



Federal Office  
for Information Security



Technical Guideline TR-03121-1

# Biometrics for Public Sector Applications

Part 1: Framework

Version 2.3

Bundesamt für Sicherheit in der Informationstechnik

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# 1 Introduction

## 1.1 Motivation and Objectives of Technical Guideline Biometrics

Biometric methods are used in many different areas of applications. The solutions and systems available on the market are able to serve a broad range regarding performance, security, usability and standard conformance. For public sector applications, it is therefore necessary to define precise requirements and general conditions. Furthermore, the systems have to be defined in a way which allows extensions for future developments to be made easily. Thus, flexibility can be achieved and investments can be protected.

The objective of this Technical Guideline (TR Biometrics) is to offer a basis for consistent and comparable quality of public sector applications and for building a common architecture. Therefore, basic requirements will be defined within this document.

In the scope of TR Biometrics the following objectives are identified:

- ▶ Specification of standardised quality requirements for various kinds of biometric applications in the public sector
- ▶ Definition of standardised security requirements
- ▶ Support for procurement processes of the public sector
- ▶ Establishment of guidelines across applications (e.g. implementation of requirements from enrolment to verification)
- ▶ Design of a simple and well-structured software architecture with defined interfaces (transparency, modularity, interchangeability) in order to avoid proprietary systems and to establish
  - ▷ Investment security
  - ▷ Flexibility
  - ▷ Interoperability
- ▶ Establishment of certification methods for conformance audit trails
- ▶ Integration into the international context
  - ▷ Consideration of established standards
  - ▷ Definition of new, internationally applicable standards, if deemed necessary

## 1.2 Fundamentals of this Guideline

To be able to fulfil the above-mentioned objectives it is necessary that the Technical Guideline Biometrics serves the following principles:

- ▶ **Modularity**  
The complete guideline is built from several single guideline modules. For a single application area only the respective modules have to be taken into account. This is done in order to avoid side effects between different kinds of applications which would occur due to changes of special functions.
- ▶ **Clarity**  
The concept of this guideline follows a well structured framework. With this framework it is easily understandable which kind of guideline modules are valid for the respective application scenario.
- ▶ **Expandability**  
Modularity is the key component of expandability in the scope of this guideline. This is valid regarding new applications as well as new functional units.
- ▶ **Standard conformance**  
The Technical Guideline takes national and international standards and guidelines into account (as far as they already exist) and deploys them for German applications. Therefore, it is based on approved fundamentals.
- ▶ **Certification**  
The guideline modules are designed in such a way that requirements and conditions for single functional units are clearly separated from each other. Products for single functional units are, therefore, clearly defined regarding the interfaces and the range of their functionality so that they can be tested with this guideline and certified.
- ▶ **Ability to reference**  
The use of functional units allows to specify precise requirements for products that are used in according application scenarios. Therefore, this guideline can be used as a reference e.g. for tenders.
- ▶ **Market orientation**  
The definition of functional units is related to the products that can be found on the market. Requirements of the guideline can, therefore, be unambiguously assigned to the respective systems and components.

It should be recognised that the content of this guideline is bounded to the aspects of biometrics. Additionally, interfaces to further technologies (e.g. connection of optical or electronic document readers) are defined in this context.

## 1.3 Target Audience and User

Audience for this guideline are institutions that are dealing with projects using biometrics in public sector applications. These include:

- ▶ Agencies that are issuing identity documents, e.g. passport agencies of the local authorities or missions abroad of the Federal Foreign Office (Auswärtiges Amt).
- ▶ Public Authorities using biometric applications for identity verification of people, e.g. the German Federal Police (Polizeien des Bundes) or the Police of the Federal States (Polizeien der Länder), the German Customs Administration (Bundeszollverwaltung) or the Federal Administrative Office (Bundesverwaltungsamt).

Beside these public sector users this guideline also addresses vendors of biometric systems as well as integrators and application developers. It is their task to design products in such a way that they comply with the requirements of public sector applications.

## 1.4 Terminology

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this technical guideline are to be interpreted as described in RFC 2119.

## 2 Structure of TR Biometrics

The TR Biometrics consists of several parts which will be introduced in the following paragraphs:

- ▶ Part 1: Framework (TR-03121-1)
  - ▷ TR-03121-1 is the main document of the guideline. It explains the concept and the relation between the different parts. Therefore it is to be seen as the framework.
  - ▷ Section 3 addresses the design and introduces the central topic in a “How to use this Technical Guideline” manual.
  - ▷ General information about Application Profiles can be found in section 4.
  - ▷ An overview and first understanding of the Function Modules is given in section 5.
  - ▷ The mapping between Application Profiles and Function Modules is presented in section 6.
  - ▷ Finally a short reference to the respective Conformance Test Specification is given in section 7.
- ▶ Part 2: Software Architecture and Application Profiles (TR-03121-2)
  - ▷ In the second part of this guideline at first the Software Architecture based on BioAPI 2.0 (ISO/IEC 19784-1) is introduced and described.
  - ▷ Profiles for applications that use biometrics and that are relevant in the public sector are furthermore specified.
  - ▷ An Application Profile can be set in relation to several Function Modules. This connection is visualised by a table in which all relevant Function Modules are mapped to the respective Application Profiles.
- ▶ Part 3: Function Modules (TR-03121-3)
  - ▷ The necessary components that are defined in the scope of this guideline are structured in Function Modules. These contain the detailed technical requirements for each of the components.

With the provision of requirements for the use of biometrics in public sector applications it becomes reasonable to present a Conformance Test Specification (TR-03122) that introduces a method how the involved systems and devices can be checked for conformance. This is done with a separate document Conformance Test Specification for TR-03121 Technical Guideline Biometrics for Public Sector Applications that describes besides other the Test Cases.

### 3 How to use this Technical Guideline

The objective of this chapter is to give the reader support in how to read and apply this guideline 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.

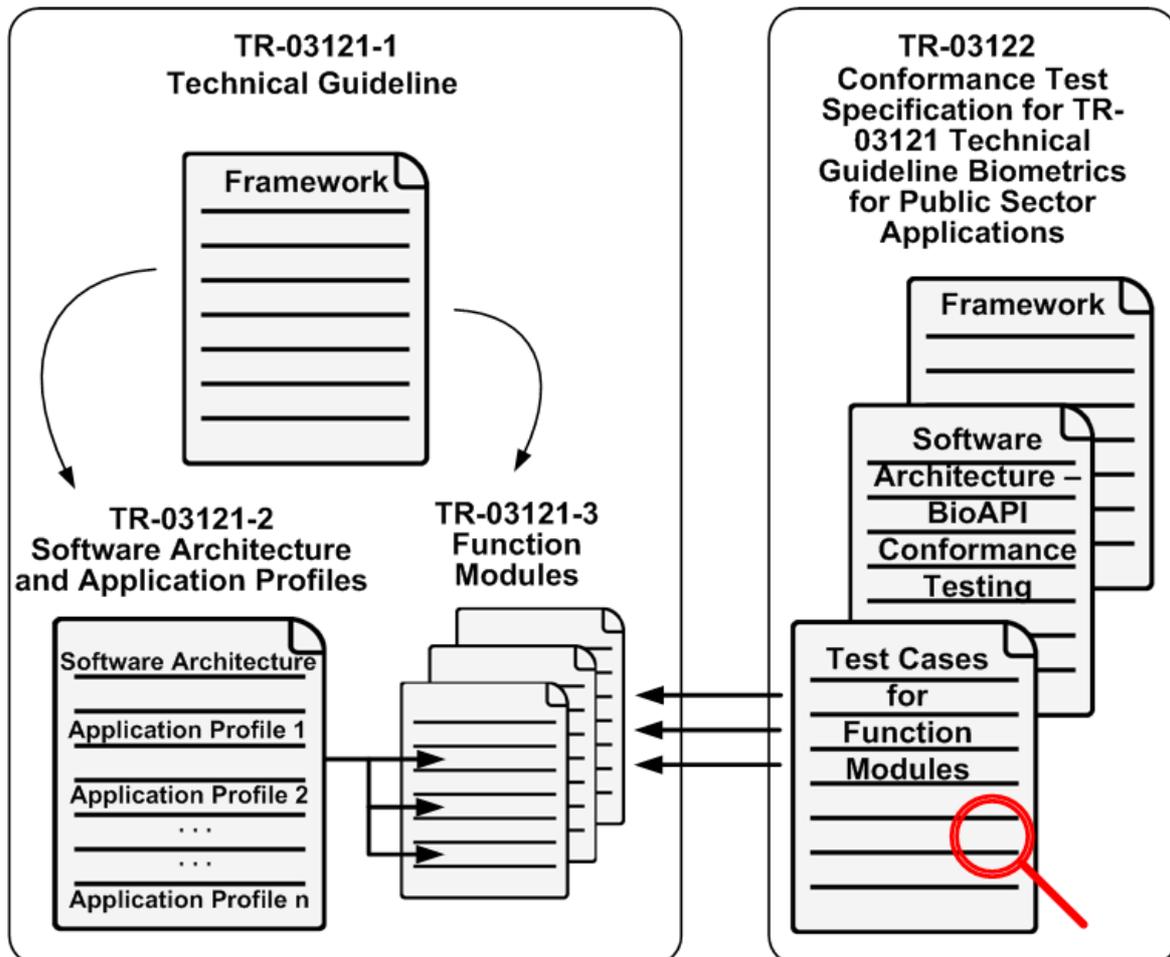


Figure 3-1: Overview of the Technical Guidelines

1. If the TR Biometrics is applied by the reader for the first time general information can be achieved by reading the Framework document (TR-03121-1). If the structure and concept of TR Biometrics are already known, the user can switch to the Software Architecture and Application Profiles (TR-03121-2).
2. TR-03121-2 offers at first general information about the Software Architecture concept. The desired Application Profile can be chosen afterwards. With the help of the Application Profile the user can get a deeper insight into the application, the dedicated software architecture and the used functionality.
3. As a result of the Application Profiles the respective Function Modules are identified. One profile can link to several Function Modules due to different kind of underlying biometric characteristics or the fact that different technologies (e.g. scanners or digital cameras for the digitisation of a photo) are used. This is represented in a table that visualises the mapping

within the according Application Profile. The connection is made by an identifier e.g.: P-FP-GID. The first abbreviation identifies the Function Module (e.g. Process), the second part represents the biometric characteristic (e.g. fingerprint), and the last letters denote the scope (e.g. German Identity Document). Function Modules for different biometric characteristics are divided by a comma while a choice between different technologies is denoted by a slash (e.g.: AH-FP-FTR, AH-PH-FBS/AH-PH-DC). If the user desires a complete overview of the mapping between all Application Profiles and all Function Modules an aggregated table can be found in section 3 of TR-03121-2. It contains all identifiers used by the different profiles.

4. On the basis of the identifier that has been achieved in step 3 the according Function Module can be consulted in TR-03121-3. Here, concrete requirements for the Function Module are provided in detail.

## 4 Application Profiles

Different areas in which this guideline can be used are defined in separate Application Profiles (APs) in TR-03121-2. Application Profiles can have mandatory status, e.g. through published regulations and laws or by requirements given in tenders. Besides, this Application Profiles can also be considered as Best Practises.

An Application Profile is described on the basis of the following items:

- ▶ Introduction (legal requirements)
- ▶ Process overview
- ▶ Target audience
  - ▷ Users
  - ▷ Technology suppliers
- ▶ Software Architecture Overview
- ▶ Relevant standards and conditions
- ▶ Information regarding the respective Function Modules as well as the connected interfaces and data flows
- ▶ Mapping between Application Profiles and Function Modules

Application Profiles are identified as relevant for TR Biometrics in particular the following identity documents:

- ▶ Electronic passport (ePass)
- ▶ Visa
- ▶ Electronic national identity card
- ▶ Electronic residence permit
- ▶ Travel Documents
  - ▷ Travel Document for Foreigners
  - ▷ Travel Document (Convention of 28 July 1951)
  - ▷ Travel Document (Convention of 28 September 1954)

The Application Profile is concerned with the application for the respective document as well as the use of the document in the scope of verification or identification of the document holder.

## 5 Function Modules

### 5.1 Organisation of the Function Modules

The components that are relevant for the applications defined in the guideline are structured in Function Modules (FMs). They contain detailed technical requirements for the respective component. This chapter explains the structure of the Function Modules. Detailed information can be found in TR-03121-3.

The Function Modules are clearly separated from each other. The interfaces between the Function Modules are designed in a way that interoperability between the Function Modules is supported.

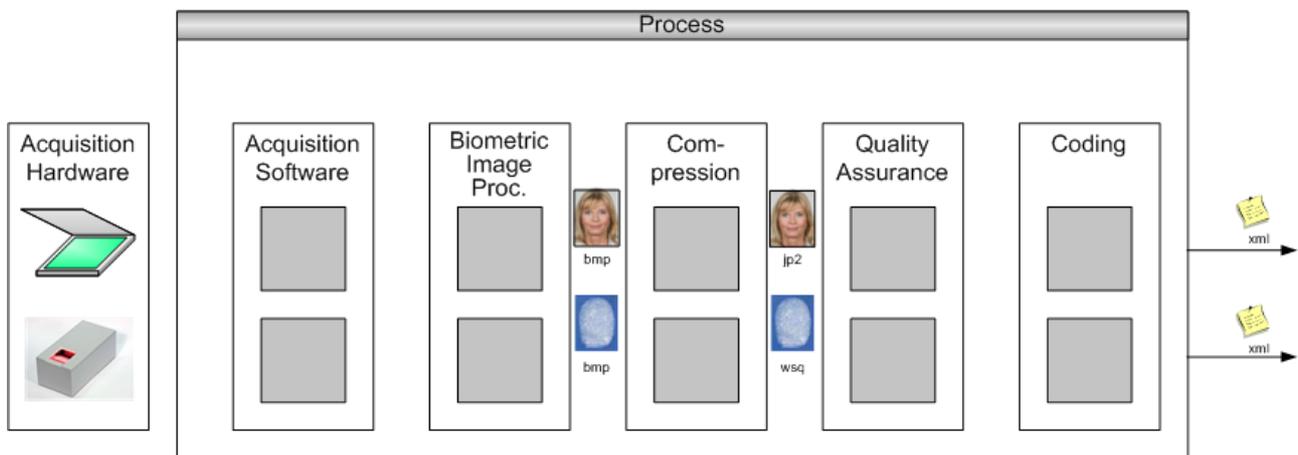


Figure 5-1: Interfaces between Function Modules with example application German Identity Card  
Function Modules are aligned to the products on the market and to the targets of evaluation.

Every Function Module is built of one or more sub-clauses which are assigned to unique identifiers. Within the sub-clauses requirements and interfaces are specified in more detail.

### 5.2 Description of the Function Modules

#### Process

The module Process describes the modality of how the different Function Modules have to be called and combined in order to achieve the objective of the Application Profile. Any deviant call of modules is specified with additional information.

#### Acquisition Hardware

Devices that are used for digitising physical representable biometric characteristics are called acquisition hardware. Scanners for capturing photographs, digital cameras to capture images of the face, fingerprint sensors, or signature tablets can be named as examples.

## **Acquisition Software**

Acquisition Software encapsulates all functionality regarding image processing except for biometric purposes. Therefore, this module usually contains driver software for the Acquisition Hardware or in general software that is very close to the physical hardware. Furthermore, colour management and image enhancement mechanisms are often part of this software layer.

## **Biometric Image Processing**

The module Biometric Image Processing provides the extraction of all relevant biometric information from the data, which is provided by the Acquisition Hardware or the Acquisition Software layer. Thus, a proprietary data block is transformed to a digital image of a biometric characteristic. In general, specific image processing for biometrics is addressed here e.g. provision of full frontal images or segmentation of fingerprints.

## **Quality Assurance**

This module contains all kinds of mechanisms and procedures to check the quality of the biometric data or to select the best quality data out of multiple instances.

## **Compression**

The objective of the module Compression is to keep the biometric data below a feasible size without losing too much quality for a biometric verification or identification.

## **Coding**

This module contains the procedures to code quality data as well as biometric data in defined formats. Interoperability is provided by means of standard compliant coding.

## **Operation**

Within the module Operation, the working process is specified for the respective operator. All steps that have to be executed are described sequentially and in more detail. This also includes descriptions of how to proceed in error cases.

## **User Interface**

It is the task of the User Interface to display and visualise the respective information that is obtained from the underlying Function Modules. This encloses, among other things, functionality, quality assurance information, and veto messages.

## **Reference Storage**

The objective of this module is to store biometric data in a way that it can be used for reference purposes later on.

## **Biometric Comparison**

The module Biometric Comparison encloses the mechanisms and algorithms to verify or identify an identity based on a one-to-one or one-to-many biometric comparison between reference data and a current biometric sample (usually a live presented image) no matter where the reference is stored (e.g. passport, identity card, AFIS, database, ...).

## **Logging**

The module Logging contains requirements how and in which modality data has to be logged.

## **Evaluation**

Methods and interfaces which are used in the scope of evaluation are the content of this module.

## 6 Mapping between Application Profiles / Function Modules

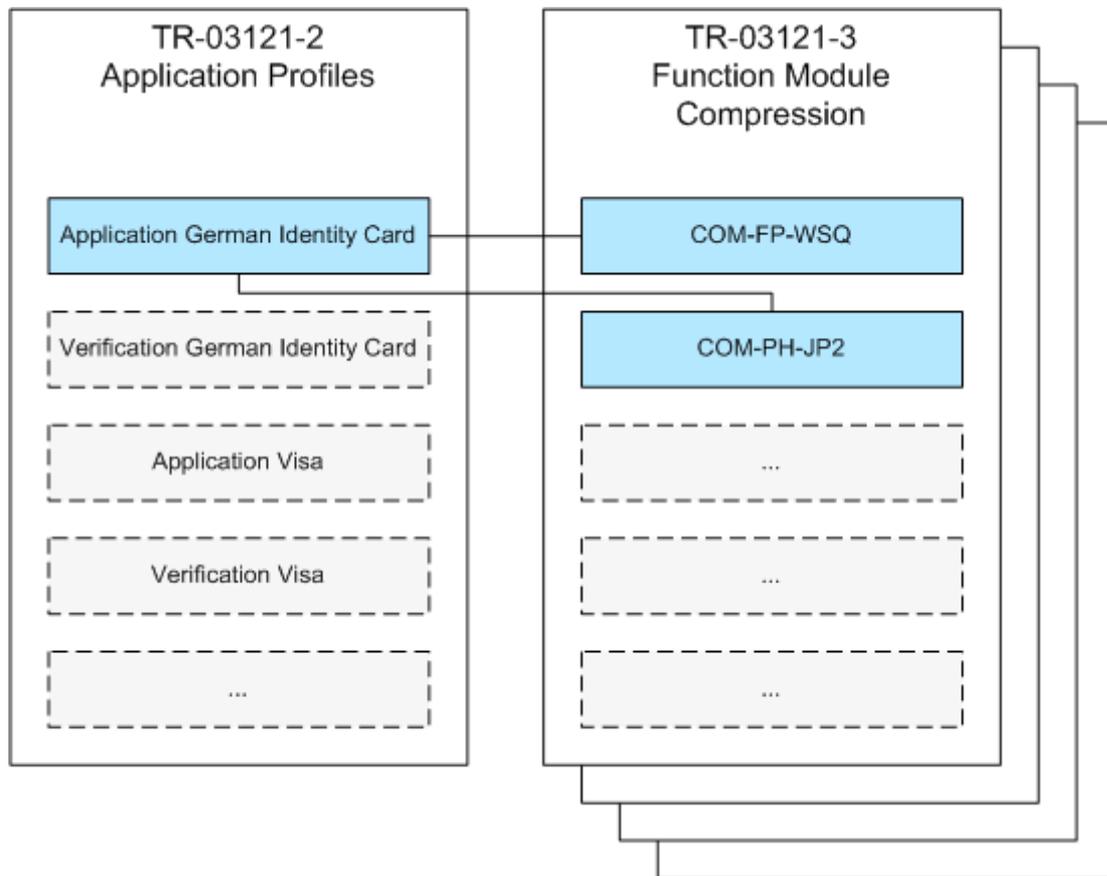


Figure 6-1: Valid function blocks for Application Profiles in connection with the example Function Module Compression

For one Application Profile several Function Modules can be relevant. Within one Function Module several function blocks (respective subcomponents) can match an Application Profile. This is shown in figure 6-1.

## 7 Conformance Test Specification

The Technical Guideline TR Biometrics describes with part 2 the Software Architecture and Application Profiles (TR-03121-2) and identifies within part 3 the Function Modules (TR-03121-3) a number of important requirements in the scope of biometrics in public sector applications. In order to be able to verify the conformance to these requirements it is necessary to define according conformance tests.

The Conformance Test Specification for Technical Guideline TR-03121 Biometrics for Public Sector Applications describes the requirements that are essential to declare conformance or to declare the absence of conformance. The structure, concept and respective test cases are explained in three parts:

- ▶ Part 1: Framework (TR-03122-1)
- ▶ Part 2: Software Architecture – BioAPI Conformance Testing (TR-03122-2)
- ▶ Part 3: Test Cases for Function Modules (TR-03122-3).

## 8 List of Abbreviations

<i>Abbreviation</i>	<i>Description</i>
AFIS	Automated Fingerprint Identification System
AH	Acquisition Hardware
AP	Application Profile
BMP	Windows Bitmap version 3
BSP	Biometric Service Provider
DC	Digital camera
ePass	Electronic passport
FBS	Flat bed scanner
FM	Function Module
FP	Fingerprint
FTR	Frustrated total reflection
GID	German Identity Document
JP2	JPEG 2000 (ISO/IEC 15444)
P	Process
PH	Photo
TR	Technische Richtlinie (Technical Guideline)
WSQ	Wavelet Scalar Quantisation