



Federal Office
for Information Security



Technical Guideline TR-03122-1

Conformance Test Specification for Technical Guideline TR-03121 Biometrics for Public Sector Applications

Part 1: Framework

Version 2.3

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1 Introduction

1.1 Motivation and Objectives of the Conformance Test Specification

The Technical Guideline Biometrics for Public Sector Applications (TR-03121) specifies requirements and recommendations for the capturing, compression, quality assurance and coding of biometric data within the scope of electronic identity documents. TR-03121-2 describes different Application Profiles (APs) in which electronic identity documents are used. Afterwards, the requirements are defined in Function Modules (compare TR-03121-3) and can be implemented for different public sector applications in the following through applications, hardware and software components from various vendors.

The objective of this Technical Guideline is to offer a base for consistent and comparable quality assurance regarding the different components that will be applied in order to fulfil the afore described requirements. Therefore, a Conformance Test Specification is necessary that specifies tests on the one hand for the Software Architecture (in particular BioAPI conformance testing) and on the other hand defines all test cases being relevant to verify the conformance for the different requirements described in the Function Modules (FMs).

To summarise, the following objectives are identified in the scope of the Conformance Test Specification:

- Appliance of international standards
- Correct establishment of the underlying Software Architecture
- Specification of test cases in agreement with the respective requirements for various kinds of biometric applications in the public sector
- Design of standardised procedure within the test cases
- Definition of necessary additional interfaces

1.2 Target Audience

Audience for this guideline are institutions that are dealing with projects using biometrics in public sector applications that require certified modules, hardware, and/or software. These include:

- Vendors of hardware or software products that want to present their solutions for conformance test and acquire to be compliant to this Technical Guideline.
- Evaluation laboratories that check the conformance of hardware and/or software modules that are used within the scope of biometrics and electronic identity documents in public sector applications.

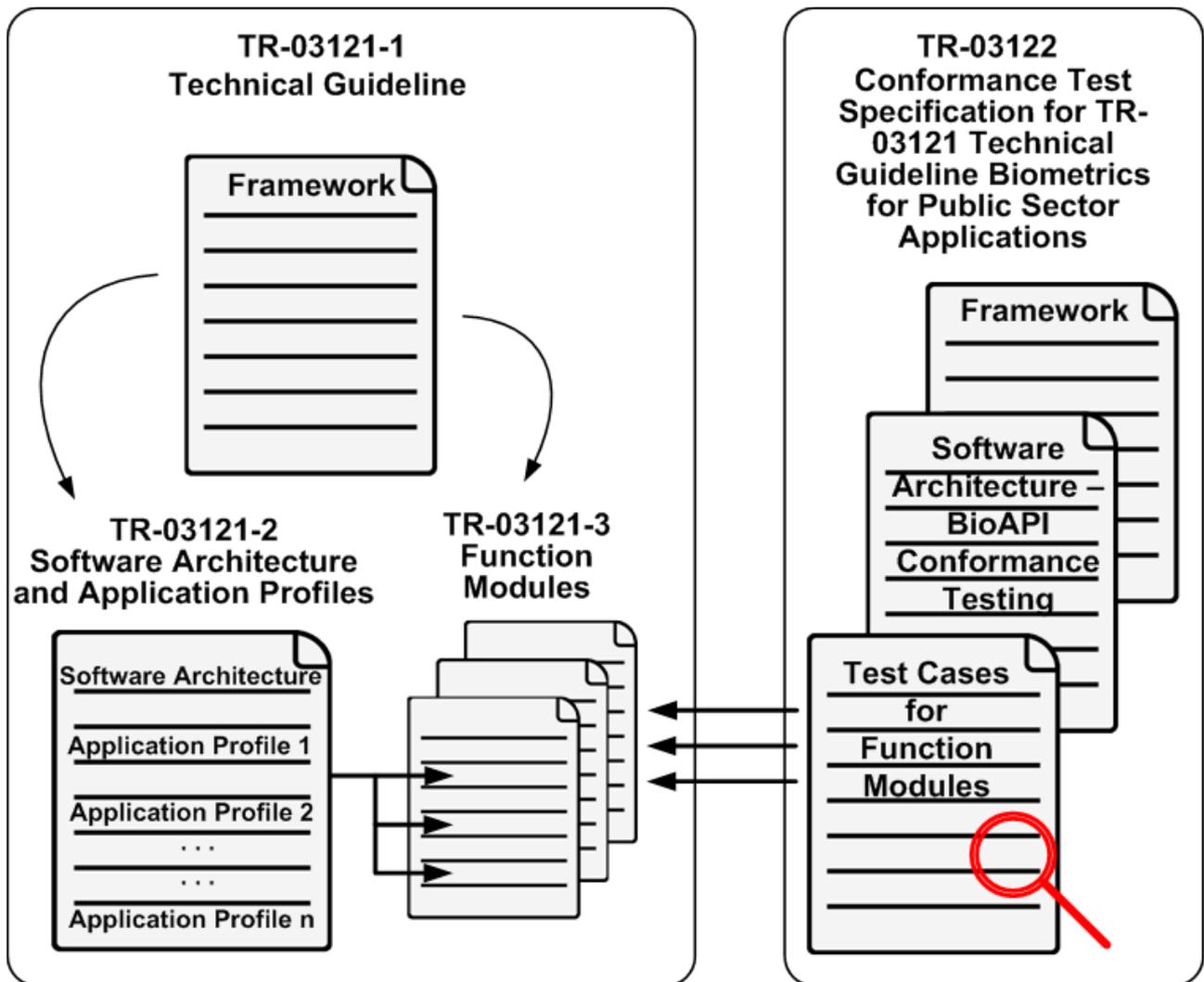
2 Structure of the Conformance Test Specification

The Conformance Test Specification consists of three parts which will be introduced in the following:

- Part 1: Framework (TR-03122-1)
 - TR-03122-1 explains the concept of this Conformance Test Specification and shows the integration of this document in the context of the different parts of the Technical Guideline Biometrics for Public Sector Applications. It is to be seen as the framework.
 - Section 3 explains the design and introduces the central topic in a “How to use this Conformance Test Specification” manual. By this means it will become possible to understand how the conformance testing of the Software Architecture (compare TR-03121-2) and evaluation of the Function Modules (described in TR-03121-3), which encapsulate the specific requirements, can be performed.
- Part 2: Software Architecture – BioAPI Conformance Testing (TR-03122-2)
 - In the second part the architecture model for conformance testing is introduced and described in more detail. Essential topics are the description of the BioAPI Conformance Test Suite (CTS) as well as the Testing Methodology.
- Part 3: Test Cases for Function Modules (TR-03122-3)
 - In the third part the necessary test cases for hardware and software components are identified in relation to the requirements of the Function Modules. Thereby the scope, precondition and description of the single steps within a test case are presented.

3 How to use this Conformance Test Specification

The objective of this chapter is to give the reader support in how to read and apply this guideline for conformance testing step by step. In section 1 and 2 the concept and the structure of the document have been introduced. Now the reader will be guided how all essentially relevant information for any desired application can be obtained.



1. If the Conformance Test Specification is applied by the reader for the first time, general information can be achieved by reading the Framework document (TR-03122-1). In general, the structure of the Conformance Test Specification is based on the design of the Technical Guideline TR-03121. The framework introduces the structure of the Conformance Test Specification, describes the need for the Conformance Test Interfaces and gives an overview about the conformance instruments. If the structure and the concept of the Conformance Test Specification is already known, the user can switch either to the Software Architecture and BioAPI Conformance Testing (TR-03122-2) or to the connected Test Cases for Function Modules (TR-03122-3).

2. TR-03122-2 gives an overview about the BioAPI Conformance Testing regarding [ISO_24709] and therefore introduces the architecture models. Afterwards, a description how every single layer in the architecture can be tested is presented. Finally, the BioAPI Conformance Test Suite and the Testing Methodology are introduced.
3. The requirements for an electronic identity document and the connected public sector application are combined in several Function Modules within TR-03121-3. Information how the Function Modules are organised can be found in TR-03121 Part 1 and Part 2. If the conformance to one or more specific Function Modules has to be checked the reader has to identify at first the relevant Function Modules with the according abbreviation e.g. P-FP-GID.
4. As a result the corresponding test cases can be selected in TR-03122-2 under the same identification while the prefix 'TC-' indicates the according test case. Depending on the number of defined test cases the abbreviation is followed by an ascending numbering e.g. TC-P-FP-GID-001.
5. In general, a test case in TR-03122-3 is structured in three parts as shown in table 2.

Test Case ID: <u>TC-P-FP-GID-001</u>	
Scope	
- Short overview of the test case	
Precondition	
- Requirements that need to be fulfilled before the test case can be executed	
Description	
1. Listing of every single test step	
Expected Result	- Description of the expected result for the corresponding test step

Table 1: Example of the structure of a test case

Conformance to the specification of a Function Module can be established if all test cases for that Function Module are completed successfully and the requirements of the test methodology are satisfied. Thus, the received result equals the expected result. This means that several test cases can be assigned to one Function Module each containing one or multiple test steps.

Note: the Conformance Test Specification does not define requirements for the object to be tested except the interfaces for conformance testing.

4 Conformance Test Interfaces

As already described in section 2 of TR-03121-2, the Software Architecture is based on the BioAPI specification as described in [ISO_19784-1]. Each profile defines one or more individual Biometric Service Provider (BSP) in connection with the respective Application Profiles (AP).

Within the BioAPI standard a set of interfaces is defined that is used in TR-03121 for the handling of Public Sector Applications. In general, the output of an BSP can be checked for conformance. This can be achieved by the execution of the regular process which is performed by the operator of the evaluation laboratory.

Nevertheless it can be necessary to simulate defined input in order to be able to check the output in a defined state. Thus, the BSP has to provide interfaces especially for conformance testing.

As a recommendation, the BioAPI function `BioAPI_ControlUnit` can be used as conformance interface. The software for conformance testing includes the mechanisms to enable the conformance test mode by calling the function `BioAPI_ControlUnit` with a predefined control code (compare table 2).

BioAPI_ControlUnit	BioAPI_HANDLE	BioAPI_UNIT_ID	uint32_t	const BioAPI_DATA	BioAPI_DATA
	BSPHandle	UnitID	48879	*InputData	*OutputData

Table 2: Overview `BioAPI_ControlUnit`

The call of `BioAPI_ControlUnit` has to be made for the appropriate BioAPI unit of the selected BSP (i.e., the appropriate sensor unit in case of testing a Capture BSP) at which the parameter *UnitID* denotes the ID of the selected unit.

In opposite to the standard workflow, this request is used as an alternative point of entry so that the standard steps for the acquisition of the biometric image (e.g. facial image or fingerprint image), further processing of the image and/or compression of the image can be skipped.

The BSP is provided with the test data over the input parameter *InputData* for the `BioAPI_ControlUnit` function instead of the acquisition over the standard workflow. Depending on the entry point the test data comprises the image (facial image or one or more fingerprint images) binary coded, meta data describing the coding of the image as well as the entry point in the workflow.

The test data encloses the following information:

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
attributeFormDefault="unqualified" elementFormDefault="qualified"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:bio_common="http://trbio.bsi.bund.de/1.0/bio_common"
targetNamespace="http://trbio.bsi.bund.de/1.0/bio_common">
  <xs:element name="testsetup">
    <xs:complexType>
      <xs:sequence>
        <xs:element maxOccurs="unbounded" name="param">
```

```
<xs:complexType>
  <xs:simpleContent>
    <xs:extension base="xs:base64Binary">
      <xs:attribute name="type" type="bio_common:paramtype"
        use="required" />
      <xs:attribute name="subtype" type="bio_common:subtypemask"
        use="optional" />
      <xs:attribute name="format" type="bio_common:imageformat"
        use="required" />
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>
</xs:element>
</xs:sequence>
<xs:attribute name="entrytype" type="bio_common:entrytype"
  use="required" />
</xs:complexType>
</xs:element>
<xs:simpleType name="entrytype">
  <xs:restriction base="xs:string">
    <xs:enumeration value="processed">
      <xs:annotation>
        <xs:documentation>after capture and processing</xs:documentation>
      </xs:annotation>
    </xs:enumeration>
    <xs:enumeration value="compressed">
      <xs:annotation>
        <xs:documentation>after capture, processing and compression
        </xs:documentation>
      </xs:annotation>
    </xs:enumeration>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="paramtype">
  <xs:restriction base="xs:string">
    <xs:enumeration value="face"/>
    <xs:enumeration value="fingerprint"/>
  </xs:restriction>
</xs:simpleType>
```

4 Conformance Test Interfaces

```
</xs:simpleType>
<xs:simpleType name="subtype">
  <xs:restriction base="xs:string">
    <xs:enumeration value="left"/>
    <xs:enumeration value="right"/>
    <xs:enumeration value="thumb"/>
    <xs:enumeration value="indexfinger"/>
    <xs:enumeration value="middlefinger"/>
    <xs:enumeration value="ringfinger"/>
    <xs:enumeration value="littlefinger"/>
    <xs:enumeration value="multiple"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="subtypemask">
  <xs:list itemType="bio_common:subtype"/>
</xs:simpleType>
<xs:simpleType name="imageformat">
  <xs:restriction base="xs:string">
    <xs:enumeration value="WSQ"/>
    <xs:enumeration value="BMP"/>
    <xs:enumeration value="JPEG"/>
    <xs:enumeration value="JPEG2000"/>
    <xs:enumeration value="TIFF"/>
    <xs:enumeration value="GIF"/>
    <xs:enumeration value="PNG"/>
  </xs:restriction>
</xs:simpleType>
</xs:schema>
```

Example Fingerprint Image

```
<?xml version="1.0" encoding="UTF-8"?>
<bio_common:testsetup xmlns:bio_common="http://trbio.bsi.bund.de/1.0/bio_common"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://trbio.bsi.bund.de/1.0/bio_common testsetup.xsd"
  entrytype="compressed">
  <bio_common:param type="fingerprint" subtype="left indexfinger"
    format="WSQ">
    VghpcyBmaWVsZCBjb250YWlucyB0aGUgZmluZ2VychJpbnQgaWlhZ2UgaGVyZSBhcyBXU1Eu
  </bio_common:param>
</bio_common:testsetup>
```

Example Facial Image

```
<?xml version="1.0" encoding="UTF-8"?>
<bio_common:testsetup xmlns:bio_common="http://trbio.bsi.bund.de/1.0/bio_common"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://trbio.bsi.bund.de/1.0/bio_common testsetup.xsd"
  entrytype="processed">
  <bio_common:param type="face" format="BMP">
    VghpcyBmaWVsZCBjb250YWlucyB0aGUgZmFjaWFsIGltYWdlIGhlcmUgYXMgQk1QLg==
  </bio_common:param>
</bio_common:testsetup>
```

In principle further interfaces can be used for the check of conformance of a specific implementation, but additional adjustments may be necessary to do so.

5 Conformance instruments

Besides the interfaces and the subject which is to be tested, the conformance instruments build an important part for conformance testing. All necessary components for conformance testing are included.

The certification authority approves all conformance instruments. Part of this are the following components:

- Conformance test tools
The software components that are used to check the compliance of the BSP compare the expected result with the actually received result. Furthermore, for the validation of the coding, a test tool can be understood as a validating parser.
- Appropriate conformance test databases
The conformance test databases contain specific test data that are used by the evaluation laboratory to perform certain test cases. Furthermore, tolerance thresholds and domain parameters (e.g. ground truth values) are provided. Default processing, exceptions, and error behaviour can be verified.

Besides the afore described components further test resources are necessary e.g.:

- Colour Image
In order to check the regular process of scanning, a photo in order to acquire a facial image for the acquisition of eIDs samples need to be available.
- Application Form
Facial images can be acquired by digital cameras or by scanning photos that were taken by a photographer. In the second case, an application form is used to adjust the photo on a document with a special pattern.
- Finger
In order to check the regular process of capturing fingerprint images, several fingers need to be available.
- Image decoding algorithm
For the further image decoding respective algorithms such as a FBI certified WSQ algorithm and a JPEG2000 Encoder according to ISO need to be available.

6 List of Abbreviations

<i>Abbreviation</i>	<i>Description</i>
AP	Application Profile
BioAPI	Biometric Application Programming Interface (compare [ISO_19784-1])
BSP	Biometric Service Provider (compare [ISO_19784-1])
CTS	Conformance Test Specification
eID	Electronic identity document
FM	Function Module
FP	Fingerprint
GID	German Identity Document
P	Process
TC	Test Case
TR	Technische Richtlinie (engl. Technical Guideline)

7 Bibliography

- [ISO_19784-1] ISO/IEC 19784-1:2006 “Information technology – Biometric application programming interface – Part 1: BioAPI specification”
- [ISO_24709] ISO/IEC 24709 “Information technology – Conformance testing for the biometric interface (BioAPI)”