MACHINE READABLE TRAVEL DOCUMENTS TECHNICAL REPORT

RF PROTOCOL AND APPLICATION TEST STANDARD FOR EMRTD - PART 6

TESTS FOR DIGITAL SEALS

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FOR THE INTERNATIONAL CIVIL AVIATION ORGANIZATION

Release Control

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0.1	October 4, 2022	Initial draft for discussion in the 64th WG3 meeting in Berlin
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1.0	August 16,2023	First final version.

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1 Introduction

1.1 Scope

Visible Digital Seals are getting more and more important in several areas. They can be found in context of travel documents (e.g. visa, emergency travel documents) or in the context of health (e.g. vaccination certificates). ICAO has specified digital seals in ICAO Doc 9303 Part 13 [Doc9303-13] and in "Visible Digital Seals for non-constrained environments" [TR-VDSNC]. Digital seals are generated on the one side by an organization, are used by citizens, and then on the other side are read and verified by another organization. So, in the typical use cases of digital seals there are different stakeholders distributed over the world. One elementary requirement is, that a digital seal is verifiable all over the world. The popularity of digital seals makes it necessary to establish conformity tests similar to eMRTD documents and readers. This contribution is a proposal how to establish a conformity test for generators and verifiers.

There are some differences between seals specified in [Doc9303-13] and in [TR-VDSNC], [TR-DTA]. This test specification handles digital seals specified in [Doc9303-13]. The following table (not complete) shows some differences between these variants:

	VDS	**VDS-NC / DTA**
Coding	TLV + C40	JSON
Valid characters	'A'…'Z' '0'…'9' ' ' (space)	'A'…'Z' '0'…'9' ' ' (space) 'a'…'z' !@#$%&'*+-/=?^_`{|}~.
Image encoding	All 2D bar codes whose symbology is specified as an ISO standard	DataMatrix Aztec Codes QR Codes (recommended)
Data zone	Differences in header and message	Differences in header and message
Signature	ECDSA is used as signature algorithm; the hashing algorithm is deduced from the bit length of the order of the base point generator of the curve used for creating the signature	Signer algorithm is explicitly named
…	…	…

But for all that there are similarities in both seals, e.g. there can be a generic test setup used to handle both worlds.

Note: Test of image quality and bar code quality are not part of this TR.

1.2 Terminology

The key words "MUST", "SHALL", "REQUIRED", "SHOULD", "RECOMMENDED", and "MAY" in this document are to be interpreted as described in [RFC2119].

MUST   This word, or the terms "REQUIRED" or "SHALL", mean that the definition is an absolute requirement of the specification.

MUST NOT   This phrase, or the phrase "SHALL NOT", mean that the definition is an absolute prohibition of the specification.

SHOULD   This word, or the adjective "RECOMMENDED", mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.

SHOLD NOT This phrase, or the phrase "NOT RECOMMENDED" mean that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.

MAY This word, or the adjective "OPTIONAL", mean that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation which does not include a particular option MUST be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. In the same vein an implementation which does include a particular option MUST be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides.)

1.3 Abbreviations

Abbreviation	
ASN.1	Abstract Syntax Notation One
DER	Distinguished Encoding Rules
DS	Digital Seal
DSA	Digital Signature Algorithm
DTA	Digital Travel Authorization
ECDSA	Elliptic Curve DSA
ETD	Emergency Travel Document
ICAO	International Civil Aviation Organization
MRTD	Machine Readable Travel Document
MRV	Machine Readable Visa
MRZ	Machine Readable Zone
OID	Object Identifier
PKI	Public Key Infrastructure
TR	Technical Report
VDS	Visible Digital Seal

1.4 Reference documentation

The following documentation served as reference for this technical report:

[Doc9303-3]	ICAO Doc 9303 Machine Readable Tracel Documents, Eigth Edition 2021, Part 3: Specifications Common to all MRTDs
[Doc9303-7]	ICAO Doc 9303 Machine Readable Travel Documents, Eigth Edition 2021, Part 7: Machine Readable Visas
[Doc9303-8]	ICAO Doc 9303 Machine Readable Travel Documents, Eigth Edition 2021, Part 8: Emergency Travel Documents
[Doc9303-13]	ICAO Doc 9303 Machine Readable Travel Documents, Eigth Edition 2021, Part 13: Visible Digital Seals
[RFC2119]	S. Bradner, RFC 2119 Key words for use in RFCs to Indicate Requirement Levels, March 1997

[TR-DTA]	ICAO Technical Report Digital Travel Authorizations, Version 2.15, June 2021
[TR-PKI]	ICAO Technical Report Radio Frequency Protocol and Application Test Standard for eMRTD – Part 5 Tests for PKI Objects, Version 2.00, August 5, 2022
[TR-VDSNC]	ICAO Technical Report VDS-NC Visible Digital Seal for non-constrained environments, Version 1.4, May 27, 2022

2 General test requirements

In [Doc9303-13] and in [TR-VDSNC] there is the generation of seals described as well as the verification. So, conformity test must handle both systems (similar to an eMRTD and an inspection system in the context of ePassports).

The following figure describes a simplified data flow regarding digital seals. On the left side you can see the generation of a seal and on the right side you can see the verification of a seal. The interface between both worlds that also combines both worlds is the image of the 2D bar code. The image is part of the generator (as a result) and the image is also part of the verification (as an input). On this way the image can be used as an input for generator tests and also for verification tests.
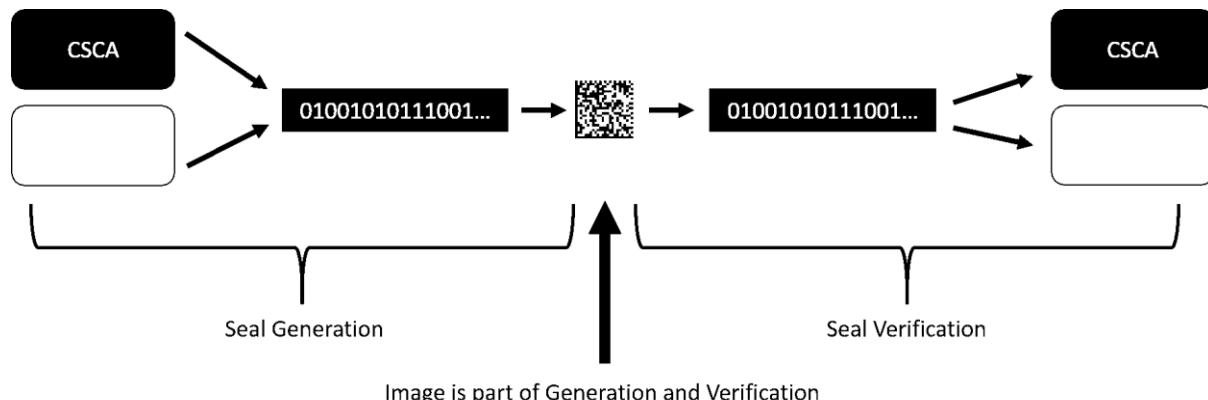
Figure 1Test-Setup for Digital Seals

Each generation system for digital seals might use its own CA. On this way a health certificate could use a different CA than the CSCA that is used in context of eMRTD. Conformity tests should also cover this behaviour.

A test suite implementation that is compliant to this Technical Report must implement all test cases as specified in this Technical Report.

2.1 Profiles

The profile denotes the type of object to be tested.

Profile	Explanation
ETD	Emergency Travel Documents as specified in [Doc9303-8]
VISA	Machine Readable Visa in general as specified in [Doc9303-7]
VISA-MRV-A	Machine Readable Visa of type MRV-A as specified in [Doc9303-7]
VISA-MRV-B	Machine Readable Visa of type MRV-B as specified in [Doc9303-7]
VISA Version 3	Machine Readable Visa as specified in [Doc9303-7]
VISA Version 4	Machine Readable Visa as specified in [Doc9303-7]
Verifier	VDS Verifier for MRV, ETD
MRV-Verifier	VDS Verifier for MRV
ETD-Verifier	VDS Verifier for ETD

Table 1 Profiles

2.2 Assumptions

Tbd.

2.3 Preconditions

Preconditions in test cases serve two purposes:

- Preconditions specify optional components that must be present to execute the test case, e.g. "The image with encoded seal X must be available".

- Preconditions specify test cases that must be passed successfully to execute the test case, e.g. "The digital seal has passed the test case X successfully".

2.4 Information required (Implementation Conformance Statement)

Table 2 lists the information required for the test execution for the different profiles.

Profile	Information required
ETD	Profile, see Table 1
VISA	Profile, see Table 1
VISA-MRV-A	Profile, see Table 1
VISA-MRV-B	Profile, see Table 1
VISA Version 3	Profile, see Table 1
VISA Version 4	Profile, see Table 1
Verifier	Profile, see Table 1
MRV-Verifier	Profile, see Table 1
ETD-Verifier	Profile, see Table 1
Bar code signer certificate	
CSCA certificate	

Table 2 Information required for test execution

3 Test cases for Digital Seals Generators

This clause covers all tests for generators of Digital Seals. All tests for a given profile are mandatory, i.e. a Digital Seal of that profile must pass these test cases successfully, unless marked as optional or conditional.

3.1 Header

3.1.1 Test case VDS-Seal-Header-01

Testcase ID	VDS-Seal-Header-01
Purpose	Verify the fix length of Visa in version 3
Profile	VISA Version 3
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the header of the digital seal
Result	1. The length of the header MUST be 18 bytes.

3.1.2 Test case VDS-Seal-Header-02

Testcase ID	VDS-Seal-Header-02
Purpose	Verify the magic constant of the seal
Profile	VISA or ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the first byte of the array
Result	1. The byte MUST have the value 0xDC.

3.1.3 Test case VDS-Seal-Header-03

Testcase ID	VDS-Seal-Header-03
Purpose	Verify the version number of the seal
Profile	VISA or ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the second byte of the array
Result	1. The byte MUST have the value 0x02 (Version 3) or 0x03 (Version 4).

3.1.4 Test case VDS-Seal-Header-04

Testcase ID	VDS-Seal-Header-04
Purpose	Verify the issuing State or organization of the seal
Profile	VISA or ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the third and fourth byte of the array
Result	1. The bytes MUST have been C40 encoded. The value of the decoded three bytes MUST be a valid three-letter code according to [Doc9303-3]. If the three-letter code comprises less than three letters, the code MUST be padded with filler characters ('<').

3.1.5 Test case VDS-Seal-Header-05

Testcase ID	VDS-Seal-Header-05
Purpose	Verify the signer & certificate reference of the seal
Profile	VISA Version 3
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read byte no. 5 to byte no. 10 (6 bytes) of the array
Result	1. The bytes MUST have been C40 encoded. The value of the decoded nine bytes MUST be a valid Signer Identifier and Certificate Reference. The Certificate Reference 0 ... 0 is reserved for testing purposes and MUST NOT be used.

3.1.6 Test case VDS-Seal-Header-06

Testcase ID	VDS-Seal-Header-06
Purpose	Verify the signer & certificate reference of the seal
Profile	VISA Version 4 or ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read length bytes no. 5 and byte no. 6 (2 bytes) of the array 2. Read the number of bytes encoded as length starting at byte no. 7
Result	1. The bytes MUST have been C40 encoded. The value of the decoded bytes MUST be a valid Signer Identifier and Certificate Reference. The Certificate Reference 0 ... 0 is reserved for testing purposes and MUST NOT be used.

3.1.7 Test case VDS-Seal-Header-07

Testcase ID	VDS-Seal-Header-07
Purpose	Verify the encoded document issuing date
Profile	VISA, ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Depending on the encoding of the previous header read three bytes starting at 0x0A or 0x04+v of the array
Result	1. The three bytes MUST have been C40 encoded. The value of the decoded bytes MUST be a valid calendar date.

3.1.8 Test case VDS-Seal-Header-08

Testcase ID	VDS-Seal-Header-08
Purpose	Verify the encoded signature creation date
Profile	VISA, ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Depending on the encoding of the previous header read three bytes starting at 0x0D or 0x07+v of the array
Result	1. The three bytes MUST have been C40 encoded. The value of the decoded bytes MUST be a valid calendar date.

3.1.9 Test case VDS-Seal-Header-09

Testcase ID	VDS-Seal-Header-09
Purpose	Verify the encoded Document Feature Definition Reference
Profile	VISA
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Depending on the encoding of the previous header read one byte starting at 0x10 or 0x0A+v of the array
Result	1. The value of the byte MUST be 0x5D.

3.1.10 Test case VDS-Seal-Header-10

Testcase ID	VDS-Seal-Header-10
Purpose	Verify the encoded Document Feature Definition Reference
Profile	ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Depending on the encoding of the previous header read one byte starting at 0x10 or 0x0A+v of the array
Result	1. The value of the byte MUST be 0x5E.

3.1.11 Test case VDS-Seal-Header-11

Testcase ID	VDS-Seal-Header-11
Purpose	Verify the encoded Document Type Category
Profile	VISA
Preconditions	The bar code must be decoded as a byte array.

Test scenario	1. Depending on the encoding of the previous header read one byte starting at 0x11or 0x0B+v of the array
Result	1. The value of the byte MUST be 0x01.

3.1.12 Test case VDS-Seal-Header-12

Testcase ID	VDS-Seal-Header-12
Purpose	Verify the encoded Document Type Category
Profile	ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Depending on the encoding of the previous header read one byte starting at 0x11 or 0x0B+v of the array
Result	1. The value of the byte MUST be 0x03.

3.2 Visa document features

This clause covers all tests for Digital Seals of type Visa as specified in [Doc9303-7].

3.2.1 Test case VDS-Seal-VISA-MessageZone-01

Testcase ID	VDS-Seal-VISA-MessageZone-01
Purpose	Verify that no unspecified document features are present
Profile	VISA
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the complete message zone
Result	1. The message zone MUST NOT contain any document features with tags other than 0x01, 0x02, 0x03, 0x04, 0x05, 0x06

3.2.2 Test case VDS-Seal-VISA-MessageZone-02

Testcase ID	VDS-Seal-VISA-MessageZone-02
Purpose	Verify that all document features are only present once
Profile	VISA
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the complete message zone
Result	1. The message zone MUST NOT contain any document features with the same tag more than once

3.2.3 Test case VDS-Seal-VISA-MessageZone-MRZ-01

Testcase ID	VDS-Seal-VISA-MessageZone-MRZ-01
Purpose	Verify the presence of required MRZ document feature
Profile	VISA
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the complete message zone
Result	1. The message zone MUST either contain a document feature with tag 0x01 (indicating the MRV-A MRZ document feature) or contain a document feature with tag 0x02 (indicating an MRV-B MRZ document feature)

3.2.4 Test case VDS-Seal-VISA-MessageZone-MRZ-02-MRV-A

Testcase ID	VDS-Seal-VISA-MessageZone-MRZ-02-MRV-A
Purpose	Verify the length field of the MRZ document feature
Profile	VISA-MRV-A
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the length field (1 byte for version 3 or 1-5 bytes using the DER format in version 4) following the tag byte found in VDS-Seal-VISA-MessageZone-MRZ-01
Result	1. The encoded length MUST be 48 bytes

	2. In case of version 4 the length must be encoded in the minimum number of octets

3.2.5 Test case VDS-Seal-VISA-MessageZone-MRZ-02-MRV-B

Testcase ID	VDS-Seal-VISA-MessageZone-MRZ-02-MRV-B
Purpose	Verify the length field of the MRZ document feature
Profile	VISA-MRV-B
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the length field (1 byte for version 3 or 1-5 bytes using the DER format in version 4) following the tag byte found in VDS-Seal-VISA-MessageZone-MRZ-01
Result	1. The encoded length MUST be 44 bytes 2. In case of version 4 the length must be encoded in the minimum number of octets

3.2.6 Test case VDS-Seal-VISA-MessageZone-MRZ-03-MRV-A

Testcase ID	VDS-Seal-VISA-MessageZone-MRZ-03-MRV-A
Purpose	Verify the contents of the MRZ document feature
Profile	VISA-MRV-A
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the number of bytes indicated by the length field read in VDS-Seal-VISA-MessageZone-MRZ-02 starting after the length field
Result	1. The content bytes MUST be C40-encoded where the filler byte < is replaced by a space character. The decoded content bytes MUST consist of the MRZ of an MRV-A (conforming [Doc9303-7]).

3.2.7 Test case VDS-Seal-VISA-MessageZone-MRZ-03-MRV-B

Testcase ID	VDS-Seal-VISA-MessageZone-MRZ-03-MRV-B
Purpose	Verify the contents of the MRZ document feature
Profile	VISA-MRV-B
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the number of bytes indicated by the length field read in VDS-Seal-VISA-MessageZone-MRZ-02 starting after the length field
Result	1. The content bytes MUST be C40-encoded where the filler byte < is replaced by a space character. The decoded content bytes MUST consist of the MRZ of an MRV-B (conforming [Doc9303-7]).

3.2.8 Test case VDS-Seal-VISA-MessageZone-NoE-01

Testcase ID	VDS-Seal-VISA-MessageZone-NoE-01
Purpose	Verify the length field of optional Number of Entries document feature
Profile	VISA
Preconditions	The bar code must be decoded as a byte array. The message zone contains a document feature with tag 0x03 (indicating Number of Entries)
Test scenario	1. Read the length field (1 byte for version 3 or 1-5 bytes using the DER format in version 4) following the tag byte of the document feature
Result	1. The encoded length MUST be 1 byte 2. In case of version 4 the length must be encoded in the minimum number of octets

3.2.9 Test case VDS-Seal-VISA-MessageZone-DoS-01

Testcase ID	VDS-Seal-VISA-MessageZone-DoS-01
Purpose	Verify the presence of required Duration of Stay document feature
Profile	VISA
Preconditions	The bar code must be decoded as a byte array.

Test scenario	1. Read the complete message zone
Result	1. The message zone MUST contain a document feature with tag 0x04 (indicating Duration of Stay)

3.2.10 Test case VDS-Seal-VISA-MessageZone-DoS-02

Testcase ID	VDS-Seal-VISA-MessageZone-DoS-02
Purpose	Verify the length field of the Duration of Stay document feature
Profile	VISA
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the length field (1 byte for version 3 or 1-5 bytes using the DER format in version 4) following the tag byte found in VDS-Seal-VISA-MessageZone-DoS-01
Result	1. The encoded length MUST be 3 bytes 2. In case of version 4 the length must be encoded in the minimum number of octets

3.2.11 Test case VDS-Seal-VISA-MessageZone-PN-01

Testcase ID	VDS-Seal-VISA-MessageZone-PN-01
Purpose	Verify the presence of required Passport Number document feature
Profile	VISA
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the complete message zone
Result	1. The message zone MUST contain a document feature with tag 0x05 (indicating Passport Number)

3.2.12 Test case VDS-Seal-VISA-MessageZone-PN-02

Testcase ID	VDS-Seal-VISA-MessageZone-PN-02
Purpose	Verify the length field of the Passport Number document feature
Profile	VISA
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the length field (1 byte for version 3 or 1-5 bytes using the DER format in version 4) following the tag byte found in VDS-Seal-VISA-MessageZone-PN-01
Result	1. The encoded length MUST be 6 bytes 2. In case of version 4 the length must be encoded in the minimum number of octets

3.2.13 Test case VDS-Seal-VISA-MessageZone-PN-03

Testcase ID	VDS-Seal-VISA-MessageZone-PN-03
Purpose	Verify the contents of the Passport Number document feature
Profile	VISA
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the number of bytes indicated by the length field read in VDS-Seal-VISA-MessageZone-PN-02 starting after the length field
Result	1. The content bytes MUST be C40 encoded 2. The decoded content MUST contain a valid passport number in accordance with the provisions of [Doc9303-7]

3.2.14 Test case VDS-Seal-VISA-MessageZone-VT-01

Testcase ID	VDS-Seal-VISA-MessageZone-VT-01
Purpose	Verify the length field of optional Visa Type document feature
Profile	VISA
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Scan the byte array for a document feature with tag 0x06. If no such document feature exists, abort.

	2. Read the length field (1 byte for version 3 or 1-5 bytes using the DER format in version 4) following the tag byte of the document feature
Result	1. The encoded length MUST be at least 1 byte and not greater than 4 bytes

3.3 ETD document features

This clause covers all tests for Digital Seals of type ETD as specified in [Doc9303-8].

3.3.1 Test case VDS-Seal-ETD-MessageZone-01

Testcase ID	VDS-Seal-ETD-MessageZone-01
Purpose	Verify that no unspecified document features are present
Profile	ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the complete message zone
Result	1. The message zone MUST NOT contain any document features with tags other than 0x02

3.3.2 Test case VDS-Seal-ETD-MessageZone-02

Testcase ID	VDS-Seal-ETD-MessageZone-02
Purpose	Verify that all document features are only present once
Profile	ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the complete message zone
Result	1. The message zone MUST NOT contain any document features with the same tag more than once

3.3.3 Test case VDS-Seal-ETD-MessageZone-MRZ-01

Testcase ID	VDS-Seal-ETD-MessageZone-MRZ-01
Purpose	Verify the presence of required MRZ document feature
Profile	ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the complete message zone
Result	1. The message zone MUST contain a document feature with tag 0x02 (indicating Machine Readable Zone)

3.3.4 Test case VDS-Seal-ETD-MessageZone-MRZ-02

Testcase ID	VDS-Seal-ETD-MessageZone-MRZ-02
Purpose	Verify the length field of the MRZ document feature
Profile	ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the length field (1 byte for version 3 or 1-5 bytes using the DER format in version 4) following the tag byte found in VDS-Seal-ETD-MessageZone-MRZ-01
Result	1. The encoded length MUST be 48 bytes 2. In case of version 4 the length must be encoded in the minimum number of octets

3.3.5 Test case VDS-Seal-ETD-MessageZone-MRZ-03

Testcase ID	VDS-Seal-ETD-MessageZone-MRZ-03
Purpose	Verify the contents of the MRZ document feature
Profile	ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the number of bytes indicated by the length field read in VDS-Seal-ETD-MessageZone-MRZ-02 starting after the length field

Result	1. The content bytes MUST be C40-encoded where the filler byte < is replaced by a space character
	2. The decoded content bytes MUST consist of the concatenation of the first and second line of the MRZ of a TD2-MROTD (each 36 character)

3.4 Test cases for signatures

This clause covers main tests for signatures of Digital Seals. In [TR-PKI] more test cases for Digital Seals are specified.

3.4.1 Test case VDS-Seal-Signature-01

Testcase ID	VDS-Seal-Signature-01
Purpose	Verify that signature field is present
Profile	VISA or ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the first byte after the message zone
Result	1. The byte MUST be 0xff (tag of signature field)

3.4.2 Test case VDS-Seal-Signature-02

Testcase ID	VDS-Seal-Signature-02
Purpose	Verify the length of signature
Profile	VISA or ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Read the length field (1 byte for version 3 or 1-5 bytes using the DER format in version 4) following the tag byte found in VDS-Seal-Signature-01
Result	1. The value of the length field MUST match the number of bytes remaining (not including the tag and length value)[1]
	2. In case of version 4 the length must be encoded in the minimum number of octets

3.4.3 Test case VDS-Seal-Signature-03

Testcase ID	VDS-Seal-Signature-03
Purpose	Verify the validity of signature
Profile	VISA or ETD
Preconditions	The bar code must be decoded as a byte array.
Test scenario	1. Validate the signature by providing the (hashed) concatenation of the header and complete message zone (excluding all bytes starting from the 0xFF byte indicating the signature field) and the signature bytes following the signature length field to the verify function of the signature algorithm in use. Use ECDSA for signature verification with a hash algorithm deduced from the bit length of the order of the base point generator of the curve used for creating the signature – as specified in the clarification on Doc 9303-13.
Result	1. The result MUST indicate "valid"

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[1] Note: The specification allows for an optional padding. However, the padding is applied on bar code level and should not be present in the decoded byte sequence

4 Test cases for Digital Seals Verifiers

This clause covers all tests for verifiers of Digital Seals. All tests for a given profile are mandatory, i.e. a Digital Seal of that profile must pass these test cases successfully, unless marked as optional or conditional. All test cases make use of a valid signature if not otherwise specified.

4.1 Header

4.1.1 Test case VDS-Verifier-Header-01

Testcase ID	VDS-Verifier-Header-01
Purpose	Positive test case to assure that the Verifier interprets a correct magic constant correctly
Profile	Verifier
Preconditions	The corresponding bar code must be available.
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.1.2 Test case VDS-Verifier-Header-02

Testcase ID	VDS-Verifier-Header-02
Purpose	Negative test case to assure that the Verifier detects an incorrect magic constant
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace magic constant with invalid value 0xDB
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect an invalid magic constant.

4.1.3 Test case VDS-Verifier-Header-03

Testcase ID	VDS-Verifier-Header-03
Purpose	Positive test case to assure that the Verifier interprets a correct version 3 byte
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace version byte with valid value 0x02
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.1.4 Test case VDS-Verifier-Header-04

Testcase ID	VDS-Verifier-Header-04
Purpose	Positive test case to assure that the Verifier interprets a correct version 4 byte
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace version byte with valid value 0x03
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.1.5 Test case VDS-Verifier-Header-05

Testcase ID	VDS-Verifier-Header-05
Purpose	Negative test case to assure that the Verifier detects an incorrect version byte
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace version byte with invalid value 0x01
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect an invalid version number.

4.1.6 Test case VDS-Verifier-Header-06

Testcase ID	VDS-Verifier-Header-06
Purpose	Positive test case to assure that the Verifier interprets a correct version 4 byte
Profile	ETD-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace version byte with valid value 0x03
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.1.7 Test case VDS-Verifier-Header-07

Testcase ID	VDS-Verifier-Header-07
Purpose	Negative test case to assure that the Verifier detects a version 3 byte
Profile	ETD-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace version byte with unsupported value 0x02
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect an invalid version number.

4.1.8 Test case VDS-Verifier-Header-08

Testcase ID	VDS-Verifier-Header-08
Purpose	Positive test case to assure that the Verifier interprets a correct issuing country code
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace country code with valid C40-encoded value 'D<<'
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.1.9 Test case VDS-Verifier-Header-09

Testcase ID	VDS-Verifier-Header-09
Purpose	Negative test case to assure that the Verifier interprets an incorrect issuing country code
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace country code with C40 encoding of invalid country code 'ABC'
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect an invalid country code.

4.1.10 Test case VDS-Verifier-Header-10

Testcase ID	VDS-Verifier-Header-10
Purpose	Negative test case to assure that the Verifier interprets an incorrectly padded issuing country code
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace country code with C40 encoding of incorrectly padded country code 'D<'
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect an invalid country code.

4.1.11 Test case VDS-Verifier-Header-11

Testcase ID	VDS-Verifier-Header-11

Purpose	Positive test case to assure that the Verifier interprets a correct signer identifier
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Use a valid signer identifier consisting of a two-letter country code according to [Doc9303-3] and two alphanumerical characters
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal

4.1.12 Test case VDS-Verifier-Header-12

Testcase ID	VDS-Verifier-Header-12
Purpose	Positive test case to assure that the Verifier interprets a correct certificate reference
Profile	Verifier
Preconditions	The corresponding bar code with header version 3 must be available
	Variance: Use a valid certificate reference consisting of exactly 5 hex characters
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal

4.1.13 Test case VDS-Verifier-Header-13

Testcase ID	VDS-Verifier-Header-13
Purpose	Positive test case to assure that the Verifier interprets a correct certificate reference
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Use a valid certificate reference consisting of exactly 2 hex characters denoting the length of the following hex characters and the hex characters identifying a certificate
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal

4.1.14 Test case VDS-Verifier-Header-14

Testcase ID	VDS-Verifier-Header-14
Purpose	Positive test case to assure that the Verifier interprets a long certificate reference
Profile	Verifier
Preconditions	The corresponding bar code with header version 4 must be available
	Variance: Use a certificate reference using a certificate serial number of 20 octects
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal

4.1.15 Test case VDS-Verifier-Header-15

Testcase ID	VDS-Verifier-Header-15
Purpose	Negative test case to assure that the verifier detects an invalid signer identifier
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Use a signer identifier using a country / issuer code not defined in [Doc9303-3]
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect an invalid signer identifier

4.1.16 Test case VDS-Verifier-Header-16

Testcase ID	VDS-Verifier-Header-16

Purpose	Positive test case to assure that the Verifier interprets a correct document issue date
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace document issue date with valid date encoding for 07.04.2022
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.1.17 Test case VDS-Verifier-Header-17

Testcase ID	VDS-Verifier-Header-17
Purpose	Negative test case to assure that the Verifier interprets an incorrect document issue date
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace document issue date with invalid date encoding for 40.13.2022
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect an invalid document issue date.

4.1.18 Test case VDS-Verifier-Header-18

Testcase ID	VDS-Verifier-Header-18
Purpose	Positive test case to assure that the Verifier interprets a correct signature creation date
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace signature creation date with valid date encoding for 07.04.2022
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.1.19 Test case VDS-Verifier-Header-19

Testcase ID	VDS-Verifier-Header-19
Purpose	Negative test case to assure that the Verifier interprets an incorrect signature creation date
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace signature creation date with invalid date encoding for 40.13.2022
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect an invalid signature creation date.

4.1.20 Test case VDS-Verifier-Header-20

Testcase ID	VDS-Verifier-Header-20
Purpose	Positive test case to assure that the Verifier interprets a correct Document Feature Definition Reference
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace Document Feature Definition Reference with valid value 0x5D for Document Type Category 0x01
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.1.21 **Test case VDS-Verifier-Header-21**

Testcase ID	VDS-Verifier-Header-21
Purpose	Positive test case to assure that the Verifier interprets an incorrect Document Feature Definition Reference
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace Document Feature Definition Reference with invalid value 0x5E for Document Type Category 0x01
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect an invalid Document Feature Definition Reference.

4.1.22 **Test case VDS-Verifier-Header-22**

Testcase ID	VDS-Verifier-Header-22
Purpose	Positive test case to assure that the Verifier interprets a correct Document Type Category
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace Document Type Category with valid value 0x01
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.1.23 **Test case VDS-Verifier-Header-23**

Testcase ID	VDS-Verifier-Header-23
Purpose	Positive test case to assure that the Verifier interprets an incorrect Document Type Category
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace Document Type Category with an undefined value 0x07
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect an invalid Document Type Category.

4.2 Visa document features

4.2.1 **Test case VDS-Verifier-VISA-MRZ-01**

Testcase ID	VDS-Verifier-VISA-MRZ-01
Purpose	Positive test case to assure that the Verifier interprets a barcode with valid MRZ-A document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Includes a valid MRZ of a MRV-A document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.2.2 **Test case VDS-Verifier-VISA-MRZ-02**

Testcase ID	VDS-Verifier-VISA-MRZ-02
Purpose	Positive test case to assure that the Verifier interprets a barcode with valid MRZ-B document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Includes a valid MRZ of MRV-B document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.2.3 **Test case VDS-Verifier-VISA-MRZ-03**

Testcase ID	VDS-Verifier-VISA-MRZ-03
Purpose	Negative test case to assure that the Verifier detects a barcode with no MRZ document feature present
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Includes neither an MRZ of MRV-A nor an MRZ of MRV-B document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that an MRZ feature is missing

4.2.4 **Test case VDS-Verifier-VISA-MRZ-04**

Testcase ID	VDS-Verifier-VISA-MRZ-04
Purpose	Negative test case to assure that the Verifier detects a barcode with an instance of both the MRZ of MRV-A and MRZ of MRV-B document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Includes an MRZ of MRV-A and an MRZ of MRV-B document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that there are multiple MRZ document features present

4.2.5 **Test case VDS-Verifier-VISA-MRZ-05**

Testcase ID	VDS-Verifier-VISA-MRZ-05
Purpose	Negative test case to assure that the Verifier detects a barcode with multiple instances of the MRZ of MRV-A document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Includes two MRZ of MRV-A document features
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that there are multiple MRZ document features present

4.2.6 **Test case VDS-Verifier-VISA-MRZ-06**

Testcase ID	VDS-Verifier-VISA-MRZ-06
Purpose	Negative test case to assure that the Verifier detects a barcode with multiple instances of the MRZ of MRV-B document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Includes two MRZ of MRV-B document features
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that there are multiple MRZ document features present

4.2.7 **Test case VDS-Verifier-VISA-MRZ-07**

Testcase ID	VDS-Verifier-VISA-MRZ-07
Purpose	Negative test case to assure that the Verifier detects a barcode with a too long MRZ of MRV-A
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available

	Variance: Include an MRZ of MRV-A with a value longer than 48 bytes (by appending < padding symbols to a valid MRZ string)
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the MRZ feature is incorrect

4.2.8 Test case VDS-Verifier-VISA-MRZ-08

Testcase ID	VDS-Verifier-VISA-MRZ-08
Purpose	Negative test case to assure that the Verifier detects a barcode with a too short MRZ of MRV-A
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include an MRZ of MRV-A with a value shorter than 48 bytes
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the MRZ feature is incorrect

4.2.9 Test case VDS-Verifier-VISA-MRZ-09

Testcase ID	VDS-Verifier-VISA-MRZ-09
Purpose	Negative test case to assure that the Verifier detects a barcode with an invalid MRZ of MRV-A
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include an MRZ of MRV-A with 48 bytes of random data
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the MRZ feature is incorrect

4.2.10 Test case VDS-Verifier-VISA-MRZ-10

Testcase ID	VDS-Verifier-VISA-MRZ-10
Purpose	Negative test case to assure that the Verifier detects a barcode with an MRZ of MRV-A document feature which value is a correct value for MRZ of MRV-B
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include an MRZ of MRV-A which value is a valid value for the MRZ of MRV-B document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the MRZ-A feature is incorrect

4.2.11 Test case VDS-Verifier-VISA-MRZ-11

Testcase ID	VDS-Verifier-VISA-MRZ-11
Purpose	Negative test case to assure that the Verifier detects a barcode with a too long MRZ of MRV-B
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include an MRZ of MRV-B with a value longer than 44 bytes (by appending < padding symbols to a valid MRZ string)
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the MRZ feature is incorrect

4.2.12 **Test case VDS-Verifier-VISA-MRZ-12**

Testcase ID	VDS-Verifier-VISA-MRZ-12
Purpose	Negative test case to assure that the Verifier detects a barcode with a too short MRZ of MRV-B
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include an MRZ of MRV-B with a value shorter than 44 bytes
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the MRZ feature is incorrect

4.2.13 **Test case VDS-Verifier-VISA-MRZ-13**

Testcase ID	VDS-Verifier-VISA-MRZ-13
Purpose	Negative test case to assure that the Verifier detects a barcode with an invalid MRZ of MRV-B
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include an MRZ of MRV-B with 44 bytes of random data
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the MRZ feature is incorrect

4.2.14 **Test case VDS-Verifier-VISA-MRZ-14**

Testcase ID	VDS-Verifier-VISA-MRZ-14
Purpose	Negative test case to assure that the Verifier detects a barcode with an MRZ of MRV-B document feature which value is a correct value for MRZ of MRV-A
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include an MRZ of MRV-B which value is a valid value for the MRZ of MRV-A document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the MRZ of MRV-B feature is incorrect

4.2.15 **Test case VDS-Verifier-VISA-NoE-01**

Testcase ID	VDS-Verifier-VISA-NoE-01
Purpose	Positive test case to assure that the Verifier accepts a barcode with a valid Number of Entries document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include a valid Number of Entries document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.2.16 **Test case VDS-Verifier-VISA-NoE-02**

Testcase ID	VDS-Verifier-VISA-NoE-02
Purpose	Positive test case to assure that the Verifier accepts a barcode without a Number of Entries document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Do not include a valid Number of Entries document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.2.17 Test case VDS-Verifier-VISA-NoE-03

Testcase ID	VDS-Verifier-VISA-NoE-03
Purpose	Negative test case to assure that the Verifier detects a barcode with multiple instances of the Number of Entries document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Includes two valid Number of Entries document features
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that there are multiple Number of Entries document features present

4.2.18 Test case VDS-Verifier-VISA-NoE-04

Testcase ID	VDS-Verifier-VISA-NoE-04
Purpose	Negative test case to assure that the Verifier detects a barcode with a Number of Entries document feature with length of 0
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include (empty) Number of Entries document feature with length set to 0
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the Number of Entries document feature is incorrect

4.2.19 Test case VDS-Verifier-VISA-NoE-05

Testcase ID	VDS-Verifier-VISA-NoE-05
Purpose	Negative test case to assure that the Verifier detects a barcode with a Number of Entries document feature with length greater than 1
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include Number of Entries document feature with a length of 2
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the Number of Entries document feature is incorrect

4.2.20 Test case VDS-Verifier-VISA-DoS-01

Testcase ID	VDS-Verifier-VISA-DoS-01
Purpose	Positive test case to assure that the Verifier accepts a barcode with a valid Duration of Stay document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include a valid Duration of Stay document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.2.21 Test case VDS-Verifier-VISA-DoS-02

Testcase ID	VDS-Verifier-VISA-DoS-02
Purpose	Negative test case to assure that the Verifier detects a barcode without a Duration of Stay document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Do not include a Duration of Stay document feature
Test scenario	The Verifier must read the image

Result	The Verifier MUST decode the image and MUST detect that the Duration of Stay document feature is missing

4.2.22 Test case VDS-Verifier-VISA-DoS-03

Testcase ID	VDS-Verifier-VISA-DoS-03
Purpose	Negative test case to assure that the Verifier detects a barcode with multiple Duration of Stay document features
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include multiple valid Duration of Stay document features
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image and MUST detect that there are more than one instances of the Duration of Stay document feature

4.2.23 Test case VDS-Verifier-VISA-DoS-04

Testcase ID	VDS-Verifier-VISA-DoS-04
Purpose	Negative test case to assure that the Verifier detects a barcode with a Duration of Stay document feature with length less than 3
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include Duration of Stay document feature with a length of 2
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the Duration of Stay document feature is incorrect

4.2.24 Test case VDS-Verifier-VISA-DoS-05

Testcase ID	VDS-Verifier-VISA-DoS-05
Purpose	Negative test case to assure that the Verifier detects a barcode with a Duration of Stay document feature with length greater than 3
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include Duration of Stay document feature with a length of 4
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the Duration of Stay document feature is incorrect

4.2.25 Test case VDS-Verifier-VISA-DoS-06

Testcase ID	VDS-Verifier-VISA-DoS-06
Purpose	Positive test case to assure that the verifier accepts a Duration of Stay with special value 0x000000
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include Duration of Stay document feature with value 0x000000
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.2.26 Test case VDS-Verifier-VISA-DoS-07

Testcase ID	VDS-Verifier-VISA-DoS-07
Purpose	Positive test case to assure that the verifier accepts a Duration of Stay with special value 0xFFFFFF
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include Duration of Stay document feature with value 0xFFFFFF
Test scenario	The Verifier must read the image

Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.2.27 **Test case VDS-Verifier-VISA-DoS-08**

Testcase ID	VDS-Verifier-VISA-DoS-08
Purpose	Positive test case to assure that the verifier accepts a Duration of Stay with special value 0xFEFEFE
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include Duration of Stay document feature with value 0xFEFEFE
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.2.28 **Test case VDS-Verifier-VISA-PN-01**

Testcase ID	VDS-Verifier-VISA-PN-01
Purpose	Positive test case to assure that the Verifier accepts a barcode with a valid Passport Number document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include a valid Passport Number document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.2.29 **Test case VDS-Verifier-VISA-PN-02**

Testcase ID	VDS-Verifier-VISA-PN-02
Purpose	Negative test case to assure that the Verifier detects a barcode without a Passport Number document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Do not include a valid Passport Number document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the Passport Number document feature is missing.

4.2.30 **Test case VDS-Verifier-VISA-PN-03**

Testcase ID	VDS-Verifier-VISA-PN-03
Purpose	Negative test case to assure that the Verifier detects a barcode with multiple instances of the Passport Number document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Includes two valid Passport Number document features
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that there are multiple Passport Number document features present

4.2.31 **Test case VDS-Verifier-VISA-PN-04**

Testcase ID	VDS-Verifier-VISA-PN-04
Purpose	Negative test case to assure that the Verifier detects a barcode with a Passport Number document feature with length shorter than 6 bytes
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include Passport Number document feature with length of 5
Test scenario	The Verifier must read the image

Result	The Verifier MUST decode the image successfully and MUST detect that the Passport Number document feature is incorrect

4.2.32 **Test case VDS-Verifier-VISA-PN-05**

Testcase ID	VDS-Verifier-VISA-PN-05
Purpose	Negative test case to assure that the Verifier detects a barcode with a Passport Number document feature with length greater than 6 bytes
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include Passport Number document feature with length of 7
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the Passport Number document feature is incorrect

4.2.33 **Test case VDS-Verifier-VISA-VT-01**

Testcase ID	VDS-Verifier-VISA-VT-01
Purpose	Positive test case to assure that the Verifier accepts a barcode with a valid Visa Type document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include a valid Visa Type document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.2.34 **Test case VDS-Verifier-VISA-VT-02**

Testcase ID	VDS-Verifier-VISA-VT-02
Purpose	Negative test case to assure that the Verifier detects a barcode without Visa Type document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Do not include Visa Type document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that this is not a valid digital seal.

4.2.35 **Test case VDS-Verifier-VISA-VT-03**

Testcase ID	VDS-Verifier-VISA-VT-03
Purpose	Negative test case to assure that the Verifier detects a barcode with multiple instances of the Visa Type document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Includes two valid Visa Type document features
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that there are multiple Visa Type document features present

4.2.36 **Test case VDS-Verifier-VISA-VT-04**

Testcase ID	VDS-Verifier-VISA-VT-04
Purpose	Negative test case to assure that the Verifier detects a barcode with empty Visa Type document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Includes Visa Type with length 0

Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the Visa Type document feature is incorrect

4.2.37 **Test case VDS-Verifier-VISA-VT-05**

Testcase ID	VDS-Verifier-VISA-VT-05
Purpose	Negative test case to assure that the Verifier detects a barcode with a Visa Type document feature with length greater than 4 bytes
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include Visa Type document feature with length of 5
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the Visa Type document feature is incorrect

4.2.38 **Test case VDS-Verifier-VISA-AF-02**

Testcase ID	VDS-Verifier-VISA-AF-02
Purpose	Positive test case to assure that the Verifier accepts a barcode without Additional Field document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Do not include Additional Field document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.2.39 **Test case VDS-Verifier-VISA-AF-03**

Testcase ID	VDS-Verifier-VISA-AF-03
Purpose	Negative test case to assure that the Verifier detects a barcode with multiple instances of the Additional Field document feature
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Includes two valid Additional Field document features
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that there are multiple Additional Field document features present

4.2.40 **Test case VDS-Verifier-VISA-AF-04**

Testcase ID	VDS-Verifier-VISA-AF-04
Purpose	Negative test case to assure that the Verifier detects a barcode with an Additional Field document feature with length greater than 254 bytes
Profile	MRV-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include Additional Field document feature with length of 255
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the Additional Field document feature is incorrect

4.3 ETD document features

4.3.1 Test case VDS-Verifier-ETD-MRZ-01

Testcase ID	VDS-Verifier-ETD-MRZ-01
Purpose	Positive test case to assure that the Verifier accepts a barcode with a valid Machine Readable Zone document feature
Profile	ETD-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include a valid Machine Readable Zone document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.3.2 Test case VDS-Verifier-ETD-MRZ-02

Testcase ID	VDS-Verifier-ETD-MRZ-02
Purpose	Negative test case to assure that the Verifier detects a barcode without a Machine Readable Zone document feature
Profile	ETD-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Do not include the Machine Readable Zone document feature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the Machine Readable Zone document feature is missing.

4.3.3 Test case VDS-Verifier-ETD-MRZ-03

Testcase ID	VDS-Verifier-ETD-MRZ-03
Purpose	Negative test case to assure that the Verifier detects a barcode with multiple Machine Readable Zone document features
Profile	ETD-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include multiple valid Machine Readable Zone document features
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image and MUST detect that there are more than one instances of the Machine Readable Zone document feature

4.3.4 Test case VDS-Verifier-ETD-MRZ-04

Testcase ID	VDS-Verifier-ETD-MRZ-04
Purpose	Negative test case to assure that the Verifier detects a barcode with an MRZ that is too long
Profile	ETD-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include an MRZ with a value longer than 48 bytes (by appending < padding symbols to a valid MRZ string)
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the MRZ feature is incorrect

4.3.5 Test case VDS-Verifier-ETD-MRZ-05

Testcase ID	VDS-Verifier-ETD-MRZ-05
Purpose	Negative test case to assure that the Verifier detects a barcode with an MRZ that is too short
Profile	ETD-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include an MRZ with a value shorter than 48 bytes
Test scenario	The Verifier must read the image

Result	The Verifier MUST decode the image successfully and MUST detect that the MRZ feature is incorrect

4.3.6 Test case VDS-Verifier-ETD-MRZ-06

Testcase ID	VDS-Verifier-ETD-MRZ-06
Purpose	Negative test case to assure that the Verifier detects a barcode with an invalid MRZ-A
Profile	ETD-Verifier
Preconditions	The corresponding bar code must be available
	Variance: Include an MRZ with 48 bytes of random data
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the MRZ feature is incorrect

4.4 Test cases for signatures

This clause covers main tests for signatures of Digital Seals. In [TR-PKI] more test cases for Digital Seals are specified.

4.4.1 Test case VDS-Verifier-Signature-01

Testcase ID	VDS-Verifier-Signature-01
Purpose	Positive test case to assure that the Verifier accepts a barcode with a valid signature
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Append valid signature over header and message zone
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully as a valid digital seal.

4.4.2 Test case VDS-Verifier-Signature-02

Testcase ID	VDS-Verifier-Signature-02
Purpose	Negative test case to assure that the Verifier detects a barcode without a signature field
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Remove signature from barcode
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the signature is missing

4.4.3 Test case VDS-Verifier-Signature-03

Testcase ID	VDS-Verifier-Signature-03
Purpose	Negative test case to assure that the Verifier detects a barcode with empty signature field
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Append signature field with a length of 0
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the signature is empty

4.4.4 Test case VDS-Verifier-Signature-04

Testcase ID	VDS-Verifier-Signature-04

Purpose	Negative test case to assure that the Verifier detects a barcode with invalid signature tag
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Append a valid signature but replace tag with 0xFE
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that no signature can be found

4.4.5 Test case VDS-Verifier-Signature-05

Testcase ID	VDS-Verifier-Signature-05
Purpose	Negative test case to assure that the Verifier detects a barcode where the signature field is encoded within the message zone
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Move the signature field before the last document feature of the message zone
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect the incorrect encoding

4.4.6 Test case VDS-Verifier-Signature-06

Testcase ID	VDS-Verifier-Signature-06
Purpose	Negative test case to assure that the Verifier detects a barcode where the signature's length field is greater than the number of bytes following
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Increment the value of the length field of a valid signature
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect the incorrect encoding

4.4.7 Test case VDS-Verifier-Signature-07

Testcase ID	VDS-Verifier-Signature-07
Purpose	Negative test case to assure that the Verifier detects a barcode where the signature is invalid
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace the value of the signature with random values
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the signature is invalid

4.4.8 Test case VDS-Verifier-Signature-08

Testcase ID	VDS-Verifier-Signature-08
Purpose	Negative test case to assure that the Verifier detects a barcode where the signature is computed only over the message zone
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace the signature's value with a signature over the message zone
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the signature is invalid

4.4.9 Test case VDS-Verifier-Signature-09

Testcase ID	VDS-Verifier-Signature-09
Purpose	Negative test case to assure that the Verifier detects a barcode where the signature is computed only over the header
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace the signature's value with a signature over the header
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the signature is invalid

4.4.10 Test case VDS-Verifier-Signature-10

Testcase ID	VDS-Verifier-Signature-10
Purpose	Negative test case to assure that the Verifier detects a barcode where the signature is computed over header, message zone, as well as tag and length bytes of signature field
Profile	Verifier
Preconditions	The corresponding bar code must be available
	Variance: Replace the signature's value with a signature over the header, message zone, as well as tag and length bytes of signature field
Test scenario	The Verifier must read the image
Result	The Verifier MUST decode the image successfully and MUST detect that the signature is invalid