



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 5.2



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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-BCL

Test Case ID: TC-AH-FI-BCL-001

<i>Scope</i>	Examination of technical specifications of the digital camera used to obtain facial biometrics.						
<i>Preconditions</i>	<ul style="list-style-type: none"> The camera used in the specific application profile is at hand and ready for operation. Product documentation of the camera model is at hand (e.g. data sheet, manual). 						
<i>CTS Mode</i>	Not supported						
<i>Description</i>	<table border="1"> <thead> <tr> <th>Step</th><th>Description / Expected Result</th></tr> </thead> <tbody> <tr> <td>1</td><td> <i>Description:</i> Consult product documentation of the camera system. <i>Expected Result:</i> The product documentation states that the camera system supports the capture of color images. </td></tr> <tr> <td>2</td><td> <i>Description:</i> Consult the product documentation of the camera system. <i>Expected Result:</i> The product documentation states the support of capturing facial images of a biometric subjects with a body height in the range of 140 cm to 200 cm. </td></tr> </tbody> </table>	Step	Description / Expected Result	1	<i>Description:</i> Consult product documentation of the camera system. <i>Expected Result:</i> The product documentation states that the camera system supports the capture of color images.	2	<i>Description:</i> Consult the product documentation of the camera system. <i>Expected Result:</i> The product documentation states the support of capturing facial images of a biometric subjects with a body height in the range of 140 cm to 200 cm.
Step	Description / Expected Result						
1	<i>Description:</i> Consult product documentation of the camera system. <i>Expected Result:</i> The product documentation states that the camera system supports the capture of color images.						
2	<i>Description:</i> Consult the product documentation of the camera system. <i>Expected Result:</i> The product documentation states the support of capturing facial images of a biometric subjects with a body height in the range of 140 cm to 200 cm.						

Table 2.2 TC-AH-FI-BCL-001 Description

Table 2.1 Test Case ID: TC-AH-FI-BCL-001

Test Case ID: TC-AH-FI-BCL-002

<i>Scope</i>	Examination of image resolution and cropping features of the digital camera used to obtain facial biometrics.
<i>Preconditions</i>	<ul style="list-style-type: none"> The camera used in the specific application profile is at hand and ready for operation. The IUT implements an interface for conformance testing where a single image can be captured. The IUT is able to return the results for every captured image via the test interface. One test subject is available to test the Implementation Under Test (IUT)'s behaviour.

Test Case ID: TC-AH-FI-BCL-002*CTS Mode*

- interactive
- no provision of pre-defined input data
- HTTP method: GET
- test case variants:

/TR03122/TC-AH-FI-BCL-002/1

Table 2.4 TC-AH-FI-BCL-002 Test Case Variants*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Position the biometric subject in a distance of 60 cm towards the camera system. • Acquire an image with the camera system via the CTS interface. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • A message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>). • The CTS verifies that the image returned by the IUT has a resolution of 1600 x 1200 pixels with a maximal deviation of -10%.

Table 2.5 TC-AH-FI-BCL-002 Description**Table 2.3** Test Case ID: TC-AH-FI-BCL-002**Test Case ID: TC-AH-FI-BCL-003***Scope*

Examination of image processing features of the digital camera or provided/integrated software used to obtain facial biometrics.

Preconditions

- The camera used in the specific application profile is at hand and ready for operation.
- The IUT implements an interface for conformance testing where a single image can be captured.
- The IUT is able to return the results for every captured image via the test interface.
- Two biometric test subjects are available to test the IUT's behaviour.

CTS Mode

- interactive
- no provision of pre-defined input data
- HTTP method: GET
- Test case variants:

/TR03122/TC-AH-FI-BCL-003/1

Table 2.7 TC-AH-FI-BCL-003 Test Case Variants

Test Case ID: TC-AH-FI-BCL-003*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> Position one biometric subject in front of the camera system. Verify that this biometric subject is standing in a distance above 40 cm and below 100 cm to the camera system. Position the second biometric subject in front of the camera system. Verify that the biometric subject is standing in a distance below 40 cm to the camera system. Attempt to acquire an image with the camera system by using the CTS. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> The camera system does not acquire an image. A message conforming to TR-03121 XML but not containing facial image data is returned via the test interface (<code>bio:FaceAcquisition</code>).

Table 2.8 TC-AH-FI-BCL-003 Description**Table 2.6** Test Case ID: TC-AH-FI-BCL-003**Test Case ID: TC-AH-FI-BCL-004***Scope*

Examination of image processing features of the digital camera or provided/integrated software used to obtain facial biometrics.

Preconditions

- The camera used in the specific application profile is at hand and ready for operation.
- The IUT implements an interface for conformance testing where a single image can be captured.
- The IUT is able to return the results for every captured image via the test interface.
- Two biometric test subjects are available to test the IUT's behaviour.

CTS Mode

- interactive
- no provision of pre-defined input data
- HTTP method: GET
- test case variants:

/TR03122/TC-AH-FI-BCL-004/1

Table 2.10 TC-AH-FI-BCL-004 Test Case Variants

Test Case ID: TC-AH-FI-BCL-004

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> Position one biometric subject in front of the camera system. Verify that this biometric subject is standing in a distance above 40 cm and below 100 cm to the camera system. Position the second biometric subject in front of the camera system. Verify that the biometric subject is standing in a distance above 100 cm to the camera system. Acquire an image with the camera system by using the CTS. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> A message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>). The returned image depicts the biometric subject which was positioned in a distance above 40 cm and below 100 cm to the camera system.

Table 2.11 TC-AH-FI-BCL-004 Description

Table 2.9 Test Case ID: TC-AH-FI-BCL-004

2.1.2. Test Cases FM AH-FI-FBS

Test Case ID: TC-AH-FI-FBS-001

Scope	Examination of capable image resolution of flat bed scanner used to scan photos for enrolment purposes.
Precondition	Product documentation of the scanner model is at hand (e.g. data sheet, manual).
CTS Mode	Not supported
Description	

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> Verify that the scanner provides a physical resolution of at least 300ppi. Consult product documentation of the scanner. <p><i>Expected Result:</i></p> <p>The product documentation states that the physical/native resolution is at least 300ppi.</p>

Table 2.13 TC-AH-FI-FBS-001 Description

Table 2.12 Test Case ID: TC-AH-FI-FBS-001

Test Case ID: TC-AH-FI-FBS-002

Scope	Examination of image quality of flat bed scanner used to scan photos for enrolment purposes
Precondition	<ul style="list-style-type: none"> IUT is running, required modules are loaded. The scanner used in the specific application profile is connected. As necessary test resources: a photo with at least 36 mm x 45 mm.

Test Case ID: TC-AH-FI-FBS-002*CTS Mode*

- Interactive
- No provision of pre-defined input data
- HTTP method: GET
- Test case variants:

/TR03122/TC-AH-FI-FBS-002/1

Table 2.15 TC-AH-FI-FBS-002 Test Case Variants*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • A photo is placed on the scan area. • The IUT is called via the CTS. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The image dimension is 413 pixels width and 531 pixels height with a tolerance of +/- 10 pixels. • The image has a file size of at least 11 KB. • The image is compressed via the JPEG2000 or JPEG standard.

Table 2.16 TC-AH-FI-FBS-002 Description**Table 2.14** Test Case ID: TC-AH-FI-FBS-002**2.1.3. 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)

Test Case ID: TC-AH-FI-DC-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Verify that the sensor of the camera provides a physical resolution of at least 1200 x 1600 pixels.</p> <p>Consult product documentation of the camera.</p> <p><i>Expected Result:</i></p> <p>The product documentation states that the physical, native resolution is at least 1200 x 1600 pixels.</p>
2	<p><i>Description:</i></p> <p>Verify that the active camera setting (e.g. configurable via camera firmware) used for the specific application provides an image resolution of at least 1200 x 1600 pixels.</p> <p>Consult product documentation of the camera or options in the cameras firmware.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The setting provides a native image resolution of at least 1200 x 1600 pixels. • This setting is the active setting for the application profile

Table 2.18 TC-AH-FI-DC-001 Description**Table 2.17** Test Case ID: TC-AH-FI-DC-001**2.1.4. Test Cases FM AH-FI-ICS****Test Case ID: TC-AH-FI-ICS-001**

<i>Scope</i>	Examination of technical specifications of the integrated camera systems used to obtain digitised facial images. This test case covers the minimum physical resolution of the captured facial image. Note, this requirement is not MANDATORY for scenarios where only a facial verification is performed.
<i>Precondition</i>	Product documentation of the camera unit is at hand (e.g. data sheet, manual).
<i>CTS Mode</i>	Not supported
<i>Description</i>	

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Verify that the sensor of the camera provides a physical resolution of at least 1200 x 1600 pixels without any up-scaling. • Consult product documentation of the camera. <p><i>Expected Result:</i></p> <p>The product documentation states that the physical, native resolution is at least 1200 x 1600 pixels.</p>

Table 2.20 TC-AH-FI-ICS-001 Description**Table 2.19** Test Case ID: TC-AH-FI-ICS-001**Test Case ID: TC-AH-FI-ICS-002**

<i>Scope</i>	Examination of technical specifications of the integrated camera systems used to obtain digitised facial images. This test case covers the illumination.
<i>Precondition</i>	Product documentation of the integrated camera system is at hand (e.g. data sheet, manual).

Test Case ID: TC-AH-FI-ICS-002

CTS Mode Not supported

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Verify that the integrated camera system provides diffuse lighting adapting to the environmental light conditions. • Verify that the integrated camera system allows high quality acquisitions independently from the environmental light situation. • Consult product documentation of the integrated camera system. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The product documentation states that the camera system uses diffuse lighting adapting to the environmental light conditions. • The product documentation states that the camera system allows high quality acquisitions independently from the environmental light situation that can usually be found in the environment in question.

Table 2.22 TC-AH-FI-ICS-002 Description

Table 2.21 Test Case ID: TC-AH-FI-ICS-002

Test Case ID: TC-AH-FI-ICS-003

Scope Examination of technical specifications of the integrated camera systems used to obtain digitised facial images. This test case covers the colour space of the captured facial image. Note, this requirement is not MANDATORY for scenarios where only a facial verification is performed.

Precondition Product documentation of the camera unit is at hand (e.g. data sheet, manual).

CTS Mode Not supported

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Verify that the integrated camera system provides a 24 bit RGB mode. • Consult product documentation of the integrated camera system. <p><i>Expected Result:</i></p> <p>The product documentation states that the camera system is able to capture images in 24 bit RGB.</p>

Table 2.24 TC-AH-FI-ICS-003 Description

Table 2.23 Test Case ID: TC-AH-FI-ICS-003

2.1.5. Test Cases FM AH-FP-OPT

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

Scope Test of image sensor linearity.

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

Preconditions

- The scanner is connected.
- 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.

CTS Mode

Not supported

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

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. <p><i>Expected Result:</i></p> <p>Set of images with a uniform area covered by the target or a single image of a target with a grey scale step tablet.</p>
2	<p><i>Description:</i></p> <p>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).</p> <p><i>Expected Result:</i></p> <p>The resulting plot should be close to a linear function.</p> <p>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.</p> <p>None of the calculated differences SHALL exceed 7.65 grey levels.</p>
3	<p><i>Description:</i></p> <p>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.</p> <p><i>Expected Result:</i></p> <p>None of the calculated differences SHALL exceed 7.65 grey levels.</p>

Table 2.26 TC-AH-FP-OPT-001 Description**Table 2.25** Test Case ID: TC-AH-FP-OPT-001**Test Case ID: TC-AH-FP-OPT-002**

Scope

Test of scanner resolution and geometrical accuracy.

Test Case ID: TC-AH-FP-OPT-002*Preconditions*

- 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).

CTS Mode

Not supported

Test Case ID: TC-AH-FP-OPT-002

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>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.</p> <p><i>Expected Result:</i></p> <p>Set of images with the lines of the Ronchi pattern in vertical and horizontal direction, respectively.</p>
2	<p><i>Description:</i></p> <p>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.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> Resolution: The scanner's output resolution in both sensor detector row and column directions SHALL be $(R \pm 0.01 R)$, 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: <ul style="list-style-type: none"> For 500-ppi scanner: $D \leq 0.0007, \text{ for } 0.00 < X \leq 0.07$ $D \leq 0.01 X, \text{ for } 0.07 \leq X \leq 1.50$ For 1,000-ppi scanner: $D \leq 0.0005, \text{ for } 0.00 < X \leq 0.07$ $D \leq 0.0071 X, \text{ for } 0.07 \leq X \leq 1.5$ <p>where:</p> $D = Y - X$ <p>X = actual target distance</p> <p>Y = measured image distance</p> <p>D, X, Y are in inches.</p> 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 2.28 TC-AH-FP-OPT-002 Description**Table 2.27** Test Case ID: TC-AH-FP-OPT-002**Test Case ID: TC-AH-FP-OPT-003**

Scope

Test of spatial frequency response.

Test Case ID: TC-AH-FP-OPT-003*Preconditions*

- 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 2.31 for 500 ppi scanners or in ▶Table 2.32 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).

CTS Mode

Not supported

Test Case ID: TC-AH-FP-OPT-003

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>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.</p> <p><i>Expected Result:</i></p> <p>Set of images with the bars of the Ronchi pattern in vertical and horizontal direction, showing dark patterns on a bright background.</p>
2	<p><i>Description:</i></p> <p>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 absolute with respect to the dynamic range of the image and do not represent the contrast transfer function (CTF).</p> <p><i>Expected Result:</i></p> <p>Absolute modulation values for each of the Ronchi patterns on the test chart.</p>
3	<p><i>Description:</i></p> <p>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: $M_0 = \frac{G_{white} - G_{black}}{G_{white} + G_{black}}$</p> <p>with</p> <ul style="list-style-type: none"> • 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 <p>Having determined M_0 the value of the CTF can be calculated from the modulation of the Ronchi pattern: $CTF(R) = \frac{M(R)}{M_0}$</p> <p>with $M(R)$ Modulation at spatial frequency R</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The values of the CTF for each of the spatial frequencies specified in ▶Table 2.31 (500 ppi scanners) or ▶Table 2.32 (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 2.30 TC-AH-FP-OPT-003 Description**Table 2.29** 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
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 2.31 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 2.32 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.

Test Case ID: TC-AH-FP-OPT-004*Preconditions*

- 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).

CTS Mode

Not supported

Test Case ID: TC-AH-FP-OPT-004

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>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”.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • 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	<p><i>Description:</i></p> <p>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.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • 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 $\text{with } SNR_{black} = \frac{\overline{G_{white}} - \overline{G_{black}}}{\sigma_{black}}, SNR_{white} = \frac{\overline{G_{white}} - \overline{G_{black}}}{\sigma_{white}}$ <p>$\overline{G_{white}}, \overline{G_{black}}$: average grey level in a block of the black and white image, respectively</p> <p>$\sigma_{white}, \sigma_{black}$: standard deviation of the grey levels in a block of the black and white image, respectively</p> <p>The signal to noise ratio SHALL exceed 125 for at least 97% of the tested blocks in both the black and the white image.</p> <ul style="list-style-type: none"> • 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 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 2.34 TC-AH-FP-OPT-004 Description

Table 2.33 Test Case ID: TC-AH-FP-OPT-004

Test Case ID: TC-AH-FP-OPT-005

Scope Test of fingerprint image quality.

Preconditions

- 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.

CTS Mode Not supported

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>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.</p> <p><i>Expected Result:</i></p> <p>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.</p>
2	<p><i>Description:</i></p> <p>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.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • 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 2.36 TC-AH-FP-OPT-004 Description

Table 2.35 Test Case ID: TC-AH-FP-OPT-005

2.1.6. Test Cases FM AH-ALL-SSS

Test Case ID: TC-AH-ALL-SSS-001

Scope Examination of the surveillance camera systems of the self-service system (SSS) used for to obtain digitised facial images and fingerprints.

Preconditions

- The IUT's SSS is ready for operation.
- A environment surveillance camera system which supervises the area around the SSS is available.
- A environment surveillance camera system which supervises the fingerprint capture system of the SSS is available.
- The IUT implements a graphical user interface.
- The IUT implements a user interface of fingerprint acquisition shown to the biometric subject.
- Two test subjects are available to test the IUT's behaviour.

CTS Mode Not supported

Test Case ID: TC-AH-ALL-SSS-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • A single biometric subject initiates the SSS process of the IUT. • Perform a bona fide fingerprint presentation on the fingerprint scanner of the IUT. • Interact with the graphical user interface of the IUT. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • A fingerprint image is captured. • The surveillance camera system captures a colour image of the surrounding area at the moment of the finger capture attempt in which the face of the biometric subject using the fingerprint scanner is visible. • The surveillance camera system captures a colour image of the fingerprint acquisition area at the moment of the finger capture attempt. • The images captured by the surveillance camera systems are cached locally. • The images captured by the surveillance camera systems are at least of resolution 1280 x 720 pixels. • The differences of capture times between the images captured by the surveillance camera systems and the fingerprint capture attempt image are below 100 ms.
2	<p><i>Description:</i></p> <p>A single biometric subject initiates the SSS process of the IUT.</p> <p><i>Expected Result:</i></p> <p>The IUT starts the SSS process and enables interaction via the graphical user interface.</p>
3	<p><i>Description:</i></p> <p>A second biometric subject moves into the corridor of the SSS (distance of 100 cm in front the SSS).</p> <p><i>Expected Result:</i></p> <p>The image captured by the surveillance camera system of the surrounding area allows to identify whether that more than one person is in range of the SSS.</p>
4	<p><i>Description:</i></p> <p>Both biometric subjects leave the corridor of the SSS.</p> <p><i>Expected Result:</i></p> <p>The IUT stops the SSS process.</p>

Table 2.38 TC-AH-ALL-SSS-001 Description**Table 2.37** Test Case ID: TC-AH-ALL-SSS-001**2.1.7. Test Cases FM AH-FI-SSS****Test Case ID: TC-AH-FI-SSS-001**

<i>Scope</i>	Examination of SSS scenarios where a digitised facial image is obtained.
<i>Preconditions</i>	<ul style="list-style-type: none"> • The IUT's SSS is ready for operation. • The SSS implements a graphical user interface and an interface where a single image can be captured. • One test subject is available to test the IUT's behaviour.
<i>CTS Mode</i>	Not supported

Test Case ID: TC-AH-FI-SSS-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • The biometric subject initiates the SSS process of the IUT. • Acquire an image with the camera system of the IUT. • Interact with the graphical user interface of the IUT. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • A facial image is captured. • During the interaction with the IUT's graphical user interface the biometric subject did not have to rotate his/her head towards the camera system of the IUT for capturing the facial image.

Table 2.40 TC-AH-FI-SSS-001 Description**Table 2.39** Test Case ID: TC-AH-FI-SSS-001**2.1.8. Test Cases FM AH-FI-SSS2****Test Case ID: TC-AH-FI-SSS2-001***Scope* Examination of technical specifications of the digital camera used to obtain facial biometrics.

Preconditions

- The camera used in the specific application profile is at hand and ready for operation.
- Product documentation of the camera model is at hand (e.g. data sheet, manual).

CTS Mode Not supported*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Consult the product documentation of the camera system.</p> <p><i>Expected Result:</i></p> <p>The product documentation states the support of capturing facial images of a biometric subjects with a body height at least in the range of 140 cm to 200 cm.</p>

Table 2.42 TC-AH-FI-SSS2-001 Description**Table 2.41** Test Case ID: TC-AH-FI-SSS2-001**Test Case ID: TC-AH-FI-SSS2-002***Scope* Examination of SSS scenarios where a digitised facial image is obtained.

Preconditions

- The IUT's SSS is ready for operation.
- The SSS implements a graphical user interface and an interface where a single image can be captured.
- One test subject is available to test the IUT's behaviour.

CTS Mode Not supported

Test Case ID: TC-AH-FI-SSS2-002*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • The biometric subject initiates the SSS process of the IUT. • Acquire a facial image with the camera system of the IUT. • Interact with the graphical user interface of the IUT. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • A facial image is captured. • During the interaction with the IUT's graphical user interface the biometric subject did not have to rotate his/her head towards the camera system of the IUT for capturing the facial image.

Table 2.44 TC-AH-FI-SSS2-002 Description**Table 2.43** Test Case ID: TC-AH-FI-SSS2-002**Test Case ID: TC-AH-FI-SSS2-003***Scope*

Examination of image resolution and cropping features of the digital camera used to obtain facial image.

Preconditions

- The camera used in the specific application profile is at hand and ready for operation.
- The IUT implements an interface for conformance testing where a single image can be captured.
- The IUT is able to return the results for every captured image via the test interface.
- One test subject is available to test the IUT's behaviour.

CTS Mode

- interactive
- no provision of pre-defined input data
- HTTP method: GET
- test case variants:

/TR03122/TC-AH-FI-SSS2-003/1

Table 2.46 TC-AH-FI-SSS2-003 Test Case Variants*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Position the biometric subject in a distance of 130 cm towards the camera system. • Acquire a facial image with the camera system via the CTS interface. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • A message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>). • The CTS verifies that the image returned by the IUT has a resolution of 680 x 480 pixels with a maximal deviation of -10%.

Table 2.47 TC-AH-FI-SSS2-003 Description**Table 2.45** Test Case ID: TC-AH-FI-SSS2-003

Test Case ID: TC-AH-FI-SSS2-004

Scope	Examination of image resolution and cropping features of the digital camera used to obtain facial image.
Preconditions	<ul style="list-style-type: none"> The camera used in the specific application profile is at hand and ready for operation. The IUT implements an interface for conformance testing where a single image can be captured. The IUT is able to return the results for every captured image via the test interface. One test subject is available to test the IUT's behaviour.
CTS Mode	<ul style="list-style-type: none"> Interactive No provision of pre-defined input data HTTP method: GET Test case variants:

/TR03122/TC-AH-FI-SSS2-004/1

Table 2.49 TC-AH-FI-SSS2-004 Test Case Variants*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> Position the biometric subject at a distance of 120 cm towards the camera system looking frontal. If the IUT's maximum distance is below 120 cm use the next possible distance limit. Acquire a facial image with the camera system via the CTS interface. Verify the image returned by the CTS. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> A message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>). The CTS shows a facial image according to the definition of "full frontal" (see [ISO_FACE]).
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> Position the biometric subject in a distance of 70 cm towards the camera system looking frontal. Acquire a facial image with the camera system via the CTS interface. Verify the image returned by the CTS. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> A message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>). The CTS shows a facial image according to the definition of "full frontal" (see [ISO_FACE]).

Table 2.50 TC-AH-FI-SSS2-004 Description**Table 2.48** Test Case ID: TC-AH-FI-SSS2-004**2.1.9. Test Cases FM AH-FP-SSS****Test Case ID: TC-AH-FP-SSS-001**

Scope	Examination of SSS scenarios where digitised fingerprint images are obtained.
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Test Case ID: TC-AH-FP-SSS-001*Preconditions*

- The IUT's SSS is ready for operation.
- The SSS implements a graphical user interface and an interface where fingerprint images can be captured.
- Two test subjects are available to test the IUT's behaviour.

CTS Mode

Not supported

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • The biometric subject initiates the SSS process of the IUT. • Acquire fingerprint images with the acquisition system of the IUT using the right hand. • Interact with the graphical user interface of the IUT. <p><i>Expected Result:</i></p> <p>Fingerprint images of the right hand are captured.</p>
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> • The biometric subject initiates the SSS process of the IUT. • Acquire fingerprint images with the acquisition system of the IUT using the left hand. • Interact with the graphical user interface of the IUT. <p><i>Expected Result:</i></p> <p>Fingerprint images of the left hand are captured.</p>
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> • The biometric subject initiates the SSS process of the IUT with another subject being present within the reach of the fingerprint acquisition system of the SSS. • Acquire fingerprint images with the acquisition system of the IUT using the left or right hand. • Interact with the graphical user interface of the IUT. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • During the fingerprint acquisition process multiple persons are detected by the SSS. • The acceptance conditions are not met, i.e. the total result of the acquisition is negative. • The multiple person detection result is cached locally on the SSS.

Table 2.52 TC-AH-FP-SSS-001 Description**Table 2.51** Test Case ID: TC-AH-FP-SSS-001

2.2. Test Cases Acquisition Software

2.2.1. Test Cases FM AS-FI-BCL

Test Case ID: TC-AS-FI-BCL-001*Scope*

Examination of correctness of the software module used for integrated camera systems in order to obtain digitised facial images for detection of multiple faces.

Test Case ID: TC-AS-FI-BCL-001**Preconditions**

- The IUT is in operation, required modules are loaded.
- The integrated camera system used in the specific application scenario is connected.
- The IUT implements an interface for conformance testing where a single image can be captured.
- The IUT is able to return the results for every captured image via the test interface.
- At least two test subjects are available to test the IUT's behaviour.

CTS Mode

- interactive
- no provision of pre-defined input data
- HTTP method: GET
- test case variants:

/TR03122/TC-AS-FI-BCL-001/1/

Table 2.54 TC-AS-FI-BCL-001 Test Case Variants**Description**

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • A single biometric subject is present in the IUT's capture area. • The IUT is called via the conformance test interface and a compliant face presentation is performed according to AS-FI-BCL. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A compliant facial image is acquired according to AS-FI-BCL. • The acceptance conditions (i.e. no multiple faces detected) are satisfied and achieved. • A message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (bio:FaceAcquisition).
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> • More than one biometric subjects are present in the IUT's capture area. • The IUT is called via the conformance test interface and non-compliant face presentation containing multiple faces is performed. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • Facial image acquisition by the IUT is omitted. • The acceptance conditions are not met, i.e. the total result of the acquisition is negative. • A message conforming to TR-03121 XML but not containing facial image data is returned via the test interface (bio:FaceAcquisition).

Table 2.55 TC-AS-FI-BCL-001 Description**Table 2.53 Test Case ID: TC-AS-FI-BCL-001****Test Case ID: TC-AS-FI-BCL-002****Scope**

Examination of correctness of the software module used for integrated camera systems in order to obtain digitised facial images for estimating the distance between the forehead of the biometric subject and the optics of the camera system.

For the estimation of the distance between the forehead of the biometric subject and the optics of the camera system a tolerance of 10 % is taken into account.

Test Case ID: TC-AS-FI-BCL-002

Preconditions

- The IUT is in operation, required modules are loaded.
- The integrated camera system used in the specific application scenario is connected.
- The IUT implements an interface for conformance testing where a single image can be captured.
- The IUT is able to return the results for every captured image via the test interface.
- One test subject is available to test the IUT's behaviour.

CTS Mode

- interactive
- no provision of pre-defined input data
- HTTP method: GET
- test case variants:

/TR03122/TC-AS-FI-BCL-002/1/

Table 2.57 TC-AS-FI-BCL-002 Test Case Variants

Test Case ID: TC-AS-FI-BCL-002*Description*

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <p>The IUT is called via the conformance test interface and a compliant face presentation is performed, i.e. the distance of subject is within the IUT's specified optimal range (40 cm +10% to 100 cm -10% resulting in 44 cm to 90 cm) for acquisition according to AS-FI-BCL and AH-FI-BCL, respectively.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A compliant facial image is captured according to AS-FI-BCL • The acceptance conditions (i.e. tolerable distance of the presented face) are satisfied and achieved. • The IUT behaves according to the test description, i.e. no positional adjustment of subject is required. • As a result, a message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>).
2	<p><i>Description:</i></p> <p>The IUT is called via the conformance test interface and non-compliant face presentation is performed, i.e. the subject moves forward until its distance to the IUT falls below the specified optimal range for acquisition (40 cm -10% resulting in 36 cm) according to AS-FI-BCL.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • No facial image is captured by the IUT. • The acceptance conditions are not met, i.e. the total result of the acquisition is negative.
3	<p><i>Description:</i></p> <p>The IUT is called via the conformance test interface and non-compliant face presentation is performed, i.e. the test subject moves backwards until its distance to the IUT rises above the specified optimal range for acquisition (100 cm +10% resulting in 110 cm) according to AS-FI-BCL.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • No facial image is captured by the IUT. • The acceptance conditions are not met, i.e. the total result of the acquisition is negative.

Table 2.58 TC-AS-FI-BCL-002 Description**Table 2.56** Test Case ID: TC-AS-FI-BCL-002**2.2.2. Test Cases FM AS-FI-ICS****Test Case ID: TC-AS-FI-ICS-001**

<i>Scope</i>	Examination of technical specifications for acquisition software used for integrated camera systems in order to obtain digitised facial images. This test case covers the image formats supported by the acquisition software of the camera system.
<i>Precondition</i>	Product documentation of the utilised camera system is at hand (e.g. data sheet, manual).
<i>CTS Mode</i>	Not supported

Test Case ID: TC-AS-FI-ICS-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Consult the product documentation of the camera system and check the supported image formats.</p> <p><i>Expected Result:</i></p> <p>The product documentation states that the software provides raw uncompressed image data e.g. YUV422 or RGB or the software provides a lossless image container format (e.g. BMP, TIFF).</p>

Table 2.60 TC-AS-FI-ICS-001 Description**Table 2.59** Test Case ID: TC-AS-FI-ICS-001**Test Case ID: TC-AS-FI-ICS-002***Scope*

Examination of technical specifications for acquisition software used for integrated camera systems in order to obtain digitised facial images. This test case covers the minimum physical resolution of the captured facial image. Note, this requirement is not MANDATORY for scenarios where only a facial verification is performed.

Preconditions

- The integrated camera system used in the specific application profile is connected and the system is ready for capturing.
- Product documentation of the camera unit is at hand (e.g. data sheet, manual).

CTS Mode

Not supported

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Verify that the active camera setting (e.g. configurable via camera firmware) used for the specific application provides an image resolution of at least 1200 x 1600 pixels without any up-scaling. • Consult product documentation of the camera and options in the cameras firmware. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The setting provides a native image resolution of at least 1200 x 1600 pixels. • This setting is the active setting for the application profile.

Table 2.62 TC-AS-FI-ICS-002 Description**Table 2.61** Test Case ID: TC-AS-FI-ICS-002**Test Case ID: TC-AS-FI-ICS-003***Scope*

Examination of technical specifications for acquisition software used for integrated camera systems in order to obtain digitised facial images. This test case covers the illumination.

Preconditions

- The integrated camera system used in the specific application profile is connected and the system is ready for capturing.
- Product documentation of the integrated camera system is at hand (e.g. data sheet, manual).

CTS Mode

Not supported

Test Case ID: TC-AS-FI-ICS-003*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Verify that the active setting of the integrated camera system used for the specific application provides diffuse lighting adapting to the environmental light conditions. • Consult product documentation of the integrated camera system and options in the firmware. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The setting provides diffuse lighting adapting to the environmental light conditions. • The setting is the active setting for the application profile.

Table 2.64 TC-AS-FI-ICS-003 Description**Table 2.63** Test Case ID: TC-AS-FI-ICS-003**Test Case ID: TC-AS-FI-ICS-004***Scope*

Examination of technical specifications for acquisition software used for integrated camera systems in order to obtain digitised facial images. This test case covers the colour space of the captured facial image. Note, this requirement is not MANDATORY for scenarios where only a facial verification is performed.

Preconditions

- The integrated camera system used in the specific application profile is connected and the system is ready for capturing.
- Product documentation of the camera unit is at hand (e.g. data sheet, manual).

CTS Mode

Not supported

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Verify that the active setting of the integrated camera system used for the specific application provides the ability to capture images in colour. • Consult product documentation of the integrated camera system and options in the firmware. <p><i>Expected Result:</i></p> <p>The setting provides the ability to capture images in colour (24 bit RGB).</p>

Table 2.66 TC-AS-FI-ICS-004 Description**Table 2.65** Test Case ID: TC-AS-FI-ICS-004**2.2.3. 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

- 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

Test Case ID: TC-AS-FI-DC-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check proper data encoding, resolution and format of the returned image</p> <ul style="list-style-type: none"> • 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 <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • As a result, a message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code> and <code>bio:Records</code>) • The image is at least of resolution 1200 x 1600 pixels with an inter eye distance of at least 120 pixels and stored in colour (24 bit RGB). Note, the latter requirement is not mandatory for scenarios where only a facial verification is performed. • The image is encoded in one of the following lossless formats and can be properly decoded: <ul style="list-style-type: none"> • 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 encoded as JPEG with minimal compression mode • There are no visible compression artefacts in the resulting image

Table 2.68 TC-AS-FI-DC-001 Description**Table 2.67** Test Case ID: TC-AS-FI-DC-001**2.2.4. Test Cases FM AS-FI-FBS****Test Case ID: TC-AS-FI-FBS-001**

Scope	Examination of acquisition software for flat bed scanners that are used for the provisioning of digitised application forms. This test case covers the image format used by the acquisition software of the scanner system.
Precondition	<ul style="list-style-type: none">• IUT is running, required modules are loaded• A document scanner is connected• As test resource: a application form preferable for German Identity Document (GID)
CTS Mode	<ul style="list-style-type: none">• Automatic• Image provision as JPEG or JPEG2000 using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")• HTTP method: GET• test case variants:
<div>/TR03122/TC-AS-FI-FBS-001/1</div>	

Table 2.70 TC-AS-FI-FBS-001 Test Case Variants

Test Case ID: TC-AS-FI-FBS-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Initiate the test case via the test interface. • Verfiy compression of file with BMP decoder/viewer. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • A message conforming to TR-03121 XML containing the encoded image is returned via the test interface. • The image is compressed with Windows Bitmap Version 3 standard. • The image can be displayed.

Table 2.71 TC-AS-FI-FBS-001 Description**Table 2.69** Test Case ID: TC-AS-FI-FBS-001**2.2.5. Test Cases FM AS-FP-MF****Test Case ID: TC-AS-FP-MF-001**

Scope Examination of automatic acquisition of the fingerprint image, the automatic acquisition timeout, and the automatic acquisition behaviour with fingerprints of insufficient quality.

Preconditions

- 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.
- Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces").

CTS Mode

- interactive
- no provision of pre-defined input data
- HTTP method: GET
- test case variants:

/TR03122/TC-AS-FP-MF-001/1/

Table 2.73 TC-AS-FP-MF-001 Test Case Variants

Test Case ID: TC-AS-FP-MF-001*Description*

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> Initiate test case by calling the IUT via the test interface. Place fingers properly on the scanner. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> 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 in Windows Bitmap Version 3 (BMP) format is returned via the test interface (<code>bio:FingerAcquisition</code>).
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> Initiate test case by calling the IUT via the test interface. Do not place any fingers on the fingerprint scanner. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> The acquisition automatically stops after reaching timeout. An adequate error message is given that no fingerprint has been captured.
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> When the timeout is reached, the automatic acquisition is optional. 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 in Windows Bitmap Version 3 (BMP) format is returned via the test interface (<code>bio:FingerAcquisition</code>).

Table 2.74 TC-AS-FP-MF-001 Description**Table 2.72** Test Case ID: TC-AS-FP-MF-001**Test Case ID: TC-AS-FP-MF-002***Scope*

Examination of correct functionality the fingerprint scanners pre-qualification regarding a medium/default setting and test configurability of pre-qualification thresholds, regarding a relaxed and strict settings (if supported by the IUT).

Preconditions

- 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.
- Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces").

Test Case ID: TC-AS-FP-MF-002*CTS Mode*

- interactive
- no provision of pre-defined input data
- HTTP method: GET
- test case variants:

/TR03122/TC-AS-FP-MF-002/1/

Table 2.76 TC-AS-FP-MF-002 Test Case Variants

Test Case ID: TC-AS-FP-MF-002

Description

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • 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 in Windows Bitmap Version 3 (BMP) format is returned via the test interface (<code>bio:FingerAcquisition</code>).
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Configure pre-qualification threshold as relaxed 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • 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 (<code>bio:FingerAcquisition</code>).
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> • 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • 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 (<code>bio:FingerAcquisition</code> and <code>bio:Records</code>).

Table 2.77 TC-AS-FP-MF-002 Description

Table 2.75 Test Case ID: TC-AS-FP-MF-002

Test Case ID: TC-AS-FP-MF-003

<i>Scope</i>	Examination of the fingerprint scanners resulting image resolution.
<i>Preconditions</i>	Product documentation of the fingerprint scanner model is at hand (e.g. data sheet, manual, manufacturer declaration).
<i>CTS Mode</i>	not supported
<i>Description</i>	

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Verify that the resolution of the fingerprint scanner fulfils the requirements for acquisition setting levels 31 or 41 [ISO_FINGER] • Consult product documentation <p><i>Expected Results:</i></p> <p>The documentation attests that the requirements are fulfilled.</p>

Table 2.79 TC-AS-FP-MF-003 Description**Table 2.78** Test Case ID: TC-AS-FP-MF-003**2.2.6. Test Cases FM AS-FP-SF****Test Case ID: TC-AS-FP-SF-001**

<i>Scope</i>	Examination of automatic acquisition of a single fingerprint, the automatic acquisition timeout, and the automatic acquisition behaviour with a fingerprint image of insufficient quality.
<i>Preconditions</i>	<ul style="list-style-type: none"> • 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. • Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces").
<i>CTS Mode</i>	<ul style="list-style-type: none"> • Interactive • No provision of pre-defined input data • HTTP method: GET • Test case variants:

/TR03122/TC-AS-FP-SF-001/1/

Table 2.81 TC-AS-FP-SF-001 Test Case Variants

Test Case ID: TC-AS-FP-SF-001*Description*

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> Initiate test case by calling the IUT via the test interface. Place a single finger properly on the scanner. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> The activation of the acquisition occurs automatically. As a result, a message conforming to TR-03121 XML containing the encoded fingerprint image in Windows Bitmap Version 3 (BMP) format is returned via the test interface (<code>bio:FingerAcquisition</code>). A message is given that the required fingerprint was captured successfully.
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> Initiate test case by calling the IUT via the test interface. Do not place any finger on the fingerprint scanner. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> The acquisition automatically stops after reaching timeout. As a result a message conforming to TR-03121 XML (<code>bio:FingerAcquisition</code>) is returned via the CTS containing an adequate error message stating that no fingerprint has been captured.
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> Initiate test case by calling the IUT via the test interface. Place finger incorrectly on the scanner, e.g. such that only a fingertip is slightly visible to scanner, but automatic acquisition is not performed. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> When the timeout is reached, the automatic acquisition is performed optionally (according to the IUT's active configuration during test case execution). An optional adequate error message is displayed stating fingerprint of insufficient quality has been captured. As a result, a message conforming to TR-03121 XML containing the encoded fingerprint image in Windows Bitmap Version 3 (BMP) format and the error message is returned via the test interface (<code>bio:FingerAcquisition</code>).

Table 2.82 TC-AS-FP-SF-001 Description**Table 2.80** Test Case ID: TC-AS-FP-SF-001**2.2.7. Test Cases FM AS-FP-SLP****Test Case ID: TC-AS-FP-SLP-001***Scope*

Examination of correctness of automatic classification of left and right hand slap.

Preconditions

- IUT is running, required modules are loaded.
- A four finger slap scanner is connected.
- As necessary test resources: a test person to perform the fingerprint acquisition with.
- Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces").

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

- CTS Mode*
- interactive
 - no provision of pre-defined input data
 - HTTP method: GET
 - test case variants:

/TR03122/TC-AS-FP-SLP-001/1/

Table 2.84 TC-AS-FP-SLP-001 Test Case Variants

Description

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Initiate test case by calling the IUT via the test interface. • Place left hand slap properly on the scanner. • Perform a capture of the hand slap, e.g. according to PAP Task ACQ-FPS-SV-2: Capture Slap Supervised. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • 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 correct slap code is returned via the test interface (bio:FingerClassifierInformation within bio:FingerAcquisition).
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Initiate test case by calling the IUT via the test interface. • Place right hand slap properly on the scanner. • Perform a capturing of the hand slap, e.g. according to PAP Task ACQ-FPS-SV-2: Capture Slap Supervised. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • 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 correct slap code is returned via the test interface (bio:FingerClassifierInformation within bio:FingerAcquisition).

Table 2.85 TC-AS-FP-SLP-001 Description

Table 2.83 Test Case ID: TC-AS-FP-SLP-001

Test Case ID: TC-AS-FP-SLP-002

- Scope* Examination of the performance and configurability of the automated hand slap classification.
- Preconditions* The vendor of the algorithm provides a documentation which gives information about the accuracy of the classification algorithm.

Test Case ID: TC-AS-FP-SLP-002*Description*

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <p>Examination of the documentation provided by the vendor of the classification algorithm.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The documentation gives information of the performance of the algorithm based on a reference database. • The documentation gives evidence that the classification algorithm ensures an accuracy of at least 99%, i.e. 99% of left and right hand slaps are correctly classified. • The documentation gives evidence that the classification algorithm can be calibrated for accuracy levels using configurable thresholds in case the classification algorithm returns more than two possible results, e.g. "left", "right" and "unknown".

Table 2.87 TC-AS-FP-SLP-002 Description**Table 2.86** Test Case ID: TC-AS-FP-SLP-002**Test Case ID: TC-AS-FP-SLP-003***Scope* Examination of deactivation of automated hand slap classification.

Preconditions

- IUT is running, required modules are loaded.
- A four finger slap scanner is connected.
- As necessary test resources: a test person to perform the fingerprint acquisition with.
- Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces").

CTS Mode

- interactive
- no provision of pre-defined input data
- HTTP method: GET
- test case variants:

/TR03122/TC-AS-FP-SLP-003/1/

Table 2.89 TC-AS-FP-SLP-003 Test Case Variants

Test Case ID: TC-AS-FP-SLP-003

Description

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Activate automated hand slap classification (e.g. via software/firmware, consult product documentation). • Initiate test case by calling the IUT via the test interface. • Place hand slap properly on the scanner. • Perform a capture of the hand slap, e.g. according to PAP Task ACQ-FPS-SV-2: Capture Slap Supervised. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • 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 correct slap code is returned via the test interface (<code>bio:FingerClassifierInformation</code> within <code>bio:FingerAcquisition</code>).
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Deactivate automated hand slap classification (e.g. via software/firmware, consult product documentation). • Initiate test case by calling the IUT via the test interface. • Place hand slap properly on the scanner. • Perform a capturing of the hand slap, e.g. according to PAP Task ACQ-FPS-SV-2: Capture Slap Supervised. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • 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 no slap code is returned via the test interface (<code>bio:FingerClassifierInformation</code> within <code>bio:FingerAcquisition</code>).

Table 2.90 TC-AS-FP-SLP-003 Description**Table 2.88** Test Case ID: TC-AS-FP-SLP-003**2.2.8. 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

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

<i>Description</i>	<p>Check the captured rolled fingerprint image</p> <p>For each finger of each test person:</p> <ul style="list-style-type: none"> • 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 <p>Note:</p> <ul style="list-style-type: none"> • 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 <p>The operator is required to be trained in capturing fingerprints of persons to ensure a realistic finger roll process</p>
<i>Expected Result</i>	<p>As a result per acquisition, a message conforming to TR-03121 XML containing the encoded fingerprint images is returned via the test interface (<code>bio:FingerAcquisition</code> and <code>bio:Records</code>)</p> <p>For each captured fingerprint image of each test person, the following results are expected:</p> <ul style="list-style-type: none"> • 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. • 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: <ul style="list-style-type: none"> • The captured fingerprint image clearly depicts features. • If loop features exists for the given fingerprint: <p>The captured fingerprint image clearly depicts loop features (core and delta).</p> • 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: <p>The captured fingerprint image depicts the fingerprints delta features.</p> • 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 2.91 Test Case ID: TC-AS-FP-ROLL-001

Test Case ID: TC-AS-FP-ROLL-002

<i>Scope</i>	Examination of the fingerprint scanners resulting image resolution
<i>Precondition</i>	Product documentation of the fingerprint scanner model is at hand (e.g. data sheet, manual, manufacturer declaration)
<i>Description</i>	Verify that the resolution of the fingerprint scanner fulfils the requirements for acquisition setting levels 31 or 41 [ISO_FINGER] Consult product documentation
<i>Expected Result</i>	The documentation attests that the requirements are fulfilled

Table 2.92 Test Case ID: TC-AS-FP-ROLL-002

2.3. Test Cases Biometric Image Processing

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

Test Case ID: TC-BIP-FI-DC-HQ-001

<i>Scope</i>	Verify correct facial image processing
<i>Precondition</i>	<ul style="list-style-type: none"> IUT is running, required modules are loaded As necessary test resource: <ul style="list-style-type: none"> 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") <ul style="list-style-type: none"> Test case path: /TR03122/TC-BIP-FI-DC-HQ-001/1 HTTP method: POST 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.

Test Case ID: TC-BIP-FI-DC-HQ-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check correct processing of generic facial images</p> <ul style="list-style-type: none"> • Initiate test case by loading the reference facial image using the test interface • Examine the processed image <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • As a result, a message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code> and <code>bio:Records</code>) • The processed image has dimensions of exactly 1600*1200 pixels (in regard to height and width), if it was larger before. Otherwise the dimensions of the image are unchanged • The height/width ratio of the processed image is 4:3 • The minimum distance between both eyes is at least 120 pixels
2	<p><i>Description:</i></p> <p>Check correct processing of facial images for GSAT</p> <ul style="list-style-type: none"> • Initiate test case by loading the reference facial image using the test interface • Examine the processed image <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • 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:XMLRecord[@type="GSAT-xml"]</code>), whereby only the contained facial image data (Element <code>it1:FaceImage</code>) is relevant for this test case • The processed image has dimensions of exactly 800*600 pixels, if it was larger before. Otherwise the dimensions of the image are unchanged (height/width ratio is 4:3) • The minimum distance between both eyes is at least 120 pixels

Table 2.94 TC-BIP-FI-DC-HQ-001 Description**Table 2.93** Test Case ID: TC-BIP-FI-DC-HQ-001**2.3.2. Test Cases FM BIP-FI-FBS****Test Case ID: TC-BIP-FI-FBS-001**

<i>Scope</i>	Verify correct image processing of application forms and the cropping of the facial image on the application form using a flat bed scanner.
<i>Preconditions</i>	<ul style="list-style-type: none"> • The IUT is in operation, required modules are loaded. • As test resource: an application form with a facial image that fulfills the requirements of "full frontal" specified in [ISO_FACE].
<i>CTS Mode</i>	<ul style="list-style-type: none"> • Interactive • Image provision as JPEG or JPEG 2000 using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces") • HTTP method: POST • Test case variants:

/TR03122/TC-BIP-FI-FBS-001/1

Table 2.96 TC-BIP-FI-FBS-001 Test Case Variants

Test Case ID: TC-BIP-FI-FBS-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check correct processing of the output of flat bad scanner:</p> <ul style="list-style-type: none"> • Initiate test case by loading the reference application form using the test interface. • Examine the processed image, i.e.: <ul style="list-style-type: none"> • The image crop. • The image width and height. • The colour depth. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>). • The processed image is cropped. • The face is centered and fully visible in the foreground. • The image dimension is 413 pixels width and 531 pixels height with a tolerance of +/- 10 pixels. • The colour depth is 24 bit RGB. Note, for scenarios where only a facial verification is performed a colour depth of 8 bit grey scale is also possible.

Table 2.97 TC-BIP-FI-FBS-001 Description**Table 2.95** Test Case ID: TC-BIP-FI-FBS-001**2.3.3. Test Cases FM BIP-FI-GID****Test Case ID: TC-BIP-FI-GID-001***Scope* Verify correct image processing and the cropping of the facial image using a digital camera.

Preconditions

- The IUT is in operation, required modules are loaded.
- As test resource: a biometric test subject.

CTS Mode

- Interactive
- No provision of pre-defined input data
- HTTP method: GET
- Test case variants:

/TR03122/TC-BIP-FI-GID-001/1

Table 2.99 TC-BIP-FI-GID-001 Test Case Variants

Test Case ID: TC-BIP-FI-GID-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check correct processing of the output of the digital camera:</p> <ul style="list-style-type: none"> • Position the biometric test subject properly in front of the digital camera. • Initiate test case using the test interface. • Examine the processed image, i.e.: <ul style="list-style-type: none"> • The image crop. • The image width and height. • The colour depth. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>). • The processed image is cropped. • The face is centered and fully visible in the foreground. • The image size is 413 pixels width and 531 pixels height with a tolerance of +/- 10 pixels. • The colour depth is 24 bit RGB. Note, for scenarios where only a facial verification is performed a colour depth of 8 bit grey scale is also possible.

Table 2.100 TC-BIP-FI-GID-001 Description**Table 2.98** Test Case ID: TC-BIP-FI-GID-001**2.3.4. Test Cases FM BIP-FI-APP****Test Case ID: TC-BIP-FI-APP-001***Scope*

Verify correct facial image processing with respect to the output of integrated camera systems to obtain a facial image. The metrics applied for assessment are based on [ISO_FACE] .

Preconditions

- The IUT is in operation, required modules are loaded.
- A database with facial images for conformance test and the CTS are at hand.
- The following definitions according to [ISO_FACE] are relevant for verifying the geometric requirements:
 - The intersection of the vertical line passing through the approximate horizontal midpoints of the mouth and the bridge of the nose, and the horizontal line connecting the centres of the two eyes, is called the centre of the face.
 - The width of the head is defined as the distance between the two imaginary lines parallel to the vertical line mentioned above. Each line is drawn between the upper and lower lobes of each ear and positioned where the external ear connects the head.
 - The length of the head is defined as the distance between the base of the chin and the crown (i.e. the top of the head ignoring any hair) measured on the vertical line mentioned above.

Test Case ID: TC-BIP-FI-APP-001*CTS Mode*

- interactive
- image provision as JPEG or JPEG 2000 using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")
- HTTP method: POST
- test case variants:

/TR03122/TC-BIP-FI-APP-001/1/

Table 2.102 TC-BIP-FI-APP-001 Test Case Variants*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check correct processing of the output of integrated camera systems:</p> <ul style="list-style-type: none"> • Initiate test case by loading the reference facial image using the test interface. • Examine the processed image, i.e.: <ul style="list-style-type: none"> • Determine the width of the image and the head width. • Determine the height of the image and the head length. • Determine the X and Y coordinates of the centre of the face, assuming that the origin of the coordinate system is in the upper left corner of the image. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>). • The colour depth is 24 bit RGB. Note, for scenarios where only a facial verification is performed a colour depth of 8 bit grey scale is also possible. • The face is fully visible in foreground. • The minimum distance between both eyes is 120 pixels. • The processed image is cropped and de-rotated. • The size of the face within the processed image meets the geometric requirements of [ISO_FACE], chapter 8.3, i.e.: <ul style="list-style-type: none"> • The X coordinate of the centre of the face is between 45 % and 55 % of the image width. • The Y coordinate of the centre of the face is between 30 % and 50 % (for children under the age of 11 between 30 % and 60 %) of the image height. • The head width is between 50 % and 75 % of the image width. • The head length is between 60 % and 90 % (for children under the age of 11 between 50 % and 90 %) of the vertical length of the image.

Table 2.103 TC-BIP-FI-APP-001 Description**Table 2.101** Test Case ID: TC-BIP-FI-APP-001

2.3.5. 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 be applied additionally.

Test Case ID: TC-BIP-FP-APP-001

<i>Scope</i>	Examination of segmentation in connection with single finger scanners.
<i>Preconditions</i>	<ul style="list-style-type: none"> • 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.
<i>CTS Mode</i>	<ul style="list-style-type: none"> • interactive • No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces"). • HTTP method: GET • test case variants:

/TR03122/TC-BIP-FP-APP-001/1/

Table 2.105 TC-BIP-FP-APP-001 Test Case Variants

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.

Test Case ID: TC-BIP-FP-APP-001

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> As a result, a message conforming to TR-03121 XML containing an encoded fingerprint image is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. Note: segmentation for single finger scanners is optional. No upscaling has been applied to the fingerprint image. The fingerprint image may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint image.
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. Note: In case the IUT rejects strongly rotated fingerprints such that the capture process does not yield a biometric sample, the capture process can be initiated manually. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> As a result, a message conforming to TR-03121 XML containing an encoded fingerprint image is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). The fingerprint is corrected to be vertical in the image which is manually verified by the examiner. A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. Note: segmentation for single finger scanners is optional. No upscaling has been applied to the fingerprint image. The fingerprint image may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint image.

Table 2.106 TC-BIP-FP-APP-001 Description

Test Case ID: TC-BIP-FP-APP-001

Step	Description / Expected Result
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> As a result, a message conforming to TR-03121 XML containing an encoded fingerprint image is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). The image contains only the first part of the finger. A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. Note: segmentation for single finger scanners is optional. No upscaling has been applied to the fingerprint image. The fingerprint image may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint image.

Table 2.107 TC-BIP-FP-APP-001 Description**Table 2.104** 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.
Preconditions	<ul style="list-style-type: none">• 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.
CTS Mode	<ul style="list-style-type: none">• interactive• No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces").• HTTP method: GET• test case variants:<div><div>/TR03122/TC-BIP-FP-APP-002/1/</div></div>

Table 2.109 TC-BIP-FP-APP-002 Test Case Variants

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.

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

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • As a result, a message conforming to TR-03121 XML containing two encoded fingerprint images is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). • Two independent images are returned within the data. • A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. • No upscaling has been applied to the fingerprint images. The fingerprint images may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint images.
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> • 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • As a result, a message conforming to TR-03121 XML containing one encoded fingerprint image is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). • A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. • No upscaling has been applied to the fingerprint image. The fingerprint image may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint image.

Table 2.110 TC-BIP-FP-APP-002 Description

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

Step	Description / Expected Result
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. Note: In case the IUT rejects strongly rotated fingerprints such that the capture process does not yield a biometric sample, the capture process can be initiated manually. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> As a result, a message conforming to TR-03121 XML containing two encoded fingerprint images is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). Two independent images are returned within the data. The fingerprints are corrected to be vertical in the image which is manually verified by the examiner. A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. No upscaling has been applied to the fingerprint images. The fingerprint images may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint images.
4	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. Note: In case the IUT rejects strongly rotated fingerprints such that the capture process does not yield a biometric sample, the capture process can be initiated manually. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> As a result, a message conforming to TR-03121 XML containing an encoded fingerprint image is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). The fingerprint is corrected to be vertical in the image which is manually verified by the examiner. A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. No upscaling has been applied to the fingerprint image. The fingerprint image may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint image.

Table 2.111 TC-BIP-FP-APP-002 Description

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

Step	Description / Expected Result
5	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> As a result, a message conforming to TR-03121 XML containing two encoded fingerprint images is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). 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. No upscaling has been applied to the fingerprint images. The fingerprint images may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint images.
6	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> As a result, a message conforming to TR-03121 XML containing one encoded fingerprint image is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). Image contains only the first part of the finger. A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. No upscaling has been applied to the fingerprint image. The fingerprint image may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint image.

Table 2.112 TC-BIP-FP-APP-002 Description**Table 2.108** Test Case ID: TC-BIP-FP-APP-002**Test Case ID: TC-BIP-FP-APP-003**

<i>Scope</i>	Examination of segmentation in connection with four finger scanners.
<i>Preconditions</i>	<ul style="list-style-type: none"> 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.

Test Case ID: TC-BIP-FP-APP-003*CTS Mode*

- interactive
- No provision of pre-defined input data; Test case initiation via test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces").
- HTTP method: GET
- test case variants:

/TR03122/TC-BIP-FP-APP-003/1/

Table 2.114 TC-BIP-FP-APP-003 Test Case Variants

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.

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • As a result, a message conforming to TR-03121 XML containing three encoded fingerprint images is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). • Three independent images are returned within the data. • A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. • No upscaling has been applied to the fingerprint images. The fingerprint images may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint images.
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> • 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • As a result, a message conforming to TR-03121 XML containing four encoded fingerprint images is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). • Four independent images are returned within the data. • A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. • No upscaling has been applied to the fingerprint images. The fingerprint images may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint images.

Table 2.115 TC-BIP-FP-APP-003 Description

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

Step	Description / Expected Result
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. Note: In case the IUT rejects strongly rotated fingerprints such that the capture process does not yield a biometric sample, the capture process can be initiated manually. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> As a result, a message conforming to TR-03121 XML containing three encoded fingerprint images is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). Three independent images are returned within the data. The fingerprints are corrected to be vertical in the image which is manually verified by the examiner. A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. No upscaling has been applied to the fingerprint images. The fingerprint images may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint images.
4	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. Note: In case the IUT rejects strongly rotated fingerprints such that the capture process does not yield a biometric sample, the capture process can be initiated manually. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> As a result, a message conforming to TR-03121 XML containing four encoded fingerprint images is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). Four independent images are returned within the data. The fingerprints are corrected to be vertical in the image which is manually verified by the examiner. A correct segmentation has been performed. In case of uncertainty, the test SHALL be repeated. No upscaling has been applied to the fingerprint images. The fingerprint images may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint images.

Table 2.116 TC-BIP-FP-APP-003 Description

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

Step	Description / Expected Result
5	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> As a result, a message conforming to TR-03121 XML containing three encoded fingerprint images is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). 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. No upscaling has been applied to the fingerprint images. The fingerprint images may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint images.
6	<p><i>Description:</i></p> <ul style="list-style-type: none"> Start of the acquisition of four fingerprints by positioning four fingers on the sensor such that all phalanges are captured during acquisition and extraction of the fingerprint images from the resulting data. Initiate test case by calling the IUT via the test interface. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> As a result, a message conforming to TR-03121 XML containing four encoded fingerprint images is returned via the test interface (element <code>bio:FingerAcquisition</code> and <code>bio:Records</code>). 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. No upscaling has been applied to the fingerprint images. The fingerprint images may have been evenly surrounded with white pixels to reach the desired size if the targeted system or database requires fingerprint images of higher size than captured the fingerprint images.

Table 2.117 TC-BIP-FP-APP-003 Description

Table 2.113 Test Case ID: TC-BIP-FP-APP-003

2.4. Test Cases Quality Assurance

2.4.1. Test Cases FM QA-FI-GENERIC

Test Case ID: TC-QA-FI-GENERIC-001	
Scope	<p>Examination of the software-based quality assurance for facial images regarding the generic quality evaluation criteria.</p> <p>Note that the examination for fixed parameters and thresholds are not part of this test case, as they are specified by the volume specific Function Module.</p>
Preconditions	<ul style="list-style-type: none">• The IUT is in operation, required modules are loaded.• As necessary test resources, a Ground Truth database for conformance test and the CTS are at hand.• The database contains:<ul style="list-style-type: none">• 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.• 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.
CTS Mode	<ul style="list-style-type: none">• Automatic• Image provision as JPEG or JPEG 2000 using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")• HTTP method: POST• Test case variants:<div><div>/TR03122/TC-QA-FI-GENERIC-001/1</div></div>

Table 2.119 TC-QA-FI-GENERIC-001 Test Case Variants

Test Case ID: TC-QA-FI-GENERIC-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • The IUT is called via the conformance test interface and compliant facial images from the conformance test database are committed consecutively according to QA-FI-GENERIC criteria. • The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • For every facial image a “<code>bio:FaceQuality</code>” element is returned by the IUT via the test interface. • 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: <ul style="list-style-type: none"> • “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. • The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) are satisfied: <ul style="list-style-type: none"> • $tmin \geq min, tmax \leq max$ • $min \leq result \leq max$

Table 2.120 TC-QA-FI-GENERIC-001 Description

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

Step	Description / Expected Result
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and compliant facial images from the conformance test database are committed consecutively according to QA-FI-GENERIC criteria. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT may provide quality values for criteria marked with “O” in the respective Function Module. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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. The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) are satisfied: <ul style="list-style-type: none"> $tmin \geq min, tmax \leq max$ $min \leq result \leq max$

Table 2.121 TC-QA-FI-GENERIC-001 Description**Table 2.118** Test Case ID: TC-QA-FI-GENERIC-001**Test Case ID: TC-QA-FI-GENERIC-002**

Scope	<p>Examination of correctness of the Quality Assurance module for identification of the best capture.</p> <p>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.</p> <p>Note that there exist different variants of this testcase.</p>
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Test Case ID: TC-QA-FI-GENERIC-002**Preconditions**

- IUT is in operation, required modules are loaded
- As necessary test resources, a Ground Truth database for conformance test and the CTS are at hand.
- The database contains:
 - sequences of images for all criteria to be tested
 - Ground Truth for best capture of each image sequence according to the best capture identification process defined in the respective Function Module.
- The IUT implements an interface for conformance testing where a sequence of images 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 sequence of images via the test interface.

CTS Mode

- automatic
- image provision as JPEG or JPEG 2000 using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")
- HTTP method: POST
- test case variants:

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/TR03122/TC-QA-FI-GEN-
ERIC-002/1
```

Table 2.123 TC-QA-FI-GENERIC-002 Test Case Variants**Description**

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • All face image sequences from the conformance test database for this test case are committing consecutively. • The test case is initiated by calling the IUT via the test interface. <p><i>Expected Results:</i></p> <p>For every input sequence the final selected face image capture and quality information (bio:FaceAcquisition) is returned by the IUT via the test interface.</p>
2	<p><i>Description:</i></p> <p>Examination of correct identification and comparison of the IUT's selection of the best capture out of multiple captures with the Ground Truth database.</p> <p><i>Expected Results:</i></p> <p>All best captures (as specified in the Ground Truth database) are identical with the actual received results of face images and corresponding quality information.</p>

Table 2.124 TC-QA-FI-GENERIC-002 Description**Table 2.122** Test Case ID: TC-QA-FI-GENERIC-002**2.4.2. Test Cases FM QA-FI-BCL****Test Case ID: TC-QA-FI-BCL-001****Scope**

Examination of the software-based quality assurance for facial images within the context of border control.

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.

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

Preconditions

- The IUT is in operation, required modules are loaded.
- As necessary test resources, a Ground Truth database for conformance test and the CTS are at hand.
- The database 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.
- 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.

CTS Mode

- Automatic
- Image provision as JPEG or JPEG 2000 using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")
- HTTP method: POST
- Test case variants:

/TR03122/TC-QA-FI-BCL-001/1

Table 2.126 TC-QA-FI-BCL-001 Test Case Variants

Test Case ID: TC-QA-FI-BCL-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-BCL. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT provides the quality values for all criteria marked with “M” in the respective table for quality threshold requirements of Function Module QA-FI-BCL. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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. The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) are satisfied: <ul style="list-style-type: none"> $tmin \geq min, tmax \leq max$ $min \leq result \leq max$

Table 2.127 TC-QA-FI-BCL-001 Description

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

Step	Description / Expected Result
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-BCL. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT may provide quality values for criteria marked with “O” in the respective table for quality threshold requirements of Function Module QA-FI-BCL. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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. The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) are satisfied: <ul style="list-style-type: none"> $tmin \geq min, tmax \leq max$ $min \leq result \leq max$

Table 2.128 TC-QA-FI-BCL-001 Description

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

Step	Description / Expected Result
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and non-compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-BCL. This has to be done for all criteria that have been identified as mandatory. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT provides the quality values for all criteria marked with "M" in the respective table for quality threshold requirements of Function Module QA-FI-BCL. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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 The acceptance conditions are not met, i.e. the total result of the quality evaluation is negative.

Table 2.129 TC-QA-FI-BCL-001 Description

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

Step	Description / Expected Result
4	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and non-compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-BCL. This has to be done for all criteria that have been identified as optional. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT may provide quality values for criteria marked with "O" in the respective table for quality threshold requirements of Function Module QA-FI-BCL. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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 2.130 TC-QA-FI-BCL-001 Description**Table 2.125** Test Case ID: TC-QA-FI-BCL-001**2.4.3. Test Cases FM QA-FI-GID****Test Case ID: TC-QA-FI-GID-001**

<i>Scope</i>	<p>Examination of the software-based quality assurance for facial images within the context of german identity documents.</p> <p>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.</p>
<i>Preconditions</i>	<ul style="list-style-type: none"> The IUT is in operation, required modules are loaded. As necessary test resources, a Ground Truth database for conformance test and the CTS are at hand. The database contains: <ul style="list-style-type: none"> 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. 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.

Test Case ID: TC-QA-FI-GID-001
CTS Mode

- Automatic
- Image provision as JPEG or JPEG 2000 using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")
- HTTP method: POST
- Test case variants:

/ TR03122/TC-QA-FI-GID-001/1

Table 2.132 TC-QA-FI-GID-001 Test Case Variants
Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • The IUT is called via the conformance test interface and compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-GID. • The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • For every facial image a "bio:FaceQuality" element is returned by the IUT via the test interface. • The IUT provides the quality values for all criteria marked with "M" in the respective table for quality threshold requirements of Function Module QA-FI-GID. • If applicable, the quality values are correctly set: <ul style="list-style-type: none"> • "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. • The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) are satisfied: <ul style="list-style-type: none"> • $tmin \geq min, tmax \leq max$ • $min \leq result \leq max$

Table 2.133 TC-QA-FI-GID-001 Description

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

Step	Description / Expected Result
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-GID. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT may provide quality values for criteria marked with “O” in the respective table for quality threshold requirements of Function Module QA-FI-GID. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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. The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) are satisfied: <ul style="list-style-type: none"> $tmin \geq min, tmax \leq max$ $min \leq result \leq max$

Table 2.134 TC-QA-FI-GID-001 Description

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

Step	Description / Expected Result
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and non-compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-GID. This has to be done for all criteria that have been identified as mandatory. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT provides the quality values for all criteria marked with "M" in the respective table for quality threshold requirements of Function Module QA-FI-GID. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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 The acceptance conditions are not met, i.e. the total result of the quality evaluation is negative.

Table 2.135 TC-QA-FI-GID-001 Description

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

Step	Description / Expected Result
4	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and non-compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-GID. This has to be done for all criteria that have been identified as optional. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT may provide quality values for criteria marked with "O" in the respective table for quality threshold requirements of Function Module QA-FI-GID. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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 2.136 TC-QA-FI-GID-001 Description

Table 2.131 Test Case ID: TC-QA-FI-GID-001

2.4.4. Test Cases FM QA-FI-ARE

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

<i>Scope</i>	<p>Examination of the software-based quality assurance for facial images within the context of alien register enrolment.</p> <p>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.</p>
<i>Preconditions</i>	<ul style="list-style-type: none"> The IUT is in operation, required modules are loaded. As necessary test resources, a Ground Truth database for conformance test and the CTS are at hand. The database contains: <ul style="list-style-type: none"> 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. 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.

Test Case ID: TC-QA-FI-ARE-001*CTS Mode*

- Automatic
- Image provision as JPEG or JPEG 2000 using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")
- HTTP method: POST
- Test case variants:

/TR03122/TC-QA-FI-ARE-001/1

Table 2.138 TC-QA-FI-ARE-001 Test Case Variants*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • The IUT is called via the conformance test interface and compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-ARE. • The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • For every facial image a "bio:FaceQuality" element is returned by the IUT via the test interface. • The IUT provides the quality values for all criteria marked with "M" in the respective table for quality threshold requirements of Function Module QA-FI-ARE. • If applicable, the quality values are correctly set: <ul style="list-style-type: none"> • "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. • The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) are satisfied: <ul style="list-style-type: none"> • $tmin \geq min, tmax \leq max$ • $min \leq result \leq max$

Table 2.139 TC-QA-FI-ARE-001 Description

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

Step	Description / Expected Result
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-ARE. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT may provide quality values for criteria marked with “O” in the respective table for quality threshold requirements of Function Module QA-FI-ARE. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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. The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) are satisfied: <ul style="list-style-type: none"> $tmin \geq min, tmax \leq max$ $min \leq result \leq max$

Table 2.140 TC-QA-FI-ARE-001 Description

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

Step	Description / Expected Result
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and non-compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-ARE. This has to be done for all criteria that have been identified as mandatory. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT provides the quality values for all criteria marked with "M" in the respective table for quality threshold requirements of Function Module QA-FI-ARE. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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 The acceptance conditions are not met, i.e. the total result of the quality evaluation is negative.

Table 2.141 TC-QA-FI-ARE-001 Description

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

Step	Description / Expected Result
4	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and non-compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-ARE. This has to be done for all criteria that have been identified as optional. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT may provide quality values for criteria marked with "O" in the respective table for quality threshold requirements of Function Module QA-FI-ARE. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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 2.142 TC-QA-FI-ARE-001 Description**Table 2.137** Test Case ID: TC-QA-FI-ARE-001**2.4.5. Test Cases FM QA-FI-IMA****Test Case ID: TC-QA-FI-IMA-001**

<i>Scope</i>	<p>Examination of the software-based quality assurance for facial images within the context of immigration authorities.</p> <p>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.</p>
<i>Preconditions</i>	<ul style="list-style-type: none"> The IUT is in operation, required modules are loaded. As necessary test resources, a Ground Truth database for conformance test and the CTS are at hand. The database contains: <ul style="list-style-type: none"> 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. 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.

Test Case ID: TC-QA-FI-IMA-001*CTS Mode*

- automatic
- image provision as JPEG or JPEG 2000 using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")
- HTTP method: POST
- test case variants:

/TR03122/TC-QA-FI-IMA-001/1

Table 2.144 TC-QA-FI-IMA-001 Test Case Variants*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • The IUT is called via the conformance test interface and compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-IMA. • The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • For every facial image a "bio:FaceQuality" element is returned by the IUT via the test interface. • The IUT provides the quality values for all criteria marked with "M" in the respective table for quality threshold requirements of Function Module QA-FI-IMA. • If applicable, the quality values are correctly set: <ul style="list-style-type: none"> • "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. • The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) are satisfied: <ul style="list-style-type: none"> • $tmin \geq min, tmax \leq max$ • $min \leq result \leq max$

Table 2.145 TC-QA-FI-IMA-001 Description

Test Case ID: TC-QA-FI-IMA-001*Description*

Step	Description / Expected Result
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-IMA. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT may provide quality values for criteria marked with “O” in the respective table for quality threshold requirements of Function Module QA-FI-IMA. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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. The acceptance conditions (i.e. defined tolerances, depending on the specific application at hand) are satisfied: <ul style="list-style-type: none"> $tmin \geq min, tmax \leq max$ $min \leq result \leq max$

Table 2.146 TC-QA-FI-IMA-001 Description

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

Step	Description / Expected Result
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and non-compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-IMA. This has to be done for all criteria that have been identified as mandatory. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT provides the quality values for all criteria marked with "M" in the respective table for quality threshold requirements of Function Module QA-FI-IMA. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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 The acceptance conditions are not met, i.e. the total result of the quality evaluation is negative.

Table 2.147 TC-QA-FI-IMA-001 Description

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

Step	Description / Expected Result
4	<p><i>Description:</i></p> <ul style="list-style-type: none"> The IUT is called via the conformance test interface and non-compliant facial images from the conformance test database are committed consecutively according to the respective table for quality threshold requirements of Function Module QA-FI-IMA. This has to be done for all criteria that have been identified as optional. The results returned by the IUT are checked (depending on the specific application profile at hand) if the expected quality values are available. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> For every facial image a “bio:FaceQuality” element is returned by the IUT via the test interface. The IUT may provide quality values for criteria marked with "O" in the respective table for quality threshold requirements of Function Module QA-FI-IMA. If applicable, the quality values are correctly set: <ul style="list-style-type: none"> “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 2.148 TC-QA-FI-IMA-001 Description**Table 2.143** Test Case ID: TC-QA-FI-IMA-001**2.4.6. Test Cases FM QA-FP-APP****Test Case ID: TC-QA-FP-APP-001**

<i>Scope</i>	Examination of correctness of the Quality Assurance module for fingerprint acquisition sequence 4-4-2.
<i>Preconditions</i>	<ul style="list-style-type: none"> IUT is running, a Ground Truth database for conformance test and the CTS are at hand. The test database contains: <ul style="list-style-type: none"> Sequences of fingerprint images including corresponding finger codes. Corresponding Ground Truth values.
<i>CTS Mode</i>	<ul style="list-style-type: none"> automatic 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). HTTP method: POST test case variants: <div data-bbox="448 1899 802 1924" data-label="Text">/TR03122/TC-QA-FP-APP-001/1</div>

Table 2.150 TC-QA-FP-APP-001 Test Case Variants

Test Case ID: TC-QA-FP-APP-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Start of the module by committing consecutively all fingerprints sequences for this test case from the conformance test database.</p> <p>Initiate test case by calling the IUT via the test interface.</p> <p><i>Expected Result:</i></p> <p>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:FingerAcquisition).</p>
2	<p><i>Description:</i></p> <p>Examination of correct identification and comparison of the IUTs selection of the best capture out of multiple captures with the Ground Truth database.</p> <p><i>Expected Result:</i></p> <p>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.</p>

Table 2.151 TC-QA-FP-APP-001 Description**Table 2.149** Test Case ID: TC-QA-FP-APP-001**Test Case ID: TC-QA-FP-APP-002**

<i>Scope</i>	Examination of correctness of the Quality Assurance module for fingerprint acquisition sequence 4-1-4-1.
<i>Preconditions</i>	<ul style="list-style-type: none"> IUT is running, a Ground Truth database for conformance test and the CTS are at hand. The test database contains: <ul style="list-style-type: none"> Sequences of fingerprint images including corresponding finger codes. Corresponding Ground Truth values.
<i>CTS Mode</i>	<ul style="list-style-type: none"> automatic 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). HTTP method: POST test case variants: <div> /TR03122/TC-QA-FP-APP-002/1 </div>

Table 2.153 TC-QA-FP-APP-002 Test Case Variants

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

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Start of the module by committing consecutively all fingerprints sequences for this test case from the conformance test database.</p> <p>Initiate test case by calling the IUT via the test interface.</p> <p><i>Expected Result:</i></p> <p>For every input sequence an XML element is returned, containing the final selected sets of fingerprints (<code>bio:Records</code>) and the corresponding capture and quality information (<code>bio:FingerAcquisition</code>).</p>
2	<p><i>Description:</i></p> <p>Examination of correct identification and comparison of the IUTs selection of the best capture out of multiple captures with the Ground Truth database.</p> <p><i>Expected Result:</i></p> <p>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.</p>

Table 2.154 TC-QA-FP-APP-002 Description**Table 2.152** Test Case ID: TC-QA-FP-APP-002**Test Case ID: TC-QA-FP-APP-003**

<i>Scope</i>	Examination of correctness of NFIQ 2.0 algorithm implementation.
<i>Preconditions</i>	<ul style="list-style-type: none"> IUT is running, a Ground Truth database for conformance test and the CTS are at hand The test database contains: <ul style="list-style-type: none"> 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.
<i>CTS Mode</i>	<ul style="list-style-type: none"> automatic Image provision as Windows Bitmap Version 3 (BMP) using the test interface (TR-03122-1, Chapter 4, "Conformance Test Interfaces"). HTTP method: POST test case variants:

/TR03122/TC-QA-FP-APP-003/1

Table 2.156 TC-QA-FP-APP-003 Test Case Variants

Test Case ID: TC-QA-FP-APP-003*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>The fingerprint images are consecutively passed to the IUT for quality evaluation and compared to the Ground Truth values.</p> <p>Initiate test case by calling the IUT via the test interface.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • For each passed fingerprint image a result containing a “<code>bio:FingerQuality</code>” element is returned by the IUT via the test interface. • The quality value returned by the IUT for the current fingerprint image equals the corresponding Ground Truth value. <p>Note: Minor deviations of the quality value from the Ground Truth may only be acceptable after a case specific analyse of the reasoning.</p>
2	<p><i>Description:</i></p> <p>Data expected to yield an error code (in BMP format) during quality assessment is used as input for the IUT.</p> <p>Initiate test case by calling the IUT via the test interface</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • For such a passed data a result containing a “<code>bio:FingerQuality</code>” element is returned by the IUT via the test interface. • The decimal error code 255 is returned therein, indicating an error during quality computation.

Table 2.157 TC-QA-FP-APP-003 Description**Table 2.155** Test Case ID: TC-QA-FP-APP-003

2.5. Test Cases Compression

2.5.1. Test Cases FM COM-FI-JPG

Test Case ID: TC-COM-FI-JPG-001

<i>Scope</i>	Examine correct parametrisation of JPEG compression
<i>Precondition</i>	<ul style="list-style-type: none"> • IUT is running, required modules are loaded • As necessary test resources: a test database containing multiple compressed and uncompressed (including losslessly compressed) facial reference images of varying resolution <ul style="list-style-type: none"> • 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") <ul style="list-style-type: none"> • Test case path: /TR03122/TC-COM-PH-JPG-001/1 • HTTP method: POST

Test Case ID: TC-COM-FI-JPG-001

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check minimum file size after compression of small sized images (531*413 pixel)</p> <ul style="list-style-type: none"> Initiate test case by loading a uncompressed or losslessly compressed 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 <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> 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
2	<p><i>Description:</i></p> <p>Check minimum file size after compression of medium sized images (800*600 pixel)</p> <ul style="list-style-type: none"> Initiate test case by loading a uncompressed or losslessly compressed 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 <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> 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
3	<p><i>Description:</i></p> <p>Check minimum file size after compression of standard sized images (1600*1200 pixel)</p> <ul style="list-style-type: none"> Initiate test case by loading a uncompressed or losslessly compressed reference facial image using the test interface, given standard sized images as input Verify integrity of compressed file by decoding with a standard JPEG viewer/decoder <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> 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 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 2.159 TC-COM-FI-JPG-001 Description

Test Case ID: TC-COM-FI-JPG-001

Step	Description / Expected Result
4	<p><i>Description:</i></p> <p>Check rejection of already compressed face images</p> <ul style="list-style-type: none"> • Initiate test case by loading a compressed reference facial image using the test interface, given standard sized images as input • Verify integrity of compressed file by decoding with a standard JPEG viewer/decoder <p><i>Expected Result:</i></p> <p>As a result, a message that the acceptance conditions are not met is returned, since multiple lossy compression is not allowed.</p>

Table 2.160 TC-COM-FI-JPG-001 Description**Table 2.158** 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	<ul style="list-style-type: none">• IUT is running, required modules are loaded• As necessary test resources: a test database containing multiple compressed and uncompressed (including losslessly compressed) facial reference images of resolution 531*413 pixel; JPEG2000 Decoder according to ISO/IEC 15444-1• Provision of the according biometric container including the image data
CTS Mode	<ul style="list-style-type: none">• Automatic• Image provision as JPEG or JPEG2000 using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")• HTTP method: POST• Test case variants: <div>/TR03122/TC-COM-FI-JP2-001/1</div>

Table 2.162 TC-COM-FI-JP2-001 Test Case Variants

Test Case ID: TC-COM-FI-JP2-001

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Extraction of the compressed facial image file from the biometric container</p> <ul style="list-style-type: none"> Initiate test case by loading a uncompressed or losslessly compressed reference facial image using the test interface, given standard sized images as input. Verify compression of file with JPEG decoder/viewer. <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> The actual file size of 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
2	<p><i>Description:</i></p> <p>Check minimum file size after compression of standard sized images (531*413 pixel)</p> <ul style="list-style-type: none"> Initiate test case by loading a uncompressed or losslessly compressed reference facial image using the test interface, given standard sized images as input Verify integrity of compressed file by decoding with a standard JPEG2000 viewer/decoder <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> 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 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
3	<p><i>Description:</i></p> <p>Check rejection of already compressed face images</p> <ul style="list-style-type: none"> Initiate test case by loading a compressed reference facial image using the test interface, given standard sized images as input Verify integrity of compressed file by decoding with a standard JPEG2000 viewer/decoder <p><i>Expected Result:</i></p> <p>As a result, a message that the acceptance conditions are not met is returned, since multiple lossy compression is not allowed.</p>

Table 2.163 TC-COM-FI-JP2-001 Description**Table 2.161** Test Case ID: TC-COM-FI-JP2-001**2.5.3. Test Cases FM COM-FI-BCL****Test Case ID: TC-COM-FI-BCL-001**

Scope

Examine the correctness of the compression of live images used within the context of border control.

Test Case ID: TC-COM-FI-BCL-001*Precondition*

- IUT is running, required modules are loaded.
- As necessary test resources: a test database containing multiple compressed and uncompressed (including losslessly compressed) facial images.
- Provision of the according biometric container including the image data.

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>1. Extraction of the compressed facial image file from the biometric container.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The resulting image is compressed using JPEG2000 (according to ISO/IEC 15444-1) or JPEG (according to ISO/IEC 10918-1) compression standard. • The actual file size of the compressed image is below 375 kB. • The compression level is below 1:20.

Table 2.165 TC-COM-FI-BCL-001 Description**Table 2.164** Test Case ID: TC-COM-FI-BCL-001**2.5.4. Test Cases FM COM-FI-IMA****Test Case ID: TC-COM-FI-IMA-001***Scope*

Examine the correctness of the compression of live images used within the context of immigration authorities.

Precondition

- IUT is running, required modules are loaded.
- As necessary test resources: a test database containing multiple compressed and uncompressed (including losslessly compressed) facial images.
- Provision of the according biometric container including the image data.

CTS Mode

- Automatic
- Image provision using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")
- HTTP method: POST
- Test case variants:

/TR03122/TC-COM-FI-IMA-001/1

Table 2.167 TC-COM-FI-IMA-001 Test Case Variants

Test Case ID: TC-COM-FI-IMA-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check file size and file compression.</p> <ul style="list-style-type: none"> • Initiate test via CTS. • Verify integrity of compressed file by decoding with a standard JPEG viewer/decoder <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The resulting image is compressed using JPEG2000 (according to ISO/IEC 15444-1) or JPEG (according to ISO/IEC 10918-1) compression standard. • The actual file size of the compressed image is below 375 kB. • The compression level is below 1:20.
2	<p><i>Description:</i></p> <p>Check rejection of already compressed face images and initiate test case by loading a compressed reference facial image using the test interface, given standard sized images as input.</p> <p><i>Expected Result:</i></p> <p>Since multiple lossy compression is not allowed, either an error code that the acceptance conditions are not met is returned, or no additional processing is performed on the input image (i. e. the returned image is bitwise identical to the provided image).</p>

Table 2.168 TC-COM-FI-IMA-001 Description**Table 2.166** Test Case ID: TC-COM-FI-IMA-001**2.5.5. Test Cases FM COM-FP-WSQ****Test Case ID: TC-COM-FP-WSQ-001**

<i>Scope</i>	Examination of the size and compression format of the resulting fingerprint images.
<i>Preconditions</i>	<ul style="list-style-type: none"> • A necessary test resource: IUT with FBI certified Wavelet Scalar Quantisation (WSQ) algorithm. • A FBI certificate for the used WSQ implementation of the IUT is available • 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 test data base contains: <ul style="list-style-type: none"> • Sequences of fingerprint images. • Corresponding Ground Truth values of WSQ compressed images with a bit-rate of 0.75.
<i>CTS Mode</i>	<ul style="list-style-type: none"> • automatic • image provision using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces") • HTTP method: POST • test case variants: <div data-bbox="446 1870 818 1899" data-label="Text">/TR03122/TC-COM-FP-WSQ-001/1</div>

Table 2.170 TC-COM-FP-WSQ-001 Test Case Variants

Test Case ID: TC-COM-FP-WSQ-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> 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. <p><i>Expected Result:</i></p> <p>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 (<i>bio:Record</i>).</p>
2	<p><i>Description:</i></p> <p>Examination of the size of the WSQ image data.</p> <p><i>Expected Result:</i></p> <p>The size of the compressed WSQ image is between 1/10 and 1/20 of the original raw image.</p>
2	<p><i>Description:</i></p> <p>Examination of the software implementation value (sf) from the WSQ header of the image data and the certification of the WSQ algorithm used by the IUT.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> The sf value in the WSQ header is not 0. The sf value is referenced in the FBI certificate for the WSQ implementation of the module. The WSQ implementation is certified by the FBI. The WSQ implementation of the module is version 3.1 and based on NBIS Version 5.0.
3	<p><i>Description:</i></p> <p>Examination of the resulting format of the images (decode image data from the biometric container using a certified WSQ implementation).</p> <p><i>Expected Result:</i></p> <p>All returned fingerprint images can be decoded with the WSQ algorithm.</p>

Table 2.171 TC-COM-FP-WSQ-001 Description**Table 2.169** Test Case ID: TC-COM-FP-WSQ-001**2.5.6. Test Cases FM COM-FP-WSQE****Test Case ID: TC-COM-FP-WSQE-001**

<i>Scope</i>	Examination of the size and compression format of the resulting fingerprint images
<i>Precondition</i>	<ul style="list-style-type: none"> A necessary test resource: IUT with FBI certified WSQ algorithm 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 test data base contains: <ul style="list-style-type: none"> 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 ID: TC-COM-FP-WSQE-001*CTS Mode*

- Automatic
- Image provision using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")
- HTTP method: POST
- Test case variants:

/TR03122/TC-COM-FP-WSQE-001/1	Examination of the WSQ 3.0 compatibility
/TR03122/TC-COM-FP-WSQE-001/2	Examination of the WSQ 3.1 compatibility

Table 2.173 TC-COM-FP-WSQ-001 Test Case Variants*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Committing consecutively fingerprint images for this test case from the conformance test data base</p> <p>Initiate test case by calling the IUT and providing the images via the test interface</p> <p><i>Expected Result:</i></p> <p>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 (<i>bio:Record</i>)</p>
2	<p><i>Description:</i></p> <p>Examination of the size of the WSQ image data</p> <p><i>Expected Result:</i></p> <p>The size of the compressed WSQ image is between 1/10 and 1/20 of the original raw image.</p>
3	<p><i>Description:</i></p> <p>Examination of the software implementation value (sf) from the WSQ header of the image data</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • 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	<p><i>Description:</i></p> <p>Examination of the resulting format of the images (decode image data from the biometric container using a certified WSQ implementation)</p> <p><i>Expected Result:</i></p> <p>All returned fingerprint images can be decoded with the WSQ algorithm.</p>

Table 2.174 TC-COM-FP-WSQE-001 Description**Table 2.172** 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

Test Case ID: TC-COM-FP-WSQE-002*Description*

Step	Description / Expected Result
1	<i>Description:</i> Check of the FBI certificate of the used WSQ implementation <i>Expected Result:</i> The WSQ implementation is certified by the FBI.

Table 2.176 TC-COM-FP-WSQE-002 Description**Table 2.175** Test Case ID: TC-COM-FP-WSQE-002**2.5.7. 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

Step	Description / Expected Result
1	<i>Description:</i> Extraction of the compressed facial image file from the biometric container <i>Expected Result:</i> <ul style="list-style-type: none"> • The size of the compressed WSQ image is smaller than or equal to 18 kB. • 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 • All returned fingerprint images can be decoded with the WSQ algorithm

Table 2.178 TC-COM-FP-WSQR-001 Description**Table 2.177** Test Case ID: TC-COM-FP-WSQR-001**2.5.8. Test Cases FM COM-FP-BCL****Test Case ID: TC-COM-FP-BCL-001***Scope*

Examine the correctness of the compression of fingerprint images contained in ANSI/NIST-ITL 1 files within the context of border control.

Precondition

- IUT is running, required modules are loaded.
- As necessary test resources: a test database containing multiple compressed and uncompressed (including losslessly compressed) facial images.
- Provision of the according biometric container including the image data.

Test Case ID: TC-COM-FP-BCL-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>1. Extraction of the compressed facial image file from the biometric container.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The resulting image is compressed using JPEG or JPEG2000 compression standard. • The actual file size of the compressed image is between 50 kB and 100 kB per Type-14 record. • The compression level is below 1:20.

Table 2.180 TC-COM-FP-BCL-001 Description**Table 2.179** Test Case ID: TC-COM-FP-BCL-001**2.5.9. Test Cases FM COM-FP-IMA****Test Case ID: TC-COM-FP-IMA-001**

Scope Examine the correctness of the compression of fingerprint images contained in ANSI/NIST-ITL 1 files within the context of immigration authorities.

Precondition

- IUT is running, required modules are loaded.
- As necessary test resources: a test database containing multiple fingerprint and slap images.

CTS Mode

- Automatic
- Image provision using the test interface (see TR-03122-1, Chapter 4, "Conformance Test Interfaces")
- HTTP method: POST
- Test case variants:

/TR03122/TC-COM-FP-IMA-001/1

Table 2.182 TC-COM-FP-IMA-001 Test Case Variants*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check file size and file compression: initiate test case by loading fingerprint and slap images using the test interface.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The IUT returns a message conforming to TR-03121 XML containing an ANSI/NIST container within <code>type.bio.Record</code> • For each provided image a Type 14 record exists and the actual file size of the compressed image is between 50 kB and 100 kB.

Table 2.183 TC-COM-FP-IMA-001 Description**Table 2.181** Test Case ID: TC-COM-FP-IMA-001

2.6. Test Cases User Interface

2.6.1. Test Cases FM UI-FI-BSJ

Test Case ID: TC-UI-FI-BSJ-001

Scope Examination of availability of digital or physical mirror image and user guidance in the user interface shown to the biometric subject during facial image acquisition.

Preconditions

- The IUT is in operation, required modules are loaded.
- The integrated camera system used in the specific application scenario is connected.
- The IUT implements a user interface of facial image acquisition shown to the biometric subject.
- The IUT is able to display a digital or physical mirror image and information for guidance to help the biometric subject with the correct positioning.
- The acquisition system is required by another Function Module to have a feedback screen for the facial acquisition

CTS Mode Not supported

Description

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <p>A biometric subject performs a compliant face presentation in the IUT's capture area.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A digital or physical mirror image is shown by the IUT for guidance to help the biometric subject with the correct positioning. • A compliant facial image is acquired.
2	<p><i>Description:</i></p> <p>A biometric subject performs a non-compliant face presentation in the IUT's capture area where positional requirements are not met.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A digital or physical mirror image is shown by the IUT for guidance to help the biometric subject with the correct positioning. • The IUT displays user guidance information to help the biometric subject with the correct positioning in front of the camera. • The facial image acquisition is omitted by the IUT.
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> • A biometric subject initially performs a non-compliant face presentation in the IUT's capture area where positional requirements are not met. • The biometric subject follows the user guidance information provided by the IUT until a compliant face presentation is performed where positional requirements are met. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A digital or physical mirror image is shown by the IUT for guidance to help the biometric subject with the correct positioning. • A compliant facial image is acquired.

Table 2.185 TC-UI-FI-BSJ-001 Description

Table 2.184 Test Case ID: TC-UI-FI-BSJ-001

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	<ul style="list-style-type: none"> 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	<table> <tr> <th>Step</th><th>Description / Expected Result</th></tr> <tr> <td>1</td><td> <p><i>Description:</i></p> <p>An image with sufficient quality is captured using the IUT.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> 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) </td></tr> </table>	Step	Description / Expected Result	1	<p><i>Description:</i></p> <p>An image with sufficient quality is captured using the IUT.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> 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)
Step	Description / Expected Result				
1	<p><i>Description:</i></p> <p>An image with sufficient quality is captured using the IUT.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> 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 2.187 TC-UI-FI-OP-001 Description

Table 2.186 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	<ul style="list-style-type: none"> 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	<table> <tr> <th>Step</th><th>Description / Expected Result</th></tr> <tr> <td>1</td><td> <p><i>Description:</i></p> <p>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.</p> <p>Initiate test case calling the IUT via the test interface</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> 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) </td></tr> </table>	Step	Description / Expected Result	1	<p><i>Description:</i></p> <p>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.</p> <p>Initiate test case calling the IUT via the test interface</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> 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)
Step	Description / Expected Result				
1	<p><i>Description:</i></p> <p>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.</p> <p>Initiate test case calling the IUT via the test interface</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> 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 2.189 TC-UI-FI-OP-002 Description

Table 2.188 Test Case ID: TC-UI-FI-OP-002

2.6.3. Test Cases FM UI-FP-BSJ

Test Case ID: TC-UI-FP-BSJ-001	
Scope	Examination of availability of real-time feedback and user guidance in the user interface shown to the biometric subject during fingerprint acquisition.

Test Case ID: TC-UI-FP-BSJ-001

<i>Preconditions</i>	<ul style="list-style-type: none">• The IUT is in operation, required modules are loaded.• The fingerprint scanner used in the specific application scenario is connected.• The IUT implements a user interface of fingerprint acquisition shown to the biometric subject.• The IUT is able to display a digital feedback and information for guidance to help the biometric subject with the correct positioning.• Fake fingerprints (e.g. made of silicone) are available as necessary test resource.
<i>CTS Mode</i>	Not supported

Test Case ID: TC-UI-FP-BSJ-001

Description

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <p>A biometric subject performs a compliant fingerprint presentation on the IUT's fingerprint scanner.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A digital feedback is shown by the IUT in real-time including the acquisition process status and guidance to help the biometric subject with the fingerprint selection and correct positioning. • A compliant fingerprint image is acquired.
2	<p><i>Description:</i></p> <p>A biometric subject performs a compliant fingerprint presentation on the IUT's fingerprint scanner where positional requirements are not met.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A digital feedback is shown by the IUT in real-time including the acquisition process status and guidance to help the biometric subject with the fingerprint selection and correct positioning. • The IUT displays user guidance information to help the biometric subject with the correct positioning on the sensor. • The fingerprint image acquisition is omitted by the IUT.
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> • A biometric subject initially performs a non-compliant fingerprint presentation on the IUT's fingerprint scanner where positional requirements are not met. • The biometric subject follows the user guidance information provided by the IUT until a compliant fingerprint presentation is performed where positional requirements are met. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A digital feedback is shown by the IUT in real-time including the acquisition process status and guidance to help the biometric subject with the fingerprint selection and correct positioning. • A compliant fingerprint image is acquired.
4	<p><i>Description:</i></p> <p>A biometric subject initially performs a fingerprint presentation attack on the IUT's fingerprint scanner.</p> <p><i>Expected Results:</i></p> <p>A fingerprint or slap image is captured and the resulting image is displayed by the IUT.</p> <ul style="list-style-type: none"> • The IUT's presentation attack detection (PAD) displays a warning for each finger individually and an overall result in the form of a normalized PAD score in the range [0,...,1] where 1 indicates bona fide and 0 presentation attack to the calling application. • The PAD score returned by the IUT indicates a presentation attack. • The PAD result or score is only displayed to the operator and not to the person whose fingerprints are acquired.

Table 2.191 TC-UI-FP-BSJ-001 Description**Table 2.190** Test Case ID: TC-UI-FP-BSJ-001

2.6.4. Test Cases FM UI-FP-OP

Test Case ID: TC-UI-FP-OP-001

<i>Scope</i>	Examination of the correct user interface for capturing fingerprints.
<i>Preconditions</i>	<ul style="list-style-type: none">• The IUT is in operation, required modules are loaded.• The fingerprint scanner used in the specific application scenario is connected.• The IUT implements a user interface of fingerprint acquisition shown to the biometric subject.• The IUT is able to display a digital feedback and information for guidance to help the biometric subject with the correct positioning.• 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.
<i>CTS Mode</i>	Not supported

Test Case ID: TC-UI-FP-OP-001

Description

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <p>A biometric subject performs a compliant fingerprint presentation on the IUT's fingerprint scanner.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • Guidance to help the biometric subject with the fingerprint selection and correct positioning is shown by the IUT. • Visual feedback of the actual fingerprints is given by the IUT (at least by displaying the resulting captured images). • The IUT provides the following information to the operator: <ul style="list-style-type: none"> • Visual feedback of all segmented fingerprints. • Feedback on the quality level of captured fingerprints. • A warning message if a slap acquisition is in place, a slap classifier is in use and the classification result mismatches with the expected slap of the current acquisition. • A warning message if PAD was performed and a presentation attack was detected (for each finger individually and in form of an overall result). • The IUT provides veto power for the operator for the enrolment.
2	<p><i>Description:</i></p> <p>A biometric subject performs a non-compliant fingerprint presentation on the IUT's fingerprint scanner.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • Guidance to help the biometric subject with the fingerprint selection and correct positioning is shown by the IUT. • Visual feedback of the actual fingerprints is given by the IUT (at least by displaying the resulting captured images). • The IUT provides the following information to the operator: <ul style="list-style-type: none"> • Visual feedback of all segmented fingerprints. • Feedback on the quality level of captured fingerprints. • A warning message if a slap acquisition is in place, a slap classifier is in use and the classification result mismatches with the expected slap of the current acquisition. • A warning message if PAD was performed and a presentation attack was detected (for each finger individually and in form of an overall result). • The IUT provides veto power for the operator for the enrolment.

Table 2.193 TC-UI-FP-OP-001 Description**Table 2.192** 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 error occurs.

Preconditions

- The IUT is in operation, required modules are loaded.
- The fingerprint scanner used in the specific application scenario is connected.
- The IUT implements a user interface of fingerprint acquisition shown to the biometric subject.
- 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.

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

CTS Mode Not supported

Description

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <p>A biometric subject performs a compliant fingerprint presentation on the IUT's fingerprint scanner.</p> <p>The biometric subject performs a fingerprint presentation on the IUT's fingerprint scanner using the same finger for a different finger position.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT displays a warning message that a sequence error was detected. • The fingers involved in the unexpected successful comparisons shall be displayed to the official.

Table 2.195 TC-UI-FP-OP-002 Description

Table 2.194 Test Case ID: TC-UI-FP-OP-002

2.6.5. Test Cases FM UI-FP-VER

Test Case ID: TC-UI-FP-VER-001

Scope Examination of availability of user interface for operator during fingerprint verification.

Preconditions

- The IUT is in operation, required modules are loaded.
- The fingerprint scanner used in the specific application scenario is connected.
- The IUT implements a user interface of fingerprint acquisition shown to the operator.
- The IUT is able to display a visual feedback of the fingerprint verification to the operator.

CTS Mode Not supported

Description

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • A biometric subject performs a compliant fingerprint presentation on the IUT's fingerprint scanner. • Depending on the used scanner a compliant presentation of a single finger, multiple fingers or slap is conducted, respectively. <p><i>Expected Results:</i></p> <p>A compliant fingerprint image is acquired.</p>
2	<p><i>Description:</i></p> <p>The operator initiates a fingerprint verification process.</p> <p><i>Expected Results:</i></p> <p>A visual feedback about the result of the verification process is shown by the IUT to the operator.</p>

Table 2.197 TC-UI-FP-VER-001 Description

Table 2.196 Test Case ID: TC-UI-FP-VER-001

2.7. Test Cases Presentation Attack Detection

2.7.1. Test Cases FM PAD-FI-APP and APP1

Test Case ID: TC-PAD-FI-APP-001

Scope	Examination of correctness and availability of PAD functionality in the context of the acquisition of facial images.
Preconditions	<ul style="list-style-type: none"> • The IUT is in operation, required modules are loaded. • The integrated camera system used in the specific application scenario is connected. • The IUT implements an interface for conformance testing where a single image can be captured. • The PAD functionality of the IUT is activated for performing the test case. • The IUT is able to return the results for every captured image via the test interface. • The IUT is able to return the results for the conducted PAD. • The following artefacts (partial and full) can be used during test cases: <ol style="list-style-type: none"> 1. Masks created from casted silicon, big (size of a face) and small (smaller than a normal face), in different thicknesses 2. Masks created from latex in different thicknesses and made from different materials 3. Masks printed on paper in different thicknesses and styles 4. Masks printed with 3D-printer in different thicknesses and styles 5. Photographs on displays, e.g. phones, tablets, laptops, etc 6. Videos on displays 7. Faces printed on paper with different thicknesses and structures of paper and different structures of printing (colouring, etc.) 8. Faces printed on fabrics with different thicknesses and structures of the fabrics and different methods of printing (flock print, silk screening, etc.)
CTS Mode	<ul style="list-style-type: none"> • interactive • no provision of pre-defined input data • HTTP method: GET • test case variants:

/TR03122/TC-PAD-FI-APP-001/1/

Table 2.199 TC-PAD-FI-APP-001 Test Case Variants

Test Case ID: TC-PAD-FI-APP-001*Description*

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> At least two biometric subjects perform a compliant face presentation (bona fide) in the IUT's capture area. The IUT is called via the conformance test interface and a compliant face presentation is performed. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> A compliant facial image is acquired. All acceptance conditions for the facial image acquisition are satisfied and achieved. The IUT's PAD returns its detection results in the form of a normlized PAD score in the range [0,...,1] where 1 indicates bona fide and 0 presentation attack to the calling application. The PAD score returned by the IUT indicates a bona fide face presentation. A message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>).
2	<p><i>Description:</i></p> <ul style="list-style-type: none"> At least two biometric subjects present each mask made from different materials including paper, silicon, printed 3D and latex a number of pre-defined times, either by wearing the mask or by using a special construction in the IUT's capture area. The IUT is called via the conformance test interface and a compliant face presentation is performed. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> The IUT's PAD returns its detection results in the form of a normlized PAD score in the range [0,...,1] where 1 indicates bona fide and 0 presentation attack to the calling application. The PAD score returned by the IUT indicates a presentation attack.
3	<p><i>Description:</i></p> <ul style="list-style-type: none"> At least two biometric subjects present photographs displayed on electronic devices (e.g. phones etc.) where different methods of displaying might be used, either by holding the display into the camera or by using a special construction in the IUT's capture area. The IUT is called via the conformance test interface and a compliant face presentation is performed. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> The IUT's PAD returns its detection results in the form of a normlized PAD score in the range [0,...,1] where 1 indicates bona fide and 0 presentation attack to the calling application. The PAD score returned by the IUT indicates a presentation attack.
4	<p><i>Description:</i></p> <ul style="list-style-type: none"> At least two biometric subjects present videos displayed on electronic devices, especially showing motion of a biometric subject, either by holding the display into the camera or by using a special construction in the IUT's capture area. The IUT is called via the conformance test interface and a compliant face presentation is performed.

Table 2.200 TC-PAD-FI-APP-001 Description

Test Case ID: TC-PAD-FI-APP-001

Step	Descriptions/ Expected Results
4	<p><i>Expected Results:</i></p> <ul style="list-style-type: none"> The IUT's PAD returns its detection results in the form of a normlized PAD score in the range [0,...,1] where 1 indicates bona fide and 0 presentation attack to the calling application. The PAD score returned by the IUT indicates a presentation attack.
5	<p><i>Description:</i></p> <ul style="list-style-type: none"> At least two biometric subjects present photographs printed on paper (parts of the face or complete face with holes in the paper) with different thicknesses, either by holding the picture into the camera, by wrapping it around the face or by using a special construction in the IUT's capture area. The IUT is called via the conformance test interface and a compliant face presentation is performed. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> The IUT's PAD returns its detection results in the form of a normlized PAD score in the range [0,...,1] where 1 indicates bona fide and 0 presentation attack to the calling application. The PAD score returned by the IUT indicates a presentation attack.
6	<p><i>Description:</i></p> <ul style="list-style-type: none"> At least two biometric subjects present photographs printed on fabrics, e.g. t-shirt, with different thicknesses and structures of the fabrics, either by holding the picture into the camera or by using a special construction in the IUT's capture area. The IUT is called via the conformance test interface and a compliant face presentation is performed. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> The IUT's PAD returns its detection results in the form of a normlized PAD score in the range [0,...,1] where 1 indicates bona fide and 0 presentation attack to the calling application. The PAD score returned by the IUT indicates a presentation attack.

Table 2.201 TC-PAD-FI-APP-001 Description*Evaluation*

- Four artifacts of each of the eight artifact class SHALL be created, so that a total of 32 artifacts are obtained.
- Each artifact SHALL be tested ten times.
- An artifact is considered as detected, if the device recognize six out of ten attempts. Further in-depth tests are not required.
- A device failed the total test, if a single artifact class was never recognized and/or nine artifacts in total were not detected (more than 25% failure rate).

Table 2.198 Test Case ID: TC-PAD-FI-APP-001**2.7.2. Test Cases FM 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

<i>Scope</i>	Examination of the certification of the PAD subsystem.
<i>Preconditions</i>	Product documentation of the fingerprint scanner model is at hand (e.g. data sheet, manual, manufacturer declaration).

Test Case ID: TC-PAD-FP-APP-001*Description*

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <p>Consult product documentation and verify that the subsystem certification meets the requirements.</p> <p>i</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • 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 2.203 TC-PAD-FP-APP-001 Description**Table 2.202** Test Case ID: TC-PAD-FP-APP-001**Test Case ID: TC-PAD-FP-APP-002***Scope*

Examination of correctness and availability of PAD functionality in the context of the acquisition of fingerprint images.

Preconditions

- The IUT is in operation, required modules are loaded.
- The scanner used in the specific application scenario is connected.
- The IUT implements an interface for conformance testing where a single finger can be captured.
- The PAD functionality of the IUT is activated for performing the test case.
- The IUT is able to return the results for every captured finger via the test interface.
- The IUT is able to return the results for the conducted PAD.
- Fake fingerprints (e.g. made of silicone) are available as necessary test resource.

CTS Mode

- interactive
- no provision of pre-defined input data
- HTTP method: GET
- test case variants:

/TR03122/TC-PAD-FP-APP-002/1/

Table 2.205 TC-PAD-FP-APP-002 Test Case Variants

Test Case ID: TC-PAD-FP-APP-002*Description*

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <p>The IUT is called via the conformance test interface and a compliant fingerprint presentation (bona fide) is performed.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A fingerprint or slap image is captured by the IUT. • All acceptance conditions for the finger image acquisition are satisfied and achieved. • The IUT's PAD returns its detection results corresponding to the respective finger capture attempt for each finger individually and an overall result in the form of a normlized PAD score in the range [0,...,1] where 1 indicates bona fide and 0 presentation attack to the calling application. • The PAD score returned by the IUT indicates a bona fide finger presentation. • A message conforming to TR-03121 XML containing the encoded fingerprint image is returned via the test interface (<code>bio:FingerAcquisition</code>).
2	<p><i>Description:</i></p> <p>The IUT is called via the conformance test interface and a fingerprint presentation attack is performed.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • A fingerprint or slap image is captured by the IUT. • The IUT's PAD returns its detection results corresponding to the respective finger capture attempt for each finger individually and an overall result in the form of a normlized PAD score in the range [0,...,1] where 1 indicates bona fide and 0 presentation attack to the calling application. • The PAD score returned by the IUT indicates a presentation attack.

Table 2.206 TC-PAD-FP-APP-002 Description**Table 2.204** 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

Test Case ID: TC-CMP-FP-CC-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Examination of the documentation provided by the vendor of the comparison algorithm</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • 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 2.208 TC-CMP-FP-CC-001 Description**Table 2.207** 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

Test Case ID: TC-CMP-FP-CC-002

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check IUT correct behaviour of a mated crossmatching</p> <ul style="list-style-type: none"> • 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 <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • As a result, a message conforming to TR-03121 XML is returned via the test interface (element <code>bio:FingerAcquisition</code>, 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 <code>bio:ControlVerification</code>) • Each single comparison score is above the threshold and each verification result is positive
2	<p><i>Description:</i></p> <p>Check IUT correct behaviour of a non-mated crossmatching</p> <ul style="list-style-type: none"> • Initiate test case by calling the IUT via the test interface • Capture 10 fingerprints, each fingerprint rolled and plain (non-mated, e.g. by applying fingerprints of a second person or permuting fingers) • Resulting in a total of 10 captured pairs (rolled, plain) of distinct fingerprints <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • As a result, a message conforming to TR-03121 XML is returned via the test interface (element <code>bio:FingerAcquisition</code>, 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 <code>bio:ControlVerification</code>) • Non-mated crossmatchings (distinct fingers) yield a comparison score below the threshold and a negative verification result

Table 2.210 TC-CMP-FP-CC-002 Description**Table 2.209** Test Case ID: TC-CMP-FP-CC-002**2.8.2. Test Cases FM CMP-FP-VER****Test Case ID: TC-CMP-FP-VER-001**

Scope	Examination of the configured security level for biometric comparison.
Preconditions	The vendor of the biometric comparison algorithm provides a documentation which gives information about the working point of the comparison algorithm.
CTS Mode	Not supported

Test Case ID: TC-CMP-FP-VER-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Examination of the documentation provided by the vendor of the comparison algorithm.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • 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 2.212 TC-CMP-FP-VER-001 Description**Table 2.211** Test Case ID: TC-CMP-FP-VER-001**2.8.3. Test Cases FM CMP-FI-VER****Test Case ID: TC-CMP-FI-VER-001**

<i>Scope</i>	Examination of the configured security level for biometric comparison.
<i>Preconditions</i>	The vendor of the biometric comparison algorithm provides a documentation which gives information about the working point of the comparison algorithm.
<i>CTS Mode</i>	Not supported
<i>Description</i>	

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Examination of the documentation provided by the vendor of the comparison algorithm.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The documentation gives information (typically a 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 FMR of 0.1 % and a 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 2.214 TC-CMP-FI-VER-001 Description**Table 2.213** Test Case ID: TC-CMP-FI-VER-001**2.8.4. Test Cases FM CMP-FP-GENERIC****Test Case ID: TC-CMP-FP-GENERIC-001**

<i>Scope</i>	Examination of the configured security level for biometric comparison
<i>Precondition</i>	The vendor of the biometric comparison algorithm provides the documentation for his system which gives information about the implemented fingerprint identification algorithms.

Test Case ID: TC-CMP-FP-GENERIC-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Examination of the documentation provided by the vendor of the identification algorithm.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The documentation gives evidence that the comparison algorithms achieve one of the following operating points: <ul style="list-style-type: none"> • A maximum false-positive-identification-rate (FPIR) of 0.1 % and a false-negative-identification-rate (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 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 <ul style="list-style-type: none"> • 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 2.216 TC-CMP-FP-GENERIC-001 Description**Table 2.215** Test Case ID: TC-CMP-FP-GENERIC-001**2.8.5. 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.

Test Case ID: TC-CMP-FI-GENERIC-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Examination of the documentation provided by the vendor of the identification algorithm.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The documentation gives evidence that the comparison algorithms achieve one of the following operating points: <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 2.218 TC-CMP-FI-GENERIC-001 Description**Table 2.217** Test Case ID: TC-CMP-FI-GENERIC-001

2.9. Test Cases Logging

2.9.1. Test Cases FM LOG-ALL-ARE

Test Case ID: TC-LOG-ALL-ARE-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

Test Case ID: TC-LOG-ALL-ARE-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Verify semantics of logging data and information contained therein</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • Information about any existing facial images of the applicant in the CIR <ul style="list-style-type: none"> • 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 2.220 TC-LOG-ALL-ARE-001 Description**Table 2.219** Test Case ID: TC-LOG-ALL-ARE-001**2.9.2. Test Cases FM LOG-ALL-BCL****Test Case ID: TC-LOG-ALL-BCL-001**

<i>Scope</i>	Examination of correct syntax and semantics for the logging of information in the context of border control.
<i>Preconditions</i>	<ul style="list-style-type: none"> • Five sets of logging data (encoded as XML) containing <code>bcl-log</code> elements are available. • Each logging data set is produced by performing five deviating processes using the IUT, which include but are not limited to: <ul style="list-style-type: none"> • bona-fide acquisition of at least one modality with fulfilled quality criteria • acquisition of at least one modality with unfulfilled quality criteria • cancelled acquisition process • rejected image acquisition result via veto by operator and repeated acquisition • failed acquisition process based on incorrect behaviour of the subject. • The performed steps for each log data set are documented. • TR-03121 XML schema definition files and documentation are at hand.
<i>CTS Mode</i>	File based

Test Case ID: TC-LOG-ALL-BCL-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Validate each log file against the TR-03121 schema definition "trbio4v7.xsd".</p> <p><i>Expected Result:</i></p> <p>Each file passes the validation process without errors.</p>
2	<p><i>Description:</i></p> <p>Verify the content of each log file and check the contained information.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The process flow and information described by the contents of the log file matches the actually performed process using the IUT. • For externally stored images the embedded <code>type.data.record</code> elements refer to the image via the attribute <code>externalReference</code> and furthermore do not contain <code>Data</code> elements. • The element <code>ApplicationProfile</code> is filled with a valid application profile of volume BCL.

Table 2.222 TC-LOG-ALL-BCL-001 Description**Table 2.221** Test Case ID: TC-LOG-ALL-BCL-001**2.9.3. Test Cases FM LOG-ALL-GID****Test Case ID: TC-LOG-ALL-GID-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
- 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

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Verify semantics of logging data and information contained therein</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • 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 2.224 TC-LOG-ALL-GID-001 Description**Table 2.223** Test Case ID: TC-LOG-ALL-GID-001**2.9.4. Test Cases FM LOG-ALL-GENERIC****Test Case ID: TC-LOG-ALL-GENERIC-001***Scope*

Examination of the correct semantics of logging data.

Note that the exact scheme version for this test case is depending on the context of the volume.

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

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Verify semantics of logging data and information contained therein against the TR-03121 schema definition "<i>trbio4v7.xsd</i>" (for volumes BCL and IMA) and "<i>tr-bio4v6.xsd</i>" (for volumes GID and ARE).</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • Generic process information <ul style="list-style-type: none"> • a globally unique Transaction ID according to RFC 4122 Version 1 (time-based) • name of the implemented application profile (e.g. BCL_ManualBorderControl) (for scheme version 4v7) • 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 station¹ • the software used in this transaction, at least with the following identifiers <ul style="list-style-type: none"> • vendor name • software name • version number² • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • the rank of the candidate • score and threshold information • an error code in case of abnormal termination of the identification process

Table 2.226 TC-LOG-ALL-GENERIC-001 Description

¹ The exact semantic of this value is profile-dependent. See the profile's function module for a refined definition

² Using a version numbering scheme which allows for proper lexicographic ordering is highly recommended.

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

Step	Description / Expected Result
1	<ul style="list-style-type: none"> Information about any enrolment processes performed during this transaction <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> the verification result for each comparison: the result of the comparison, the duration of the comparison process, detailed scoring and threshold information and an error code in case of abnormal termination of the comparison process an error code in case of abnormal termination of the verification process Information about the records collected in this transaction <ul style="list-style-type: none"> type of record (encoding format) size of record purpose of the record (enrolment, identification, verification)
2	<p><i>Description:</i></p> <p>Check availability of detailed error code list</p> <p><i>Expected Result:</i></p> <p>A detailed list of error codes used with complete semantic descriptions is available for</p> <ul style="list-style-type: none"> 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

Table 2.227 TC-LOG-ALL-GENERIC-001 Description

Table 2.225 Test Case ID: TC-LOG-ALL-GENERIC-001

2.9.5. Test Cases FM LOG-FI-GENERIC

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

Scope Examination of correct syntax and semantics for the logging of information regarding facial image acquisition.

Note that the exact scheme version for this test case is depending on the context of the volume.

- Preconditions**
- Five sets of logging data (encoded as XML) containing at least one `FaceAcquisition` element are available.
 - Each logging data set is produced by performing five deviating processes using the IUT, which include but are not limited to:
 - bona-fide facial image acquisition with fulfilled quality criteria
 - facial image acquisition with unfulfilled quality criteria
 - cancelled acquisition process
 - rejected image acquisition result via veto by operator and repeated acquisition
 - failed acquisition process based on incorrect behaviour of the subject.
 - The performed steps for each log data set are documented.
 - TR-03121 XML schema definition files and documentation are at hand.

CTS Mode

File based

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Validate each log file against the TR-03121 schema definition "<i>trbio4v7.xsd</i>" (for volumes BCL and IMA) and "<i>trbio4v6.xsd</i>" (for volumes GID and ARE).</p> <p><i>Expected Result:</i></p> <p>Each file passes the validation process without errors.</p>
2	<p><i>Description:</i></p> <p>Verify the content of each log file and check the contained information.</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • name of the implemented application profile (e.g. BCL_ManualBorderControl) (for scheme version 4v7) • the overall result for the acquisition process (for scheme version 4v7) • the purpose of the acquisition (enrolment, identification, verification) • start time of the facial acquisition process • end time of the facial acquisition process • the time out if configured (for scheme version 4v7) • 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

Table 2.229 TC-LOG-FI-GENERIC-001 Description

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

Step	Description / Expected Result
2	<p><i>Expected Result:</i></p> <ul style="list-style-type: none"> for each face capture: <ul style="list-style-type: none"> if a veto was put by the operator: the type of veto (OK/NOK) the operation mode (if information is available) the vertical position of the camera (if information is available, for scheme version 4v7) the illumination level (if information is available, for scheme version 4v7) the focus distance (if information is available, for scheme version 4v7) for the selected capture, detailed quality information about the result, detailing: <ul style="list-style-type: none"> information about the quality assessment software duration of quality assessment detailed quality values accompanied by: <ul style="list-style-type: none"> identifiers upper and lower value bounds, if available upper and lower threshold bounds, if available any error code in case of abnormal termination of the quality assessment information about PAD data during the capture: <ul style="list-style-type: none"> information about the PAD subsystem the overall PAD assessment result for each probe: <ul style="list-style-type: none"> the PAD result detailed PAD quality values accompanied by identifiers, upper and lower value bounds and upper and lower threshold bounds information about the user interface: <ul style="list-style-type: none"> an indication of a displayed PAD alert if PAD was performed during the acquisition process, the PAD result was at least once detected and displayed to the operator during the acquisition process an indication that a live feedback screen was available to the biometric subject if a live feedback screen was available to the biometric subject
3	<p><i>Description:</i></p> <p>Check the availability of detailed error code list.</p> <p><i>Expected Result:</i></p> <p>A detailed list of error codes used with complete semantic descriptions is available for:</p> <ul style="list-style-type: none"> any error code in case of abnormal termination of the quality assessment any error code in case of abnormal termination of the facial acquisition process.

Table 2.230 TC-LOG-FI-GENERIC-001 Description

Table 2.228 Test Case ID: TC-LOG-FI-GENERIC-001

2.9.6. Test Cases FM LOG-FP-GENERIC

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

Scope Examination of correct syntax and semantics for the logging of information regarding fingerprint acquisition.

Note that the exact scheme version for this test case is depending on the context of the volume.

Precondition

- Five sets of logging data (encoded as XML) containing at least one `FingerAcquisition` element are available.
- The performed steps for each log data set are documented.
- TR-03121 XML schema definition files and documentation are at hand.

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

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Verify semantics of logging data and information contained therein against the TR-03121 schema definition "<i>trbio4v7.xsd</i>" (for volumes BCL and IMA) and "<i>tr-bio4v6.xsd</i>" (for volumes GID and ARE).</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • name of the implemented application profile (e.g. BCL_ManualBorderControl) (for scheme version 4v7) • the purpose of the acquisition (enrolment, identification, verification) • the overall result for the acquisition process (for scheme version 4v7) • start time of the fingerprint acquisition process • end time of the fingerprint acquisition process • the time out if configured (for scheme version 4v7) • 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) • information for each capture process for a dedicated fingerprint of slap, detailing <ul style="list-style-type: none"> • 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 (when comparing a rolled image against a finger extracted from a control slap) • for each capture attempt, detailing <ul style="list-style-type: none"> • whether the capture attempt was acceptable • the duration of the capture attempt • in case of a capture attempt failure: the rejection reason and the error code • for all captures, detailed quality information about the result, containing <ul style="list-style-type: none"> • 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

Table 2.232 TC-LOG-FP-GENERIC-001 Description

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

Step	Description / Expected Result
	<ul style="list-style-type: none"> • if a sequence check has been performed as part of the fingerprint acquisition, uniqueness check information, detailing <ul style="list-style-type: none"> • 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 PAD is supported, the semantics of following logging data SHALL be tested in addition <ul style="list-style-type: none"> information about PAD data during the capture <ul style="list-style-type: none"> • information about the PAD subsystem • the overall PAD assessment result • for each probe <ul style="list-style-type: none"> • the PAD result • detailed PAD quality values accompanied by <ul style="list-style-type: none"> - identifiers - upper and lower value bounds - upper and lower threshold bounds

Table 2.233 TC-LOG-FP-GENERIC-001 Description

Check availability of detailed error code list

Expected Result	A detailed list of error codes used with complete semantic descriptions is available for <ul style="list-style-type: none"> • 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.
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Table 2.231 Test Case ID: TC-LOG-FP-GENERIC-001**2.9.7. 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 2.234 Test Case ID: TC-LOG-FP-BCL-001**2.9.8. Test Cases FM LOG-FP-GID****Test Case ID: TC-LOG-FP-GID-001**

Scope

Examination of the correct semantics of logging data.

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

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.
- 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.

Correct semantics of the evaluation work flow logging data

Test Case ID: TC-LOG-FP-GID-001	
Expected Result	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 2.235 Test Case ID: TC-LOG-FP-GID-001

2.10. Test Cases Coding

2.10.1. Test Cases FM COD-ALL-BCL

Test Case ID: TC-COD-ALL-BCL-001	
Scope	Examine requirements and interfaces for the overall coding of biometric (facial image and fingerprints) and biographic data used within the context of border control.
Preconditions	<ul style="list-style-type: none"> • The IUT is in operation, required modules are loaded. • All required acquisition devices, i.e. a fingerprint scanner respectively a digital camera are at hand and connected to the IUT. • The IUT implements an interface for conformance testing where biometric data can be acquired. • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static and fictitious dummy values by the IUT. The goal is to focus on the encoding of biometric data so that the process can be finalized and the resulting data is returned by IUT in TR-03121 XML format, i.e. a <code>FaceAcquisition</code> element is returned for facial data respectively a <code>FingerAcquisition</code> for fingerprint data. • As necessary test resources: a biometric test subject whose biometric features are acquired using the IUT.
CTS Mode	<ul style="list-style-type: none"> • Interactive • No provision of pre-defined input data • HTTP method: GET • Test case variants: <div data-bbox="445 1809 829 1836" data-label="Text"> / TR03122/TC-COD-ALL-BCL-001/1 </div>

Table 2.237 TC-COD-ALL-BCL-001 Test Case Variants

Test Case ID: TC-COD-ALL-BCL-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Perform the acquisition process of all desired biometric elements using the IUT with subsequent examination of returned result data.</p> <p><i>Expected Result:</i></p> <p>The resulting data is encoded in an appropriate XML TR-03121 format:</p> <ul style="list-style-type: none"> • The XML data can be successfully validated against the TR-03121 XML schema definition file "bcl4v7.xsd" and referenced schema files. • The XML data contains biometric data containers as record element only for the acquired biometric modalities. • Biometric data containers are embedded within a <code>FaceAcquisition</code> respectively <code>FingerAcquisition</code> element. • The contained biometric data can be successfully decoded.

Table 2.238 TC-COD-ALL-BCL-001 Description**Table 2.236** Test Case ID: TC-COD-ALL-BCL-001**2.10.2. Test Cases FM COD-ALL-IMA****Test Case ID: TC-COD-ALL-IMA-001**

<i>Scope</i>	Examine requirements and interfaces for the overall coding of biometric (facial image and fingerprints) and biographic data used within the context of Immigration Authorities.
<i>Preconditions</i>	<ul style="list-style-type: none"> • The IUT is in operation, required modules are loaded. • All required acquisition devices, i.e. a fingerprint scanner respectively a digital camera are at hand and connected to the IUT. • The IUT implements an interface for conformance testing where biometric data can be acquired. • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static and fictitious dummy values by the IUT. The goal is to focus on the encoding of biometric data so that the process can be finalized and the resulting data is returned by IUT in TR-03121 XML format, i.e. a <code>FaceAcquisition</code> element is returned for facial data respectively a <code>FingerAcquisition</code> for fingerprint data. • As necessary test resources: a biometric test subject whose biometric features are acquired using the IUT.
<i>CTS Mode</i>	<ul style="list-style-type: none"> • Interactive • No provision of pre-defined input data • HTTP method: GET • Test case variants:
	/TR03122/TC-COD-ALL-IMA-001/1

Table 2.240 TC-COD-ALL-IMA-001 Test Case Variants

Test Case ID: TC-COD-ALL-IMA-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Perform the acquisition process of all desired biometric elements using the IUT with subsequent examination of returned result data.</p> <p><i>Expected Result:</i></p> <p>The resulting data is encoded in an appropriate XML TR-03121 format:</p> <ul style="list-style-type: none"> • The XML data can be successfully validated against the TR-03121 XML schema definition file "ima4v7.xsd" and referenced schema files. • The XML data contains biometric data containers as record element only for the acquired biometric modalities. • Biometric data containers are embedded within a <code>bio:FaceAcquisition</code> respectively <code>bio:FingerAcquisition</code> element. • The contained biometric data can be successfully decoded.

Table 2.241 TC-COD-ALL-IMA-001 Description**Table 2.239** Test Case ID: TC-COD-ALL-IMA-001**2.10.3. Test Cases FM COD-FI-GENERIC****Test Case ID: TC-COD-FI-GENERIC-001**

Scope	Examine requirements and interfaces for the overall coding used during the acquisition process of facial images.
Preconditions	<ul style="list-style-type: none">• The IUT is in operation, required modules are loaded.• The integrated camera system used in the specific application scenario is connected.• The IUT implements an interface for conformance testing where a single image can be captured.• The IUT is able to return the results as TR XML for every captured image via the test interface.• As necessary test resources: a biometric test subject whose biometric features are acquired using the IUT.
CTS Mode	<ul style="list-style-type: none">• interactive• no provision of pre-defined input data• HTTP method: GET• test case variants:<div><div>/TR03122/TC-COD-FI-GENERIC-001/1</div></div>

Table 2.243 TC-COD-FI-GENERIC-001 Test Case Variants

Test Case ID: TC-COD-FI-GENERIC-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>In this test case a successful facial image acquisition is conducted.</p> <p>Perform the facial image acquisition process using the IUT with subsequent examination of returned result data.</p> <p>Initiate test case by calling the IUT via the test interface.</p> <p><i>Expected Result:</i></p> <p>The resulting data is encoded in an appropriate XML TR-03121 format:</p> <ul style="list-style-type: none"> • The XML data can be successfully validated against the TR-03121 XML schema definition files. • The XML data contains biometric data containers as record element only for the acquired biometric modality. • Biometric data containers are embedded as record elements within the acquisition element <code>FaceAcquisition</code>. • The contained biometric data can be successfully decoded.

Table 2.244 TC-COD-FI-GENERIC-001 Description**Table 2.242** Test Case ID: TC-COD-FI-GENERIC-001**2.10.4. Test Cases FM COD-ALL-ARE****Test Case ID: TC-COD-ALL-ARE-001**

<i>Scope</i>	Examine proper overall encoding of input data (considering biographic, biometric and transaction specific data) for identification purposes.
<i>Preconditions</i>	<ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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
<i>CTS Mode</i>	<ul style="list-style-type: none"> • Interactive • No provision of pre-defined input data • HTTP method: GET • Test case variants:

/TR03122/TC-COD-ALL-ARE-001/1

Table 2.246 TC-COD-ALL-ARE-001 Test Case Variants

Test Case ID: TC-COD-ALL-ARE-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Perform the whole acquisition process using the IUT in the identification scenario with subsequent examination of returned result data</p> <p>Initiate test case by calling the IUT via the test interface</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • 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 <code>bio:XMLRecord[@type="GSAT-xml"]</code>) • The XML data can be successfully validated against the TR-03121 XML schema definition file "<i>aad4v6.xsd</i>" and referenced schema files • Namespaces are declared according to GSAT 3.0 standard • The XML root element <code>itl:NISTBiometricInformationExchangePackage</code> exists and contains the following sub-elements <ul style="list-style-type: none"> • <code>itl:PackageInformationRecord</code> • <code>itl:PackageDescriptiveTextRecord</code> • <code>itl:PackageFingerprintImageRecord</code> (multiple occurrences)
2	<p><i>Description:</i></p> <p>Examination of Package Information Record contents (<code>itl:PackageInformationRecord</code>) in regard to syntax</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The following sub-elements are contained within <code>itl:PackageInformationRecord</code> <ul style="list-style-type: none"> • <code>ansi-nist:RecordCategoryCode</code> • <code>int-i:Transaction</code> • The following mandatory sub-elements are contained within <code>int-i:Transaction</code> (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> • DAT • DAI • ORI • GMT • TCN • DOM • NSR • NTR • VER • PRY • CNT • TOT

Table 2.247 TC-COD-ALL-ARE-001 Description

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

Step	Description / Expected Result
3	<p><i>Description:</i></p> <p>Examination of Package Descriptive Text Record contents (<code>itl:PackageDescriptiveTextRecord</code>) in regard to syntax</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> The following mandatory sub-elements are contained within <code>itl:PackageDescriptiveTextRecord</code> (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> <code>ansi-nist:RecordCategoryCode</code> IDC <code>itl:UserDefinedDescriptiveText/ GSAT:DomainDefinedDescriptiveFields</code> The following mandatory sub-elements are contained within element <code>itl:UserDefinedDescriptiveText/ GSAT:DomainDefinedDescriptiveFields</code> (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> DPR OBU SEX PCN PTM

Table 2.248 TC-COD-ALL-ARE-001 Description

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

Step	Description / Expected Result
4	<p><i>Description:</i></p> <p>Examination of the contents of each occurring Package Fingerprint Image Record (<code>itl:PackageFingerprintImageRecord</code>) in regard to syntax</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> The following mandatory sub-elements are contained within each occurrence of element <code>itl:PackageFingerprintImageRecord</code> (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> <code>ansi-nist:RecordCategoryCode</code> IDC <code>itl:FingerprintImage</code> The following mandatory sub-elements are contained in element <code>itl:FingerprintImage</code> (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> DAT BPX FCD SRC CGA HLL HPS SLC VLL VPS IMP FGP

Table 2.249 TC-COD-ALL-ARE-001 Description

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

Step	Description / Expected Result
5	<p><i>Description:</i></p> <p>Examination of the contents of Package Information Record (<code>itl:PackageInformationRecord</code>) in regard to semantics</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • <code>Elementansi-nist:RecordCategoryCode</code> contains value '1' • The following mandatory sub-elements within element <code>int-i:Transaction</code> 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) <ul style="list-style-type: none"> • DAT • DAI • ORI • GMT • TCN • DOM • NSR • NTR • VER • PRY • CNT • TOT
6	<p><i>Description:</i></p> <p>Examination of the contents of Package Descriptive Text Record (<code>itl:PackageDescriptiveTextRecord</code>) in regard to semantics</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • <code>Elementansi-nist:RecordCategoryCode</code> contains value '2' • Element with mnemonic code IDC is filled. • The following mandatory sub-elements within element <code>itl:UserDefinedDescriptiveText/ GSAT:DomainDefinedDescriptiveFields</code> 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) <ul style="list-style-type: none"> • DPR • OBU • SEX • PCN • PTM

Table 2.250 TC-COD-ALL-ARE-001 Description

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

Step	Description / Expected Result
7	<p><i>Description:</i></p> <p>Examination of the contents of each occurring Package Fingerprint Image Record (<code>itl:PackageFingerprintImageRecord</code>) in regard to semantics</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • Element <code>ansi-nist:RecordCategoryCode</code> contains value '14' • Element with mnemonic code IDC is filled. • The following mandatory sub-elements within element <code>itl:FingerprintImage</code> 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) <ul style="list-style-type: none"> • DAT • BPX • FCD • SRC • CGA • HLL • HPS • SLC • VLL • VPS • IMP • FGP

Table 2.251 TC-COD-ALL-ARE-001 Description

Table 2.245 Test Case ID: TC-COD-ALL-ARE-001

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

<i>Scope</i>	Examine proper overall encoding of input data (considering biographic, biometric and transaction specific data) for enrolment purposes.
<i>Preconditions</i>	<ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 ID: TC-COD-ALL-ARE-002*CTS Mode*

- interactive
- no provision of pre-defined input data
- HTTP method: GET
- test case variants:

/TR03122/TC-COD-ALL-ARE-002/1

Table 2.253 TC-COD-ALL-ARE-002 Test Case Variants

Test Case ID: TC-COD-ALL-ARE-002*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>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</p> <p>Initiate test case by calling the IUT via the test interface</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> Namespaces are declared according to GSAT 3.0 standard The XML root element <code>itl:NISTBiometricInformationExchangePackage</code> exists and contains the following sub-elements <ul style="list-style-type: none"> <code>itl:PackageInformationRecord</code> <code>itl:PackageDescriptiveTextRecord</code> <code>itl:PackageFingerprintImageRecord</code> (multiple occurrences for both rolled and plain captured fingerprints) <code>itl:PackageFacialAndSMTImageRecord</code>
2	<p><i>Description:</i></p> <p>Examination of Package Information Record contents (<code>itl:PackageInformationRecord</code>) in regard to syntax</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> The following sub-elements are contained within <code>itl:PackageInformationRecord</code> <ul style="list-style-type: none"> <code>ansi-nist:RecordCategoryCode</code> <code>int-i:Transaction</code> The following mandatory sub-elements are contained within <code>int-i:Transaction</code> (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> DAT DAI ORI GMT TCN DOM NSR NTR VER PRY CNT TOT

Table 2.254 TC-COD-ALL-ARE-002 Description

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

Step	Description / Expected Result
3	<p><i>Description:</i></p> <p>Examination of Package Descriptive Text Record contents (<code>itl:PackageDescriptiveTextRecord</code>) in regard to syntax</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The following mandatory sub-elements are contained within <code>itl:PackageDescriptiveTextRecord</code> (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> • <code>ansi-nist:RecordCategoryCode</code> • IDC • <code>itl:UserDefinedDescriptiveText/ GSAT:DomainDefinedDescriptiveFields</code> • The following mandatory sub-elements are contained within element <code>itl:UserDefinedDescriptiveText/ GSAT:DomainDefinedDescriptiveFields</code> (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> • DPR • OBU • SEX • PCN • PTM • RFP • DOB • DBR • POB • NAT • NAM • OTY • MN1 • PAA • DAA • NOO

Table 2.255 TC-COD-ALL-ARE-002 Description

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

Step	Description / Expected Result
4	<p><i>Description:</i></p> <p>Examination of the contents of each occurring Package Fingerprint Image Record (itl:PackageFingerprintImageRecord) in regard to syntax</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • 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) <ul style="list-style-type: none"> • 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) <ul style="list-style-type: none"> • DAT • BPX • FCD • SRC • CGA • HLL • HPS • SLC • VLL • VPS • IMP • FGP

Table 2.256 TC-COD-ALL-ARE-002 Description

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

Step	Description / Expected Result
5	<p><i>Description:</i></p> <p>Examination of the contents of the Package Facial and SMT Image Record (<code>itl:PackageFacialAndSMTImageRecord</code>) in regard to syntax</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The following mandatory sub-elements are contained within each occurrence of element <code>itl:PackageFacialAndSMTImageRecord</code> (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> • <code>ansi-nist:RecordCategoryCode</code> • IDC • <code>itl:FaceImage</code> • The following mandatory sub-elements are contained in element <code>itl:FaceImage</code> (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> • DAT • PHD • SRC • CSP • CGA • HLL • HPS • SLC • IMT • VLL • VPS • SAP

Table 2.257 TC-COD-ALL-ARE-002 Description

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

Step	Description / Expected Result
6	<p><i>Description:</i></p> <p>Examination of the contents of Package Information Record (<code>itl:PackageInformationRecord</code>) in regard to semantics</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none">• <code>Elementansi-nist:RecordCategoryCode</code> contains value '1'• The following mandatory sub-elements within element <code>int-i:Transaction</code> 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)<ul style="list-style-type: none">• DAT• DAI• ORI• GMT• TCN• DOM• NSR• NTR• VER• PRY• CNT• TOT

Table 2.258 TC-COD-ALL-ARE-002 Description

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

Step	Description / Expected Result
7	<p><i>Description:</i></p> <p>Examination of the contents of Package Descriptive Text Record(itl:PackageDescriptiveTextRecord) in regard to semantics</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • Elementansi-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) <ul style="list-style-type: none"> • DPR • OBU • SEX • PCN • PTM • RFP • DOB • DBR • POB • NAT • NAM • OTY • MN1 • PAA • DAA • NOO

Table 2.259 TC-COD-ALL-ARE-002 Description

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

Step	Description / Expected Result
8	<p><i>Description:</i></p> <p>Examination of the contents of each occurring Package Fingerprint Image Record (<code>itl:PackageFingerprintImageRecord</code>) in regard to semantics</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • Element <code>ansi-nist:RecordCategoryCode</code> contains value '14' • Element with mnemonic code IDC is filled. • The following mandatory sub-elements within element <code>itl:FingerprintImage</code> 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) <ul style="list-style-type: none"> • DAT • BPX • FCD • SRC • CGA • HLL • HPS • SLC • VLL • VPS • IMP • FGP

Table 2.260 TC-COD-ALL-ARE-002 Description

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

Step	Description / Expected Result
9	<p><i>Description:</i></p> <p>Examination of the contents of the Package Facial and SMT Image Record (<code>itl:PackageFacialAndSMTImageRecord</code>) in regard to semantics</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • <code>ansi-nist:RecordCategoryCode</code> contains value '10' • Element with mnemonic code IDC is filled. • The following mandatory sub-elements within element <code>itl:FaceImage</code> 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) <ul style="list-style-type: none"> • DAT • PHD • SRC • CSP • CGA • HLL • HPS • SLC • IMT • VLL • VPS • SAP

Table 2.261 TC-COD-ALL-ARE-002 Description

Table 2.252 Test Case ID: TC-COD-ALL-ARE-002

2.10.5. Test Cases FM COD-ALL-GID

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

<i>Scope</i>	Examine requirements and interfaces for the overall coding of biometric (facial image and fingerprints) and biographic data used within the context of German Identity Document.
<i>Preconditions</i>	<ul style="list-style-type: none"> • The IUT is in operation, required modules are loaded. • All required acquisition devices, i.e. a fingerprint scanner respectively a digital camera are at hand and connected to the IUT. • The IUT implements an interface for conformance testing where biometric data can be acquired. • Provision of any other than biometric data (e.g. biographic, agency or process related) may be done in form of static and fictitious dummy values by the IUT. The goal is to focus on the encoding of biometric data so that the process can be finalized and the resulting data is returned by IUT in TR-03121 XML format, i.e. a <code>FaceAcquisition</code> element is returned for facial data respectively a <code>FingerAcquisition</code> for fingerprint data. • As necessary test resources: a biometric test subject whose biometric features are acquired using the IUT.

Test Case ID: TC-COD-ALL-GID-001**CTS Mode**

- Interactive
- No provision of pre-defined input data
- HTTP method: GET
- Test case variants:

/TR03122/TC-COD-ALL-GID-001/1

Table 2.263 TC-COD-ALL-GID-001 Test Case Variants**Description**

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Perform the acquisition process of all desired biometric elements using the IUT with subsequent examination of returned result data.</p> <p><i>Expected Result:</i></p> <p>The resulting data is encoded in an appropriate XML TR-03121 format:</p> <ul style="list-style-type: none"> • The XML data can be successfully validated against the TR-03121 XML schema definition file "gid4v6.xsd" and referenced schema files. • The XML data contains biometric data containers as record element only for the acquired biometric modalities. • Biometric data containers are embedded within a <code>bio:FaceAcquisition</code> respectively <code>bio:FingerAcquisition</code> element. • The contained biometric data can be successfully decoded.

Table 2.264 TC-COD-ALL-GID-001 Description**Table 2.262** Test Case ID: TC-COD-ALL-GID-001**2.10.6. 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

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 | <ul style="list-style-type: none"> • 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 <code>bio:XMLRecord[@type="GSAT-xml"]</code>) • The root element within element <code>bio:XMLRecord</code> is <code>itl:NISTBiometricInformationExchangePackage</code> • The contained sub-element <code>itl:PackageFacialAndSMTImageRecord</code> exists and further contains the following sub-elements (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> • <code>ansi-nist:RecordCategoryCode</code> • IDC • <code>itl:FaceImage</code> • The following mandatory sub-elements are contained in element <code>itl:FaceImage</code> (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> • DAT • PHD • SRC • CSP • CGA • HLL • HPS • SLC • IMT • VLL • VPS • SAP |
|-----------------|--|

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

- | | |
|-----------------|--|
| Expected Result | <ul style="list-style-type: none"> • <code>ansi-nist:RecordCategoryCode</code> contains value '10' • The following mandatory sub-elements within element <code>itl:FaceImage</code> 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) <ul style="list-style-type: none"> • PHD • IDC • SRC • IMT contains value 'FACE' • SAP |
|-----------------|--|

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

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

Expected Result	<ul style="list-style-type: none"> • 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) <ul style="list-style-type: none"> • CSP • CGA • HLL • HPS • SLC • VLL • VPS
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Table 2.265 Test Case ID: TC-COD-FI-GSAT3-001**2.10.7. Test Cases FM COD-FP-GSAT3****Test Case ID: TC-COD-FP-GSAT3-001**

Scope

Examine proper encoding of plain captured fingerprints for identification

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

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

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

Expected Result	<ul style="list-style-type: none"> 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 <code>bio:XMLRecord[@type="GSAT-xml"]</code>) The element within the sub-element <code>bio:Data</code> of element <code>bio:XMLRecord</code> is <code>itl:NISTBiometricInformationExchangePackage</code> A total of 14 occurrences (segmented fingerprints and slaps, in case of scenario 4-4-2 with segmented thumbs) of sub-element <code>itl:PackageFingerprintImageRecord</code> exist and further, each contains the following sub-elements (if available, referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> <code>ansi-nist:RecordCategoryCode</code> IDC <code>itl:FingerprintImage</code> The following mandatory sub-elements are contained in each occurring element <code>itl:FingerprintImage</code> (referenced by mnemonic code as listed in corresponding FM of TR-03121-3) <ul style="list-style-type: none"> DAT BPX FCD SRC CGA HLL HPS SLC VLL VPS IMP FGP
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Examination of information within each occurrence of element `itl:PackageFingerprintImageRecord` in regard to semantics

Expected Result	<ul style="list-style-type: none"> <code>ansi-nist:RecordCategoryCode</code> contains value '14' Element with mnemonic code IDC contains a value The following mandatory sub-elements within element <code>itl:FingerprintImage</code> 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) <ul style="list-style-type: none"> FCD SRC IMP
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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)

Test Case ID: TC-COD-FP-GSAT3-001	
Expected Result	<ul style="list-style-type: none"> • 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) <ul style="list-style-type: none"> • BPX • CGA • HLL • HPS • SLC • VLL • VPS • FGP

Table 2.266 Test Case ID: TC-COD-FP-GSAT3-001

Test Case ID: TC-COD-FP-GSAT3-002
<p>Scope</p> <p>Examine proper encoding of plain captured fingerprints for identification, with at least one missing finger during capture</p> <p>Precondition</p> <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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") <ul style="list-style-type: none"> • Test case path: /TR03122/TC-COD-FP-GSAT3-002/1 • HTTP method: GET <p>Description</p> <p>Perform the acquisition process using the IUT with subsequent examination of returned result data</p> <p>Initiate test case by calling the IUT via the test interface</p>

Test Case ID: TC-COD-FP-GSAT3-002**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"]`)
- The element within the sub-element `bio:Data` of element `bio:XMLRecord` is `itl:NISTBiometricInformationExchangePackage`
- A total of 14 occurrences (segmented fingerprints and slaps, in case of scenario 4-4-2 with segmented thumbs) of sub-element `itl:PackageFingerprintImageRecord` exist and further, each 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: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

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

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`)

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

Expected Result	<ul style="list-style-type: none"> • 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 • 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) <ul style="list-style-type: none"> • BPX • CGA • HLL • HPS • SLC • VLL • VPS • FGP
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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	<ul style="list-style-type: none"> • <code>ansi-nist:RecordCategoryCode</code> contains value '14' • Element with mnemonic code IDC contains a value • The following mandatory sub-elements within element <code>itl:FingerprintImage</code> 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) <ul style="list-style-type: none"> • 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)
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Table 2.267 Test Case ID: TC-COD-FP-GSAT3-002

Test Case ID: TC-COD-FP-GSAT3-003

Scope
Examine proper encoding of rolled captured fingerprints for enrolment
Precondition

Test Case ID: TC-COD-FP-GSAT3-003

- 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
 - HTTP method: GET

Description

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:XMLRecord[@type="GSAT-xml"]`)
- The element within the sub-element `bio:Data` of element `bio:XMLRecord` is `itl:NISTBiometricInformationExchangePackage`
- A total of 14 occurrences of sub-element `itl:PackageFingerprintImageRecord` exist and further, each 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: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

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

Test Case ID: TC-COD-FP-GSAT3-003

- 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

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 2.268 Test Case ID: TC-COD-FP-GSAT3-003

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

Scope

Examine proper encoding of rolled captured fingerprints for enrolment, 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

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

Description

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:XMLRecord[@type="GSAT-xml"]`)
 - The element within the sub-element `bio:Data` of element `bio:XMLRecord` is `itl:NISTBiometricInformationExchangePackage`
 - A total of 14 occurrences of sub-element `itl:PackageFingerprintImageRecord` exist and further, each 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: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

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

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`)

Test Case ID: TC-COD-FP-GSAT3-004	
Expected Result	<ul style="list-style-type: none"> • 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 • 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) <ul style="list-style-type: none"> • BPX • CGA • HLL • HPS • SLC • VLL • VPS • FGP
<p>Examination of fingerprint related information within element <code>itl:FingerprintImage</code> in regard to semantics, only does apply to fingers NOT captured</p> <p>(for each occurrence of element <code>itl:PackageFingerprintImageRecord</code>)</p>	
Expected Result	<ul style="list-style-type: none"> • <code>ansi-nist:RecordCategoryCode</code> contains value '14' • Element with mnemonic code IDC contains a value • The following mandatory sub-elements within element <code>itl:FingerprintImage</code> 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) <ul style="list-style-type: none"> • IMP • FGP • AMP

Table 2.269 Test Case ID: TC-COD-FP-GSAT3-004

2.10.8. 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
Preconditions	<ul style="list-style-type: none"> • Acquisition of the fingerprint of two different fingers • Provision of the according biometric container including the fingerprint data

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

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Decoding of the CBEFF Header, Biometric Header Template (BHT) (XML element <data>) for each fingerprint</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • CBEFF Patron Header Version = '0101' • Biometric Data Block (BDB) Biometric Type: value = '08' (Fingerprint) • BDB Biometric Subtype: one of the following values: <ul style="list-style-type: none"> • 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	<p><i>Description:</i></p> <p>Decoding of the general record header</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • 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 = '0x001F' (Level 31) or '0x0029' (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

Table 2.271 TC-COD-FP-GID-001 Description

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

Step	Description / Expected Result
3	<p><i>Description:</i></p> <p>Decoding of the finger image header record</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • 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	<p><i>Description:</i></p> <p>Examination of the finger image data</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • Finger image data size < 18432 bytes • Encoded as WSQ image • <code>sf</code> value coded in the image header unequal 0

Table 2.272 TC-COD-FP-GID-001 Description**Table 2.270** Test Case ID: TC-COD-FP-GID-001**Test Case ID: TC-COD-FP-GID-002**

<i>Scope</i>	Check of consistency of coded values
<i>Preconditions</i>	<ul style="list-style-type: none"> • Acquisition of the fingerprints of two different fingers • Provision of the according biometric container including the image data

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

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>For both elements of record in <code>bio:FingerAcquisition</code>:</p> <p>Examination of the values in the field BDB Biometric Subtype in the CBEFF Header and finger position code in the finger image header</p> <p><i>Expected Result:</i></p> <p>For each record:</p> <p>the BDB Biometric Subtype contains the value for the same finger as the finger position code in the finger image header record</p>
2	<p><i>Description:</i></p> <p>For both elements record in <code>bio:FingerAcquisition</code>: Examination of the finger position code in the finger image header and for both elements <code>bio:FingerCapture</code>: Examination of the value in the attribute <code>fc</code></p> <p><i>Expected Result:</i></p> <p>For both finger position codes in record there is a corresponding <code>fc</code> in <code>qa_finger</code></p>
3	<p><i>Description:</i></p> <p>Check if the fingerprint positioned on the fingerprint sensor (as demanded in the IUT graphical user interface (GUI)) is coded with the correct value in <code>fc</code> within <code>bio:FingerAcquisition</code>.</p> <p><i>Expected Result:</i></p> <p>Value of <code>fc</code> is equal to the fingerprint positioned on the fingerprint sensor</p>
4	<p><i>Description:</i></p> <p>Examination of the XML Encoding</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> The XML-element <code>FingerAcquisition</code> occurs at least once for applicants older than 6 years applying for: <ul style="list-style-type: none"> Residence Permit Passport Identity Card (from 2. August 2021) The XML-element <code>FingerAcquisition</code> does not occur for applicants younger than 6 years. The XML-element <code>FingerAcquisition/Records</code> may be missing e.g. if fingers are physically impossible to acquire. The XML-element <code>FingerAcquisition/Records</code> occurs at maximum once in one of the <code>FingerAcquisition</code> XML-elements. The XML-element <code>FingerAcquisition/Records/XMLRecord</code> is not used. The XML-element <code>FingerAcquisition/Records/Record</code> occurs at least once and at maximum two times. The XML-element <code>FingerAcquisition/Records/Record/@type</code> is <code>icao-cbeff-bit-bdb-19794-4</code> The XML-element <code>FingerAcquisition/Records/Record/Data</code> occurs exactly once per record.

Table 2.274 TC-COD-FP-GID-002 Description**Table 2.273** Test Case ID: TC-COD-FP-GID-002

2.10.9. Test Cases FM COD-FI-GID

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

Scope	Correct coding of the CBEFF container
Preconditions	<ul style="list-style-type: none"> 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

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Decoding of the CBEFF Header, BHT (XML element <data>) for the facial image</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> 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	<p><i>Description:</i></p> <p>Further decoding of data: BDB data</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> Facial Record Header <ul style="list-style-type: none"> Format Identifier = 0x46414300 Version Number = 0x30313000 Length of Record = 20 bytes + size of Facial Record Data Length Number of Facial Images = 1 Facial Record Data <ul style="list-style-type: none"> Facial Information <ul style="list-style-type: none"> Facial Record Data Length = 32 bytes + size of Image Data Block (+ size of Feature Point blocks) Number of Feature Points ≥ 0 Image Information <ul style="list-style-type: none"> Face Image Type = 0x01 Image Data Type = 0x01 Width = determined width of input image Height = determined height of input image Image Data <p>JPEG2000</p>

Table 2.276 TC-COD-FI-GID-001 Description

Table 2.275 Test Case ID: TC-COD-FI-GID-001

Test Case ID: TC-COD-FI-GID-002

Scope	Check of consistency of coded values
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Test Case ID: TC-COD-FI-GID-002

- Preconditions*
- 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

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Examination of relation of the range and/or tolerance if values are available</p> <p><i>Expected Result:</i></p> <p>If min, max, tmin or tmax are present the following relation has to be valid: min<=tmin<=tmax<=max</p>
2	<p><i>Description:</i></p> <p>Examination of the XML Encoding</p> <p><i>Expected Result:</i></p> <ul style="list-style-type: none"> • The XML-element <code>FaceAcquisition</code> occurs once. • The XML-element <code>FaceAcquisition/Records</code> occurs once. • The XML-element <code>FaceAcquisition/Records/XMLRecord</code> is not used. • The XML-element <code>FingerAcquisition/Records/Record</code> occurs once. • The XML-element <code>FingerAcquisition/Records/Record/@type</code> is <code>icao-cbeff-bit-bdb-19794-5</code> • The XML-element <code>FingerAcquisition/Records/Record/Data</code> occurs once.

Table 2.278 TC-COD-FI-GID-002 Description**Table 2.277** Test Case ID: TC-COD-FI-GID-002**2.10.10. Test Cases FM COD-FP-VER****Test Case ID: TC-COD-FP-VER-001**

- Scope* Examine requirements for the coding used during the verification process of fingerprint images.
- Preconditions*
- The IUT is in operation, required modules are loaded.
 - The integrated camera system used in the specific application scenario is connected.
 - The IUT implements an interface for conformance testing where fingerprint images can be captured.
 - The IUT is able to return the results as TR XML for every verification process of fingerprint images.
 - As necessary test resources: a biometric test subject whose biometric features are acquired using the IUT.
- CTS Mode*
- interactive
 - no provision of pre-defined input data
 - HTTP method: GET
 - test case variants:

/TR03122/TC-COD-FP-VER-001/1

Table 2.280 TC-COD-FP-VER-001 Test Case Variants

Test Case ID: TC-COD-FP-VER-001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Perform the fingerprint image acquisition process using the IUT. • Initiate a fingerprint verification process. <p><i>Expected Result:</i></p> <p>The resulting data of the verification process is encoded in an appropriate XML TR-03121 format and can be successfully validated against the TR-03121 XML schema definition files.</p>

Table 2.281 TC-COD-FP-VER-001 Description**Table 2.279** Test Case ID: TC-COD-FP-VER-001**2.10.11. Test Cases FM COD-FI-VER****Test Case ID: TC-COD-FI-VER-001**

<i>Scope</i>	Examine requirements for the coding used during the verification process of facial images.
<i>Preconditions</i>	<ul style="list-style-type: none"> • The IUT is in operation, required modules are loaded. • The integrated camera system used in the specific application scenario is connected. • The IUT implements an interface for conformance testing where facial images can be captured. • The IUT is able to return the results as TR XML for every verification process of facial images. • As necessary test resources: a biometric test subject whose biometric features are acquired using the IUT.
<i>CTS Mode</i>	<ul style="list-style-type: none"> • interactive • no provision of pre-defined input data • HTTP method: GET • test case variants:

/TR03122/TC-COD-FI-VER-001/1

Table 2.283 TC-COD-FI-VER-001 Test Case Variants*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • Perform the facial image acquisition process using the IUT. • Initiate a face verification process. <p><i>Expected Result:</i></p> <p>The resulting data of the verification process is encoded in an appropriate XML TR-03121 format and can be successfully validated against the TR-03121 XML schema definition files.</p>

Table 2.284 TC-COD-FI-VER-001 Description**Table 2.282** Test Case ID: TC-COD-FI-VER-001

3. Test Cases Partial Application Processes

The following sections define test cases for Partial Application Processes.

3.1. Test Cases PAP ACQ-FI-SV-5: Supervised Facial Image Acquisition System

Test Case ID: TC-PAP-ACQ-FI-SV-5-001

<i>Scope</i>	<p>Examination of the availability and the correctness of veto power of the operator in the automated and manual capturing process for facial image acquisition.</p> <p>The test case is separated in different groups of steps:</p> <ul style="list-style-type: none"> • Steps A.*: Test of manual rejection succeeded by an acceptance during automated facial image acquisition. • Steps B.*: Test of manual rejection succeeded by an acceptance, including switching from manual to automated facial image acquisition.
<i>Preconditions</i>	<ul style="list-style-type: none"> • The IUT implements the HLBS service definition interface for "Facial Image Acquisition" specified in TR 03121-2.2. • The integrated camera system used in the specific application scenario is connected.

Test Case ID: TC-PAP-ACQ-FI-SV-5-001

Description

Step	Descriptions/ Expected Results
A.1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • A single biometric subject is present in the IUT's acquisition area. • The operator starts an automated acquisition process of a facial image for enrolment or verification/identification. • The operator triggers the capturing process of a facial image. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT executes the process autonomously, i.e. the system handles the entire process execution, including configuration of the camera system to the height of the biometric subject. • The operator conducts a manual QA of the acquired facial image and reviews the software-based QA result.
A.2	<p><i>Description:</i></p> <p>The operator rejects the acquired facial image.</p> <p><i>Expected Results:</i></p> <p>The IUT starts a new automated acquisition process of a facial image for enrolment or verification/identification.</p>
A.3	<p><i>Description:</i></p> <p>The operator triggers the capturing process of a facial image.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT executes the process autonomously, i.e. the system handles the entire process execution, including configuration of the camera system to the height of the biometric subject. • The operator conducts a manual QA of the acquired facial image and reviews the software-based QA result.
A.4	<p><i>Description:</i></p> <p>The operator accepts the acquired facial image.</p> <p><i>Expected Results:</i></p> <p>As a result, a message conforming to TR-03121 XML containing the encoded facial image is returned (bio:FaceAcquisition).</p>
B.1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • A single biometric subject is present in the IUT's acquisition area. • The operator starts a manual acquisition process of a facial image for enrolment or verification/identification. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT executes the process where each sub-process requires manual handling of the operator. • The IUT's test interface offers the operator the option to manually adjust the camera system to the height of the biometric subject.

Table 3.2 TC-PAP-ACQ-FI-SV-5-001 Description

Test Case ID: TC-PAP-ACQ-FI-SV-5-001

Step	Descriptions/ Expected Results
B.2	<p><i>Description:</i></p> <p>The operator triggers the automatic height configuration process of a facial image for enrolment or verification/identification.</p> <p><i>Expected Results:</i></p> <p>The IUT adjusts the configuration of the camera system to the height of the biometric subject.</p>
B.3	<p><i>Description:</i></p> <p>The operator triggers the facial image capturing process.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT executes the face image capturing process. • The operator conducts a manual QA of the acquired facial image and reviews the software-based QA result.
B.4	<p><i>Description:</i></p> <p>The operator rejects the acquired facial image.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT starts a new manual acquisition process of a facial image for enrolment or verification/identification. • The IUT executes the process where each sub-process requires manual handling of the operator.
B.5	<p><i>Description:</i></p> <p>The operator triggers the automatic height configuration process of a facial image for enrolment or verification/identification.</p> <p><i>Expected Results:</i></p> <p>The IUT adjusts the configuration of the camera system to the height of the biometric subject.</p>
B.6	<p><i>Description:</i></p> <p>The operator triggers the facial image capturing process.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT executes the face image capturing process. • The operator conducts a manual QA of the acquired facial image and reviews the software-based QA result.
B.7	<p><i>Description:</i></p> <p>The operator accepts the acquired facial image.</p> <p><i>Expected Results:</i></p> <p>As a result, a message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>).</p>

Table 3.3 TC-PAP-ACQ-FI-SV-5-001 Description**Table 3.1** Test Case ID: TC-PAP-ACQ-FI-SV-5-001

Test Case ID: TC-PAP-ACQ-FI-SV-5-002

Scope	Examination of the availability and the correctness of the camera adjustment in the manual capturing process for facial image acquisition.
Preconditions	<ul style="list-style-type: none"> The IUT implements the HLBS service definition interface for "Facial Image Acquisition" specified in TR 03121-2.2 The integrated camera system used in the specific application scenario is connected.

Description

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> A single biometric subject is present in the IUT's acquisition area. The operator starts a manual acquisition process of a facial image for enrolment or verification/identification. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> The IUT executes the process where each sub-process requires manual handling of the operator. The IUT's test interface offers the operator the option to manually adjust the camera system to the height of the biometric subject.
2	<p><i>Description:</i></p> <p>The operator triggers the automatic height configuration process of a facial image for enrolment or verification/identification.</p> <p><i>Expected Results:</i></p> <p>The IUT adjusts the configuration of the camera system to the height of the biometric subject.</p>
3	<p><i>Description:</i></p> <p>The operator triggers the facial image capturing process.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> The IUT executes the face image capturing process. The operator conducts a manual QA of the acquired facial image and reviews the software-based QA result.
4	<p><i>Description:</i></p> <p>The operator rejects the acquired facial image.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> The IUT starts a new manual acquisition process of a facial image for enrolment or verification/identification. The IUT executes the process where each sub-process requires manual handling of the operator. The IUT's test interface offers the operator the option to manually adjust the camera system to the height of the biometric subject.
5	<p><i>Description:</i></p> <p>The operator manually increases the height configuration of the camera system until the maximum height configuration.</p> <p><i>Expected Results:</i></p> <p>The IUT adjusts the configuration of the camera system to the height configured by the operator.</p>

Table 3.5 TC-PAP-ACQ-FI-SV-5-002 Description

Test Case ID: TC-PAP-ACQ-FI-SV-5-002

Step	Descriptions/ Expected Results
6	<p><i>Description:</i></p> <p>The operator manually decreases the height configuration of the camera system until the minimum height configuration.</p> <p><i>Expected Results:</i></p> <p>The IUT adjusts the configuration of the camera system to the height configured by the operator.</p>
7	<p><i>Description:</i></p> <p>The operator triggers the facial image capturing process.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT executes the face image capturing process. • The operator conducts a manual QA of the acquired facial image and reviews the software-based QA result.
8	<p><i>Description:</i></p> <p>The operator accepts the acquired facial image.</p> <p><i>Expected Results:</i></p> <p>As a result, a message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>).</p>

Table 3.6 TC-PAP-ACQ-FI-SV-5-002 Description**Table 3.4** Test Case ID: TC-PAP-ACQ-FI-SV-5-002**Test Case ID: TC-PAP-ACQ-FI-SV-5-003**

<i>Scope</i>	Examination of the availability and the correctness of the switching functionality between the automated and the manual capturing process for facial image acquisition.
<i>Preconditions</i>	<ul style="list-style-type: none"> • The IUT implements the HLBS service definition interface for "Facial Image Acquisition" specified in TR 03121-2.2 • The integrated camera system used in the specific application scenario is connected.

Test Case ID: TC-PAP-ACQ-FI-SV-5-003*Description*

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • A single biometric subject is present in the IUT's acquisition area. • The operator starts a manual acquisition process of a facial image for enrolment or verification/identification. • The operator switches from the manual acquisition process to an automated acquisition process. • The operator triggers the capturing process of a facial image. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT executes the process autonomously, i.e. the system handles the entire process execution, including configuration of the camera system to the height of the biometric subject. • The operator conducts a manual QA of the acquired facial image and reviews the software-based QA result.
2	<p><i>Description:</i></p> <p>The operator rejects the acquired facial image.</p> <p><i>Expected Results:</i></p> <p>The IUT starts a new automated acquisition process of a facial image for enrolment or verification/identification.</p>
3	<p><i>Description:</i></p> <p>The operator switches from the automated acquisition process to a manual acquisition process.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT executes the process where each sub-process requires manual handling of the operator. • The IUT's test interface offers the operator the option to manually adjust the camera system to the height of the biometric subject.
4	<p><i>Description:</i></p> <p>The operator triggers the automatic height configuration process of a facial image for enrolment or verification/identification.</p> <p><i>Expected Results:</i></p> <p>The IUT adjusts the configuration of the camera system to the height of the biometric subject.</p>
5	<p><i>Description:</i></p> <p>The operator triggers the facial image capturing process.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT executes the face image capturing process. • The operator conducts a manual QA of the acquired facial image and reviews the software-based QA result.

Table 3.8 TC-PAP-ACQ-FI-SV-5-003 Description

Test Case ID: TC-PAP-ACQ-FI-SV-5-003

Step	Descriptions/ Expected Results
6	<p><i>Description:</i></p> <p>The operator accepts the acquired facial image.</p> <p><i>Expected Results:</i></p> <p>As a result, a message conforming to TR-03121 XML containing the encoded facial image is returned via the test interface (<code>bio:FaceAcquisition</code>).</p>

Table 3.9 TC-PAP-ACQ-FI-SV-5-003 Description**Table 3.7** Test Case ID: TC-PAP-ACQ-FI-SV-5-003

3.2. Test Cases PAP ACQ-FI-AUTO-1: Automated Facial Image Acquisition

Test Case ID: TC-ACQ-FI-AUTO-1-001

<i>Scope</i>	Examination of the correctness and duration of the unsupervised automated face image acquisition processes for optimal face presentations (bona fide).
<i>Preconditions</i>	<ul style="list-style-type: none"> • The IUT implements the HLBS service definition for "Facial Image Acquisition" specified in TR 03121-2.2. • The integrated camera system used in the specific application scenario is connected. • Depending on the scenario the IUT is used in (supervised or non-supervised), PAD functionality is to be activated or disabled for performing the test case. The active setting has to be regarded when the results of this test case are evaluated.

Test Case ID: TC-ACQ-FI-AUTO-1-001

Description

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • A single biometric subject is present in the IUT's capture area. • The process for automated facial image acquisition is started. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT guides the biometric subject to present a compliant face presentation according to AS-FI-BCL. • The IUT adjusts the configuration of the camera system to the height of the biometric subject.
2	<p><i>Description:</i></p> <p>The biometric subject enters alone in the optimal distance range.</p> <p><i>Expected Results:</i></p> <p>All acceptance conditions (no multiple faces and optimal distance) are met according to AS-FI-BCL.</p>
3	<p><i>Description:</i></p> <p>The biometric subject performs an optimal (bona fide) face presentation.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT captures a face image. • Depending on the PAD configuration, the IUT performs a PAD. • In case the IUT performs a PAD, all acceptance conditions are met according to PAD-FI-APP. • The IUT assesses the quality of the captured face image. • All acceptance conditions are met according to QA-FI-SB. • As a result, a message conforming to TR-03121 XML containing the encoded facial image is returned (<code>bio:FaceAcquisition</code>). • The time required for the overall facial image acquisition process did not exceed ten seconds if PAD is performed or seven seconds if no PAD is performed.

Table 3.11 TC-ACQ-FI-AUTO-1-001 Description

Table 3.10 Test Case ID: TC-ACQ-FI-AUTO-1-001

Test Case ID: TC-ACQ-FI-AUTO-1-002

Scope

Examination of the correctness and availability of timeout of the unsupervised automated face image acquisition processes for non-compliant face presentations.

Preconditions

- The IUT implements the HLBS service definition for "Facial Image Acquisition" specified in TR 03121-2.2.
- The integrated camera system used in the specific application scenario is connected.
- Depending on the scenario the IUT is used in (supervised or non-supervised), PAD functionality is to be activated or disabled for performing the test case. The active setting has to be regarded when the results of this test case are evaluated.

Test Case ID: TC-ACQ-FI-AUTO-1-002

Description

Step	Descriptions/ Expected Results
1	<p><i>Description:</i></p> <ul style="list-style-type: none"> • A single biometric subject is present in the IUT's capture area. • The process for automated facial image acquisition is started. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT guides the biometric subject to present a compliant face presentation according to AS-FI-BCL. • The IUT adjusts the configuration of the camera system to the height of the biometric subject.
2	<p><i>Description:</i></p> <p>The biometric subject enters alone in the optimal distance range.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • All acceptance conditions (no multiple faces and optimal distance) are met according to AS-FI-BCL. • As a result, a message conforming to TR-03121 XML containing the encoded facial image is returned (<code>bio:FaceAcquisition</code>).
3	<p><i>Description:</i></p> <p>The biometric subject performs a non-conformant face presentation, e.g. the biometric subject does not look in the camera or disappears from the system.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT captures a face image. • Depending on the PAD configuration, the IUT performs a PAD. • In case the IUT performs a PAD, all acceptance conditions are met according to PAD-FI-APP. • The IUT assesses the quality of the captured face image. • The acceptance conditions are not met are met according to QA-FI-SB.
4	<p><i>Description:</i></p> <p>The biometric subject repeats Step 3 for the duration of the configured timeout.</p> <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT repeats the automated face image acquisition process until the timeout exceeds. • After the timeout is exceeded the IUT aborts the face image acquisition process. • After the timeout is exceeded the IUT aborts the face image acquisition process. • After the timeout is exceeded a message conforming to TR-03121 XML containing the encoded facial image exhibiting the best quality of all captured images may be returned (<code>bio:FaceAcquisition</code>).

Table 3.13 TC-ACQ-FI-AUTO-1-002 Description**Table 3.12** Test Case ID: TC-ACQ-FI-AUTO-1-002

3.3. 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	
<ul style="list-style-type: none"> 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") <ul style="list-style-type: none"> Test case path: /TR03122/TC-P-PH-ARE-001/1 HTTP method: POST 	
Description	
Step 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
Step 2	
Check quality indication of loaded image	
Expected Result	A <code>bio:FaceQuality</code> element is returned by the IUT via the test interface and an indication whether the face image from the CIR is reusable is given by the IUT
Step 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)
Step 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)
Step 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	<ul style="list-style-type: none"> 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 <code>bio:XMLRecord[@type="GSAT-xml"]</code>) The therein contained image data matches the data of the previously selected image (after proper decoding of element <code>it1:FaceImage</code>)

Table 3.14 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	
<ul style="list-style-type: none"> 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") <ul style="list-style-type: none"> Test case path: /TR03122/TC-P-PH-ARE-002/1 HTTP method: POST 	
Description	
Step 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
Step 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
Step 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)
Step 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)
Step 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	<ul style="list-style-type: none"> 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 <code>bio:XMLRecord[@type="GSAT-xml"]</code>) The therein contained image data matches the data of the previously selected image (after proper decoding of element <code>itl:FaceImage</code>)

Table 3.15 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	

Test Case ID: TC-PAP-ACQ-FI-SV-2_003	
Precondition	
<ul style="list-style-type: none"> 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") <ul style="list-style-type: none"> Test case path: /TR03122/TC-P-PH-ARE-003/1 HTTP method: GET 	
Description	
Step 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
Step 2 Check availability of live image acquisition process	
Expected Result	When option for live acquisition is selected, the process starts
Step 3 Check availability of live image acquisition process <ul style="list-style-type: none"> 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
Step 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	<ul style="list-style-type: none"> 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 <code>bio:XMLRecord[@type="GSAT-xml"]</code>) The therein contained image data matches the data of the previously captured image (after proper decoding of element <code>it1:FaceImage</code>)

Table 3.16 Test Case ID: TC-PAP-ACQ-FI-SV-2_003

3.4. Test Cases PAP ACQ-FI-SV-4: Supervised Facial Image Acquisition without CIR Lookup

Test Case ID: TC-PAP-ACQ-FI-SV-4-001	
Scope	Verify correct behaviour of facial image acquisition process without CIR using live enrolment equipment operated by an operator.

Test Case ID: TC-PAP-ACQ-FI-SV-4-001

- Preconditions*
- The IUT is in operation, required modules are loaded.
 - As test resource: a biometric test subject.

- CTS Mode*
- interactive
 - no provision of pre-defined input data
 - HTTP method: POST
 - test case variants:

/TR03122/TC-PAP-ACQ-FI-SV-4-001/1/

Table 3.18 TC-PAP-ACQ-FI-SV-4-001 Test Case Variants

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check the automatic capturing of a proper facial image.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Place the biometric test subject properly in front of the digital camera. • Wait for an automatic captured image. • Verify the displayed image and accept it. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT captured a facial image automatically. • The captured image is cropped and derotated. • A quality assessment of the captured image has been performed. • The image is displayed by the IUT. • The image is released to the requesting application after being accepted. • As a result, an image is returned via the test interface in a XML-Log conforming to TR-03121 XML.
2	<p><i>Description:</i></p> <p>Check the automatic capturing of an insufficient facial image.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Place the biometric test subject improperly in front of the digital camera. The quality assessment of the captured images has to be negative for every capture. At least two images SHALL be captured. • Wait for the timeout. • Accept the displayed image. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT captured a facial images automatically. • A quality assessment of the captured images was negative. • The IUT chose the best captured image and displays it. • The image can be cropped and rotated manually. • The image is released to the requesting application after being accepted. • As a result, an image is returned via the test interface in a XML-Log conforming to TR-03121 XML.

Table 3.19 TC-PAP-ACQ-FI-SV-4-001 Description

Test Case ID: TC-PAP-ACQ-FI-SV-4-001

Step	Description / Expected Result
3	<p><i>Description:</i></p> <p>Check the manual capturing of an image. Note, the quality of the captured image is not relevant for this test.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Verify the option to capture an image manually. • Capture an image manually. • Verify the option to crop and rotate the captured image. • Accept the image. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT displays an option to take an image manually. • An image was captured and is displayed by the IUT. • The displayed image can be cropped and rotated manually. • The image is released to the requesting application after being accepted. • As a result, an image is returned via the test interface in a XML-Log conforming to TR-03121 XML.
4	<p><i>Description:</i></p> <p>Check correct timeout handling.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface without placing a test subject in front of the camera. • Wait for the timeout to trigger. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • No image was captured. • The acquisition process ended.
5	<p><i>Description:</i></p> <p>Check the rejection of a captured image and restart of the capturing process after image rejection.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Wait roughly 70 % of the timeout time. • Capture an image. • Reject the captured image. • Wait roughly 70 % of the timeout time. • Capture a new image without restarting the capturing process manually. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT displays an image. • An image can be and was manually rejected. • The image capture process was restarted automatically. • The timeout was reset and did not end the capturing process. • A new image could be captured.

Table 3.20 TC-PAP-ACQ-FI-SV-4-001 Description**Table 3.17** Test Case ID: TC-PAP-ACQ-FI-SV-4-001

3.5. Test Cases PAP ACQ-FPS-SV-1: Supervised Acquisition Single Slap

Test Case ID: TC-PAP-ACQ-FPS-SV-1_001

Scope Verify the overall supervised acquisition process for single slap images.

- Preconditions*
- The IUT is in operation, required modules are loaded.
 - Hardware capable of capturing fingerprint images is connected.
 - As test resource: a biometric test subject for fingerprint capture.
 - If HLBS is used by the system, the "Service Definition Fingerprint Acquisition" of Part 2, Volume 2 of TR-03121 is implemented.

- CTS Mode*
- Interactive
 - No provision of pre-defined input data
 - HTTP method: GET
 - Test case variants:

/TR03122/TC-PAP-ACQ-FPS-SV-1-001/1

Table 3.22 TC-PAP-ACQ-FPS-SV-1-001 Test Case Variants

Test Case ID: TC-PAP-ACQ-FPS-SV-1_001

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check the Process without a second slap capture.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Select one finger as missing. • Follow the instructions of the IUT for the slap placement on the scanner for the biometric test subject. • Choose not to capture the second slap. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The instructions were displayed and correct for the captured fingers. • The process ended without capturing the second slap. • A message conforming to TR-03121 XML containing the images for the captured fingers is returned via the test interface.
2	<p><i>Description:</i></p> <p>Check the Process with a second slap capture.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Follow the instructions of the IUT for the slap placement on the scanner for the biometric test subject. • Choose to capture the second slap. • Follow the instructions of the IUT for the slap placement on the scanner for the biometric test subject. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The instructions were displayed for both slaps and correct for the captured fingers. • The process ended after capturing the second slap. • A message conforming to TR-03121 XML containing the encoded images is returned via the test interface.

Table 3.23 TC-PAP-ACQ-FPS-SV-1_001 Description

Table 3.21 Test Case ID: TC-PAP-ACQ-FPS-SV-1_001

Test Case ID: TC-PAP-ACQ-FPS-SV-1_002

Scope	Verify the correct acquisition process for a single slap.
Preconditions	<ul style="list-style-type: none"> • The IUT is in operation, required modules are loaded. • Hardware capable of capturing fingerprint images is connected. • As test resource: a biometric test subject for fingerprint capture.
CTS Mode	<ul style="list-style-type: none"> • Interactive • No provision of pre-defined input data • HTTP method: GET • Test case variants:

/TR03122/TC-PAP-ACQ-FPS-SV-1-002/1

Table 3.25 TC-PAP-ACQ-FPS-SV-1-002 Test Case Variants

Test Case ID: TC-PAP-ACQ-FPS-SV-1_002

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check the segmentation, quality assessment and PAD of the slap image acquisition.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Follow the instructions of the IUT for the slap placement on the scanner for the biometric test subject. • Choose not to capture the second slap. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The captured slap image has been segmented into four single fingerprint images. • The quality assesment is performed for each single fingerprint image individually. • PAD has been performed and no warning or error is shown. • Sequence check has been performed and no warning or error for duplicated fingerprints is shown. • A message conforming to TR-03121 XML containing the encoded images with the QA value and PAD result is returned via the test interface.
2	<p><i>Description:</i></p> <p>Check the sequence check of the slap image acquisition.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Follow the instructions of the IUT for the slap placement on the scanner for the biometric test subject. • Choose to capture the second slap • Place the same hand again on the finger scan area. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT shows a warning or error for duplicated fingerprint images. • A message conforming to TR-03121 XML containing the warning was returned via the test interface.
3	<p><i>Description:</i></p> <p>Check the slap classifier.</p> <ul style="list-style-type: none"> • Verfiy the option to toggle the slap classifier between off and evaluation mode. • Set the slap classifier to evaluation mode. • Initiate test case using the test interface. • Follow the instructions of the IUT for the slap placement on the scanner for the biometric test subject. • Choose to capture the second slap • Place the same hand again on the finger scan area. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT threw an error. • A message conforming to TR-03121 XML containing the error was returned via the test interface.

Table 3.26 TC-PAP-ACQ-FPS-SV-1-002 Description

Table 3.24 Test Case ID: TC-PAP-ACQ-FPS-SV-1_002

Test Case ID: TC-PAP-ACQ-FPS-SV-1_003

Scope Verify the correct behaviour of supervised acquisition process for a single finger. This test case covers PAP Task ACQ-FPP-SV-2.

Preconditions

- The IUT is in operation, required modules are loaded.
- Hardware capable of capturing fingerprint images is connected.
- As test resource: a biometric test subject for fingerprint capture.

CTS Mode

- Interactive
- No provision of pre-defined input data
- HTTP method: POST
- Test case variants:

/TR03122/TC-PAP_ACQ-FPS-SV-1-003/1

Table 3.28 TC-PAP_ACQ-FPP-SV-2-001 Test Case Variants

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check the behaviour of captured images.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Start the acquisition process and switch to the single finger acquisition. • Follow the instructions of the IUT for the single finger placement on the scanner for the biometric test subject. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • PAD has been performed and no warning or error is shown. • Sequence check has been performed and no warning or error for duplicated fingerprints is shown. • A message conforming to TR-03121 XML containing the fingerprint and its QA value is returned via the test interface.
2	<p><i>Description:</i></p> <p>Check the sequence check.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Select one finger as missing. • Start the acquisition process and switch to the single finger acquisition. • Follow the instructions of the IUT for the single finger placement on the scanner for the biometric test subject. • Place the same finger on the finger scan area. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The IUT shows a warning or error for duplicated fingerprint images. • A message conforming to TR-03121 XML containing the error was returned via the test interface.

Table 3.29 TC-PAP_ACQ-FPS-SV-1-003 Description**Table 3.27** Test Case ID: TC-PAP-ACQ-FPS-SV-1_003

3.6. 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	Verify the overall process of supervised acquisition of fingerprint slaps in the order of 4-4-2.
Preconditions	<ul style="list-style-type: none"> • The IUT is in operation, required modules are loaded. • Hardware capable of capturing fingerprint images is connected. • As test resource: a biometric test subject for fingerprint capture. • If HLBS is used by the system, the "Service Definition Fingerprint Acquisition" of Part 2, Volume 2 of TR-03121 is implemented.
CTS Mode	<ul style="list-style-type: none"> • Interactive • No provision of pre-defined input data • HTTP method: GET • Test case variants:

/TR03122/TC-PAP-ACQ-FP442-SV-1-001/1

Table 3.31 TC-PAP-ACQ-FP442-SV-1-001 Test Case Variants

Description

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Verifys the order of captured fingerprint images.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Follow the instructions of the IUT for the slap placement on the scanner for the biometric test subject. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The instructions are displayed and correct. • The order of captured fingerprint images is right slap, left slap, both thumbs. • A message conforming to TR-03121 XML containing the encoded images within <code>FingerAcquisition</code> is returned via the test interface .
2	<p><i>Description:</i></p> <p>This test case PAP ACQ-FP4141-SV-1 uses PAP Task ACQ-FPS-SV-1 and PAP Task ACQ-FPP-SV-2 which have been defined as part of PAP ACQ-FPS-SV-1. ▶Test Cases PAP ACQ-FPS-SV-1: Supervised Acquisition Single Slap has to be tested separately for conformance.</p> <p><i>Expected Results:</i></p> <p>▶Test Cases PAP ACQ-FPS-SV-1: Supervised Acquisition Single Slap is passed.</p>

Table 3.32 TC-PAP-ACQ-FP442-SV-1_001 Description

Table 3.30 Test Case ID: TC-PAP-ACQ-FP442-SV-1_001

3.7. 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	Verify the overall process of supervised acquisition of fingerprint slaps in the order of 4-1-4-1.
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Test Case ID: TC-PAP-ACQ-FP4141-SV-1_001

- Preconditions*
- The IUT is in operation, required modules are loaded.
 - Hardware capable of capturing fingerprint images is connected.
 - As test resource: a biometric test subject for fingerprint capture.
 - If HLBS is used by the system, the "Service Definition Fingerprint Acquisition" of Part 2, Volume 2 of TR-03121 is implemented.

- CTS Mode*
- Interactive
 - No provision of pre-defined input data
 - HTTP method: GET
 - Test case variants:

/TR03122/TC-PAP-ACQ-FP4141-SV-1-001/1

Table 3.34 TC-PAP-ACQ-FP4141-SV-1-001 Test Case Variants*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Verifys the order of captured fingerprint images.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Follow the instructions of the IUT for the slap placement on the scanner for the biometric test subject. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The instructions are displayed and correct. • The order of captured fingerprint images is right slap, right thumb, left slap, left thumb. • A message conforming to TR-03121 XML containing the encoded images within <code>FingerAcquisition</code> is returned via the test interface .
2	<p><i>Description:</i></p> <p>This test case PAP ACQ-FP4141-SV-1 uses PAP Task ACQ-FPS-SV-1 and PAP Task ACQ-FPP-SV-2 which have been defined as part of PAP ACQ-FPS-SV-1. ▶Test Cases PAP ACQ-FPS-SV-1: Supervised Acquisition Single Slap has to be tested separately for conformance.</p> <p><i>Expected Results:</i></p> <p>▶Test Cases PAP ACQ-FPS-SV-1: Supervised Acquisition Single Slap is passed.</p>

Table 3.35 TC-PAP-ACQ-FP4141-SV-1_001 Description**Table 3.33** Test Case ID: TC-PAP-ACQ-FP4141-SV-1_001

3.8. 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

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

- 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**Step 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`

Step 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. 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`

Step 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

Test Case ID: TC-PAP-ACQ-FP2P-SV-1_001	
Expected Result	<ul style="list-style-type: none"> • 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 <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>
<p>Step 4</p> <p>Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a missing hand</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 <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>
<p>Step 5</p> <p>Check the correct execution of the acquisition process with fingerprints of insufficient quality, regarding capture repetition</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 <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>

Test Case ID: TC-PAP-ACQ-FP2P-SV-1_001	
<p>Step 6</p> <p>Check whether the IUT supports the execution of the mandatory fallback single-finger acquisition process for cases where a slap capture is not practical.</p> <ul style="list-style-type: none"> Initiate test case by calling the IUT via the test interface Perform the acquisition process 	
Expected Result	<ul style="list-style-type: none"> 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 <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>
<p>Step 7</p> <p>In case of a plain fingerprint enrolment scenario: Check whether the IUT supports the execution of the mandatory fallback single finger acquisition process for fingers of insufficient quality.</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> After capturing the slap, 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 <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>
<p>Step 8</p> <p>In case of a plain fingerprint enrolment scenario: Check whether the mandatory fallback single finger acquisition process actually replaces the corresponding fingerprints from the slap capture.</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 <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> The enforced fingerprint of insufficient quality is replaced by the fingerprint of ensured good quality from single-finger acquisition

Table 3.36 Test Case ID: TC-PAP-ACQ-FP2P-SV-1_001

3.9. 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

Test Case ID: TC-PAP-ACQ-FP2P-SV-2_001	
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	
<ul style="list-style-type: none"> 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") <ul style="list-style-type: none"> Test case path: /TR03122/TC-P-FP-PLAIN-004/1 HTTP method: GET 	
Description	
Step 1	
Check the correct execution of the acquisition process with fingerprints of sufficient quality	
<ul style="list-style-type: none"> Initiate test case by calling the IUT via the test interface Perform the acquisition process of the two fingerprints 	
Expected Result	<ul style="list-style-type: none"> 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 <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>
Step 2	
Check the correct execution of the acquisition process with fingerprints of sufficient quality, with a handicap on the right slap	
<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 <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>

Test Case ID: TC-PAP-ACQ-FP2P-SV-2_001
Step 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
- 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`

Step 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`

Step 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

Test Case ID: TC-PAP-ACQ-FP2P-SV-2_001	
Expected Result	<ul style="list-style-type: none"> 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 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>

Table 3.37 Test Case ID: TC-PAP-ACQ-FP2P-SV-2_001

3.10. 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	
<ul style="list-style-type: none"> 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") <ul style="list-style-type: none"> Test case path: <code>/TR03122/TC-P-FP-ROLL-001/1</code> HTTP method: <code>GET</code> 	
Description	
<p>Step 1</p> <p>Check the correct execution of the acquisition process with fingerprints of sufficient quality</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 <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>

Test Case ID: TC-PAP-ACQ-FP10R-SV-1_001
Step 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`

Step 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`

Step 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

Test Case ID: TC-PAP-ACQ-FP10R-SV-1_001	
Expected Result	<ul style="list-style-type: none"> • The IUT detects the insufficient quality and restarts the acquisition of the current finger • 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 <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>

Table 3.38 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	
<ul style="list-style-type: none"> • 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") <ul style="list-style-type: none"> • Test case path: <code>/TR03122/TC-P-FP-ROLL-002/1</code> • HTTP method: <code>GET</code> 	
Description	
<p>Step 1</p> <p>Check the correct execution of the acquisition process with fingerprints of sufficient quality, but with hardware reported issues</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 <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>. The <code>rejectionReason</code> element matches the reason chosen by the operator.

Test Case ID: TC-PAP-ACQ-FP10R-SV-1_002	
<p>Step 2</p> <p>Check the correct execution of the acquisition process with fingerprints of insufficient quality and with hardware reported issues</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 <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>. The repetition with the best QA score is marked as "selected" and the <code>rejectionReason</code> for the first attempts matches the reason chosen by the operator.
<p>Step 3</p> <p>Check the ability of operators to accept negative capture results in case both fingerprints of insufficient quality and hardware reported issues are encountered</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 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 <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>. The first repetition with insufficient QA score is marked as "selected" and the <code>rejectionReason</code> for the first and last attempts matches the reason chosen by the operator.

Table 3.39 Test Case ID: TC-PAP-ACQ-FP10R-SV-1_002

3.11. Test Cases PAP ACQ-FPS-USV-1: Unsupervised Acquisition Single Slap

Test Case ID: TC-PAP-ACQ-FPS-USV-1_001

Scope Verify the correct acquisition process for a single slap with four fingers and missing finger(s).

Preconditions

- The IUT is in operation, required modules are loaded.
- Hardware capable of capturing fingerprint images is connected.
- As test resource: a biometric test subject for fingerprint capture.

CTS Mode

- Interactive
- No provision of pre-defined input data
- HTTP method: GET
- Test case variants:

/TR03122/TC-PAP-ACQ-FPS-USV-1-001/1

Table 3.41 TC-PAP-ACQ-FPS-USV-1-001 Test Case Variants

Test Case ID: TC-PAP-ACQ-FPS-USV-1_001*Description*

Step	Description / Expected Result
1	<p><i>Description:</i></p> <p>Check the capturing of surveillance images, segmentation, quality assessment, PAD and time required for the slap image acquisition.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Present slap with four fingers. • Follow the instructions of the IUT for the slap placement on the scanner for the biometric test subject. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The captured slap image are segmented into four single fingerprint images. • PAD has been performed for each single fingerprint image and no warning or error is shown. • Surveillance images are captured. • The quality assesment is performed for each single fingerprint image individually. • The slap classification is performed. • The overall finger slap capture process was perfomed in under ten seconds. • A message conforming to TR-03121 XML containing the encoded images with the QA value, the PAD result, the result of the slap classifier and captured surveillance images is returned via the test interface.
2	<p><i>Description:</i></p> <p>Check the timeout of the capturing process.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Increase the minimum required quality thresholds for each fingerprint to 100. • Consecutively present slap with four fingers. • Follow the instructions of the IUT for the slap placement on the scanner for the biometric test subject. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The captured slap image are segmented into four single fingerprint images. • PAD has been performed for each single fingerprint image and no warning or error is shown. • Surveillance images are captured. • The quality assesment is performed for each single fingerprint image individually and the overall quality assesment is negative. • The slap classification is performed. • The capturing process is restarted until the timeout of 10 seconds is reached. • After the timeout is reached the captured slap with best quality is identified and a message conforming to TR-03121 XML containing the encoded images with the QA value, the PAD result, the result of the slap classifier and captured surveillance images is returned via the test interface.

Table 3.42 TC-PAP-ACQ-FPS-USV-1-001 Description

Test Case ID: TC-PAP-ACQ-FPS-USV-1_001

Step	Description / Expected Result
3	<p><i>Description:</i></p> <p>Check the Process with missing fingers.</p> <ul style="list-style-type: none"> • Initiate test case using the test interface. • Present slap with at least one finger missing. • Follow the instructions of the IUT for the slap placement on the scanner for the biometric test subject. <p><i>Expected Results:</i></p> <ul style="list-style-type: none"> • The captured finger and surveillance images are discarded. • The process ended without capturing the slap.

Table 3.43 TC-PAP-ACQ-FPS-USV-1-001 Description**Table 3.40** Test Case ID: TC-PAP-ACQ-FPS-USV-1_001

List of Abbreviations

Abbreviation	Description
BDB	Biometric Data Block
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
GID	German Identity Document
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
SSS	self-service system
WSQ	Wavelet Scalar Quantisation

Bibliography

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[ISO_FINGER] *ISO/IEC 19794-4:2005 "Information technology - Biometric data interchange formats – Part 4: Finger image data".*

[TR-03118] *BSI TR-03118 Part 1 Prüfspezifikation zur TR-PDÜ.*