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Processes, data elements and documents in commerce, industry and administration — Long term signature —

Part 1: Profiles for CMS Advanced Electronic Signatures (CAdES)

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 154 *Processes, data elements and documents in commerce, industry and administration*.

This third edition cancels and replaces the second edition (ISO 14533-1:2014), which has been technically revised.

The main changes are as follows:

— Clause 6 and Annex B have been technically revised with the addition of a new archive time-stamp format: archive-time-stamp-v3 (ATSv3) and an associated attribute ats-hash-index-v3 and with the addition of other methods defined in ISO 14533-4:2019.

A list of all parts in the ISO 14533 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The purpose of this document is to ensure the interoperability of implementations with respect to long term signatures that make digital signatures verifiable for a long term. Long term signature specifications referenced by each implementation cover Cryptographic Message Syntax (CMS) digital signatures defined in IETF RFC 5652 extended in CAdES digital signatures developed by the European Telecommunications Standards Institute (ETSI).

ETSI changes 'CMS Advanced Electronic Signature' to 'CAdES Digital Signature' from TS to EN. In this document, CAdES is used also in line with the ETSI EN definition.

Processes, data elements and documents in commerce, industry and administration — Long term signature —

Part 1: Profiles for CMS Advanced Electronic Signatures (CAdES)

1 Scope

This document specifies the elements, among those defined in CMS digital signatures and CAdES digital signatures that enable verification of a digital signature over a long period of time.

It does not give new technical specifications about the digital signature itself, nor new restrictions of usage of the technical specifications about the digital signatures which have already existed.

NOTE CAdES digital signature is the extended specification of Cryptographic message syntax (CMS), used widely.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14533-4, *Processes, data elements and documents in commerce, industry and administration — Long term signature profiles — Part 4: Attributes pointing to (external) proof of existence objects used in long term signature formats (PoEAttributes)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
long term signature
signature that is made verifiable having the ability to maintain its validity status and to get a proof of existence of the associated signed data for a long term by implementing measures to enable the detection of illegal alterations of signature information, including the identification of signing time, the subject of said signature, and validation data

3.2
profile
rule used to ensure interoperability, related to the optional elements of referenced specifications, the range of values

3.3
required level
level of requirement for implementing each element constituting a *profile* (3.2)

3.4
cryptographic message syntax
CMS
syntax pertaining to the signature, digest, authentication, and encryption of a given message

Note 1 to entry: Cryptographic message syntax is defined in IETF RFC 5652.

3.5
CMS digital signature
CAdES digital signature
CAdES
digital signature for which the signer can be identified, and any illegal data alteration detected

Note 1 to entry: Note 1to entry: A digital signature is defined in IETF/RFC 5652 and ETSI/EN 319 122-1.

3.6
CAdES-T
CAdES with time
CAdES digital signature with information to ascertain signing time

EXAMPLE Signature time-stamp.

Note 1 to entry: A CAdES digital signature is defined in ETSI/EN 319 122-1.

3.7
CAdES-A
archival CAdES
CAdES digital signature with information that enables the detection of any illegal alterations of information pertaining to the signature, including the subject of the signature and validation data

EXAMPLE Archive time-stamp.

Note 1 to entry: A CAdES digital signature is defined in ETSI/EN 319 122-1.

3.8
content information
data structure that defines the content in CMS

3.9
signed data
data structure in CMS or related data

3.10
signerinfo
data structure that defines the signature information for each signer or related data

3.11
signed attribute
signature information that is the subject of a signature

3.12
unsigned attribute
signature information that is not the subject of a signature

Note 1 to entry: The signature time-stamp and archive time-stamp are unsigned attributes.

3.13
validation data
certificate and revocation information used to validate a signature and time-stamp

3.14
time-stamping authority
TSA
trusted third party (3.19) commissioned to provide proof that certain data existed prior to a certain point in time

3.15
time-stamp token
TST
data object that binds a representation of a datum to a particular time, thus establishing evidence that the datum existed before that time

3.16
signature time-stamp
time-stamp affixed to a signature value in order to identify the time when the signature existed

3.17
archive time-stamp
time-stamp affixed to information pertaining to a signature, including the subject of the signature and *validation data* (3.13), in order to enable the detection of any illegal alteration

3.18
trust anchor
origin of trust provided in the form of a public key certificate or public key used by the validator to validate an electronic signature, and generally a public key certificate issued by a trusted root certification authority

3.19
trusted third party
TTP
security authority or its agent entrusted by another entity in connection with activities related to security

3.20
certification authority
CA
centre that is entrusted with the development and assignment of public key certificates

Note 1 to entry: Certification authorities can, at their discretion, develop and assign keys to entities, see ISO/IEC 9594-8.

3.21
certificate
information on the publicly disclosed key as a part of an asymmetric key pair for an entity, signed by a *certification authority* (3.20) to prevent forgery

3.22
attribute certificate
certificate (3.21) containing the job, qualification, position, and other attributes and attribute values

3.23
revocation information
information issued by a *certification authority* (3.20) with respect to a certificate revocated within the effective period

Note 1 to entry: This information can be collated to determine whether the certificate is still in force.

3.24
enhanced security service
ESS
optional enhanced service related to a signature including, but not limited to, information identifying SigningCertificate and information showing the type of signature

4 Symbols

The following symbols are used for the “required level”.

— C: Conditional;

— M: Mandatory;

— O: Optional;

— P: Prohibited (creation or modification).

5 Requirements

5.1 The generation or validation of CAdES-T data conforms to this document provided that the following requirements are met:

a) all processing of elements whose required level is “Mandatory” in the CAdES-T profile, as specified in this document, shall be included;

b) detailed specifications pertaining to the processing of any element whose required level is “Conditional” in the CAdES-T profile, as specified in this document, shall be provided.

5.2 The generation or validation of CAdES-A data conforms to this document provided that the following requirements are met:

a) all processing of elements whose required level is “Mandatory” in the CAdES-A profile, as specified in this document, shall be included;

b) detailed specifications pertaining to the processing of any element whose required level is “Conditional” in the CAdES-A profile, as specified in this document, shall be provided.

5.3 If first-party conformity assessment is used, the implementer shall make a declaration of conformity to this document by disclosing the supplier's declaration of compliance and its attachment (as given in Annex A) containing a description of implementation status (and the specifications for any “Conditional” elements).

NOTE Figure 1 shows the positioning of the generation and validation of CAdES-T data and CAdES-A data.

6 Long term signature profiles

6.1 Defined profiles

In order to make electronic signatures verifiable for a long term, signing time shall be identifiable, any illegal alterations of information pertaining to signatures, including the subject of information and validation data, shall be detectable, and interoperability ensured. To meet these requirements, this document defines the following two profiles with respect to CAdES:

a) CAdES-T profile: a profile pertaining to the generation and validation of CAdES-T data;

b) CAdES-A profile: a profile pertaining to the generation and validation of CAdES-A data.

Figure 1 shows the relation between CAdES-T data and CAdES-A data.

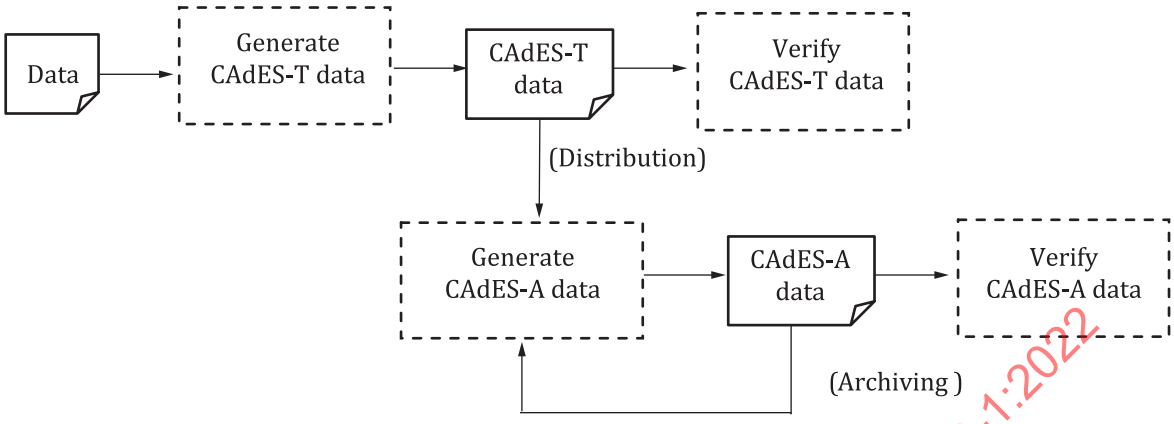

Figure 1 — Relation between CAdES-T data and CAdES-A data

6.2 Representation of the required level

This document defines the following representation methods for the required level (as a profile) of each element constituting CAdES-T data and CAdES-A data.

a) Mandatory (M): Elements whose required level is "Mandatory" shall be implemented without fail. If such an element has optional sub-elements, at least one sub-element shall be selected. Any element whose required level is "Mandatory" and is one of the sub-elements of an optional element shall be selected whenever the optional element is selected.

b) Optional (O): Elements whose required level is "Optional" may be implemented at the discretion of the implementer.

c) Conditional (C): Elements whose required level is "Conditional" may be implemented at the discretion of the implementer provided that detailed specifications for the processing thereof are provided separately.

d) Prohibited (P): Elements whose required level is 'Prohibited' shall not be created or modified, may be read.

6.3 Standard for setting the required level

The required level of each element constituting CAdES-T data and CAdES-A data shall be set in accordance with the following requirements.

a) The required level shall be "Mandatory" for elements whose required level is "Mandatory" in the definition of CAdES, and those necessary for the generation and validation of long term signatures. The elements whose required level is "Optional" in the definition of CAdES are defined as "Mandatory", "Optional" or "Conditional".

b) The required level shall be "Conditional" for externally defined elements.

EXAMPLE 1 CMSAlgorithmProtection attribute (IETF RFC 6211) as one of the signed attributes, see IETF RFC 8933.

c) The required level shall be "Conditional" for elements intended to interact with a certain application.

EXAMPLE 2 ContentReference.

d) The required level shall be "Conditional" for elements with an operation-dependent factor, e.g. as specified in ISO 14533-4.

EXAMPLE 3 Attribute certificate; time mark.

NOTE The archiving-type time-stamp defined in ISO/IEC 18014-2 is included in "Time mark or other method."

e) The required level shall be "optional" for elements containing only reference information.

6.4 Action to take when an optional element is not implemented

The following action shall be taken when the CAdES data used in a validation transaction contains an unimplemented element.

a) When the required level of an upper-level element is mandatory and one or more subordinate optional elements shall be selected, or one or more relevant optional elements shall be selected, the validator shall be cautioned that validation requires implementation of said element(s); otherwise, validation cannot be performed.

EXAMPLE In a validation transaction, a BasicOCSPResponse element is detected where only the processing of CertificateList elements, among all other optional elements in RevocationValues, is implemented.

b) When CounterSignature is an unimplemented element, the validator shall be cautioned that validation requires implementation of said element; otherwise, validation cannot be performed.

c) Optional elements other than those specified above may be ignored for implementation.

6.5 CAdES-T profile

6.5.1 General

The required levels of constituent elements of CAdES-T data are specified in 6.5.2 to 6.5.4.

If a certification authority (CA) or other trusted service is trusted to maintain and keep certificates for the signature validation accessible for an appropriate period of time and parties relying on the signature validity know the location where the certificates are accessible, there is no need to hold them with the signature. Otherwise, for the interoperability reasons, the generator should include the signer certificate in CAdES-T. The fields where the signer certificate or validation data may be included are determined according to strategies defined in ETSI/EN 319 122-1 v1.1.1, 5.5.3 where for the interoperability reasons and to prevent the signature to contain multiple values of the same large CRLs or certificates and OCSPs the elements defined in CMS (see Table 2) CertificateSet or RevocationInfoChoices can be used. The OtherRevocationInfoFormat should be used for BasicOCSPResponse responses (see IETF RFC 6960, 4.2.1).

NOTE The signer certificate is the starting point where the public key for signature verification is stored and contains references where the validation data and issuer certificate are located (see "Authority Information Access" where id-ad-caIssuers and id-ad-ocsp are defined in IETF RFC 5280, 4.2.2.1 and "CRL Distribution Points" where id-ce-cRLDistributionPoints is defined in IETF RFC 5280, 4.2.1.13).

6.5.2 Content information

Table 1 specifies the required level of each constituent element of Content information.

Table 1 — Content information (CAdES-T)

Element	Required level	Value	ETSI/EN 319 122–1 v1.1.1 reference
ContentType	M	Id-signedData	4.2
Content	M	SignedData	4.3

6.5.3 Signed data and Signer Info

Tables 2 and 3 specify the required level of each constituent element of Signed data and Signer Info.

Table 2 — Signed Data (CAdES-T)

Element	Required level	ETSI/EN 319 122–1 v1.1.1 reference
CMSVersion	M	IETF RFC 5652, 5.1
DigestAlgorithmIdentifiers	M	4.4
EncapsulatedContentInfo	M	4.5
eContentType	M	4.5
eContent	O	4.5
CertificateSet (Certificates)	O	4.4
Certificate	O	4.4
AttributeCertificateV2	O	4.4
OtherCertificateFormat	C	4.4
RevocationInfoChoices (crls)	O	4.4
CertificateList	O	4.4
OtherRevocationInfoFormat	C	4.4
SignerInfos	M	4.6
single	O	4.6
parallel	O	4.6

Table 3 — Signer Info (CAdES-T)

Element	Required level	ETSI/EN 319 122–1 v1.1.1 reference
CMSVersion	M	4.6
SignerIdentifier	M	4.6
IssuerAndSerialNumber	O	4.6
SubjectKeyIdentifier	O	4.6
DigestAlgorithmIdentifier	M	4.6
SignedAttributes	M	4.6
SignatureAlgorithmIdentifier	M	4.6
SignatureValue	M	4.6
UnsignedAttributes	M	4.6

6.5.4 Signed attribute and unsigned attribute

Tables 4 and 5 specify the required levels of elements that constitute signed attributes and unsigned attributes. The required level shall be “Conditional” for any signed and unsigned attribute elements not listed in Tables 4 and 5.

Table 4 — Signed Attributes (CAdES-T)

Attribute	Required level	ETSI/EN 319 122–1 v1.1.1 reference
ContentType	M	5.1.1
MessageDigest	M	5.1.2
[a] Other methods defined in ISO 14533-4.		

Table 4 *(continued)*

Attribute	Required level	ETSI/EN 319 122–1 v1.1.1 reference
SigningCertificateReference	M	5.2.2
ESS SigningCertificate	O	5.2.2.2
ESS SigningCertificate v2	O	5.2.2.3
OtherSigningCertificate	P	A.2.2
SignaturePolicyIdentifier	P	5.2.9
SigningTime	O	5.2.1
ContentReference	C	5.2.11
ContentIdentifier	C	5.2.12
ContentHints	C	5.2.4.1
CommitmentTypeIndication	C	5.2.3
SignerLocation	C	5.2.5
SignerAttribute	C	5.2.6
ContentTimestamp	C	5.2.8
Time Mark or other method	C [a]	
[a] Other methods defined in ISO 14533-4.		

Table 5 — Unsigned Attributes (CAdES-T)

Attribute	Required level	ETSI/EN 319 122–1 v1.1.1 reference
CounterSignature	O	5.2.7
Trusted time	M	
SignatureTimeStamp	O	5.3
Time Mark or other method like archive time-stamp as its replacement	O [a]	
[a] Other methods defined in ISO 14533-4.		

6.6 CAdES-A profile

6.6.1 General

The required levels of constituent elements of CAdES-A data are specified in 6.6.2 to 6.6.3.

The required levels of elements differ whether the signature applies the ArchiveTimeStampV3 form or it applies one of the ArchiveTimeStampV1, ArchiveTimeStampV2 forms.

NOTE The ArchiveTimeStampV1, the ArchiveTimeStampV2 or the long-term-validation forms were defined with the following limitations:

— The hash calculation is invalidated after modification of the CertificateSet element, the RevocationInfoChoices element, the CertificateValues attribute or the RevocationValues attribute of the time-stamped signature after applying those types of the time-stamp.

— The hash calculation is invalidated when any other unsigned attributes are included after applying those types of the time-stamp.

— The hash calculation can be invalidated according to usage of different incompatible implementations where BER or DER reordering (see in ISO/IEC 8825-1:2008, 11.6) is used or where the tag and the length of unsigned attributes SET OF are included or not in the archive time-stamp hashing procedure.

— CMS implementations are not able to use certificates or revocation values stored in unsigned attributes CertificateValues or RevocationValues. A usage of such unsigned attributes causes a redundant presence of multiple values in parallel signatures or in any types of time-stamps.

Creation of the ArchiveTimeStampV1, ArchiveTimeStampV2 or long-term-validation forms were deprecated in ETSI/TS 101 733 v2.2.1. The *ats-hash-index* attribute as defined in ETSI/TS 101 733 v2.2.1 is deprecated. The *ats-hash-index-v3* attribute defined in ETSI/EN 319 122-1 V1.2.1 (2021-10), 5.5.2 shall be included in the *archive-time-stamp-v3*. ArchiveTimeStampV3 should be used for a new archive time-stamp.

6.6.2 Structure of the CAdES-A profile

The CAdES-A profile is defined as an extended form of the CAdES-T profile to which the unsigned attributes specified in Table 6 are added. The required level of each element of the portion corresponding to CAdES-T shall be as specified in 6.5.

6.6.3 Additional unsigned attributes

The required level of each element added to unsigned attributes shall be as stated in Table 6. The required level shall be "Conditional" for any element not specified in Table 6.

Table 6 — Unsigned Attributes (CAdES-A)

Attribute	Required level		ETSI/EN 319 122–1 v1.1.1 reference
	ArchiveTimeStampV3	ArchiveTimeStampV1 ArchiveTimeStampV2	
CounterSignature	C	C [e]	5.2.7
Trusted time	M	M	
SignatureTimeStamp	O	O	5.3
Time Mark or other method like archive time-stamp as its replacement	O [g]	O	
CompleteCertificateReferences	C	M [e]	A.1.1.1
CompleteRevocationReferences	C	M [e]	A.1.2.1
CompleteRevRefs CRL	O	O	A.1.2.1
CompleteRevRefs OCSP	O	O	A.1.2.1
OtherRevRefs	C	C	A.1.2.1
Attribute certificate references	C	C [e]	A.1.3
Attribute revocation references	C	C [e]	A.1.4
CertificateValues	C	M [e]	A.1.1.2
CertificateValues	O	O	A.1.1.2
Certificates maintained by trusted service	C	C	[a]

[a] If a certification authority (CA) or other trusted service is trusted to maintain and keep the signature validation data accessible for an appropriate period of time and parties relying on the signature validity know the location where the signature validation data are accessible, there is no need to hold them with the signature.

[b] Defined in ETSI/TS 101 733 v1.4.0 or earlier versions.

[c] Defined in IETF RFC 4998.

[d] If the other trusted service is trusted to maintain time-stamping for the archiving period, it can be applied.

[e] Attribute shall not be included after applying those types of the time-stamp.

[f] Not recommended attribute.

[g] Other methods defined in ISO 14533-4.

Table 6 *(continued)*

Attribute	Required level		ETSI/EN 319 122–1 v1.1.1 reference
	ArchiveTimeStampV3	ArchiveTimeStampV1 ArchiveTimeStampV2	
RevocationValues	C	M [e]	A.1.2.2
CertificateList	O	O	A.1.1.2
BasicOCSPResponse	O	O	A.1.2.2
OtherRevVals	C	C	A.1.2.2
RevocationValues maintained by trusted service	C	C	[a]
CAdES-C-timestamp	C	C	A.1.5.2
Timestamped cert and crls reference	C	C	A.1.5.1
Archiving	M	M	A.2.4
ArchiveTimestampV3 id-aa-ets-archiveTimestampV3	O	O	5.5.3
ArchiveTimestampV2 ArchiveTimestamp id-aa-48	C [f]	O	A.2.4
ArchiveTimestampV1 ArchiveTimestamp id-aa-27	C [f]	O	b
Evidence Record	O	O	c
Other method	C [g]	C	d

[a] If a certification authority (CA) or other trusted service is trusted to maintain and keep the signature validation data accessible for an appropriate period of time and parties relying on the signature validity know the location where the signature validation data are accessible, there is no need to hold them with the signature.

[b] Defined in ETSI/TS 101 733 v1.4.0 or earlier versions.

[c] Defined in IETF RFC 4998.

[d] If the other trusted service is trusted to maintain time-stamping for the archiving period, it can be applied.

[e] Attribute shall not be included after applying those types of the time-stamp.

[f] Not recommended attribute.

[g] Other methods defined in ISO 14533-4.

6.7 Time-stamp validation data

The validation of past time-stamps requires certificates and revocation information up to the trust anchor. Time-stamp validation data requires certificates in the certificate chain from time-stamping authority (TSA) certificates to trust anchor certificates, and the revocation information pertaining to each such certificate.

Validation data may be stored with CAdES-A data as described below. When not stored with CAdES-A data, validation data shall be stored by other secure means including, but not limited to, storage by CA as a trusted third party (TTP) or by TSA.

In past time-stamp validation, validation data stored as described below or by other secure means may also be used.

Annex B specifies the requirements that shall be used relevant to the structure of a time-stamp token (TST).

Validation data for signature time-stamp shall be stored upon generation at one of the places specified in Table 7 or by CA, etc. The elements of storing validation data differ whether the signature applies the ArchiveTimeStampV3 form or it applies one of the ArchiveTimeStampV1, ArchiveTimeStampV2 forms as shown in Table 7.

Table 7 — Elements of storing validation data for signature time-stamp

The elements of storing validation data		ArchiveTimeStampV3		ArchiveTimeStampV1 ArchiveTimeStampV2	
		Required level	Preferred order	Required level	Preferred order
The SignedData of the time-stamped signature	CertificateSet	O	2	O	2
	RevocationInfoChoices	O	1	O	2
	CertificateValues attribute	C [a]		O	3
	RevocationValues attribute	C [a]		O	3
The time-stamp token of the signature time-stamp	CertificateSet	O	1	O	1
	RevocationInfoChoices	O	2	O	1
	CertificateValues attribute	C [a]		O	4
	RevocationValues attribute	C [a]		O	4

[a] Not recommended attribute.

Archive time-stamp validation data shall be stored upon generation at one of the places specified in Table 8 or by CA, etc. The elements of storing validation data differ whether the signature applies the ArchiveTimeStampV3 form or it applies one of the ArchiveTimeStampV1, ArchiveTimeStampV2 forms as shown in Table 8.

Table 8 — Elements of storing validation data for archive time-stamp

The elements of storing validation data		ArchiveTimeStampV3		ArchiveTimeStampV1 ArchiveTimeStampV2	
		Required level	Preferred order	Required level	Preferred order
The SignedData of the archive time-stamped signature	CertificateSet	O	2	P	
	RevocationInfoChoices	O	1	P	
	CertificateValues attribute	P		P	
	RevocationValues attribute	P		P	
The time-stamp token of the archive time-stamp	CertificateSet	O	1	O	1
	RevocationInfoChoices	O	2	O	1
	CertificateValues attribute	C [a]		O	2
	RevocationValues attribute	C [a]		O	2

[a] Not recommended attribute.

Annex A
(informative)

Supplier's declaration of conformity and its attachment

A.1 General

This annex specifies the form of the supplier's declaration of conformity to the CAdES long term signature profile.

A.2 Form of the supplier's declaration of conformity

Supplier's declaration of conformity with the long term signature profile

No.

Issuer's name:

Issuer's address:

Object of declaration:

The object of the declaration described above is in conformity with the requirement of the following long term signature profiles.

CAdES-T profile and/or CAdES-A profile

The implemented elements are as specified in A.3 below.

Additional information:

(The results of operation checks, etc. may be inserted here.)

Signed for and on behalf of:

_____

_____

(Place and date of issue)

_____

(Name, title)

A.3 Form of the attachment to the supplier's declaration of conformity

A.3.1 General

The attachment to the supplier's declaration of conformity shall contain the items specified in A.3.2 to A.3.7.

A.3.2 Version number of ETSI/TS 101 733 to be referenced

A.3.3 Scope of profile implementation

Table A.1 — Profile Implementation

Profile identifier	Generator	Verifier
CAdES-T		
CAdES-A		

A.3.4 Conformity with the CAdES-T profile

Table A.2 — Signed Data (CAdES-T)

Element	Required level	Generator	Verifier
CMSVersion	M		
DigestAlgorithmIdentifiers	M		
EncapsulatedContentInfo	M		
eContentType	M		
eContent	O		
CertificateSet (Certificates)	O		
Certificate	O		
AttributeCertificateV2	O		
OtherCertificateFormat	C		
RevocationInfoChoices (crls)	O		
CertificateList	O		
OtherRevocationInfoFormat	C		
SignerInfos	M		
single	O		
parallel	O		

Table A.3 — Signer Info (CAdES-T)

Element	Required level	Generator	Verifier
CMSVersion	M		
SignerIdentifier	M		
IssuerAndSerialNumber	O		
SubjectKeyIdentifier	O		
DigestAlgorithmIdentifier	M		
SignedAttributes	M		
SignatureAlgorithmIdentifier	M		
SignatureValue	M		
UnsignedAttributes	M		

Table A.4 — Signed Attributes (CAdES-T)

Attribute	Required level	Generator	Verifier
ContentType	M		
MessageDigest	M		
SigningCertificateReference	M		
ESS SigningCertificate	O		
ESS SigningCertificate v2	O		
OtherSigningCertificate	C		
SignaturePolicyIdentifier	C		
SigningTime	O		
ContentReference	C		
ContentIdentifier	C		
ContentHints	C		
CommitmentTypeIndication	C		
SignerLocation	C		
SignerAttribute	C		
ContentTimestamp	C		
Time Mark or other method	C		

Table A.5 — Unsigned Attributes (CAdES-T)

Attribute	Required level	Generator	Verifier
CounterSignature	C		
Trusted signing time	M		
SignatureTimeStamp	O		
Time Mark or other method like archive time-stamp as its replacement	O		

A.3.5 Conformity with the CAdES-A profile

Table A.6 — Unsigned Attributes (CAdES-A)

Attribute	Required level		Generator	Verifier
	ArchiveTimeStampV3	ArchiveTimeStampV1 ArchiveTimeStampV2		
CounterSignature	C	C[a]		
Trusted time	M	M		
SignatureTimeStamp	O	O		
Time Mark or other method like archive time-stamp as its replacement	O	O		
CompleteCertificateReferences	C	M[a]		
CompleteRevocationReferences	C	M[a]		
CompleteRevRefs CRL	O	O		
CompleteRevRefs OCSP	O	O		
OtherRevRefs	C	C		

[a] Attribute shall not be included after applying those types of the time-stamp.

[b] Not recommended attribute.