Federal Office
for Information Security

Technical Guideline TR-03122-3

Conformance Test Specification for BSI-TR 03121 Biometrics for Public Sector Applications

Part 3: Test Cases for Function Modules and Processes

Version 5.0

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1. Introduction

This document is part three of the Conformance Test Specification (TR-03122). It is the counterpart of TR-03121-3 describing the test cases for the defined Function Modules.

Not all Function Modules have test cases associated with them.

2. Test Cases Function Modules

The following sections define test cases for Function Modules.

2.1. Test Cases Acquisition Hardware

For test cases for dark field and light field scanners based on the optical principle of frustrated total reflection, the reader is referred to [TR-03118] (German only). These test cases will be incorporated here in a future version of this guideline. Test cases for direct contact imaging scanners are defined in the following.

2.1.1. Test Cases FM AH-FI-DC

Test Case ID: TC-AH-FI-DC-001	
Scope	
• Examination of technical specifications of the digital camera used to obtain facial biometrics	
Precondition	
• The camera used in the specific application profile is at hand • Product documentation of the camera model is at hand (e.g. data sheet, manual)	
Description	
2. Verify that the sensor of the camera provides a physical resolution of at least 1600*1200 pixels Consult product documentation of the camera	
Expected Result	• The product documentation states that the physical, native resolution is at least 1600*1200 pixels
3. Verify that the active camera setting (e.g. configurable via camera firmware) used for the specific application provides an image resolution of at least 1600*1200 pixels Consult product documentation of the camera or options in the cameras firmware	
Expected Result	• The setting provides a native image resolution of at least 1600*1200 pixels • This setting is the active setting for the application profile

Table 2.1. Test Case ID: TC-AH-FI-DC-001

2.1.2. Test Cases FM AH-FP-OPT

For test cases for dark field and light field scanners based on the optical principle of frustrated total reflection, the reader is referred to [TR-03118] (German only). These test cases will be incorporated here in a future version of this guideline.

Test cases for direct contact imaging scanners are defined in the following.

Test Case ID: TC-AH-FP-OPT-001
Scope
• Test of image sensor linearity
Precondition
• The scanner is connected.

Test Case ID: TC-AH-FP-OPT-001	

• The scanner software is set to output unprocessed images.
• Captured images can be saved for subsequent evaluation.
• Depending on the following conditions method A, B, C or D is chosen for the test:
  • Method A: It is possible to control the integration time of the scanner's image sensor.
  • Method B: It is possible to control the intensity of the scanner's illumination.
  • Method C: It is only possible to turn the scanner's illumination on and off.
  • Method D: Neither of the above can be controlled.
• Test resources:
  • Method A and B: A diffuse reflecting uniform white target (e.g. Munsell N9).
  • Method C: An external extended uniform light source (e.g. LED backlight or similar).
  • Method B and C: Measurement equipment for measuring the luminance of the illumination.
  • Method D: A diffuse reflecting target with a grey scale step tablet or a set of uniform neutral grey targets cards with various known reflectance.
  • Image processing software to determine the average grey value in a region of interest in the image.	

Description	
4. Method A: The white target is placed on the scanner platen. The scanner's illumination is turned on and left unchanged during the test. Multiple images are taken while varying the integration time of the image sensor. The setting of the integration time is recorded with each image. Method B: The white target is placed on the scanner platen. Multiple images are taken while varying the intensity of the illumination of the scanner. The luminance of the illumination is monitored at the same time and recorded with each image. Method C: The scanner's illumination is turned off. The external light source is placed on the scanner platen. Multiple images are taken while varying the intensity of the external illumination. The luminance of the external illumination is monitored at the same time and recorded with each image. Method D: The grey scale target is placed on the scanner platen and an image is taken. In case of a set of uniform targets images of each target are taken sequentially and the reflectance of the target is recorded with each image. All methods: At least nine images/individual grey values are required that substantially cover the scanners dynamic range.	
Expected Result	• Set of images with a uniform area covered by the target or a single image of a target with a grey scale step tablet.
5. For each of the images the average grey value is determined in the area covered by the colour test card. The average grey value is plotted against the previously recorded integration time (Method A), luminance (Method B, C) or reflectance (Method D).	
Expected Result	• The resulting plot should be close to a linear function.
6. A linear regression is performed over the value pairs (integration time, average grey value),(luminance, average grey value) or (reflectance, grey value). The difference between the average grey value and the grey value from regression is calculated for each measurement.	
Expected Result	• None of the calculated differences SHALL exceed 7.65 grey levels.

Table 2.2. Test Case ID: TC-AH-FP-OPT-001

Test Case ID: TC-AH-FP-OPT-002	
Scope	
• Test of scanner resolution and geometrical accuracy	
Precondition	

• The scanner is connected.
• The scanner software is set to output unprocessed images.
• Captured images can be saved for subsequent evaluation.
• Test resources:
  • A Ronchi bar pattern target, that consists of an equal-width bar and space square wave pattern at 1.0 cy/mm, preferably on a flexible, diffuse white reflecting substrate. The target pattern SHALL cover at least 70% of the scanner's capture area.
  • The test software WinGeo (IQS Test Tools CD).	

Description	
1. The target is placed on the scanner platen and images are taken with the lines of the Ronchi pattern parallel to the pixel columns (vertical bars) and rows (horizontal bars) of the image sensor, respectively. A flexible target has to be pressed against the scanner platen to make sure the target is in contact with the platen over the entire pattern area. To discern properties of the scanner and the target the procedure may be repeated with the target being rotated by 180 degrees. If accuracy failures in the images remain at the same location they are most probably due to the scanner.	
Expected Result	• Set of images with the lines of the Ronchi pattern in vertical and horizontal direction, respectively.
2. The obtained image files are converted to raw image data (pixel grey values without header) and are processed with the software WinGeo. The program calculates the 1-bar and 6-bar distances of the pattern in the image (across-bar accuracy) as well as the along-bar accuracy. Also the resolution is calculated from the 6-bar distances.	

Expected Result	• Resolution: The scanner's output resolution in both sensor detector row and column directions SHALL be (R ± 0.01 R), with R being 500 pixels per inch or 1000 pixels per inch.
	• Across-bar accuracy: The difference D between the distance of the bars on the target and the corresponding distance measured in the image SHALL not exceed in at least 99% of the tested cases in horizontal and vertical direction, respectively:
	  • For 500-ppi scanner:
	  $D \leq 0.0007$, for $0.00 < X \leq 0.07$
	  $D \leq 0.01\ X$, for $0.07 \leq X \leq 1.50$
	  • For 1,000-ppi scanner:
	  $D \leq 0.0005$, for $0.00 < X \leq 0.07$
	  $D \leq 0.0071\ X$, for $0.07 \leq X \leq 1.5$
	  where:
	  $D = \lvert Y-X \rvert$

Test Case ID: TC-AH-FP-OPT-002	
	X = actual target distance Y = measured image distance D, X, Y are in inches. • Along-bar accuracy: In both vertical bar and horizontal bar orientations, the maximum difference in the horizontal or vertical direction, respectively, between the locations of any two points within a 1.5-inch segment of a given bar image SHALL not exceed 0.016 inches for at least 99.0 percent of the tested cases.

Table 2.3. Test Case ID: TC-AH-FP-OPT-002

Test Case ID: TC-AH-FP-OPT-003	
Scope	
• Test of spatial frequency response	
Precondition	

• The scanner is connected.
• The scanner software is set to output unprocessed images.
• Captured images can be saved for evaluation.
• Test resources:
  • A test chart containing Ronchi test patterns meeting or exceeding the minimum requirements given in Table 2.5 for 500 ppi scanners or in Table 2.6 for 1000 ppi scanners. The target must also contain large black and white patches for normalizing the contrast. Preferably the target should consist of dark patterns on a flexible, diffuse white reflecting substrate material. The material SHALL be optically opaque and exhibit no significant volume scattering as this degrades the contrast of the patterns. Rigid materials should not be used, if possible, to avoid damage to the image sensor.
  • A file describing the type, position and size of the different patterns on the test chart. This is required for processing the captured images with WinMTF.
  • The test software WinMTF (IQS Test Tools CD).	

Description	
1. The target is placed on the scanner platen and images are taken with the lines of the Ronchi pattern parallel to the pixel columns (vertical bars) and rows (horizontal bars) of the image sensor, respectively. A flexible target has to be pressed against the scanner platen to make sure the target is in contact with the platen over the entire pattern area. If the target pattern covers less than 25% of the scanners capture area, the procedure is applied to the right and the left half of the capture area, respectively. The bars of the Ronchi patterns have to be aligned with the pixel rows and columns to an angle less than 0.5°. If the images from the scanner are inverted they have to be inverted back to show dark patterns on a bright background.	
Expected Result	• Set of images with the bars of the Ronchi pattern in vertical and horizontal direction, showing dark patterns on a bright background
2. The resulting images files are converted to TIFF format and are processed with the tool WinMTF. This program determines the modulation in each of the Ronchi test patterns. These modulation values are	

Test Case ID: TC-AH-FP-OPT-003	
absolute with respect to the dynamic range of the image and do not represent the contrast transfer function (CTF).	
Expected Result	• Absolute modulation values for each of the Ronchi patterns on the test chart
3. The absolute modulation values have to be normalized by the modulation of the large black and white patches on the test chart, representing a spatial frequency of approximately zero cycles per millimetre. The average grey level in the black and white patches is calculated and the modulation is calculated as follows: $M_0 = \frac{G_{white} - G_{black}}{G_{white} + G_{black}}$ (2.1) with • M_0: Modulation for 0 cy/mm • G_{white}: average grey level in the white patch • G_{black}: average grey level in the black patch Having determined M_0 the value of the CTF can be calculated from the modulation of the Ronchi pattern: $CTF(R) = \frac{M(R))}{M_0}$ (2.2) with • $M(R)$ Modulation at spatial frequency R	
Expected Result	• The values of the CTF for each of the spatial frequencies specified in Table 2.5 (500 ppi scanners) or Table 2.6 (1000 ppi scanners) must be greater than the corresponding minimum CTF and less than the corresponding maximum CTF specified in the same table. • The resulting image SHALL be free from significant effects of aliasing.

Table 2.4. Test Case ID: TC-AH-FP-OPT-003

Spatial Frequency R [cycles/mm]	**R/Rnyquist 500ppi**	**Min. Number of Bars**	**Bar width [mm]**	**Min. Length of Bars [mm]**	**Min. CTF 500ppi**	**Max. CTF**
<0,3	3%	1	>1.7	1.7	-	-
1	10%	4	0.500	2.5	0.948	1.05
2	20%	5	0.250	2.5	0.869	1.05
3	30%	5	0.167	2.5	0.791	1.05
4	40%	5	0.125	2.5	0.713	1.05
5	50%	10	0.100	2.5	0.636	1.05
6	60%	10	0.083	2.5	0.559	1.05
7	70%	10	0.071	2.5	0.483	1.05

Spatial Frequency R [cycles/mm]	R/Rnyquist 500ppi	Min. Number of Bars	Bar width [mm]	Min. Length of Bars [mm]	Min. CTF 500ppi	Max. CTF
8	80%	10	0.063	2.5	0.408	1.05
9	90%	10	0.056	2.5	0.333	1.05
10	100%	10	0.050	2.5	0.259	1.05

Table 2.5. Requirements for CTF test charts for 500 ppi scanners.

Spatial Frequency R [cycles/mm]	R/Rnyquist 500ppi	Min. Number of Bars	Bar width [mm]	Min. Length of Bars [mm]	Min. CTF 500ppi	Max. CTF
<0,3	2%	1	>1.7	1.7	-	-
1	5%	4	0.500	2.5	0.957	1.05
2	10%	4	0.250	2.5	0.904	1.05
3	15%	5	0.167	2.5	0.854	1.05
4	20%	5	0.125	2.5	0.805	1.05
5	25%	5	0.100	2.5	0.760	1.05
6	30%	5	0.083	2.5	0.716	1.05
7	35%	5	0.071	2.5	0.675	1.05
8	40%	5	0.063	2.5	0.636	1.05
9	45%	10	0.056	2.5	0.598	1.05
10	50%	10	0.050	2.5	0.563	1.05
12	60%	10	0.042	2.5	0.497	1.05
14	70%	10	0.036	2.5	0.437	1.05
16	80%	10	0.031	2.5	0.382	1.05
18	90%	10	0.028	2.5	0.332	1.05
20	100%	10	0.025	2.5	0.284	1.05

Table 2.6. Requirements for CTF test charts for 1000 ppi scanners

Test Case ID: TC-AH-FP-OPT-004
Scope
• Test of signal to noise ratio and grey level uniformity
Precondition

• The scanner is connected.
• The scanner software is set to output unprocessed images.
• Captured images can be saved for evaluation.
• Test resources:
  • A uniform diffuse reflecting neutral grey target of high reflectance that covers the scanner's entire capture area (e.g Munsell N9)
  • A uniform diffuse reflecting neutral grey target of low reflectance that covers the scanner's entire capture area (e.g Munsell N2)
  • The test software signal-to-noise ratio (SNR)(IQS Test Tools CD).

Test Case ID: TC-AH-FP-OPT-004	
Description	
1. The black target is placed on the scanner platen and an image is taken. After that the procedure is repeated with the white target. The definition of “black image” and “white image” for the subsequent analyses depends on the grey value that the target would produce in the final fingerprint image. If high reflectance produces a high grey value in the final fingerprint image then the image obtained with the high reflectance target is considered the “white image”. If low reflectance produces a high grey value (inverting behaviour) then the image obtained with the low reflectance target is considered the “white image”. The other image is then considered the “black image”.	
Expected Result	• A black image with the average grey value in the image being at least 4 grey levels above the scanner’s minimum output grey level. • A white image with the average grey value in the image being at least 4 grey levels below the scanner’s maximum output grey level.
2. The black and white images are converted to raw image data (pixel grey values without header) and are processed with the software SNR. The program divides the images in blocks of 6.35 mm x 6.35 mm and determines the average grey level, the standard deviation, the grey level averages in the columns and rows, respectively, and the number of pixels with a higher-than-allowed difference of the grey level from the average in each of the blocks. With these quantities the required tests regarding signal-noise-ratio and grey level uniformity are performed.	
Expected Result	• Signal to noise ratio: Signal is defined as the difference between the average grey levels of corresponding blocks in the white and the black image. Noise is defined as the standard deviation of the grey levels in each block of the white and black image, respectively. The signal-noise ratio is calculated as with $SNR_{black} = \frac{\overline{G_{white}} - \overline{G_{black}}}{\sigma_{black}}, SNR_{white} = \frac{\overline{G_{white}} - \overline{G_{black}}}{\sigma_{white}}$ (2.3) $\overline{G_{white}}, \overline{G_{black}}$: average grey level in a block of the black and white image, respectively $\sigma_{white}, \sigma_{black}$: standard deviation of the grey levels in a block of the black and white image, respectively The signal to noise ratio SHALL exceed 125 for at least 97% of the tested blocks in both the black and the white image. • Grey level uniformity requirement #1 (adjacent row, column uniformity): At least 99% of the average grey levels between every two adjacent 6.35 mm long rows and 99% between every two adjacent 6.35 mm long columns, SHALL not differ by more than 1.0 grey levels in the black and SHALL not differ by more than 2.0 grey levels in the white image. • Grey level uniformity requirement #2 (pixel to pixel uniformity): For at least 99.9% of all pixels within every independent 6.35 mm x 6.35 mm block no individual pixel’s grey level SHALL vary from the average by more than 8.0 grey levels in the black image, and SHALL not vary from the average by more than 22.0 grey levels in the white image. • Grey level uniformity requirement #3 (small area uniformity): For every two independent 6.35 mm x 6.35 mm blocks the average grey levels of the two blocks

Test Case ID: TC-AH-FP-OPT-004	
	SHALL not differ by more than 3.0 grey levels in the black image, and SHALL not differ by more than 12.0 grey levels in the white image.

Table 2.7. Test Case ID: TC-AH-FP-OPT-004

Test Case ID: TC-AH-FP-OPT-005	
Scope	
• Test of fingerprint image quality	
Precondition	

• The scanner is connected.
• The scanner software is set to output completely processed fingerprint images.
• Captured images can be saved for evaluation.
• Test resources:
  • 10 different test persons
  • Image processing software for histogram analysis	

Description	
1. Images of every finger of each test person are taken with the scanner. If the scanner is capable of capturing 4-finger images additional 4-finger images of each hand are taken.	
Expected Result	• Images of every finger of each test person. In case of a 4-finger scanner also 4-finger images of every hand of each test person.
2. For each image a histogram of the grey levels is produced. The histogram is tested for gaps and the number of grey levels with at least 5 counts in the image are counted.	
Expected Result	• The number of grey levels present with at least 5 pixels in the image SHALL be at least 128 for at least 99% of the tested images. • The number of grey levels present with at least 5 pixels in the image SHALL be at least 200 for at least 80% of the tested images. • There SHALL be no gaps in the histogram.

Table 2.8. Test Case ID: TC-AH-FP-OPT-005

2.1.3. Test Cases FM AH-IR-DC

Test Case ID: TC-AH-IR-DC-001
Scope
• Examination of technical specifications of the digital camera used to obtain iris biometrics
Precondition
• The camera used in the specific application profile is at hand • Product documentation of the camera model is at hand (e.g. data sheet, manual)
Description
1. Verify that the sensor of the camera provides a physical resolution of at least 640*480 pixels Consult product documentation of the camera

Test Case ID: TC-AH-IR-DC-001	
Expected Result	• The product documentation states that the physical, native resolution is at least 640*480 pixels
2. Verify that the active camera setting (e.g. configurable via camera firmware) used for the specific application provides an image resolution of at least 640*480 pixels Consult product documentation of the camera or options in the cameras firmware	
Expected Result	• The setting provides a native image resolution of at least 640*480 pixels • This setting is the active setting for the application profile
3. Verify that the quality of the captured images is adequate regarding the following requirements of [ISO_IRIS_QA]: • Requirement 6.2.2 “Iris-sclera contrast” • Requirement 6.2.3 “Iris-pupil contrast” • Requirement 6.2.5 “Grey scale utilisation” • Requirement 6.2.10 “Sharpness”	
Expected Result	• The quality of the resulting image meets the referenced requirements

Table 2.9. Test Case ID: TC-AH-IR-DC-001

2.2. Test Cases Acquisition Software

2.2.1. Test Cases FM AS-FI-DC

Test Case ID: TC-AS-FI-DC-001
Scope
• Examination of the software module used for acquisition of digitised facial images
Precondition

• Implementation Under Test (IUT) is running, required modules are loaded
• The digital camera used in the specific application scenario is connected
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-AS-PH-DC-001/1`
  • HTTP method: `GET`

Description

1. Check proper data encoding and format of the returned image
  • Initiate test case by calling the IUT via the test interface
  • Capture an image with the camera, examine the digitised image data
  • Check the resulting image for visible compression artefacts

Expected Result • As a result, a message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (`bio:FaceAcquisitionandbio:Records`) • The image is encoded in one of the following lossless formats and can be properly decoded:

Test Case ID: TC-AS-FI-DC-001	
	• Windows Bitmap Format Version 3 • JPEG Lossless • DNG (in combination with JPEG Lossless) • Note: This is a recommendation in the specification. Usage of another lossless format is considered acceptable when none of the described options are available. • If no lossless mode is supported by the IUT, the image is encodes as JPEG with minimal compression mode • There are no visible compression artefacts in the resulting image

Table 2.10. Test Case ID: TC-AS-FI-DC-001

2.2.2. Test Cases FM AS-FP-MF

Test Case ID: TC-AS-FP-MF-001	
Scope	
Examination of automatic acquisition of the fingerprint image	
Precondition	

• IUT is running, required modules are loaded
• A multi fingerprint scanner is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-AS-FP-MF-001/1`
  • HTTP method: `GET`	

Description	

1. Check the automatic acquisition of fingerprints
  • Initiate test case by calling the IUT via the test interface
  • Place fingers properly on the scanner	

Expected Result	• The activation of the acquisition occurs automatically • A message is given that the required fingerprints were captured successfully • As a result, a message conforming to TR-03121 XML containing the encoded fingerprint image is returned via the test interface (`bio:FingerAcquisitionandbio:Records`)

2. Check the automatic acquisition timeout
  • Initiate test case by calling the IUT via the test interface
  • Do not place any fingers on the fingerprint scanner	

Expected Result	• The acquisition automatically stops after reaching timeout • An adequate error message is given that no fingerprint has been captured

Test Case ID: TC-AS-FP-MF-001	
3. Check the automatic acquisition behaviour with fingerprints of insufficient quality • Initiate test case by calling the IUT via the test interface • Place fingers incorrectly on the scanner, e.g. such that only fingertips are slightly visible to scanner, but automatic acquisition is not performed	
Expected Result	• The acquisition automatically occurs when the timeout is reached • An optional adequate error message is displayed stating fingerprints of insufficient quality have been captured • As a result, a message conforming to TR-03121 XML containing the encoded fingerprint image is returned via the test interface (`bio:FingerAcquisitionandbio:Records`)

Table 2.11. Test Case ID: TC-AS-FP-MF-001

Test Case ID: TC-AS-FP-MF-002	
Scope	
• Examination of the fingerprint scanners pre-qualification functionality	
Precondition	
• IUT is running, required modules are loaded • A multi fingerprint scanner is connected • As necessary test resources: a test person to perform the fingerprint acquisition with • No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces") • Test case path: `/TR03122/TC-AS-FP-MF-002/1` • HTTP method: `GET`	
Description	
1. Check the correct functionality of the fingerprint pre-qualification, regarding a medium/default setting • Configure a medium pre-qualification threshold (e.g. default value, via software/firmware, consult product documentation) • Initiate test case by calling the IUT via the test interface • Place fingers on the scanner, at first with slightest pressure • Successively increase pressure and improve finger position on the scanner, until auto capture is performed	
Expected Result	• The automatic activation of the acquisition does not occur immediately • With improving fingerprint quality over time, the scanner performs the automatic acquisition • A message is given that the required fingerprints were captured successfully • As a result, a message conforming to TR-03121 XML containing the encoded fingerprint image is returned via the test interface (`bio:FingerAcquisition`)
2. Test configurability of pre-qualification thresholds, regarding a relaxed setting • Configure pre-qualification threshold as relaxed as possible	

Test Case ID: TC-AS-FP-MF-002	
• Initiate test case by calling the IUT via the test interface • Place fingers on the scanner, at first with slightest pressure • Successively increase pressure and improve finger position on the scanner	
Expected Result	The automatic activation of the scanner triggers early (in comparison to step 1.) • A message is given that the required fingerprints were captured successfully • As a result, a message conforming to TR-03121 XML containing the encoded fingerprint image is returned via the test interface (`bio:FingerAcquisition`)
3. If supported by the IUT, test configurability of pre-qualification thresholds, regarding a strict setting • Configure pre-qualification threshold as strict as possible • Initiate test case by calling the IUT via the test interface • Place fingers on the scanner, at first with slightest pressure • Successively increase pressure and improve finger position on the scanner	
Expected Result	• The automatic activation of the scanner triggers very late (in comparison to step 1.), respectively an acquisition timeout occurs • A message is given that the required fingerprints were captured successfully, respectively that no fingerprints were captured (in case of acquisition timeout) • As a result, a message conforming to TR-03121 XML containing the encoded fingerprint image is returned via the test interface (`bio:FingerAcquisition` and `bio:Records`)

Table 2.12. Test Case ID: TC-AS-FP-MF-002

Test Case ID: TC-AS-FP-MF-003	
Scope	
Examination of the fingerprint scanners resulting image resolution	
Precondition	
• Product documentation of the fingerprint scanner model is at hand (e.g. data sheet, manual, manufacturer declaration)	
Description	
1. Verify that the resolution of the fingerprint scanner fulfils the requirements for acquisition setting levels 31 or 41 [ISO_FINGER] Consult product documentation	
Expected Result	The documentation attests that the requirements are fulfilled

Table 2.13. Test Case ID: TC-AS-FP-MF-003

2.2.3. Test Cases FM AS-FP-ROLL

Test Case ID: TC-AS-FP-ROLL-001	
Scope	
• Examination of the software module used for rolled fingerprint acquisition	
Precondition	

• The IUT is running and required modules are loaded
• A fingerprint scanner providing rolled fingerprints is connected
• Five test persons are available in order to perform fingerprint acquisition
• A trained operator conducts the capture process with the test persons
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-AS-FP-ROLL-001/1`
  • HTTP method: `GET`	

Description	
1. Check the captured rolled fingerprint image For each finger of each test person: • Initiate test case by calling the IUT via the test interface • Start the acquisition • Roll finger uniformly from nail to nail • Examine resulting image from acquisition Note: • It is not required to acquire the fingerprints of all test persons directly in line • It is required to acquire all ten fingerprints of different test persons and not from one test person several times to achieve five capture processes • The operator is required to be trained in capturing fingerprints of persons to ensure a realistic finger roll process	
Expected Result	• As a result per acquisition, a message conforming to TR-03121 XML containing the encoded fingerprint images is returned via the test interface (`bio:FingerAcquisition` and `bio:Records`) For each captured fingerprint image of each test person, the following results are expected: • The resulting image shows the full width of the rolled fingerprint. Typically the image will roughly be of rectangular shape. • The captured fingerprint image does not depict visible distortion or interruptions. The captured fingerprint image depicts the fingerprint from nail to nail. • The captured fingerprint image depicts a faithful reproduction of the fingerprint, especially in the areas where the rolled fingerprint overlaps with the corresponding plain print.

Test Case ID: TC-AS-FP-ROLL-001	

	• The captured fingerprint image does not depict visible distortion or interruptions.
	• The captured fingerprint image does not depict puzzle effects such that parts of the fingerprint image are displaced from their actual position.
	• The captured fingerprint image clearly depicts friction ridges.
	• The captured fingerprint image does not depict blurring and smearing.
	• The captured fingerprint image clearly depicts ridge patterns.
	• If features exists for the given fingerprint:
	  • The captured fingerprint image clearly depicts features.
	  • If loop features exists for the given fingerprint:
	  • The captured fingerprint image clearly depicts loop features (core and delta).
	• The captured fingerprint image clearly depicts existing features at the border zone of the image.
	• The captured fingerprint image depicts the fingerprint's upper part.
	• The captured fingerprint image depicts the fingerprint’s core area with ridge lines.
	• If delta features exists for the given fingerprint:
	  • The captured fingerprint image depicts the fingerprints delta features.
	• The captured fingerprint image depicts the fingerprint’s baseline (bottom area).
	• The vertical axis of the fingerprint depicted in the captured image is in parallel with the fingerprint image’s vertical axis.
	• Note: In case of doubt whether one or several of the conditions above hold true for the given fingerprint, a dactyloscopy expert SHALL be consulted for clarification.

Table 2.14. Test Case ID: TC-AS-FP-ROLL-001

Test Case ID: TC-AS-FP-ROLL-002
Scope
• Examination of the fingerprint scanners resulting image resolution
Precondition
• Product documentation of the fingerprint scanner model is at hand (e.g. data sheet, manual, manufacturer declaration)
Description
1. Verify that the resolution of the fingerprint scanner fulfils the requirements for acquisition setting levels 31 or 41 [ISO_FINGER] Consult product documentation

Test Case ID: TC-AS-FP-ROLL-002	
Expected Result	• The documentation attests that the requirements are fulfilled

Table 2.15. Test Case ID: TC-AS-FP-ROLL-002

2.2.4. Test Cases FM AS-IR-DC

Test Case ID: TC-AS-IR-DC-001	
Scope	
• Examination of the software module used for acquisition of digitised iris images	
Precondition	

• IUT is running, required modules are loaded
• The digital camera used in the specific application scenario is connected
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-AS-IR-DC-001/1`
  • HTTP method: `GET`	

Description	

1. Check proper data encoding and format of the returned image
  • Initiate test case by calling the IUT via the test interface
  • Capture an image with the camera	

Expected Result	• As a result, a message conforming to TR-03121 XML containing the encoded iris image is returned via the test interface (`bio:IrisAcquisition` and `bio:Records`) • The image is encoded in the PNG lossless format and can be properly decoded
Test case specific remark	• If there is no option to obtain the digitised iris image directly from the IUT for examination, consult the manufacturer software documentation (e.g. manual, data sheet) for a reliable statement concerning the supported data formats of digitised images and verify whether the requirements are fulfilled.

Table 2.16. Test Case ID: TC-AS-IR-DC-001

2.3. Test Cases FM Biometric Image Processing

2.3.1. Test Cases FM BIP-FI-DC-HQ

Test Case ID: TC-BIP-FI-DC-HQ-001
Scope
• Verify correct facial image processing
Precondition
• IUT is running, required modules are loaded • As necessary test resource:

<table>
<tr><th colspan="2">Test Case ID: TC-BIP-FI-DC-HQ-001</th></tr>
<tr><td colspan="2">

A locally available facial image of a test person, with a resolution greater than 1600*1200 pixels (in both height and width)
Image is provided via XML file using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")

Test case path: <code>/TR03122/TC-BIP-PH-DC-HQ-001/1</code>
HTTP method: <code>POST</code>
The IUT SHALL provide an option to select the image output type for the scope of this test case (generic facial image, facial image for German Standard for AFIS Transactions (GSAT) transaction). Alternatively, the IUT can provide both output types in parallel (the output type, which is not needed, can then be discarded/disregarded).

• The second test step SHALL only be performed if producing GSAT data is in scope of the considered Application Profile. If this is the case, the facial image meeting the specific requirements of the Application Profile must be returned in the defined XML format.
</td></tr>
<tr><td colspan="2">Description</td></tr>
<tr><td colspan="2">1. Check correct processing of generic facial images

Initiate test case by loading the reference facial image using the test interface
Examine the processed image
</td></tr>
<tr><td>Expected Result</td><td>

As a result, a message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisitionand bio:Records</code>)
The processed image has dimensions of exactly 1600*1200 pixels (in regard to height and width)
The height/width ratio of the processed image is 4:3
The minimum distance between both eyes is at least 120 pixels
</td></tr>
<tr><td colspan="2">2. Check correct processing of facial images for GSAT

• Initiate test case by loading the reference facial image using the test interface
• Examine the processed image</td></tr>
<tr><td>Expected Result</td><td>

The resulting image data is encoded and returned via the test interface in an appropriate XML format, i.e. as GSAT XML embedded within a TR-03121 XML (element <code>bio:XML-Record[@type="GSAT-xml"</code>]), whereby only the contained facial image data (Element <code>itl:FaceImage</code>) is relevant for this test case
The processed image has dimensions of exactly 800*600 pixels (height/width ratio is 4:3)
The minimum distance between both eyes is at least 120 pixels
</td></tr>
</table>

Table 2.17. Test Case ID: TC-BIP-FI-DC-HQ-001

2.3.2. Test Cases FM 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	

• IUT is running, required modules are loaded
• A single fingerprint sensor is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-BIP-FP-APP-001/1`
  • HTTP method: `GET`	

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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing an encoded fingerprint image is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • 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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing an encoded fingerprint image is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • 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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing an encoded fingerprint image is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • The image contains only the first part of the finger

Test Case ID: TC-BIP-FP-APP-001	
	• A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. Note: segmentation for single finger scanners is optional.

Table 2.18. Test Case ID: TC-BIP-FP-APP-001

Test Case ID: TC-BIP-FP-APP-002	
Scope	
Examination of segmentation in connection with multi finger scanners	
Precondition	

• IUT is running, required modules are loaded
• A multi fingerprint sensor is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-BIP-FP-APP-002/1`
  • HTTP method: `GET`	

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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing two encoded fingerprint images is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • Two independent images are returned within the data • 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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing one encoded fingerprint image is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • 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 Initiate test case by calling the IUT via the test interface	

Test Case ID: TC-BIP-FP-APP-002	
Expected Result	• As a result, a message conforming to TR-03121 XML containing two encoded fingerprint images is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • Two independent images are returned within the data • 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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing an encoded fingerprint image is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • 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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing two encoded fingerprint images is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • 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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing one encoded fingerprint image is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • 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 2.19. Test Case ID: TC-BIP-FP-APP-002

Test Case ID: TC-BIP-FP-APP-003	
Scope	
Examination of segmentation in connection with four finger scanners	
Precondition	

• IUT is running, required modules are loaded
• A multi fingerprint sensor is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-BIP-FP-APP-003/1`
  • `HTTP method: GET`	

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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing three encoded fingerprint images is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • Three independent images are returned within the data • 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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing four encoded fingerprint images is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • Four independent images are returned within the data • 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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing three encoded fingerprint images is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`)

Test Case ID: TC-BIP-FP-APP-003	
	• Three independent images are returned within the data • 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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing four encoded fingerprint images is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • Four independent images are returned within the data • 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 Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing three encoded fingerprint images is returned via the test interface (element `bio:FingerAcquisition`and `bio:Records`) • 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 dat Initiate test case by calling the IUT via the test interface	
Expected Result	• As a result, a message conforming to TR-03121 XML containing four encoded fingerprint images is returned via the test interface (element `bio:FingerAcquisition` and `bio:Records`) • 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 2.20. Test Case ID: TC-BIP-FP-APP-003

2.3.3. Test Cases FM BIP-IR-APP

Test Case ID: TC-BIP-IR-APP-001	
Scope	
Examination of the Acquisition Software regarding the image type of the generated iris images	
Precondition	

• IUT is running, required modules are loaded
• As necessary test resource:
  • A locally available iris image of a test person, with a resolution greater than 640*480 pixels (in both height and width)
  • Image is provided via XML file using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-BIP-IR-APP-001/1`
  • HTTP method: `POST`	

Description	

1. Check correct processing of generic iris images
  • Initiate test case by loading the reference iris image using the test interface
  • Examine the processed image	

Expected Result	• As a result, a message conforming to TR-03121 XML containing an encoded iris image is returned via the test interface (at least the elements `bio:IrisAcquisition` and `bio:Records` are present)
	• The resulting image fully complies to at least one of the following image types defined by [ISO_IRIS_QA]:
	  • IMAGE_TYPE_VGA
	  • IMAGE_TYPE_CROPPED
	  • IMAGE_TYPE_CROPPED_AND_MASKED

Table 2.21. Test Case ID: TC-BIP-IR-APP-001

2.4. Test Cases FM Quality Assurance

2.4.1. Test Cases FM QA-FI-SB

Test Case ID: TC-QA-FI-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 application profile specific tolerances threshold regarding several assessment criteria
Precondition

• IUT is running, required modules are loaded
• As necessary test resources: a Ground Truth database for conformance test and the CTS are at hand
• 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

Test Case ID: TC-QA-FI-SB-001	

• The IUT implements an interface for conformance testing where a single image can be provided and the computed quality values and configuration data are returned
• The IUT is able to return the results from the quality assessment for every provided image via the test interface
• Image provision as BMP or JPEG 2000 using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-QA-PH-SB-001/1`
  • HTTP method: `POST`	

Description	
1. The IUT is called via the conformance test interface and compliant facial images are committed consecutively according to QA-FI-SB from the conformance test data base.	
Expected Result	• For every facial image a result containing a "`bio:FaceQuality`" element is returned by the IUT via the test interface • The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) of the conformance test data base are satisfied and achieved
2. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available.	

Expected Result	• The IUT provides the quality values for all criteria marked with "M" in the respective Function Module:
	• If applicable, the quality values are correctly set:
	  • "id" (type string) – identifier for the criteria
	  • "min" (type double) – minimum value from the range of this criteria
	  • "max" (type double) – maximum value from the range of this criteria
	  • "tmin" (type double) – minimum value of the allowed tolerance range of this criteria
	  • "tmax" (type double) – maximum value of the allowed tolerance range of this criteria
	  • "result" (type double) value of the quality evaluation result

1. Start of the module by committing consecutively non-compliant facial images according to QA-FI-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 a "`bio:FaceQuality`" elementis returned by the IUT via the test interface • The acceptance conditions are not met, i.e. the total result of the quality evaluation is negative
2. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available	

Test Case ID: TC-QA-FI-SB-001	

Expected Result	• The IUT provides the quality values for all criteria marked with "M" in the respective Function Module:
	• If applicable, the quality values are correctly set:
	  • “id” (type string) – identifier for the criteria
	  • “min” (type double) – minimum value from the range of this criteria
	  • “max” (type double) – maximum value from the range of this criteria
	  • “tmin” (type double) – minimum value of the allowed tolerance range of this criteria
	  • “tmax” (type double) – maximum value of the allowed tolerance range of this criteria
	  • “result” (type double) value of the quality evaluation result

3. Start of the module by committing consecutively non-compliant facial images according to QA-FI-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 a “`bio:FaceQuality`” elementis returned by the IUT via the test interface • The acceptance conditions are not met, i.e. the total result of the quality evaluation is negative
4. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available	

Expected Result	• The IUT provides the quality values for all criteria marked with "M" in the respective Function Module:
	• If applicable, the quality values are correctly set:
	  • “id” (type string) – identifier for the criteria
	  • “min” (type double) – minimum value from the range of this criteria
	  • “max” (type double) – maximum value from the range of this criteria
	  • “tmin” (type double) – minimum value of the allowed tolerance range of this criteria
	  • “tmax” (type double) – maximum value of the allowed tolerance range of this criteria
	  • “result” (type double) value of the quality evaluation result

Table 2.22. Test Case ID: TC-QA-FI-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 5 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.

2.4.2. Test Cases FM QA-FP-APP

Test Case ID: TC-QA-FP-APP-001	
Scope	
Examination of correctness of the Quality Assurance module for fingerprint acquisition sequence 4-4-2	
Precondition	

• IUT is running, a Ground Truth database for conformance test and the CTS are at hand
• The test database contains:
  • Sequences of fingerprint images including corresponding finger codes
  • Corresponding Ground Truth values
• Image provision as Windows Bitmap Version 3 (BMP) using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces"), whereby multiple segmented single fingerprint images are provided (encoded in biocts-testsetup XML)
  • Test case path: `/TR03122/TC-QA-FP-APP-001/1`
  • HTTP method: `POST`	

Description	
1. Start of the module by committing consecutively all fingerprints sequences for this test case from the conformance test database. Initiate test case by calling the IUT via the test interface	
Expected Result	• For every input sequence an XML `element` is returned, containing the final selected sets of fingerprints (`bio:Records`) and the corresponding capture and quality information (`bio:Finger-Acquisiton`).
2. Examination of correct identification and comparison of the IUTs selection of the best capture out of multiple captures with the Ground Truth database.	
Expected Result	• All expected finger codes and best sets of captures (as specified in the Ground Truth database) are identical with the actual received results of finger codes and returned fingerprint sequences and corresponding quality information.

Table 2.23. Test Case ID: TC-QA-FP-APP-001

Test Case ID: TC-QA-FP-APP-002
Scope
Examination of correctness of the Quality Assurance module for fingerprint acquisition sequence 4-1-4-1
Precondition

• IUT is running, a Ground Truth database for conformance test and the CTS are at hand
• The test database contains:
  • Sequences of fingerprint images including corresponding finger codes
  • Corresponding Ground Truth values

Test Case ID: TC-QA-FP-APP-002	

• Image provision as Windows Bitmap Version 3 (BMP) using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces"), whereby multiple segmented single fingerprint images are provided (encoded in biocts-testsetup XML)
  • Test case path: `/TR03122/TC-QA-FP-APP-002/1`
  • HTTP method: `POST`	

Description	
1. Start of the module by committing consecutively all fingerprints sequences for this test case from the conformance test database. Initiate test case by calling the IUT via the test interface	
Expected Result	• For every input sequence an XML `element` is returned, containing the final selected sets of fingerprints (`bio:Records`) and the corresponding capture and quality information (`bio:Finger-Acquisiton`).
2. Examination of correct identification and comparison of the IUTs selection of the best capture out of multiple captures with the Ground Truth database.	
Expected Result	• All expected finger codes and best sets of captures (as specified in the Ground Truth database) are identical with the actual received results of finger codes and returned fingerprint sequences and corresponding quality information.

Table 2.24. Test Case ID: TC-QA-FP-APP-002

Test Case ID: TC-QA-FP-APP-003	
Scope	
Examination of correctness of NFIQ 2.0 algorithm implementation	
Precondition	

• IUT is running, a Ground Truth database for conformance test and the CTS are at hand
• The test database contains:
  • Fingerprint images including corresponding finger codes
  • Corresponding NFIQ 2.0 quality values as Ground Truth
• For every provided image, the results from the quality assessment are returned by the IUT
• Image provision as Windows Bitmap Version 3 (BMP) using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-QA-FP-APP-003/1`
  • HTTP method: `POST`	

Description	
1. The fingerprint images are consecutively passed to the IUT for quality evaluation and compared to the Ground Truth values. Initiate test case by calling the IUT via the test interface	
Expected Result	• For each passed fingerprint image a result containing a "`bio:FingerQuality`" element is returned by the IUT via the test interface

Test Case ID: TC-QA-FP-APP-003	
	• The quality value returned by the IUT for the current fingerprint image equals the corresponding Ground Truth value. Note: Minor deviations of the quality value from the Ground Truth may only be acceptable after a case specific analyse of the reasoning.
2. An image expected to yield an error code during quality assessment is used as input for the IUT. Initiate test case by calling the IUT via the test interface	
Expected Result	• For such a passed fingerprint image a result containing a "`bio:FingerQuality`" element is returned by the IUT via the test interface • The quality value 255 is returned therein, indicating an error during quality computation.

Table 2.25. Test Case ID: TC-QA-FP-APP-003

2.4.3. Test Cases FM QA-IR-SB

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

• IUT is running, required modules are loaded
• The QA module provides an interface for conformance testing where a single image can be processed and the calculated values and configuration data are returned
• As necessary test resources: two sets consisting of two irises (left and right) each – one set with compliant inputs, one with non-compliant data
• For every provided image the results from the quality assessment are returned by the IUT
• Image provision as PNG or JPEG 2000 using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-QA-IR-SB-001/1`
  • `HTTP method: POST`	

Description	
1. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available	
Expected Result	• For every iris image a result containing a "`bio:IrisQuality`" element is returned by the IUT via the test interface • The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) of the conformance test data base are satisfied and achieved

Test Case ID: TC-QA-IR-SB-001	
2. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available	
Expected Result	• The IUT provides the quality values for all criteria marked with "M" in the respective Function Module • If applicable, the quality values are correctly set: • “id” (type string) – identifier for the criteria • “min” (type double) – minimum value from the range of this criteria • “max” (type double) – maximum value from the range of this criteria • “tmin” (type double) – minimum value of the allowed tolerance range of this criteria • “tmax” (type double) – maximum value of the allowed tolerance range of this criteria • value of “qa” representing the value of the quality evaluation result
3. The IUT is called via the conformance test interface and the non-compliant iris images are committed.	
Expected Result	• For every iris image a result containing a “`bio:IrisQuality`” elementis returned by the IUT via the test interface • The acceptance conditions (i.e. defined tolerances) of the conformance test data base are achieved
4. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available	
Expected Result	• If applicable the expected quality values are enclosed: • “id” (type string) – identifier for the criteria • “min” (type double) – minimum value from the range of this criteria • “max” (type double) – maximum value from the range of this criteria • “tmin” (type double) – minimum value of the allowed tolerance range of this criteria • “tmax” (type double) – maximum value of the allowed tolerance range of this criteria • value of “qa” representing the value of the quality evaluation result

Table 2.26. Test Case ID: TC-QA-IR-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.

2.5. Test Cases Compression

2.5.1. Test Cases FM COM-FI-JPG

<table>
<tr><th colspan="2">Test Case ID: TC-COM-FI-JPG-001</th></tr>
<tr><td colspan="2">Scope</td></tr>
<tr><td colspan="2">• Examine correct parametrisation of JPEG compression</td></tr>
<tr><td colspan="2">Precondition</td></tr>
<tr><td colspan="2">• IUT is running, required modules are loaded
• As necessary test resources: a test database containing multiple uncompressed facial reference images of varying resolution
  • small size (531*413 pixel)
  • medium size (800*600 pixel)
  • standard size (1600*1200 pixel)
• Image provision using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: <code>/TR03122/TC-COM-PH-JPG-001/1</code>
  • HTTP method: <code>POST</code></td></tr>
<tr><td colspan="2">Description</td></tr>
<tr><td colspan="2">1. Check minimum file size after compression of small sized images (531*413 pixel)
  • Initiate test case by loading a reference facial image using the test interface, given small sized images as input
  • Verify integrity of compressed file by decoding with a standard JPEG viewer/decoder</td></tr>
<tr><td>Expected output</td><td>• As a result, a message conforming to TR-03121 XML containing the compressed facial image is returned via the test interface (<code>bio:Record</code>)
• The actual file size the compressed image is greater than or equal to 25 KiB
• The resolution of the compressed images remains 531*413 pixel
• The resulting image can be decoded by a standard JPEG viewer/decoder</td></tr>
<tr><td colspan="2">2. Check minimum file size after compression of medium sized images (800*600 pixel)

• Initiate test case by loading a reference facial image using the test interface, given medium sized images as input
• Verify integrity of compressed file by decoding with a standard JPEG viewer/decoder</td></tr>
<tr><td>Expected output</td><td>• As a result, a message conforming to TR-03121 XML containing the compressed facial image is returned via the test interface (<code>bio:Record</code>)
• The actual file size of the compressed image is greater than or equal to 35 KiB
• The resolution of the compressed images remains 800*600 pixel
• The resulting images can be decoded by a standard JPEG viewer/decoder</td></tr>
<tr><td colspan="2">3. Check minimum file size after compression of standard sized images (1600*1200 pixel)</td></tr>
</table>

Test Case ID: TC-COM-FI-JPG-001	
2. Initiate test case by loading a reference facial image using the test interface, given standard sized images as input 3. Verify integrity of compressed file by decoding with a standard JPEG viewer/decoder	
Expected output	• As a result, a message conforming to TR-03121 XML containing the compressed facial image is returned via the test interface (`bio:Record`) • The actual file size of the compressed image is greater than or equal to 100 KiB • The resolution of the compressed images remains 1600*1200 pixel • The resulting images can be decoded by a standard JPEG viewer/decoder

Table 2.27. Test Case ID: TC-COM-FI-JPG-001

2.5.2. Test Cases FM COM-FI-JP2

Test Case ID: TC-COM-FI-JP2-001	
Scope	
• Examine correct parametrisation of JPEG2000 compression	
Precondition	
• IUT is running, required modules are loaded • 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 Decoder according to ISO/IEC 15444-1	
Description	
1. Extraction of the compressed facial image file from the biometric container	
Expected Result	• The actual file size the compressed image is 15 kB with a tolerance of +/- 5%. • The resolution of the compressed images remains 531*413 pixel • The resulting image can be decoded by a standard JPEG2000 viewer/decoder and the JPEG2000 header is coded correctly

Table 2.28. Test Case ID: TC-COM-FI-JP2-001

2.5.3. Test Cases FM COM-FP-WSQE

Test Case ID: TC-COM-FP-WSQE-001
Scope
Examination of the size and compression format of the resulting fingerprint images
Precondition
• A necessary test resource: IUT with FBI certified Wavelet Scalar Quantisation (WSQ) algorithm • IUT is running, required modules are loaded

Test Case ID: TC-COM-FP-WSQE-001	

• As necessary test resources: a Ground Truth database for conformance test and the CTS are at hand
• The test data base contains:
  • Sequences of fingerprint images
  • Corresponding Ground Truth values of WSQ compressed images with a bit-rate of 0.75
• Image provision using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: cf. "Testcase paths" below
  • `HTTP method: POST`	

Testcase paths	
Path	Description
`/TR03122/TC-COM-FP-WSQ-001/1/`	Examination of the WSQ 3.0 compatibility
`/TR03122/TC-COM-FP-WSQ-001/2/`	Examination of the WSQ 3.1 compatibility
Description	
1. Committing consecutively fingerprint images for this test case from the conformance test data base Initiate test case by calling the IUT and providing the images via the test interface	
Expected Result	As a result, for every input sequence a message conforming to TR-03121 XML containing the compressed fingerprint images is returned via the test interface (`bio:Record`)
2. Examination of the size of the WSQ image data	
Expected Result	The size of the compressed WSQ image is between 1/10 and 1/20 of the original raw image.
3. 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
4. Examination of the resulting format of the images (decode image data from the biometric container using a certified WSQ implementation)	
Expected Result	All returned fingerprint images can be decoded with the WSQ algorithm

Table 2.29. Test Case ID: TC-COM-FP-WSQE-001

Test Case ID: TC-COM-FP-WSQE-002	
Scope	
Examination of the certification of the WSQ algorithm used by the IUT.	
Precondition	
• A FBI certificate for the used WSQ implementation of the IUT is available	
Description	
1. Check of the FBI certificate of the used WSQ implementation	
Expected Result	• The WSQ implementation is certified by the FBI.

Table 2.30. Test Case ID: TC-COM-FP-WSQE-002

2.5.4. Test Cases FM 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	
• A necessary test resource: IUT with FBI certified WSQ algorithm • IUT is running, required modules are loaded • Acquisition of a fingerprint with the IUT	
Description	
1. Extraction of the compressed facial image file from the biometric container	
Expected Result	• The size of the compressed WSQ image is between (or equal) 17 and 18 kB. • The sf value in the WSQ header is not equal 0 • The sf value is referenced in the FBI certificate for the WSQimplementation of the module • All returned fingerprint images can be decoded with the WSQ algorithm

Table 2.31. Test Case ID: TC-COM-FP-WSQR-001

Table 1: Test Case TC-COM-FP-WSQR-001

2.5.5. Test Cases FM COM-IR-PNG

Test Case ID: TC-COM-IR-PNG-001	
Scope	
• Examine correct encoding of PNG images	
Precondition	

• IUT is running, required modules are loaded
• As necessary test resources: a test database containing multiple uncompressed iris reference images
• Image provision using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-COM-IR-PNG-001/1`
  • HTTP method: `POST`	

Description	

1. Check image encoding after compression
  • Initiate test case by loading a reference iris image using the test interface
  • Verify integrity of compressed file by decoding with a standard PNG viewer/decoder	

Expected output	• As a result, a message conforming to TR-03121 XML containing the compressed iris image is returned via the test interface (`bio:Record`) • The resulting image can be decoded by a standard PNG viewer/decoder

Table 2.32. Test Case ID: TC-COM-IR-PNG-001

2.6. Test Cases User Interface

2.6.1. Test Cases FM UI-FI-OP

Test Case ID: TC-UI-FI-OP-001	
Scope	
Examination of the correct user interface for facial images	
Precondition	

• IUT is running, required modules are loaded
• If the IUT does not provide a graphical user interface (e.g. it is implemented as a library), a rudimentary example user interface has to be provided for evaluation purposes
• As necessary test resource: test person, respectively test data (facial image)
• The digital camera is connected and the system is ready for capturing
• Perform manual acquisition of a facial image with IUT
  • Test case path: `/TR03122/TC-UI-PH-APP-001/1`
  • HTTP method: `GET`
• Alternatively: facial image provision using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-UI-PH-APP-001/1`
  • HTTP method: `POST`	

Description	
1. An image with sufficient quality is captured using the IUT or provided via test interface Initiate test case calling the IUT via the test interface	
Expected Result	• The test resource image is displayed in the graphical user interface (GUI) of the IUT • Any relevant quality criteria is displayed in the GUI (each resulting in OK) • The overall quality is indicated visually by the IUT (OK) • The IUT provides the option to put in veto before release of the image (veto is put in via UI, i.e. image is rejected despite positive QA result computed by IUT)

Table 2.33. Test Case ID: TC-UI-FI-OP-001

Test Case ID: TC-UI-FI-OP-002
Scope
Examination of the correct user interface for facial images
Precondition
• IUT is running, required modules are loaded • If the IUT does not provide a graphical user interface (e.g. it is implemented as a library), a rudimentary example user interface has to be provided for evaluation purposes • As necessary test resource: test person, respectively test data (facial image) • The digital camera is connected and the system is ready for capturing

Test Case ID: TC-UI-FI-OP-002	

• Perform manual acquisition of a facial image with IUT
  • Test case path: `/TR03122/TC-UI-PH-APP-002/1`
  • HTTP method: `GET`
• Alternatively: facial image provision using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-UI-PH-APP-002/1`
  • HTTP method: `POST`	

Description	
1. An image with insufficient quality is captured using the IUT or provided via test interface Initiate test case calling the IUT via the test interface	
Expected Result	• The test resource image is displayed in the GUI of the IUT • Any relevant quality criteria is displayed in the GUI (at least one resulting in NOK) • The overall quality is indicated visually by the IUT (NOK) • The cause for the negative overall quality assessment is displayed • The IUT provides the option to put in veto before release of the image (veto is put in via UI, i.e. image is accepted despite negative QA result computed by IUT)

Table 2.34. Test Case ID: TC-UI-FI-OP-002

2.6.2. Test Cases FM UI-FI-OP

Test Case ID: TC-UI-FI-OP-001	
Scope	
Examination of the correct user interface for facial images with sufficient quality	
Precondition	
• IUT is running, required modules are loaded • If the IUT does not provide a graphical user interface (e.g. it is implemented as a library), a rudimentary example user interface has to be provided for evaluation purposes	
Description	
1. An image with sufficient quality is captured using the IUT.	
Expected Result	• Any relevant quality criteria is displayed in the GUI (each resulting in OK) • The overall quality is indicated visually by the IUT (OK) • The IUT provides the option to put in veto before release of the image (veto is put in via UI, i.e. image is rejected despite positive Quality Assessment (QA) result computed by IUT)

Table 2.35. Test Case ID: TC-UI-FI-OP-001

Test Case ID: TC-UI-FI-OP-002	
Scope	
Examination of the correct user interface for facial images with insufficient quality.	
Precondition	
• IUT is running, required modules are loaded • If the IUT does not provide a graphical user interface (e.g. it is implemented as a library), a rudimentary example user interface has to be provided for evaluation purposes	
Description	
1. An image with insufficient quality is captured using the IUT e.g. the eye are closed test person closes the eyes and rotates the head. • Initiate test case calling the IUT via the test interface	
Expected Result	• Any relevant quality criteria is displayed in the GUI (at least one resulting in NOK) • The overall quality is indicated visually by the IUT (NOK) • The cause for the negative overall quality assessment is displayed • The IUT provides the option to put in veto before release of the image (veto is put in via UI, i.e. image is accepted despite negative QA result computed by IUT)

Table 2.36. Test Case ID: TC-UI-FI-OP-002

2.6.3. Test Cases FM UI-FP-OP

Test Case ID: TC-UI-FP-OP-001
Scope
Examination of the correct user interface for capturing fingerprints
Precondition

• IUT is running, required modules are loaded
• If the IUT does not provide a graphical user interface (e.g. it is implemented as a library), a rudimentary example user interface has to be provided for evaluation purposes
• As necessary test resource: a test person to perform the fingerprint acquisition with, respectively test data (fingerprint images)
• The fingerprint scanner is connected and the system is ready for capturing
• Perform manual acquisition of a facial image with IUT
  • Test case path: `/TR03122/TC-UI-FP-APP-001/1`
  • HTTP method: `GET`
• Alternatively: fingerprint image provision using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-UI-FP-APP-001/1`
  • HTTP method: `POST`

Description
1. The fingerprints are being captured using the IUT or provided via test interface

Test Case ID: TC-UI-FP-OP-001	
Initiate test case calling the IUT via the test interface	
Expected Result	• Visual feedback of the actual fingerprints is given within the IUT (at least by displaying the resulting captured images)

Table 2.37. Test Case ID: TC-UI-FP-OP-001

2.6.4. Test Cases FM UI-FP-OP

Test Case ID: TC-UI-FP-OP-001	
Scope	
Examination of the correct user interface for capturing fingerprints	
Precondition	
• IUT is running, required modules are loaded • If the IUT does not provide a graphical user interface (e.g. it is implemented as a library), a rudimentary example user interface has to be provided for evaluation purposes • As necessary test resource: a test person to perform the fingerprint acquisition with, respectively test data (fingerprint images) • The fingerprint scanner is connected and the system is ready for capturing	
Description	
1. The fingerprints are being captured using the IUT. • Capture fingerprint for test person.	
Expected Result	• Visual feedback of the actual fingerprints is given within the IUT (at least by displaying the resulting captured images)

Table 2.38. Test Case ID: TC-UI-FP-OP-001

Test Case ID: TC-UI-FP-OP-002
Scope
Examination of the correct user interface for capturing fingerprints if a sequence check occurs.
Precondition
• IUT is running, required modules are loaded • If the IUT does not provide a graphical user interface (e.g. it is implemented as a library), a rudimentary example user interface has to be provided for evaluation purposes • As necessary test resource: a test person to perform the fingerprint acquisition with, respectively test data (fingerprint images) • The fingerprint scanner is connected and the system is ready for capturing
Description
1. The fingerprints are being captured using the IUT. • Capture fingerprint of test person • Capture the same fingerprint for another finger than before position

Test Case ID: TC-UI-FP-OP-002	
Expected Result	• A warning is displayed that a sequence error was detected. • The fingers involved in the unexpected successful comparisons shall be displayed to the official.

Table 2.39. Test Case ID: TC-UI-FP-OP-002

2.6.5. Test Cases FM UI-IR-OP

Test Case ID: TC-UI-IR-OP-001	
Scope	
Examination of the correct user interface for iris images	
Precondition	

• IUT is running, required modules are loaded
• If the IUT does not provide a graphical user interface (e.g. it is implemented as a library), a rudimentary example user interface has to be provided for evaluation purposes
• Facial image provision using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • As necessary test resource: sample iris images with sufficient quality
  • Test case path: `/TR03122/TC-UI-IR-APP-001/1`
  • HTTP method: `POST`
• Alternatively:
  • As necessary test resources: test person, respectively test data (iris image)
  • The digital camera is connected and the system is ready for capturing
  • Perform manual acquisition of aniris image with IUT
  • Test case path: `/TR03122/TC-UI-IR-APP-001/1`
  • HTTP method: `GET`	

Description	
1. An image with sufficient quality is captured using the IUT or provided via the test interface Initiate the test case by calling the IUT via the test interface	
Expected Result	• The test resource image is displayed in the GUI of the IUT • For both irises: • All relevant quality criteria are displayed with their current value and threshold in the GUI (each resulting in OK) • The overall quality is indicated visually by the IUT (OK)

Table 2.40. Test Case ID: TC-UI-IR-OP-001

Test Case ID: TC-UI-IR-OP-002
Scope
Examination of the correct user interface for iris images
Precondition
• IUT is running, required modules are loaded

Test Case ID: TC-UI-IR-OP-002	

• If the IUT does not provide a graphical user interface (e.g. it is implemented as a library), a rudimentary example user interface has to be provided for evaluation purposes
• Facial image provision using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • As necessary test resource: sample iris images with insufficient quality
  • Test case path: `/TR03122/TC-UI-IR-APP-002/1`
  • HTTP method: `POST`
• Alternatively:
  • As necessary test resources: test person, respectively test data (iris image)
  • The digital camera is connected and the system is ready for capturing
  • Perform manual acquisition of an iris image with IUT
  • Test case path: `/TR03122/TC-UI-IR-APP-002/1`
  • HTTP method: `GET`	

Description	
1. An image with insufficient quality is captured using the IUT or provided via the test interface Initiate the test case by calling the IUT via the test interface	
Expected Result	• The test resource image is displayed in the GUI of the IUT • For both irises: • Any relevant quality criteria is displayed with their current value and threshold in the GUI (at least one resulting in NOK) • The overall quality is indicated visually by the IUT (NOK) • The cause for the negative overall quality assessment is displayed • The IUT provides the option to put in veto before release of the image (image accepted)

Table 2.41. Test Case ID: TC-UI-IR-OP-002

2.7. Test Cases Presentation Attack Detection

2.7.1. Test Cases PAD-FP-APP and APP1

Note, the test case 001 is optional for FM PAD-FP-APP1.

Test Case ID: TC-PAD-FP-APP-001
Scope
Examine certification of the presentation attack detection subsystem
Precondition
Product documentation of the fingerprint scanner model is at hand (e.g. data sheet, manual, manufacturer declaration)
Description
1. Verify that the subsystem certification meets the requirements • Consult product documentation

Test Case ID: TC-PAD-FP-APP-001	
Expected Result	• The documentation attest that the system is certified under the Common Criteria Agreement according to one of the following Protection profiles • BSI-CC-PP-0063-2010: Fingerprint Spoof Detection Protection Profile (FSDPP) • BSI-CC-PP-0062-2010: Fingerprint Spoof Detection Protection Profile based on Organisational Security Policies (FSDPP_OSP)

Table 2.42. Test Case ID: TC-PAD-FP-APP-001

Test Case ID: TC-PAD-FP-APP-002	
Scope	
Examine proper functionality of presentation attack detection subsystem	
Precondition	

• IUT is running, required modules are loaded
• A fingerprint scanner is connected
• As necessary test resource:
  • finger of a test person
  • fake fingerprint (e.g. made of silicone)	

Description	

1. Check proper presentation attack detection behaviour
  • Use the IUT to perform an acquisition of the finger with applied fake
  • Examine output of IUT	

Expected Result	• The (fake) fingerprint is captured and the resulting image displayed by the IUT • A message is given by the IUT regarding the attempted presentation attack • Additional information (detection result, detection score, etc.) is displayed

Table 2.43. Test Case ID: TC-PAD-FP-APP-002

2.8. Test Cases Biometric Comparison

2.8.1. Test Cases FM CMP-FP-CC

Test Case ID: TC-CMP-FP-CC-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 operating point of the comparison algorithm
Description
1. Examination of the documentation provided by the vendor of the comparison algorithm

Test Case ID: TC-CMP-FP-CC-001	
Expected Result	• The documentation gives information (typically a DET curve) of the performance of the algorithm based on a reference database. • The documentation gives evidence that the comparison algorithm ensures an operating point of a maximum false match rate (FMR) of 0.1 % and a false non-match rate (FNMR) below 2 %. • The documentation gives evidence that the comparison algorithm can be calibrated for the security level set within this specific scenario of verification.

Table 2.44. Test Case ID: TC-CMP-FP-CC-001

Test Case ID: TC-CMP-FP-CC-002	
Scope	
• Examination of proper crossmatching functionality of plain and rolled fingerprints	
Precondition	

• IUT is running, required modules are loaded
• A multi fingerprint scanner is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• IUT is configured to perform the identification process including following steps
  • Manual acquisition of ten plain fingerprints using the IUT
  • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static dummy values by IUT, so that the process can be finalized and the resulting data is returned by IUT as GSAT XML
• Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-CMP-FP-CC-002/1`
  • HTTP method: `GET`	

Description	

1. Check IUT correct behaviour of a mated crossmatching
  • Initiate test case by calling the IUT via the test interface
  • Capture 10 fingerprints, each fingerprint plain and rolled (in identical, mated order)
  • Resulting in a total of 10 captured fingerprint pairs (plain, rolled) of identical fingerprints	

Expected Result	• As a result, a message conforming to TR-03121 XML is returned via the test interface (element `bio:FingerAcquisition`, including information on the capture and crossmatching results) • The IUT returns a comparison score per pair of prints and each finger and a result of each verification (element `bio:ControlVerification`) • Each single comparison score is above the threshold and each verification result is positive

2. Check IUT correct behaviour of a non-mated crossmatching
  • Initiate test case by calling the IUT via the test interface
  • Capture 10 fingerprints, each fingerprint rolled and plain
  • Resulting in a total of 10 captured pairs (rolled, plain) of distinct fingerprints (e.g. by applying fingerprints of a second test person or permuting fingers)	

Test Case ID: TC-CMP-FP-CC-002	
Expected Result	• As a result, a message conforming to TR-03121 XML is returned via the test interface (element `bio:FingerAcquisition`, including information on the capture and crossmatching results) • The IUT returns a comparison score per pair of prints and each finger and a result of each verification (element `bio:ControlVerification`) • Non-mated crossmatchings (distinct fingers) yield a comparison score below the threshold and a negative verification result

Table 2.45. Test Case ID: TC-CMP-FP-CC-002

2.8.2. Test Cases FM CMP-FP-VID

Test Case ID: TC-CMP-FP-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 information (typically a Detection Error Trade-Off (DET) curve) of the performance of the algorithm based on a data. • 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 2 %. 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.

Table 2.46. Test Case ID: TC-CMP-FP-VID-001

2.8.3. Test Cases FM CMP-ALL-MMI

Test Case ID: TC-CMP-ALL-MMI-001
Scope
• Examination of the stated score level fusion algorithms and their performance for the biometric modalities supported by the system
Precondition
The documentation of the implemented fusion algorithms.
Description

Test Case ID: TC-CMP-ALL-MMI-001	
1. Examination of the provided documentation of the fusion algorithms.	

Expected Result	• The documentation states that the system is able to provide a single result score, based on the score-level fusion of all input modalities.
	  • Each of the biometric modalities which is available in the system is taken into account when the score-level fusion result is computed.
	  • The fusion algorithm is documented.
	  • The calibration process for the combination of the different scores is documented.
	  • The weighting scheme for each modality is documented.
	  • A combination strategy for incomplete records (containing only a subset of the required modalities) is present.
	• The documentation states that the system also provides a list of potential matches for which their respective score exceeds the thresholds configured for the system.
	• The documentation gives evidence that the system can be configured to achieve one of the following modes of operation regarding the fusion score performance:
	  • A maximum false-positive-identification-rate (FPIR) of 0.1 % and a false-negative-identification-rate (FNIR) below 1 %
	
	  or
	  • a maximum FPIR of 0.01 % and a FNIR below 2 %.
	• The documentation gives evidence that the fusion algorithm can be calibrated for different use cases.

Table 2.47. Test Case ID: TC-CMP-ALL-MMI-001

2.8.4. Test Cases FM CMP-FP-GENERIC

Test Case ID: TC-CMP-FP-GENERIC-001	
Scope	
• Examination of the configured security level for biometric comparison	
Precondition	
The vendor of the biometric comparison algorithm provides the documentation for his system which gives information about the implemented fingerprint identification algorithms.	
Description	
1. Examination of the documentation provided by the vendor of the identification algorithm.	
Expected Result	• The documentation gives evidence that the comparison algorithms achieve one of the following operating points: • A maximum FPIR of 0.1 % and a FNIR below 1,5 %

Test Case ID: TC-CMP-FP-GENERIC-001	
	or • a maximum FPIR of 0.01 % and a FNIR below 3 %. • The claims stated above are supported by test results for a series of tests performed on a database which is of similar size and characteristics as the one been used in the current application scenario. • Information about the data used for the calibration of the algorithm is provided, especially • the size and image characteristics of the database which was used for training the algorithm is stated. • the conversion routine between raw scores and threshold defined by False Positive Identification Rate is stated. • The documentation gives proof that the number of fingerprints used by the algorithm for each query can be configured up to the maximum of 10. • The documentation states that the system also provides a list of potential matches for which their respective score exceeds the thresholds configured for the system. The documentation gives proof that the maximum size of this list can be configured. • The documentation gives evidence that the comparison algorithm can be calibrated for different use cases, especially higher FPIR values in case of watchlist comparison scenarios.

Table 2.48. Test Case ID: TC-CMP-FP-GENERIC-001

2.8.5. Test Cases FM CMP-IR-GENERIC

Test Case ID: TC-CMP-IR-GENERIC-001	
Scope	
• Examination of the configured security level for biometric comparison	
Precondition	
The vendor of the biometric comparison algorithm provides the documentation for his system which gives information about the implemented iris identification algorithms.	
Description	
1. Examination of the documentation provided by the vendor of the identification algorithm.	
Expected Result	• The documentation gives evidence that the comparison algorithms achieve one of the following operating points: • A maximum FPIR of 0.1 % and a FNIR below 1,5 % or • a maximum FPIR of 0.01 % and a FNIR below 3 %. • The claims stated above are supported by test results for a series of tests performed on a database

Test Case ID: TC-CMP-IR-GENERIC-001	

	which is of similar size and characteristics as the one been used in the current application scenario.
	• Information about the data used for the calibration of the algorithm is provided, especially
	  • the size and image characteristics of the database which was used for training the algorithm is stated.
	  • the conversion routine between raw scores and threshold defined by False Positive Identification Rate is stated.
	• The documentation states that the system also provides a list of potential matches for which their respective score exceeds the thresholds configured for the system. The documentation gives proof that the maximum size of this list can be configured.
	• The documentation gives evidence that the comparison algorithm can be calibrated for different use cases, especially higher FPIR values in case of watchlist comparison scenarios.

Table 2.49. Test Case ID: TC-CMP-IR-GENERIC-001

2.8.6. Test Cases FM CMP-FI-GENERIC

Test Case ID: TC-CMP-FI-GENERIC-001	
Scope	
• Examination of the configured security level for biometric comparison	
Precondition	
The vendor of the biometric comparison algorithm provides the documentation for his system which gives information about the implemented facial image identification algorithms.	
Description	
1. Examination of the documentation provided by the vendor of the identification algorithm.	

Expected Result	• The documentation gives evidence that the comparison algorithms achieve one of the following operating points:
	  • A maximum FPIR of 1 % and a FNIR below 2,5 %
	  or
	  • a maximum FPIR of 0.1 % and a FNIR below 5 %.
	  or
	  • a maximum FPIR of 0.01 % and a FNIR below 10 %.
	• The claims stated above are supported by test results for a series of tests performed on a database which is of similar size and characteristics as the one been used in the current application scenario.
	• Information about the data used for the calibration of the algorithm is provided, especially

Test Case ID: TC-CMP-FI-GENERIC-001	
	• the size and image characteristics of the database which was used for training the algorithm is stated. • the conversion routine between raw scores and threshold defined by False Positive Identification Rate is stated. • The documentation states that the system also provides a list of potential matches for which their respective score exceeds the thresholds configured for the system. The documentation gives proof that the maximum size of this list can be configured. • The documentation gives evidence that the comparison algorithm can be calibrated for different use cases, especially higher FPIR values in case of watchlist comparison scenarios.

Table 2.50. Test Case ID: TC-CMP-FI-GENERIC-001

2.9. Test Cases Logging

2.9.1. Test Cases FM LOG-ALL-AAD

Test Case ID: TC-LOG-ALL-AAD-001	
Scope	
Examination of the correct semantics of logging data.	
Precondition	
• Availability of five sets of logging data (encoded as XML) each, e.g. produced by performing five deviating processes using IUT • Documentation about the used version scheme for all used components	
Description	
1. Verify semantics of logging data and information contained therein	
Expected Result	• Information about any existing facial images of the applicant in the CIR • number of images • whether an acceptable image is available and • whether any of the acceptable images was used. • Issuance status of Arrival Attestation Document (i.e. document issued vs. issuance postponed) • Information whether fingerprints are legally allowed to be captured

Table 2.51. Test Case ID: TC-LOG-ALL-AAD-001

2.9.2. Test Cases FM LOG-ALL-GID

Test Case ID: TC-LOG-ALL-GID-001
Scope
Examination of the correct semantics of logging data.

Test Case ID: TC-LOG-ALL-GID-001	
Precondition	
• Availability of five sets of logging data (encoded as XML) each, e.g. produced by performing five deviating processes using IUT • Documentation about the used version scheme for all used components • Note: If the IUT is a biometric component only, this test case shall not be applied as the relevant data are not acquired by the IUT itself.	
Description	
1. Verify semantics of logging data and information contained therein	
Expected Result	• Information whether fingerprint are legally allowed to be captured (i.e. person not under age) • Information about the applicant's choice of not including fingerprints in the document

Table 2.52. Test Case ID: TC-LOG-ALL-GID-001

2.9.3. Test Cases FM LOG-ALL-GENERIC

Test Case ID: TC-LOG-ALL-GENERIC-001	
Scope	
• Examination of the correct semantics of logging data.	
Precondition	
• Availability of five sets of logging data (encoded as XML) each, e.g. produced by performing five deviating processes using IUT • Documentation about the used version scheme for all used components	
Description	
1. Verify semantics of logging data and information contained therein	

Expected Result	• Generic process information
	  • a globally unique Transaction ID according to RFC 4122 Version 1 (time-based)
	  • global start time of the transaction
	  • global end time of the transaction
	  • fully qualified host name (or any other unique identifier serving as host name) of the station
	  • type of station (e.g. stationary/mobile)
	  • location of station[a]
	  • the software used in this transaction, at least with the following identifiers
	  • vendor name
	  • software name
	  • version number[b]
	  • error code (optional) detailing any abnormal termination of the process
	  • a transaction reference if this transaction is dependent or derived from another transaction
	• Information about any identification processes performed during this transaction

Test Case ID: TC-LOG-ALL-GENERIC-001	

	• start time of the identification process (i.e. beginning of capturing biometric data)
	• submit time of the identification process (i.e. when the captured data is submitted to the backend system for identification)
	• end time of the identification process (i.e. when the results from the backend system are available or the process terminated with a timeout)
	• a list of modalities used for identification
	• the result of the identification
	• the count of candidates available
	• for each candidate
	  • the rank of the candidate
	  • score and threshold information
	• an error code in case of abnormal termination of the identification process
	• Information about any enrolment processes performed during this transaction
	• start time of the enrolment process (i.e. beginning of capturing biometric data)
	• submit time of the enrolment process (i.e. when the captured data is submitted to the backend system for identification)
	• end time of the enrolment process (i.e. when the results from the backend system are available or the process terminated with a timeout)
	• a list of modalities used for enrolment
	• Information about any control verifications performed during enrolment
	• the enrolment status (i.e. whether the subject was enrolled successfully)
	• an error code in case of abnormal termination of the enrolment process
	• information about any verification processes performed during this transaction
	• start time of the verification process (i.e. beginning of capturing biometric data)
	• end time of the verification process
	• information about the references used for this verification processes (image type, position codes)
	• the verification result
	• for each verification
	  • the verification result
	  • for each comparison
	  • the result of the comparison
	  • the duration of the comparison process
	  • detailed scoring and threshold information
	  • an error code in case of abnormal termination of the comparison process

Test Case ID: TC-LOG-ALL-GENERIC-001	
	• an error code in case of abnormal termination of the verification process • Information about the records collected in this transaction • type of record (encoding format) • size of record • purpose of the record (enrolment, identification, verification)
2.Check availability of detailed error code list	
Expected Result	• A detailed list of error codes used with complete semantic descriptions is available for • if implemented, any error code detailing any abnormal termination of the process • any error code in case of abnormal termination of the identification process • any error code in case of abnormal termination of the enrolment process • any error code in case of abnormal termination of the comparison process • any error code in case of abnormal termination of the verification process

[a]The exact semantic of this value is profile-dependent. See the profile's function module for a refined definition

[b]Using a version numbering scheme which allows for proper lexicographic ordering is highly recommended.

Table 2.53. Test Case ID: TC-LOG-ALL-GENERIC-001

2.9.4. Test Cases FM LOG-FP-GENERIC

Test Case ID: TC-LOG-FP-GENERIC-001	
Scope	
• Examination of the correct semantics of logging data.	
Precondition	
• Availability of five sets of logging data (encoded as XML) each, e.g. produced by performing five deviating processes using IUT • Documentation about the used version scheme for all used components	
Description	
1. Verify semantics of the work flow logging data and information contained therein	
Expected Result	• the purpose of the acquisition (enrolment, identification, verification) • start time of the fingerprint acquisition process • end time of the fingerprint acquisition process • software used in this fingerprint acquisition process • hardware used in this fingerprint acquisition process • the finger capture mode (flat, roll, contactless) • information about missing fingers (in relation to the requirement of the profile)

Test Case ID: TC-LOG-FP-GENERIC-001	

	• information for each capture process for a dedicated fingerprint of slap, detailing
	  • fingerprint or slap code
	  • duration of the capture
	  • information whether this capture satisfies the quality requirements of the profile
	  • count of single capture attempts performed for this fingerprint of slap
	  • the capture number of the selected fingerprint or slap in case of multiple acquisitions
	  • results from the control verification process for each finger (e.g. when comparing a rolled image against a finger extracted from a control slap)
	  • for each capture attempt, detailing
	  • whether the capture attempt was acceptable
	  • the duration of the capture attempt
	  • in case of a capture attempt failure
	  • the rejection reason
	  • the error code

Expected Result	• for all captures, detailed quality information about the result, containing
	  • information about the quality assessment software
	  • duration of quality assessment
	  • detailed quality values in the range 0-100
	  • fingerprint or slap code
	  • any error code in case of abnormal termination of the quality assessment
	• uniqueness check information, detailing
	  • information about the uniqueness check algorithm
	  • the configured security level
	  • information about potential duplicates including finger codes and detailed scoring information
	  • any error code in case of abnormal termination of the uniqueness check
	• an error code in case of abnormal termination of the fingerprint acquisition process.
	• If presentation attack detection (PAD) is supported, the semantics of following logging data SHALL be tested in addition
	  • information about PAD data during the capture
	  • information about the PAD subsystem
	  • the overall PAD assessment result
	  • for each probe
	  • the PAD result
	  • detailed PAD quality values accompanied by
	  • identifiers
	  • upper and lower value bounds

Test Case ID: TC-LOG-FP-GENERIC-001	
	• upper and lower threshold bounds
2. Check availability of detailed error code list	

Expected Result	• A detailed list of error codes used with complete semantic descriptions is available for
	  • any error code in case of abnormal termination of the quality assessment
	  • any error code in case of abnormal termination of the uniqueness check
	  • any error code in case of abnormal termination of the fingerprint acquisition process.

Table 2.54. Test Case ID: TC-LOG-FP-GENERIC-001

2.9.5. Test Cases FM LOG-FP-BCL

Test Case ID: TC-LOG-FP-BCL-001
Description
• Verify semantics of logging data and information contained therein.

Table 2.55. Test Case ID: TC-LOG-FP-BCL-001

2.9.6. Test Cases FM LOG-FP-GID

Test Case ID: TC-LOG-FP-GID-001	
Scope	
• Examination of the correct semantics of logging data.	
Precondition	
• Availability of five sets of verification work flow logging data and evaluation work flow logging data (encoded as XML) each • Documentation about the used version scheme for all used components • Documentation about the used verification thresholds and the used mapping between raw scores and BioAPI FMRAchieved values.	
Description	
1. Correct semantics of the verification work flow logging data	
Expected Result	• The transaction identifier is present and unique across all transactions. • The time stamp is semantically correct (including any time zone information). • Information about the used software is present and conforms to the component version scheme. • Information about the process duration is present and plausible. • Information about the location is present. • Information about the loaded reference images (image type and image format) is present and correct. • Information about the read document (document type and issuing state) is present and correct.

Test Case ID: TC-LOG-FP-GID-001	

	• Demographic data of the document holder (gender, age class and nationality) is present and correct.
	• For the capture sub-fields:
	  • Duration of capture for each captured image is present and plausible.
	  • Information about the used capture software and hardware is present and conforms to the component version scheme.
	• Information about the probe images (size and type) is present and plausible.
	• For each captured image used for a verification attempt:
	  • Duration of the verification is present and plausible.
	  • Information about the software used for verification is present and conforms to the component version scheme.
	  • The configured threshold of the verification software is present and conforms to the documentation.
	  • Result of the genuine comparison (result, score and achieved FMR) are present and conform to the documentation, the BioAPI score mapping is correctly implemented.

2. Correct semantics of the evaluation work flow logging data	

Expected Result	• The transaction identifier is present and unique across all transactions.
	• The time stamp is semantically correct (including any time zone information).
	• Information about the used software is present and conforms to the component version scheme.
	• Information about the process duration is present and plausible.
	• Information about the location is present.
	• The transaction identifier corresponds to an existing transaction in the verification work flow.
	• Information about the quality assurance software are present and conform to the component version scheme.
	• For cross-comparison:
	  • The configured threshold of the verification software is present and conforms to the documentation.
	  • Result of the cross-comparisons (result, score and achieved FMR) are present and conform to the documentation, the BioAPI score mapping is correctly implemented.

Table 2.56. Test Case ID: TC-LOG-FP-GID-001

2.9.7. Test Cases FM LOG-FI-GENERIC

Test Case ID: TC-LOG-FI-GENERIC-001	
Scope	
• Examination of the correct semantics of logging data.	
Precondition	
• Availability of five sets of logging data (encoded as XML) each, e.g. produced by performing five deviating processes using IUT • Documentation about the used version scheme for all used components	
Description	
1. Verify semantics of logging data and information contained therein	

Expected Result	• the purpose of the acquisition (enrolment, identification, verification)
	• start time of the facial acquisition process
	• end time of the facial acquisition process
	• software used in this facial acquisition process
	• hardware used in this facial acquisition process
	• the source of the facial image under consideration
	• the count of face captures performed
	• for the best capture, detailed quality information about the result, detailing
	  • information about the quality assessment software
	  • duration of quality assessment
	  • detailed quality values for all mandatory criteria accompanied by
	  • identifiers
	  • upper and lower value bounds
	  • upper and lower threshold bounds
	  • any error code in case of abnormal termination of the quality assessment
	• an error code in case of abnormal termination of the facial acquisition process
	
	If PAD is supported, the semantics of following logging data SHALL be tested in addition
	
	• information about presentation attack detection (PAD) data during the capture
	  • information about the PAD subsystem
	  • the overall PAD assessment result
	  • for each probe
	  • the PAD result
	  • detailed PAD quality values accompanied by
	  • identifiers
	  • upper and lower value bounds
	  • upper and lower threshold bounds

2. Check availability of detailed error code list	

Test Case ID: TC-LOG-FI-GENERIC-001	

Expected Result	• A detailed list of error codes used with complete semantic descriptions is available for
	  • any error code in case of abnormal termination of the quality assessment
	  • and error code in case of abnormal termination of the facial acquisition process

Table 2.57. Test Case ID: TC-LOG-FI-GENERIC-001

2.9.8. Test Cases FM LOG-IR-GENERIC

Test Case ID: TC-LOG-IR-GENERIC-001	
Scope	
• Examination of the correct semantics of logging data.	
Precondition	
• Availability of five sets of logging data (encoded as XML) each • Documentation about the used version scheme for all used components	
Description	
1. Correct semantics of logging data and information contained therein	

Expected Result	• the purpose of the acquisition (enrolment, identification, verification)
	• start time of the iris acquisition process
	• end time of the iris acquisition process
	• software used in the iris acquisition process
	• hardware used in the iris acquisition process
	• information about missing irises
	  • label of missing iris (both, left, right, undefined)
	  • reason why iris is missing (temporary, permanent, no reason given)
	• information about capturing process of the iris image
	  • label of captured iris (both, left, right, undefined)
	  • duration of the capture of the iris (encompasses multiple tries if performed)
	• quality assurance information about captured iris images
	  • information about the quality assessment software
	  • duration of quality assessment
	  • results of iris image quality criteria accompanied by
	  • identifiers
	  • upper and lower value bounds
	  • upper and lower threshold bounds
	  • any error code in case of abnormal termination of the quality assessment
	• an error code in case of abnormal termination of the iris acquisition process

Test Case ID: TC-LOG-IR-GENERIC-001	

	If PAD is supported, the semantics of following logging data SHALL be tested in addition
	
	• information about PADdata during the capture
	  • information about the PAD subsystem
	  • the overall PAD assessment result
	  • for each probe
	  • the PAD result
	  • detailed PAD quality values accompanied by
	  • identifiers
	  • upper and lower value bounds
	  • upper and lower threshold bounds

2. Availability of detailed error code list	

Expected Result	• A detailed list of error codes used with complete semantic descriptions is available for
	  • any error code in case of abnormal termination of the iris quality assessment
	  • an error code in case of abnormal termination of the iris acquisition process

Table 2.58. Test Case ID: TC-LOG-IR-GENERIC-001

2.10. Test Cases Coding

2.10.1. Test Cases FM COD-ALL-AAD

Test Case ID: TC-COD-ALL-AAD-001
Scope
Examine proper overall encoding of input data (considering biographic, biometric and transaction specific data) for identification purposes
Precondition

• IUT is running, required modules are loaded
• A multi fingerprint scanner and facial camera is connected
• As necessary test resources: a test person to perform the biometric acquisition with
• IUT is configured to perform the identification process including following steps
  • Manual acquisition of ten plain fingerprints using the IUT
  • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static dummy values by IUT, so that the process can be finalized and the resulting data is returned by IUT as GSAT XML
• Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-COD-ALL-AAD-001/1`
  • HTTP method: `GET`

Description
1. Perform the whole acquisition process using the IUT in the identification scenario with subsequent examination of returned result data Initiate test case by calling the IUT via the test interface

Test Case ID: TC-COD-ALL-AAD-001	

Expected Result	• The resulting data is encoded and returned via the test interface in an appropriate XML format, i.e. as GSAT XML embedded within a TR-03121 XML (element `bio:XMLRecord[@type="GSAT-xml"]`)
	• Namespaces are declared according to GSAT 3.0 standard
	• The XML root element `itl:NISTBiometricInformationExchangePackage`exists and contains the following sub-elements
	  • `itl:PackageInformationRecord`
	  • `itl:PackageDescriptiveTextRecord`
	  • `itl:PackageFingerprintImageRecord`(multiple occurences)

2. Examination of Package Information Record contents (`itl:PackageInformationRecord`) in regard to syntax	

Expected Result	• The following sub-elements are contained within itl:PackageInformationRecord
	  • `ansi-nist:RecordCategoryCode`
	  • `int-i:Transaction`
	• The following mandatory sub-elements are contained within int-`i:Transaction`(referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • DAT
	  • DAI
	  • ORI
	  • GMT
	  • TCN
	  • DOM
	  • NSR
	  • NTR
	  • VER
	  • PRY
	  • CNT
	  • TOT

3. Examination of Package Descriptive Text Record contents (`itl:PackageDescriptiveTextRecord`) in regard to syntax	

Expected Result	• The following mandatory sub-elements are contained within `itl:PackageDescriptiveTextRecord` (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • `ansi-nist:RecordCategoryCode`
	  • IDC
	  • `itl:UserDefinedDescriptiveText`/ `GSAT:DomainDefinedDescriptiveFields`
	• The following mandatory sub-elements are contained within element`itl:UserDefinedDe-`

Test Case ID: TC-COD-ALL-AAD-001	
	scriptiveText/GSAT:DomainDefinedDescriptiveFields (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • DPR • OBU • SEX • PCN • PTM
4. Examination ofthe contents of each occurring Package Fingerprint Image Record (itl:PackageFingerprintImageRecord) in regard to syntax	
Expected Result	• The following mandatory sub-elements are contained within each occurrence of element itl:PackageFingerprintImageRecord (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • ansi-nist:RecordCategoryCode • IDC • itl:FingerprintImage • The following mandatory sub-elements are contained in element itl:FingerprintImage(referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • DAT • BPX • FCD • SRC • CGA • HLL • HPS • SLC • VLL VPS • IMP • FGP
5. Examination of the contents of Package Information Record (itl:PackageInformationRecord) in regard to semantics	
Expected Result	• Elementansi-nist:RecordCategoryCode-contains value '1' • The following mandatory sub-elements within element int-i:Transactioncontain the correct values as previously manually provided or programmatically generated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • DAT • DAI • ORI • GMT

Test Case ID: TC-COD-ALL-AAD-001	
	• TCN • DOM • NSR • NTR • VER • PRY • CNT • TOT
6. Examination ofthe contents of Package Descriptive Text Record(`itl:PackageDescriptiveTextRecord`) in regard to semantics	
Expected Result	• Element`ansi-nist:RecordCategoryCode` contains value '2' • Element with mnemonic code IDC is filled. • The following mandatory sub-elements within element `itl:UserDefinedDescriptiveText`/`GSAT:DomainDefinedDescriptiveFields`contain the correct values as previously manually provided or programmatically generated by the IUT (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • DPR • OBU • SEX • PCN • PTM
7. Examination ofthe contents of each occurring Package Fingerprint Image Record (`itl:PackageFingerprintImageRecord`) in regard to semantics	
Expected Result	• Element `ansi-nist:RecordCategoryCode` contains value '14' • Element with mnemonic code IDC is filled. • The following mandatory sub-elements within element `itl:FingerprintImage` contain the correct values as previously manually provided or programmatically generated by the IUT (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • DAT • BPX • FCD • SRC • CGA • HLL • HPS • SLC • VLL • VPS • IMP

Test Case ID: TC-COD-ALL-AAD-001	
	• FGP

Table 2.59. Test Case ID: TC-COD-ALL-AAD-001

Test Case ID: TC-COD-ALL-AAD-002	
Scope	
Examine proper overall encoding of input data (considering biographic, biometric and transaction specific data) for enrolment purposes	
Precondition	

• IUT is running, required modules are loaded
• As necessary test resources: fingers and face of a test person to perform the biometric acquisition with
• IUT is configured to perform the enrolment process including following steps
  • Manual acquisition of ten rolled and plain fingerprints and a facial image using the IUT
  • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static dummy values by IUT, so that the process can be finalized and the resulting data is returned as GSAT XML by IUT
• Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-COD-ALL-AAD-002/1`
  • HTTP method: `GET`	

Description	
1. Perform the whole acquisition process using the IUT in the enrolment scenario with subsequent examination of returned result data containing transaction related, biographic and biometric data Initiate test case by calling the IUT via the test interface	

Expected Result	• Namespaces are declared according to GSAT 3.0 standard
	• The XML root element `itl:NISTBiometricInformationExchangePackage` exists and contains the following sub-elements
	  • `itl:PackageInformationRecord`
	  • `itl:PackageDescriptiveTextRecord`
	  • `itl:PackageFingerprintImageRecord` (multiple occurences for both rolled and plain captured fingerprints)
	  • `itl:PackageFacialAndSMTImageRecord`

2. Examination of Package Information Record contents (`itl:PackageInformationRecord`) in regard to syntax	

Expected Result	• The following sub-elements are contained within `itl:PackageInformationRecord`
	  • `ansi-nist:RecordCategoryCode`
	  • `int-i:Transaction`
	• The following mandatory sub-elements are contained within `int-i:Transaction` (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • DAT
	  • DAI

Test Case ID: TC-COD-ALL-AAD-002	
	• ORI • GMT • TCN • DOM • NSR • NTR • VER • PRY • CNT • TOT
3. Examination of Package Descriptive Text Record contents (`itl:PackageDescriptiveTextRecord`) in regard to syntax	
Expected Result	• The following mandatory sub-elements are contained within `itl:PackageDescriptiveTextRecord` (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • `ansi-nist:RecordCategoryCode` • IDC • `itl:UserDefinedDescriptiveText`/ `GSAT:DomainDefinedDescriptiveFields` • The following mandatory sub-elements are contained within element`itl:UserDefinedDescriptiveText`/`GSAT:DomainDefinedDescriptiveFields` (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • DPR • OBU • SEX • PCN • PTM • RFP • DOB • DBR • POB • NAT • NAM • OTY • MN1 • PAA • DAA • NOO
4. Examination ofthe contents of each occurring Package Fingerprint Image Record (`itl:PackageFingerprintImageRecord`) in regard to syntax	
Expected Result	• The following mandatory sub-elements are contained within each occurrence of element `itl:PackageFingerprintImageRecord` (if

Test Case ID: TC-COD-ALL-AAD-002	
	available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • `ansi-nist:RecordCategoryCode` • IDC • `itl:FingerprintImage` • The following mandatory sub-elements are contained in element `itl:FingerprintImage`(referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • DAT • BPX • FCD • SRC • CGA • HLL • HPS • SLC • VLL • VPS • IMP • FGP
5. Examination ofthe contents of the Package Facial and SMT Image Record (`itl:PackageFacialAndSMTImageRecord`) in regard to syntax	
Expected Result	• The following mandatory sub-elements are contained within each occurrence of element `itl:PackageFacialAndSMTImageRecord` (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • `ansi-nist:RecordCategoryCode` • IDC • `itl:FaceImage` • The following mandatory sub-elements are contained in element `itl:FaceImage` (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) • DAT • PHD • SRC • CSP • CGA • HLL • HPS • SLC • IMT • VLL • VPS • SAP
6. Examination of the contents of Package Information Record (`itl:PackageInformationRecord`) in regard to semantics	

Test Case ID: TC-COD-ALL-AAD-002	

Expected Result	• Element`ansi-nist:RecordCategoryCode`– contains value '1'
	• The following mandatory sub-elements within element `int-i:Transaction`contain the correct values as previously manually provided or programmatically generated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • DAT
	  • DAI
	  • ORI
	  • GMT
	  • TCN
	  • DOM
	  • NSR
	  • NTR
	  • VER
	  • PRY
	  • CNT
	  • TOT

7. Examination ofthe contents of Package Descriptive Text Record(`itl:PackageDescriptiveTextRecord`) in regard to semantics	

Expected Result	• Element`ansi-nist:RecordCategoryCode`– contains value '2'
	• Element with mnemonic code IDC is filled.
	• The following mandatory sub-elements within element `itl:UserDefinedDescriptiveText`/`GSAT:DomainDefinedDescriptiveFields`contain the correct values as previously manually provided or programmatically generated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • DPR
	  • OBU
	  • SEX
	  • PCN
	  • PTM
	  • RFP
	  • DOB
	  • DBR
	  • POB
	  • NAT
	  • NAM
	  • OTY
	  • MN1
	  • PAA
	  • DAA
	  • NOO

Test Case ID: TC-COD-ALL-AAD-002	
• Examination ofthe contents of each occurring Package Fingerprint Image Record (`itl:PackageFingerprintImageRecord`) in regard to semantics	

Expected Result	• Element `ansi-nist:RecordCategoryCode` contains value '14'
	• Element with mnemonic code IDC is filled.
	• The following mandatory sub-elements within element `itl:FingerprintImage` contain the correct values as previously manually provided or programmatically generated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • DAT
	  • BPX
	  • FCD
	  • SRC
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • VLL
	  • VPS
	  • IMP
	  • FGP

8. Examination ofthe contents of the Package Facial and SMT Image Record (`itl:PackageFacialAndSMTImageRecord`) in regard to semantics	

Expected Result	• `ansi-nist:RecordCategoryCode`contains value '10'
	• Element with mnemonic code IDC is filled.
	• The following mandatory sub-elements within element `itl:FaceImage`contain the correct values as previously manually provided or programmatically generated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • DAT
	  • PHD
	  • SRC
	  • CSP
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • IMT
	  • VLL
	  • VPS
	  • SAP

Table 2.60. Test Case ID: TC-COD-ALL-AAD-002

2.10.2. Test Cases FM COD-ALL-GID

Test Case ID: TC-COD-ALL-GID-001	
Scope	
Examine proper overall encoding of data (considering biographic, biometric and transaction specific data) in the context of enrolment for German identity documents.	
Precondition	
• IUT is running, required modules are loaded • A fingerprint scanner and photo scanner or digital camera are connected • As necessary test resources: a test person • Manual acquisition of fingerprints and facial image using the IUT • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static dummy values by IUT, so that the process can be finalized and the resulting data is returned by IUT as TR XML	
Description	
1. Perform the complete acquisition process using the IUT in the enrolment scenario with subsequent examination of returned result data	

Expected Result	• The resulting data is encoded in an appropriate XML TR-03121 format:
	  • The generated XML can be successfully validated against the TR-03121 XML schema definition files.
	  • The following nodes exist and are conformant to the schema definition files.
	  • `bio:Enrolment`
	  • `bio:FaceAcquisition`
	  • `bio:FingerAcquisition`

Table 2.61. Test Case ID: TC-COD-ALL-GID-001

2.10.3. Test Cases FM COD-FI-GSAT3

Test Case ID: TC-COD-FI-GSAT3-001
Scope
• Examine correct encoding of a facial image

• IUT is running, required modules are loaded
• A facial camera is connected
• As necessary test resources: a test person to perform the facial acquisition with
• IUT is configured to perform a facial capture for conformance testing purposes
  • Perform manual acquisition of a facial image with IUT
  • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static dummy values by IUT, so that the process can be finalized and the resulting data is returned by IUT as GSAT XML
• Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-COD-PH-GSAT3-001/1`
  • HTTP method: `GET`

Description

Test Case ID: TC-COD-FI-GSAT3-001	
1. Perform the acquisition process using the IUT with subsequent examination of returned result data Initiate test case by calling the IUT via the test interface	

Expected Result	• The resulting data is encoded and returned via the test interface in an appropriate XML format, i.e. as GSAT XML embedded within a TR-03121 XML (element `bio:XML-Record[@type="GSAT-xml"]`)
	• The root element within element bio:XML-Record is`itl:NISTBiometricInformationExchangePackage`
	• The contained sub-element `itl:PackageFacialAndSMTImageRecord`exists and further contains the following sub-elements (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • `ansi-nist:RecordCategoryCode`
	  • IDC
	  • `itl:FaceImage`
	• The following mandatory sub-elements are contained in element `itl:FaceImage` (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • DAT
	  • PHD
	  • SRC
	  • CSP
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • IMT
	  • VLL
	  • VPS
	  • SAP

2. Examination of transaction related information within element `itl:PackageFacialAndSMTImageRecord` in regard to semantics	

Expected Result	• `ansi-nist:RecordCategoryCode`contains value ‘10’
	• The following mandatory sub-elements within element `itl:FaceImage`contain the correct values as previously manually provided or programmatically generated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • PHD
	  • IDC
	  • SRC
	  • IMT contains value ‘`FACE`’
	  • SAP

3. Examination of photo related information within element `itl:FaceImage` in regard to semantics	

Test Case ID: TC-COD-FI-GSAT3-001	

Expected Result	• Element with mnemonic code DAT contains a base64-encoded string value
	• The string value can be correctly decoded to a binary image file using a suitable software tool
	• The resulting binary file can be decoded by a standard image viewer application and visually represents the photo previously used as reference input
	• The information represented by the following elements match the decoded image properties at hand (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • CSP
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • VLL
	  • VPS

Table 2.62. Test Case ID: TC-COD-FI-GSAT3-001

2.10.4. Test Cases FM COD-FP-GSAT3

Test Case ID: TC-COD-FP-GSAT3-001	
Scope	
Examine proper encoding of plain captured fingerprints	
Precondition	

• IUT is running, required modules are loaded
• A multi fingerprint scanner is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• IUT is configured to capture plain fingerprints for conformance testing purposes
  • Perform manual acquisition of ten fingerprints using IUT
  • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static dummy values by IUT, so that the process can be finalized and the resulting data is returned by IUT as GSAT XML
• Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-COD-FP-GSAT3-001/1`
  • HTTP method: `GET`	

Description	
1. Perform the acquisition process using the IUT with subsequent examination of returned result data Initiate test case by calling the IUT via the test interface	
Expected Result	• The resulting data is encoded and returned via the test interface in an appropriate XML format, i.e. as GSAT XML embedded within a TR-03121 XML (element `bio:XML-Record[@type="GSAT-xml"]`)

Test Case ID: TC-COD-FP-GSAT3-001	

	• The root element within element `bio:XMLRecord`is-`itl:NISTBiometricInformationEx-changePackage`
	• A total of 14 occurrences (segmented fingerprints and slaps, in case of scenario 4-1-4-1) respectively 13 occurrences (segmented fingerprints and slap, in case of scenario 4-4-2) of sub-element `itl:PackageFingerprintImageRecord`exist and further, eachcontains the following sub-elements (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • `ansi-nist:RecordCategoryCode`
	  • IDC
	  • `itl:FingerprintImage`
	• The following mandatory sub-elements are contained in each occuring element `itl:FingerprintImage` (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • DAT
	  • BPX
	  • FCD
	  • SRC
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • VLL
	  • VPS
	  • IMP
	  • FGP

2. Examination of information within each occurrence of element `itl:PackageFingerprintImageRecord`in regard to semantics	

Expected Result	• `ansi-nist:RecordCategoryCode`contains value '14'
	• Element with mnemonic code IDC contains a value
	• The following mandatory sub-elements within element `itl:FingerprintImage`contain the correct values as previously manually provided or programmatically generated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • FCD
	  • SRC
	  • IMP

3. Examination of fingerprint related information within element `itl:FingerprintImage` in regard to semantics (to be performed for each occurrence of element `itl:PackageFingerprintImageRecord`within GSAT XML fragment)	
Expected Result	• Element with mnemonic code DAT contains a base64-encoded string value

Test Case ID: TC-COD-FP-GSAT3-001	

	• The string value can be properly decoded to a binary fingerprint image file (WSQ format) using a suitable software tool
	• The resulting file can be decoded by a standard image viewer application and visually represents a fingerprint
	• The information represented by the following elements match the decoded fingerprint image at hand (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • BPX
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • VLL
	  • VPS
	  • FGP

Table 2.63. Test Case ID: TC-COD-FP-GSAT3-001

Test Case ID: TC-COD-FP-GSAT3-002	
Scope	
Examine proper encoding of plain captured fingerprints, with at least one missing finger during capture	
Precondition	

• IUT is running, required modules are loaded
• A multi fingerprint scanner is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• IUT is configured to capture plain fingerprints for conformance testing purposes
  • Perform manual acquisition of fingerprints, omit acquisition of at least one finger (i.e. by marking it as missing)
  • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static dummy values by IUT, so that the process can be finalized and the resulting data is returned by IUT as GSAT XML
• Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-COD-FP-GSAT3-002/1`
  • HTTP method: `GET`	

Description	
1. Perform the acquisition process using the IUT with subsequent examination of returned result data Initiate test case by calling the IUT via the test interface	
Expected Result	• The resulting data is encoded and returned via the test interface in an appropriate XML format, i.e. as GSAT XML embedded within a TR-03121 XML (element `bio:XML-Record[@type="GSAT-xml"]`) • The root element within element `XMLRecord` is `itl:NISTBiometricInformationExchangePackage`

Test Case ID: TC-COD-FP-GSAT3-002	

	• A total of 14 occurrences (segmented fingerprints and slaps, in case of scenario 4-1-4-1) respectively 13 occurrences (segmented fingerprints and slap, in case of scenario 4-4-2) of sub-element `itl:PackageFingerprintImageRecord`exist and further, eachcontains the following sub-elements (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • `ansi-nist:RecordCategoryCode`
	  • IDC
	  • `itl:FingerprintImage`
	• The following mandatory sub-elements are contained in element `itl:FingerprintImage` (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • DAT
	  • BPX
	  • FCD
	  • SRC
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • VLL
	  • VPS
	  • IMP
	  • FGP

2. Examination of information within each occurrence of element `itl:PackageFingerprintImageRecord`in regard to semantics	

Expected Result	• `ansi-nist:RecordCategoryCode`contains value '14'
	• Element with mnemonic code IDC contains a value
	• The following mandatory sub-elements within element `itl:FingerprintImage`contain the correct values as previously manually provided or programmatically generated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • FCD
	  • SRC
	  • IMP

3. Examination of fingerprint related information within element `itl:FingerprintImage` in regard to semantics, only does apply to fingers actually captured (for each occurrence of element `itl:PackageFingerprintImageRecord`)	
Expected Result	• Element with mnemonic code DAT contains a base64-encoded string value • The string value can be properly decoded to a binary fingerprint image file (WSQ format) using a suitable software tool

Test Case ID: TC-COD-FP-GSAT3-002	

	• The resulting file can be decoded by a standard image viewer application
	• The information represented by the following elements match the decoded fingerprint image at hand (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • BPX
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • VLL
	  • VPS
	  • FGP

4. Examination of fingerprint related information within element `itl:FingerprintImage` in regard to semantics, only does apply to fingers NOT captured (for each occurrence of element `itl:PackageFingerprintImageRecord`)	

Expected Result	• `ansi-nist:RecordCategoryCode`contains value '14'
	• Element with mnemonic code IDC contains a value
	• The following mandatory sub-elements within element `itl:FingerprintImage`contain the correct values as previously manually provided or programmatically generated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • IMP
	  • FGP (additionally check if specified finger code value equals specific finger for which the acquisition was omitted for)
	  • AMP (additionally check if specified finger code value equals specific finger for which the acquisition was omitted for)

Table 2.64. Test Case ID: TC-COD-FP-GSAT3-002

Test Case ID: TC-COD-FP-GSAT3-003
Scope
Examine proper encoding of rolled captured fingerprints
Precondition

• IUT is running, required modules are loaded
• A multi fingerprint scanner is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• IUT is configured to capture rolled fingerprints for conformance testing purposes
  • Perform manual acquisition of fingerprints
  • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static dummy values by IUT, so that the process can be finalized and the resulting data is returned by IUT as GSAT XML
• Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-COD-FP-GSAT3-003/1`

Test Case ID: TC-COD-FP-GSAT3-003	
• HTTP method: `GET`	
Description	
1. Perform the acquisition process using the IUT with subsequent examination of returned result data Initiate test case by calling the IUT via the test interface	

Expected Result	• The resulting data is encoded and returned via the test interface in an appropriate XML format, i.e. as GSAT XML embedded within a TR-03121 XML (element `bio:XML-Record[@type="GSAT-xml"]`)
	• The root element within element XMLRecordis-`itl:NISTBiometricInformationEx-changePackage`
	• 14 occurrences of sub-element itl:PackageFingerprintI-mageRecordexist and further, eachcontains the following sub-elements (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • `ansi-nist:RecordCategoryCode`
	  • IDC
	  • `itl:FingerprintImage`
	• The following mandatory sub-elements are contained in element `itl:FingerprintImage` (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • DAT
	  • BPX
	  • FCD
	  • SRC
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • VLL
	  • VPS
	  • IMP
	  • FGP

2. Examination of information within each occurrence of element `itl:PackageFingerprintI-mageRecord`in regard to semantics	

Expected Result	• `ansi-nist:RecordCategoryCode`contains value ‘14’
	• Element with mnemonic code IDC contains a value
	• The following mandatory sub-elements within element `itl:FingerprintImage`contain the correct values as previously manually provided or programmatically generated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • FCD
	  • SRC
	  • IMP

Test Case ID: TC-COD-FP-GSAT3-003	
3. Examination of fingerprint related information within element `itl:FingerprintImage` in regard to semantics (to be performed for each occurrence of element `itl:PackageFingerprintImageRecord`within GSAT XML fragment)	

Expected Result	• Element with mnemonic code DAT contains a base64-encoded string value
	• The string value can be properly decoded to a binary fingerprint image file (WSQ format) using a suitable software tool
	• The resulting file can be decoded by a standard image viewer application and visually represents a fingerprint
	• The information represented by the following elements match the decoded fingerprint image at hand (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • BPX
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • VLL
	  • VPS
	  • FGP

Table 2.65. Test Case ID: TC-COD-FP-GSAT3-003

Test Case ID: TC-COD-FP-GSAT3-004
Scope
Examine proper encoding of rolled captured fingerprints, with at least one missing finger during capture
Precondition

• IUT is running, required modules are loaded
• A multi fingerprint scanner is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• IUT is configured to capture rolled fingerprints for conformance testing purposes
  • Perform manual acquisition of fingerprints, omit acquisition of at least one finger (i.e. by marking it as missing)
  • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static dummy values by IUT, so that the process can be finalized and the resulting data is returned by IUT as GSAT XML
• Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-COD-FP-GSAT3-004/1`
  • HTTP method: `GET`

Description
1. Perform the acquisition process using the IUT with subsequent examination of returned result data Initiate test case by calling the IUT via the test interface

Expected Result	• The resulting data is encoded and returned via the test interface in an appropriate XML format, i.e. as GSAT XML

Test Case ID: TC-COD-FP-GSAT3-004	

	embedded within a TR-03121 XML (element `bio:XML-Record[@type="GSAT-xml"]`)
	• The root element within element `bio:XMLRecord`is-`itl:NISTBiometricInformationEx-changePackage`
	• 14 occurrences of sub-element `itl:PackageFin-gerprintImageRecord`exist and further, eachcon-tains the following sub-elements (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • ansi-`nist:RecordCategoryCode`
	  • IDC
	  • `itl:FingerprintImage`
	• The following mandatory sub-elements are contained in element `itl:FingerprintImage` (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • DAT
	  • BPX
	  • FCD
	  • SRC
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • VLL
	  • VPS
	  • IMP
	  • FGP

2. Examination of information within each occurrence of element `itl:PackageFingerprintI-mageRecord`in regard to semantics	

Expected Result	• `ansi-nist:RecordCategoryCode`contains value '14'
	• Element with mnemonic code IDC contains a value
	• The following mandatory sub-elements within element `itl:FingerprintImage`contain the correct values as previously manually provided or programmatically gen-erated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • FCD
	  • SRC
	  • IMP

3. Examination of fingerprint related information within element `itl:FingerprintImage` in regard to semantics, only does apply to fingers actuallycaptured (for each occurrence of element `itl:PackageFingerprintImageRecord`)	
Expected Result	• Element with mnemonic code DAT contains a base64-en-coded string value

Test Case ID: TC-COD-FP-GSAT3-004	

	• The string value can be properly decoded to a binary fingerprint image file (WSQ format) using a suitable software tool
	• The resulting file can be decoded by a standard image viewer application
	• The information represented by the following elements match the decoded fingerprint image at hand (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • BPX
	  • CGA
	  • HLL
	  • HPS
	  • SLC
	  • VLL
	  • VPS
	  • FGP

4. Examination of fingerprint related information within element `itl:FingerprintImage` in regard to semantics, only does apply to fingers NOT captured (for each occurrence of element `itl:PackageFingerprintImageRecord`)	

Expected Result	• `ansi-nist:RecordCategoryCode`contains value '14'
	• Element with mnemonic code IDC contains a value
	• The following mandatory sub-elements within element `itl:FingerprintImage`contain the correct values as previously manually provided or programmatically generated by the IUT (referenced by mnemonic code as listed in corresponding FM of TR-03121-3)
	  • IMP
	  • FGP
	  • AMP

Table 2.66. Test Case ID: TC-COD-FP-GSAT3-004

2.10.5. Test Cases FM COD-FP-GID

Test Case ID: TC-COD-FP-GID-001	
Scope	
• Correct coding of the Common Biometric Exchange Formats Framework (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, Biometric Header Template (BHT) (XML element <data>) for each fingerprint	
Expected Result	• CBEFF Patron Header Version = '0101' • Biometric Data Block (BDB) Biometric Type: value = '08' (Fingerprint)

Test Case ID: TC-COD-FP-GID-001	
	• 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) • 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 {1,2,3,4,6,7,8,9} • Count of views = '01' • View number = '01' • Finger image quality {0-100} or 255 in case of error • Impression type = 0 (Live-scan plain) • Horizontal line length >0 • Vertical line length >0 • Reserved = 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 2.67. Test Case ID: TC-COD-FP-GID-001

Test Case ID: TC-COD-FP-GID-002	
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 `bio:FingerAcquistion`: 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 `bio:FingerAcquistion`: Examination of the finger position code in the finger image header and for both elements `bio:FingerCapture`: Examination of the value in the attribute `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 IUT GUI) is coded with the correct value in `fc` within `bio:FingerAcquistion`.	
Expected Result	• Value of `fc` is equal to the fingerprint positioned on the fingerprint sensor

Table 2.68. Test Case ID: TC-COD-FP-GID-002

2.10.6. Test Cases FM COD-ALL-MMI

Test Case ID: TC-COD-ALL-MMI-001
Scope
Examine proper overall encoding of data (considering biographic, biometric and transaction specific data) in the context of watchlist checks
Precondition

• IUT is running, required modules are loaded
• A fingerprint scanner, iris and facial camera are connected
• As necessary test resources: a test person
• IUT is configured to perform the watchlist checks including following steps
  • Manual acquisition of fingerprints, face and iris using the IUT
  • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static dummy values by IUT, so that the process can be finalized and the resulting data is returned by IUT as TR XML containing a NATO Standardization Agreement (STANAG) container
• Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-COD-ALL-MMI-001/1`
  • HTTP method: `GET`

Test Case ID: TC-COD-ALL-MMI-001	
Description	
1. Perform the complete acquisition process using the IUT in the enrolment scenario with subsequent examination of returned result data Initiate test case by calling the IUT via the test interface	
Expected Result	• • The generated XML can be successfully validated against the TR-03121 XML schema definition files. • The following nodes exist and are conformant to the schema definition files. Nodes for the respective modality SHALL exists if the modality is supported by the IUT. • `bio:Enrolment` • `bio:FaceAcquisition` • `bio:FingerAcquisition` • `bio:IrisAcquisition`

Table 2.69. Test Case ID: TC-COD-ALL-MMI-001

2.10.7. Test Cases FM COD-FP-STANAG

Test Case ID: TC-COD-FP-STANAG-001	
Scope	
Correct coding of fingerprint images according to [STANAG4715] transactions in binary format	
Precondition	
• STANAG container with fingerprints is available • STANAG parser is available	
Description	
1. Validating the structure of the STANAG container	
Expected Result	• The container consists of three record types occurring in exactly this order: • Type-1 • Type-2 • Type-14 • All mandatory fields for the given record type are present. In the context of this document, 'mandatory' is defined as an OR operation of the following elements: • Type-1 • "min-occurs" > 0 in Annex A • "M" in Annex J, column NES • Required by the Biometric Enabled Watchlist (BEWL) chapter (3.1) • Type-2 • "min-occurs" > 0 in Annex B • "M" in Annex K, column NES • Required by the BEWL chapter (3.1)"

Test Case ID: TC-COD-FP-STANAG-001	
	• Type-14 • "min-occurs" > 0 in Annex E

Table 2.70. Test Case ID: TC-COD-FP-STANAG-001

2.10.8. Test Cases FM COD-IR-STANAG

Test Case ID: TC-COD-IR-STANAG-001	
Scope	
Correct coding of iris images according to [STANAG4715] transactions in binary format	
Precondition	
• STANAG container with iris images is available • STANAG parser	
Description	
2. Validating the structure of the STANAG container	

Expected Result	• The container consists of three record types occurring in exactly this order:
	  • Type-1
	  • Type-2
	  • Type-17
	• All mandatory fields for the given record type are present. In the context of this document, 'mandatory' is defined as an OR operation of the following elements:
	  • Type-1
	  • "min-occurs" > 0 in Annex A
	  • "M" in Annex J, column NES
	  • Required by the BEWL chapter (3.1)
	  • Type-2
	  • "min-occurs" > 0 in Annex B
	  • "M" in Annex K, column NES
	  • Required by the BEWL chapter (3.1)"
	  • Type-17
	  • "min-occurs" > 0 in Annex F

Table 2.71. Test Case ID: TC-COD-IR-STANAG-001

2.10.9. Test Cases FM COD-FI-STANAG

Test Case ID: TC-COD-FI-STANAG-001
Scope
Correct coding of facial images according to [STANAG4715] transactions in binary format
Precondition
• STANAG container with a face image is available • STANAG parser
Description

Test Case ID: TC-COD-FI-STANAG-001	
1. Validating the structure of the STANAG container	

Expected Result	• The container consists of three record types occurring in exactly this order:
	  • Type-1
	  • Type-2
	  • Type-10
	• All mandatory fields for the given record type are present. In the context of this document, 'mandatory' is defined as an OR operation of the following elements:
	  • Type-1
	  • "min-occurs" > 0 in Annex A
	  • "M" in Annex J, column NES
	  • Required by the BEWL chapter (3.1)
	  • Type-2
	  • "min-occurs" > 0 in Annex B
	  • "M" in Annex K, column NES
	  • Required by the BEWL chapter (3.1)"
	  • Type-10
	  • "min-occurs" > 0 in Annex C

Table 2.72. Test Case ID: TC-COD-FI-STANAG-001

2.10.10. Test Cases FM COD-FI-GID

Test Case ID: TC-COD-FI-GID-001	
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	

	• 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

Test Case ID: TC-COD-FI-GID-001	

	• 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 2.73. Test Case ID: TC-COD-FI-GID-001

Test Case ID: TC-COD-FI-GID-002	
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 min, max, tmin or tmax are present the following relation has to be valid: min<=tmin<=tmax<=max

Table 2.74. Test Case ID: TC-COD-FI-GID-002

3. Test Cases Partial Application Processes

The following sections define test cases for Partial Application Processes.

3.1. Test Cases PAP ACQ-FI-SV-2: Supervised Facial Image Acquisition with CIR Lookup

Test Case ID: TC-PAP-ACQ-FI-SV-2_001	
Scope	
• Verify correct behaviour of the image acquisition process when a single admissible image is available from Central Identity Register (CIR)	
Precondition	

• IUT is running, required modules are loaded
• As necessary test resource:
  • A locally available facial image of a test person (simulating CIR data)
• Image provision as BMP or JPEG using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-P-PH-AAD-001/1`
  • HTTP method: `POST`	

Description	
1. Check display of loaded image in IUT Initiate test case by loading the reference facial image using the test interface	
Expected Result	• The resource image used as input is displayed within the GUI of the IUT, if applicable cropped and aligned
2. Check quality indication of loaded image	
Expected Result	The image quality is indicated and a hint regarding reusability of the image is given by the IUT
3. Verify availability option for manual capture	
Expected Result	Besides displaying the loaded image, the IUT presents the option to capture a new live image (do not perform)
4. Check proper take over of image by IUT Select the displayed image for re-use	
Expected Result	The selected image is accepted for the further process within the IUT (either sufficient quality indication or by operator veto)
5. Verify encoding of selected image Proceed in the process until the facial image is encoded in the output format for export to CIR	
Expected Result	• The selected image is encoded and returned via the test interface in an appropriate XML format, e.g. as GSAT XML embedded within a TR-03121 XML (element `bio:XMLRecord[@type="GSAT-xml"]`)

Test Case ID: TC-PAP-ACQ-FI-SV-2_001	
	• The therein contained image data matches the data of the previously selected image (after proper decoding of element `itl:FaceImage`)

Table 3.1. Test Case ID: TC-PAP-ACQ-FI-SV-2_001

Test Case ID: TC-PAP-ACQ-FI-SV-2_002	
Scope	
Verify correct behaviour of the image acquisition process in case multiple admissible images are available from CIR	
Precondition	

• IUT is running, required modules are loaded
• As necessary test resource:
  • Multiple locally available facial images of a test person (simulating CIR data)
• Images are provided as BMP or JPEG in a single XML file using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-P-PH-AAD-002/1`
  • HTTP method: `POST`	

Description	
1. Check display of loaded images in IUT Initiate test case by loading the reference facial images using the test interface	
Expected Result	• The resource images used as input are displayed within the GUI of the IUT, if applicable cropped and aligned
2. Check quality indication of loaded images	
Expected Result	• The quality assessment result for each displayed image is indicated and a hint regarding re-usability of each image is given by the IUT
3. Verify availability option for manual capture	
Expected Result	• Besides the display of the available images, the IUT presents the option to capture a new live image (do not perform)
4. Check proper take over of image by IUT Select one of the displayed images for re-use	
Expected Result	The selected image is accepted for the further process within the IUT (either sufficient quality indication or by operator veto)
5. Verify encoding of selected image Proceed in the process until the facial image is encoded in the output format for export to CIR	
Expected Result	• The selected image is encoded and returned via the test interface in an appropriate XML format, e.g. as GSAT XML embedded within a TR-03121 XML (element `bio:XMLRecord[@type="GSAT-xml"]`)

Test Case ID: TC-PAP-ACQ-FI-SV-2_002	
	• The therein contained image data matches the data of the previously selected image (after proper decoding of element `itl:FaceImage`)

Table 3.2. Test Case ID: TC-PAP-ACQ-FI-SV-2_002

Test Case ID: TC-PAP-ACQ-FI-SV-2_003	
Scope	
Verify correct behaviour of the image acquisition when no admissible image is available from CIR	
Precondition	

• IUT is running, required modules are loaded
• A connected digital camera, accessible by IUT
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-P-PH-AAD-003/1`
  • HTTP method: `GET`	

Description	
1. Verify proper behaviour of IUT Initiate test case by calling the IUT via the test interface Check for dialogue in order to perform a live capture	
Expected Result	IUT does not display any images IUT displays the option to perform a live capture
2. Check availability of live image acquisition process	
Expected Result	• When option for live acquisition is selected, the process starts
3. Check availability of live image acquisition process • Perform a facial capture intentionally resulting in subsequent quality assessment to fail • Check for hint and option to re-capture in IUT (ignore both) • Check for availability of option to veto (i.e. override the negative result of the quality assessment) • Put in veto	
Expected Result	Veto is accepted by IUT Captured photo is used in further steps of process
4. Verify encoding of selected image Proceed in the process until the facial image is encoded in the output format for export to CIR	
Expected Result	• The selected image is encoded and returned via the test interface in an appropriate XML format, e.g. as GSAT XML embedded within a TR-03121 XML (element `bio:XMLRecord[@type="GSAT-xml"]`)

Test Case ID: TC-PAP-ACQ-FI-SV-2_003	
	• The therein contained image data matches the data of the previously captured image (after proper decoding of element `itl:FaceImage`)

Table 3.3. Test Case ID: TC-PAP-ACQ-FI-SV-2_003

3.2. Test Cases PAP ACQ-FP442-SV-1: Supervised Acquisition 4-4-2 for Enrolment

Test Case ID: TC-PAP-ACQ-FP442-SV-1_001	
Scope	
• Examination of the correct process for the acquisition of up to ten fingerprints using the 4-4-2 capture sequence with a multi fingerprint scanner	
Precondition	

• IUT is running, required modules are loaded
• A multi fingerprint scanner is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-P-FP-PLAIN-001/1`
  • HTTP method: `GET`	

Description	

1. Check the correct execution of the acquisition process with fingerprints of sufficient quality
  • Initiate test case by calling the IUT via the test interface
  • Perform the acquisition process of all fingers of the right slap, left slap and both thumbs	

Expected Result	• The acquisition is performed in the 4-4-2 sequence (right slap, left slap, thumbs) • The IUT finishes without any error message • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`

2. Check the correct execution of the acquisition process with fingerprints of sufficient quality
  • Initiate test case by calling the IUT via the test interface
  • Mark one finger of the right slap as handicapped
  • Perform the acquisition process	

Expected Result	• The IUT allows marking handicapped fingers before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked finger is excluded from the acquisition process

Test Case ID: TC-PAP-ACQ-FP442-SV-1_001	
	• The IUT finishes without any error message • As a result, nine encoded fingerprints (missing finger of the right slap) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
3. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicap on the left slap • Initiate test case by calling the IUT via the test interface • Mark one finger of the left slap as handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking handicapped fingers before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked finger is excluded from the acquisition process • The IUT finishes without any error message • As a result, nine encoded fingerprints (missing finger of the right slap) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
4. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicapped thumb • Initiate test case by calling the IUT via the test interface • Mark one thumb as handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking handicapped fingers before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked thumb is excluded from the acquisition process • The IUT finishes without any error message • As a result, nine encoded fingerprints (missing thumb) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-el-

Test Case ID: TC-PAP-ACQ-FP442-SV-1_001	
	ements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
5. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a missing hand • Initiate test case by calling the IUT via the test interface • Mark a whole hand as not available/handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking a hand (or all fingers of one hand individually) as not available before acquisition. • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked hand is excluded from the acquisition process • The IUT finishes without any error message • As a result, five encoded fingerprints (missing hand) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
6. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with one finger for each slap. • Initiate test case by calling the IUT via the test interface • Mark only one finger per slap as available • Perform the acquisition process	
Expected Result	• The IUT acquires the single fingers in a slap capture each. • The acquisition is triggered by placing the finger(s) on the acquisition hardware • Per slap, only one finger is expected by the IUT (one finger per right and left slap, one thumb) • The IUT finishes without any error message • As a result, three encoded fingerprints (one finger per each hand, one thumb) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`

Test Case ID: TC-PAP-ACQ-FP442-SV-1_001	
7. Check the correct execution of the acquisition process with fingerprints of insufficient quality, regarding capture repetition • Initiate test case by calling the IUT via the test interface • Enforce insufficient quality of at least one fingerprint during capture • Perform the acquisition process	
Expected Result	• The IUT detects the insufficient quality and restarts the acquisition of the current slap • The acquisition of the slap with insufficient fingerprint quality is repeated twice (i.e. total of three performed attempts) • The IUT finishes without any error message • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
8. Check whether the IUT offers the execution of the fallback single-finger acquisition process for cases where a slap capture is not practical. • Initiate test case by calling the IUT via the test interface • Perform the acquisition process	
Expected Result	• After selecting the 4-4-2 sequence option, the IUT offers an option to start acquisition in single finger mode in cases when a slap capture is not practical. • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
9. In case of a plain fingerprint enrolment scenario: Check whether the IUT offers the execution of the fallback single-finger acquisition process for fingers of insufficient quality. • Initiate test case by calling the IUT via the test interface • Enforce insufficient quality of at least one fingerprint during capture of right hand slap • Perform the acquisition of right hand slap • Enforce insufficient quality of at least one fingerprint during capture of left hand slap • Perform the acquisition of left hand slap • Enforce insufficient quality of at least one fingerprint during capture of thumbs • Perform the acquisition of thumbs	
Expected Result	• After capturing each slap (left and right), as well as after capturing the thumbs, the IUT offers an op-

Test Case ID: TC-PAP-ACQ-FP442-SV-1_001	
	tion to start acquisition in single finger mode for fingers of the current slap. • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
10. In case of a plain fingerprint enrolment scenario: Check whether the fallback single finger acquisition process replaces the corresponding fingerprints from the slap capture. • Initiate test case by calling the IUT via the test interface • Enforce insufficient quality of one fingerprint during capture of right hand slap • Perform the acquisition of right hand slap • ensure sufficient quality of the same right hand fingerprint during capture in single-finger acquisition • Perform the acquisition of right hand single finger • Enforce insufficient quality of one fingerprint during capture of left hand slap • Perform the acquisition of left hand slap • ensure sufficient quality of the same left hand fingerprint during capture in single-finger acquisition • Perform the acquisition of left single finger • Enforce insufficient quality of one fingerprint during capture of thumbs • Perform the acquisition of thumbs • ensure sufficient quality of the same thumb during capture in single-finger acquisition • Perform the acquisition of single thumb	
Expected Result	• As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records` • The enforced fingerprints of insufficient quality are replaced by the fingerprints of ensured good quality from single-finger acquisition.

Table 3.4. Test Case ID: TC-PAP-ACQ-FP442-SV-1_001

3.3. Test Cases PAP ACQ-FP4141-SV-1: Supervised Acquisition 4-1-4-1 for Enrolment

Test Case ID: TC-PAP-ACQ-FP4141-SV-1_001
Scope
• Examination of the correct process for the acquisition of up to ten fingerprints using the 4-1-4-1 capture sequence with a multi fingerprint scanner

<table>
<tr><th colspan="2">Test Case ID: TC-PAP-ACQ-FP4141-SV-1_001</th></tr>
<tr><td colspan="2">Precondition</td></tr>
<tr><td colspan="2">• IUT is running, required modules are loaded
• A multi fingerprint scanner is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: <code>/TR03122/TC-P-FP-PLAIN-002/1</code>
  • HTTP method: <code>GET</code></td></tr>
<tr><td colspan="2">Description</td></tr>
<tr><td colspan="2">1. Check the correct execution of the acquisition process with fingerprints of sufficient quality
  • Initiate test case by calling the IUT via the test interface
  • Perform the acquisition process of all fingers of the right slap, left slap and thumbs</td></tr>
<tr><td>Expected Result</td><td>• The acquisition is performed in the 4-1-4-1 sequence (right slap, right thumb, left slap, left thumb)
• The IUT finishes without any error message
• As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element <code>bio:FingerAcquisition</code> and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element <code>bio:Records</code></td></tr>
<tr><td colspan="2">2. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicap on the right slap
  • Initiate test case by calling the IUT via the test interface
  • Mark one finger of the right slap as handicapped
  • Perform the acquisition process</td></tr>
<tr><td>Expected Result</td><td>• The IUT allows marking handicapped fingers before acquisition
• The acquisition is triggered by placing the finger(s) on the acquisition hardware
• The marked finger is excluded from the acquisition process
• The IUT finishes without any error message
• As a result, nine encoded fingerprints (missing finger of the right slap) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element <code>bio:FingerAcquisition</code> and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element <code>bio:Records</code></td></tr>
</table>

Test Case ID: TC-PAP-ACQ-FP4141-SV-1_001	
3. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicapped right thumb • Initiate test case by calling the IUT via the test interface • Mark the right thumb as handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking handicapped fingers before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The right thumb is excluded from the acquisition process • The IUT finishes without any error message • As a result, nine encoded fingerprints (missing right thumb) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
4. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicap on the left slap • Initiate test case by calling the IUT via the test interface • Mark one finger of the left slap as handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking handicapped fingers before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked finger is excluded from the acquisition process • As a result, nine encoded fingerprints (missing finger of the left slap) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
5. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicapped left thumb • Initiate test case by calling the IUT via the test interface • Mark the left thumb as handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking handicapped fingers before acquisition

Test Case ID: TC-PAP-ACQ-FP4141-SV-1_001	
	• The acquisition is triggered by placing the finger(s) on the acquisition hardware • The left thumb is excluded from the acquisition process • The IUT finishes without any error message • As a result, nine encoded fingerprints (missing left thumb) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
6. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a missing hand • Initiate test case by calling the IUT via the test interface • Mark a whole hand (right or left) as not available/handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking a hand (or all fingers of one hand individually) as not available before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked hand is excluded from the acquisition process • The IUT finishes without any error message • As a result, five encoded fingerprints (missing hand) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
7. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with one finger for each slap. • Initiate test case by calling the IUT via the test interface • Mark only one finger per slap (left and right) as available • Perform the acquisition process	
Expected Result	• The IUT acquires the single fingers in a slap capture each. • The acquisition is triggered by placing the finger(s) on the acquisition hardware • Per slap, only one finger is expected by the IUT: one finger per right and left slap, thumbs successively • The IUT finishes without any error message

Test Case ID: TC-PAP-ACQ-FP4141-SV-1_001	
	• As a result, four encoded fingerprints (one finger per each hand, including both thumbs) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
8. Check the correct execution of the acquisition process with fingerprints of insufficient quality, regarding capture repetition • Initiate test case by calling the IUT via the test interface • Enforce insufficient quality of at least one fingerprint during capture • Perform the acquisition process	
Expected Result	• The IUT detects the insufficient quality and restarts the acquisition of the current slap • The acquisition of the slap with insufficient fingerprint quality is repeated twice (i.e. total of three performed attempts) • The IUT finishes without any error message • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
9. Check whether the IUT offers the execution of the fallback single finger acquisition process for cases where a slap capture is not practical. • Initiate test case by calling the IUT via the test interface • Perform the acquisition process	
Expected Result	• After selecting the 4-1-4-1 sequence option, the IUT offers an option to start acquisition in single finger mode in cases when a slap capture is not practical. • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`

Test Case ID: TC-PAP-ACQ-FP4141-SV-1_001	
10. In cases of a plain fingerprint enrolment scenario: Check whether the IUT offers the execution of the fallback single-finger acquisition process for fingers of insufficient quality. • Initiate test case by calling the IUT via the test interface • Enforce insufficient quality of one fingerprint during capture of right hand slap • Perform the acquisition of right hand slap • Perform the acquisition of right hand thumb • Enforce insufficient quality of one fingerprint during capture of left hand slap • Perform the acquisition of left hand slap • Perform the acquisition of left hand thumb	
Expected Result	• After capturing each slap (left and right) the IUT offers an option to start acquisition in single finger mode for fingers of the current slap • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
11. In case of a plain fingerprint enrolment scenario: Check whether the fallback single finger acquisition process replaces the corresponding fingerprints from the slap capture. • Initiate test case by calling the IUT via the test interface • Select the capture sequence 4-1-4-1 • Enforce insufficient quality of one fingerprint during capture of right hand slap • Enter fallback single-finger mode • ensure sufficient quality of the same right hand fingerprint during capture of right hand slap in single-finger acquisition • Perform the acquisition of right hand thumb • Enforce insufficient quality of one fingerprint during capture of left hand slap • Enter fallback single-finger mode • ensure sufficient quality of the same left hand fingerprint during capture of right hand slap in single-finger acquisition • Perform the acquisition of left hand thumb	
Expected Result	• The enforced fingerprints of insufficient quality are replaced by the fingerprints of ensured good quality from single-finger acquisition. • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`

Table 3.5. Test Case ID: TC-PAP-ACQ-FP4141-SV-1_001

3.4. Test Cases PAP ACQ-FP2P-SV-1: Supervised Acquisition of Two Plain Fingers on Multi-Finger Hardware for Enrolment

Test Case ID: TC-PAP-ACQ-FP2P-SV-1_001	
Scope	
Examination of the correct process for the acquisition of up to two fingerprints using the two finger capture mode with a multi fingerprint scanner	
Precondition	

• IUT is running, required modules are loaded
• A multi fingerprint scanner is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-P-FP-PLAIN-003/1`
  • HTTP method: `GET`	

Description	

1. Check the correct execution of the acquisition process with fingerprints of sufficient quality
  • Initiate test case by calling the IUT via the test interface
  • Perform the acquisition process of the two fingerprints	

Expected Result	• The acquisition is triggered by placing the finger(s) on the acquisition hardware in the two finger mode (right index and left index) • The IUT finishes without any error message • As a result, two encoded fingerprints (left and right index fingers) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`

2. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicap on the right hand
  • Initiate test case by calling the IUT via the test interface
  • Mark index finger of the right hand as handicapped
  • Perform the acquisition process	

Expected Result	• The IUT allows marking handicapped fingers before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked finger is excluded from the acquisition process • The IUT changes to single finger mode • The IUT finishes without any error message • As a result, two encoded fingerprints (right thumb, left index finger) are returned via the test interface in a message conforming to TR-03121 XML.

Test Case ID: TC-PAP-ACQ-FP2P-SV-1_001	
	The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
3. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicap on the left hand • Initiate test case by calling the IUT via the test interface • Mark index finger of the left hand as handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking handicapped fingers before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked finger is excluded from the acquisition process • The IUT changes to single finger mode • The IUT finishes without any error message • As a result, two encoded fingerprints (right index finger, left thumb) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
4. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a missing hand • Initiate test case by calling the IUT via the test interface • Mark a whole hand (right or left) as not available/handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking a hand (or all fingers of one hand individually) as not available before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked hand is excluded from the acquisition process • The IUT changes to single finger mode for the existing hand • The IUT finishes without any error message • As a result, two encoded fingerprints (index finger and thumb of left, respectively right hand) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:Fin-`

Test Case ID: TC-PAP-ACQ-FP2P-SV-1_001	
	`gerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
5. Check the correct execution of the acquisition process with fingerprints of insufficient quality, regarding capture repetition • Initiate test case by calling the IUT via the test interface • Enforce insufficient quality of at least one fingerprint during capture • Perform the acquisition process	
Expected Result	• The IUT detects the insufficient quality and restarts the acquisition of the current slap • The acquisition of the slap of insufficient fingerprint quality is repeated twice (i.e. total of three performed attempts) • The IUT finishes without any error message • As a result, two encoded fingerprints (both index fingers) returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
6. Check whether the IUT offers the execution of the fallback single-finger acquisition process for cases where a slap capture is not practical. • Initiate test case by calling the IUT via the test interface • Perform the acquisition process	
Expected Result	• After selecting the two-finger sequence for multi-finger hardware, the IUT offers an option to start acquisition in single finger mode • As a result, two encoded fingerprints (both index fingers) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
7. In case of a plain fingerprint enrolment scenario: Check whether the IUT offers the execution of the fallback single finger acquisition process for fingers of insufficient quality. • Initiate test case by calling the IUT via the test interface • Ensure insufficient fingerprint quality of at least one fingerprint • Perform the acquisition process	
Expected Result	• After capturing the slap, the IUT offers an option to start acquisition in single finger mode

Test Case ID: TC-PAP-ACQ-FP2P-SV-1_001	
	• As a result, two encoded fingerprints (both index fingers) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
8. In case of a plain fingerprint enrolment scenario: Check whether the fallback single finger acquisition process replaces the corresponding fingerprints from the slap capture. • Initiate test case by calling the IUT via the test interface • Enforce insufficient quality of one fingerprint during capture of slap • Ensure sufficient quality of the same fingerprint during capture in single-finger acquisition • Perform the acquisition process	
Expected Result	• As a result, two encoded fingerprints (both index fingers) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records` • The enforced fingerprint of insufficient quality is replaced by the fingerprint of ensured good quality from single-finger acquisition

Table 3.6. Test Case ID: TC-PAP-ACQ-FP2P-SV-1_001

3.5. Test Cases PAP ACQ-FP2P-SV-2: Supervised Acquisition of Two Plain Fingers on Single-Finger Hardware for Enrolment

Test Case ID: TC-PAP-ACQ-FP2P-SV-2_001
Scope
Examination of the correct process for the acquisition of up to two fingerprints using the two finger capture mode with a single fingerprint scanner
Precondition

• IUT is running, required modules are loaded
• A single fingerprint scanner is connected
• As necessary test resources: a test person to perform the fingerprint acquisition with
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-P-FP-PLAIN-004/1`
  • HTTP method: `GET`

Description
1. Check the correct execution of the acquisition process with fingerprints of sufficient quality

Test Case ID: TC-PAP-ACQ-FP2P-SV-2_001	
• Initiate test case by calling the IUT via the test interface • Perform the acquisition process of the two fingerprints	
Expected Result	• The acquisition is triggered by placing the finger(s) on the acquisition hardware in the two finger mode (right index and left index) • The IUT finishes without any error message • As a result, two encoded fingerprints (both index fingers) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
2. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicap on the right slap • Initiate test case by calling the IUT via the test interface • Mark index finger of the right slap as handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking handicapped fingers before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked finger is excluded from the acquisition process • The IUT changes to single finger mode • The IUT finishes without any error message • As a result, two encoded fingerprints (right thumb, left index finger) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
3. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicap on the left slap • Initiate test case by calling the IUT via the test interface • Mark index finger of the left slap as handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking handicapped fingers before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked finger is excluded from the acquisition process

Test Case ID: TC-PAP-ACQ-FP2P-SV-2_001	
	• The IUT changes to single finger mode • The IUT finishes without any error message • As a result, two encoded fingerprints (right index finger, left thumb) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
4. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a missing hand. • Initiate test case by calling the IUT via the test interface • Mark a whole hand (right or left) as not available/handicapped • Perform the acquisition process	
Expected Result	• The IUT allows marking a hand (or all fingers of one hand individually) as not available before acquisition • The acquisition is triggered by placing the finger(s) on the acquisition hardware • The marked hand is excluded from the acquisition process • The IUT captures two fingerprints from the existing hand • The IUT finishes without any error message • As a result, two encoded fingerprints (index finger and thumb of left, respectively right hand) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
5. Check the correct execution of the acquisition process with fingerprints of insufficient quality, regarding capture repetition • Initiate test case by calling the IUT via the test interface • Enforce insufficient quality of at least one fingerprint during capture • Perform the acquisition process	
Expected Result	• The IUT detects the insufficient quality and restarts the acquisition of the current slap • The acquisition of the slap of insufficient fingerprint quality is repeated twice (i.e. total of three performed attempts) • The IUT finishes without any error message • As a result, two encoded fingerprints (both index fingers) are returned via the test interface in a

Test Case ID: TC-PAP-ACQ-FP2P-SV-2_001	
	message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`

Table 3.7. Test Case ID: TC-PAP-ACQ-FP2P-SV-2_001

3.6. Test Cases PAP ACQ-FP10R-SV-1: Ten Finger Rolled Supervised Acquisition for Enrolment

Test Case ID: TC-PAP-ACQ-FP10R-SV-1_001	
Scope	
Examination of the correct process for the acquisition of up to ten rolled fingerprints	
Precondition	

IUT is running
 	
A fingerprint scanner providing rolled fingerprints is connected
 	
As necessary test resources: a test person to perform the fingerprint acquisition with
 	
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-P-FP-ROLL-001/1`
  • HTTP method: `GET`	

Description	

1. Check the correct execution of the acquisition process with fingerprints of sufficient quality
  • Initiate test case by calling the IUT via the test interface
  • Perform the flat acquisition process of all fingers in order to obtain the necessary reference data for the control verification
  • Perform the rolled acquisition process of all fingers, beginning with the thumb of the right hand and ending with the little finger of the left hand	

Expected Result	• The acquisition of the reference slaps is performed by the IUT • The IUT successively performs the acquisition of the rolled fingerprints • The IUT finishes without any error message • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`

Test Case ID: TC-PAP-ACQ-FP10R-SV-1_001	
2. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicapped finger • Initiate test case by calling the IUT via the test interface • Mark one finger as handicapped in the IUT • Perform the acquisition process for the control slaps • Perform the acquisition process for the rolled prints	
Expected Result	• The IUT allows marking handicapped fingers before acquisition • The marked finger is excluded from both acquisition processes • The IUT finishes without any error message • As a result, nine encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
3. Check the correct execution of the acquisition process with fingerprints of sufficient quality, with multiple handicapped fingers • Initiate test case by calling the IUT via the test interface • Mark multiple fingers as handicapped in the IUT • Perform the acquisition process for the control slaps • Perform the acquisition process for the rolled prints	
Expected Result	• The IUT allows marking multiple handicapped fingers before acquisition • The marked fingers are excluded from both acquisition processes • The IUT finishes without any error message • As a result, encoded fingerprints (depending on missing ones) are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`
4. Check the correct execution of the acquisition process with fingerprints of insufficient quality, regarding capture repetition • Initiate test case by calling the IUT via the test interface • Enforce insufficient quality of at least one fingerprint during capture • Perform the acquisition process for the control slaps • Perform the acquisition process for the rolled prints	
Expected Result	• The IUT detects the insufficient quality and restarts the acquisition of the current finger

Test Case ID: TC-PAP-ACQ-FP10R-SV-1_001	
	• Perform the control slap acquisition regularly, e.g. without inducing errors • The rolled acquisition of the finger with insufficient fingerprint quality is repeated twice (i.e. total of three performed attempts) • The IUT finishes without any error message • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`

Table 3.8. Test Case ID: TC-PAP-ACQ-FP10R-SV-1_001

Test Case ID: TC-PAP-ACQ-FP10R-SV-1_002	
Scope	
Examination of the correct process for the acquisition of rolled fingerprints in case the IUTs hardware reports issues	
Precondition	

IUT is running
 	
A fingerprint scanner providing rolled fingerprints is connected
 	
As necessary test resources: a test person to perform the fingerprint acquisition with
 	
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-P-FP-ROLL-002/1`
  • HTTP method: `GET`	

Description	

1. Check the correct execution of the acquisition process with fingerprints of sufficient quality, but with hardware reported issues
  • Initiate test case by calling the IUT via the test interface
  • Perform the control slap acquisition regularly, e.g. without inducing errors
  • Enforce a hardware reported issue during the rolled capture process for at least one finger. Consult the documentation of the hardware in regards of supported issues (e.g. “finger shifted”)
  • Repeat the capture without enforcing any further errors and finalize the acquisition process	

Expected Result	• The IUT detects the hardware issue and restarts the acquisition of the current finger • The IUT finishes without any error message • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcqui-`

Test Case ID: TC-PAP-ACQ-FP10R-SV-1_002	
	`sition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`. The `rejectionReason` element matches the reason chosen by the operator.
2. Check the correct execution of the acquisition process with fingerprints of insufficient quality and with hardware reported issues • Initiate test case by calling the IUT via the test interface • Perform the control slap acquisition regularly, e.g. without inducing errors • Enforce a hardware reported issue during the rolled capture process for at least one finger. Consult the documentation of the hardware in regards of supported issues (e.g. shift) • Two times: Enforce insufficient quality of the same fingerprint during the capture • For the remaining fingers: perform the acquisition process as usual	
Expected Result	• The IUT detects the hardware issue and restarts the rolled acquisition of the current finger • The IUT detects the insufficient quality and restarts the rolled acquisition of the current finger • The acquisition was repeated twice in total (one time due to the rolling issue, one time due to the quality) • The IUT finishes without any error message • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`. The repetition with the best QA score is marked as "selected" and the `rejectionReason` for the first attempts matches the reason chosen by the operator.
3. Check the ability of operators to accept negative capture results in case both fingerprints of insufficient quality and hardware reported issues are encountered • Initiate test case by calling the IUT via the test interface • Perform the control slap acquisition regularly, e.g. without inducing errors • Enforce a hardware reported issue during the rolled capture process for at least one finger. Consult the documentation of the hardware in regards of supported issues (e.g. shift) • Enforce insufficient quality of the same fingerprint during capture • Enforce another hardware reported issue during the final capture attempt for the finger. Afterwards select the option to keep the current results • For the remaining fingers: perform the acquisition process as usual	
Expected Result	• The IUT detects the hardware issue and restarts the acquisition of the current finger • The IUT detects the insufficient quality and restarts the acquisition of the current finger

Test Case ID: TC-PAP-ACQ-FP10R-SV-1_002	
	• The detects the hardware issue and offers to either restart the capture or to continue with the current result • As a result, ten encoded fingerprints are returned via the test interface in a message conforming to TR-03121 XML. The XML must also include the information corresponding to the performed acquisition process (element `bio:FingerAcquisition` and relevant sub-elements). The raw fingerprint data may be stored either as sub-element of this element or as descendant of the sibling element `bio:Records`. The first repetition with insufficient QA score is marked as “selected” and the `rejectionReason` for the first and last attempts matches the reason chosen by the operator.

Table 3.9. Test Case ID: TC-PAP-ACQ-FP10R-SV-1_002

3.7. Test Cases PAP ACQ-IR-SV-1: Supervised Iris Acquisition

Test Case ID: TC-PAP-ACQ-IR-SV-1_001	
Scope	
Verify correct behaviour of the iris image acquisition process during an enrolment with a Live Enrolment Station where the resulting image quality is sufficient	
Precondition	

• IUT is running, required modules are loaded
• A connected digital camera, accessible by IUT
• As necessary test resources: iris of a test person
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-P-IR-APP-001/1`
  • HTTP method: `GET`	

Description	

1. Verify proper behaviour of IUT
  • Initiate test case by calling the IUT via the test interface
  • Check for dialogue in order to perform a live capture
  • Initiate the acquisition process
  • Perform an iris capture resulting in the subsequent quality assessment to succeed	

Expected Result	• IUT displays the option to perform a live capture • The acquisition is performed • The IUT finishes without any error message • The quality of the captured image is identified as sufficient

2. Verify encoding of captured image
  • Accept the image
  • Proceed in the process until the iris image is encoded in the output format for export to the CIR	

Test Case ID: TC-PAP-ACQ-IR-SV-1_001	
Expected Result	• The selected image is encoded and returned via the test interface in an appropriate XML format, e.g. as STANAG container embedded within a TR-03121 XML (element `bio:Record[@type="stanag4715"]`) • The therein contained image data matches the data of the previously captured image

Table 3.10. Test Case ID: TC-PAP-ACQ-IR-SV-1_001

Test Case ID: TC-PAP-ACQ-IR-SV-1_002	
Scope	
Verify correct behaviour of the iris image acquisition process during an enrolment with a Live Enrolment Station where the resulting image quality is insufficient	
Precondition	

• IUT is running, required modules are loaded
• A connected digital camera, accessible by IUT
• As necessary test resources: iris of a test person
• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces")
  • Test case path: `/TR03122/TC-P-IR-APP-002/1`
  • HTTP method: `GET`	

Description	
1. Verify proper behaviour of IUT Initiate test case by calling the IUT via the test interface Check for dialogue in order to perform a live capture Initiate the acquisition process Perform an iris capture resulting in the subsequent quality assessment to fail	
Expected Result	• IUT displays the option to perform a live capture • The acquisition is performed • The quality of the captured image is identified as insufficient • The veto (i.e. override the negative result of the quality assessment) option is available
2. Check the image acquisition process in case of a veto Put in veto	
Expected Result	Veto is accepted by IUT Captured photo is used in further steps of process
3. Verify encoding of selected image Proceed in the process until the iris image is encoded in the output format for export to CIR	

Test Case ID: TC-PAP-ACQ-IR-SV-1_002	
Expected Result	• The selected image is encoded and returned via the test interface in an appropriate XML format, e.g. as STANAG container embedded within a TR-03121 XML (element `bio:Record[@type="stanag4715"]`) • The therein contained image data matches the data of the previously captured image

Table 3.11. Test Case ID: TC-PAP-ACQ-IR-SV-1_002

List of Abbreviations

Abbreviation	Description
BDB	Biometric Data Block
BEWL	Biometric Enabled Watchlist
BHT	Biometric Header Template
CBEFF	Common Biometric Exchange Formats Framework
CIR	Central Identity Register
CTF	contrast transfer function
DET	Detection Error Trade-Off
FMR	false-match-rate
FNIR	false-negative-identification-rate
FNMR	false-non-match-rate
FPIR	false-positive-identification-rate
GSAT	German Standard for AFIS Transactions
GUI	graphical user interface
IUT	Implementation Under Test
PAD	presentation attack detection
QA	Quality Assessment
SNR	signal-to-noise ratio
STANAG	NATO Standardization Agreement
WSQ	Wavelet Scalar Quantisation

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