50	9A	41
6E	A5	95	8F	75	CF	A3	04	F9	BA	32	18	BF	ED	24	EC
B6	06	5E	62	80	42	F9	7A	C1	32	2C	F3	75	3F	D5	92
72	2C	A2	83	E8	B5	47	12	59	F6	4B	CD	A6	4E	D8	7F
7B	56	DA	D9	57	32	79	B4	7B	66	79	C9	F7	18	40	7E
CF	AC	5C	46	14	6A	B7	70	1D	47	D0	51	E7	81	62	2B
49	D7	09	5F	47	A4	4C	A3	3F	67	04	02	4B	40	3D	71
AA	5F	3E	A2	30	53	77	30	71	0A	96	DD	62	BE	6C	BF
40	27	28	0C	9F	FF	E0	6D	0A	8C	5E	E0	75	E2	30	A4
49	13	65	08	E5	A9	11	E3	7D	1C	FF	7F	B9	31	18	1F

SHA-256 hash :

D4	7A	24	27	5C	5F	D8	0D
50	1B	CF	28	C5	38	FE	1F
51	DD	24	8B	3E	5C	72	D5
CD	47	9D	82	79	0C	EF	52

I hereby confirm the above public keys for my electronic signature.

11.5.2 Initialisation letter for HIA (example)

User name	Hans Mustermann
Date	TT.MM.JJJJ
Time	HH:MM:SS
Recipient	DFÜ-Bank
User ID	Xxxxxxxx
Customer ID	Yyyyyyyy
Identification and authentication signature version	X002
Encryption version	E002

Public identification and authentication key:

Exponent : 1024 Bit length

00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	01	00	01

Modulus: 1024 Bit length

B7	9D	3A	F0	68	15	AC	6E	AB	BF	F3	A1	D4	38	A3	D1
4D	D6	74	2C	CB	6D	00	52	D5	0C	A2	B0	BF	22	BD	08
8F	F4	5B	3E	B5	67	B5	F5	AE	D6	39	69	01	41	D0	69
8B	D5	F6	EA	03	F1	4B	59	56	84	DE	93	13	D8	07	FB
26	13	05	4B	04	F2	27	65	DA	26	51	35	48	50	64	B3
68	CA	7C	E7	FD	B0	12	34	CF	37	94	EE	CE	7B	B6	2D
79	73	09	82	0A	96	D9	13	75	26	D6	AC	19	40	F8	3E
6C	FD	A0	31	42	2C	F0	A4	EB	30	A0	69	08	A7	61	78
79	9A	67	25	DC	44	CB	66	39	30	11	9A	A5	13	CA	E7
84	53	1A	4C	27	AB	66	62	83	43	E1	B2	81	D6	70	83

SHA-256 hash:

B8	3C	B0	19	66	C9	9C	6E
2C	A5	BA	6A	2B	56	01	92
35	2A	B4	91	53	E9	0B	BA
34	C1	5E	B5	9F	4A	64	F7

Public encryption key:

Exponent : 1024 Bit length

00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	01	00	01

Modulus: 2048 Bit length

C1	C6	41	30	AF	7A	7C	4C	37	07	48	B0	BD	C1	FD	06
8B	56	06	52	CF	2C	88	9A	FB	24	03	99	A4	22	17	63
56	8D	EA	84	FE	53	40	2E	B1	D9	FF	3A	8E	DD	7A	F4
94	95	53	44	A3	D9	B5	26	60	EC	B1	09	FE	D9	70	F3
D9	6E	40	74	77	16	9B	85	1F	53	65	A3	45	2D	C6	97
5D	7F	9D	0B	22	D9	1B	3C	6F	C9	1B	7B	44	11	C2	69
F0	B8	2C	B6	53	BD	02	11	DB	FF	5D	B1	C4	A7	A7	6C
1B	25	CA	13	0D	46	A2	E7	31	E0	78	11	4A	07	DA	05
C7	CE	A2	C9	39	8C	AB	A7	0D	3B	42	8B	D7	30	9F	B2
A3	48	8A	62	A3	81	0B	FD	1A	8C	05	F7	6A	8D	43	6C
42	74	A1	F9	5A	74	03	63	EA	CB	BF	E9	35	83	60	93
59	B6	2C	95	99	2A	B7	44	32	9D	72	48	32	B6	01	5E
3F	D5	B8	2B	F8	5A	A2	2A	A1	DE	1F	C5	28	21	09	A0
13	93	62	64	4B	C4	82	E8	41	E7	9C	39	01	11	AB	36
40	4D	BF	6B	1B	A5	FB	E1	E6	F9	A3	5F	73	C8	29	37
EC	C7	2A	D7	89	A3	3B	62	9D	2F	B0	03	D7	6B	96	9D

SHA-256 hash:

9D	2D	C0	AF	55	6E	D4	D9
04	00	BB	23	AF	C8	1B	AB
91	A3	7A	2E	97	A9	31	6D
D0	01	79	5F	C6	D0	CD	54

I hereby confirm the above public keys for my electronic signature.

____________________ ______________________________

Place/date Signature

11.6 Generation of the transaction IDs

Transaction IDs are cryptographically-strong random numbers with a length of 128 bits. This means that the likelihood of any two bank systems using the same transaction ID at the same time is sufficiently small.

Transaction IDs are generated by cryptographic pseudo-random number generators (PRNG) that have been initialised with a real random number (seed). The entropy of the seed should be at least 100 bits.

12 Overview of selected EBICS details

12.1 Optional EBICS features

With EBICS, not all functions are defined as mandatory. Financial institutions that implement the EBICS standard are free to support some order types or functions within a transaction sequence.

12.1.1 Optional order types

The following EBICS order types CAN be supported by a financial institution (i.e. they are optional):

- HAA (download retrievable order types)
- HKD (download customer's customer and subscriber data)
- HTD (download subscriber's customer and subscriber data)
- HSA (subscriber initialisation for subscribers with access to remote data transmission via FTAM).

12.1.2 Optional functionalities in the course of the transaction

A financial institution or a customer product CAN support the following EBICS functionalities (i.e. they are optional for both sides):

- Preliminary verification (see Chapters 3.6 and 5.3)
- Recovery (see Chapters 3.4 and 5.4).

12.2 EBICS bank parameters

With EBICS order type HPD (see also Chapter 9.2), the subscriber can receive information relating to the financial institution's specific access (`AccessParams`) and protocol parameters (`ProtocolParams`).

Access parameters (`AccessParams`):

Parameter name	#	Meaning	Example
`URL`	1..∞	URL or IP address for electronic access to the financial institution It is possible to specify several URLs. Every URL with a valid_from-date that has been reached (or if the corresponding field is empty) is valid. If a URL cannot be reached the customer may use another valid address.	"www.die-bank.de"
`URL@valid_from`	0..1	Commencement of validity of URL/IP. If not specified, the entry is valid with immediate effect	"2005-01-30T15:30:45.123Z"

Institute	1	Designation of the financial institution	“Die Bank“
HostID	0..1	ID of the EBICS bank system	“bank01“

Protocol parameters (ProtocolParams):

Parameter name	#	Meaning	coll. order types
Version	1	Permitted versions (listed in each case) for EBICS protocol (Protocol), encryption (Encryption) signature (Signature) and identification and authentication (Authentication)	all
Recovery	0..1	Support for the recovery of transactions	all
PreValidation	0..1	Support for preliminary verification. If this parameter is set, the financial institution thereby ensures that it checks at least a part of the data that is transmitted by the subscriber within the framework of preliminary verification. However, the financial institution is not obliged to comprehensively verify the data	uploads
X509Data	0..1	Support for X.509 data such as e.g. certificates from the XML field ebicsRequest/body/X509Data. The financial institution can specify via the attribute flag @persistent whether it persistently archives the subscriber’s X.509 data in the state “Ready”. In this event, the subscriber does not have to transmit them anew with each transaction initialisation. If not specified, the financial institution does not support persistent X.509 data maintenance	all
ClientDataDownload	0..1	Support of order types HKD (download customer data, Chapter 9.3) and HTD (download subscriber data, Chapter 9.4).	HKD, HTD
DownloadableOrder» Data	0..1	Support of order type HAA (download retrievable order types, Chapter 9.1).	HAA

12.3 Order attributes

The following settings are permissible for the order attribute (5 bytes alphanumeric) in EBICS:

Position	Meaning	Permitted values
1	Type of transmitted data	**O** = order data and ES’s **U** = bank-technical ES’s **D** = order data and transport ES (**D** is also used for HIA, INI, HPB)
2	Compression type for order data and/or ES’s	**Z** = ZIP compression
3	Encryption type for order data and/or ES’s	**N** = no encryption **H** = hybrid process AES/RSA
4	*Reserve*	
5	*Reserve*	

Depending on order type and possible further marginal conditions, an EBICS client MUST enter the following order attributes in the control data of the first EBICS request of an EBICS transaction (`ebicsRequest/header/static/OrderDetails/OrderAttribute`):

Order type	Marginal conditions	Order attributes
INI	-	DZNNN
HIA	-	DZNNN
HSA	-	OZNNN
HPB	-	DZHNN
PUB	-	OZHNN
HCA	-	OZHNN
HCS	-	OZHNN
SPR	-	UZHNN
HVE	-	UZHNN
HVS	-	UZHNN
H3K	-	OZNNN
other upload order types	order data and ES(s)	OZHNN
other upload order types	only bank-technical ES(s), no order data	UZHNN
other upload order types	order data with transport signature (release of the order via accompanying note instead of bank-technical ES)	DZHNN
other download order types	download data request with financial institution's bank-technical ES	OZHNN
other download order types	download data request without financial institution's bank-technical ES	DZHNN

12.4 Security media of bank-technical keys

EBICS defines the following value categories for specification of the security medium of (secret) bank-technical keys:

Security medium	Setting
No specification	0000
Diskette	01dd
Chipcard	02dd
Other removable storage medium	03dd
Non-removable storage medium	04dd

In the above table, "dd" represents any number combination that is specified individually by each institution.

12.5 Patterns for subscriber IDs, customer IDs, order IDs

The following table specifies the patterns of different IDs that are permitted in EBICS. In addition, for each ID all of the XML types that are used in EBICS are listed to record corresponding IDs.

ID	Subscriber ID / ID of the technical subscriber	Customer ID	Order ID
Pattern	[a-zA-Z0-9,=]{1,35}	[a-zA-Z0-9,=]{1,35}	[A-Z]{1}[A-Z0-9]{3}
XML type (XML schema file)	Both of the type `UserIDType` (ebics_types_H004.xsd)	`PartnerIDType` (ebics_types_H004.xsd)	`OrderIDType` ebics_types_H004.xsd

For the bank computer number HostID (XML type `HostIDType` in schema file ebics_types_H004.xsd) no pattern [a-zA-Z0-9,=]{1,35} is defined.

13 Appendix: Order type identifiers

The order types in the following table are explained in detail in Chapters 8.3, 9 and 10.

Identification	Direction of trans-mission	Text	Optional/mandatory support
FDL	D	Download file with any format	Optional
FUL	U	Upload file with any format	Optional
HAA	D	Download retrievable order types	Optional
HAC	D	Download customer acknowledgement (XML-format)	Mandatory
HCA	U	Send amendment of the subscriber key for identification and authentication and encryption	Mandatory
HCS	U	Transmission of the subscriber key for ES, identification and authentication and encryption	Mandatory
HEV	D	Download supported EBICS versions	Mandatory
HIA	U	Transmission of the subscriber key for identification and authentication and encryption within the framework of subscriber initialisation	Mandatory
HKD	D	Download customer's customer and subscriber data	Optional
HPB	D	Transfer the public bank key (download)	Mandatory
HPD	D	Download bank parameters	Mandatory
HSA	U	Transmission of the subscriber key for identification and authentication and encryption within the framework of subscriber initialisation for subscribers that have remote access data transmission via FTAM	Optional
HTD	D	Download subscriber's customer and subscriber data	Optional
HVD	D	Retrieve VEU state	Conditional[1]
HVE	U	Add VEU signature	Conditional[1]
HVS	U	VEU cancellation	Conditional[1]
HVT	D	Retrieve VEU transaction details	Conditional[1]
HVU	D	Download VEU overview	Conditional[1]
HVZ	D	Download VEU overview with additional informations	Conditional[1]
H3K	U	Transmission of all public keys (subscriber key, key for identification and authentication and key for encryption) for initialisation in case of certificates	Optional

[1] Mandatory for German banks , currently not supported by French banks

Further order types for the key management:

Identification	Direction of transmission	Text	Format
INI	U	Send password initialisation	Customer's public key for the ES (see Appendix Chapter 14)
PTK	D	Download customer protocol	Format see Implementation Guide (chapter 4.3.1, mandatory for German banks)
PUB	U	Send public key for signature verification	Customer's public key for the ES (see Appendix Chapter 14)
SPR	U	Suspension of access authorisation	Transmission of an ES file with a signature for a dummy file that only contains a space (mandatory)

Further order types (which are independent from the key management process and the EBICS schema, respectively) can be found in the document "EBICS Annex 2 – Order Types".

14 Appendix: Signature process for the electronic signature

The utilised security processes must provide the electronic signature for the data that is to be transmitted. In doing this, the following requirements profile is to be fulfilled:

- The signature may only be provided by the signatory so that the signatory cannot deny the signature and so that it can be verified that the origin of any misuse can only be the responsibility of the signatory.
- All potential recipients must be able to verify the correctness of the signature, wherein it must be additionally guaranteed that this verification is also possible at a later point in time (e.g. by legal entities).
- The signature must be in direct connection to the signed data contents so that it simultaneously authenicates the corresponding data contents, allowing any potential recipient (especially legal entities, even at a later point in time) to also verify the data contents by means of the signature (data integrity verification).
- The signature solution must be applicable to any contents.
- From a performance viewpoint, the signature process must be useable on less-powerful PCs with passable computing performance.
- The administration requirement for necessary storage of the data required for generation of the signature, and especially verification of the signature (identifications) must be as low as possible (simple key management).
- The concrete technical solution must be compatible with common operating systems that may be used by the signatory and the recipient.
- The characters restricted to the operating system (CR, LF and Ctrl-Z) are not included in the calculation of hash values of the A005/A006 ES (analogous to A004 ES).

This requirements profile can only be fulfilled by the use of asymmetrical cryptographic processes.

Use of the electronic signature is strongly recommended for all data transmissions that do not serve purely for information acquisition, insofar as an alternative is not agreed in the special arrangements for individual processes.

A detailed description of the mathematical processes and data structures used must be published free of charge for each security process that is used. This description must be sufficient to allow a functionally-compatible product to be created by any manufacturer. Furthermore, a positive certificate of conformity for the process as a whole and in particular the mathematical procedures utilised therein must be provided by an accreditation agency specified by the German banking sector.

With due consideration for these requirements, it is mandatory that the electronic signature process described in the following text is supported by the bank from 1st April 2002.

14.1 Version A005/A006 of the electronic signature

With due consideration for the requirements in chapter 14, it is mandatory that the electronic signature process described in the following text is supported by the bank from September 1st , 2009.
For the signature processes A005 and A006 an interval of 1536 bit (minimum) and 4096 bit (maximum) is defined for the key length.

14.1.1 Preliminary remarks and introduction

The following sub-chapters of chapter 14.1 contain the description of two new signature mechanisms. The two signature mechanisms are both based on the signature schemes of [PKCS1] and the usage of SHA-256 as algorithm for the hashing, but differentiated by the usage of different methods of [PKCS1] for padding.
Since the completion of [A005] the naming for the signature mechanisms has been changed. In contrast to [A005], where the two new signature mechanisms still have been named A005_V1.5 and A005_PSS, the mechanisms will be called A005 and A006 in future. The following table shows the relationship between future names, the old names of [A005] and the names used in [PKCS1]:

future name	name in [A005]	[PKCS1]
A005	A005_V1.5	EMSA-PKCS1-v1_5 with SHA-256
A006	A005_PSS (with SHA-256 hash value as input)	EMSA-PSS with SHA-256 (with SHA-256 hash value as input)

The following description of the two new signature mechanisms is based on the corresponding paragraphs of the specification of SECCOS 6 [SECCOS6]. Both signature mechanisms will be supported by a ZKA signature card, which is based on SECCOS 6 and which contains the ZKA signature application [ZKASigAnw].
For the calculation of an electronic signature the ZKA signature application [ZKASigAnw] offers two different keys, the so called AUT-key and the so called DS-key. Since banking applications will in future use for the calculations of electronic signatures the AUT-key as well as the DS-key, the following special conditions of SECCOS 6 for the usage of these keys must be taken into account:

- For the AUT-key the signature will be calculated using the command INTERNAL AUTHENTICATE. If used with the PSS padding of [PKSC1], the SECCOS smart card will always calculate a hash value over the input data within the execution of the command INTERNAL AUTHENTICATE. Since the application usually also calculates a hash value over the actual message M before calling INTERNAL AUTHENTICATE, this procedure will result in calculating the hash value twice, i. e. the value hash(hash(M)) will be calculated.

- For this reason A006 will be defined in such a way that a prior calculated hash value over the message M will be used as input for the signature mechanism rather than the message M itself.

The asymmetric cryptographic algorithms supported by the SECCOS ICC are based on the RSA algorithm with odd public key exponent ([RSA]).
In chapter 14.1.3 of this document, the principle of construction and the **key components** of the public and private RSA keys according to annex F of [EMV CA], and [PKCS1] for odd public exponents are explained.
A ***signature algorithm*** consists of an algorithm for signature generation and an inverse algorithm for message recovery. The standard signature algorithm supported by the ZKA SECCOS ICC is described in chapter 14.1.3 of this document.
The described signature algorithm based on the RSA algorithm is used by the ZKA SECCOS ICC only in the context of signature mechanisms. A ***signature mechanism*** defines, in which way a message M is transformed into a byte sequence which serves as input for the signature generation by a signature algorithm. The byte sequence generated by a signature mechanism is referred to as ***Digital Signature Input*** (***DSI***).
The ZKA SECCOS ICC supports several signature mechanisms. In chapter 14.1.4 of this document, the new so called A005 and A006 mechanisms are described which are both based on PKCS #1 padding and the usage of SHA-256 as hash algorithm.

14.1.2 RSA

An RSA key pair consists of

- a **public key P_K** and
- a **private key S_K**.

The public and private key consist of **key components**. RSA keys are also called **asymmetric keys**.
For the generation of an RSA key pair with an **odd public key exponent e**, two different **primes p and q (prime factors)** are used. e must be coprime to (p-1) and (q-1).
The corresponding **private exponent d** is defined by

$$e*d \equiv 1 \bmod kgV(p-1, q-1).$$

The primes p and q as well as the private exponent d have to be kept secret.
The product of the primes n = p*q is called **modulus**.
The **public key P_K** of the RSA key pair consists of the components

- **modulus n** and
- **public exponent e**.

The **private key S_K** of the RSA key pair may be represented by components in two ways (see [PKCS1]):

1. Representation of S_K by the components:
   - **modulus n** and
   - **private exponent d**,
2. Representation of S_K by the components:

- **prime factor p,**
- **prime factor q,**
- **d_p = d mod (p-1),**
- **d_q = d mod (q-1) and**
- **qInv = q^{-1} mod p.**

Of the first representation, only the component d has to be kept secret. The components of the second representation are called **Chinese Remainder Theorem-Parameters** (**CRT parameters**). All CRT parameters have to be kept secret.
The SECCOS ICC shall support the RSA algorithm with any odd public key exponent. In most cases one of the odd public key exponents 3 or $F_4 = 2^{16}+1$ is used.

In this document the following notation is used:
k denotes the bit length of the modulus n of an RSA key pair.
k is defined unambiguously by the equation $2^{k-1} <= n < 2^k$.
n is represented by a bit sequence:

$n = b_k\ b_{k-1} \ldots b_1$, with $b_k <> 0$.

The integer value of n is defined by the leftmost bit b_k being the most significant bit and the rightmost bit b_1 being the least significant bit of the binary representation of n.
For k there exist unique digits N >= 1 and 8 >= r >=1 with k = 8*(N-1) + r such that n may also be represented by the bit sequence:

$n = b_r\ b_{r-1} \ldots b_1\ b_{8*(N-1)} \ldots b_{8*(N-2)+1} \ldots b_8 \ldots b_1$.

If r = 8, n may be represented as a sequence of N byte:

$n = B_N\ B_{N-1} \ldots B_1$, with $B_N <>$ '00'.

If r < 8, the bit sequence $b_r\ b_{r-1} \ldots b_1\ b_{8*(N-1)} \ldots b_{8*(N-2)+1} \ldots b_8 \ldots b_1$ 8-r leading binary 0's are added:

$n = 0 \ldots 0\ b_r\ b_{r-1} \ldots b_1\ b_{8*(N-1)} \ldots b_{8*(N-2)+1} \ldots b_8 \ldots b_1$.

In this way n may be represented as a byte sequence

$n = B_N\ B_{N-1} \ldots B_1$, with $B_N <>$ '00'.

The integer value of n is not changed by the introduction of leading 0's in the binary representation of n. Therefore the integer value of n is the same, whether n is represented by a sequence of N byte or by a sequence of k bit.
N is the byte length of n.
N is defined unambiguously by the equation $2^{8*(N-1)} <= n < 2^{8*N}$

14.1.3 Standard digital signature algorithm

14.1.3.1 Standard signing function

Let S_K be a private RSA key consisting of the modulus n and the private key exponent d or consisting of CRT parameters. The associated public RSA key P_K consists of the modulus n and the public key exponent e.
Then a binary coded byte sequence x, its integer value between 0 and n-1 resulting from the binary representation of x, may be signed with S_K. Then x may be represented as a byte sequence with a length of N byte and as a bit sequence with a length of k bit. The k-th bit of the representing byte or bit sequence may have the value 1, but does not have to. If existent, the bit b_{8*N} ... b_{k+1} of the representing byte sequence have the value 0.
The following notation is used for the generation of a signature with the private key S_K consisting of n and d:

$$sign(S_K)[x] = x^d \bmod n$$

If the private key S_K is represented by CRT parameters, $sign(S_K)[x] = x^d \bmod n$ shall be computed as follows:

$$sign(S_K)[x] = s_2 + h*q$$

where s_2 and h shall be computed as follows:

$$s_1 = x^{dp} \bmod p,$$

$$s_2 = x^{dq} \bmod q,$$

$$h = qInv*(s_1 - s_2) \bmod p.$$

The exponentiations $x^d \bmod n$, $x^{dp} \bmod p$ and $x^{dq} \bmod q$ shall be performed with the integer value resulting from the binary representation of x.
The result of the signature generation is a byte sequence s resulting from the binary representation of the integer value of the exponentiation $x^d \bmod n$ or from the binary representation of the integer value of $s_2 + h*q$. The integer value is between 0 and n-1. Then s may be represented as a byte sequence with a length of N byte and as a bit sequence with a length of k bit. The k-th bit of the representing byte or bit sequence may have the value 1, but does not have to. If existent, the bit b_{8*N} ... b_{k+1} of the representing byte sequence have the value 0.

14.1.3.2 Standard recovery function

Let P_K be a public RSA key consisting of the modulus n and the public key exponent e.
The plaintext may be recovered using P_K from a binary coded byte sequence s, if the integer value, resulting from the binary representation of s, is between 0 and n-1. Then s may be represented as a byte sequence with a length of N byte and as a bit sequence with a length of k bit. The k^{-th} bit of the representing byte or bit sequence may have the value 1, but does not have to. If existent, the bit b_{8*N} ... b_{k+1} of the representing byte sequence have the value 0.
The following notation is used for the plaintext recovery:

$$recover(P_K)[s] = s^e \bmod n$$

The exponentiation s^e mod n shall be performed with the integer value resulting from the binary representation of s.
The result of the plaintext recovery is an integer value between 0 and n-1. It may therefore be represented as a byte sequence with a length of N byte and as a bit sequence with a length of k bit. The k^{-th} bit of the representing byte or bit sequence may have the value 1, but does not have to. If existent, the bit b_{8*N} ... b_{k+1} of the representing byte sequence have the value 0.
It is valid for a RSA key pair P_K and S_K:

$recover(P_K)[sign(S_K)[x]] = x$

14.1.4 ZKA Signature Mechanisms A005 and A006

The digital signature mechanisms A005 and A006 are both based on the industry standard [PKCS1] using the hash algorithm SHA-256. They are both signature mechanisms without message recovery.
A **hash algorithm** maps bit sequences of arbitrary length (**input bit sequences**) to byte sequences of a fixed length, determined by the Hash algorithm. The result of the execution of a Hash algorithm to a bit sequence is defined as **hash value**.
The hash algorithm SHA-256 is specified in [FIPS H2]. SHA-256 maps input bit sequences of arbitrary length to byte sequences of 32 byte length. The padding of input bit sequences to a length being a multiple of 64 byte is part of the hash algorithm. The padding even is applied if the input bit sequence already has a length that is a multiple of 64 byte.
SHA-256 processes the input bit sequences in blocks of 64 byte length.
The hash value of a bit sequence x under the hash algorithm SHA-256 is referred to as follows:

SHA-256(x)

For building the value of the **Digital Signature Input (DSI)** out of the hash value [PKCS1] defines two different encoding methods, called EMSA-PKCS1-v1_5 and EMSA-PSS. Therefore two different digital signature mechanisms will be defined based on these two encoding methods. The different mechanisms will be denoted A005 and A006.

14.1.4.1 Signature Mechanism A005

For the computation and verification of a digital signature with the signature mechanism described in [PKCS1] using the encoding method EMSA-PKCS1-v1_5, the following points have to be indicated:

- the hash algorithm HASH to be used,
- the byte length H of the generated hash values,
- the signature algorithm to be used and
- the maximal byte length N of the generated DSI to be allowed as input for the signature algorithm.

The digital signature mechanism A005 is identical to EMSA-PKCS1-v1_5 using the hash algorithm SHA-256. The byte length H of the hash value is 32.
Within ZKA smart cards RSA is used as signature algorithm. Therefore N is the byte length of the modulus n of the applied RSA key.
In the following, digital signature generation and verification on the basis of the digital signature mechanism A005 are described. The used abbreviations are defined in chapter 14.1.2.

14.1.4.1.1 Digital signature generation

According [PKCS1] (using the method EMSA-PKCS1-v1_5) the following steps shall be performed for the computation of a signature for message M with bit length m.

1. The hash value HASH(M) of the byte length H shall be computed. In the case of A005 SHA-256(M) with a length of 32 bytes.

2. The DSI for the signature algorithm shall be generated.

   The DSI is a sequence of N-1 byte constructed as follows:

Denotation	Byte length	Value
Block type	1	'01'
Padding field	N-3-D	'FF..FF'
Separator	1	'00'
Digest-Info	D	BER-TLV coded data object with OID and parameters of the hash algorithm and with the hash value HASH(M)

   Using SHA-256 the Digest-Info is structured as follows:

Tag	Length (in byte)	Value	Description
'30'	'31'		Tag and length of SEQUENCE
'30'	'0D'		Tag and length of SEQUENCE
'06'	'09'	'60 86 48 01 65 03 04 02 01'	OID of the SHA-256 (2 16 840 1 101 3 4 2 1)
'05'	'00'	-	TLV coding of ZERO
'04'	'20'	'XX..XX'	hash value

   The byte length D of the Digest-info has the value 51. The padding field has a length of N-54 byte. Since N has at least the value 128 (for the minimal key length of 1024 bits), it must be padded at least with 74 byte 'FF'.

3. A signature shall be computed using the DSI with the standard algorithm for the signature generation described in section 14.1.3.1.

Since the DSI is a byte sequence of length N-1, the integer value resulting from the binary representation of the DSI is always less than the value of the modulus n.

The signature may be represented as a byte sequence with the byte length N. In the representation of the modulus n as a byte sequence the bit b_k has the value 1 and the bit b_{8*N} b_{8*N-1} ... b_{k+1} have, if existent, the value 0. In the representation of the signature as a byte sequence the bit b_{8*N} b_{8*N-1} ... b_{k+1} therefore also shall have the value 0.

14.1.4.1.2 Digital signature verification

According to [PKCS1] (using the method EMSA-PKCS1-v1_5) the following steps shall be performed for the verification of a signature. The signature to be verified and the message M' require to be available as byte sequences.

1. The signature must be represented as a byte sequence with the byte length N. In the representation of the signature as a byte sequence the bit b_{8*N} b_{8*N-1} ... b_{k+1} ,if existent, shall have the value 0. If this is not the case, the signature shall be rejected.

   The integer value resulting from the binary representation of the signature shall be less than n. If this is not the case, the signature shall be rejected.

2. The standard algorithm for plaintext recovery described in section 14.1.3.1 shall be applied to the signature. The result has to be represented as a byte sequence of N-1 byte length. If this is not the case, the signature shall be rejected.

3. A DSI' with a length of N-1 byte shall be generated from the message M' as described in steps 1. and 2. of section 14.1.4.1.1.

The DSI' shall be compared with the plaintext recovered in step 2. If the values match, the verification of the signature was successful. Otherwise the signature shall be rejected.

14.1.4.1.3 Notation

The following notation is used for the computation of a signature for the message M with the signature mechanism A005 and the private RSA key S_K:

$s = sign_{A005}(S_K)[M]$.

The following notation is used for the verification of a signature s for the message M with the signature mechanism A005 and the public RSA key P_K:

$verify_{A005}(P_K)[s,M]$.

14.1.4.2 Signature mechanism A006

For the computation and verification of a digital signature with the signature mechanism described in [PKCS1] using the encoding method EMSA-PSS, he following points have to be indicated:

- the hash algorithm HASH to be used,
- the byte length H of the generated hash values,

- the byte length S of the salt to be used,
- the mask generation function to used,
- the signature algorithm to be used,
- the maximal bit length k of the generated DSI to be allowed as input for the signature algorithm and
- the maximal byte length N of the generated DSI to be allowed as input for the signature algorithm.

The digital signature mechanism A006 is based on EMSA-PSS using the hash algorithm SHA-256. The byte length H of the hash value is 32.
The length S of the salt is defined by the used hash algorithm, i.e. the length S of the salt shall be the byte length H of the hash value.
For A006 only the mask generation function MGF1 as described in [PKCS1] will be used.
Notation: k is length of the modulus n (in bits) of the applied RSA key. The length of the DSI (in bits) is k – 1 and will be denoted as emBits. The length of the modulus n (in bytes) is denoted as N. The length of the DSI (in bytes) is denoted as emLen.

14.1.4.2.1 Mask generation function MGF1

The mechanism described in [PKCS1], sections 8.1 and 9.1 uses a mask generation function described in [PKCS1], section B.2.
MGF1 is a mask generation function based on a hash algorithm HASH, which calculates hash values with the byte length H. MGF1 creates a byte sequence of a given length **maskLen** from a given input value (seed) **mgfSeed** as described in the following:

1. Let T be an empty byte sequence.
2. For a counter from 0 to $\lceil maskLen / H \rceil - 1$, do the following:
   a. Convert the counter to a byte sequence C with the length of 4 bytes.
   b. Calculate the hash value HASH (mgfSeed | C) and concatenate this to the byte sequence T:

$$T = T \mid HASH(mgfSeed \mid C)$$

3. The result MGF1(mfgSeed, maskLen) will be the leftmost maskLen bytes of the byte sequence T.

Note that $\lceil maskLen / H \rceil$ defines the smallest integer larger than or equal to (maskLen / H).

14.1.4.2.2 Digital signature generation according to EMSA-PSS

According to [PKCS1] (using the method EMSA-PSS), sections 8.1.1 and 9.1.1 the following steps shall be performed for the computation of a signature for message M with bit length m.

1. The hash value HASH(M) of the byte length H shall be computed. If EMSA-PSS will be used as basis for the signature mechanism A006, the hash value SHA-256(M) with the length of 32 bytes will be calculated.

2. The input value DSI for the signature algorithm shall be generated as follows:

   Generate a random number of S bytes to be used as salt.

   Build the message M' as follows:

   M' = '00 00 00 00 00 00 00 00' | HASH(M) | salt

   Compute over M' the hash value HASH(M') of the byte length H.

   Build a padding string PS with a length of emLen – H – S – 2 bytes consisting of '00' bytes.

   Let DB = PS | '01' | salt; DB is a byte sequence of the length emLen – H – 1.

   Let dbMask = MGF(HASH(M'), emLen – H – 1) the result of the mask generation function. If EMSA-PSS is used as basis for A006, the function MGF1 as described in 14.1.4.2.1 will be used.

   Let maskedDB = DB $\oplus$ dbMask.

   Set the leftmost 8*emLen – emBits bits of the leftmost byte in maskedDB to zero.

   Let DSI = maskedDB | HASH(M') | 'BC'.

3. A signature shall be computed using the byte sequence DSI as input to the standard signing function described in 14.1.3.1.

   It has to be regarded, that the DSI is represented as a sequence of emLen byte. The integer value resulting from the binary representation of the DSI is always less than the value of the modulus n, since the bit length emBits of the DSI is less than the bit length of the modulus.

   The signature may be represented as a byte sequence with the byte length N. In the representation of the modulus n as a byte sequence the bit b_k has the value 1 and the bit b_{8*N} b_{8*N-1} ... b_{k+1} have, if present, the value 0. In the representation of the signature as a byte sequence the bit b_{8*N} b_{8*N-1} ... b_{k+1} therefore also shall have the value 0.

14.1.4.2.3 Digital signatur verification according to EMSA-PSS

According to [PKCS1] (using the method EMSA-PSS), sections 8.1.2 and 9.1.2, the following steps shall be performed for the verification of a signature. The signature to be verified and the message M must to be available as byte sequences.

1. The signature must be represented as a byte sequence with the byte length N. In the representation of the signature as a byte sequence the bit b_{8*N} b_{8*N-1} ... b_{k+1} ,if present, shall have the value 0. If this is not the case, the signature shall be rejected.

   The integer value resulting from the binary representation of the signature shall be less than n. If this is not the case, the signature shall be rejected.

2. The standard function for plaintext recovery shall be applied as described in 14.1.3.2 to the signature. The result has to be represented as a byte sequence of emLen byte length. If this is not the case, the signature shall be rejected.

3. The recovered plaintext shall be checked as follows:

   The hash value HASH(M) of the byte length H shall be computed.

   The least significant byte of the recovered plaintext shall have the value 'BC'. If this is not the case, the signature shall be rejected.

   Let maskedDB be the leftmost emLen – H – 1 bytes of the recovered plaintext and let HM' be the next H bytes of the recovered plaintext.

   If the leftmost 8*emLen – emBits bits of the most significant byte of maskedDB are not all equal to zero, the signature shall be rejected.

   Let dbMask = MGF (HM', emLen – H – 1), using the function MGF1.

   Let DB = maskedDB ⊕ dbMask.

   Set the leftmost 8*emLen – emBits bits of the leftmost byte in DB to zero.

   If the emLen – H – S – 2 leftmost bytes of DB are not all equal to '00' or if the byte at the position emLen – H – S – 1 does not have the value '01', the signature shall be rejected.

   Let salt be the rightmost S bytes of DB.

   Let

   M' = '00 00 00 00 00 00 00 00' | HASH(M) | salt

   and compute the hash value HASH(M') of the byte length H.

If HM' = HASH(M') the verification of the signature was successful. Otherwise the signature shall be rejected.

14.1.4.2.4 Notation for EMSA-PSS

The following notation is used for the computation of a signature for the message M with the signature mechanism according to [PKCS1] using EMSA-PSS and the private RSA key S_K:

$s = sign_{EMSA\text{-}PSS}(S_K)[M]$.

The following notation is used for the verification of a signature s for the message M with the signature mechanism according to [PKCS1] using EMSA-PSS and the public RSA key P_K:

$verify_{EMSA\text{-}PSS}(P_K)[s,M]$.

14.1.4.2.5 Digital signature generation according to A006

As already mentioned banking applications will also use the AUT-key for the generation of a signature, which was formerly intended only for authentication purposes. Using the command INTERNAL AUTHENTICATE with the AUT-key and the signature mechanism EMSA-PSS the SECCOS smart card will always calculate internally a hash value over the input data of the command. Since banking applications have to calculate signatures over messages which are usually quite long, these messages cannot be given directly as input data with the command INTERNAL AUTHENTICATE to the SECCOS smart card. For this reason the banking application will also calculate a hash value over the message. This hash value will be the input data of the command INTERNAL AUTHENTICATE. Hence, using the AUT-key and EMSA-PSS, the hash value will be calculated twice. For this reason the signature mechanism A006 will be defined as follows.
To calculate a signature s over a message M with the private key S_K using the signature mechanism A006 the following steps have to be performed:

- calculate the hash value HM = SHA-256(M).
- then calculate the signature $s = sign_{EMSA\text{-}PSS}(S_K)[HM]$.

14.1.4.2.6 Digital signature verification according to A006

To verify a signature s over a message M with the public key P_K using the signature mechanism A006 the following steps have to be performed:

- calculate the hash value HM = SHA-256(M).
- then verify the signature using $verify_{EMSA\text{-}PSS}(P_K)[s,HM]$.

14.1.4.2.7 Notation for A006

The following notation is used for the computation of a signature for the message M with the signature mechanism A006 and the private RSA key S_K:

$s = sign_{A006}(S_K)[M]$.

The following notation is used for the verification of a signature s for the message M with the signature mechanism A006 and the public RSA key P_K::

$verify_{A006}(P_K)[s,M]$.

14.1.5 References

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[SECCOS6] Interface Specifications for the SECCOS ICC, Secure Chip Card Operating System (SECCOS), Version 6.1, 19.05.2006 (with revisions as on October 16th, 2006)

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14.1.6 XML structure of signature versions A005/A006

The following diagram illustrates the structure of the bank-technical electronic signature (ES) in structured form:

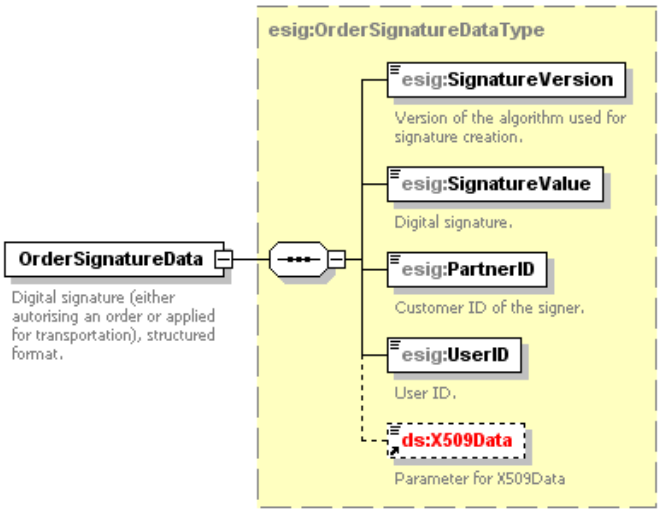

Diagram 105: OrderSignatureData – structured electronic signature

`OderSignatureData` may only be transmitted as part of an XML document with root element `UserSignatureData`. Detailed information and illustrations see chapter 3.5.3 .

With the intention to utilize the ES in structured form outside of EBICS, all necessary data structures have been defined in an independent XSD file (ebics_signature.xsd) which can be downloaded from http://www.ebics.org (see “Specification”).
For the transport of the public signature key the format `SignaturePubKeyInfoType` is used (see chapter 4.2).

14.2 Version A004 of the electronic signature

The support of the electronic signature process described in the following text is no longer mandatory for banks since September 1st 2009.

14.2.1 Introduction

The asymmetrical cryptographic algorithms used in Version A004 of the electronic signature are based on the RSA algorithm with odd public exponents ([RSA], see Chapter 14.2.5.5).

The design principle and the **key components** of the public and private RSA keys in

accordance with Appendix B of [EMV B2], Appendix A of [ISO DS2] and [PKCS1] are explained for odd public exponents in chapter 14.2.2.

A **signature algorithm** comprises an algorithm for signature generation and a corresponding inverse algorithm for recovery of clear text. The signature algorithm that is supported as standard is described in Chapter 14.2.3 under “Signature generation”.

The described signature algorithm based on the RSA algorithm is only used within the framework of signature processes. A **signature process** specifies the manner in which a message M is to be prepared with regard to a byte sequence that is then entered into the signature generation of a signature algorithm. The byte sequence generated by a signature process is designated as **Digital Signature Input (DSI).**

The signature process that is supported for the generation of digital signatures is described in Chapter 14.2.4. This signature process corresponds to DIN specification [DINSIG], (see Chapter 14.2.5.5) of a signature application/function in accordance with SigG and SigV.

14.2.2 RSA key components

An RSA key pair comprises

- a public key P_K and
- a private key S_K

Public and private keys comprise ***key components***. RSA keys are also known as ***asymmetrical keys***.

In order to generate an RSA key pair with an odd **public exponent e**, two different **prime numbers p and q (prime factors)** are used for which e is relatively prime to (p-1) and (q-1).

The associated ***private exponent d*** is then determined by

$e*d \equiv 1 \bmod kgV(p-1, q-1)$.

The prime numbers p and q and the private exponent d must be kept secret.

The product of the prime numbers n = p*q is called the ***modulus***.

The ***public key P_K*** of the RSA key pair comprises the components

- modulus n and
- public exponent e.

The ***private key S_K*** of the RSA key pair can be represented by components in two ways (cf. [PKCS1], see Chapter 14.2.5.5):

1. Representation of S_K by components:

   - modulus n and
   - private exponent d,

2. Representation of S_K by components:

   - prime factor p,
   - prime factor q,
   - d_p = d mod (p-1),
   - d_q = d mod (q-1) and
   - qInv = q^{-1} mod p.

Only the component d of the first representation must be kept secret. The components of the 2nd representation are known as ***Chinese Remainder Theorem parameters*** (***CRT parameters***). All of the CRT parameters must be kept secret.

The RSA algorithm is supported with any odd public exponents that do not exceed the length of the modulus. Generally, the odd public exponent $F_4 = 2^{16}+1$ is used. The following notation is used in this document:

k designates the bit length of the modulus n of an RSA key pair.

k is unambiguously defined by the equation $2^{k-1} <= n < 2^k$.

n can be represented as a sequence of bits

$n = b_k\ b_{k-1} \ldots b_1$, wherein $b_k <> 0$.

The value of n as an integer is defined in that the first left-hand bit b_k is the highest-value bit and the last, right-hand bit is the lowest-value bit in the binary representation of n.

For k, the unambiguous numbers exist: N >= 1 and 8 >= r >=1 with k = 8*(N-1) + r. Then n can also be written as a sequence of bits as

$n = b_r\ b_{r-1} \ldots b_1\ b_{8*(N-1)} \ldots b_{8*(N-2)+1} \ldots b_8 \ldots b_1$.

Where r = 8, n can be written directly as a sequence of N bytes:

$n = B_N\ B_{N-1} \ldots B_1$, wherein $B_N <>$ '00' and $B_N >=$ '80'.

If r < 8, 8-r binary 0 are placed before the bit sequence $b_r\ b_{r-1}$ ... $b_1\ b_{8*(N-1)}$ ... $b_{8*(N-2)+1}$ ... b_8 ... b_1:

$n = 0$ ... $0\ b_r\ b_{r-1}$ ... $b_1\ b_{8*(N-1)}$ ... $b_{8*(N-2)+1}$ ... b_8 ... b_1.

again giving a byte sequence

$n = B_N\ B_{N-1}$ ... B_1, wherein B_N <> '00' and B_N < '80'.

The integer value of n is not changed by the leading 0 in the binary representation, which means that the representation of n as a sequence of N bytes does not change the number value represented by a sequence of k bits.

N is the byte length of n.

Only moduli that are at least 128 bytes long are used. For technical reasons,

- only moduli with a maximum length of 256 bytes can be processed for the calculation of a signature and
- only moduli with a maximum length of 252 bytes

can be processed for verification of a signature.

14.2.3 Signature algorithm

Signature generation

Let S_K be a private RSA key comprising the modulus n and the private exponent d or comprising the CRT parameters. Let the associated public RSA key P_K comprise the modulus n and the public exponent e.

Then S_K can sign the binary-coded byte sequences x whose integer value resulting from the binary representation of x lies between 0 and n-1. Thus x can be represented as a byte sequence with a length of N bytes and as a bit sequence with a length of k bits. The k^{th} bit in the representing byte or bit sequence can - but does not have to - have the value 1. Where present, bit b_{8*N} ... b_{k+1} in the representing byte sequence have the value 0.

The following notation is used for signature generation with the private keys comprising n and d:

$sign(S_K)[x] = x^d \bmod n$

If the private key S_K comprises the CRT parameters,
$sign(S_K)[x] = x^d \bmod n$ is calculated as follows:

$sign(S_K)[x] = s_2 + h*q$

wherein S_2 and h are calculated as follows:

s_1 = x^{dp} mod p

s_2 = x^{dq} mod q

h = qInv*(s_1 - s_2) mod p.

Here, the potentiations x^d mod n, x^{dp} mod p, x^{dq} mod q are displayed with the integer whose value results from the binary representation of x.

The result of the signature generation is again a byte sequence s, that is the result of the binary representation of the integer value of the power x^d mod n or from s_2 + h*q. This integer value again lies between 0 and n-1. Thus s can be represented as a byte sequence with a length of N bytes and as a bit sequence with a length of k bits. The k^{th} bit in the representing byte or bit sequence can - but does not have to - have the value 1. Where present, the bits b_{8*N} ... b_{k+1} in the represented sequence have the value 0.

Clear text recovery

Let P_K be a public RSA key comprising the modulus n and the public exponent e.

Then using P_K from a binary-coded byte sequence s, clear text can be recovered if the integer value resulting from the binary representation of s lies between 0 and n-1. Thus s can be represented as a byte sequence with a length of N bytes and as a bit sequence with a length of k bits. The k^{th} bit in the representing byte or bit sequence can - but does not have to - have the value 1. Where present, the bits b_{8*N} ... b_{k+1} in the represented byte sequence have the value 0.

The following notation is used for clear text recovery:

$$recover(P_K)[s] = s^e \bmod n$$

Here, the potentiation s^e mod n is shown with the integer whose value results from the binary representation of s.

The result of the clear text recovery is an integer whose value lies between 0 and n-1. It can thus be represented as a byte sequence with a length of N bytes and as a bit sequence with a length of k bits. The k^{th} bit in the representing byte or bit sequence can - but does not have to - have the value 1. Where present, the bits b_{8*N} ... b_{k+1} in the represented sequence have the value 0.

The following applies for an RSA key pair P_K and S_K:

$$recover(P_K)[sign(S_K)[x]] = x$$

14.2.4 Signature process according to the DIN specification

In the following text, the messages M used in a signature process are understood as a bit sequence with bit length m. A message can therefore be written as a sequence of bits b_i

$$M = b_m\ b_{m-1} \ldots b_1$$

If M is understood as a binary number, the first, left-hand bit b_m is the highest-value bit and the last, right-hand bit b_1 is the lowest-value bit. The highest value bit or bits of a message can have the value 0.

Generally, m is a multiple of 8, so M can also be represented as a sequence of bytes. Processes for coding messages as bit or byte sequences are not a part of the supported signature process.

If a part of the message M that is to be signed is contained in the DSI as a byte sequence, this part can be recovered from the signature by the clear text recovery feature of the signature algorithm. In this case, it is a signature process **with message recovery.** The **recoverable part** of the message M is designated as $\mathbf{M_r}$. If the entire signed message can be recovered from the signature, this is ***complete message recovery*** ($M = M_r$), otherwise it is partial message recovery. The **non-recoverable part** of the message M is then designated as $\boldsymbol{M_n}$.

If the DSI does not contain any part of the message as a byte sequence, this is a signature process **without message recovery** ($M = M_n$).

In order to verify a digital signature generated with a signature process, the non-recoverable part of the signed message is required in addition to the signature.

The signature process described in the following text is specified in [DINSIG]. It is a signature process without recovery that is based on [ISO DS2] (see Chapter 14.2.5.5 for both references). It uses the following to generate the DSI:

- a hash algorithm and
- a format mechanism.

A hash algorithm displays bit sequences of any length (***input bit sequences***) on byte sequences of a fixed length specified by the hash algorithm. The result of the application of a hash algorithm on a bit sequence is designated as the ***hash value***.
The signature process supported for the generation of digital signatures uses the hash algorithm ***RIPEMD-160***.

The hash algorithm RIPEMD-160 is specified in [RIPEMD] and [ISO HF3] (see Chapter 14.2.5.5). RIPEMD-160 displays input bit sequences of any length on a hash value of 20 bytes represented as a byte sequence. A component of the hash algorithm is the padding of input bit sequences to a multiple of 64 bytes. Padding also takes place when the input bit sequence already has a length that is a multiple of 64 bytes.

RIPEMD-160 processes the input bit sequences in blocks with a length of 64 bytes.
The hash value of an input bit sequence x under hash algorithm RIPEMD-160 is designated as follows:

RIPEMD(x).

The following text describes the format mechanism of the signature process in accordance with specification [DINSIG] ((see Chapter 14.2.5.5). The abbreviations used are defined in Chapter 14.2.2.

Calculation of a signature

The following steps are carried out in accordance with specification [DINSIG] and [ISO DS2] (see Chapter 14.2.5.5) for calculating a signature for message M of bit length m.

- The hash value RIPEMD(M) with a length of 160 bits is calculated.
  Here, operating system-dependent characters (*with Windows: CR, LF, CRLF and Control-Z*) are not used in configuring the hash value.

- The DSI is generated.
  The DSI is a sequence of k bits, composed as follows:

Designation	Bit length	Value
Header	2	0 1
More-data bit	1	1, since , M = M_n
Padding field	k-235	k-236 bit 0, followed by a bit 1 (limit bit)
Data field	64	Random number: The random number must be dynamically generated and set in the DSI with each signature calculation.
Hash value	160	RIPEMD(M)
Trailer	8	'BC'

Message M completely comprises the non-recoverable part M_n.
The first four bits of the DSI can only assume the value '6', since k-236 > 0.

- A signature is calculated from the DSI with the algorithm for signature generation in accordance with Chapter 14.2.3.

  Here, it should be noted that the DSI can be represented as a sequence of k bits, wherein the first (highest-value) bit has the value 0. The integer value of the DCI resulting from the binary representation is therefore less than 2^{k-1} and hence less than the value of the modulus n.

  Furthermore, the DSI can be represented as a byte sequence, optionally in that a maximum of 7 bits are placed before the first bit in the bit sequence with the value 0. This

byte sequence has the same integer value as the bit sequence that represents the DSI.

The signature can be represented as a byte sequence whose byte length is a maximum of N. In the representation of the modulus n as a byte sequence, the bit b_k has the value1 and bits b_{8*N} b_{8*N-1} ... b_{k+1}, where present, have the value 0. In the representation of the signature as a byte sequence, the bits b_{8*N} b_{8*N-1} ... b_{k+1} also have the value 0.

Verifying a signature

The following steps are carried out in accordance with specifications [DINSIG] and [ISO DS2] (see Chapter 14.2.5.5) for verification of a signature. To carry this out, the signature s that is to be verified and the message M' of bit length m' must be present.

- It must be possible to represent the signature as a byte sequence whose byte length is a maximum of N. In the representation of s as a byte sequence, the bits b_{8*N} b_{8*N-1} ... b_{k+1}, where present, must have the value 0. If this is not the case, the signature is rejected. The integer value resulting from the binary representation of s must lie between 0 and n-1. If this is not the case, the signature is rejected.
- The algorithm for clear text recovery in accordance with Chapter 14.2.3 is applied to the signature. The result is a bit sequence b_k ... b_1, designated DSI'. DSI' must satisfy the following requirements:

  The lowest-value byte comprising b_8 ... b_1 has the value 'BC'.

  The bit b_{k-1} has the value 1 and all higher-value bits have the value 0.

  The bit b_{k-2} ('More Data' bit) has the value 1.

  The padding field comprises (k – 236) zeroes and a 1 (limit bit).

  If the requirements are not fulfilled the signature is rejected.
- A hash value' is derived from DSI'. The hash value' comprises the 160 bits that precede the trailer 'BC'.
- The hash value RIPEMD(M') is calculated and compared with the hash value'. If the values are identical the signature verification was successful. Otherwise the signature is rejected.

Notation

The following notation is used for calculation of a signature to a message M with the signature process in accordance with [DINSIG], the signature algorithm RSA and the private RSA key S_K:

$sign_{DINSIG}(S_K)[M]$.

For verification of a signature s to a message M with the signature process in accordance with [DINSIG], the signature algorithm RSA and the private RSA key P_K:

$verify_{DINSIG}(P_K)[s,M]$.

14.2.5 Signature format A004

14.2.5.1 Signature format

Version A004 of the electronic signature is based on RSA signatures that are generated with keys whose moduli have a length of 1024 bits. The A004 signature supports the RSA algorithm with any odd public exponents. Generally, the odd public exponent $F_4 = 2^{16}+1$ is used. The padding format “ISO 9796 Part 2 with random number” is used as a padding format, described in the “DIN specification for interfaces to chip cards with digital signature application/function in accordance with SigG and SigV”.

14.2.5.2 Determination of the hash value via the file that is to be signed

The signature process that is utilised in Version A004 of the electronic signature uses the hash algorithm RIPEMD-160.

RIPEMD-160 displays input bit sequences of any length on a hash value of 20 bytes represented as a byte sequence. A component of the hash algorithm is the padding of input bit sequences to a multiple of 64 bytes. Padding also takes place when the input bit sequence already has a length that is a multiple of 64 bytes. RIPEMD-160 processes the input bit sequences in blocks with a length of 64 bytes. The padding of the message to the corresponding block size is specified in the description of the hash process. The initialisation vector that is to be used is also specified in the description of the hash process.

The hash value specified in the initialisation letter is also calculated in accordance with this process via the 256 bytes – comprising public exponents and modulus.

14.2.5.3 Structure of the signature file

Before transmission of an electronic signature, this is set in a signature file that is to be transmitted separately and has the following structure:

Contents	Length in bytes	Data format[2]	Setting	Explanation
Version number	4	an	'A004'	
Modulus length	4	n	,1024'	
Order type	3	an	e.g. 'IZV'	Order abbreviation of the original file
ES	128	binary	'0, ..., 0, SIGNATURE'	right-justified
User ID	8	an	e.g. 'A2B2C2D2'	
Original file	128	an		Local file name of the original file
Date/time file created	16	an	yyyymmddX'20'hhmmssX'20'	
Date/time signature	16	an	yyyymmddX'20'hhmmssX'20'	
Freely-useable field	8	binary	X'00'	Currently unused
Reserve	197	binary	X'00'	Currently unused

The field "Original file" does not have to be provided. There will be no verification during the ES verification.

14.2.5.4 Structure of the public key file (INI file)

Contents	No. of bytes	Setting/explanation
Version number	4 ASCII	'A004' This field identifies the utilised ES process (A004).
User ID	8 ASCII	'A2B2C2D2' This field contains the institution-specific user ID. The result of this is that the customer system must enter the corresponding user ID before transmission of the public key file.
LExponent	4 ASCII	'1024', length of the exponents, value in bits
Exponent	128 binary	00...010001 (Hex) This field can contain values to a maximum of 1024 bits.
LModulo	4 ASCII	'1024', length of modulo, value in bits
Modulo	128 binary	0...bc7bdc...87 This field can contain values to a maximum of 1024 bits.

[2] an = alphanumeric; n = numeric; values in ASCII format are left-justified and are filled to the right with blank spaces (X'20'). Values in binary format are right-justified and are filled to the left with X'00'.

Contents	No. of bytes	Setting/explanation
Reserve	236 ASCII	Fill up with X'20'

Values in ASCII format are set left-justified and are filled out with blanks X'20' to the right.
Values in binary format are set right-justified and are filled out with X'00' to the left.

14.2.5.5 References

[DINSIG] DIN specification for interfaces to chip cards with digital signature application/function in accordance with SigG and SigV, DIN NI-17.4, Version 1.0, 15.12.1998

[EMV B2] EMV2000, Integrated Circuit Card Specification for Payment Systems, Book 2, Security and Key Management, Version 4.0, EMVCo, December 2000

[ISO DS2] ISO 9796 - 2, Information technology - Security techniques - Digital signature scheme giving message recovery, Part 2: Mechanisms using a hash function, 1997

[ISO HF3] ISO 10118 - 3, Information technology - Security techniques - Hash-functions, Part 3: Dedicated hash functions, 1998

[PKCS1] PKCS #1: RSA Cryptography Standard, Version 2.0, 1.10.1998

[RIPEMD] H. Dobbertin, A. Bosselaers, B. Preneel, RIPEMD-160: A strengthened version of RIPEMD, 1996

[RSA] R. L. Rivest, A. Shamir, and L. Adleman, A method for obtaining digital signatures and public key cryptosystems, Communications of the ACM, vol. 1, n. 2, 1978, 120-126

15 Appendix: Encryption process V001

15.1 Workflows at the sender's end

Generation of the secret DES key (2-key triple DES)

Two random bit strings **DEK_{left}** and **DEK_{right}** are generated, each with a length of 64 bits. The link between DEK_{left} and DEK_{right} is designated as DEK.
Let

$$DEK = DEK_{left}||DEK_{right} = x_{127}, \ldots, x_o$$

with $DEK_{left} = x_{127}, \ldots, x_{64}$ and $DEK_{right} = x_{63}, \ldots, x_{o.}$

In the interpretation of the DES key as a natural number, it is assumed that the respective left-hand bit (x_{127} or x_{63}) of the key is understood as the highest-value bit of the number.

Verifying the secret DES key

The generated random numbers that are used as right and left key halves of the 2-key triple DES are to be verified to ensure that it is not a weak or semi-weak DES key.

Weak DES keys							
01	01	01	01	01	01	01	01
FE	FE	FE	FE	FE	FE	FE	FE
1F	1F	1F	1F	0E	0E	0E	0E
E0	E0	E0	E0	F1	F1	F1	F1
Semi-weak DES keys							
01	FE	01	FE	01	FE	01	FE
FE	01	FE	01	FE	01	FE	01
1F	E0	1F	E0	0E	F1	0E	F1
E0	1F	E0	1F	F1	0E	F1	0E
01	E0	01	E0	01	F1	01	F1
E0	01	E0	01	F1	01	F1	01
1F	FE	1F	FE	0E	FE	0E	FE
FE	1F	FE	1F	FE	0E	FE	0E
01	1F	01	1F	01	0E	01	0E
1F	01	1F	01	0E	01	0E	01
E0	FE	E0	FE	F1	FE	F1	FE
FE	E0	FE	E0	FE	F1	FE	F1

Preparation for DEK encryption

The 128 bit DEK that is interpreted as a natural number is filled out with null bits to 768 bits in front of the highest-value bit. The result is called **PDEK.**

Encryption of the secret DES key

PDEK is then encrypted with the recipient's public key of the RSA key system and is then expanded with leading null bits to 1024 bits.

The result is called **EDEK.** It must be ensured that EDEK is not equal to DEK.

Encryption of the messages

Padding of the message:
The method **Padding with Octets** in accordance with ANSI X9.23 is used for padding the message, i.e. in all cases, data is appended to the message that is to be encrypted.

Application of the encryption algorithm:
The message is encrypted in CBC mode in accordance with ANSI X3.106 with the secret key DEK according to the 2-key triple DES process as specified in ANSI X3.92-1981.

In doing this, the following initialisation value "ICV" is used: X '00 00 00 00 00 00 00 00'.

15.2 Workflows at the recipient's end

Decryption of the DES key
The leading 256 null bits of the EDEK are removed and the remaining 768 bits are decrypted with the recipient's secret key of the RSA key system. PDEK is then present. The secret DES key DEK is obtained from the lowest-value 128 bits of PDEK, this is split into the individual keys DEK_{left} and DEK_{right}.

Decryption of the message
The encrypted original message is decrypted in CBC mode in accordance with the 2-key triple DES process via the secret DES key (comprising DEK_{left} and DEK_{right}). In doing this, the following initialisation value ICV is again used.

Removal of the padding information
The method "Padding with Octets" according to ANSI X9.23 is used to remove the padding information from the decrypted message. The original message is then available in decrypted form.

16 Appendix: Standards and references

The EBICS detailed concept refers to a number of processes, algorithms and format stipulations.

The associated standard document identifications and links to the referenced documents are listed in the following section.

Standard	Characteristics	Standard identification	Reference
EBICS	Multi-bank capable interface for Internet-based communication	H004	http://www.ebics.org, category „Specification“ (XML-Schema)
ZIP	Universal compression algorithm	RFC 1950, RFC 1951	http://www.ietf.org/rfc/rfc1950.txt http://www.ietf.org/rfc/rfc1951.txt
base64	Coding format for textual byte code transport	RFC 1421, RFC 2045	http://www.ietf.org/rfc/rfc1421.txt http://www.ietf.org/rfc/rfc2045.txt
UTF-8	Coding format for Unicode characters	RFC 3629 (ISO 10646)	http://www.ietf.org/rfc/rfc3629.txt
HTTP 1.1	Internet application protocol	RFC 2616	http://www.ietf.org/rfc/rfc2616.txt
TLS	Transport layer encryption	RFC 2246, RFC 3268 (+AES), RFC 2818 (HTTP via TLS)	http://www.ietf.org/rfc/rfc2246.txt http://www.ietf.org/rfc/rfc3268.txt http://www.ietf.org/rfc/rfc2818.txt
TCP	Internet transmission protocol	RFC 793	http://www.ietf.org/rfc/rfc793.txt
IP(v4)	Internet network protocol	RFC 791	http://www.ietf.org/rfc/rfc791.txt
XML	Hierarchical documentation language	(W3C-Rec.)	http://www.w3.org/TR/REC-xml/
XML signature	Process for digital signature	RFC 3275	http://www.ietf.org/rfc/rfc3275.txt http://www.w3.org/TR/xmldsig-core/

	of XML documents		
X.509v3	Format and profile for PKI certification data	RFC 3280	http://www.ietf.org/rfc/rfc3280.txt
Country codes	Format for country abbreviations	RFC 1766, ISO 639	http://www.ietf.org/rfc/rfc1766.txt
Time stamp	Format for date & time stamp	ISO 8601 (2004)	http://www.iso.org/iso/en/CatalogueDetail»Page.CatalogueDetail?CSNUMBER=40874
SHA-1	Hash algorithm	RFC 3174, FIPS 180-2 (SHA gen.)	http://www.ietf.org/rfc/rfc3174.txt http://csrc.nist.gov/publications/fips/fips»180-2/fips180-2withchangenotice.pdf
Triple DES, 3DES	Symmetrical encryption algorithm	FIPS 46-3	http://csrc.nist.gov/publications/fips/fips46-»3/fips46-3.pdf
AES	Symmetrical encryption algorithm	FIPS 197	http://csrc.nist.gov/publications/fips/fips197/»fips-197.pdf

17 Appendix: Glossary

3DES	Triple DES, a version of the “Digital Encryption Standard“ DES is a symmetrical encryption algorithm with a working key length of 56 bits. In order to meet modern security requirements, with 3DES the algorithm is displayed three times in sequence in the same data block and a key with a working length of 112 bits (2-key 3DES) or 168 bits (3-key 3DES). In the EBICS context, 3DES is used for TLS (in accordance with RFC 2246). Furthermore, the version 2-key DES is used in the encryption of bank-technical order data and bank-technical signatures.
AES	“Advanced Encryption Standard”: a symmetrical encryption algorithm that is intended to replace DES. In the EBICS context, AES is used for TLS as well as for the encryption of bank-technical order data (in accordance with RFC 3268).
Bank system	Components within the responsibility sphere of the financial institution that are involved in the implementation of an EBICS transaction. This includes both the bank-technical target system and the HTTP server(s) that receive the EBICS message and forward it to the bank-technical target system.
Bank-technical electronic signature	Subscriber’s ES of signature class “E”, “A” or “B”, via which the processing of an order is authorised.
Bank-technical key (public/private)	RSA key pair whose private key is used for configuring the bank-technical electronic signature and whose public key is used for its verification.
Bank-technical order data	Data that is required for the processing of an order. The format of this data depends on the order type. The majority of the data formats that are used in EBICS have already been defined. The data formats of the order types that have been newly defined for EBICS (such as e.g. Distributed Electronic Signature order types) are defined in EBICS by means of an XML schema. The order data of an order is transparently embedded (in compressed, encrypted form) in EBICS messages.
Bank-technical target system	Component within the responsibility sphere of the financial institution that is responsible for the administration of customers/subscribers and the processing of bank-technical orders. Within the framework of the EBICS specification, the bank-technical target system can be viewed as a “secure black box”.
base64	Coding algorithm and format in accordance with RFCs 1421 & 2045. The result of a base64 coding run can be completely represented in ASCII.
CA	Abbreviation for certificate authority
Client	Communications unit that sends EBICS requests and receives EBICS responses. See also “Customer system”.

Control data	Data in an EBICS message that is required for controlling the flow of an EBICS transaction. This is data for authentication of the subscriber by the bank system, data for identification of the next transaction step that is to be carried out, or technical return codes, or order parameters, or data for preliminary verification or bank-technical return codes.
Customer	Organisational unit (company or private person) that concludes a contract with the financial institution. In this contract it will be agreed as to which business transactions the customer will conduct with the financial institution, which accounts are concerned, which of the customer's subscribers work with the system and the authorisations that these subscribers will possess.
Customer system	Components that are used by subscribers to upload orders to the financial institution and to obtain information on orders or subscriber accounts from the financial institution.
Distributed bank-technical signature	See "Distributed Electronic Signature".
Distributed Electronic Signature	A process wherein bank-technical electronic signatures can be supplied for a particular order, irrespective of time or place. See Chapter 8 for details. The abbreviation is "VEU".
Download transaction	EBICS transaction for transmission of a download order. The transaction phases of a download transaction are: transaction initialisation, data transfer, acknowledgement of the download data.
EBICS message	EBICS request from a subscriber or EBICS response from the financial institution. EBICS messages are mainly composed of control data, the identification and authentication signature and bank-technical data.
EBICS request	Request from a subscriber in XML format that has been defined in EBICS.
EBICS response	Response from the financial institution in XML format that has been defined in EBICS.
EBICS transaction	Sequential flow of EBICS transaction phases that are necessary to transmit an order to the bank-technical target system. EBICS transactions can be upload or download transactions.
EBICS transaction administration	Bank system component that is responsible for the administration of EBICS transactions.
EBICS transaction phase	Sequence of connected EBICS transaction steps. A differentiation is drawn in EBICS between the following transaction phases: Transaction initialisation ("initialisation"), data transfer ("transfer") and acknowledgement ("receipt") .
EBICS transaction step	Pair comprising an EBICS request and the associated EBICS response. An EBICS request is always initiated by the customer system.
Electronic signature (ES)	Voluntary signature of the order data in an upload order by a subscriber with which the corresponding order can be submitted or authorised, or also a financial institution signature for download data. In EBICS, ES's are used in accordance with the Appendix (Chapter

	14) that are at least configured in accordance with process A004
Encryption key (public/private)	RSA key pair whose public key is used by the communications partners for encryption of the symmetrical transaction key and whose private key is used by owners for decrypting the same transaction key.
ES	See “Electronic signature”.
ES signature key	See “Bank-technical key (public/private)”.
Host ID	EBICS host ID for the identification of the EBICS bank computer system in every request message of the customer system. This host ID does not have to be identical with the host ID for the FTAM process. The financial institution communicates the EBICS host ID together with the URL for the bank access to the customer.
Identification and authentication key (public/private)	RSA key pair whose private key is used for configuring the identification and authentication signature and whose public key is used for its verification.
Identification and authentication signature	Digital signature to ensure the authenticity of the control data in an EBICS message. XML Signature is used as a signature format.
Key management	Component of the bank system that is responsible for the assignment of public keys to subscribers and that controls access to the keys it administrates.
Order	Bank-technical or system-related business transaction whose type is identified via the so-called order type.
Order attributes	Five-digit alphanumeric code that contains information for an EBICS transaction about the type of data transmitted (ES’s relating to an existing order, order data together with bank-technical ES’s, order data with transport signature) as well as the type of compression and encryption of this data. See Chapter 12.3 for details.
Order data	See “Bank-technical order data”
Order parameters	Additional order parameters that the client transmits to the server in the first transaction step. See Chapter 3.11.
Order ID	Unambiguous order ID assigned by the bank server and submitted to the client system in the response of an upload transaction. It especially serves the synchronizing of order data and electronic signatures in a second upload. The application is to ensure the allocation of unambiguous order IDs per each customer ID and per order type. Structure of a 4-digit order ID: 1st position: Alphabetic character (A–Z), selectable freely 2nd to 4th position: Alphanumerical characters (A–Z or 0–9) in ascending order
Order type	Three-figure alphanumeric code that identifies the type of order. The standardised, system-related and reserved order types are listed in the Appendix (Chapter 13) and document “EBICS Annex 2 Order Types”. New EBICS order types are recognisable by their first letter “H”. See Chapter 3.10 for details.
OrderAttribute	See “Order attributes”.
OrderData	See “Order type”.
Partner	See “Customer”

Segmentation	Division of the data volume of the order data after compression, encryption and base64-coding into segments with a size of max. 1 MB. See also Chapter 7.
Server	Communications unit that receives EBICS requests and sends EBICS responses. See also “Bank system”.
Signature class	Relates to subscriber’s ES’s. EBICS defines the following signature classes: Individual signature (type “E“), First signature (type “A“), Second signature (type “B“), Transport signature (type “T“). See Chapter 3.5.1 for details.
Subscriber	Human users (“non-technical subscribers”) or a technical system (“technical subscriber”) that is/are assigned to a customer. Is identified by the combination of subscriber ID and customer ID. The technical subscriber serves for the data exchange between customer and financial institution. It must not be put on the same level as a technical ID for a service provider.
Subscriber initialisation	A process according to which the public subscriber keys are transmitted to the financial institution and are then activated by the financial institution. After successful execution of subscriber initialisation, subscriber are set in the bank system to the state “Ready”.
TLS	“Transport Layer Security”: Protocol in accordance with RFCs 2246 & 3268 for the cryptographic security of messages that use TCP/IP as a transmission protocol. In the EBICS context, TLS is used for the transport encryption of HTTP messages (HTTPS).
Transaction	See “EBICS transaction”.
Transaction key	Symmetrical key that is used within the EBICS transaction for the encryption of bank-technical data.
Transaction management	See “EBICS transaction management”.
Transaction phase	See “EBICS transaction phase”.
Transaction step	See “EBICS transaction step”.
Transport signature (TES)	Subscriber’s ES of signature class “T” via which the order is submitted (but its processing is not authorised).
Trust anchor	In the context of certification verification, a trust anchor (point of trust) is a certificate that is considered trustworthy. This is usually a certificate from a CA (Certification Authority).
Upload transaction	EBICS transaction for transmission of an upload order. The transaction phases of an upload transaction are: Transaction initialisation, data transfer.
UTF-8	“Unicode Transformation Format“, a character encoding standard according to RFC 3629.
VEU	See “Distributed Electronic Signature”.
ZIP	Loss-free compression algorithm according to RFCs 1950 and 1951.

18 Table of diagrams