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

Part 3: Test Cases for Function Modules

Version 2.3

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1 Introduction

This document is part 3 of the Conformance Test Specification (TR-03122). As shown in figure 3-1 in the framework document of this technical guideline, it is the counterpart of the part 3 of TR Biometrics describing the test cases for the Function Modules of TR Biometrics (TR-03121-3).

2 Test Case: Process

2.1 P-FP-GID

The acquisition of fingerprints can be performed with the help of a single fingerprint sensor or a multi fingerprint sensor. In the first case TC-P-FP-GID-001 has to be applied in the second case TC-P-FP-GID-002.

Test Case ID: TC-P-FP-GID-001	
Scope	
- Examination of the correct process for the acquisition of two fingerprints with a single fingerprint sensor	
Precondition	
- A single fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - As necessary test resources: finger of a test person	
Description	
1 Start of the acquisition process and execution of the standard process: - three times correct positioning of the index finger of the right hand and three times correct positioning of the index finger of the left hand by a test person	
Expected Result	- The module finishes execution without any error message and returns data that includes coded fingerprints of the two index fingers, additional quality information and other information
2 Start of the acquisition process with simulation of missing index fingers: - excluding of index fingers (if possible) or skip acquisition of index fingers - three times correct positioning of the thumb of the right hand and three times correct positioning of the thumb of the left hand by a test person	
Expected Result	- The module offers the possibility to exclude fingers such that for both hands instead of the index fingers the thumbs are selected for acquisition - The module finishes execution without any error message and returns data that includes coded fingerprints of the two thumbs, additional quality information and other information

3 Start of the acquisition process with simulation that no fingers are available on the left hand but all fingers are available on the right hand (and can be captured successfully): - excluding of fingers of left hand (if possible) or skip acquisition of fingers of left hand - three times correct positioning of the index finger of the right hand and three times correct positioning of the thumb of the right hand by a test person	
Expected Result	- The module offers the possibility to change from the acquisition of fingerprints from both hands to the acquisition of two fingerprints from one hand - The module finishes execution without any error message and returns data that includes coded fingerprints of the right index finger and the right thumb, additional quality information and other information
4 Examination of the repetition of the fingerprint acquisition and the possibility to abort: Start of the acquisition process with a test person that has all fingers on both hands and repeating of the acquisition with always incorrect positioning of a finger (enforcing of images with bad quality e.g. by weak pressure of the fingertip), first from the right hand afterwards from the left hand	
Expected Result	- In general: the module offers the possibility to repeat the acquisition of a single finger - Right hand: after no adequate quality has been captured by the acquisition of the index finger it is proceeded with the thumb. After the thumb has not been captured successfully an option to abort the process is given by the module and it is proceeded with the middle finger. After the unsuccessful attempt to capture the middle finger an option to abort is given and it is proceeded with the ring finger acquisition. After the ring finger was not captured successfully, too, the fingerprint with the best quality from all captured fingerprints is returned. - Left hand: the same procedure and results as described for the right hand is expected. - The module finishes execution and returns data that includes coded fingerprints of one finger of the right hand and one finger of the left hand, additional quality information and other information
5 Start of the acquisition process with simulation that fingers are not available on either hand	
Expected Result	- The module offers the possibility to exclude all fingers or to skip the capturing of all fingers - The module finishes execution and returns data that includes no fingerprints, but additional quality information and other information

Table 1: Test Case TC-P-FP-GID-001

Test Case ID: TC-P-FP-GID-002	
Scope	
- Examination of the correct process for the acquisition of two fingerprints with a multi fingerprint sensor	
Precondition	
- A multi fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - As necessary test resources: finger of a test person	
Description	
1 Start of the acquisition process and execution of the standard process: selection of single or multi finger acquisition and three times correct positioning of both index fingers by a test person	
Expected Result	- Single finger acquisition: fingers are captured separately - Multi finger acquisition: fingers are captured at the same time - The module finishes execution without any error message and returns data that includes coded fingerprints of the two index fingers, additional quality information and other information
2 Start of the acquisition process with simulation of missing index fingers: - excluding of index fingers (if possible) or skip acquisition of index fingers - three times correct positioning of the thumbs of the right hand and of the left hand by a test person	
Expected Result	- The module offers the possibility to exclude fingers such that instead of the index fingers the thumbs are selected for acquisition. - The module finishes execution without any error message and returns data that includes coded fingerprints of the two thumbs, additional quality information and other information
3 Start of the acquisition process with simulation that no fingers are available on the left hand but all fingers are available on the right hand (and can be captured successfully): - excluding of fingers of left hand (if possible) or skip acquisition of fingers of left hand - three times correct positioning of the index finger of the right hand and three times correct positioning of the thumb of the right hand by a test person	
Expected Result	- The module offers the possibility to change from the acquisition of fingerprints from both hands to the acquisition of two fingerprints from one hand - The module finishes execution without any error message and returns data that

	includes coded fingerprints of the right index finger and the right thumb, additional quality information and other information
4 Examination of the repetition of the fingerprint acquisition and the possibility to abort: Start of the acquisition process with a test person that has all fingers on both hands and repeating of the acquisition with always incorrect positioning of the fingers (enforcing of images with bad quality e.g. by weak pressure of the fingertip), simultaneous for fingers of both hands	
Expected Result	- In general: the module offers the possibility to repeat the acquisition of two fingers as well as the acquisition of a single finger - After no adequate quality has been captured by the acquisition of the index fingers it is proceeded with the thumbs. After the thumbs has not been captured successfully an option to abort the process is given by the module and it is proceeded with single finger acquisition of the middle fingers and ring fingers (after the unsuccessful attempt to capture the middle finger again an option to abort is given). After the middle and ring fingers were not captured successfully, too, for each hand the fingerprint with the best quality from all captured fingerprints of this hand is returned. - The module finishes execution and returns data that includes coded fingerprints of one finger of the right hand and one finger of the left hand, additional quality information and other information
5 Start of the acquisition process with simulation that fingers are not available on either hand	
Expected Result	- The module offers the possibility to exclude all fingers or to skip the capturing of all fingers - The module finishes execution and returns data that includes no fingerprints, but additional quality information and other information

Table 2: Test Case TC-P-FP-GID-002

2.2 P-FP-VAPP

The acquisition of fingerprints can be performed with the help of a multi fingerprint sensor or in exceptional cases with a single fingerprint scanner. In the first case TC-P-FP-VAPP-001 has to be applied, in the second case TC-P-FP-VAPP-002.

Test Case ID: TC-P-FP-VAPP-001
Scope
- Examination of the correct process for the acquisition of up to ten fingerprints with a multi fingerprint sensor
Precondition

- A multi fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - As necessary test resources: finger of a test person	
Description	
1 Start of the acquisition process and execution of the standard process with fingerprints with good quality: - three times correct positioning of the right hand, three times correct positioning of the left hand, and three times correct positioning of the thumbs by a test person.	
Expected Result	- The activation of the acquisition is performed automatically (hardware or software based). - The module finishes execution without any error message and returns data that includes all ten coded fingerprints, additional quality information, and other information.
2 Start of the acquisition process and execution with fingerprints with good and inadequate quality whereas at least for every individual finger one image with adequate quality is available. - three times correct positioning of the right hand, three times correct positioning of the left hand, and three times correct positioning of the thumbs by a test person.	
Expected Result	- The activation of the acquisition is performed automatically (hardware or software based). - The module finishes execution without any error message. A composite record is combined that contains the highest quality image per finger of the sequence. The fingerprint data from this composite record is coded such that the result includes all ten coded fingerprints, additional quality information, and other information.
3 Start of the acquisition process and execution with insufficient quality for several fingerprints (not all). - three times correct positioning of the right hand, three times correct positioning of the left hand, and three times correct positioning of the thumbs by a test person.	
Expected Result	One of the following alternatives is offered: - A direct restart of the acquisition process of one slap if for at least one fingerprint of this slap insufficient quality has been achieved. - After the acquisition of all three slaps (i.e. right hand, left hand, and thumbs) it can be tried to improve the fingerprints with insufficient quality by switching directly to the according slap. - The process switches to the acquisition of single fingers for those with insufficient quality.
4 Start of the acquisition process and execution with all available fingerprints of a person having	

handicaps (amputated fingers or bandaged). - three times correct positioning of the right hand, three times correct positioning of the left hand, and three times correct positioning of the thumbs by a test person.	
Expected Result	- During the acquisition process an option to mark handicapped fingers is offered. - Handicapped fingers are excluded from the acquisition process. - The fingerprint data from this composite record is coded such that the result includes all available coded fingerprints, additional quality information, and other information.

Table 3: Test Case TC-P-FP-VAPP-001

Test Case ID: TC-P-FP-VAPP-002	
Scope	
- Examination of the correct process for the acquisition of ten fingerprints with a single fingerprint sensor.	
Precondition	
- A single fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - As necessary test resources: finger of a test person	
Description	
1 Start of the acquisition process and execution with fingerprints of good quality: - three times correct positioning of each of the ten fingers by a test person.	
Expected Result	- The activation of the acquisition is performed automatically (hardware or software based). - The module finishes execution without any error message and returns data that includes all ten coded fingerprints, additional quality information, and other information.
2 Start of the acquisition process and execution with fingerprints with good and inadequate quality whereas at least for every individual finger one image with adequate quality is available. - three times correct positioning of the ten fingers by a test person.	
Expected Result	- The activation of the acquisition is performed automatically (hardware or software based). - The module finishes execution without any error message. A composite record is combined that contains the highest quality image per finger of the sequence. The fingerprint data from this composite record is coded such that the result

	includes all ten coded fingerprints, additional quality information, and other information.
3 Start of the acquisition process and execution with insufficient quality for several fingerprints (not all). - three times correct positioning of the ten fingers by a test person.	
Expected Result	- A direct restart of the acquisition process of one single finger if insufficient quality has been achieved.
4 Start of the acquisition process and execution with all available fingerprints of a person having handicaps (amputated fingers or bandaged). - three times correct positioning of the available fingers by a test person	
Expected Result	- During the acquisition process an option to mark handicapped fingers is offered. - Handicapped fingers are excluded from the acquisition process. - The fingerprint data from this composite record is coded such that the result includes all available coded fingerprints, additional quality information, and other information.

Table 4: Test Case TC-FP-VAPP-002

2.3 P-FP-VBIC

No test cases are currently defined for this Function Module.

2.4 P-FP-VEIC

No test cases are currently defined for this Function Module.

2.5 P-PH-APP

No test cases are currently defined for this Function Module.

2.6 P-PH-VID

No test cases are currently defined for this Function Module.

3 Test Case: Acquisition Hardware

3.1 AH-FP-FTR

For test cases, the reader is referred to TR-03118-1 (German only).

3.2 AH-PH-FBS

No test cases are currently defined for this Function Module.

3.3 AH-PH-DC

No test cases are currently defined for this Function Module.

3.4 AH-PH-VID

For integrated camera systems, general requirements examined in TC-AH-PH-VID-001 have to be applied. Additionally, for the usage in eGate scenarios TC-AH-PH-VID-002 has to be applied.

Test Case ID: TC-AH-PH-VID-001	
Scope	
- Examination of general requirements for integrated camera systems	
Precondition	
- The camera system is connected - As necessary test resources: various test persons of different heights (tall, small-sized, medium-sized persons) - Vendor proclaimed values of the supported maximum camera range and capturing distance	
Description	
1 The camera system installation is examined.	
Expected Result	- The camera system has the possibility to be adapted for the application scenario (automatic adjustment, appropriate installation). - There is a possibility to use active diffuse lighting of the camera unit.
Following test steps (steps 2 and 3) have to be repeated for every available test person in order to be able to test the camera system with persons of different heights.	

2 The test person stands at the maximum proclaimed distance of the camera range, looks straight to the camera unit and then capturing is started.	
Expected Result	- The camera is automatically adjusted to the height of the person standing in front of the camera. - The returned camera video stream has a physical resolution of at least 640 x 480 pixels. - Captured images have an adequate image quality to match requirements of ISO/IEC 19794-5:2005. - Yaw, roll and pitch of the captured face image are close to 0 (= frontal face image). - The captured images are uniformly lightened; no mirroring effects of glasses are visible; the captured images are sharp.
3 The test person stands at the minimum proclaimed distance of the camera range, looks straight into the camera unit and then capturing is started.	
Expected Result	- The camera is automatically adjusted to the height of the person standing in front of the camera. - The returned camera video stream has a physical resolution of at least 640 x 480 pixels. - Captured images have an adequate image quality to match requirements of ISO/IEC 19794-5:2005. - Yaw, roll and pitch of the captured face image are close to 0 (= frontal face image). - The captured images are uniformly lightened; no mirroring effects of glasses are visible; the captured images are sharp.

Table 5: Test Case TC-AH-PH-VID-001

Test Case ID: TC-AH-PH-VID-002	
Scope	
- Examination of specific requirements for eGate scenarios	
Precondition	
- The camera system is connected - As necessary test resources: test person	
Description	
1 The eGate installation is examined.	
Expected	- The camera is placed in the moving direction of the person (sideways attached

Result	camera units which require a rotation of the moving passenger are not allowed). - A feedback screen for displaying the camera live stream (mirrored image) is provided to the passenger. - The feedback screen is attached directly next to the camera to ensure that the passenger is looking straight to the feedback screen when entering the eGate and moving straight to the camera.
2 The test person enters the eGate and moves towards the camera. An image is captured directly when the person enters the eGate (distance of about 2 meters from the camera).	
Expected Result	- The camera releases within a short time. - The captured image contains the face of the passenger in the foreground of the image. - The captured image is sharp.
3 The test person enters the eGate and moves towards the camera. An image is captured when the person stands close in front of the camera unit.	
Expected Result	- The camera releases within a short time. - The captured image contains the face of the passenger in the foreground of the image. - The captured image is sharp.

Table 6: Test Case TC-AH-PH-VID-002

4 Test Case: Acquisition Software

4.1 AS-FP-SF

Test Case ID: TC-AS-FP-SF-001	
Scope	
- Examination of automatic acquisition of the fingerprint image	
Precondition	
- A single fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - As necessary test resources: finger of a test person	
Description	
1 Start of the acquisition and correct placement of the finger on the sensor	
Expected Result	- The activation of the acquisition occurs automatically at the latest at the end of the time-out.
2 Start of the acquisition without placement of a finger on the sensor	
Expected Result	- An adequate error message is given that no fingerprint has been captured successfully.

Table 7: Test Case TC-AS-FP-SF-001

4.2 AS-FP-MF

Test Case ID: TC-AS-FP-MF-001
Scope
- Examination of automatic acquisition of the fingerprint image
Precondition
- A multi fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - As necessary test resources: finger of a test person
Description

1 Start of the acquisition and correct placement of the fingers on the sensor	
Expected Result	- The activation of the acquisition occurs automatically at the latests at the end of the time-out.
2 Start of the acquisition without placement of any finger on the sensor	
Expected Result	- An adequate error message is given that no fingerprint has been captured successfully.

Table 8: Test Case TC-AS-FP-MF-001

4.3 AS-PH-FBS

No test cases are currently defined for this Function Module.

4.4 AS-PH-DC

Test Case ID: TC-AS-PH-DC-001	
Scope	
- Examination of the acquisition software module used for digitised face images	
Precondition	
- An image was acquired via the according Acquisition Hardware Function Module - As necessary test resource: Windows Bitmap Format Version 3 Encoder	
Description	
1 Examination of the returned uncompressed face image (including image header)	
Expected Result	- The uncompressed image data is provided in Windows Bitmap Format Version 3 (BMP) and the Bitmap header is coded correctly.

Table 9: Test Case TC-AS-PH-DC-001

4.5 AS-PH-VID

Test Case ID: TC-AS-PH-VID-001	
Scope	
- Examination of the acquisition software module used for digitised face images	
Precondition	

- An image was acquired via the according Acquisition Hardware Function Module
- As necessary test resource:
  - Windows Bitmap Format Version 3 Encoder
  - TIFF Encoder	

Description	
1 Examination of the returned uncompressed face image (including image header)	
Expected Result	- The uncompressed image data is provided in either Windows Bitmap Format Version 3 (BMP) and the Bitmap header is coded correctly or the image data is provided in Tagged Image File Format (TIFF) and the TIFF header is coded correctly.

Table 10: Test Case TC-AS-PH-VID-001

5 Test Case: Biometric Image Processing

5.1 BIP-FP-APP

The acquisition of fingerprints can be performed with the help of a single fingerprint sensor or a multi fingerprint sensor. In the first case TC-BIP-FP-APP-001 has to be applied, in the second case TC-BIP-FP-APP-002. Furthermore, in the case of four finger sensors TC-BIP-FP-APP-003 has to applied additionally.

Test Case ID: TC-BIP-FP-APP-001	
Scope	
- Examination of segmentation in connection with single finger scanners	
Precondition	
- A single fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - The module supports segmentation - As necessary test resources: finger of a test person	
Description	
The test case is repeated 10 times for every test step in order to be able to estimate the quality of the segmentation process. The fingers have to be lifted after every acquisition	
1 Start of the acquisition of one fingerprint by correct placement of this finger on the sensor and extraction of the fingerprint image from the resulting data	
Expected Result	- The image contains a fingerprint - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated. Note: segmentation for single finger scanners is optional.
2 Start of the acquisition of one fingerprint by positioning this finger rotated up to 45 degree on the sensor and extraction of the fingerprint image from the resulting data	
Expected Result	- The image contains a fingerprint - The fingerprint is corrected to be vertical in the image - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated. Note: segmentation for single finger scanners is optional.
3 Start of the acquisition of one fingerprint by positioning this finger on the sensor such that all phalanges are captured during acquisition and extraction of the fingerprint image from the resulting data	

Expected Result	- Image contains only the first part of the finger - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated. Note: segmentation for single finger scanners is optional.

Table 11: Test Case TC-BIP-FP-APP-001

Test Case ID: TC-BIP-FP-APP-002	
Scope	
- Examination of segmentation in connection with multi finger scanners	
Precondition	
- A multi fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - As necessary test resources: finger of a test person	
Description	
The test case is repeated 10 times for every test step in order to be able to evaluate the quality of the segmentation process. The fingers have to be lifted after every acquisition	
1 Start of the acquisition of two fingerprints by correct placement of two fingers on the sensor and extraction of the fingerprint images from the resulting data	
Expected Result	- Two independent images are returned within the data - Each of the images contains a fingerprint - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
2 Start of the acquisition of one fingerprint by correct placement of one finger on the sensor and extraction of the fingerprint image from the resulting data	
Expected Result	- One image is returned within the data - The image contains an extracted fingerprint - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
3 Start of the acquisition of two fingerprints by positioning the fingers rotated up to 45 degrees on the sensor (both fingers in the same direction) and extraction of the fingerprint images from the resulting data	
Expected Result	- Two independent images are returned within the data - Each of the images contains a fingerprint - The fingerprints are corrected to be vertical in the image

	- A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
4 Start of the acquisition of one fingerprint by positioning the finger rotated up to 45 degrees on the sensor and extraction of the fingerprint image from the resulting data	
Expected Result	- One image is returned within the data - The image contains a fingerprint - The fingerprint is corrected to be vertical in the image - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
5 Start of the acquisition of two fingerprints by positioning two fingers on the sensor such that all phalanges are captured during acquisition and extraction of the fingerprint images from the resulting data	
Expected Result	- Two images are returned within the data - Both images contain only the first part of the finger - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
6 Start of the acquisition of one fingerprint by positioning this finger on the sensor such that all phalanges are captured during acquisition and extraction of the fingerprint image from the resulting data	
Expected Result	- One image is returned within the data - Image contains only the first part of the finger - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated

Table 12: Test Case TC-BIP-FP-APP-002

Test Case ID: TC-BIP-FP-APP-003
Scope
- Examination of segmentation in connection with four finger scanners
Precondition
- A four fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - As necessary test resources: finger of a test person
Description

The test case is repeated 10 times for every test step in order to be able to evaluate the quality of the segmentation process. The fingers have to be lifted after every acquisition	
1 Start of the acquisition of three fingerprints by correct placement of three fingers on the sensor and extraction of the fingerprint images from the resulting data	
Expected Result	- Three independent images are returned within the data - Each of the images contains a fingerprint - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
2 Start of the acquisition of four fingerprints by correct placement of four fingers on the sensor and extraction of the fingerprint images from the resulting data	
Expected Result	- Four independent images are returned within the data - Each of the images contains a fingerprint - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
3 Start of the acquisition of three fingerprints by positioning the fingers rotated up to 45 degrees on the sensor (all fingers in the same direction) and extraction of the fingerprint images from the resulting data	
Expected Result	- Three independent images are returned within the data - Each of the images contains a fingerprint - The fingerprints are corrected to be vertical in the image - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
4 Start of the acquisition of four fingerprints by positioning the fingers rotated up to 45 degrees on the sensor (all fingers in the same direction) and extraction of the fingerprint images from the resulting data	
Expected Result	- Four independent images are returned within the data - Each image contains a fingerprint - The fingerprints are corrected to be vertical in the image - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
5 Start of the acquisition of three fingerprints by positioning three fingers on the sensor such that all phalanges are captured during acquisition and extraction of the fingerprint images from the resulting data	
Expected Result	- Three independent images are returned within the data - All images contain only the first part of the finger

	- A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
6 Start of the acquisition of four fingerprints by positioning four fingers on the sensor such that all phalanges are captured during acquisition and extraction of the fingerprint images from the resulting data	
Expected Result	- Four independent images are returned within the data - Each image contains only the first part of the finger - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated

Table 13: Test Case TC-BIP-FP-APP-003

5.2 BIP-FP-VIS

The acquisition of fingerprints can be performed with the help of a single fingerprint sensor or a multi fingerprint sensor. In the first case TC-BIP-FP-VIS-001 has to be applied, in the second case TC-BIP-FP-VIS-002.Furthermore, in the case of four finger sensors TC-BIP-FP-APP-003 has to applied additionally. Finally, TC-BIP-FP-VIS-004 applies in any case.

Test Case ID: TC-BIP-FP-VIS-001	
Scope	
- Examination of segmentation in connection with single finger scanners	
Precondition	
- A single fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - The module supports segmentation - As necessary test resources: finger of a test person	
Description	
The test case is repeated 10 times for every test step in order to be able to estimate the quality of the segmentation process. The fingers have to be lifted after every acquisition	
1 Start of the acquisition of one fingerprint by correct placement of this finger on the sensor and extraction of the fingerprint image from the resulting data	
Expected Result	- The image contains a fingerprint - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated. Note: segmentation for single finger scanners is optional.

2 Start of the acquisition of one fingerprint by positioning this finger rotated up to 45 degree on the sensor and extraction of the fingerprint image from the resulting data	
Expected Result	- The image contains a fingerprint - The fingerprint is corrected to be vertical in the image - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated. Note: segmentation for single finger scanners is optional.
3 Start of the acquisition of one fingerprint by positioning this finger on the sensor such that all phalanges are captured during acquisition and extraction of the fingerprint image from the resulting data	
Expected Result	- Image contains only the first part of the finger - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated. Note: segmentation for single finger scanners is optional.

Table 14: Test Case TC-BIP-FP-VIS-001

Test Case ID: TC-BIP-FP-VIS-002
Scope
- Examination of segmentation in connection with multi finger scanners
Precondition
- A multi fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - As necessary test resources: finger of a test person
Description
The test case is repeated 10 times for every test step in order to be able to evaluate the quality of the segmentation process. The fingers have to be lifted after every acquisition
1 Start of the acquisition of two fingerprints by correct placement of two fingers on the sensor and extraction of the fingerprint images from the resulting data
Expected Result: - Two independent images are returned within the data - Each of the images contains a fingerprint - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
2 Start of the acquisition of one fingerprint by correct placement of one finger on the sensor and extraction of the fingerprint image from the resulting data
Expected: - One image is returned within the data

Result	- The image contains an extracted fingerprint - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
3 Start of the acquisition of two fingerprints by positioning the fingers rotated up to 45 degrees on the sensor (both fingers in the same direction) and extraction of the fingerprint images from the resulting data	
Expected Result	- Two independent images are returned within the data - Each of the images contains a fingerprint - The fingerprints are corrected to be vertical in the image - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
4 Start of the acquisition of one fingerprint by positioning the finger rotated up to 45 degrees on the sensor and extraction of the fingerprint image from the resulting data	
Expected Result	- One image is returned within the data - The image contains a fingerprint - The fingerprint is corrected to be vertical in the image - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
5 Start of the acquisition of two fingerprints by positioning two fingers on the sensor such that all phalanges are captured during acquisition and extraction of the fingerprint images from the resulting data	
Expected Result	- Two images are returned within the data - Both images contain only the first part of the finger - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
6 Start of the acquisition of one fingerprint by positioning this finger on the sensor such that all phalanges are captured during acquisition and extraction of the fingerprint image from the resulting data	
Expected Result	- One image is returned within the data - Image contains only the first part of the finger - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated

Table 15: Test Case TC-BIP-FP-VIS-002

Test Case ID: TC-BIP-FP-VIS-003

Scope	
- Examination of segmentation in connection with four finger scanners	
Precondition	
- A four fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached - As necessary test resources: finger of a test person	
Description	
The test case is repeated 10 times for every test step in order to be able to evaluate the quality of the segmentation process. The fingers have to be lifted after every acquisition	
1 Start of the acquisition of three fingerprints by correct placement of three fingers on the sensor and extraction of the fingerprint images from the resulting data	
Expected Result	- Three independent images are returned within the data - Each of the images contains a fingerprint - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
2 Start of the acquisition of four fingerprints by correct placement of four fingers on the sensor and extraction of the fingerprint images from the resulting data	
Expected Result	- Four independent images are returned within the data - Each of the images contains a fingerprint - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
3 Start of the acquisition of three fingerprints by positioning the fingers rotated up to 45 degrees on the sensor (all fingers in the same direction) and extraction of the fingerprint images from the resulting data	
Expected Result	- Three independent images are returned within the data - Each of the images contains a fingerprint - The fingerprints are corrected to be vertical in the image - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
4 Start of the acquisition of four fingerprints by positioning the fingers rotated up to 45 degrees on the sensor (all fingers in the same direction) and extraction of the fingerprint images from the resulting data	
Expected	- Four independent images are returned within the data

Result	- Each image contains a fingerprint - The fingerprints are corrected to be vertical in the image - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
5 Start of the acquisition of three fingerprints by positioning three fingers on the sensor such that all phalanges are captured during acquisition and extraction of the fingerprint images from the resulting data	
Expected Result	- Three independent images are returned within the data - All images contain only the first part of the finger - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated
6 Start of the acquisition of four fingerprints by positioning four fingers on the sensor such that all phalanges are captured during acquisition and extraction of the fingerprint images from the resulting data	
Expected Result	- Four independent images are returned within the data - Each image contains only the first part of the finger - A correct segmentation has been performed. In case of uncertainty, the test shall be repeated

Table 16: Test Case TC-BIP-FP-VIS-003

Test Case ID: TC-BIP-FP-VIS-004
Scope
- Examination of image resolution and segmentation
Precondition
- The module accepts fingerprints from a conformance test data base - The conformance test data base contains fingerprint images of the right slap, the left slap and thumb slaps - A conformance test tool is available that includes the mechanisms of a BioAPI framework enabling the conformance test mode - Conformance test interfaces according to TR_03122-1 are available
Description
1 Start of the module by committing consecutively three times three types of slaps (i.e. right slap (three times), left slap (three times), and thumb slap (three times)) for this test case from the conformance test data base.

Expected Result	- The module finishes execution without any error message and returns data that includes all ten (coded) segmented fingerprints, additional quality information, and other information. - All segmented fingers are corrected to be aligned vertically - Each segmented fingerprint image contains one (single) fingerprint - The width of all ten fingerprint images is between 400 and 900 pixels, the height between 400 and 800 pixels. - For committed slaps that contained fingerprints smaller than 400 pixels in width and/or height: The resulting fingerprint images must provide at least the minimum size of 400 pixels and are filled with white space around the fingerprint image. - For committed slaps that contained fingerprint images that have a width greater than 900 pixels and/or a height greater than 800 pixels: The resulting fingerprint images are cropped to the maximum width of 900pixels and height of 800 pixels.

Table 17: Test Case TC-BIP-FP-VIS-004

5.3 BIP-PH-FBS

Test Case ID: TC-BIP-PH-FBS-001	
Scope	
- Check of correct properties (size, resolution, colour depth) for colour pictures or black-and-white pictures	
Precondition	
- Scanning of application form 3 times containing a colour picture with a size of 35 mm width and 45 mm height - Scanning of application form 3 times containing a black-and-white picture with a size of 35 mm width and 45 mm height - Provision of the according data including the facial image	
Description	
1 Examination of facial image width and hight/image resolution	
Expected Result	- 413 pixel x 531 pixel (width x height) with a tolerance of +/- 10 pixels - 300 ppi at image size of 35 mm x 45 mm (width x height) - In every case a correct cropping has been performed
2 Examination of facial image colour depth	

Expected Result	- 24 bit RGB for colour pictures - 24 bit RGB or 8 bit grey scale for black-and-white pictures

Table 18: Test Case TC-BIP-PH-FBS-001

5.4 BIP-PH-DC

Test Case ID: TC-BIP-PH-DC-001	
Scope	
- Check of correct properties (size, resolution, colour depth) for colour pictures	
Precondition	
- Capturing of the facial image and provision of a selected single image (colour image) - Provision of the according data including the facial image	
Description	
1 Examination of facial image width and height/image resolution	
Expected Result	- 413 pixel x 531 pixel (width x height) - 300 ppi at image size of 35 mm x 45 mm (width x height)
2 Examination of facial image colour depth	
Expected Result	- 24 bit RGB

Table 19: Test Case TC-BIP-PH-DC-001

5.5 BIP-PH-VID

Test Case ID: TC-BIP-PH-VID-001	
Scope	
- Examination of the biometric image processing module used for facial images in use with automated face recognition	
Precondition	
- A facial image of the passenger was captured in the preferred area of the camera range - The facial image was provided according to the AH and AS Function Module of this profile	
Description	
1 Examination of the returned and processed facial image	
Expected Result	- The returned image has a colour depth of 24 bit RGB (for colour and black-and-white pictures) or 8 bit grey scale (just for black-and-white pictures). - The face of the passenger is fully visible in the foreground of the provided image. - The distance between both eye centres is at least 120 pixels.

Table 20: Test Case TC-BIP-PH-VID-001

6 Test Case: Quality Assurance

6.1 QA-FP-APPD

Test Case ID: TC-QA-FP-APPD-001	
Scope	
- Examination of the correctness of the Quality Assurance module	
Precondition	

- Conformance interfaces (as specified in Part 1) and respective documentation are available for the implementation under test
- The module accepts fingerprints from an appropriate conformance test data base in image format Windows Bitmap Version 3.
- The module provides an according biometric container including the fingerprint data. There exist 8 different fingerprint types which can occur null or three times.[1]
- The conformance test data base contains:
  - Sequences of fingerprint images
  - Corresponding Ground Truth values	

Description	
1 Start of the module by committing consecutively all fingerprints sequences for this test case from the conformance test data base	
Expected Result	- For every input sequence a biometric container (BioAPI BIR) is returned
2 Examination of failure rate: For every fingerprint sequence the finger code and the view of the returned fingerprints are decoded from the biometric container and compared to the Ground Truth value of the conformance test database	
Expected Result	- All expected finger codes and views of the fingerprint sequences are identical with the received results of finger codes and views of these fingerprint sequences

Table 21: Test Case TC-P-FP-APPD-001

1 Here, fingerprints cannot occur one or two times.

6.2 QA-FP-CRM

Test Case ID: TC-QA-FP-CRM-001	
Scope	
- Examination of the correctness of the Quality Assurance module	
Precondition	

- Conformance interfaces (as specified in Part 1) and respective documentation are available for the implementation under test
- The module accepts fingerprints from an appropriate conformance test data base in image format Windows Bitmap Version 3.
- The module provides an according biometric container including the fingerprint data. There exist 10 different fingerprint types which can occur null or three times.
- The conformance test data base contains:
  - Sequences of fingerprint images
  - Corresponding Ground Truth values	

Description	
1 Start of the module by committing consecutively all fingerprints sequences for this test case from the conformance test data base	
Expected Result	- For every input sequence a biometric container (BioAPI BIR) is returned
2 Examination of failure rate: For every fingerprint sequence the finger code and the view of the returned fingerprints are decoded from the biometric container and compared to the Ground Truth value of the conformance test database	
Expected Result	- All expected finger codes and views of the fingerprint sequences are identical with the received results of finger codes and views of these fingerprint sequences

Table 22: Test Case TC-QA-FP-CRM-001

6.3 QA-PH-SB

Test Case ID: TC-QA-PH-SB-001	
Scope	
- Examination of the software based quality assurance for facial images - The test object consists of the quality assurance software and a fixed parameter set describing the tolerances threshold regarding several assessment criteria	
Precondition	

- Conformance interfaces (as specified in Part 1) and respective documentation are available for the implementation under test (IUT)
- The IUT has to provide a mode to process digital images in JPEG 2000 format from an appropriate conformance test data base
- The module provides an according biometric container including the facial image data i.e. the Function Module COD-PH-GID has to be executed before this evaluation can be performed.
- For every request one image is delivered.
- The data base contains:
  - Compliant images and non compliant images for all criteria to be tested
  - Acceptance conditions (error rates) for each criterion, based on the statistical significance of data in the database for the corresponding criterion	

Description	
1 The module is called by the conformance test tool and compliant facial images are committed consecutively according to QA-PH-SB from the conformance test data base.	
Expected Result	- For every facial image a result (BioAPI BIR) containing <qa_face> within the namespace xmlns:bio_face is returned - The acceptance conditions (i.e. defined tolerances) of the conformance test data base are satisfied are achieved
2 The returned results (data sets) are checked if the expected quality values are available	

Expected Result	- If applicable the expected quality values are enclosed:
	  - “id” (type string) – identifier for the criteria
	  - “m” (type double) – minimum value from the rage of this criteria
	  - “M” (type double) – maximum value from the range of this criteria
	  - “t” (type double) – minimum value of the allowed tolerance range of this criteria
	  - “T” (type double) – maximum value of the allowed tolerance range of this criteria

	- value of “qa” - representing the value of the quality evaluation result
3 Start of the module by committing consecutively non compliant facial images according to QA-PH-SB criteria from the conformance test data base. This has to be done for all criteria that have been identified as mandatory	
Expected Result	- For every facial image a result containing <qa_face> within the namespace xmlns:bio_face is returned - The acceptance conditions (i.e. defined tolerances) of the conformance test data base are achieved
4 Start of the module by committing consecutively non compliant facial images according to QA-PH-SB criteria from the conformance test data base. This step has to be done for all criteria that are not mandatory but are supported by the IUT	
Expected Result	- For every facial image a result containing <qa_face> within the namespace xmlns:bio_face is returned - The acceptance conditions (i.e. defined tolerances) of the conformance test data base are achieved
5 The returned results (data sets) are checked if the expected quality values are available	

	- If applicable the expected quality values are enclosed:
	  - “id” (type string) – identifier for the criteria
	  - “m” (type double) – minimum value from the rage of this criteria
	  - “M” (type double) – maximum value from the range of this criteria
	  - “t” (type double) – minimum value of the allowed tolerance range of this criteria
	  - “T” (type double) – maximum value of the allowed tolerance range of this criteria
	  - value of “qa” - representing the value of the quality evaluation result

Table 23: Test Case TC-QA-PH-SB-001

Note:

- The approval of the module including the quality assurance software is based on a fix configuration of the tolerances regarding the defined criteria. In general, a quality assurance module can be approved for different configurations.
- If step 1 or step 3 have failed during the test the complete test case is failed.
- If step 4 has failed during the test the complete test case is failed. Nevertheless, this case can be compensated if the failed criteria are removed or excluded from the total evaluation of the facial image (this is done in order to support a pilot phase of new criteria and algorithms without avoiding the objectives of this guideline). As a consequence, all test steps of this test case have to be restarted.

6.4 QA-PH-PG

No test cases are currently defined for this Function Module.

6.5 QA-PH-PT

No test cases are currently defined for this Function Module.

6.6 QA-PH-VID

Test Case ID: TC-QA-PH-VID-001	
Scope	
- Examination of the prequalification algorithm used for automated face recognition	
Precondition	

- As necessary test resource:
  - test person
  - further equipment (sunglasses, external lighting source)	

Description	
1 The test person enters the area of the camera range (or the eGate) in a correct way and behaviour (frontal pose of the face, eyes visible and opened, straight head pose, normal facial expression with mouth closed, active, diffuse and uniform environmental lighting). During the way towards the camera, the test person moves the head to the right in a way that only the left contour of the head is visible to the camera.	
Expected Result	- The prequalification algorithm returns an image with a frontal pose of the head captured in the first phase when the test person enters the area of the camera range (or the eGate). - The returned image is uniformly lightened (no shadows in the face). - The face of the test person is visible in the foreground of the image. - The eyes of the test person are visible and opened in the returned image. - The facial expression is normal (mouth closed).
2 The test person enters the area of the camera range (or the eGate) in a correct way and behaviour (frontal pose of the face, eyes visible and opened, straight head pose, normal facial expression with mouth closed, active, diffuse and uniform environmental lighting). During the way towards the camera, a strong external lighting source is switched on and pointed towards the right side of the head of the test person. As a result, a dark shadow on the left side of the test person's face appears.	

Expected Result	- The prequalification algorithm returns an image with a frontal pose of the head captured in the first phase when the test person enters the area of the camera range (or the eGate). - The returned image is uniformly lightened (no shadows in the face). - The face of the test person is visible in the foreground of the image. - The eyes of the test person are visible and opened in the returned image. - The facial expression is normal (mouth closed).
3 The test person enters the area of the camera range (or the eGate) in a correct way and behaviour (frontal pose of the face, eyes visible and opened, straight head pose, normal facial expression with mouth closed, active, diffuse and uniform environmental lighting). During the way towards the camera, the test person starts to open the mouth widely. Additionally, the test person opens the eyes extraordinary widely.	
Expected Result	- The prequalification algorithm returns an image with a frontal pose of the head captured in the first phase when the test person enters the area of the camera range (or the eGate). - The returned image is uniformly lightened (no shadows in the face). - The face of the test person is visible in the foreground of the image. - The eyes of the test person are visible and opened in the returned image. - The facial expression is normal (mouth closed).
4 The test person enters the area of the camera range (or the eGate) in a correct way and behaviour (frontal pose of the face, eyes visible and opened, straight head pose, normal facial expression with mouth closed, active, diffuse and uniform environmental lighting). During the way towards the camera, the test person puts on the sunglasses.	
Expected Result	- The prequalification algorithm returns an image with a frontal pose of the head captured in the first phase when the test person enters the area of the camera range (or the eGate). - The returned image is uniformly lightened (no shadows in the face). - The face of the test person is visible in the foreground of the image. - The eyes of the test person are visible and opened in the returned image (no sunglasses visible). - The facial expression is normal (mouth closed).

Table 24: Test Case TC-QA-PH-VID-001

7 Test Case: Compression

7.1 COM-FP-WSQR

Test Case ID: TC-COM-FP-WSQR-001	
Scope	
- Examination of the size and compression format of the resulting fingerprint images	
Precondition	
- The module accepts fingerprints from a conformance test data base - A conformance test tool is available that includes the mechanisms of a BioAPI framework enabling the conformance test mode - Conformance test interfaces according to TR_03122-1 are available - Provision of the according biometric container including the fingerprint data - A FBI certificate for the used WSQ implementation of the IUT is available - A necessary test resource: FBI certified WSQ algorithm	
Description	
1 Check of the FBI certificate for the used WSQ implementation	
Expected Result	- The WSQ implementation is certified by the FBI.
2 Start of the module by committing consecutively both fingerprints sequences for this test case from the conformance test data base	
Expected Result	- For every input sequence a biometric container (BioAPI BIR) is returned
3 Examination of the resulting format of the images (decode image data from the biometric container using a certified WSQ implementation)	
Expected Result	- All fingerprint images can be decoded with the WSQ algorithm
4 Examination of the resulting image size	
Expected Result	- All fingerprint images do not exceed the maximum size of 18 kB - For the second sequence the size of the fingerprint image is between (or equal) 17 and 18 kB
5 Examination of the software implementation value (sf) from the WSQ header of the image data	

Expected Result	- The sf value in the WSQ header is not equal 0 - The sf value is referenced in the FBI certificate for the WSQ implementation of the module

Table 25: Test Case TC-COM-FP-WSQR-001

7.2 COM-FP-WSQ

Test Case ID: TC-COM-FP-WSQ-001	
Scope	
- Examination of the size and compression format of the resulting fingerprint images	
Precondition	

- The module accepts fingerprints from a conformance test data base
- A conformance test tool is available that includes the mechanisms of a BioAPI framework enabling the conformance test mode
- Conformance test interfaces according to TR_03122-1 are available
- A FBI certificate for the used WSQ implementation of the IUT is available
- A necessary test resource: FBI certified WSQ algorithm
- The conformance test data base contains:
  - Sequences of fingerprint images
  - Corresponding Ground Truth values of WSQ compressed images with a bit-rate of 0.75	

Description	
1 Check of the FBI certificate for the used WSQ implementation	
Expected Result	- The WSQ implementation is certified by the FBI.
2 Start of the module by committing consecutively slap sequences (i.e. three times a right slap, three times left slap, and three times thumb slap) for this test case from the conformance test data base	
Expected Result	- For every input sequence a biometric container (BioAPI BIR) is returned
3 Examination of the resulting format of the images (decode image data from the biometric container using a certified WSQ implementation)	
Expected Result	- All fingerprint images can be decoded with the WSQ algorithm

4 Examination of the software implementation value (sf) from the WSQ header of the image data	
Expected Result	- The sf value in the WSQ header is not equal 0 - The sf value is referenced in the FBI certificate for the WSQ implementation of the module
5 Examination of the size of the WSQ image data against the Ground Truth	
Expected Result	- The size of the compressed WSQ image data equals the values of the Ground Truth (to determine if exactly a bit-rate of 0.75 was used for compression). A tolerance of +/- 1 % is allowed.

Table 26: Test Case TC-COM-FP-WSQ-001

7.3 COM-PH-JPG

No test cases are currently defined for this Function Module.

7.4 COM-PH-JP2

Test Case ID: TC-COM-PH-JP2-001	
Scope	
- Examination of the size and compression format of the resulting facial image file	
Precondition	
- Scanning of application form or capturing of the facial image and provision of a selected single image - Provision of the according biometric container including the image data - A necessary test resource: JPEG2000 Encoder according to ISO/IEC 15444-1	
Description	
1 Extraction of the compressed facial image file from the biometric container	
Expected Result	- A single compressed facial image
2 Decoding of the facial image, in particular the JPEG2000 header	
Expected Result	- The facial image file in JPEG2000 format can be parsed and the JPEG2000 header is coded correctly.
3 Examination of the size of the resulting facial image	

Expected Result	- The facial image is characterised by the size of 15 kB. For the measurement of this value, a tolerance of +/- 5 % is allowed.

Table 27: Test Case TC-COM-PH-JP2-001

7.5 COM-PH-VID

Test Case ID: TC-COM-PH-VID-001	
Scope	
- Examination of the size and compression format of the resulting facial image file	
Precondition	

- Capturing of the facial image and provision of a selected single image
- As necessary test resource:
  - JPEG2000 Encoder according to ISO/IEC 15444-1
  - JPEG Encoder according to ISO/IEC 10918-1	

Description	
1 Examination of the facial image	
Expected Result	- A single compressed or uncompressed facial image
2 Only if compression is used: Examination of the compression method	
Expected Result	- The used compression method is either JPEG2000 according to ISO/IEC 15444-1 or JPEG according to ISO/IEC 10918-1.
3 Only if JPEG2000 compression is used: Decoding of the facial image, in particular the JPEG2000 header	
Expected Result	- The facial image file in JPEG2000 format can be parsed and the JPEG2000 header is coded correctly.
4 Only if JPEG2000 compression is used: Examination of the size of the resulting facial image	
Expected Result	- The facial image is characterised by the size of at least 75 kB.
5 Only if JPEG compression is used: Decoding of the facial image, in particular the JPEG header	
Expected Result	- The facial image file in JPEG format can be parsed and the JPEG header is coded correctly.

6 Only if JPEG compression is used: Examination of the size of the resulting facial image	
Expected Result	- The facial image is characterised by the size of at least 75 kB.

Table 28: Test Case TC-COM-PH-VID-001

8 Test Case: Coding

8.1 COD-FP-GID

Test Case ID: TC-COD-FP-GID-001	
Scope	
- Correct coding of the BioAPI BIR Header - Within this test case the correct coding of the fingerprints, additional quality information and other data for the case that two fingerprints were captured is checked.	
Precondition	
- Acquisition of the fingerprints of two different fingers - Provision of the according biometric container including the fingerprint data	
Description	
1 Parsing of the BioAPI BIR that is returned by the capture function of the respective BSP	
Expected Result	- *Header* (mandatory) - *Biometric Data Block* – BDB (mandatory)
2 Parsing of the BioAPI BIR Header	
Expected Result	- Header Version = '20' - Format ID Owner = '0x004B' (Federal Office for Information Security (BSI)) - Format ID Type = '0x0002' (TR Biometrics XML-Finger 1.0) - Purpose = '4' (BioAPI_PURPOSE_ENROLL_FOR_VERIFICATION_ONLY) - Biometric Type = '0x00000008' (BioAPI_TYPE_FINGERPRINT) - BioAPI Subtype shall be available and has the following value - BioAPI_BIR_NO_SUBTYPE_AVAILABLE

Table 29: Test Case TC-COD-FP-GID-001

Test Case ID: TC-COD-FP-GID-002	
Scope	
- Correct parsing of the XML structure fp-gid	
Precondition	
- Acquisition of the fingerprints of two different fingers - Provision of the according biometric container including the fingerprint data	
Description	
1 Parsing (decoding) of the Biometric Data Block containing *fp-gid*	
Expected Result	- *record* (mandatory, must occur two times) - *xinfo_fp_gid* (mandatory) - *aux* (optional)
2 Parsing of *record* Here, both elements of records have to be checked separately.	

Expected Result	- *data* (mandatory)
	  - Number of Biometric Information Template in *data* = 1
	  - BIT is encoded in Base64
	- *md5* (optional)

3 Examination of check sum *md5* (if present)	
Expected Result	- Calculated MD5-Hash(*data*) equal value in *record*
4 Parsing of *xinfo_fp_gid*	
Expected Result	- *moduleinfo* (mandatory) - *qa_finger* (must occur two times) - *time* (mandatory) - *note* (optional, can occur arbitrarily often)
5 Parsing of *moduleinfo* Here, all elements of moduleinfo have to be checked separately.	

Expected Result	- *moduletype* (mandatory) - *vendorinfo* (mandatory) - *comp* (optional can occur arbitrarily often) - *algorithm* (optional can occur arbitrarily often)
6 Parsing of *vendorinfo*	
Expected Result	- *vendorname* (mandatory) - *productname* (mandatory) - *version* (mandatory) - *firmwareversion* (optional) - *qa_config* (optional) - *aux* (optional)
7 Parsing of *comp* Here, all elements of comp have to be checked separately.	
	- *name* (mandatory) - *version* (mandatory)
8 Parsing of *algorithm* Here, all elements of algorithm have to be checked separately.	
Expected Result	- *type* (mandatory) - *name* (mandatory) - *version* (mandatory)
9 Parsing of *qa_finger* Here, both elements of qa_finger have to be checked separately.	
Expected Result	- *total* (mandatory) - *fc* (mandatory) - *qa* (mandatory, can occur arbitrarily often)
10 Parsing of *qa* Here, all elements of qa have to be checked separately.	
Expected Result	- id (mandatory) - m (optional) - M (optional) - t (optional) - T (optional)

11 Parsing of *time* (mandatory)	
Expected Result	- available
12 Parsing of *note* (optional) Here, all elements of note have to be checked separately.	
Expected Result	- Can occur zero times or arbitrarily

Table 30: Test Case TC-COD-FP-GID-002

Test Case ID: TC-COD-FP-GID-003	
Scope	
- Correct coding of the CBEFF container	
Precondition	
- Acquisition of the fingerprint of two different fingers - Provision of the according biometric container including the fingerprint data	
Description	
1 Decoding of the CBEFF Header, BHT (XML element <data>) for each fingerprint	

Expected Result	- CBEFF Patron Header Version = '0101'
	- BDB Biometric Type: value = '08' (Fingerprint)
	- BDB Biometric Subtype: one of the following values:
	  - 0000 0101 (thumb right)
	  - 0000 0110 (thumb left)
	  - 0000 1001 (index right)
	  - 0000 1010 (index left)
	  - 0000 1101 (middle finger right)
	  - 0000 1110 (middle finger left)
	  - 0001 0001 (ring finger right)
	  - 0001 0010 (ring finger left)
	- BDB Format Owner: value = '0x0101' (ISO/IEC JTC 1 SC 37-Biometrics)
	- BDB Format Type: value = '0x0007' (ISO/IEC JTC 1 SC 37-Biometrics)

2 Decoding of the general record header	

Expected Result	- Format Identifier = 0x46495200 (“FIR” - Finger Image Record) - Version Number = 0x30313000 (“010”) - Record Length = 32+ 1 * (14 bytes + Data length[2]) - Capture device ID = 2 bytes (Vendor specified) - Image acquisition level = '1F' (Level 31) or '29' (Level 41) - Number of fingers = 1 - Scale units = 1 (pixel/inch) - Scan resolution (horiz) = 01F4 (500ppi) - Scan resolution (vert) = 01F4 (500ppi) - Image resolution (horiz) <= Scan resolution (horiz) - Image resolution (vert) <= Scan resolution (vert) - Pixel depth = 08 (256 gray levels) - Image compression Algorithm = 02 (WSQ) - Reserved = 00 00
3 Decoding of the finger image header record	
Expected Result	- Length of finger data block (bytes) = includes header and the image data block - Finger position = fingercode according to P-FP-GID {1,2,3,4,6,7,8,9} - Count of views = '01' - View number = '01' - Finger image quality = Q_{A_i} according to QA-FP-GID {0,25,50,75,100} - Impression type = 0 (Live-scan plain) - Horizontal line length >0 - Vertical line length >0 - Reserved = 00 00
4 Examination of the finger image data	
Expected Result	- Finger image data size < 18432 bytes - Encoded as WSQ image - sf value coded in the image header unequal 0

Table 31: Test Case TC-COD-FP-GID-003

Test Case ID: TC-COD-FP-GID-004

2 Length of finger image data

Scope	
- Correct coding of the fingerprints, additional quality information and other data for the case that one fingerprint was captured	
Precondition	
- Acquisition of the fingerprint of one finger - Provision of the according biometric container including the fingerprint data	
Description	
1 Parsing of the BioAPI BIR that is returned by the capture function of the respective BSP	
Expected Result	- *Header* (mandatory) - *Biometric Data Block* – BDB (mandatory)
2 Parsing (decoding) of the Biometric Data Block containing *fp-gid*	
Expected Result	- *record* (mandatory, must occur one time) - *xinfo_fp_gid* (mandatory) - *aux* (optional)
3 Parsing of *record*	

Expected Result	- *data* (mandatory)
	  - Number of Biometric Information Template in *data* = 1
	  - BIT is encoded in Base64
	- *md5* (optional)

4 Parsing of *xinfo_fp_gid*	
Expected Result	- *moduleinfo* (mandatory) - *qa_finger* (must occur one time) - *time* (mandatory) - *note* (optional can occur arbitrarily often)

Table 32: Test Case TC-COD-FP-GID-004

Test Case ID: TC-COD-FP-GID-005
Scope
- Correct coding of the quality information and other data for the case that no fingerprint was captured
Precondition

- Acquisition process with simulation that no finger is available - Provision of the according biometric container	
Description	
1 Parsing of the BioAPI BIR that is returned by the capture function of the respective BSP	
Expected Result	- *Header* (mandatory) - *Biometric Data Block* – BDB (mandatory)
2 Parsing (decoding) of the Biometric Data Block containing *fp-gid*	
Expected Result	- *record* is not contained in *fp-gid* - *xinfo_fp_gid* (mandatory) - *aux* (optional)
3 Parsing of *xinfo_fp_gid*[3]	
Expected Result	- *moduleinfo* (mandatory) - *qa_finger* is not contained in *xinfo_fp_gid* - *time* (mandatory) - *note* (optional can occur arbitrarily often)

Table 33: Test Case TC-COD-FP-GID-005

3 Consisting of moduleinfo, time and optionally note.

Test Case ID: TC-COD-FP-GID-006	
Scope	
- Compliance to the range of values of the coding of the fingerprint images, additional quality information and other data	
Precondition	
- Acquisition of the fingerprints of two different fingers - Provision of the according biometric container including the image data	
Description	
1 Examination of the range of values of the coding or if adequate correct length of value[4]	

Expected Result	- *md5*: length of value = 128 bit
	- *moduletype*: one of the following Function Module identifiers
	  - TRBIO_ModuleType_AH
	  - TRBIO_ModuleType_AS
	  - TRBIO_ModuleType_BIP
	  - TRBIO_ModuleType_QA
	  - TRBIO_ModuleType_COM
	  - TRBIO_ModuleType_COD
	- *vendorname*: value of type string
	- *productname*: value of type string
	- *version*: value of type string
	- *firmwareversion*: value of type string
	- *qa_config*: if available value of type string
	- *comp*: if available *version* and *name* values have to be present and of type string
	- *algorithm*: if available *type*, *name* and *version* values have to be present and of type string
	- *total*: value of type boolean
	- *fc*: value of type integer
	- *id*: value of type string
	- *m, M, t, T*: if available values of type double
	- *time*: value of type dateTime
	- *note*: if available value(s) of type string

4 Note: The following range of values is defined by XML.

Table 34: Test Case TC-COD-FP-GID-006

Test Case ID: TC-COD-FP-GID-007	
Scope	
- Check of consistency of coded values	
Precondition	
- Acquisition of the fingerprints of two different fingers - Provision of the according biometric container including the image data	
Description	
1 For both elements of *record* in *fp-gid*: Examination of the values in the field *BDB Biometric Subtype* in the CBEFF Header and *finger position code* in the finger image header	
Expected Result	- For each *record*: the BDB Biometric Subtype contains the value for the same finger as the finger position code in the finger image header record
2 For both elements *record* in *fp-gid*: Examination of the *finger position code* in the finger image header and for both elements *qa_finger* in *fp-gid→xinfo_fp_gid*: Examination of the value in the field *fc*	
Expected Result	- For both finger position codes in *record* there is a corresponding fc in *qa_finger*
3 Check if the fingerprint positioned on the fingerprint sensor (as demanded in the BSP GUI) is coded with the correct value in fc within *qa_finger*	
Expected Result	- Value of fc is equal to the fingerprint positioned on the fingerprint sensor
4 Examination of relation of the range and/or tolerance if values are available	
Expected Result	- If *m, M, t,* or *T* are present the following relation holds: `m<=t<=T<=M`

Table 35: Test Case TC-COD-FP-GID-007

8.2 COD-FP-VIS

For the purpose of enrolment during the application of biometric visa TC-COD-FP-VIS-001, TC-COD-FP-VIS-004 and COD-FP-VIS-007 have to be applied. For basic identity check and a conducted verification TC-COD-FP-VIS-002, TC-COD-FP-VIS-005 and TC-COD-FP-VIS-008 have to be applied. For extended identity check and a conducted identification TC-COD-FP-VIS-003, TC-COD-FP-VIS-006 and TC-COD-FP-VIS-009 have to be applied. TC-COD-FP-VIS-010 applies for the evaluation workflow during the identity check of biometric visa.

Test Case ID: TC-COD-FP-VIS-001	
Scope	
- Correct coding of the BioAPI BIR Header for enrolment of fingerprints during the application of a biometric visa	
Precondition	
- Acquisition of all ten fingerprints of a test person. - Provision of the according biometric container including the fingerprint data.	
Description	
1 Parsing of the BioAPI BIR that is returned by the capture function of the respective BSP.	
Expected Result	- *Header* (mandatory) - *Biometric Data Block* – BDB (mandatory)
2 Parsing of the BioAPI BIR Header	
Expected Result	- Header Version = '20' - Format ID Owner ='0x004B' (Federal Office for Information Security (BSI)) - Format ID Type = “0x0003” (TR Biometrics XML-FP-Visa Application 1.0) - Purpose ='3' (BioAPI_PURPOSE_ENROLL) - Biometric Type = '0x00000008' (BioAPI_TYPE_FINGERPRINT) - BioAPI Subtype shall be available and has the following value - BioAPI_BIR_NO_SUBTYPE_AVAILABLE

Table 36: Test Case TC-COD-FP-VIS-001

Test Case ID: TC-COD-FP-VIS-002
Scope
- Correct coding of the BioAPI BIR Header for verification using fingerprints

Precondition	
- Acquisition of one fingerprint of a test person. - Provision of the according biometric container including the fingerprint data.	
Description	
1 Parsing of the BioAPI BIR that is returned by the capture function of the respective BSP.	
Expected Result	- *Header* (mandatory) - *Biometric Data Block* – BDB (mandatory)
2 Parsing of the BioAPI BIR Header	
Expected Result	- Header Version = '20' - Format ID Owner ='0x004B' (Federal Office for Information Security (BSI)) - Format ID Type = “0x0005” (TR Biometrics XML-FP-Visa Basic Identity Check 1.0) - Purpose ='1' (BioAPI_PURPOSE_VERIFY) - Biometric Type = '0x00000008' (BioAPI_TYPE_FINGERPRINT) - BioAPI Subtype shall be available and has the following value - BioAPI_BIR_NO_SUBTYPE_AVAILABLE

Table 37: Test Case TC-COD-FP-VIS-002

Test Case ID: TC-COD-FP-VIS-003	
Scope	
- Correct coding of the BioAPI BIR Header for identification using fingerprints	
Precondition	
- Acquisition of all ten fingerprints of a test person. - Provision of the according biometric container including the fingerprint data.	
Description	
1 Parsing of the BioAPI BIR that is returned by the capture function of the respective BSP.	
Expected Result	- *Header* (mandatory) - *Biometric Data Block* – BDB (mandatory)
2 Parsing of the BioAPI BIR Header	
Expected	- Header Version = '20'

Result	- Format ID Owner ='0x004B' (Federal Office for Information Security (BSI)) - Format ID Type = “0x0006” (TR Biometrics XML-FP-Visa Extended Identity Check 1.0) - Purpose ='2' (BioAPI_PURPOSE_IDENTIFY) - Biometric Type = '0x00000008' (BioAPI_TYPE_FINGERPRINT) - BioAPI Subtype shall be available and has the following value - BioAPI_BIR_NO_SUBTYPE_AVAILABLE

Table 38: Test Case TC-COD-FP-VIS-003

Test Case ID: TC-COD-FP-VIS-004	
Scope	
- Correct parsing of the XML structure fp-visa in case of enrolment during the application of biometric visa	
Precondition	
- Acquisition of all ten fingerprints of a test person. - Provision of the according biometric container including the fingerprint data.	
Description	
1 Parsing (decoding) of the Biometric Data Block containing fp-visa	
Expected Result	- *record* (mandatory) - *xinfo-fp-visa* (mandatory) - *aux* (optional)
2 Parsing of *record* Here, all elements of *record* have to be checked separately.	

Expected Result	- *data* (mandatory)
	  - Number of VIS-ANSI/NIST messages in *data* = 1
	  - VIS-ANSI/NIST message is encoded in Base64
	- *md5* (optional)
	- *purpose* (optional)
	  - only mandatory if multiple *record* elements are stored
	  - must be one value of the following enumeration:
	  - *enrolment*, *verification* or *identification*

3 Examination of check sum *md5* (if present)	

Expected Result	- Calculated MD5-Hash (data) equals value in record
4 Parsing of *xinfo-fp-visa*	
Expected Result	- *Transaction* (mandatory) - *Date* (mandatory) - *Capture* (mandatory) - *Comment* (optional) - *Test* (mandatory) - *ErrorCode* (optional) - *ORI* (mandatory) - *SoftwareType* (optional) - *DemographicData* (optional) - *aux* (optional)
5 Parsing of *Transaction*	
Expected Result	- *TransactionID* (mandatory) - *Counter* (optional) - *Counter* is not required within this TC
6 Parsing of *Capture*	
Expected Result	- Element *ExtendedCapture* is present
7 Parsing of *ExtendedCapture*	
Expected Result	- *Duration* (optional) - *CaptureCounts* (mandatory) - *CaptureSuccess* (mandatory) - *LocalQualityValue* (mandatory, can occur arbitrarily often) - *CentralQualityValue* (optional, can occur arbitrarily often) - *UniquenessCheck* (optional, can occur arbitrarily often) - *SegmentationError* (optional) - *SequenceError* (optional) - *SoftwareType* (mandatory) - *HardwareType* (mandatory) - *ContainerSize* (mandatory, can occur arbitrarily often)

	- *ErrorCode* (optional) - *aux* (optional)
8 Parsing of *CaptureCounts*	
Expected Result	- *Right* (mandatory) - *Left* (mandatory) - *Thumbs* (mandatory) - *SingleFinger* (optional)
9 Parsing of *SingleFinger (if present)*	
Expected Result	- *fp1* (optional) - *fp2* (optional) - *fp3* (optional) - *fp4* (optional) - *fp5* (optional) - *fp6* (optional) - *fp7* (optional) - *fp8* (optional) - *fp9* (optional) - *fp10* (optional)
10 Parsing *CaptureSuccess*	
Expected Result	- *Right* (mandatory) - *Left* (mandatory) - *Thumbs* (mandatory)
11 Parsing *LocalQualityValue* Here, all elements of *LocalQualityValue* have to be checked separately.	
Expected Result	- *software* (mandatory) - *OverallQualityValue* (optional) - *fp1* (optional) - *fp2* (optional) - *fp3* (optional) - *fp4* (optional) - *fp5* (optional)

	- *fp6* (optional) - *fp7* (optional) - *fp8* (optional) - *fp9* (optional) - *fp10* (optional)
12 Parsing of *software*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional) - *configuration* (optional)
13 Parsing of *configuration* (if present)	
Expected Result	- *criterion* (mandatory, can occur arbitrarily often)
14 Parsing of *criterion* Here, all elements of *criterion* have to be checked separately.	
Expected Result	- *m* (optional) - *M* (optional) - *t* (optional) - *T* (optional)
15 Parsing *CentralQualityValue* (if present) Here, all elements of *CentralQualityValue* have to be checked separately.	
Expected Result	- *software* (mandatory) - *OverallQualityValue* (optional) - *fp1* (optional) - *fp2* (optional) - *fp3* (optional) - *fp4* (optional) - *fp5* (optional) - *fp6* (optional) - *fp7* (optional) - *fp8* (optional)

	- *fp9* (optional) - *fp10* (optional)
16 Parsing of *software*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional) - *configuration* (optional)
17 Parsing of *configuration* (if present)	
Expected Result	- *criterion* (mandatory, can occur arbitrarily often)
18 Parsing of *criterion* Here, all elements of *criterion* have to be checked separately.	
Expected Result	- *m* (optional) - *M* (optional) - *t* (optional) - *T* (optional)
19 Parsing of *UniquenessCheck* (if present)	
Expected Result	- *SoftwareType* (mandatory) - *SecurityLevel* (optional) - *Unique* (mandatory) - *Duplicates* (optional)
20 Parsing of *SoftwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional) - *configuration* (optional)
21 Parsing of *configuration*	
Expected Result	- *criterion* (mandatory, can occur arbitrarily often)

22 Parsing of *criterion* Here, all elements of *criterion* have to be checked separately.	
Expected Result	- *m* (optional) - *M* (optional) - *t* (optional) - *T* (optional)
23 Parsing of *Duplicates (*if present)	
Expected Result	- *DuplicateFingerCandidate* (mandatory, can occur two times or up to ten times) - *Duplicate* (mandatory, can occur one to forty-five times)
24 Parsing of *Duplicate* Here, all elements of *Duplicate* have to be checked separately.	
	- *FingerCode* (mandatory, must occur two times)
25 Parsing of *SoftwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional)
26 Parsing of *HardwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *firmwareversion* (optional) - *note* (optional)
27 Parsing of *SoftwareType* (if present)	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional)
28 Parsing of *DemographicData* (if present)	

Expected Result	- *Gender* (mandatory) - *AgeClass* (mandatory) - *Nationality* (optional)

Table 39: Test Case TC-COD-FP-VIS-004

Test Case ID: TC-COD-FP-VIS-005	
Scope	
- Correct parsing of the XML structure fp-visa in case of basic identity check and a conducted verification	
Precondition	
- Acquisition of all necessary fingerprints and all other data as specified in P-FP-VBIC (full process of basic identity check performed) - Provision of the according biometric container including the fingerprint data. - Conducted biometric verification without errors returned by the EU-VIS BMS	
Description	
1 Parsing (decoding) of the Biometric Data Block containing fp-visa	
Expected Result	- *record* (mandatory) - *xinfo-fp-visa* (mandatory) - *aux* (optional)
2 Parsing of *record* Here, all elements of *record* have to be checked separately.	

Expected Result	- *data* (mandatory)
	  - Number of VIS-ANSI/NIST messages in *data* = 1
	  - VIS-ANSI/NIST message is encoded in Base64
	- *md5* (optional)
	- *purpose* (optional)
	  - only mandatory if multiple *record* elements are stored
	  - must be one value of the following enumeration:
	  - *enrolment*, *verification* or *identification*

3 Examination of check sum *md5* (if present)	
Expected Result	- Calculated MD5-Hash (data) equals value in record

4 Parsing of *xinfo-fp-visa*	
Expected Result	- *Transaction* (mandatory) - *Date* (mandatory) - *Capture* (mandatory) - *Verification* (optional, but must be present within this TC) - *Comment* (optional) - *Test* (mandatory) - *ErrorCode* (optional) - *ORI* (mandatory) - *SoftwareType* (optional) - *DemographicData* (optional) - *aux* (optional)
5 Parsing of *Transaction*	
Expected Result	- *TransactionID* (mandatory) - *Counter* (optional) - *Counter* shall be set to 1 for the first try
6 Parsing of *Capture*	
Expected Result	- Element *BasicCapture* is present
7 Parsing of *BasicCapture*	
Expected Result	- *Duration* (optional) - *CapturedFingers* (mandatory) - *SoftwareType* (mandatory) - *HardwareType* (mandatory) - *ContainerSize* (mandatory, can occur arbitrarily often) - *ErrorCode* (optional) - *aux* (optional)
8 Parsing of *CapturedFingers*	

Expected Result	- *FingerCode* (mandatory)
	  - exactly one element must be available for every captured finger during the acquisition process
	  - value must be between 1 and 10

9 Parsing of *SoftwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional)
10 Parsing of *HardwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *firmwareversion* (optional) - *note* (optional)
11 Parsing of *Verification*	

Expected Result	- *Duration* (optional)
	- *VerificationResult* (optional)
	  - must be present within this TC
	  - must have one of the following values: *true*, *false* (depending on the verification result)
	- *ErrorCode* (optional)
	- aux (optional)

12 Parsing of *SoftwareType* (if present)	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional)
13 Parsing of *DemographicData* (if present)	
Expected Result	- *Gender* (mandatory) - *AgeClass* (mandatory) - *Nationality* (optional)

Table 40: Test Case TC-COD-FP-VIS-005

Test Case ID: TC-COD-FP-VIS-006
Scope

- Correct parsing of the XML structure fp-visa in case of extended identity check and a conducted identification	
Precondition	
- Acquisition of all necessary fingerprints and all other data as specified in P-FP-VEIC (full process of extended identity check performed) - Provision of the according biometric container including the fingerprint data. - Conducted biometric identification without errors returned by the EU-VIS BMS	
Description	
1 Parsing (decoding) of the Biometric Data Block containing fp-visa	
Expected Result	- *record* (mandatory) - *xinfo-fp-visa* (mandatory) - *aux* (optional)
2 Parsing of *record* Here, all elements of *record* have to be checked separately.	

Expected Result	- *data* (mandatory)
	  - Number of VIS-ANSI/NIST messages in *data* = 1
	  - VIS-ANSI/NIST message is encoded in Base64
	- *md5* (optional)
	- *purpose* (optional)
	  - only mandatory if multiple *record* elements are stored
	  - must be one value of the following enumeration:
	  - *enrolment*, *verification* or *identification*

3 Examination of check sum *md5* (if present)	
Expected Result	- Calculated MD5-Hash (data) equals value in record
4 Parsing of *xinfo-fp-visa*	
Expected Result	- *Transaction* (mandatory) - *Date* (mandatory) - *Capture* (mandatory) - *Identification* (optional, but must be present within this TC) - *Comment* (optional)

	- *Test* (mandatory) - *ErrorCode* (optional) - *ORI* (mandatory) - *SoftwareType* (optional) - *DemographicData* (optional) - *aux* (optional)
5 Parsing of *Transaction*	
Expected Result	- *TransactionID* (mandatory) - *Counter* (optional) - *Counter* shall be set to 1 for the first try
6 Parsing of *Capture*	
Expected Result	- Element *ExtendedCapture* is present
7 Parsing of *ExtendedCapture*	
Expected Result	- *Duration* (optional) - *CaptureCounts* (mandatory) - *CaptureSuccess* (mandatory) - *LocalQualityValue* (mandatory, can occur arbitrarily often) - *CentralQualityValue* (optional, can occur arbitrarily often) - *UniquenessCheck* (optional, can occur arbitrarily often) - *SegmentationError* (optional) - *SequenceError* (optional) - *SoftwareType* (mandatory) - *HardwareType* (mandatory) - *ContainerSize* (mandatory, can occur arbitrarily often) - *ErrorCode* (optional) - *aux* (optional)
8 Parsing of *CaptureCounts*	
Expected Result	- *Right* (mandatory) - *Left* (mandatory) - *Thumbs* (mandatory) - *SingleFinger* (optional)

9 Parsing of *SingleFinger* (if present)	
Expected Result	- *fp1* (optional) - *fp2* (optional) - *fp3* (optional) - *fp4* (optional) - *fp5* (optional) - *fp6* (optional) - *fp7* (optional) - *fp8* (optional) - *fp9* (optional) - *fp10* (optional)
10 Parsing *CaptureSuccess*	
Expected Result	- *Right* (mandatory) - *Left* (mandatory) - *Thumbs* (mandatory)
11 Parsing *LocalQualityValue* Here, all elements of *LocalQualityValue* have to be checked separately.	
Expected Result	- *software* (mandatory) - *OverallQualityValue* (optional) - *fp1* (optional) - *fp2* (optional) - *fp3* (optional) - *fp4* (optional) - *fp5* (optional) - *fp6* (optional) - *fp7* (optional) - *fp8* (optional) - *fp9* (optional) - *fp10* (optional)
12 Parsing of *software*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory)

	- *version* (mandatory) - *note* (optional) - *configuration* (optional)
13 Parsing of *configuration* (if present)	
Expected Result	- *criterion* (mandatory, can occur arbitrarily often)
14 Parsing of *criterion* Here, all elements of *criterion* have to be checked separately.	
Expected Result	- *m* (optional) - *M* (optional) - *t* (optional) - *T* (optional)
15 Parsing *CentralQualityValue* (if present) Here, all elements of *CentralQualityValue* have to be checked separately.	
Expected Result	- *software* (mandatory) - *OverallQualityValue* (optional) - *fp1* (optional) - *fp2* (optional) - *fp3* (optional) - *fp4* (optional) - *fp5* (optional) - *fp6* (optional) - *fp7* (optional) - *fp8* (optional) - *fp9* (optional) - *fp10* (optional)
16 Parsing of *software*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional) - *configuration* (optional)

17 Parsing of *configuration* (if present)	
Expected Result	- *criterion* (mandatory, can occur arbitrarily often)
18 Parsing of *criterion* Here, all elements of *criterion* have to be checked separately.	
Expected Result	- *m* (optional) - *M* (optional) - *t* (optional) - *T* (optional)
19 Parsing of *UniquenessCheck* (if present)	
Expected Result	- *SoftwareType* (mandatory) - *SecurityLevel* (optional) - *Unique* (mandatory) - *Duplicates* (optional)
20 Parsing of *SoftwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional) - *configuration* (optional)
21 Parsing of *configuration*	
Expected Result	- *criterion* (mandatory, can occur arbitrarily often)
22 Parsing of *criterion* Here, all elements of *criterion* have to be checked separately.	
Expected Result	- *m* (optional) - *M* (optional) - *t* (optional) - *T* (optional)
23 Parsing of *Duplicates (*if present)	
Expected	- *DuplicateFingerCandidate* (mandatory, can occur two times or up to ten

Result	times) *or* - *Duplicate* (mandatory, can occur one to forty-five times)
24 Parsing of *Duplicate* Here, all elements of *Duplicate* have to be checked separately.	
	- *FingerCode* (mandatory, must occur two times)
25 Parsing of *SoftwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional)
26 Parsing of *HardwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *firmwareversion* (optional) - *note* (optional)
27 Parsing of *Identification*	
Expected Result	- *Duration* (optional) - *IdentificationPossible* (mandatory) - *NumberOfCandidates* (optional) - *IdentificationResult* (optional) - *ErrorCode* (optional) - *aux* (optional)
28 Parsing of *SoftwareType* (if present)	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional)
29 Parsing of *DemographicData* (if present)	

Expected Result	- *Gender* (mandatory) - *AgeClass* (mandatory) - *Nationality* (optional)

Table 41: Test Case TC-COD-FP-VIS-006

Test Case ID: TC-COD-FP-VIS-007	
Scope	
- Correct coding of the ANSI/NIST-ITL container for enrolment during the application of biometric visa	
Precondition	
- Acquisition of the fingerprints of all available fingers - Provision of the according biometric container including the fingerprint data - A necessary test resource: WSQ En-/Decoder	
Description	
1 Decoding of the ANSI/NIST-ITL container	
Expected Result	- One Type-1 record exists - One Type-2 record exists - One Type-4 record for every finger exists
2 Decoding and parsing of the Type-1 record	
Expected Result	- Field 1.001 Logical Record Length exists - Field 1.002 Version Number exists and is set to “0300” - Field 1.003 File Content exists and has the required format according to the available fields in the ANSI/NIST container - Field 1.004 Type of Transaction exists and is set to “ATP” - Field 1.005 Date of Transaction exists and has the proper format - Field 1.007 Destination Agency Identifier exists and is set to “BMS-VIS” - Field 1.008 Originating Agency Identifier (ORI) exists - Field 1.008 ORI has format “XX/Agency” where XX is a valid 2-letter country code according to Table 2 of the VIS-NIST Description and Agency is a alphanumerical text - Field 1.009 Transaction Control Number exists and is set to “0000000000Z” - Field 1.011 Native Scanning Resolution exists and is set to “19.68” - Field 1.012 Nominal Transmitting Resolution exists and is set to “19.68”

	- Field 1.013 Domain Name exists and is set to “INT-I<US>4.22<GS>” - Field 1.014 Greenwich Mean Time exists and has the proper format
3 Decoding and parsing of the Type-2 record	
Expected Result	- Field 2.001 Logical Record Length exists - Field 2.002 Image Designation Character exists and is set to any numerical value between 0 and 22 - Field 2.003 System Information exists and is set to “0422” - Field 2.004 Date of Record exists and has the proper format - Field 2.012 External ID (MN1) exists and has appropriate format starting with the 2-letter country code according to Table 2 of the VIS-NIST Description, followed by 27 zero's (e.g. DE00000000000000000000000000) - Field 2.014 Implementation Scenario ID (MN3) exists and is set to “01” - Field 2.019 Date Fingerprinted exists and has the proper format (optional) - Field 2.083 Finger Present exists and has appropriate format if handicaps are available (XX = amputation, UP = unable to print, ISO finger codes). Only needs to be present if fingers are missing in the container. See VIS-NIST Description for detailed syntax of this field.
4 Decoding and parsing of every Type-4 record available	
Expected Result	- Field 4.001 Logical Record Length exists - Field 4.002 Image Designation Character exists and has a numerical value between 1 and 14 - Field 4.003 Impression Type exists and has one of its allowed values (0 - 9) - Field 4.004 Finger Position exists and has one of its allowed ISO finger position codes (1 - 14) - Field 4.005 Image Scanning Resolution exists and is set to “0” describing a resolution of exactly 500 ppi - Field 4.006 Horizontal Line Length exists and its value is between 400 and 900 pixels for single finger images, between 1120 and 1600 pixels for a four finger slap and between 400 and 880 pixels for a thumb slap - Field 4.007 Vertical Line Length exists and its value is between 400 and 800 pixels for single finger images, between 860 and 1480 pixels for a four finger slap and between 400 and 880 pixels for a thumb slap - Field 4.008 Gray-Scale Compression Algorithm exists and is set to “1” describing WSQ compression - Field 4.009 The Image exists and contains the WSQ compressed fingerprint image - The WSQ compressed fingerprint image from Field 4.009 can be decoded

	properly and has a valid WSQ header

Table 42: Test Case TC-COD-FP-VIS-007

Test Case ID: TC-COD-FP-VIS-008	
Scope	
- Correct coding of the ANSI/NIST-ITL container for verification	
Precondition	
- Acquisition of the fingerprints of all necessary fingers for verification - Provision of the according biometric container including the fingerprint data for verification - As necessary test resource: WSQ En-/Decoder	
Description	
1 Decoding of the ANSI/NIST-ITL container	
Expected Result	- One Type-1 record exists - One Type-2 record exists - One Type-4 record for every captured finger exists
2 Decoding and parsing of the Type-1 record	
Expected Result	- Field 1.001 Logical Record Length exists - Field 1.002 Version Number exists and is set to “0300” - Field 1.003 File Content exists and has the required format according to the available fields in the ANSI/NIST-ITL container - Field 1.004 Type of Transaction exists and is set to “AVT” - Field 1.005 Date of Transaction exists and has the proper format - Field 1.007 Destination Agency Identifier exists and is set to “BMS-VIS” - Field 1.008 Originating Agency Identifier (ORI) exists - Field 1.008 ORI has format “XX/Agency” where XX is a valid 2-letter country code according to Table 2 of the VIS-NIST Description and Agency is a alphanumerical text - Field 1.009 Transaction Control Number exists and is set to “0000000000Z” - Field 1.011 Native Scanning Resolution exists and is set to “19.68” - Field 1.012 Nominal Transmitting Resolution exists and is set to “19.68” - Field 1.013 Domain Name exists and is set to “INT-I<US>4.22<GS>” - Field 1.014 Greenwich Mean Time exists and has the proper format

3 Decoding and parsing of the Type-2 record	
Expected Result	- Field 2.001 Logical Record Length exists - Field 2.002 Image Designation Character exists and is set to any numerical value between 0 and 22 - Field 2.003 System Information exists and is set to “0422” - Field 2.004 Date of Record exists and has the proper format - Field 2.083 Finger Present exists and has appropriate format if handicaps are available (XX = amputation, UP = unable to print, ISO finger codes). Only needs to be present if fingers are missing in the container. See VIS-NIST Description for detailed syntax of this field. - optional Field 2.203 Repetitive Verification Flag may be available - if available the value has to be set to 0 or 1
4 Decoding and parsing of every Type-4 record available	
Expected Result	- Field 4.001 Logical Record Length exists - Field 4.002 Image Designation Character exists and has a numerical value between 1 and 14 - Field 4.003 Impression Type exists and has one of its allowed values (0 - 9) - Field 4.004 Finger Position exists and has one of its allowed ISO finger position codes (1 - 14) - Field 4.005 Image Scanning Resolution exists and is set to “0” describing a resolution of exactly 500 ppi - Field 4.006 Horizontal Line Length exists and its value is between 400 and 900 pixels for single finger images, between 1120 and 1600 pixels for a four finger slap and between 400 and 880 pixels for a thumb slap - Field 4.007 Vertical Line Length exists and its value is between 400 and 800 pixels for single finger images, between 860 and 1480 pixels for a four finger slap and between 400 and 880 pixels for a thumb slap - Field 4.008 Gray-Scale Compression Algorithm exists and is set to “1” describing WSQ compression - Field 4.009 The Image exists and contains the WSQ compressed fingerprint image - The WSQ compressed fingerprint image from Field 4.009 can be decoded properly and has a valid WSQ header

Table 43: Test Case TC-COD-FP-VIS-008

Test Case ID: TC-COD-FP-VIS-009
Scope

- Correct coding of the ANSI/NIST-ITL container for identification	
Precondition	
- Acquisition of the fingerprints of all available fingers - Provision of the according biometric container including the fingerprint data for identification - As necessary test resource: WSQ En-/Decoder	
Description	
1 Decoding of the ANSI/NIST-ITL container	
Expected Result	- One Type-1 record exists - One Type-2 record exists - One Type-4 record for every captured finger exists
2 Decoding and parsing of the Type-1 record	
Expected Result	- Field 1.001 Logical Record Length exists - Field 1.002 Version Number exists and is set to “0300” - Field 1.003 File Content exists and has the required format according to the available fields in the ANSI/NIST-ITL container - Field 1.004 Type of Transaction exists and is set to “NPS” - Field 1.005 Date of Transaction exists and has the proper format - Field 1.007 Destination Agency Identifier exists and is set to “BMS-VIS” - Field 1.008 Originating Agency Identifier (ORI) exists - Field 1.008 ORI has format “XX/Agency” where XX is a valid 2-letter country code according to Table 2 of the VIS-NIST Description and Agency is a alphanumerical text - Field 1.009 Transaction Control Number exists and is set to “0000000000Z” - Field 1.011 Native Scanning Resolution exists and is set to “19.68” - Field 1.012 Nominal Transmitting Resolution exists and is set to “19.68” - Field 1.013 Domain Name exists and is set to “INT-I<US>4.22<GS>” - Field 1.014 Greenwich Mean Time exists and has the proper format
3 Decoding and parsing of the Type-2 record	
Expected Result	- Field 2.001 Logical Record Length exists - Field 2.002 Image Designation Character exists and is set to any numerical value between 0 and 22 - Field 2.003 System Information exists and is set to “0422”

	- Field 2.004 Date of Record exists and has the proper format - Field 2.083 Finger Present exists and has appropriate format if handicaps are available (XX = amputation, UP = unable to print, ISO finger codes). Only needs to be present if fingers are missing in the container. See VIS-NIST Description for detailed syntax of this field.
4 Decoding and parsing of every Type-4 record available	
Expected Result	- Field 4.001 Logical Record Length exists - Field 4.002 Image Designation Character exists and has a numerical value between 1 and 14 - Field 4.003 Impression Type exists and has one of its allowed values (0 - 9) - Field 4.004 Finger Position exists and has one of its allowed ISO finger position codes (1 - 14) - Field 4.005 Image Scanning Resolution exists and is set to “0” describing a resolution of exactly 500 ppi - Field 4.006 Horizontal Line Length exists and its value is between 400 and 900 pixels for single finger images, between 1120 and 1600 pixels for a four finger slap and between 400 and 880 pixels for a thumb slap - Field 4.007 Vertical Line Length exists and its value is between 400 and 800 pixels for single finger images, between 860 and 1480 pixels for a four finger slap and between 400 and 880 pixels for a thumb slap - Field 4.008 Gray-Scale Compression Algorithm exists and is set to “1” describing WSQ compression - Field 4.009 The Image exists and contains the WSQ compressed fingerprint image - The WSQ compressed fingerprint image from Field 4.009 can be decoded properly and has a valid WSQ header

Table 44: Test Case TC-COD-FP-VIS-009

Test Case ID: TC-COD-FP-VIS-010
Scope
- Correct parsing of the XML structure fp-visa-eval as result of the evaluation workflow
Precondition
- Acquisition of all necessary fingerprints and all other data as specified in P-FP-VBIC or P-FP-VEIC (full process of basic or extended identity check performed) - Conducted biometric verification without errors returned by the BMS-VIS
Description

1 Parsing (decoding) of the XML containing *fp-visa-eval*	
Expected Result	- *Transaction* (mandatory) - *Date* (mandatory) - *QualityAssurance* (mandatory, can occur arbitrarily often) - *Comment* (optional) - *Test* (mandatory) - *ErrorCode* (optional) - *aux* (optional)
2 Parsing of *Transaction*	
Expected Result	- *TransactionID* (mandatory) - *Counter* (mandatory) - *Counter* shall be set to 1 for the first try
3 Parsing of *QualityAssurance* Here, all elements of *QualityAssurance* have to be checked separately.	
Expected Result	- *Duration* (optional) - *SoftwareType* (mandatory) - *QualityResult* (optional, but required within this TC, can occur arbitrarily often) - *ErrorCode* (optional) - *aux* (optional)
4 Parsing of *SoftwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional) - *configuration* (optional)
5 Parsing of *configuration* (if present)	
Expected Result	- *criterion* (mandatory, can occur arbitrarily often)
6 Parsing of *criterion* *Here, all elements of criterion have to be checked separately.*	

Expected Result	- *m* (optional) - *M* (optional) - *t* (optional) - *T* (optional)
7 Parsing of *QualityResult*	
Expected Result	- *OverallQualityValue* (optional) - *qa* (mandatory, can occur from 1 to 10 times) - each element has attribute *fc*

Table 45: Test Case TC-COD-FP-VIS-010

8.3 COD-PH-GID

Correct coding of the facial image, additional quality information and other data

Test Case ID: TC-COD-PH-GID-001	
Scope	
- Correct coding of the BioAPI BIR Header	
Precondition	
- Scanning of application form or capturing of the facial image and provision of a selected single image - Provision of the according biometric container including the image data	
Description	
1 Parsing of the BioAPI BIR that is returned by the capture function of the respective BSP	
Expected Result	- *Header* (mandatory) - *Biometric Data Block* – BDB (mandatory)
2 Parsing of the BioAPI BIR Header	

Expected Result	- Header Version = '20' - Format ID Owner = '0x004B' (Federal Office for Information Security (BSI)) - Format ID Type = '0x0001' (TR Biometrics XML-Face 1.0) - Purpose = '3' (BioAPI_PURPOSE_ENROLL) or '4' (BioAPI_PURPOSE_ENROLL_FOR_VERIFICATION_ONLY) - Biometric Type = '0x00000002' (BioAPI_TYPE_FACIAL_FEATURES) - BioAPI Subtype shall be available and has the following value - BioAPI_BIR_NO_SUBTYPE_AVAILABLE

Table 46: Test Case TC-COD-PH-GID-001

Test Case ID: TC-COD-PH-GID-002	
Scope	
- Correct parsing of the XML structure ph-gid	
Precondition	
- Scanning of application form or capturing of the facial image and provision of a selected single image - Provision of the according biometric container including the image data	
Description	
1 Parsing (decoding) of the Biometric Data Block containing *ph-gid*	
Expected Result	- *record* (mandatory) - *xinfo-ph-gid* (mandatory) - *aux* (optional)
2 Parsing of *record*	

Expected Result	- *data* (mandatory)
	  - Number of Biometric Information Template in *data* = 1
	  - BIT is encoded in Base64
	- *md5* (optional)

3 Examination of check sum *md5* (if present)	
Expected Result	- Calculated MD5-Hash(*data*) equal value in *record*
4 Parsing of *xinfo-ph-gid*	

Expected Result	- *moduleinfo* (mandatory, can occur arbitrarily often) - *qa_face* (optional) - *time* (mandatory) - *note* (optional, can occur arbitrarily often)
5 Parsing of *moduleinfo* Here, all elements of *moduleinfo* have to be checked separately.	
Expected Result	- *moduletype* (mandatory) - *vendorinfo* (mandatory) - *comp* (optional, can occur arbitrarily often) - *algorithm* (optional, can occur arbitrarily often)
6 Parsing of *vendorinfo*	
Expected Result	- *vendorname* (mandatory) - *productname* (mandatory) - *version* (mandatory) - *firmwareversion* (optional) - *qa_config* (optional) - *aux* (optional)
7 Parsing of *comp* Here, all elements of *comp* have to be checked separately.	
	- *name* (mandatory) - *version* (mandatory)
8 Parsing of *algorithm* Here, all elements of *algorithm* have to be checked separately.	
Expected Result	- *type* (mandatory) - *name* (mandatory) - *version* (mandatory)
9 Parsing of *qa_face*	
Expected Result	- *total* (mandatory) - *qa* (mandatory, can occur once or arbitrarily)
10 Parsing of *qa* Here, all elements of *qa* have to be checked separately.	

Expected Result	- id (mandatory) - m (optional) - M (optional) - t (optional) - T (optional)
11 Parsing of *time* (mandatory)	
Expected Result	- available
12 Parsing of *note* (optional) Here, all elements of *note* have to be checked separately.	
Expected Result	- Can occur zero or arbitrarily often

Table 47: Test Case TC-COD-PH-GID-002

Test Case ID: TC-COD-PH-GID-003	
Scope	
- Correct coding of the CBEFF container	
Precondition	
- Scanning of application form or capturing of the facial image and provision of a selected single image - Provision of the according biometric container including the image data - Determination of width and height of the image data	
Description	
1 Decoding of the CBEFF Header, BHT (XML element <data>) for the facial image	
Expected Result	- CBEFF Patron Header Version = '0101' - BDB Biometric Type: value = '02' (Facial Features) - BDB Format Owner: value = '0x0101' (ISO/IEC JTC 1 SC 37-Biometrics) - BDB Format Type: value = '0x0008' (ISO/IEC JTC 1 SC 37-Biometrics)
2 Further decoding of data: BDB data	
Expected Result	- Facial Record Header - Format Identifier = 0x46414300

	- Version Number = 0x30313000 - Length of Record = 20 bytes + size of Facial Record Data Length - Number of Facial Images = 1 - Facial Record Data - Facial Information - Facial Record Data Length = 32 bytes + size of Image Data Block (+ size of Feature Point blocks) - Number of Feature Points ≥ 0 - Image Information - Face Image Type = 0x01 - Image Data Type = 0x01 - Width = determined width of input image - Height = determined height of input image - Image Data - JPEG2000

Table 48: Test Case TC-COD-PH-GID-003

Test Case ID: TC-COD-PH-GID-004	
Scope	
- Compliance to the range of values of the coding of the facial image, additional quality information and other data	
Precondition	
- Scanning of application form or capturing of the facial image and provision of a selected single image - Provision of the according biometric container including the image data	
Description	
1 Examination of the range of values of the coding or if adequate correct length of value[5]	
Expected Result	- *md5*: length of value = 128 bit - *moduletype*: one of the following Function Module identifiers - TRBIO_ModuleType_AH - TRBIO_ModuleType_AS - TRBIO_ModuleType_BIP

5 Note: The following range of values is defined by XML.

	- TRBIO_ModuleType_QA - TRBIO_ModuleType_COM - TRBIO_ModuleType_COD - *vendorname*: value of type string - *productname*: value of type string - *version*: value of type string - *firmwareversion*: value of type string - *qa_config*: if available value of type string - *comp*: if available *version* and *name* values have to be present and of type string - *algorithm*: if available *type*, *name* and *version* values have to be present and of type string - *total*: value of type boolean - *id*: value of type string - *m, M, t, T*: if available values of type double - *time*: value of type dateTime - *note*: if available value(s) of type string

Table 49: Test Case TC-COD-PH-GID-004

Test Case ID: TC-COD-PH-GID-005	
Scope	
- Check of consistency of coded values	
Precondition	
- Scanning of application form or capturing of the facial image and provision of a selected single image - Provision of the according biometric container including the image data	
Description	
1 Examination of relation of the range and/or tolerance if values are available	
Expected Result	- If *m, M, t,* or *T* are present the following relation has to be valid: `m<=t<=T<=M`

Table 50: Test Case TC-COD-PH-GID-005

8.4 COD-PH-VAPP

Correct coding of the facial image, additional quality information and other data

Test Case ID: TC-COD-PH-VAPP-001	
Scope	
- Correct coding of the BioAPI BIR Header	
Precondition	
- Scanning of application form or capturing of the facial image and provision of a selected single image - Provision of the according biometric container including the image data	
Description	
1 Parsing of the BioAPI BIR that is returned by the capture function of the respective BSP	
Expected Result	- *Header* (mandatory) - *Biometric Data Block* – BDB (mandatory)
2 Parsing of the BioAPI BIR Header	
Expected Result	- Header Version = '20' - Format ID Owner = '0x004B' (Federal Office for Information Security (BSI)) - Format ID Type = '0x0004' (TR Biometrics XML-PH-Visa Application 1.0) - Purpose = '3' (BioAPI_PURPOSE_ENROLL) - Biometric Type = '0x00000002' (BioAPI_TYPE_FACIAL_FEATURES) - BioAPI Subtype shall be available and has the following value - BioAPI_BIR_NO_SUBTYPE_AVAILABLE

Table 51: Test Case TC-COD-PH-VAPP-001

Test Case ID: TC-COD-PH-VAPP-002
Scope
- Correct parsing of the XML structure ph-visa
Precondition
- Scanning of application form or capturing of the facial image and provision of a selected single image - Provision of the according biometric container including the image data

Description	
1 Parsing (decoding) of the Biometric Data Block containing *ph-visa*	
Expected Result	- *record* (mandatory) - *xinfo-ph-visa* (mandatory) - *aux* (optional)
2 Parsing of *record*	
Expected Result	- *data* (mandatory) - Face image encoded in Base64 - *md5* (optional)
3 Examination of check sum *md5* (if present)	
Expected Result	- Calculated MD5-Hash(*data*) equals value in *record*
4 Parsing of *xinfo-ph-visa*	
Expected Result	- *Transaction* (mandatory) - *Date* (mandatory) - *Duration* (optional) - *moduleinfo* (mandatory, can occur arbitrarily often) - *qa_face* (optional) - *note* (optional, can occur arbitrarily often) - *Test* (mandatory) - *ErrorCode* (optional) - *ORI* (mandatory) - *ImageFormat* (mandatory)
5 Parsing of *Transaction*	
Expected Result	- *TransactionID* (mandatory) - *Counter* (optional) - *Counter* is not required within this TC
6 Parsing of *moduleinfo* Here, all elements of *moduleinfo* have to be checked separately.	

Expected Result	- *moduletype* (mandatory) - *vendorinfo* (mandatory) - *comp* (optional, can occur arbitrarily often) - *algorithm* (optional, can occur arbitrarily often)
7 Parsing of *vendorinfo*	
Expected Result	- *vendorname* (mandatory) - *productname* (mandatory) - *version* (mandatory) - *firmwareversion* (optional) - *qa_config* (optional) - *aux* (optional)
8 Parsing of *comp* Here, all elements of *comp* have to be checked separately.	
	- *name* (mandatory) - *version* (mandatory)
9 Parsing of *algorithm* Here, all elements of *algorithm* have to be checked separately.	
Expected Result	- *type* (mandatory) - *name* (mandatory) - *version* (mandatory)
10 Parsing of *qa_face*	
Expected Result	- *total* (mandatory) - *qa* (mandatory, can occur once or arbitrarily)
11 Parsing of *qa* Here, all elements of *qa* have to be checked separately.	
Expected Result	- id (mandatory) - m (optional) - M (optional) - t (optional) - T (optional)

Table 52: Test Case TC-COD-PH-VAPP-002

Test Case ID: TC-COD-PH-VAPP-003

Scope
- Compliance to the range of values of the coding of the facial image, additional quality information and other data
Precondition
- Scanning of application form or capturing of the facial image and provision of a selected single image - Provision of the according biometric container including the image data
Description
1 Examination of the range of values of the coding or if adequate correct length of value[6]
Expected Result

- *md5*: length of value = 128 bit
- *Date*: value of type date
- *Duration*: if available value of type duration
- *moduletype*: one of the following Function Module identifiers
  - TRBIO_ModuleType_AH
  - TRBIO_ModuleType_AS
  - TRBIO_ModuleType_BIP
  - TRBIO_ModuleType_QA
  - TRBIO_ModuleType_COM
  - TRBIO_ModuleType_COD
- *vendorname*: value of type string
- *productname*: value of type string
- *version*: value of type string
- *firmwareversion*: value of type string
- *qa_config*: if available value of type string
- *comp*: if available *version* and *name* values have to be present and of type string
- *algorithm*: if available *type*, *name* and *version* values have to be present and of type string
- *total*: value of type boolean
- *id*: value of type string
- *m, M, t, T*: if available values of type double
- *note*: if available value(s) of type string

6 Note: The following range of values is defined by XML.

	- *Test*: value of type boolean - *ErrorCode*: if available value of type integer - *ORI*: value of type string - *ImageFormat*: either *jpeg* or *jpeg2000*

Table 53: Test Case TC-COD-PH-VAPP-003

Test Case ID: TC-COD-PH-VAPP-004	
Scope	
- Check of consistency of coded values	
Precondition	
- Scanning of application form or capturing of the facial image and provision of a selected single image - Provision of the according biometric container including the image data	
Description	
1 Examination of relation of the range and/or tolerance if values are available	
Expected Result	- If *m, M, t,* or *T* are present the following relation has to be valid: `m<=t<=T<=M`

Table 54: Test Case TC-COD-PH-VAPP-004

8.5 COD-PH-VID

Test Case ID: TC-COD-PH-VID-001	
Scope	
- Correct parsing of the XML structure ph-vid-verify	
Precondition	
- Acquisition of the face image and all other data as specified in the verification workflow of P-PH-VID - Conducted biometric verification without errors	
Description	
1 Parsing (decoding) of the XML containing *ph-vid-verify*	
Expected	- *Transaction* (mandatory)

Result	- *Date* (mandatory) - *Capture* (mandatory) - *Verification* (mandatory) - *SoftwareType* (mandatory, may occur arbitrarily often) - *ReferenceImage* (mandatory) - *DocumentInformation* (mandatory) - *DemographicData* (optional) - *Comment* (optional) - *ErrorCode* (optional) - *aux* (optional)
2 Parsing of *Transaction*	
Expected Result	- *TransactionID* (mandatory) - *Counter* (mandatory) - *Counter* shall be set to 1 for the first try
3 Parsing of *Capture*	
Expected Result	- *Duration* (optional) - *SoftwareType* (mandatory) - *HardwareType* (mandatory) - *ErrorCode* (optional) - *aux* (optional)
4 Parsing of *SoftwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional)
5 Parsing of *HardwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *firmwareversion* (optional) - *note* (optional)

6 Parsing of *Verification*	
Expected Result	- *Duration* (optional) - *SoftwareType* (mandatory) - *Threshold* (mandatory) - *GenuineComparison* (required within this TC) - *ErrorCode* (optional) - *aux* (optional)
7 Parsing of *SoftwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional)
8 Parsing of *GenuineComparison*	
Expected Result	- *ComparisonScore* (mandatory) - *ComparisonResult* (mandatory)
9 Parsing of *SoftwareType* *Here, all elements of SoftwareType have to be checked separately.*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional)
10 Parsing of *ReferenceImage*	
Expected Result	- *ImageType* (mandatory) - *ImageFormat* (mandatory)
11 Parsing of *DocumentInformation*	
Expected Result	- *DocumentType* (mandatory) - *IssuingState* (mandatory)
12 Parsing of *DemographicData (if present)*	
Expected Result	- *Gender* (mandatory) - *AgeClass* (mandatory)

	- *Nationality* (optional)

Table 55: Test Case TC-COD-PH-VID-001

Test Case ID: TC-COD-PH-VID-002	
Scope	
- Correct parsing of the XML structure ph-vid-eval	
Precondition	
- Acquisition of the face image and all other data as specified in the evaluation workflow of P-PH-VID - Conducted biometric verification without errors	
Description	
1 Parsing (decoding) of the XML containing *ph-vid-eval*	
Expected Result	- *Transaction* (mandatory) - *QualityAssurance* (mandatory, may occur arbitrarily often) - *CrossComparison* (mandatory, may occur arbitrarily often) - *Comment* (optional) - *ErrorCode* (optional) - *aux* (optional)
2 Parsing of *Transaction*	
Expected Result	- *TransactionID* (mandatory) - *Counter* (mandatory) - *Counter* shall be set to 1 for the first try
3 Parsing of *QualityAssurance* *Here, all elements of QualityAssurance have to be checked separately.*	
Expected Result	- *Duration* (optional) - *SoftwareType* (mandatory) - *QualityResult* (required in this TC, may occur arbitrarily often) - *ErrorCode* (optional) - *aux* (optional)
4 Parsing of *SoftwareType*	

Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional) - *configuration* (optional)
5 Parsing of *configuration* (if present)	
Expected Result	- *criterion* (mandatory, can occur arbitrarily often)
6 Parsing of *criterion* *Here, all elements of criterion have to be checked separately.*	
Expected Result	- *m* (optional) - *M* (optional) - *t* (optional) - *T* (optional)
7 Parsing of *QualityResult*	
Expected Result	- *ImageSource* (mandatory) - attribute *total* (mandatory) - *qa* (mandatory, may occur arbitrarily often)
8 Parsing of *qa*	

Expected Result	- has following attributes
	  - *id* (mandatory)
	  - *m* (optional)
	  - *M* (optional)
	  - *t* (optional)
	  - *T* (optional)

9 Parsing of *CrossComparison*	
Expected Result	- *Duration* (optional) - *SoftwareType* (mandatory) - *Threshold* (mandatory) - *GenuineComparison* (required within this TC) - *ImpostorComparison* (required within this TC, may occur arbitrarily often)

	- *ErrorCode* (optional) - *aux* (optional)
10 Parsing of *SoftwareType*	
Expected Result	- *identifier* (mandatory) - *name* (mandatory) - *version* (mandatory) - *note* (optional)
11 Parsing of *GenuineComparison*	
Expected Result	- *ComparisonScore* (mandatory) - *ComparisonResult* (mandatory)
12 Parsing of *ImpostorComparison* *Here, all elements of ImpostorComparison have to be checked separately.*	
Expected Result	- *ComparisonScore* (mandatory) - *ComparisonResult* (mandatory)

Table 56: Test Case TC-COD-PH-VID-002

9 Test Case: Operation

9.1 O-FP-GID

No test cases are currently defined for this Function Module.

9.2 O-FP-ACQ

No test cases are currently defined for this Function Module.

9.3 O-PH-APP

No test cases are currently defined for this Function Module.

9.4 O-PH-VID

No test cases are currently defined for this Function Module.

10 Test Case: User Interface

10.1 UI-FP-APP

Test Case ID: TC-UI-FP-APP-001	
Scope	
- Examination of the correct displaying of the module	
Precondition	
- A fingerprint sensor is connected - The module (Fingerprint Enrolment BSP) is loaded and a session is attached	
Description	
1 Start of the acquisition process and successfully execution of the standard process: three times correct positioning of the index finger of the right hand and three times correct positioning of the index finger of the left hand resp. three times correct positioning of the right hand, the left hand and the thumbs (when using multi-finger sensors) by a test person	
Expected Result	- Visual feedback of the fingerprint acquisition module: displaying of the final captured fingerprint images
2 Entering of comment in the GUI containing the following signs - umlauts ('ä','ö','ü') - '-->'	
Expected Result	- Field *note* is available and contains the entered umlauts as well as the string '-->'[7]

Table 57: Test Case TC-UI-FP-APP-001

10.2 UI-FP-VBIC

No test cases are currently defined for this Function Module.

10.3 UI-FP-VEIC

No test cases are currently defined for this Function Module.

7 The string '-->' is not converted into a XML comment tag.

10.4 UI-PH-APP

Test Case ID: TC-UI-PH-APP-001	
Scope	
- Examination of the correct displaying of the module	
Precondition	
- An acquisition hardware device is connected - The module (Facial Image Enrolment BSP) is loaded and a session is attached	
Description	
1 Scanning of application form with a non-compliant photograph or capturing of a non-compliant facial image (to enforce the need of the veto function) and provision of a selected single image	
Expected Result	- Displaying of the current evaluated picture - Displaying of all criteria evaluated with the current value and threshold as well as their relation: OK/NOK for every criterion - Displaying of the summarised result OK/NOK for the current picture; in the case of NOK: declaration of rejection arguments - Provision of the veto power for the official
2 Entering of a comment in the GUI regarding a veto	
Expected Result	- Existence of a comment field in the GUI
3 Entering of comment in the GUI containing the following signs - umlauts ('ä','ö','ü') - '-->'	
Expected Result	- Field *note* is available and contains the entered umlauts as well as the string '-->'[8]
4 Examination of the resulting BioAPI BIR	
Expected Result	- Value coded in field *total* equals false - Field *note* is available and contains the comment regarding the veto as given in the GUI

Table 58: Test Case TC-UI-PH-APP-001

8 The string '-->' is not converted into a XML comment tag.

10.5 UI-PH-VID

Test Case ID: TC-UI-PH-VID-001	
Scope	
- Examination of the correct user interface for verification of facial images	
Precondition	
- The camera unit is connected and the system is ready for verification - As necessary test resource: test person	
Description	
1 The test person starts the process by putting the identity document onto the reader and completes the whole verification workflow by using facial verification.	
Expected Result	- The operator is provided with visual feedback of the verification process. - The live captured image as well as the reference image retrieved from the identity document is displayed to the operator.

Table 59: Test Case TC-UI-PH-VID-001

11 Test Case: Reference Storage

11.1 REF-FP-GID

No test cases are currently defined for this Function Module.

11.2 REF-FP-VAPP

No test cases are currently defined for this Function Module.

11.3 REF-PH-GID

No test cases are currently defined for this Function Module.

11.4 REF-PH-VAPP

No test cases are currently defined for this Function Module.

12 Test Case: Biometric Comparison

12.1 CMP-FP-VIC

No test cases are currently defined for this Function Module.

12.2 CMP-PH-VID

Test Case ID: TC-CMP-PH-VID-001	
Scope	
- Examination of the configured security level for biometric comparison	
Precondition	
- The vendor of the biometric comparison algorithm provides a documentation which gives information about the working point of the comparison algorithm	
Description	
1 Examination of the documentation provided by the vendor of the comparison algorithm	
Expected Result	- The documentation gives evidence that the comparison algorithm ensures a working point of a maximum false match rate (FMR) of 0.1 % and a false non-match rate (FNMR) below 5 %. Stronger settings are allowed (lower FMR and/or FNMR). - The documentation gives evidence that the comparison algorithm can be calibrated for the security level set within this specific scenario of verification. - Calibration data based on the actual system performance is provided by the vendor of the algorithm.

Table 60: Test Case TC-CMP-PH-VID-001

13 Test Case: Logging

13.1 LOG-FP-GID

No test cases are currently defined for this Function Module.

13.2 LOG-FP-VAPP

No test cases are currently defined for this Function Module.

13.3 LOG-FP-VIC

No test cases are currently defined for this Function Module.

13.4 LOG-PH-GID

No test cases are currently defined for this Function Module.

13.5 LOG-PH-VAPP

No test cases are currently defined for this Function Module.

13.6 LOG-PH-VID

No test cases are currently defined for this Function Module.

14 Test Case: Evaluation

14.1 EVA-FP-GID

No test cases are currently defined for this Function Module.

14.2 EVA-FP-VAPP

No test cases are currently defined for this Function Module.

14.3 EVA-FP-VIC

No test cases are currently defined for this Function Module.

14.4 EVA-PH-GID

No test cases are currently defined for this Function Module.

14.5 EVA-PH-VAPP

No test cases are currently defined for this Function Module.

14.6 EVA-PH-VID

No test cases are currently defined for this Function Module.