



Federal Office  
for Information Security

BSI Technical Guideline TR-03121-1

# Biometrics for Public Sector Applications

Part 1: Framework

Version 6.0



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# 1. Changelog

The following tables present the changes introduced to this Technical Guideline since version 5.2. The changelog lists the changes grouped per part of this Technical Guideline, and per building block (Application Profile (AP), Partial Application Process (PAP), Task, Function Module (FM)) or element (section, table, figure):

- *Added* for new features
- *Changed* for changes in existing functionality
- *Deprecated* for soon-to-be removed features
- *Removed* for now removed features
- *Fixed* for any bug fixes
- *Security* in case of vulnerabilities

## 1.1. Changelog Version 5.4-draft1

This chapter includes all changes between Version 5.3 and Version 5.4-draft1.

### 1.1.1. Changelog BSI TR-03121, General

Element Name	Type of Change	Change Description
Schema	Changed	Changed schema version to 5v1 for all volumes.

Table 1.1 Changelog BSI TR-03121, General

### 1.1.2. Changelog BSI TR-03121, Part 1

Element Name	Type of Change	Change Description
Logging scheme	Changed	Updated chapter according to new usage of schema 5v1.

Table 1.2 Changelog BSI TR-03121, Part 1

### 1.1.3. Changelog BSI TR-03121, Part 2, Volume HLBS

Element Name	Type of Change	Change Description
Service Definition Facial Image Acquisition System	Changed	Usage of schema 5v1 for all volumes.
Service Definition Basic Facial Image Acquisition System	Changed	Usage of schema 5v1 for all volumes.
Service Definition Fingerprint Acquisition	Changed	Usage of schema 5v1 for all volumes.
Service Definition Rolled Fingerprint Acquisition	Changed	Usage of schema 5v1 for all volumes.

Element Name	Type of Change	Change Description
Service Definition Self-Service System	Changed	Usage of schema 5v1 for all volumes.

Table 1.3 Changelog BSI TR-03121, Part 2

### 1.1.4. Changelog BSI TR-03121, Part 3

TR Volume	Block / Section / Type	Name	Type of Change	Change Description
ARE, BCL, GID, IMA	FM	LOG-ALL-GENERIC	Changed	Changed requirements for IDs.
ARE, BCL, GID, IMA	FM	LOG-FI-GENERIC	Changed	Introduced Delivery Element and tradd:BinaryData.
GID	FM	LOG-FP-GENERIC	Changed	Introduced Delivery Element and tradd:BinaryData.
GID	FM	LOG-FI-GID2	Changed	Introduced Delivery Element and tradd:BinaryData.
GID	FM	LOG-FP-GID2	Changed	Introduced tradd:BinaryData Element.
GID	FM	COD-FI-GENERIC	Changed	Introduced Delivery Element.
GID	Basics	Legal Requirements	Changed	Added bibliography reference to EU regulation 1157/2019.
BCL, IMA	FM	COM-FI-BCL, COM-FI-IMA	Changed	Changing description of compression ratio
ARE, IMA	FM	COM-FP-WSQE	Changed	Changing description of compression ratio
GID	FM	BIP-FI-GID	Changed	Updated requirements
ARE	PAP Task	ACQ-FPR-1	Changed	Logging of each quality value of a capture attempt
IMA	FM	COM-FP-IMA	Changed	GSAT3 format for SIS instead of NIST file
ARE	FM	COD-ALL-ARE	Changed	Changed root element to are-log for new schema version 5v1.
BCL	FM	COD-ALL-BCL	Changed	Changed schema version to 5v1.
GID	FM	COD-ALL-GID	Changed	Changed root element to gid-log for new schema version 5v1.
IMA	FM	COD-ALL-IMA	Changed	Changed schema version to 5v1.
ARE, BCL, GID, IMA	FM	COD-FI-GENERIC	Changed	Changed schema version 5v1 for all volumes.
BCL	FM	COD-FI-VER	Changed	Fixed element to log for verifications to bcl-log and example reference accordingly.

TR Volume	Block / Section / Type	Name	Type of Change	Change Description
BCL	FM	COD-FP-VER	Changed	Fixed element to log for verifications to bcl-log and example reference accordingly.
ARE	FM	LOG-ALL-ARE	Changed	Reduced information in LOG FM and moved to schema documentation.
ARE, BCL, GID, IMA	FM	LOG-ALL-GENERIC	Changed	Reduced information in LOG FM and moved to schema documentation.
GID	FM	LOG-ALL-GID	Changed	Added application profile log information.
ARE, BCL, GID, IMA	FM	LOG-FI-GENERIC	Changed	Added FaceDelivery. Removed information from FM, as they are already defined in the schema. Restructured left information.
ARE, BCL, GID, IMA	FM	LOG-FP-GENERIC	Changed	Added FaceDelivery. Removed information from FM, as they are already defined in the schema. Restructured left information.
GID	FM	LOG-FP-GID	Changed	Restructured FM.
GID	FM	LOG-FI-GID	Changed	Restructured FM.
ARE	FM	LOG-ALL-ARE	Changed	Added ApplicationProfile information.
GID	AP	AP Scan of Photograph	Added/Changed	Application Profile "Scan of Photograph" was added again to Volume GID since there will be a few special cases, in which scanning of photographs is still permitted after 1st of May 2025. The scan shall result in a facial image of 622x800 pixels (meaning scan with 600 dpi) to be compliant with the future passport production procedures.
GID	FM	COD-FI-PRD	Changed	All facial images which are delivered to the German passport production shall have a size of 622x800 pixels, no matter the source of the image (live enrolled, delivered, scanned).
GID	FM	COD-FI-ROR	Changed	Images captured live or delivered to the authority are stored in the Register of Residents with a resolution of at least 1244x1600 pixels. Scanned images are stored with a resolution of at least 622x800 pixels.
GID	FM	COD-FI-GID/GID2	Renamed	COD-FI-GID was renamed to COD-FI-CHIP. COD-FI-GID2 was renamed to COD-FI-GID.
GID	FM	QA-FI-GID	Changed	Quality assessment was adapted to the new scanning scenario: The quality assessment is to be conducted on the original image. For live captured and delivered images, the original image has a size of 1244x1600 pixels (with an IED of at least 300 pixels), for scanned images, the size is 622x800 pixels (with an IED of at least 90 pixels).
GID	FM	LOG-FI-GID2	Changed	Facial images are stored as JPEG in the future. File type "icao-cbeff-bit-bdb-19794-5" was therefore replaced with "JPEG".
ARE, BCL, GID, IMA	FM	Different FMs	Changed	For facial images in colour, the colour space "sRGB" with a colour depth of 24 bit is now mandatory in all Volumes. For grey scale images 8 bit sRGB is used.
ARE, BCL, GID, IMA	FM	UI-FI-BSJ	Partly Removed	UI-FI-BSJ ist only required in scenarios with automated facial image acquisition. FM was consequently removed from all scenarios in which a digital camera is used.
BCL, GID	FM	AH-FI-ICS/ICS2	Changed	Mandatory Digital Mirror: The feedback screen (digital mirror) is now mandatory in all scenarios where facial images are captured automatically (i.e. SSS, FIAS and ABC in Volumes BCL and GID).

TR Volume	Block / Section / Type	Name	Type of Change	Change Description
GID	AP	AP Biometric Data Selection	Changed	AP Biometric Data Selection now includes the control verification of fingerprint images which was previously part of AP Unsupervised Self-Service Fingerprint Acquisition System.
GID	AP	AP Unsupervised Self-Service Fingerprint Acquisition System	Changed	The control verification of fingerprint images was moved from AP Unsupervised Self-Service Fingerprint Acquisition System to AP Biometric Data Selection.
GID	AP	AP Supervised Fingerprint Acquisition	Changed	UI-FP-BSJ is no longer part of AP Supervised Fingerprint Acquisition, because in supervised scenarios, no feedback for biometric subjects is needed.
GID	FM	COM-FI-JP2	Changed	The chip image shall have a file size of 17 kB including header information.
ARE, BCL, GID, IMA	PAP	Different PAPs	Changed	HLBS has been included as a possible interface in all matching PAPs. HLBS is optional when capturing facial images and fingerprints. However, if HLBS is used, then the corresponding service definition from Volume 2, Part 2 shall be implemented.
GID	AP	AP De-Mail	Deleted	Delivery of facial images via De-Mail is no longer permitted from May 2025 on. Therefore, the corresponding Application Profile was deleted.

Table 1.4 Changelog BSI TR-03121, Part 3

## 1.2. Changelog Version 5.4-draft2

This chapter includes all changes between Version 5.4-draft1 and Version 5.4-draft2.

### 1.2.1. Changelog BSI TR-03121, General

Element Name	Type of Change	Change Description
NFIQ Version	Changed	Use NFIQ Version 2.2

Table 1.5 Changelog BSI TR-03121, General

### 1.2.2. Changelog BSI TR-03121, Part 1

Element Name	Type of Change	Change Description
Organisation of Partial Application Processes	Changed	Added DEL (Delivery) to table of primary information items.

Table 1.6 Changelog BSI TR-03121, Part 1



### 1.2.3. Changelog BSI TR-03121, Part 2, Volume HLBS

Element Name	Type of Change	Change Description
Data Type Application-Profile	Changed	Considered new application profile name of GID Basic FIAS.

Table 1.7 Changelog BSI TR-03121, Part 2

### 1.2.4. Changelog BSI TR-03121, Part 3

TR Volume	Block / Section / Type	Name	Type of Change	Change Description
GID	FM	AH-FI-ICS2, AH-FI-SSS2	Changed	Added sitting position for SSS in context GID as alternative to standing position. The biometric subject can now be standing upright in front of the camera or sitting upright in front of the camera. In both cases, a body height range of 140-200 cm shall be covered.
GID	FM	AH-FI-ICS2	Changed	Added clarification, that adaption to environmental lighting conditions is only expected within common environmental setting and with normal lighting conditions (no direct light from windows etc.).
GID	FM	QA-FI-GID	Changed	Inter-eye distance of scanned facial mages was set to (minimum) 120 pixels.
GID	AP	Facial Image Digital Delivery via Cloud	Changed	Added clarification for requirements of facial images delivered via cloud. Capture has to be conducted by natural person who ensures quality of facial image and the exclusion of presenation attacks.
GID	AP	Facial Image Digital Delivery via Cloud	Changed	Added clarification for requirements of facial images delivered via cloud. Facial images taken be the enrolee him- or herself (selfie) and facial images taken by a non-professional photographer shall not be used.
GID	AP	Self Service Systems	Changed	Application Profiles "Unsupervised Self-Service Facial Image Acquisition System" and "Unsupervised Self-Service Fingerprint Acquisition System" were clarified to only be used for systems located within agencies and connected directly to the agency's network.
GID	AP	Biometric Data Selection	Changed	Added clarification on which sources of facial images exist.
All	FM	PAD-FI-APP/APP1	Changed	Added requirement of 2% false-alarm-rate maximum.
All	FM	PAD-FP-APP/APP1	Changed	Added requirement of 2% false-alarm-rate maximum.
GID	FM	AH-FI-ICS2	Changed	For automated facial images acquisitions systems, the requirement to display a feedback screen (digital mirror) was changed from mandatory to optional.
IMA	FM	COD-ALL-IMA	Changed	Added alternative to log GSAT container as base64 encoded Binary-Record.
ARE	FM	COD-ALL-ARE	Changed	Changed Record to BinaryRecord (was renamed in schema).

TR Volume	Block / Section / Type	Name	Type of Change	Change Description
GID	FM	Different FMs	Changed	Removed grey scale images for all live captured and cloud images. Only in the case of scanning, grey scale photographs can be scanned in grey scale (photographs in colour shall be scanned in colour, not grey scale).
GID	AP	AP Supervised Basic Facial Image Acquisition	Changed	Renamed Application Profile "Supervised Facial Image Acquisition with Digital Camera" to "Supervised Basic Facial Image Acquisition" to clarify scope of AP.
GID	AP	AP Facial Image Delivery by Digital Camera	Added	Added new Application Profile for Facial Image Delivery by Digital Camera that is detached from the operators application.
GID	FM	COM-FI-JP2	Changed	Renamed to COM-FI-CHIP to make usage clearer.
GID	FM	COD-FI-PRD	Changed	Changed image format to JPEG 2000. The facial image is coded as JPEG 2000 before data transmission to the central document production. The highest possible quality level (i.e. the least compression possible) shall be used.
GID	General	Basics	Changed	Changed introduction text to clarify that for fingerprints, a repeated quality assessment at the counter is not necessary. For fingerprints, quality assessment is only done during the enrolment process, not during control verification.
GID	PAP	DEL-FI-SV-1	Added	Added new PAP for digital delivered facial images.
GID	FM	LOG-ALL-GID	Changed	Changed ApplicationProfile entries according to name changes of application profiles.
ARE, BCL, GID, IMA	FM	UI-FI-OP	Changed	Added requirements to display PAD warning and result to the operator if PAD was detected.
GID	FM	O-ALL-USV	Changed	Added requirement that within the application scenario GID, the device shall be set up in such a way that it can be permanently observed by an official.
GID	FM	AS-FI-FBS	Changed	Requirement "no compression" was sharpened to the effect, that apart from the compression of JPEG itself, no prior or further compression shall be applied.
GID	PAP	ACQ-FI-AUTO-1	Changed	Added distinction regarding time limits of the acquisition process: Within the application context GID, the overall acquisition process shall not exceed 30 seconds.
GID	FM	QA-FI-GID	Changed	The dimensions of the images (width and height in pixels) may now be +/- 10 pixels.
ARE	FM	LOG-ALL-ARE	Changed	Precised logging for facial images from CIR.
BCL	FM	LOG-ALL-BCL	Changed	Adapted FM to current schema version.
GID	FM	LOG-ALL-GID	Changed	Removed Processing for Document Production from Application-Profile list for logging.
GID	FM	LOG-FI-GID2	Changed	Adapted FM to current schema version.

TR Volume	Block / Section / Type	Name	Type of Change	Change Description
GID	FM	LOG-FP-GID2	Changed	Adapted FM to current schema version.
GID	AP	Biometric Data Selection	Changed	Clarified wording about the resolution of facial images. Also, post-processing of facial images (repeated rotation and cropping) is no longer a step of the Facial Image Selection Procedure.
BCL, GID	PAP Task	ACQ-FPP-USV-1	Changed	Simplified timeouts: Only one timeout.
BCL, GID	PAP Task	ACQ-FPS-USV-1	Changed	Simplified timeouts: Only one timeout.
BCL, GID	PAP Task	ACQ-FPS-USV-1	Changed	Add configurable number of retries, if wrong slap is detected.
GID	General	Basics	Changed	Changed text regarding sources of facial images because of the introduction of AP Facial Image Delivery by Digital Camera. The distinction between live images and delivered images is updated to cover all possible image origins.
GID	FM	COD-FI-GID and COD-FI-ROR	Changed	Added requirement that the highest possible quality level (i.e. the least compression possible) shall be used.
GID	FM	REF-FI-GID	Changed	Added requirements for storage of location where the facial image was taken ("lichtbildaufnehmende Stelle").
GID	AP	Supervised Facial Image Acquisition System	Changed	Added clarification that system is not required to provide a manual mode. In this case, other means to capture a facial image manually must be available within the agency (Basic Facial Image Acquisition System and/or Facial Image Digital Delivery via Digital Camera).
GID	FM	COM-FI-CHIP	Changed	Deleted requirement of test interface as compression of JPEG2000 is no longer a task that is performed within the agency but in document production only.
GID	FM	LOG-FI-GID and LOG-FI-GID2	Changed	Renamed LOG-FI-GID to LOG-FI-CHIP to make usage in document production clearer. Renamed LOG-FI-GID2 to LOG-FI-GID for consistency.
GID	FM	LOG-FP-GID and LOG-FP-GID2	Changed	Renamed LOG-FP-GID to LOG-FP-CHIP to make usage in document production clearer. Renamed LOG-FP-GID2 to LOG-FP-GID for consistency.
GID	AP	Biometric Data Selection	Changed	Added reference to AP Supervised Fingerprint Acquisition to be used during control verification. When conducting a control verification, no quality thresholds are to be applied during the repeated acquisition of fingerprints.
GID	FM	AH-FI-DC2 and AH-FI-ICS2	Changed	Added reference to ICAO Technical Guideline "Portrait Quality". Wide-angle setting must not be used.
ARE, BCL, IMA	FM	AH-FI-DC and AH-FI-ICS	Changed	Added reference to ICAO Technical Guideline "Portrait Quality". Wide-angle setting must not be used.
GID	FM	AS-FI-ICS2	Changed	Clarified uniform background greyscale in case of elimination of the original background.

TR Volume	Block / Section / Type	Name	Type of Change	Change Description
GID	AP	Biometric Data Selection	Changed	Modified the figure concerning the process of control verification of fingerprints: added the operator's task to control the biometric subject's fingers in case of PAD alarms.
GID	FM	EVA-* and EVA-ALL-APP	Deleted resp. Added	Deleted current EVA-FMs from GID volume. The quality statistics that are to be created by the document manufacturer shall be build according to an annex of this TR in the future. This annex will be specified in a future version of this TR. Added EVA-ALL-APP as link to future annex.

Table 1.8 Changelog BSI TR-03121, Part 3

## 1.3. Changelog Version 6.0

This chapter includes all changes between Version 5.4-draft2 and Version 6.0.

### 1.3.1. Changelog BSI TR-03121, General

Element Name	Type of Change	Change Description

Table 1.9 Changelog BSI TR-03121, General

### 1.3.2. Changelog BSI TR-03121, Part 1

Element Name	Type of Change	Change Description

Table 1.10 Changelog BSI TR-03121, Part 1

### 1.3.3. Changelog BSI TR-03121, Part 2, Volume HLBS

Element Name	Type of Change	Change Description
Service Definition Facial Delivery System	Added	Added new service definition.

Table 1.11 Changelog BSI TR-03121, Part 2

### 1.3.4. Changelog BSI TR-03121, Part 3

TR Volume	Block / Section / Type	Name	Type of Change	Change Description
GID	FM	AS-FI-ICS3	Changed	Replaced the distance measurement by a face recognition property: process terminates if a face completely leaves the capture area.
GID	AP	Biometric Data Selection	Changed	Modified two figures to be compliant with the TR regulations.
BCL, GID	FM	O-ALL-USV	Changed	Edited requirements to make specifications of 'visible' and 'observable' clearer.
GID	FM	AH-FI-SSS2	Changed	Added the definition of Frankfurt Horizon.

TR Volume	Block / Section / Type	Name	Type of Change	Change Description
GID	AP	Unsupervised Self-Service Facial Image Acquisition System	Changed	Added a clarifying footnote that the selection of acquired facial images by the biometric subject is allowed under certain conditions.
GID	AP	Biometric Data Selection	Changed	Modified and simplified process flow of figure "Process Facial Image Selection Procedure for German Identity Documents purposes". Adjusted some wording.
GID	AP	Biometric Data Selection	Changed	Modified and simplified process flow of figure "Overview Process of Control Verification of Fingerprints".
GID	AP	Biometric Data Selection	Changed	Added required function modules to the table.
GID	AP	Biometric Data Selection	Changed	Rephrased and clarified text regarding Mandatory Process of Fingerprint Images.
GID	FM	PAD-FI-APP1	Changed	Deleted relation to fingerprints.
GID	AP	Biometric Data Selection	Changed	Modified figure "Process Facial Image Selection Procedure for German Identity Documents purposes" regarding referenced FMs at first task box. Added accidentally deleted text in Mandatory Process regarding both modalities.
BCL, GID, ARE, IMA	FM	LOG-FP-GENERIC	Changed	Added configured pixel density of fingerprint scanner to log as ConfigurationInformation.
GID	FM	LOG-FI-GID	Changed	Added configured pixel density to log for scanned images as ConfigurationInformation.
GID	AP	Unsupervised Self-Service Fingerprint Acquisition System	Changed	Removed unnecessary FM (FM UI-FP-OP) from table with Mandatory Function Modules.
GID	AP	Unsupervised Self-Service Fingerprint Acquisition System	Changed	Added necessary FM (FM COD-FP-CHIP) in table with Mandatory Function Modules.
GID	General	Basics	Changed	Added an example how multiple processes can be reduced.
GID	FM	QA-FI-GENERIC	Changed	Deleted the explicit mention of the file format JPEG2000.
GID	FM	COD-FI-CHIP	Changed	Added Source Type as information to be stored together with facial image in the chip.

TR Volume	Block / Section / Type	Name	Type of Change	Change Description
GID	FM	AH-FI-DC2, AH-FI-ICS2, AS-FI-ICS2	Changed	Added reference to 'ICAO Technical Report Portrait Quality' regarding uniform background. Also, added recommendation that uniform background should be grey.
ARE, BCL, IMA	FM	AH-FI-DC	Changed	Added reference to 'ICAO Technical Report Portrait Quality' regarding uniform background. Also, added recommendation that uniform background should be grey.
GID	FM	QA-FI-GID	Changed	Removed range of +/- 10 pixels for image height and image width, as there is no tolerance necessary for these criteria.
GID	General	---	Changed	Renamed Register of Residents to Register of Documents.
GID	FM	LOG-ALL-GID	Changed	Renamed RegisterOfResidents to RegisterOfDocuments.
GID	FM	LOG-ALL-GID	Changed	Added information on StartTime and EndTime of enrolment element as well as the information that all collected data are to be maintained if not explicitly stated otherwise.
GID	FM	LOG-FP-GID	Changed	Changed allowance of appearance of Finger element to FingerAcquisition.
GID	FM	COD-FI-ROR	Changed	Renamed to COD-FI-ROD (Register of Documents)
GID	FM	REF-FI-GID	Changed	Added detailed information on the location, where the facial image was captured (lichtbildaufnehmende Stelle).
BCL, GID	PAP Task	ACQ-FPS-USV-1	Changed	Modified describing text to bring it in line with corresponding model.
BCL, GID	PAP	ACQ-FI-SV-5	Changed	Modified describing text regarding software based QA and manual review of the operator to bring it in line with corresponding model.
BCL, GID	PAP	ACQ-FI-SV-5	Changed	The support of a manual service mode is optional within the application context GID but mandatory otherwise.
ARE	AP	Arrival Attestation Document	Changed	Precised overview process and introduced PAP Supervised Facial Image Digital Delivery.
ARE	AP	Arrival Attestation Document	Changed	Precised overview process and introduced PAP Supervised Facial Image Digital Delivery.
ARE, GID	PAP	DEL-FI-SV-1	Changed	Added interface requirements.
BCL	---	Bibliography	Changed	Updates EES Interface Control Document to version 0.7.2.
ARE	PAP	ACQ-FP442-SV-2	Changed	Modified model regarding addition of selection option right before capture of thumbs.
BCL, GID, ARE, IMA	FM	UI-FI-OP	Changed	Added requirements regarding displaying PAD alarms to the operator.
BCL	FM	QA-FI-BCL	Changed	Deleted ratio of image width and height of 3:4 as quality criterion.
ARE, BCL, GID, IMA	FM	BIP-FP-APP	Changed	Resolution of 1000 ppi was missing.

TR Volume	Block / Section / Type	Name	Type of Change	Change Description
GID	FM	AS-FI-ICS2	Changed	Marked background elimination as full alternative for using a uniform background (removed disclaimer).
GID	AP	Biometric Data Selection	Changed	All biometric data from a SSS are to be retrieved together (not separated in facial images and fingerprints).
IMA	APs	Multi-modal Processing in Immigration Authorities for EES and for SIS	Changed	Added FM AS-FP-SF for processes where single-finger scanner are used as backup.
GID	FM	PAD-FI-APP1	Changed	Changed interpretation of PAD score. In dependence on the ISO/IEC 30107-2:2017 the value 0 is bona fide, 1 (not 100) is an attack. The value range/data type is kept to [0,1] and double, in order to keep more interim values.
ARE, GID, IMA	FM	PAD-FP-APP	Changed	Changed interpretation of PAD score. In dependence on the ISO/IEC 30107-2:2017 the value 0 is bona fide, 1 (not 100) is an attack. The value range/data type is kept to [0,1] and double, in order to keep more interim values.
BCL	FM	PAD-FI-APP	Changed	Changed interpretation of PAD score. In dependence on the ISO/IEC 30107-2:2017 the value 0 is bona fide, 1 (not 100) is an attack. The value range/data type is kept to [0,1] and double, in order to keep more interim values.
BCL	FM	PAD-FP-APP1	Changed	Changed interpretation of PAD score. In dependence on the ISO/IEC 30107-2:2017 the value 0 is bona fide, 1 (not 100) is an attack. The value range/data type is kept to [0,1] and double, in order to keep more interim values.

**Table 1.12** Changelog BSI TR-03121, Part 3

## 2. Introduction

### 2.1. 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 necessary to define precise requirements and general conditions. Furthermore, the systems have to be defined in a way which allows for extension in future developments.

The objective of this Technical Guideline (TR Biometrics) is to offer a basis for a consistent and comparable quality of public sector applications and for building a common architecture.

This guideline has the following objectives:

- *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 and deploys them for governmental applications.
- *Conformance and 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 clearly defined regarding the interfaces and the range of their functionality so that they can be tested for conformance 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 be unambiguously assigned to the respective systems and components.

It should be noted that the content of this guideline is limited to the aspects of biometric characteristics. Interfaces to further technologies (e.g. connection of optical or electronic document readers) are out of scope of this document.

### 2.2. Target Audience and User

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

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



Beside these users, this guideline also addresses vendors of biometric systems as well as integrators and application developers.

### 2.3. 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 [BIB\_RFC2119].

### 2.4. Business Process Modelling Notation (BPMN)

The processes in this Technical Guideline are modelled using the Business Process Modelling Notation (BPMN). ▶Figure 2.1 gives an overview over the relevant icons herein.

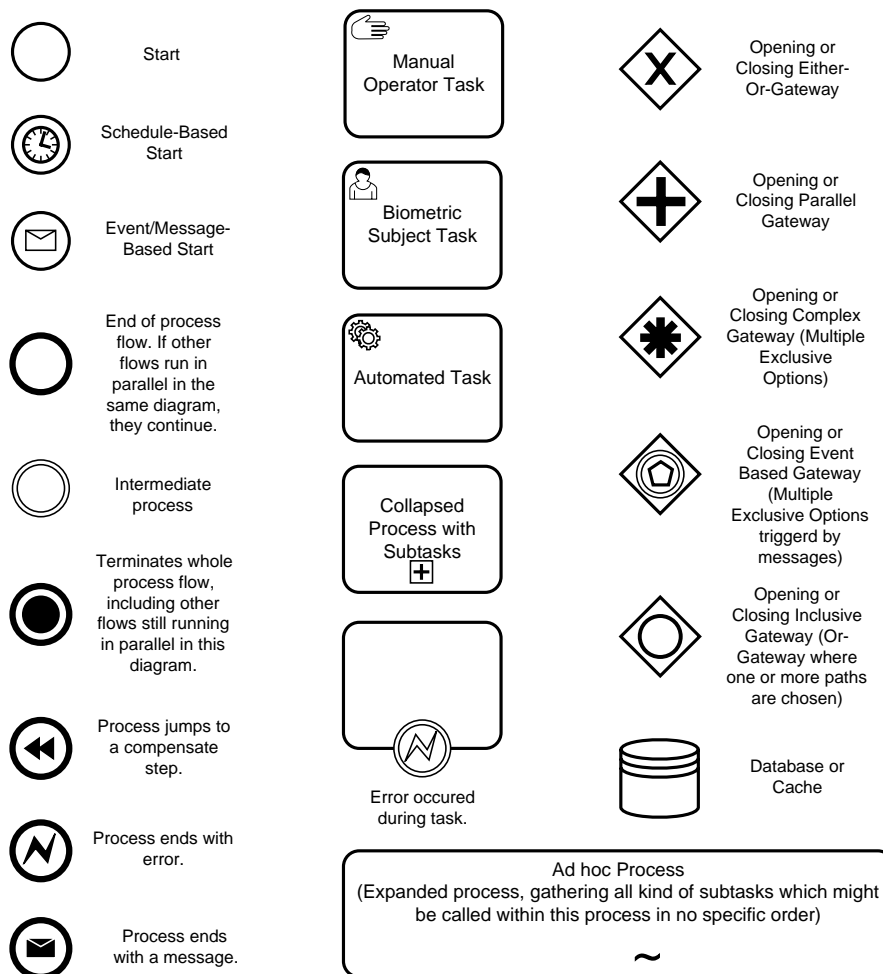


Figure 2.1. BPMN Symbols used for the Process Modelling

## 3. Structure of Technical Guideline Biometrics

This Technical Guideline consists of the following parts:

- Part 1: Framework (TR-03121-1)

TR-03121-1 is the framework document of the guideline. It explains the concept and the relation between the different parts.

- Part 2: Software Architecture (TR-03121-2)

The High Level Biometric Services (HLBS) as well as Service Definitions for specific use cases are specified here.

- Part 3: Application Profiles, Function Modules and Processes (TR-03121-3)

- In the third part, the different Application Profiles with corresponding Partial Application Processes and Function Modules are defined. These contain the detailed technical requirements for each of the components.

- Application Profiles may reference Function Modules, Partial Application Processes and Service Definitions (refer to Part 2).
- Partial Application Processes may refer to Function Module Categories and may be comprised of *Tasks*. Tasks are processes which are part of more than one Partial Application Process.
- For practical purposes, this part is split up in different volumes to serve different user groups.
  - Border Control (BCL)
  - German Identity Documents (GID)
  - Alien Register Enrolment (ARE)
  - Immigration Authorities (IMA)

Please refer to ▶Figure 3.1 for a class diagram of the structure described above.

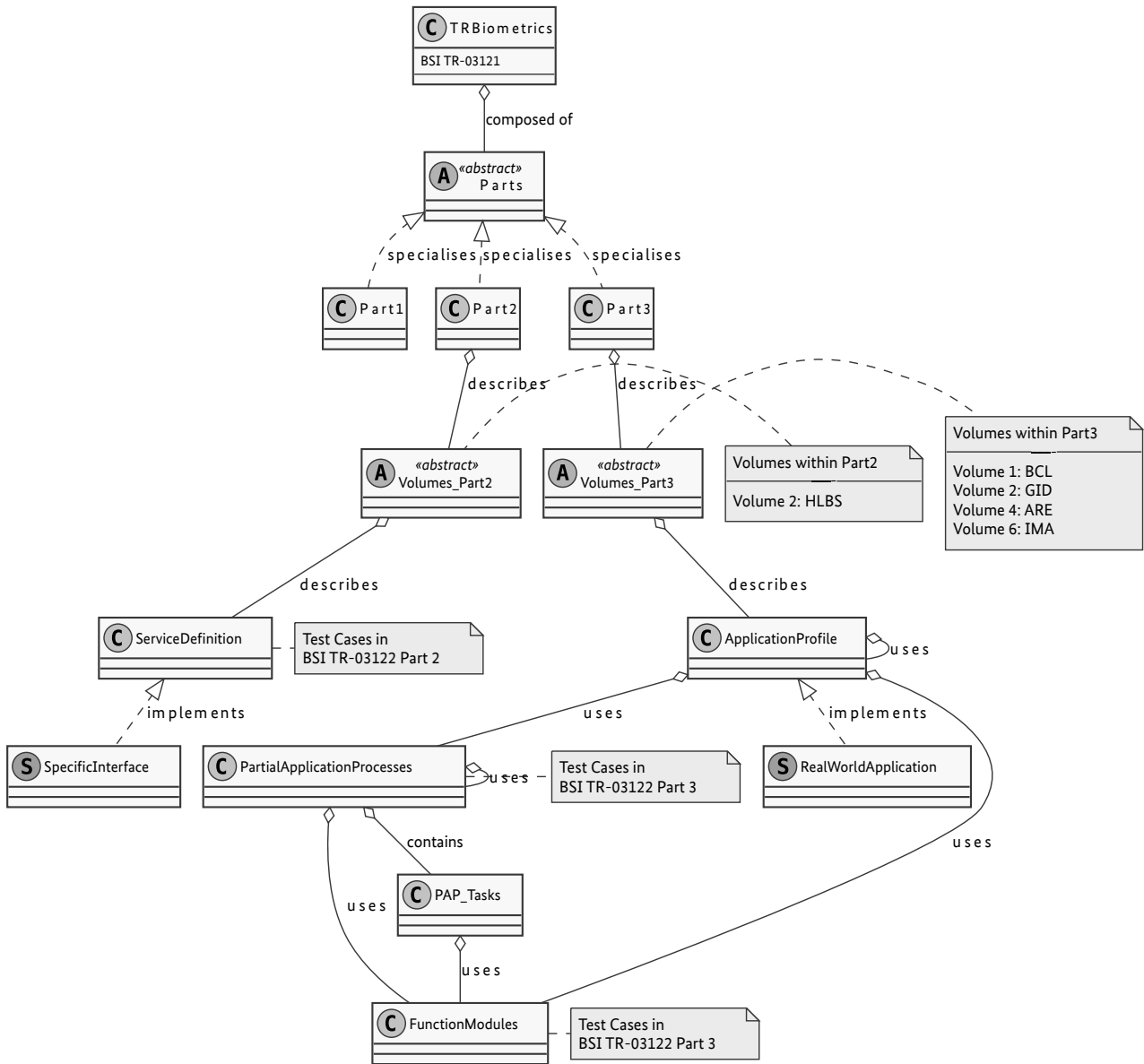


Figure 3.1. Class Diagram of the Technical Guidelines

Additionally, the Technical Guideline BSI-TR 03122 "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. It consists of the following parts:

- Part 1: Framework (TR-03122-1)
- Part 3: Test Cases for Function Modules and Processes (TR-03122-3)

## 4. How to use this Technical Guideline

This chapter gives a short overview how to read and apply this guideline step by step.

1. The user chooses the desired Application Profile. With the help of the Application Profile the user can get a deeper insight into the application, the required software architecture components and the described functionality. TR-03121-2 offers further information about the software architecture component model.
2. Based on the Application Profile, the mandatory Partial Application Processes and Function Modules are identified. One profile can link to several Partial Application Processes and Function Modules due to different kinds of underlying biometric characteristics or the fact that different technologies (e.g. scanners or digital cameras for the digitisation of a photo) are used.

Function Modules are referenced by an explicit identifier, e.g. AH-FP-GID. The first part identifies the requirement type (e.g. Hardware), the second part represents the biometric characteristic (e.g. fingerprint), and the last part denotes a further descriptor, typically 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 a Function Module is denoted with a placeholder between a less-than and greater-than sign (< >) the actual referenced Function Module is dependant on the context in which the Function Module has been mentioned. For example the Function Module AH-FI-<VL> has been mentioned within a Partial Application Process used in the BCL volume, then the actual referenced Function Module is AH-FI-BCL. The same procedure holds for Application Profiles denoted as <AP> analogously. If no specific Function Module applies, then there are no further requirements defined for this context.

Partial Application Processes are referenced by an explicit identifier, refer to Partial Application Profile section.

3. On the basis of the identifier the according Function Module and Partial Application Processes can be examined. Every Function Module and Partial Application Process provides detailed technical requirements and recommendations. Note, each reference to a Function Module or Partial Application Processes is a link within the document.

## 5. Logging scheme

### 5.1. Use cases

This chapter specifies a logging scheme, which allows to document all technical activities performed. The schema files contain additional and mandatory information on technical requirements. Such a logging scheme SHALL be used to measure the quality of the biometric processes across different systems, regardless of the used hard- or software. This enables the possibility of an operational monitoring for technical as well as functional processes and evaluations.

### 5.2. XML schemas

The logging scheme is based on a transactional logging format which collects performance and evaluation results from the different application domains. The schema file `trbio5v1.xsd` imports all other schema files and as such the main file used for validation.

A separate XML schema definition exists for each volume of TR-03121-3, which SHALL be used within the respective application area. ▶Table 5.1 gives an overview of the different XML schema files.

Application domain	Schemafilename	Namespace
Alien register enrolment	are5v1.xsd	http://trbio.bsi.bund.de/are/5
Border control log	bcl5v1.xsd	http://trbio.bsi.bund.de/bcl/5
Type definitions	biotypes5v1.xsd	http://trbio.bsi.bund.de/base/5
German identity documents	gid5v1.xsd	http://trbio.bsi.bund.de/gid/5
High level biometric services	hlbs5v1.xsd	http://trbio.bsi.bund.de/hlbs/5
Immigration authorities	ima5v1.xsd	http://trbio.bsi.bund.de/ima/5
Conformance test specification	biocts5v1.xsd	http://trbio.bsi.bund.de/biocts/5

**Table 5.1** Overview XML schema files

## 6. Application Profiles

Different areas in which this guideline can be used are defined in separate Application Profiles. Application Profiles can have mandatory status, e.g. through published regulations and laws or by requirements given in tenders. Besides, such Application Profiles can also be considered as Best Practices. Thus, the certification process SHALL use one or more separate Application Profiles.

An Application Profile is described with the following items:

- Introduction (legal requirements)
- Process overview
  - Target audience
  - Users
- Relevant standards and conditions
- List of
  - mandatory Function Modules
  - mandatory Partial Application Processes

## 7. Organisation of the Function Modules

Specific technical requirements are structured in Function Modules. They contain detailed technical requirements for the respective component. 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 subclauses which are assigned to unique identifiers. Within the subclauses requirements and recommendations are specified in detail.

Function Modules are referenced by their ID, which can contain up to three information items pointing to its contents. The basic structure of an ID is: "FM AAA-BBB-CCC".

Here, *AAA* is the primary information item, pointing to the main contents. *BBB* and *CCC* are optional information items, which can further specify the Function Module. These information items may be two to seven alphanumeric digits. ▶Table 7.1 gives an overview of the different primary information items used for Function Module categories. ▶Table 7.2 gives an overview of the different optional information items *BBB* used for Function Module categories.

Primary Information Item	Function Module Category	Description
AH	Acquisition Hardware	Devices that are used for digitising physical representable biometric characteristics are called Acquisition Hardware. Scanners for capturing photographs, digital cameras to capture facial images, fingerprint sensors, or signature tablets can be named as examples.
AS	Acquisition Software	Acquisition Software encapsulates all functionality regarding image processing except for biometric purposes. Therefore, this module usually contains device 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.
BIP	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 biometric characteristics is addressed here e.g. provision of full frontal images or segmentation of fingerprints.

Primary Information Item	Function Module Category	Description
CMP	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.
COD	Coding	This module contains the procedures to code logging data as well as biometric data in defined formats. Interoperability is provided by means of standard compliant coding.
COM	Compression	The objective of the module Compression is to keep the biometric data below a feasible size without losing too much quality for biometric verification or identification.
EVA	Evaluation	Methods and interfaces which are used in the scope of evaluation are the content of this module.
LOG	Logging	The module Logging contains requirements how and in which modality data has to be logged.
O	Operation	Within the module Operation, the working process is specified for the respective operator.
PAD	Presentation Attack Detection	The Presentation Attack Detection modules give requirements on fake detection. This encloses, among other things, functionality and certification requirements.
QA	Quality Assessment	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. Quality Assessment is typically used in evaluation of an application's performance over time.
REF	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.
UI	User Interface	The User Interface modules give requirements on visualization and user interaction. This encloses, among other things, functionality, quality assurance information, and veto messages.

**Table 7.1** Overview FM Categories Primary Information Items

Optional Information Item	Function Module Category
ALL	Overall
CCTV	Closed Circuit Television (Surveillance Camera)



Optional Information Item	Function Module Category
FI	Facial Image
FP	Fingerprint

**Table 7.2** Overview FM Categories Optional Information Items

## 8. Organisation of the Partial Application Processes

Partial Application Processes are referenced by their ID, which can contain up to three information items pointing to its contents. The basic structure of an ID is: "PAP (Task) AAA-BBB-CCC-#".

Here, "Task" is optional and is only used if the *PAP* is a task. *AAA* is the primary information item, pointing to the main contents. *BBB* and *CCC* are optional information items, which can further specify the *PAP*. These information items may be one to six alphanumeric digits. The abbreviations used for the *PAP* IDs are listed in ▶Table 8.1 and ▶Table 8.2. All *PAP* IDs end with a number #. This number is usually 1, unless multiple IDs with similar preceding information items exist. In this case, they are enumerated increasingly.

Primary Information Item	Description
ACQ	Acquisition
ASS	Assessment
DEL	Delivery
EVA	Evaluation
ID	Identification
UPD	Update
VER	Verification

**Table 8.1** Overview *PAP* ID Primary Information Items

Optional Information Item	Description
ALL	Overall
AUTO	Automated
B	Biometrics (fingerprints and facial images)
EES	Entry-Exit-System
FI	Facial Image
FP10R	Fingerprint 10 Finger Rolled
FP2P	2 Plain Fingerprints
FP4141	Fingerprint 4-1-4-1
FP442	Fingerprint 4-4-2
FPS	Single Slap Fingerprint Image
ID	Identification
nCIR	no Connected Identity Register
SV	Supervised
USV	Unsupervised
VER	Verification
wCIR	with Connected Identity Register

**Table 8.2** Overview *PAP* ID Optional Information Items

## List of Abbreviations

Abbreviation	Description
AP	Application Profile
ARE	Alien Register Enrolment
BCL	Border Control
FM	Function Module
GID	German Identity Documents
HLBS	High Level Biometric Services
IMA	Immigration Authorities
PAP	Partial Application Process

## **Bibliography**

[BIB\_RFC2119] *RFC 2119: Key words for use in RFCs to Indicate Requirement Levels.*