# Contents

1 **Introduction** ............................................................................................................. 6
  1.1 Description .................................................................................................................. 6
  1.2 Functions ..................................................................................................................... 6
  1.2.1 Features .................................................................................................................. 7
  1.2.2 Formats ..................................................................................................................... 8
  1.2.3 Conformance ............................................................................................................ 8
  1.3 Interfaces .................................................................................................................... 8
  1.4 Operating Systems ....................................................................................................... 9
  1.5 How to Best Read this Manual ..................................................................................... 9
  1.6 Digital Signatures ...................................................................................................... 9
    1.6.1 Overview ............................................................................................................... 9
    1.6.2 Terminology ........................................................................................................... 9
    1.6.3 Why Digitally Signing? .......................................................................................... 10
    1.6.4 What is an Electronic Signature? ........................................................................... 11
      Simple Electronic Signature ......................................................................................... 11
      Advanced Electronic Signature .................................................................................. 11
      Qualified Electronic Signature ................................................................................... 12
    1.6.5 How to Create Electronic Signatures .................................................................... 12
      Preparation Steps ........................................................................................................ 12
      Application of the Signature ....................................................................................... 13

2 **Installation and Deployment** .................................................................................. 15
  2.1 Windows ..................................................................................................................... 15
  2.2 Linux and macOS ....................................................................................................... 15
    2.2.1 Linux .................................................................................................................... 16
    2.2.2 macOS .................................................................................................................. 16
  2.3 Zip Archive .................................................................................................................. 17
    2.3.1 Development ......................................................................................................... 17
    2.3.2 Deployment ........................................................................................................... 19
  2.4 NuGet Package ........................................................................................................... 19
  2.5 Interface Specific Installation Steps ............................................................................ 20
    2.5.1 COM Interface ...................................................................................................... 20
    2.5.2 Java Interface ........................................................................................................ 20
    2.5.3 .NET Interface ..................................................................................................... 21
    2.5.4 C Interface ............................................................................................................ 21
  2.6 Uninstall, Install a New Version ................................................................................... 21
  2.7 Note about the Evaluation License ............................................................................. 22
  2.8 Special Directories ..................................................................................................... 22
    2.8.1 Directory for temporary files ............................................................................... 22
    2.8.2 Cache Directory .................................................................................................... 22
    2.8.3 Font Directories .................................................................................................... 23

3 **License Management** ............................................................................................... 24
  3.1 License Features ......................................................................................................... 24
<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>BeginSession</td>
<td>81</td>
</tr>
<tr>
<td>Close</td>
<td>81</td>
</tr>
<tr>
<td>ErrorCode</td>
<td>81</td>
</tr>
<tr>
<td>ErrorMessage</td>
<td>82</td>
</tr>
<tr>
<td>EndSession</td>
<td>82</td>
</tr>
<tr>
<td>ForceEncryption</td>
<td>82</td>
</tr>
<tr>
<td>ForceIncrementalUpdate</td>
<td>82</td>
</tr>
<tr>
<td>ForceSignature</td>
<td>83</td>
</tr>
<tr>
<td>GetPdf</td>
<td>83</td>
</tr>
<tr>
<td>GetRevision, GetRevisionFile, GetRevisionStream</td>
<td>83</td>
</tr>
<tr>
<td>GetMetadata</td>
<td>84</td>
</tr>
<tr>
<td>GetSignature</td>
<td>84</td>
</tr>
<tr>
<td>GetSignatureCount</td>
<td>84</td>
</tr>
<tr>
<td>InfoEntry</td>
<td>84</td>
</tr>
<tr>
<td>LicenseIsValid</td>
<td>85</td>
</tr>
<tr>
<td>Linearize</td>
<td>85</td>
</tr>
<tr>
<td>NoCache</td>
<td>86</td>
</tr>
<tr>
<td>Open</td>
<td>86</td>
</tr>
<tr>
<td>OpenMem</td>
<td>86</td>
</tr>
<tr>
<td>OpenStream</td>
<td>87</td>
</tr>
<tr>
<td>PageCount</td>
<td>87</td>
</tr>
<tr>
<td>ProductVersion</td>
<td>87</td>
</tr>
<tr>
<td>RevisionCount</td>
<td>88</td>
</tr>
<tr>
<td>RemoveSignatureField</td>
<td>88</td>
</tr>
<tr>
<td>SaveAs</td>
<td>88</td>
</tr>
<tr>
<td>SaveInMemory</td>
<td>90</td>
</tr>
<tr>
<td>SaveAsStream</td>
<td>91</td>
</tr>
<tr>
<td>SetLicenseKey</td>
<td>91</td>
</tr>
<tr>
<td>SetMetadata, SetMetadataStream</td>
<td>91</td>
</tr>
<tr>
<td>SetSessionProperty</td>
<td>91</td>
</tr>
<tr>
<td>SignatureCount</td>
<td>92</td>
</tr>
<tr>
<td>SignPreparedSignature</td>
<td>92</td>
</tr>
<tr>
<td>SignSignatureField</td>
<td>92</td>
</tr>
<tr>
<td>Terminate</td>
<td>93</td>
</tr>
<tr>
<td>TestSession</td>
<td>93</td>
</tr>
<tr>
<td>ValidateSignature</td>
<td>93</td>
</tr>
<tr>
<td>pdfSignatureInterface</td>
<td>94</td>
</tr>
<tr>
<td>ContactInfo</td>
<td>94</td>
</tr>
<tr>
<td>Contents</td>
<td>94</td>
</tr>
<tr>
<td>Date</td>
<td>95</td>
</tr>
<tr>
<td>DocMdpPermissions</td>
<td>95</td>
</tr>
<tr>
<td>DocumentHasBeenModified</td>
<td>95</td>
</tr>
<tr>
<td>Email</td>
<td>96</td>
</tr>
<tr>
<td>EmbedRevocationInfo</td>
<td>96</td>
</tr>
<tr>
<td>FillColor</td>
<td>96</td>
</tr>
<tr>
<td>FieldName</td>
<td>97</td>
</tr>
<tr>
<td>Filter</td>
<td>97</td>
</tr>
<tr>
<td>FontName1</td>
<td>97</td>
</tr>
<tr>
<td>FontName2</td>
<td>98</td>
</tr>
<tr>
<td>Font1Mem</td>
<td>98</td>
</tr>
<tr>
<td>Font2Mem</td>
<td>98</td>
</tr>
<tr>
<td>FontSize1</td>
<td>98</td>
</tr>
</tbody>
</table>
7 Version History ................................................................. 111
7.1 Changes in Version 6 ................................................. 111
7.2 Changes in Version 5 .................................................. 111
7.3 Changes in Version 4.12 ............................................. 111
7.4 Changes in Version 4.11 ............................................. 112
7.5 Changes in Version 4.10 ............................................. 112
7.6 Changes in Version 4.9 ............................................. 113
7.7 Changes in Version 4.8 ............................................. 113

8 Licensing, Copyright, and Contact ................................. 115
1 Introduction

1.1 Description

The 3-Heights™ PDF Security API enables the application of digital signatures to PDF documents and their subsequent protection through setting passwords and user authorizations.

Both standard signatures and qualified signatures that use signature cards (“smart cards”, “USB tokens”, “HSM”) can be used.

PDF documents used in professional circumstances contain important information that needs to be protected against misuse and unintentional alteration. This is achieved by protecting PDF documents through encryption and user authorization rights.

When exchanging electronic documents the ability to ascertain that a document is authentic and has not been manipulated on its way from sender to recipient is of particular importance. This is only achievable through the use of electronic signatures.

Through its interfaces (C, Java, .NET, COM) and thanks to its flexibility a developer can integrate the 3-Heights™ PDF Security API in virtually any application.

1.2 Functions

The 3-Heights™ PDF Security API enables users to encrypt and—if the passwords are known—decrypt PDF documents. The tool can set and cancel all known PDF user authorizations. It can, for instance, set an owner password so that only authorized users can edit and change the document. A user password ensures that only authorized users have access to the document’s content. The tool’s signature module allows the user to apply, read and verify...
both classic digital signatures and MDP (modification detection and prevention) signatures. The visibility and visual appearance of digital signatures can be adapted to suit requirements. The tool also supports customized signature handlers and types.

### 1.2.1 Features

- Apply simple, advanced, and qualified electronic signatures
  - PDF/A conforming signatures
  - Support European Signature Norms
- Signature types
  - Document signatures to “digitally sign” documents
  - Modification detection & prevention (MDP) signatures to “certify” documents
  - Document time-stamp signatures to “time-stamp” documents
- Apply PAdES-B-LTA (long term availability and integrity of validation material) and PAdES-LTV (Long Term Validation) signatures
  - Embedded trust chain, time-stamp, and revocation information (OCSP, CRL)
  - Enlarge the longevity of existing signatures
  - Add signature validation material to the document security store (DSS)
- Add an optional visual appearance of the signature (page, size, color, position, text, background image, etc.)
- Cache OCSP, CRL, and other data for mass signing
- Various types of cryptographic providers
  - Windows certificate store
  - Hardware such as hardware security module (HSM), smart cards, and USB tokens
  - Online signature services
    - SwissSign Digital Signing Service
    - Swisscom All-in Signing Service
    - GlobalSign Digital Signing Service
    - QuoVadis sealsign
  - Custom signature handler plugin interface
- Mass signing of documents
- Multiple signatures
- Extract digital signatures
  - Validate digital signatures
  - Remove digital signatures
  - Extract signed version (revision) of document
- Encrypt and decrypt PDF documents
  - Set document restrictions, including:
    - Print document
    - Modify document content
    - Extract or copy content
    - Add comments
    - Fill in form fields
    - Content extraction for accessibility
    - Assemble documents
    - Print in high resolution
  - Set crypt and stream filters
  - Set encryption strength
  - Set owner and user password
- Stamping
  - Stamp text, images, or vector graphics
  - Add hyperlinks
- PDF/A conforming stamps
- Modify existing stamps
- Stamping of signed documents preserves existing signatures
- Set document metadata
- Optimize for the web (linearize) (not for PDF 2.0)
- Read input from and write output document to file, memory, or stream

1.2.2 Formats

Input Formats

- PDF 1.x (PDF 1.0, ..., PDF 1.7)
- PDF 2.0
- PDF/A-1, PDF/A-2, PDF/A-3

Output Formats

- PDF 1.x (PDF 1.0, ..., PDF 1.7)
- PDF 2.0
- PDF/A-1, PDF/A-2, PDF/A-3

1.2.3 Conformance

Standards:
- ISO 32000-1 (PDF 1.7)
- ISO 32000-2 (PDF 2.0)
- ISO 19005-1 (PDF/A-1)
- ISO 19005-2 (PDF/A-2)
- ISO 19005-3 (PDF/A-3)
- PAdES (ETSI EN 319 142) signature levels B-B, B-T, B-LT, B-LTA, CMS
- Legacy PAdES baseline signature (ETSI TS 103 172) B-Level, T-Level, LT-Level, and LTA-Level
- Legacy PAdES (ETSI TS 102 778) Part 2 (PAdES Basic), Part 3 (PAdES-BES), and Part 4 (PAdES-LTV, Long Term Validation)
- Long term signature profiles for PAdES (ISO 14533-3)
- Cryptographic Suites (ETSI TS 119 312)

1.3 Interfaces

The following interfaces are available:

- C
- Java
- .NET Framework
- .NET Core
- COM

---

1 Limited supported OS versions. Operating Systems
1.4 Operating Systems

The 3-Heights™ PDF Security API is available for the following operating systems:

- Windows Client 7+ | x86 and x64
- Linux:
  - Red Hat, CentOS, Oracle Linux 7+ | x64
  - Fedora 29+ | x64
  - Debian 8+ | x64
  - Other: Linux kernel 2.6+, GCC toolset 4.8+ | x64
- macOS 10.10+ | x64

‘+’ indicates the minimum supported version.

1.5 How to Best Read this Manual

If you are reading this manual for the first time, i.e. would like to evaluate the software, the following steps are suggested.

1. Read the chapter Introduction to verify this product meets your requirements.
2. Identify what interface your programming language uses.
3. Read and follow the instructions in the chapter Installation and Deployment.
4. In the chapter Zip Archive find your programming language. Please note that not every language is covered in this manual.
   For most programming languages there is sample code available. For a start it is generally best to refer to these samples rather than writing code from scratch.
5. (Optional) Read the chapter User’s Guide for general information about the API. Read the Interface Reference for specific information about the functions of the API.

1.6 Digital Signatures

1.6.1 Overview

Digital signature is a large and slightly complex topic. This manual gives an introduction to digital signatures and describes how the 3-Heights™ PDF Security API is used to apply them. It does however not describe all the technical details.

1.6.2 Terminology

**Digital Signature** is a cryptographic technique of calculating a number (a digital signature) for a message. Creating a digital signature requires a private key from a certificate. Validating a digital signature and its authorship requires a public key. Digital Signature is a technical term.

**Electronic Signature** is a set of electronic data that is merged or linked to other electronic data in order to authenticate it. Electronic Signatures can be created by means of a digital signature or other techniques. Electronic Signature is a legal term.
1.6.3 Why Digitally Signing?

The idea of applying a digital signature in PDF is very similar to a handwritten signature: A person reads a document and signs it with its name. In addition to the name, the signature can contain further optional information, such as the date and location. A valid electronic signature is a section of data that can be used to:

- Ensure the integrity of the document
- Authenticate the signer of the document
- Prove existence of file prior to date (time-stamp)

Digitally signing a document requires a certificate and its private key. How to access and use a certificate is described in the chapter Cryptographic Provider.

In a PDF document, a digital signature consists of two parts:

**A PDF related part** This part consists of the PDF objects required to embed the signature into the PDF document. This part depends on the signature type (Document Signature, MDP Signature, see table below). Information such as name of the signer, reason, date, location is stored here. The signature may optionally have a visual appearance on a page of the PDF document, which can contain text, graphics and images.

This part of the signature is entirely created by the 3-Heights™ PDF Security API.

**A cryptographic part** A digital signature is based on a cryptographic checksum (hash value) calculated from the content of the document that is being signed. If the document is modified at a later time, the computed hash value is no longer correct and the signature becomes invalid, i.e. the validation will fail and will report that the document has been modified since the signature was applied. Only the owner of the certificate and its private key is able to sign the document. However, anybody can verify the signature with the public key contained in the certificate.

This part of the signature requires a cryptographic provider for some cryptographic data and algorithms.

The 3-Heights™ PDF Security API supports the following types of digital signatures:

**Document Signature** Check the integrity of the signed part of the document and authenticate the signer’s identity. One or more document signatures can be applied. A signed document can be modified and saved by incremental updates. The state of the document can be re-created as it existed at the time of signing.

<table>
<thead>
<tr>
<th>Abbreviations</th>
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<tbody>
<tr>
<td>CA Certification Authority</td>
</tr>
<tr>
<td>CMS Cryptographic Message Syntax</td>
</tr>
<tr>
<td>CRL Certificate Revocation List</td>
</tr>
<tr>
<td>CSP Cryptographic Service Provider</td>
</tr>
<tr>
<td>HSM Hardware Security Module</td>
</tr>
<tr>
<td>OCSP Online Certificate Status Protocol</td>
</tr>
<tr>
<td>PKCS Public Key Cryptography Standards</td>
</tr>
<tr>
<td>QES Qualified Electronic Signature</td>
</tr>
<tr>
<td>TSA Time-stamp Authority</td>
</tr>
<tr>
<td>TSP Time-stamp Protocol</td>
</tr>
</tbody>
</table>
MDP (Modification detection and prevention) Signature  Enable detection of disallowed changes specified by the author. A document can contain only one MDP signature; which must be the first in the document. Other types of signatures may be present.

Document Time-stamp Signature  A time-stamp signature provides evidence that the document existed at a specific time and protects the document’s integrity. One or more document time-stamp signatures can be applied. A signed document can be modified and saved by incremental updates.

1.6.4 What is an Electronic Signature?

There are different types of electronic signatures, which normally are defined by national laws, and therefore are different for different countries. The type of electronic signatures required in a certain process is usually defined by national laws. Quite advanced in this manner are German-speaking countries where such laws and an established terminology exist. The English terminology is basically a translation from German.

Three types of electronic signatures are distinguished:

- Simple Electronic Signature “Einfache Elektronische Signatur”
- Advanced Electronic Signature “Fortgeschrittene Elektronische Signatur”
- Qualified Electronic Signature (QES) “Qualifizierte Elektronische Signatur”

All applied digital signatures conform to PDF/A and PAdES.

Simple Electronic Signature

A simple electronic signature requires any certificate that can be used for digital signing. The easiest way to retrieve a certificate, which meets that requirement, is to create a so called self-signed certificate. Self-signed means it is signed by its owner, therefore the issuer of the certificate and the approver of the legitimacy of a document signed by this certificate is the same person.

Example:

Anyone could create a self-signed certificate issued by “Peter Pan” and issued to “Peter Pan”. Using this certificate one is able to sign in the name of “Peter Pan”.

If a PDF document is signed with a simple electronic signature and the document is changed after the signature had been applied, the signature becomes invalid. However, the person who applied the changes, could at the same time (maliciously) also remove the existing simple electronic signature and—after the changes—apply a new, equally looking Simple Electronic Signature and falsify its date. As we can see, a simple electronic signature is neither strong enough to ensure the integrity of the document nor to authenticate the signer.

This drawback can overcome using an advanced or Qualified Electronic Signature.

Advanced Electronic Signature

Requirements for advanced certificates and signatures vary depending on the country where they are issued and used.

An advanced electronic signature is based on an advanced certificate that is issued by a recognized certificate authority (CA) in this country, such as VeriSign, SwissSign, QuoVadis. In order to receive an advanced certificate, its owner must prove its identity, e.g. by physically visiting the CA and presenting its passport. The owner can be an individual or legal person or entity.

An advanced certificate contains the name of the owner, the name of the CA, its period of validity and other information.

The private key of the certificate is protected by a PIN, which is only known to its owner.
This brings the following advantages over a simple electronic signature:

- The signature authenticates the signer.
- The signature ensures the integrity of the signed content.

**Qualified Electronic Signature**

Requirements for qualified certificates and signatures vary depending on the country where they are issued and used.

A Qualified Electronic Signature is similar to an advanced electronic signature, but has higher requirements. The main differences are:

- It is based on a qualified certificate, which is provided as a hardware token (USB stick, smart card).
- For every signature it is required to enter the PIN code manually. This means that only one signature can be applied at a time.
- Certificate revocation information (OCSP/CRL) can be acquired from an online service. The response (valid, revoked, etc.) must be embedded in the signature.
- A time-stamp (TSP) that is acquired from a trusted time server (TSA) may be required.

This brings the following advantages over an advanced electronic signature:

- The signature ensures the certificate was valid at the time when the document was signed (due to the embedding of the OCSP/CRL response).
- The signature ensures the integrity of the time of signing (due to the embedding of the time-stamp).
- Legal processes that require a QES are supported.

**Note:** A time-stamp can be added to any type of signature. OCSP/CRL responses are also available for some advanced certificates.

### 1.6.5 How to Create Electronic Signatures

This is a simple example of how to create an electronic document signature. More detailed examples and examples for other types of electronic signatures can be found in [How to Create Digital Signatures](#).

**Preparation Steps**

1. Identify whether an [Advanced Electronic Signature](#) or a [Qualified Electronic Signature](#) is required. For most automated processes an advanced signature is sufficient.
2. Identify regulatory requirements regarding the content and life cycle of the signature:
   - Is a time-stamp required to prove that the signature itself existed at a certain date and time?
   - Should validation information be embedded, in order to allow the signature to be validated long time after its generation?
   - Should the integrity of the validation material be protected?
   - Is a specific signature encoding required?
   These requirements (or regulatory requirements) define the signature level that must be used.
3. Acquire a corresponding certificate from a CA.
   - For automated processes we recommend to use a HSM, an online signing service, or soft certificates. Other hardware such as USB tokens or Smart Cards are often cheaper, but limited to local interactive single-user applications.
   - When using an online signing service, ensure that it supports the required signature encoding.
4. Setup and configure the certificate's Cryptographic Provider.
   - In case the certificate resides on hardware such as an USB token or a Smart Card, the required middleware (driver) needs to be installed.
   - In case the certificate is a soft certificate, it must be imported into the certificate store of a cryptographic provider.

5. Optional: Acquire access to a trusted time server (TSA) (preferably from the CA of your signing certificate).

6. Optional: Ensure your input documents conform to the PDF/A standard.
   It is recommended to sign PDF/A documents only, because this ensures that the file's visual appearance is well defined, such than it can be reproduced flawlessly and authentically in any environment. Furthermore, PDF/A conformance is typically required if the file is to be archived. Because signed files cannot be converted to PDF/A without breaking its signatures, files must be converted before signing.

   **Note:** A detailed guidance on the use of standards for signature creation can be found in the technical report ETSI TR 119 100.

**Application of the Signature**

Apply the signature by providing the following information:

1. The Cryptographic Provider where the certificate is located
2. Values for the selection of the signing certificate (e.g. the name of the certificate)
3. Optional: Time-stamp service URL (e.g. “http://server.mydomain.com:80/tsa”)
4. Optional: Time-stamp service credentials (e.g. username:password)
5. Optional: Add validation information
6. Optional: Visual appearance of the signature on a page of the document (e.g. an image).

**Example:** Steps to Add an Electronic Document Signature

The 3-Heights™ PDF Security API applies PDF/A conforming signatures. This means if a PDF/A document is digitally signed, it retains PDF/A conformance.

In order to add an electronic document signature with the 3-Heights™ PDF Security API the following steps need to be done:

1. Create a new Signature object
2. As value of the Signature's name, the name of the certificate that is to be used must be provided. The name of the certificate corresponds to the value "Issued to:"
3. If the certificate's private key is PIN protected, the PIN can be passed in the provider configuration.
4. Additional parameters can now be set such as the reason why the signature is applied, etc.

In C# the four steps above look like this:

```csharp
using (Secure doc = new Secure())
{
    if (!doc.Open("input.pdf", ""))
    {
        throw new Exception("Document cannot be opened: " + doc.ErrorMessage);
    }

    using (Signature signature = new Signature())
    {
        signature.Name = "Philip Renggli";
        signature.Provider = "cvp11.dll;0;secret-pin";
        signature.Reason = "I reviewed the document"; // optional
        signature.Rect = new PDFRect(10, 10, 210, 60); // optional
    }
}
```
The visual appearance of the digital signature on a page of the resulting output-document looks as shown below:

```
doc.AddSignature(signature);

if (!doc.SaveAs("output.pdf", "", "", PDFPermission.ePermNoEncryption, 0, "", ""))
    throw new Exception("Unable to sign document: " + doc.ErrorMessage);

doc.Close();
```

The visual appearance of the digital signature on a page of the resulting output-document looks as shown below:

```
Philip Renggli
Digitally signed by
Philip Renggli
Reason: I reviewed the document
Time: 2006/12/11 13:23:31
```
2 Installation and Deployment

2.1 Windows

The 3-Heights™ PDF Security API comes as a ZIP archive or as a NuGet package.

The installation of the software requires the following steps.

1. You need administrator rights to install this software.
2. Log in to your download account at http://www.pdf-tools.com. Select the product "PDF Security API". If you have no active downloads available or cannot log in, please contact pdfsales@pdf-tools.com for assistance.
   You will find different versions of the product available. We suggest to download the version, which is selected by default. A different version can be selected using the combo box.
   The product comes as a Zip Archive containing all files, or as a NuGet Package containing all files for development in .NET.
   There is a 32 and a 64-bit version of the product available. While the 32-bit version runs on both, 32 and 64-bit platforms, the 64-bit version runs on 64-bit platforms only. The ZIP archive as well as the NuGet package contain both the 32-bit and the 64-bit version of the product.
3. If you are using the ZIP archive, do the following. Unzip the archive to a local folder, e.g. C:\Program Files\PDF Tools AG. This creates the following subdirectories (see also Zip Archive):

<table>
<thead>
<tr>
<th>Subdirectory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bin</td>
<td>Contains the runtime executable binaries.</td>
</tr>
<tr>
<td>doc</td>
<td>Contains documentation.</td>
</tr>
<tr>
<td>include</td>
<td>Contains header files to include in your C/C++ project.</td>
</tr>
<tr>
<td>jar</td>
<td>Contains Java archive files for Java components.</td>
</tr>
<tr>
<td>lib</td>
<td>Contains the object file library to include in your C/C++ project.</td>
</tr>
<tr>
<td>samples</td>
<td>Contains sample programs in various programming languages</td>
</tr>
</tbody>
</table>

4. The usage of the NuGet package is described in section NuGet Package.
5. (Optional) Register your license key using the License Management.
6. Identify which interface you are using. Perform the specific installation steps for that interface described in Interface Specific Installation Steps.
7. Ensure the cache directory exists as described in chapter Special Directories.
8. If you want to sign documents, proceed with setting up your cryptographic provider as described in chapter Cryptographic Provider.
9. If you want to stamp text, proceed with setting the fonts required as described in chapter Fonts.

2.2 Linux and macOS

This section describes installation steps required on Linux or macOS.

The Linux and macOS version of the 3-Heights™ PDF Security API provides two interfaces:

- Java interface
Native C interface

Here is an overview of the files that come with the 3-Heights™ PDF Security API:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bin/x64/libPdfSecureAPI.so</td>
<td>This is the shared library that contains the main functionality. The file's extension differs on macOS (.dylib instead of .so).</td>
</tr>
<tr>
<td>doc/<em>.</em></td>
<td>Documentation</td>
</tr>
<tr>
<td>include/<em>.</em></td>
<td>Contains header files to include in your C/C++ project.</td>
</tr>
<tr>
<td>jar/SECA.jar</td>
<td>Java API archive.</td>
</tr>
<tr>
<td>samples</td>
<td>Example code.</td>
</tr>
</tbody>
</table>

### 2.2.1 Linux

1. Unpack the archive in an installation directory, e.g. `/opt/pdf-tools.com/`
2. Verify that the GNU shared libraries required by the product are available on your system:

   ```
   ldd libPdfSecureAPI.so
   ```

   In case the above reports any missing libraries you have three options:
   a. Download an archive that is linked to a different version of the GNU shared libraries and verify whether they are available on your system. Use any version whose requirements are met. Note that this option is not available for all platforms.
   b. Use your system's package manager to install the missing libraries. It usually suffices to install the package `libstdc++6`.
   c. Use GNU shared libraries provided by PDF Tools AG:
      2. Download the GNU shared libraries for your platform.
      3. Install the libraries manually according your system's documentation. This typically involves copying them to your library directory, e.g. `/usr/lib` or `/usr/lib64`, and running `ldconfig`.
      4. Verify that the GNU shared libraries required by the product are available on your system now.
3. Create a link to the shared library from one of the standard library directories, e.g:

   ```
   ln -s /opt/pdf-tools.com/bin/x64/libPdfSecureAPI.so /usr/lib
   ```

4. Optionally register your license key using the [license manager](#).
5. Identify which interface you are using. Perform the specific installation steps for that interface described in [Interface Specific Installation Steps](#).
6. Ensure the cache directory exists as described in chapter [Special Directories](#).
7. If you want to sign documents, proceed with setting up your cryptographic provider as described in chapter [Cryptographic Provider](#).
8. If you want to stamp text, proceed with setting the fonts required as described in chapter [Fonts](#).

### 2.2.2 macOS

The shared library must have the extension `.jnilib` for use with Java. We suggest that you create a file link for this purpose by using the following command:
2.3 Zip Archive

The 3-Heights™ PDF Security API provides four different interfaces. The installation and deployment of the software depend on the interface you are using. The table below shows the supported interfaces and examples with which programming languages they can be used.

<table>
<thead>
<tr>
<th>Interface</th>
<th>Programming Languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>.NET</td>
<td>The MS software platform .NET can be used with any .NET capable programming language such as:</td>
</tr>
<tr>
<td></td>
<td>- C#</td>
</tr>
<tr>
<td></td>
<td>- VB .NET</td>
</tr>
<tr>
<td></td>
<td>- J#</td>
</tr>
<tr>
<td></td>
<td>- others</td>
</tr>
<tr>
<td></td>
<td>For a convenient way to use this interface, see NuGet Package.</td>
</tr>
<tr>
<td>Java</td>
<td>The Java interface is available on all platforms.</td>
</tr>
<tr>
<td>COM</td>
<td>The component object model (COM) interface can be used with any COM-capable programming language, such as:</td>
</tr>
<tr>
<td></td>
<td>- MS Visual Basic</td>
</tr>
<tr>
<td></td>
<td>- MS Office Products such as Access or Excel (VBA)</td>
</tr>
<tr>
<td></td>
<td>- C++</td>
</tr>
<tr>
<td></td>
<td>- VBScript</td>
</tr>
<tr>
<td></td>
<td>- others</td>
</tr>
<tr>
<td></td>
<td>This interface is available in the Windows version only.</td>
</tr>
<tr>
<td>C</td>
<td>The native C interface is for use with C and C++. This interface is available on all platforms.</td>
</tr>
</tbody>
</table>

2.3.1 Development

The software developer kit (SDK) contains all files that are used for developing the software. The role of each file with respect to the four different interfaces is shown in table Files for Development. The files are split in four categories:

- **Req.** This file is required for this interface.
- **Opt.** This file is optional. See also table File Description to identify which files are required for your application.
- **Doc.** This file is for documentation only.
- **Empty field** An empty field indicates this file is not used at all for this particular interface.
The purpose of the most important distributed files of is described in table File Description.

### File Description

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>bin\&lt;platform&gt;\PdfSecureAPI.dll</code></td>
<td>This is the DLL that contains the main functionality (required), where <code>&lt;platform&gt;</code> is either Win32 or x64 for the 23-bit or the 64-bit library respectively.</td>
</tr>
<tr>
<td><code>bin\*NET.dll</code></td>
<td>The .NET assemblies are required when using the .NET interface. The files <code>bin\*NET.xml</code> contain the corresponding XML documentation for MS Visual Studio.</td>
</tr>
<tr>
<td><code>doc\*.*</code></td>
<td>Various documentations.</td>
</tr>
<tr>
<td><code>include\*.*</code></td>
<td>Contains files to include in your C / C++ project.</td>
</tr>
<tr>
<td><code>lib\&lt;platform&gt;\PdfSecureAPI.lib</code></td>
<td>On Windows operating systems, the object file library needs to be linked to the C/C++ project.</td>
</tr>
<tr>
<td><code>jar\SECA.jar</code></td>
<td>The Java API archive.</td>
</tr>
<tr>
<td><code>samples\*.*</code></td>
<td>Contains sample programs in different programming languages.</td>
</tr>
</tbody>
</table>

---

2 Not required for Linux or macOS.

3 These files must reside in the same directory as PdfSecureAPI.dll.
2.3.2 Deployment

For the deployment of the software only a subset of the files are required. Which files are required (Req.), optional (Opt.) or not used (empty field) for the four different interfaces is shown in the table below.

<table>
<thead>
<tr>
<th>Files for Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>bin\platform\PdfSecureAPI.dll</td>
</tr>
<tr>
<td>bin*NET.dll</td>
</tr>
<tr>
<td>jar\SECA.jar</td>
</tr>
</tbody>
</table>

The deployment of an application works as described below:

1. Identify the required files from your developed application (this may also include color profiles).
2. Identify all files that are required by your developed application.
3. Include all these files into an installation routine such as an MSI file or simple batch script.
4. Perform any interface-specific actions (e.g. registering when using the COM interface).

**Example:** This is a very simple example of how a COM application written in Visual Basic 6 could be deployed.

1. The developed and compiled application consists of the file `securer.exe`. Color profiles are not used.
2. The application uses the COM interface and is distributed on Windows only.
   - The main DLL `PdfSecureAPI.dll` must be distributed.
3. All files are copied to the target location using a batch script. This script contains the following commands:
   ```
   copy securer.exe %targetlocation%.
   copy PdfSecureAPI.dll %targetlocation%.
   ```
4. For COM, the main DLL needs to be registered in silent mode (/s) on the target system. This step requires Power-User privileges and is added to the batch script.
   ```
   regsvr32 /s %targetlocation%\PdfSecureAPI.dll.
   ```

2.4 NuGet Package

NuGet is a package manager that facilitates the integration of libraries for the software development in .NET. The nuget package for the 3-Heights™ PDF Security API contains all the libraries needed, managed and native.


In Visual Studio click on “Tools” and then “Options”. Select “NuGet Package Manager” and add the location of the downloaded package in “Package Sources”.

Right-click on a .NET project in Visual Studio and select “Manage NuGet Packages...”. Finally, select the package source that was defined above and browse to the desired package.

The required native libraries are loaded automatically. All project platforms are supported, including “AnyCPU”.

In order to use the software, you must first install a license key for the 3-Heights™ PDF Security API. To do this you have to download the product kit and use the license manager in it. See also License Management.

Note: This NuGet package is only supported on a subset of the operating systems supported by .NET Core. See also Operating Systems.

2.5 Interface Specific Installation Steps

2.5.1 COM Interface

Registration Before you can use the 3-Heights™ PDF Security API component in your COM application program you have to register the component using the regsvr32.exe program that is provided with the Windows operating system. The following command shows the registration of PdfSecureAPI.dll. Note that in Windows Vista and later, the command needs to be executed from an administrator shell.

```
regsvr32 "C:\Program Files\PDF Tools AG\bin\<platform>\PdfSecureAPI.dll"
```

Where <platform> is Win32 for the 32-bit and x64 for the 64-bit version.

If you are using a 64-bit operating system and would like to register the 32-bit version of the 3-Heights™ PDF Security API, you need to use the regsvr32 from the directory %SystemRoot%\SysWOW64 instead of %SystemRoot%\System32.

If the registration process succeeds, a corresponding dialog window is displayed. The registration can also be done silently (e.g. for deployment) using the switch /s.

Other Files The other DLLs do not need to be registered, but for simplicity it is suggested that they reside in the same directory as the PdfSecureAPI.dll.

2.5.2 Java Interface

The 3-Heights™ PDF Security API requires Java version 7 or higher.

For compilation and execution When using the Java interface, the Java wrapper jar\SECA.jar needs to be on the CLASSPATH. This can be done by either adding it to the environment variable CLASSPATH, or by specifying it using the switch -classpath:

```
javac -classpath ".;C:\Program Files\PDF Tools AG\jar\SECA.jar" sampleApplication.java
```

For execution Additionally the library PdfSecureAPI.dll needs be in one of the system’s library directories or added to the Java system property java.library.path. This can be achieved by either adding it dynamically

---

4 Otherwise you get the following message: LoadLibrary(“PdfSecureAPI.dll”) failed - The specified module could not be found.
5 On Windows defined by the environment variable PATH and e.g. on Linux defined by LD_LIBRARY_PATH.
at program startup before using the API, or by specifying it using the switch `-Djava.library.path` when starting the Java VM. Choose the correct subdirectory (`x64` or `Win32` on Windows) depending on the platform of the Java VM.

```java
java -classpath ".;C:\Program Files\PDF Tools AG\SECA.jar" ^
   `-Djava.library.path=C:\Program Files\PDF Tools AG\bin\x64" sampleApplication
```

Note that on Linux or macOS, the path separator usually is a colon and hence the above changes to something like:

```java
... -classpath ".:/path/to/SECA.jar" ...
```

2.5.3 .NET Interface

The 3-Heights™ PDF Security API does not provide a pure .NET solution. Instead, it consists of a native library and .NET assemblies, which call the native library. This has to be accounted for when installing and deploying the tool.

It is recommended to use the NuGet Package. This ensures the correct handling of both the .NET assemblies and the native library.

Alternatively, the files in the Zip Archive can be used directly in a Visual Studio project targeting .NET Framework 2.0 or later. To achieve this, proceed as follows.

The .NET assemblies (`*.NET.dll`) are to be added as references to the project; They are needed at compile time. `PdfSecureAPI.dll` is not a .NET assembly, but a native library. It is not to be added as a reference to the project. Instead, it is loaded during execution of the application.

For the operating system to find and successfully load the native library `PdfSecureAPI.dll`, it must match the executing application’s bitness (32-bit versus 64-bit) and it must reside in either of the following directories:

- In the same directory as the application that uses the library.
- In a subdirectory `win-x86` or `Pathwin-x64` for 32-bit or 64-bit applications respectively.
- In a directory that is listed in the `PATH` environment variable

In Visual Studio, when using the platforms “x86” or “x64”, the above can be achieved by adding the 32-bit or 64-bit `PdfSecureAPI.dll` respectively as an “existing item” to the project, and setting its property “Copy to output directory” to true. When using the “AnyCPU” platform, then you have to make sure by some other means that both the 32-bit and the 64-bit `PdfSecureAPI.dll` are copied to subdirectories `win-x86` and `win-x64` of the output directory respectively.

2.5.4 C Interface

- The header file `pdfsecureapi_c.h` needs to be included in the C/C++ program.
- On Windows operating systems, the library `PdfSecureAPI.lib` needs to be linked to the project.
- The dynamic link library `PdfSecureAPI.dll` needs to be in a path of executables (e.g. on the environment variable `%PATH%`).

2.6 Uninstall, Install a New Version

If you have used the ZIP file for the installation: In order to uninstall the product, undo all the steps done during installation, e.g. un-register using `regsvr32.exe /u`, delete all files, etc.

---

6 If the wrong data model is used, there is an error message similar to this: "Can’t load IA 32-bit .dll on a AMD 64-bit platform"
Installing a new version does not require to previously uninstall the old version. The files of the old version can directly be overwritten with the new version.

2.7 Note about the Evaluation License

With the evaluation license the 3-Heights™ PDF Security API automatically adds a watermark to the output files.

2.8 Special Directories

2.8.1 Directory for temporary files

This directory for temporary files is used for data specific to one instance of a program. The data is not shared between different invocations and deleted after termination of the program.

The directory is determined as follows. The product checks for the existence of environment variables in the following order and uses the first path found:

**Windows**
1. The path specified by the %TMP% environment variable.
2. The path specified by the %TEMP% environment variable.
3. The path specified by the %USERPROFILE% environment variable.
4. The Windows directory.

**Linux and macOS**
1. The path specified by the $PDFTMPDIR environment variable.
2. The path specified by the $TMP environment variable.
3. The /tmp directory.

2.8.2 Cache Directory

The cache directory is used for data that is persisted and shared between different invocations of a program. The actual caches are created in subdirectories. The content of this directory can safely be deleted to clean all caches.

This directory should be writable by the application, otherwise caches cannot be created or updated and performance will degrade significantly.

**Windows**
- If the user has a profile:
  `%LOCAL_APPDATA%\PDF Tools AG\Caches`
- If the user has no profile:
  `<TempDirectory>\PDF Tools AG\Caches`

**Linux and macOS**
- If the user has a home directory:
  `~/.pdf-tools/Caches`
- If the user has no home directory:
  `<TempDirectory>/pdf-tools/Caches`
where <TempDirectory> refers to the Directory for temporary files.

### 2.8.3 Font Directories

The location of the font directories depends on the operating system. Font directories are traversed recursively in the order as specified below.

If two fonts with the same name are found, the latter one takes precedence, i.e. user fonts will always take precedence over system fonts.

**Windows**

1. %SystemRoot%\Fonts
2. User fonts listed in the registry key \HKEY_CURRENT_USER\Software\Microsoft\Windows NT\CurrentVersion\Fonts. This includes user specific fonts from C:\Users\<user>\AppData\Local\Microsoft\Windows\Fonts and app specific fonts from C:\Program Files\WindowsApps directory Fonts, which must be a direct sub-directory of where PdfSecureAPI.dll resides.

**macOS**

1. /System/Library/Fonts
2. /Library/Fonts

**Linux**

1. /usr/share/fonts
2. /usr/local/share/fonts
3. ~/.fonts
4. $PDFFONTDIR or /usr/lib/X11/fonts/Type1
3 License Management

The 3-Heights™ PDF Security API requires a valid license in order to run correctly. If no license key is set or the license is not valid, then most of the interface elements documented in Interface Reference will fail with an error code and error message indicating the reason.

More information about license management is available in the license key technote.

3.1 License Features

The functionality of the 3-Heights™ PDF Security API contains two areas to which the following license features are assigned:

**Signature**  Create, validate, and enhance signatures.

**Stamping**  Apply and modify stamps.

A license can include an arbitrary set of these features. The presence of any feature in a given license key can be checked in the license manager. The Interface Reference specifies in more detail which functions are included in which license features.
4 Programming Interfaces

4.1 Visual Basic 6

After installing the 3-Heights™ PDF Security API and registering the COM interface (see chapter Installation and Deployment), you find a Visual Basic 6 example PdfSecureAPI.vbp in the directory samples/VB/. You can either use this sample as a base for an application, or you can start from scratch.

If you start from scratch, here is a quick start guide for you:

1. First create a new Standard-Exe Visual Basic 6 project. Then include the 3-Heights™ PDF Security API component to your project.

2. Draw a new Command Button and optionally rename it if you like.

3. Double-click the command button and insert the few lines of code below. All that you need to change is the path of the file name.

   ```vba
   Private Sub Command1_Click()
       Dim Secure As New PDFSECUREAPIlib.PdfSecure
       Secure.Open "C:\input.pdf", ""
       Secure.SaveAs "C:\output.pdf", "", "pwd", ePermPrint, 40
       Secure.Close
   End Sub
   ```

   And that's all—four lines of code. Create the object, open the input file, create the output file with no user password, owner password “owner”, allow printing and use 40 bit encryption key.

   **Example:** More advanced

   The following Visual Basic 6 sample assumes an interface with:

   - Text fields (txt*) for the input and output file names, as well as the passwords.
   - Check boxes (chk*) with a value to be set to 0 or 1 for all the permission flags.

   ```vba
   Private Sub CreateOutput_Click()
       Dim doc As New PDFSECUREAPIlib.PdfSecure
   ```
Dim iPerm As Integer
done = doc.Open(txtInput.Text, txtPwd.Text)
' Open the input file
If Not done Then
    If doc.ErrorCode = PDF_E_PASSWORD Then
        MsgBox "Input file is encrypted and Password not correct."
    Else
        MsgBox "Couldn't open input file."
    End If
End If
End If
' Set the permissions
iPerm = chkPrint.Value * ePermPrint _
    + chkModify.Value * ePermModify _
    + chkCopy.Value * ePermCopy _
    + chkAnnot.Value * ePermAnnotate _
    + chkFill.Value * ePermFillForms _
    + chkExtr.Value * ePermSupportDisabilities _
    + chkAssemble.Value * ePermAssemble _
    + chkDPrint * ePermDigitalPrint
iKey = 128
' Save the output file
If Not doc.SaveAs(txtOutput.Text, txtUser.Text, txtOwner.Text, iPerm, iKey) Then
    MsgBox "Output file could not be created."
End If
done = doc.Close
End Sub

4.2 C/C++

In order to use the 3-Heights™ PDF Security API in a C project the following steps should be done. (Note: Steps and Screenshots are specifically described for the MS Studio 6)

1. Add the header files pdfsecureapi_c.h and pdfsecuritydecl.h to the include directories.
2. Link to the object file library. (Windows: PdfSecureAPI.lib)
3. Add the path where the dynamic link library PdfSecureAPI.dll resides to the “Executable files directories”. E.g. as shown in the screenshot below. In most cases it suffices to simply add it to the environment variable Path.

![Screenshot showing executable files directories](image)

There is a C sample available within the ZIP archive of the evaluation and release version that shows how to decrypt and encrypt a PDF document, as well as how to add a digital signature. The C sample below is much simpler and does not add a digital signature.

Before the C interface can be used to create objects, it must be initialized once. This is done using PdfSecureInitialize, to un-initialize use PdfSecureUnInitialize. Other than that, equal call sequences as in the COM interface can be used.

```c
#include <stdio.h>
#include "pdfsecureapi_c.h"
#include "pdfsecuritydecl.h"

int main(int argc, char* argv[])
{
    TPdfSecure* pPdfSecure;
    PdfSecureInitialize();

    pPdfSecure = PdfSecureCreateObject();
    PdfSecureOpen(pPdfSecure, argv[1], "");
    PdfSecureSaveAsA(pPdfSecure, argv[2], "", "pwd", ePermPrint, 128, ", ", ");
    PdfSecureClose(pPdfSecure);

    PdfSecureDestroyObject(pPdfSecure);
    PdfSecureUnInitialize();
    return 0;
}
```

4.3 .NET

There should be at least one .NET sample for MS Visual Studio available in the ZIP archive of the Windows version of the 3-Heights™ PDF Security API. The easiest for a quick start is to refer to this sample.

In order to create a new project from scratch, do the following steps:
1. Start Visual Studio and create a new C# or VB project.
2. Add references to the .NET assemblies.
To do so, in the “Solution Explorer” right-click your project and select “Add Reference...”. The “Add Reference” dialog will appear. In the tab “Browse”, browse for the .NET assemblies libpdfNET.dll and PdfSecureNET.dll. Add them to the project as shown below:

3. Import namespaces (Note: This step is optional, but useful.)

4. Write your code.

Steps 3 and 4 are shown separately for C# and Visual Basic.

4.3.1 Visual Basic

3. Double-click "My Project" to view its properties. On the left hand side, select the menu “References”. The .NET assemblies you added before should show up in the upper window. In the lower window import the namespaces Pdftools.Pdf, and Pdftools.PdfSecure.

You should now have settings similar as in the screenshot below:
4. The .NET interface can now be used as shown below:

**Example:**

```vbnet
Dim doc As New PdfSecure.Secure
Dim sig As New PdfSecure.Signature
doc.Open(...)
...
If Not doc.SaveAs("C:\temp\output.pdf", "pwd", PDFPermission.ePermPrint, 128, "V2", "V2") = True Then
```
4.3.2 C#

3. Add the following namespaces:

   **Example:**
   ```csharp
   using Pdftools.Pdf;
   using Pdftools.PdfSecure;
   ```

4. The .NET interface can now be used as shown below:

   **Example:**
   ```csharp
   using (Secure doc = new Secure())
   {
      doc.Open(...)
      using (Signature sig = new Signature())
      {
         ...
         doc.AddSignature(sig)
         ...
      }
   }
   ```

4.3.3 Deployment

This is a guideline on how to distribute a .NET project that uses the 3-Heights™ PDF Security API:

1. The project must be compiled using Microsoft Visual Studio. See also .NET Interface.
2. For deployment, all items in the project's output directory (e.g. bin\Release) must be copied to the target computer. This includes the 3-Heights™ PDF Security API's .NET assemblies (*NET.dll) as well as the native library (PdfSecureAPI.dll) in its 32 bit or 64 bit version or both. The native library can alternatively be copied to a directory listed in the PATH environment variable, e.g. %SystemRoot%\System32.
3. It is crucial, that the native library PdfSecureAPI.dll is found at execution time, and that the native library's format (32 bit versus 64 bit) matches the operating system.
4. The output directory may contain multiple versions of the native library, e.g. for Windows 32 bit, Windows 64 bit, MacOS 64 bit, and Linux 64 bit. Only the versions that match the target computer's operating system need be deployed.
5. If required by the application, optional DLLs must be copied to the same folder. See Deployment for a list and description of optional DLLs.

4.3.4 Troubleshooting: TypeInitializationException

The most common issue when using the .NET interface is that the correct native DLL PdfSecureAPI.dll is not found at execution time. This normally manifests when the constructor is called for the first time and an exception of type System.TypeInitializationException is thrown.

This exception can have two possible causes, distinguishable by the inner exception (property InnerException):

- **System.DllNotFoundException**  Unable to load DLL PdfSecureAPI.dll: The specified module could not be found.
**System.BadImageFormatException**  An attempt was made to load a program with an incorrect format.

The following sections describe in more detail, how to resolve the respective issue.

**Troubleshooting: DllNotFoundException**

This means, that the native DLL `PdfSecureAPI.dll` could not be found at execution time.

Resolve this by either:

- using the [NuGet Package](#).
- adding `PdfSecureAPI.dll` as an existing item to your project and set its property "Copy to output directory" to "Copy if newer", or
- adding the directory where `PdfSecureAPI.dll` resides to the environment variable `%Path%`, or
- manually copying `PdfSecureAPI.dll` to the output directory of your project.

**Troubleshooting: BadImageFormatException**

The exception means, that the native DLL `PdfSecureAPI.dll` has the wrong "bitness" (i.e. platform 32 vs. 64 bit).

There are two versions of `PdfSecureAPI.dll` available in the [Zip Archive]: one is 32-bit (directory `bin\Win32`) and the other 64-bit (directory `bin\x64`). It is crucial, that the platform of the native DLL matches the platform of the application's process.

(Using the [NuGet Package](#) normally ensures that the matching native DLL is loaded at execution time.)

The platform of the application's process is defined by the project's platform configuration for which there are 3 possibilities:

- **AnyCPU**  This means, that the application will run as a 32-bit process on 32-bit Windows and as 64-bit process on 64-bit Windows. When using AnyCPU, then a different native DLL has to be used, depending on the Windows platform. This can be ensured either when installing the application by installing the matching native DLL, or at application start-up by determining the application's platform and ensuring the matching native DLL is loaded. The latter can be achieved by placing both the 32 bit and the 64 bit native DLL in subdirectories `win-x86` and `win-x64` of the application's directory respectively.

- **x86**  This means, that the application will always run as 32-bit process, regardless of the platform of the Windows installation. The 32-bit DLL runs on all systems.

- **x64**  This means, that the application will always run as 64-bit process. As a consequence the application will not run on a 32-bit Windows system.
5 User’s Guide

5.1 Overview of the API

5.1.1 What is the 3-Heights™ PDF Security API about?

The 3-Heights™ PDF Security API provides three key functionalities related to security in PDF documents:
1. Deal with encryption, decryption and access permissions of PDF documents
2. Deal with digital signatures
3. Apply stamps to PDF documents

These three functionalities can be combined; they however are not closely related. What encryption and what a digital signature is, is described in the upcoming chapters.

5.2 How does the API work in general?

The 3-Heights™ PDF Security API requires a PDF document as input. In this manual, that document is referred to as input-document. In the graphic below that’s the document on the left hand side. The document can be opened from file or from memory. If the document is encrypted, it is in a first step decrypted.

In the next step, application specific operations are applied. These can be setting new passwords and access permissions or add a digital signature (not shown in graphic).

After that, a new PDF document is created according to the defined settings. In this manual, the new resulting document is referred to as output-document. The input-document is never changed by the 3-Heights™ PDF Security API. Thus, the output-document must be a new document. It is not possible to directly overwrite the input-document.
5.3 Encryption

5.3.1 Encryption and how it works in PDF

A PDF document can be encrypted to protect its contents from unauthorized access. The encryption process applies encryption to all streams (e.g. images) and strings, but not to other items in the PDF document. This means the structure of the PDF document is accessible, but the content of its pages is encrypted.

When encryption is used in PDF, a security handler must be selected. The 3-Heights™ PDF Security API always uses the standard security handler which, according to the PDF Specification, has to be supported by any software that can process encrypted PDF documents.

For more detailed information about PDF encryption in general, see PDF Reference, chapter 3.5.

5.3.2 Owner Password and User Password

The standard security handler allows access permissions and up to two passwords to be specified for a document: An owner password and a user password.

**user password** protects the document against unauthorized opening and reading. If a PDF document is protected by a user password, either the user or owner password must be provided to open and read the document. If a document has a user password, it must have an owner password as well. If no owner password is defined, the owner password is the same as the user password.

**owner password** is also referred to as the author’s password. This password grants full access to the document. Not only can the document be opened and read, it also allows for changing the document’s security settings (access permission and passwords).

The following table shows the four possible combinations of passwords and how an application processing such a PDF document behaves.

<table>
<thead>
<tr>
<th>UserPwd</th>
<th>OwnerPwd</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td>none</td>
<td>Everyone can read. Everyone can change security settings. (No encryption)</td>
</tr>
<tr>
<td>none</td>
<td>set</td>
<td>Everyone can read. The user password is an empty string. Owner password required to change security settings.</td>
</tr>
<tr>
<td>set</td>
<td>none</td>
<td>User password required to read. The owner password is equal to the user password. User password required to change security settings.</td>
</tr>
<tr>
<td>set</td>
<td>set</td>
<td>User or owner password required to read. Owner password required to change security settings.</td>
</tr>
</tbody>
</table>

5.3.3 Permission Flags

What operations in a PDF document are granted is controlled via its permission flags. In order to set permission flags, the PDF document must be encrypted and have an owner password. The owner password is required to initially set or later change the permission flags.
These access permission flags are:

- Modifying the content of the document
- Copying or extracting text and graphics from the document
- Adding or modifying text annotations and interactive form fields
- Printing the document (low or high quality)
- Filling in form and digitally signing the document
- Assembling the document (inserting, rotating, deleting pages, etc.)

### 5.3.4 How to Encrypt a PDF Document

If either of the passwords or permission flags is set, the document is encrypted.

If only a user password is set, but no owner password and no permission flags, the owner password is equal to the user password and all permissions are granted.

In the 3-Heights™ PDF Security API, the passwords and permission flags are provided as parameters of the `SaveAs` function. Note that the PDF Specification accepts an empty string as password. PDF applications by default try to open documents with the empty string password.

To encrypt a document and protect it against any manipulations other than printing, the document must have an owner password and the print permission flag set. In Visual Basic such as `SaveAs` call would look like this:

```vbnet
SaveAs("C:\temp\output.pdf", ",", "ownerpwd", ePermPrint)
```

To encrypt a document similar as above, but in addition also have the application prompt the user for a password to open and read the document, you can add a user password as additional parameter in the `SaveAs` function:

```vbnet
SaveAs("C:\temp\output.pdf", "userpwd", "ownerpwd", ePermPrint)
```

To not encrypt a document at all, set empty passwords and `ePermNoEncryption` (-1) for permission flags:

```vbnet
SaveAs("C:\temp\output.pdf", ",", ",", ePermNoEncryption)
```

### 5.3.5 How to Read an Encrypted PDF Document

A PDF document which is not encrypted or protected with an owner password only, can be read and decrypted by the 3-Heights™ PDF Security API's `Open` function without providing a password.

In Visual Basic that looks like this:

```vbnet
Open("C:\temp\input.pdf", ")
```

A PDF document which is protected by a user password can only be opened if either the user or the owner password is provided as parameter in the `Open` function. Technically it does not matter later on which of the two passwords was provided, because both will grant full access to the document. However it is up to the application programmer to distinguish between input-documents that are password protected or not.

### 5.3.6 How secure is PDF Encryption?

Any PDF application that is to process or display a PDF document must be able to read and decrypt the contents of the pages in order to be able to display them. It technically cannot display an encrypted text or image without first decrypting it. A PDF application program has therefore full access to any PDF document it can decrypt and display.
PDF application programs, such as all products of the PDF Security API family, or Adobe Acrobat, can open and decrypt PDF documents which have an owner password but no user password, without knowing that password. Otherwise they couldn't display the document. The application at that point has full access to the document. However this does not imply the user of this application is given the same access rights. The user should only be given the access permissions defined by the permission flags and the password he provided. Any PDF application which behaves different from that can allow for changing the security settings or completely removing encryption from the document as long as the original document does not have a user password.

The user password protects the document, so that it only can be opened if the user or owner password is known. No PDF application program can open a user-password protected PDF document without providing the password. The security of such a document however strongly depends on the password itself. Like in most password related situations insecure passwords can easily be found programmatically. E.g. a brute force attempt testing all passwords which either exist as word in a dictionary or have less than six characters only takes minutes.

### 5.4 Fonts

Some features of the 3-Heights™ PDF Security API require fonts to be installed, e.g. for stamping text or the creation of the visual appearance of digital signatures.

#### 5.4.1 Font Cache

A cache of all fonts in all Font Directories is created. If fonts are added or removed from the font directories, the cache is updated automatically.

In order to achieve optimal performance, make sure that the cache directory is writable for the 3-Heights™ PDF Security API. Otherwise the font cache cannot be updated and the font directories have to be scanned on each program startup.

The font cache is created in the subdirectory `<CacheDirectory>/Installed Fonts` of the Cache Directory.

### 5.5 Cryptographic Provider

In order to use the 3-Heights™ PDF Security API's cryptographic functions such as creating digital signatures, a cryptographic provider is required. The cryptographic provider manages certificates, their private keys and implements cryptographic algorithms.

The 3-Heights™ PDF Security API can use various different cryptographic providers. The following list shows, for which type of signing certificate which provider can be used.

**USB Token or Smart Card**  These devices typically offer a PKCS#11 interface, which is the recommended way to use the certificate → PKCS#11 Provider.

On Windows, the certificate is usually also available in the [Windows Cryptographic Provider](#).

Note that in any case, signing documents is only possible in an interactive user session.

**Hardware Security Module (HSM)**  HSMs always offer very good PKCS#11 support → PKCS#11 Provider

For more information and installation instructions consult the separate document [TechNotePKCS11.pdf](#).

**Soft Certificate**  Soft certificates are typically PKCS#12 files that have the extension `.pfx` or `.p12` and contain the signing certificate as well as the private key and trust chain (issuer certificates). Soft certificate files cannot be used directly. Instead, they must be imported into the certificate store of a cryptographic provider.

*All Platforms:* The recommended way of using soft certificates is to import them into a store that offers a PKCS#11 interface and use the PKCS#11 Provider. For example:
A HSM
- openCryptoki on Linux
  For more information and installation instructions of the above stores consult the separate document TechNotePKCS11.pdf.
- Windows: If no PKCS#11 provider is available, soft certificates can be imported into Windows certificate store, which can then be used as cryptographic provider → Windows Cryptographic Provider

**Signature Service** Signature services are a convenient alternative to storing certificates and key material locally. The 3-Heights™ PDF Security API can use various different services whose configuration is explained in the following sections of this documentation:
- SwissSign Digital Signing Service
- Swisscom All-in Signing Service
- GlobalSign Digital Signing Service
- QuoVadis sealsign

**Custom Signature Handler** If you want to create the cryptographic part of the signature yourself, i.e. you want to implement the cryptographic provider yourself, you can register a Custom Signature Handler. This is described in the respective subsection.

### 5.5.1 PKCS#11 Provider

PKCS#11 is a standard interface offered by most cryptographic devices such as HSMs, USB Tokens or sometimes even soft stores (e.g. openCryptoki).

More information on and installation instructions of the PKCS#11 provider of various cryptographic devices can be found in the separate document TechNotePKCS11.pdf.

**Configuration**

**Provider** Property **Provider** or argument of **BeginSession**

The provider configuration string has the following syntax:

"\<PathToDll\>;\<SlotId\>;\<Pin\>"

\<PathToDll\> is the path to driver library filename, which is provided by the manufacturer of the HSM, UBS token or smart card. Examples:

- The CardOS API from Atos (Siemens) uses siecap11.dll
- The IBM 4758 cryptographic coprocessor uses cryptoki.dll
- Devices from Aladdin Ltd. use etpkcs11.dll
- The SuisseID USB Tokens use cvP11.dll

Please note that the sale of SuisseID will be discontinued as of 31. December 2019. On 15. December 2021 the SuisseID certificates will be revoked for regulatory reasons.

\<SlotId\> is optional, if it is not defined, it is searched for the first slot that contains a running token.

\<Pin\> is optional, if it is not defined, the submission for the pin is activated via the pad of the token.

If this is not supported by the token, the following error message is raised when signing: “Private key not available.”

Example:

```
Provider = "C:\Windows\system32\siecap11.dll;4;123456"
```
Note: Some PKCS#11 drivers require the **Terminate** method to be called. Otherwise your application might crash upon termination.

The chapter **Guidelines for Mass Signing** contains important information to optimize performance when signing multiple documents.

**Interoperability Support**

The following cryptographic token interface (PKCS#11) products have been successfully tested:

- SafeNet Protect Server
- SafeNet Luna
- SafeNet Authentication Client
- IBM OpenCryptoki
- CryptoVision
- Siemens CardOS
- Utimaco SafeGuard CryptoServer

**Selecting a Certificate for Signing**

The 3-Heights™ PDF Security API offers different ways to select a certificate. The product tries the first of the following selection strategies, for which the required values have been specified by the user.

1. **Certificate fingerprint**
   - Property **SignerFingerprint**
     - SHA1 fingerprint of the certificate. The fingerprint is 20 bytes long and can be specified in hexadecimal string representation, e.g. "b5 e4 5c 98 5a 7e 05 ff f4 c6 a3 45 13 48 0b c6 9d e4 5d f5". In Windows certificate store this is called "Thumbprint", if "Thumbprint algorithm" is "sha1".

2. **Certificate Issuer and SerialNumber**
   - Properties **Issuer** and **SerialNumber**
     - Certificate Issuer (e.g. "QV Schweiz CA"), in Windows certificate store this is called "Issued By".
     - Serial number of the certificate (hexadecimal string representation, e.g. "4c 05 58 fb"). This is a unique number assigned to the certificate by its issuer. In Windows certificate store this is the field called "Serial number" in the certificate's "Details" tab.

3. **Certificate Name and optionally Issuer**
   - Properties **Name** and **Issuer**
     - Common Name of the certificate (e.g. "PDF Tools AG"), in Windows certificate store this is called "Issued To".
     - Optional: Certificate Issuer (e.g. "QV Schweiz CA"), in Windows certificate store this is called "Issued By".

**Using PKCS#11 stores with missing issuer certificates**

Some PKCS#11 devices contain the signing certificate only. However, in order to embed revocation information it is important, that the issuer certificates, i.e. the whole trust chain, is available as well.

On Windows, missing issuer certificates can be loaded from the Windows certificate store. So the missing certificates can be installed as follows:

1. Get the certificates of the trust chain. You can download them from the website of your certificate provider or do the following:
   a. Sign a document and open the output in Adobe Acrobat
   b. Go to "Signature Properties" and then view the signer's certificate
   c. Select a certificate of the trust chain
d. Export the certificate as “Certificate File” (extension .cer)
e. Do this for all certificates of the trust chain
2. Open the exported files by double clicking on them in the Windows Explorer
3. Click button “Install Certificate…”
4. Select “automatically select the certificate store based on the type of certificate” and finish import

**Cryptographic Suites**

**Message Digest Algorithm**

The default hash algorithm to create the message digest is **SHA-256**. Other algorithms can be chosen by setting the provider session property `MessageDigestAlgorithm`, for which supported values are:

**SHA-1** This algorithm is considered broken and therefore strongly discouraged by the cryptographic community.

**SHA-256** (default)

**SHA-384**

**SHA-512**

**RIPEMD-160**

**Signing Algorithm**

The signing algorithm can be configured by setting the provider session property `SigAlgo`. Supported values are:

**RSA_RSA** (default) This is the RSA PKCS#1v1.5 algorithm which is widely supported by cryptographic providers.

**RSA_SSA_PSS** This algorithm is sometimes also called RSA-PSS.

Signing will fail if the algorithm is not supported by the cryptographic hardware. The device must support either the signing algorithm `CKM_RSA_PKCS_PSS` (i.e. RSA_SSA_PSS) or `CKM_RSA_X_509` (i.e. raw RSA).

**Note:** Setting the signing algorithm only has an effect on signatures created by the cryptographic provider itself. All signed data acquired from external sources might use other signing algorithms, specifically the issuer signatures of the trust chain, the time-stamp's signature, or those used for the revocation information (CRL, OCSP). It is recommended to verify, that the algorithms of all signatures provide a similar level of security.

**5.5.2 Windows Cryptographic Provider**

This provider uses Windows infrastructure to access certificates and to supply cryptographic algorithms. Microsoft Windows offers two different APIs, the Microsoft CryptoAPI and Cryptography API Next Generation (CNG).

**Microsoft CryptoAPI** Provides functionality for using cryptographic algorithms and for accessing certificates stored in the Windows certificate store and other devices, such as USB tokens, with Windows integration.

Microsoft CryptoAPI does not support some new cryptographic algorithms, such as SHA-256.

**Cryptography API: Next Generation (CNG)** CNG is an update to CryptoAPI. It extends the variety of available cryptographic algorithms, e.g. by the SHA-256 hashing algorithms. If possible the 3-Heights™ PDF Security API performs cryptographic calculations with CNG instead of CryptoAPI.
CNG is available only if:

- The operating system is at least Windows Vista or Windows Server 2008.
- The provider of the signing certificate's private key, e.g. the USB Token or SmartCard, supports CNG.

If CNG is not available, the CryptoAPI's cryptographic algorithms are used. In any case, CryptoAPI is used for the certificate accessing functionalities.

**Default Message Digest Algorithm:** Since version 4.6.12.0 of the 3-Heights™ PDF Security API, the default message digest algorithm is SHA-256. As a result, signing will fail if CNG is not available (error message "Private key not available."). To use SHA-1, the provider session property `MessageDigestAlgorithm` can be used. Note that the use of SHA-1 is strongly discouraged by the cryptographic community.

**Configuration**

**Provider**  Property `Provider` or argument of `BeginSession`

The provider configuration string has the following syntax:

```
"[\{ProviderType\}:\{Provider\}[;\{PIN\}]"
```

The `ProviderType` and `PIN` are optional. The corresponding drivers must be installed on Windows. If CNG is available, `ProviderType` and `Provider` are obsolete and can be omitted.

Optionally, when using an advanced certificate, the pin code (password) can be passed as an additional, semicolon separated parameter `PIN`. This does not work with qualified certificates, because they always require the pin code to be entered manually and every time.

If `Provider` is omitted, the default provider is used. The default provider is suitable for all systems where CNG is available.

**Examples:** Use the default provider with no pin.

Provider = ""

Examples: "123456" being the pin code.

Provider = ";123456"

Provider = "Microsoft Base Cryptographic Provider v1.0;123456"

Provider = "PROV_RSA_AES:Microsoft Enhanced RSA and AES Cryptographic" + "Provider;123456"

**Certificate Store**  Property `Store`

The value for the certificate store depends on the OS. Supported values are: "CA", "MY" and "ROOT". For signature creation the default store "MY" is usually the right choice.

**Store Location**  Property `StoreLocation`
Either of the following store locations

- “Local Machine”
- “Current User” (default)

Usually personal certificates are stored in the “Current User” location and company-wide certificates are stored under “Local Machine”.

The “Current User”’s store is only available, if the user profile has been loaded. This may not be the case in certain environments such as within an IIS web application or COM+ applications. Use the store of the Local Machine, if the user profile cannot be loaded. For other services it is sufficient to log it on as the user. Note that some cryptographic hardware (such as smart cards or USB Tokens) require an interactive environment. As a result, the private key might not be available in the service session, unless the 3-Heights™ PDF Security API is run interactively.

Certificates in the store “Local Machine” are available to all users. However, in order to sign a document, you need access to the signing certificate's private key. The private key is protected by Windows ACLs and typically readable for Administrators only. Use the Microsoft Management Console (mmc .exe) in order to grant access to the private key for other users as follows: Add the Certificates Snap-in for the certificates on Local Machine. Right-click on the signing certificate, click on “All Tasks” and then “Manage Private Keys...” where you can set the permissions.

Selecting a Certificate for Signing

Within the certificate store selected by Store Location and Certificate Store the selection of the signing certificate works the same as with the PKCS#11 provider, which is described here: Selecting a Certificate for Signing

Certificates

In order to sign a PDF document, a valid, existing certificate name must be provided and its private key must be available.

There are various ways to create or obtain a certificate. How this is done is not described in this document. This document describes the requirements for, and how to use the certificate.

On the Windows operating system certificates can be listed by the Microsoft Management Console (MMC), which is provided by Windows. In order to see the certificates available on the system, do the following steps:

1. To launch the MMC, go to Start → Run…→ type “mmc”, or start a Command Prompt and type “mmc”.

2. Under “File” → “Add/Remove Snap-in”
3. Choose “Certificates” and click the “Add” button
4. In the next window choose to manage certificates for “My user account”
5. Click “Finish”
6. The certificate must be listed under the root “Certificates - Current User”, for example as shown in the screenshot below:

![Certificate List Screenshot]

7. Double-click the certificate to open. The certificate name corresponds to the value “Issued to”:

![Certificate Details Screenshot]

8. In the tab Detail of the certificate, there is a field named “Key Usage”. This field must contain the value “Digital Signature”. Additional values are optional, see also screenshot. You must have the private key that corresponds to this certificate.
Qualified Certificates

A qualified certificate can be obtained from a certificate authority (CA). Besides the requirements listed in the previous chapter it has the additional requirement to contain the key “Authority Information Access” which contains the information about the OCSP server.
Cryptographic Suites

The message digest algorithm as well as the signing algorithm can be chosen as described for the PKCS#11 provider in Cryptographic Suites.

The MessageDigestAlgorithm can only be set to a value other than SHA-1 if the private key's provider supports CNG.

The SigAlgo can only be set to RSA_SSA_PSS if the private key's provider supports CNG.

5.5.3 SwissSign Digital Signing Service

Provider Property Provider or argument of BeginSession

The provider configuration string contains the URL to the service endpoint.

Provider Configuration The provider can be configured using provider session properties.

There are two types of properties:

- "String" Properties:
  String properties are set using method SetSessionProperty.

- "File" Properties:
  File properties are set using method SetSessionProperty with a file name parameter. Alternatively the file can be passed in-memory as byte array using the method SetSessionProperty.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity</td>
<td>String</td>
<td>required</td>
<td>The identity of your signing certificate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Example: My Company:Signing Cert 1</td>
</tr>
<tr>
<td>DSSProfile</td>
<td>String</td>
<td>required</td>
<td>Must be set to <a href="http://dss.swisssign.net/dss/profile/pades/1.0">http://dss.swisssign.net/dss/profile/pades/1.0</a></td>
</tr>
<tr>
<td>SSLClientCertificate</td>
<td>File</td>
<td>required</td>
<td>SSL client certificate in PKCS#12 Format (.p12, .pfx).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>File must contain the certificate itself, all certificates of the trust chain and the private key.</td>
</tr>
<tr>
<td>SSLClientCertificatePassword</td>
<td>String</td>
<td>optional</td>
<td>Password to decrypt the private key of the SSL client certificate.</td>
</tr>
<tr>
<td>SSLServerCertificate</td>
<td>File</td>
<td>recommended</td>
<td>Certificate of the server or its issuer (CA) certificate (.crt). The certificate may be in either PEM (ASCII text) or DER (binary) form.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Note: If this property is not set, the server certificate's trustworthiness cannot be determined. As a result, the connection is not guaranteed to be secure.</td>
</tr>
</tbody>
</table>
### RequestID

| RequestID | String | recommended | Any string that can be used to track the request. Example: An UUID like AE57F021-C0EB-4AE0-8E5E-67FB93E5BC7F |

### Signature Configuration

The signature can be customized using standard properties of the 3-Heights™ PDF Security API.

<table>
<thead>
<tr>
<th>Description</th>
<th>Required</th>
<th>Value</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Name</td>
<td>required</td>
<td>The name of the signer must be set.</td>
<td>Property <strong>Name</strong>.</td>
</tr>
<tr>
<td>Time-stamp</td>
<td>optional</td>
<td>Use the value <strong>urn:ietf:rfc:3161</strong> to embed a time-stamp.</td>
<td>Property <strong>TimeStampURL</strong></td>
</tr>
<tr>
<td>Signature Format</td>
<td>optional</td>
<td>To set the signature format</td>
<td>Property <strong>SubFilter</strong>. Must be <strong>adbe.pkcs7.detached</strong></td>
</tr>
<tr>
<td>Revocation Info</td>
<td>recommended</td>
<td>To embed OCSP responses or CRL.</td>
<td>Property <strong>EmbedRevocationInfo</strong></td>
</tr>
<tr>
<td>Visual Appearance</td>
<td>optional</td>
<td>See separate chapter <a href="#">How to Create a Visual Appearance of a Signature</a></td>
<td></td>
</tr>
</tbody>
</table>

### Proxy Configuration

If a proxy is used for the connection to the service, see chapter [How to Use a Proxy](#) for more information.

#### 5.5.4 QuoVadis sealsign

**Provider** Property **Provider** or argument of **BeginSession**

The provider configuration string contains the URL to the QuoVadis sealsign service.

- Demo service:  
  [https://services.sealsignportal.com/sealsign/ws/BrokerClient](https://services.sealsignportal.com/sealsign/ws/BrokerClient)
- Productive service:  
  [https://qvchsvsws.quovadisglobal.com/sealsign/ws/BrokerClient](https://qvchsvsws.quovadisglobal.com/sealsign/ws/BrokerClient)

**Provider Configuration** The provider can be configured using provider session properties that can be set using the method **SetSessionProperty**.

---

7 This parameter is not used for certificate selection, but for the signature appearance and signature description in the PDF only.
<table>
<thead>
<tr>
<th><strong>Name</strong></th>
<th><strong>Type</strong></th>
<th><strong>Required</strong></th>
<th><strong>Value</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Identity</strong></td>
<td>String</td>
<td>required</td>
<td>The account ID is the unique name of the account specified on the server.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Example: Rigora</td>
</tr>
<tr>
<td><strong>Profile</strong></td>
<td>String</td>
<td>required</td>
<td>The profile identifies the signature specifications by a unique name.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Example: Default</td>
</tr>
<tr>
<td><strong>secret</strong></td>
<td>String</td>
<td>required</td>
<td>The secret is the password which secures the access to the account.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Example: NeE=EKEd33FeCk70</td>
</tr>
<tr>
<td><strong>clientId</strong></td>
<td>String</td>
<td>required</td>
<td>A client ID can be used to help separating access and creating better</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>statistics. If specified in the account configuration it is necessary to</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>provide this value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Example: 3949-4929-3179-2818</td>
</tr>
<tr>
<td><strong>pin</strong></td>
<td>String</td>
<td>required</td>
<td>The PIN code is required to activate the signing key.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Example: 123456</td>
</tr>
<tr>
<td><strong>MessageDigestAlgorithm</strong></td>
<td>String</td>
<td>optional</td>
<td>The message digest algorithm to use.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Default: SHA-256</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Alternatives: SHA-1, SHA-384, SHA-512, RIPEMD-160, RIPEMD-256</td>
</tr>
</tbody>
</table>

**Signature Configuration** The signature can be customized using standard properties.

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th><strong>Required</strong></th>
<th><strong>Value</strong></th>
<th><strong>Setting</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common Name</strong></td>
<td>required</td>
<td>The name of the signer must be set.</td>
<td>Property Name.</td>
</tr>
<tr>
<td><strong>Time-stamp</strong></td>
<td>-</td>
<td>Not available.</td>
<td></td>
</tr>
<tr>
<td><strong>Revocation Info</strong></td>
<td>recommended</td>
<td>To embed OCSP responses or CRL.</td>
<td>Property EmbedRevocationInfo</td>
</tr>
<tr>
<td><strong>Visual Appearance</strong></td>
<td>optional</td>
<td>See separate chapter How to Create a Visual Appearance of a Signature.</td>
<td></td>
</tr>
</tbody>
</table>

**Proxy Configuration** If a proxy is used for the connection to the service, see chapter How to Use a Proxy for more information.

---

8 This parameter is not used for certificate selection, but for the signature appearance and signature description in the PDF only.
5.5.5 Swisscom All-in Signing Service

General Properties

To use the signature service, the following general properties have to be set:

<table>
<thead>
<tr>
<th>Description</th>
<th>Required</th>
<th>Value</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Name</td>
<td>required</td>
<td>Name of the signer(^9)</td>
<td>Property Name</td>
</tr>
<tr>
<td>Provider</td>
<td>required</td>
<td>The service endpoint URL of the REST service. Example: (<a href="https://ais.swisscom.com/AIS-Server/rs/v1.0/sign%5C">https://ais.swisscom.com/AIS-Server/rs/v1.0/sign\</a>)</td>
<td>Property Provider</td>
</tr>
<tr>
<td>Time-stamp</td>
<td>optional</td>
<td>Use the value (urn:ietf:rfc:3161) to embed a time-stamp.</td>
<td>Property TimeStampURL</td>
</tr>
<tr>
<td>Signature Format</td>
<td>optional</td>
<td>To set the signature format</td>
<td>Property SubFilter. Supported values are adbe.pkcs7.detached, ETSI.CAdES.detached, ETSI.RFC3161(^10).</td>
</tr>
<tr>
<td>Revocation Info</td>
<td>optional</td>
<td>To embed OCSP responses</td>
<td>Property EmbedRevocationInfo. Supported with adbe.pkcs7.detached only.</td>
</tr>
</tbody>
</table>

If a proxy is used for the connection to the service, see chapter How to Use a Proxy for more information.

Provider Session Properties

In addition to the general properties, a few provider specific session properties have to be set.

There are two types of properties:

- “String” Properties: String properties are set using method SetSessionProperty.
- “File” Properties: File properties are set using method SetSessionProperty with a file name parameter. Alternatively the file can be passed in-memory as byte array using the method SetSessionProperty.

\(^9\) This parameter is not used for certificate selection, but for the signature appearance and signature description in the PDF only.

\(^10\) ETSI.RFC3161 is automatically set when signing with AddTimeStampSignature
### DSSProfile
- **Type**: String
- **Required**: required
- **Value**: Must be set to http://ais.swisscom.ch/1.0

### SSLClientCertificate
- **Type**: File
- **Required**: required
- **Value**: SSL client certificate in PKCS#12 Format (.p12, .pfx).
  - File must contain the certificate itself, all certificates of the trust chain and the private key.

### SSLClientCertificatePassword
- **Type**: String
- **Required**: optional
- **Value**: Password to decrypt the private key of the SSL client certificate.

### SSLServerCertificate
- **Type**: File
- **Required**: recommended
- **Value**: Certificate of the server or its issuer (CA) certificate (.crt). The certificate may be in either PEM (ASCII text) or DER (binary) form.
  - Note: If this property is not set, the server certificate's trustworthiness cannot be determined. As a result, the connection is not guaranteed to be secure.

### Identity
- **Type**: String
- **Required**: required
- **Value**: The Claimed Identity string as provided by Swisscom: 
  - `<customer name>:<key identity>`

### RequestID
- **Type**: String
- **Required**: recommended
- **Value**: Any string that can be used to track the request.
  - Example: An UUID like AE57F021-C0EB-4AE0-8E5E-67FB93E5BC7F

---

### On-Demand Certificates
To request an on-demand certificate, the following additional property has to be set:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SwisscomAllInOnDemandDN</td>
<td>String</td>
<td>required</td>
<td>The requested distinguished name.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Example: <code>cn=Hans Muster,o=ACME,c=CH</code></td>
</tr>
</tbody>
</table>

### Step-Up Authorization using Mobile-ID
To use the step-up authorization, the following additional properties have to be set:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SwisscomAllInMSISDN</td>
<td>String</td>
<td>required</td>
<td>Mobile phone number.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Example: <code>+41798765432</code></td>
</tr>
</tbody>
</table>
SwisscomAllInMessage | String | required | The message to be displayed on the mobile phone. Example: Pipapo halolu.

SwisscomAllInLanguage | String | required | The language of the message. Example: DE

Those properties have to comply with the Swisscom Mobile-ID specification.

5.5.6 GlobalSign Digital Signing Service

Provider Property **Provider** or argument of **BeginSession**

The provider configuration string contains the URL to the service endpoint.

[https://emea.api.dss.globalsign.com:8443/v2](https://emea.api.dss.globalsign.com:8443/v2)

Provider Configuration The provider can be configured using provider session properties.

There are two types of properties:

- **“String”** Properties:
  String properties are set using method **SetSessionProperty**.

- **“File”** Properties:
  File properties are set using method **SetSessionProperty** with a file name parameter. Alternatively the file can be passed in-memory as byte array using the method **SetSessionProperty**.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Required</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>api_key</td>
<td>String</td>
<td>required</td>
<td>Your account credentials' key parameter for the login request.</td>
</tr>
<tr>
<td>api_secret</td>
<td>String</td>
<td>required</td>
<td>Your account credentials’ secret parameter for the login request.</td>
</tr>
<tr>
<td>Identity</td>
<td>String</td>
<td>required</td>
<td>Parameter to create the signing certificate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Example for an account with a static identity: {}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Example for an account with a dynamic identity: {&quot;subject_dn&quot;: {&quot;common_name&quot;: &quot;John Doe&quot;}}</td>
</tr>
<tr>
<td>SSLClientCertificate</td>
<td>File</td>
<td>required</td>
<td>SSL client certificate in PKCS#12 Format (.p12, .pfx).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>File must contain the certificate itself, all certificates of the trust chain and the private key.</td>
</tr>
<tr>
<td>SSLClientCertificatePassword</td>
<td>String</td>
<td>optional</td>
<td>Password to decrypt the private key of the SSL client certificate.</td>
</tr>
</tbody>
</table>
SSLServerCertificate

File recommended
Certificate of the server or its issuer (CA) certificate (.crt). The certificate may be in either PEM (ASCII text) or DER (binary) form.

Note: If this property is not set, the server certificate's trustworthiness cannot be determined. As a result, the connection is not guaranteed to be secure.

Signature Configuration

The signature can be customized using standard properties of the 3-Heights™ PDF Security API.

<table>
<thead>
<tr>
<th>Description</th>
<th>Required</th>
<th>Value</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Name</td>
<td>required</td>
<td>The name of the signer must be set.</td>
<td>Property Name</td>
</tr>
<tr>
<td>Time-stamp</td>
<td>recommended</td>
<td>Use the value urn:ietf:rfc:3161 to embed a time-stamp.</td>
<td>Property TimeStampURL</td>
</tr>
<tr>
<td>Signature Format</td>
<td>optional</td>
<td>To set the signature format</td>
<td>Property SubFilter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supported values are adbe.pkcs7.detached, ETSI.CAdES.detached, ETSI.RFC3161</td>
<td></td>
</tr>
<tr>
<td>Revocation Info</td>
<td>recommended</td>
<td>To embed OCSP responses or CRL.</td>
<td>Property EmbedRevocationInfo</td>
</tr>
<tr>
<td>Visual Appearance</td>
<td>optional</td>
<td>See separate chapter How to Create a Visual Appearance of a Signature.</td>
<td></td>
</tr>
</tbody>
</table>

Proxy Configuration

If a proxy is used for the connection to the service, see chapter How to Use a Proxy for more information.

How to create the SSL client certificate

When creating a new account, GlobalSign will issue an SSL client certificate clientcert.crt. The following command creates a PKCS#12 file certificate.p12 that can be used for the SSLClientCertificate:

```bash
openssl pkcs12 -export -out certificate.p12 -inkey privateKey.key -in clientcert.crt
```

How to get the SSL server certificate

The SSL server certificate can either be found in the technical documentation of the “Digital Signing Service” or downloaded from the server itself:

1. Get the server’s SSL certificate:

---

11 This parameter is not used for certificate selection, but for the signature appearance and signature description in the PDF only.
openssl s_client -showcerts -connect emea.api.dss.globalsign.com:8443 ^
-cert clientcert.crt -key privateKey.key

2. The certificate is the text starting with "-----BEGIN CERTIFICATE-----" and ending with "-----END CERTIFICATE-----". Use the text to create a text file and save it as server.crt.

3. Use server.crt or one of its CA certificates for the SSLServerCertificate.

Advice on using the service

Whenever a new session is created using BeginSession a login is performed. In this session signatures can be created using different identities, i.e. signing certificates, which are created as they are needed. Both signing sessions and signing certificates expire after 10 minutes.

Note that there are rate limits for both creating new identities and for signing operations. So, if multiple documents must be signed at once, it is advisable to re-use the same session (and hence its signing certificates) for signing.

Due to the short-lived nature of the signing certificates, it is important to embed revocation information immediately. For example by using AddValidationInformation or EmbedRevocationInfo. Furthermore it is highly recommended to embed a time-stamp in order to prove that the signature was created during the certificate's validity period.

5.5.7 Custom Signature Handler

The 3-Heights™ PDF Security API provides the capability of replacing the default built-in signature handler with a custom signature handler. A custom signature handler has full control over the creation and validation of the cryptographic part of a signature. This makes it possible to implement proprietary signing algorithms.

The custom signature handler must implement a C interface as described in the header file pdfsignaturehandler.h. It can be registered using a call to PdfRegisterSignatureHandler() during the initialization of the 3-Heights™ PDF Security API. When using a custom signature handler, it is important that this call be made before using the API for signing.

This allows for treating the PDF and signature technologies separately and also provides an easy way to replace a signature handler.

5.6 How to Create Digital Signatures

This chapter describes the steps that are required to create different types of digital signatures. A good introductory example can be found in the chapter How to Create Electronic Signatures.

5.6.1 How to Sign a PDF Document

As we saw in the chapter How to Create Electronic Signatures, the process steps to add a signature are as shown in the graphic below:
1. A PDF input-document is opened
2. A signature is created and added using a certificate
3. A new, signed PDF output-document is created
4. The input-document is closed

5.6.2 How to Create a Preview of a Signed Document

The 3-Heights™ PDF Security API provides the possibility to create a PDF document with a visual appearance of a
digital signature without actually signing the document. This document can be used for a preview. If the preview
is accepted, the document can be signed without visually change the document. The process steps to prepare a
document for signing and actually sign it upon approval of the user are as shown in the graphic below:

1. A PDF input-document is opened.
2. A digital signature is prepared and a visual appearance is generated.
3. A new preview-PDF output-document is created, this document does not contain a digital signature, however
   it contains a placeholder for a signature.
4. If the preview-PDF is approved, the document is signed using a certificate.
5. A new, signed PDF output-document is created, which looks identical to the preview-PDF.
6. The input-document is closed.

5.6.3 How to Create a PAdES Signature

The PAdES European Norm (ETSI EN 319 142) recommends to use one of the following four baseline signature levels.

PAdES-B-B A digital signature.

PAdES-B-T A digital signature with a time-stamp token.

PAdES-B-LT A digital signature with a time-stamp token and signature validation data. The signature is a long-term
   signature or “LTV enabled”.

PAdES-B-LTA A digital signature with a time-stamp token and signature validation data protected by a document
time-stamp.

The lifecycle of digital signatures in general and usage these signature levels in particular are described in more
detail in chapter 8.11.6 “Digital signatures lifecycle” of ETSI TR 119 100.
Note: The Decision 2015/1506/EU of the eIDAS Regulation (Regulation (EU) N°910/2014) still refers to the previous legacy PAdES baseline signature standard ETSI TS 103 172. However, the signatures as created by the 3-Heights™ PDF Security API are compatible.

The Compatibility of PAdES Signature Levels shows, to which other standards the signature levels described above and as created by the 3-Heights™ PDF Security API conform.

### Compatibility of PAdES Signature Levels

<table>
<thead>
<tr>
<th></th>
<th>ETSI EN 319 142</th>
<th>ETSI TS 102 778</th>
<th>ETSI TS 103 172</th>
<th>ISO 14533-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAdES-B-B</td>
<td>PAdES-BES (Part 3)</td>
<td>PAdES B-Level</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PAdES-B-T</td>
<td>PAdES-BES (Part 3)</td>
<td>PAdES T-Level</td>
<td>PAdES-T</td>
<td>-</td>
</tr>
<tr>
<td>PAdES-B-LT</td>
<td>PAdES-BES (Part 3)</td>
<td>PAdES LT-Level</td>
<td>PAdES-A</td>
<td>-</td>
</tr>
<tr>
<td>PAdES-B-LTA</td>
<td>PAdES-LTV (Part 4)</td>
<td>PAdES LTA-Level</td>
<td>PAdES-A</td>
<td>-</td>
</tr>
</tbody>
</table>

### Requirements

For general requirements and preparation steps see chapter [How to Create Electronic Signatures](#).

<table>
<thead>
<tr>
<th>Level</th>
<th>Signing Certificate</th>
<th>Time-stamp</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAdES-B-B</td>
<td>any</td>
<td>no</td>
<td>3-Heights™ PDF Security API</td>
</tr>
<tr>
<td>PAdES-B-T</td>
<td>any</td>
<td>required</td>
<td>3-Heights™ PDF Security API</td>
</tr>
<tr>
<td>PAdES-B-LT</td>
<td>advanced or qualified certificate</td>
<td>required</td>
<td>3-Heights™ PDF Security API</td>
</tr>
<tr>
<td>PAdES-B-LTA</td>
<td>advanced or qualified certificate</td>
<td>required</td>
<td>3-Heights™ PDF Security API</td>
</tr>
</tbody>
</table>

Make sure the trust store of your cryptographic provider contains all certificates of the trust chain, including the root certificate. Also include the trust chain of the time-stamp signature, if your TSA server does not include them in the time-stamp.

A proper error handling is crucial in order to ensure the creation of correctly signed documents. The output document was signed successfully, if and only if the method `SaveAs` returns true.

Note on encryption and linearization: Because signature levels PAdES-B-LT and PAdES-B-LTA must be created in a two-step process, the files cannot be linearized nor can encryption parameters be changed. When creating signature levels PAdES-B-B or PAdES-B-T that might later be augmented, linearization should not be used and all encryption parameters (user password, owner password, permission flags, and encryption algorithm) must be the same for both steps.
PAdES vs. CAdES: CAdES is an ETSI standard for the format of digital signatures. The format used in PAdES is based on CAdES, which is why the format is called ETSI.CAdES.detached (see SubFilter). Because PAdES defines additional requirements suitable for PDF signatures, mere CAdES conformance is not sufficient.

Create a PAdES-B-B Signature

Input Document  Any PDF document.

Cryptographic Provider  A cryptographic provider that supports the creation of PAdES signatures.

```csharp
using (Secure doc = new Secure())
{
    if (!doc.Open("input.pdf", "]
        throw new Exception("Error opening input.pdf: " + doc.ErrorMessage);
    
    if (!doc.BeginSession("myPKCS11.dll;;pin"))
        throw new Exception("Error connecting to provider: " + doc.ErrorMessage);

    using (Signature sig = new Signature())
    {
        sig.Name = "My Signing Certificate";
        sig.SubFilter = "ETSI.CAdES.detached";
        sig.EmbedRevocationInfo = false;
        doc.AddSignature(sig);
    }

    if (!doc.SaveAs("pades-b-b.pdf", "]
        throw new Exception("Error saving pades-b-b.pdf: " + doc.ErrorMessage);
}
```

Create a PAdES-B-T Signature

Input Document  Any PDF document.

Cryptographic Provider  A cryptographic provider that supports the creation of PAdES signatures.

```csharp
using (Secure doc = new Secure())
{
    if (!doc.Open("input.pdf", ""]
        throw new Exception("Error opening input.pdf: " + doc.ErrorMessage);
    
    if (!doc.BeginSession("myPKCS11.dll;;pin"))
        throw new Exception("Error connecting to provider: " + doc.ErrorMessage);

    using (Signature sig = new Signature())
    {
        sig.Name = "My Signing Certificate";
        sig.SubFilter = "ETSI.CAdES.detached";
        sig.EmbedRevocationInfo = false;
```
Create a PAdES-B-LT Signature

**Input Document**  A PDF document with a PAdES-B-T signature created using an advanced or qualified certificate.

**Cryptographic Provider**  Any cryptographic provider.

```csharp
using (Secure doc = new Secure())
{
    if (!doc.Open("pades-b-t.pdf", "))
        throw new Exception("Error opening pades-b-t.pdf: " + doc.ErrorMessage);

    if (!doc.BeginSession("myPKCS11.dll;0;pin"))
        throw new Exception("Error connecting to provider: " + doc.ErrorMessage);

    for (int i = 0; i < doc.SignatureCount; i++)
        using (Signature sig = doc.GetSignature(i))
        {
            if (sig.HasSignature &&
                !doc.AddValidationInformation(sig))
                throw new Exception("Error adding validation information to "
                    + sig.Name + ": " + doc.ErrorMessage);
        }

    if (!doc.SaveAs("pades-b-lt.pdf", ",", PDFPermission.ePermNoEncryption, 0, ",", "))
        throw new Exception("Error saving pades-b-lt.pdf: " + doc.ErrorMessage);
}
```

Create a PAdES-B-LTA Signature or Enlarge Longevity of a Signature

**Input Document**
- A PDF document with a PAdES-B-T signature created using an advanced or qualified certificate, or
- a PAdES-B-LTA signature whose longevity should be enlarged.

**Cryptographic Provider**  Any cryptographic provider whose trust store contains all certificates required for *Ad-dValidationInformation*.

```csharp
using (Secure doc = new Secure())
{
    if (!doc.Open("pades-b-t.pdf", "))
        throw new Exception("Error opening pades-b-t.pdf: " + doc.ErrorMessage);

    if (!doc.BeginSession("myPKCS11.dll;0;pin"))
        throw new Exception("Error connecting to provider: " + doc.ErrorMessage);
```
for (int i = 0; i < doc.SignatureCount; i++)
    using (Signature sig = doc.GetSignature(i))
    {
        if (sig.HasSignature &&
            !doc.AddValidationInformation(sig))
            throw new Exception("Error adding validation information to \
            + sig.Name + ": " + doc.ErrorMessage);
    }

using (Signature timeStamp = new Signature())
{
    timeStamp.TimeStampURL = "http://server.mydomain.com/tsa";
    doc.AddTimeStampSignature(timeStamp);
}

if (!doc.SaveAs("pades-b-lta.pdf", "", "", PDFPermission.ePermNoEncryption, 0, "", "")
    throw new Exception("Error saving pades-b-lta.pdf: " + doc.ErrorMessage);
}

5.6.4 How to Apply Multiple Signatures

Multiple Signatures can be applied to a PDF document. One signature must be applied at the time. Signing a signed file does not break existing signatures, because the 3-Heights™ PDF Security API uses an incremental update.

Note that signing a linearized file renders the linearization information unusable. Therefore it is recommended to not linearize files that will be signed multiple times.

using (Secure doc = new Secure())
{
    if (!doc.BeginSession("cvp11.dll;0;secret-pin"))
        throw new Exception("Unable to connect to Cryptographic Provider: "
        + doc.ErrorMessage);

    if (!doc.Open(inputPath, ""))
        throw new Exception("Document " + inputPath + " cannot be opened: "
        + doc.ErrorMessage);

    using (Signature signature = new Signature())
    {
        signature.Name = "First Signer";
        doc.AddSignature(signature);
    }

    var tmp = new System.IO.MemoryStream();
    if (!doc.SaveAsStream(tmp, "", "", PDFPermission.ePermNoEncryption, 0, "", "")
        throw new Exception("Unable to sign temporary document: " + doc.ErrorMessage);

    doc.Close();

    if (!doc.OpenStream(tmp, ""))
        throw new Exception("Temporary document cannot be opened: " + doc.ErrorMessage);

    using (Signature signature = new Signature())
    {
        signature.Name = "Second Signer";
    }
5.6.5 How to Create a Time-stamp Signature

For a time-stamp signature no local signing certificate is required. Instead the time-stamp signature requested from the time-stamp Authority (TSA) is embedded into the document. Nonetheless, a Cryptographic Provider that supports time-stamp signatures is required.

Example: Create a time-stamp signature using the method `AddTimeStampSignature`.

```csharp
using (Secure doc = new Secure())
{
    if (!doc.Open("input.pdf", ""))
        throw new Exception("Error opening input.pdf: " + doc.ErrorMessage);

    using (Signature timeStamp = new Signature())
    {
        timeStamp.Provider = "myPKCS11.dll";
        timeStamp.TimeStampURL = "http://server.mydomain.com/tsa";
        doc.AddTimeStampSignature(timeStamp);
    }

    if (!doc.SaveAs("output.pdf", "", "", PDFPermission.ePermNoEncryption, 0, "", ""))
        throw new Exception("Error saving output.pdf: " + doc.ErrorMessage);
}
```

5.6.6 How to Create a Visual Appearance of a Signature

Each signature may have a visual appearance on a page of the document. The visual appearance is optional and has no effect on the validity of the signature. Because of this and because a visual appearance may cover important content of the page, the 3-Heights™ PDF Security API creates invisible signatures by default.

In order to create a visual appearance, a non-empty signature rectangle must be set. For example, by setting the property `Rect` to `[10, 10, 210, 60]` the following appearance is created:

![Visual Appearance Example]

Different properties of the visual appearance can be specified.
5.6.7 Guidelines for Mass Signing

This section provides some guidelines for mass signing using the 3-Heights™ PDF Security API.

Keep the session to the security device open for multiple sign operations

Creating and ending the session to the security device is a complex operation. By re-using the session for multiple sign operations, performance can be improved:

1. Create a `PdfSecure` object.
2. Open the session to the provider using `BeginSession`.
3. Use the `PdfSecure` object to sign multiple documents.
4. Close the session to the provider using `EndSession`.
5. Dispose of the `PdfSecure` object.

Signing concurrently using multiple threads

The 3-Heights™ PDF Security API is thread-safe. Each `PdfSecure` object should be used in one thread at the time only. It is recommended that each thread has a separate `PdfSecure` object.

The performance improvement when signing concurrently using multiple threads depends mainly on the security device used. Typically the improvement is large for HSMs and small for USB Tokens.

Thread safety with a PKCS#11 provider

The PKCS#11 standard specifies, that “an application can specify that it will be accessing the library concurrently from multiple threads, and the library must […] ensure proper thread-safe behavior.” However, some PKCS#11 provider (middleware) implementations are not thread-safe. For this reason, the 3-Heights™ PDF Security API synchronizes all access to the same provider (middleware and slot id).

If your middleware is thread-safe, you can enable full parallel usage of the cryptographic device by setting the session property "LOCKING_OK" to the value "True" using the method `SetSessionProperty`.

Example:  Enable parallel access to the cryptographic device.

```csharp
doc.SetSessionPropertyString("LOCKING_OK", "true");
```

5.6.8 Miscellaneous

Caching of CRLs, OCSP, and Time-stamp Responses

In order to improve the speed when mass signing, the 3-Heights™ PDF Security API provides a caching algorithm to store CRL (Certificate Revocation List), OCSP (Online Certificate Status Protocol), TSP (Time-stamp Protocol) and
data from signature services. This data is usually valid over period of time that is defined by the protocol, which is normally at least 24 hours. Caching improves the speed, because there are situations when the server does not need to be contacted for every digital signature.

The following caches are stored automatically by the 3-Heights™ PDF Security API at the indicated locations within the Cache Directory:

<table>
<thead>
<tr>
<th>Type</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificates</td>
<td><code>&lt;CacheDirectory&gt;/Certificates/hash.cer</code></td>
</tr>
<tr>
<td>CRL</td>
<td><code>&lt;CacheDirectory&gt;/CLRs/server.der</code></td>
</tr>
<tr>
<td>OCSP responses</td>
<td><code>&lt;CacheDirectory&gt;/OCSP Responses/server-hash.der</code></td>
</tr>
<tr>
<td>Service data</td>
<td><code>&lt;CacheDirectory&gt;/Signature Sizes/hash.bin</code></td>
</tr>
<tr>
<td>Time-stamp responses</td>
<td><code>&lt;CacheDirectory&gt;/Time Stamps/server.der</code></td>
</tr>
</tbody>
</table>

The caches can be cleared by deleting the files. Usage of the caches can be deactivated by setting the **NoCache** flag. The files are automatically updated if the current date and time exceeds the “next update” field in the OCSP or CRL response respectively or the cached data was downloaded more than 24 hours ago.

**How to Use a Proxy**

The 3-Heights™ PDF Security API can use a proxy server for all communication to remote servers, e.g. to download CRL or for communication to a signature service. The proxy server can be configured using the provider session property **Proxy**. The property's value must be a string with the following syntax:

```
http[s]://[<user>[:<password>[@<host>[:<port>]]
```

Where:
- **http/https**: Protocol for connection to proxy.
- `<user>[:<password>]` (optional): Credentials for connection to proxy (basic authorization).
- `<host>`: Hostname of proxy.
- `<port>`: Port for connection to proxy.

For SSL connections, e.g. to a signature service, the proxy must allow the HTTP CONNECT request to the signature service.

**Example:** Configuration of a proxy server that is called "myproxy" and accepts HTTP connections on port 8080.

```
doc.SetSessionPropertyString("Proxy", "http://myproxy:8080")
```

**Configuration of Proxy Server and Firewall**

For the application of a time-stamp or online verification of certificates, the signature software requires access to the server of the certificates' issuer (e.g. [http://ocsp.quovadisglobal.com](http://ocsp.quovadisglobal.com) or [http://platinum-qualified-g2.ocsp.swisssign.net/](http://platinum-qualified-g2.ocsp.swisssign.net/)) via HTTP. The URL for verification is stored in the certificate; the URL for time-stamp services is provided by the issuer. In case these functions are not configured, no access is required.

In organizations where a web proxy is used, it must be ensured that the required MIME types are supported. These are:

12 The sizes of the time-stamp responses are cached only. Cached Time stamp responses cannot be embedded but used for the computation of the signature length only.
OCSP

- application/ocsp-request
- application/ocsp-response

Time-stamp

- application/timestamp-query
- application/timestamp-reply

Signature services

- Signature service specific MIME types.

Setting the Signature Build Properties

In the signature build properties dictionary the name of the application that created the signature can be set using the provider session properties Prop_Build.App.Name and Prop_Build.App.REx. The default values are “3-Heights™ PDF Security API” and its version.

5.7 How to Validate Digital Signatures

5.7.1 Validation of a Qualified Electronic Signature

There are basically three items that need to be validated:

1. Trust Chain
2. Revocation Information (optional)
3. Time-stamp (optional)

Validation can be in different ways, e.g. Adobe Acrobat, from which the screenshots below are taken.

Trust Chain

Before the trust chain can be validated, ensure the root certificate is trusted. There are different ways to add a certificate as trusted root certificate. The best way on Windows is this:

1. Retrieve a copy of the certificate containing a public key. This can be done by requesting it from the issuer (your CA) or by exporting it from an existing signature to a file (CertExchange.cer). Ensure you are not installing a malicious certificate!
2. Add the certificate to the trusted root certificates. If you have the certificate available as file, you can simply double-click it to install it.

After that you can validate the signature, e.g. by open the PDF document in Adobe Acrobat, right-click the signature and select “Validate”, then select “Properties” and select the tab “Trust”. There the certificate should be trusted to “sign documents or data”.

Revocation Information

An OCSP response or CRL must be available. This is shown in the tab "Revocation". The details should mention that "the certificate is considered valid".

The presence of revocation information must be checked for the signing certificate and all certificates of its trust chain except for the root certificate.
Time-stamp

The signature can optionally contain a time-stamp. This is shown in the tab “Date/Time”. The certificate of the time-stamp server must also be trusted, i.e. its trust chain should be validated as described in the section Trust Chain above.
5.7.2 Validation of a PAdES LTV Signature

Verifying if a signature conforms to the PAdES LTV standard is similar to validating a Qualified Electronic Signature. The following must be checked:

1. Trust Chain
2. Revocation information
3. Time-stamp
4. LTV expiration date
5. Other PAdES Requirements

**Trust Chain**

Trust chain validation works the same as for validating Qualified Electronic Signatures.

**Revocation Information**

Revocation information (OCPS response or CRL) must be valid and embedded into the signature. In the details, verify that the revocation check was performed using data that was "was embedded in the signature or embedded in the document". Revocation information that "was contained in the local cache" or "was requested online" is not embedded into the signature and does not meet PAdES LTV requirements. If Adobe Acrobat claims that revocation
information is contained in the local cache, even though it is embedded into the document, restart Adobe Acrobat
and validate the signature again.

**Time-stamp**

A time-stamp must be embedded and validated as described for validating Qualified Electronic Signatures. If a
document contains multiple time-stamps, all but the latest one must contain revocation information.

**LTV Expiration Date**

The long term validation ability expires with the expiration of the signing certificate of the latest time-stamp.
The life-time of the protection can be further extended beyond the life-of the last time-stamp applied by adding
further DSS information to validate the previous last time-stamp along with a new time-stamp. This process is
described in chapter [How to Create a PAdES Signature](#).

**Other PAdES Requirements**

Certain other PAdES requirements, such as requirements on the PKCS#7 CMS, cannot be validated using Adobe
Acrobat. For this, use the 3-Heights™ PDF Security API for validation.
See method [ValidateSignature](#) in the [PdfSecure](#) interface.

## 5.8 Advanced Guide

### 5.8.1 How to Use the in-Memory Functions

The 3-Heights™ PDF Security API always requires two PDF documents. A PDF input document from which it reads
and a PDF output document to where the result is saved.

To open from and save to files, the methods [Open](#) and [SaveAs](#) are used. These two methods are described in the
chapters [How to read an encrypted PDF](#) and [How to encrypt a PDF](#).

Instead of accessing files, the documents can be read from and written to in-memory. The corresponding methods
are [OpenMem](#) and [SaveInMemory](#).

Once the output document is saved to memory using [SaveInMemory](#), that memory block can be accessed using the
method [GetPdf](#).

A call sequence to create a first [PDFSecure](#) object that opens a PDF from file and stores its output in-memory and
then a second object, which reads that in-memory document and saves it back to a file looks like this:

```plaintext
PDFSecure1.Open(InputFile)
PDFSecure1.SaveInMemory()
PDFSecure1.Close()
```
This call sequence of course does not make much sense. It’s merely used to illustrate how to use of the in-memory functions. In a real application, the in-memory document is read from another application or a database.

5.9 Stamping

The 3-Heights™ PDF Security API can add new content such as text or images to the output document. This process is called stamping. The content of previously applied stamps can be modified.

The 3-Heights™ PDF Security API can sign and stamp documents in one step. In order to not invalidate existing signatures, stamps can be modified and created using stamp annotations with an incremental update to the input document. An example of this can be seen in the screenshot below.

5.9.1 Stamp File Syntax

Stamps are described with XML data that is passed to the 3-Heights™ PDF Security API either as file using the method AddStamps, AddStampsMem or as memory block using the method AddStamps, AddStampsMem. A stamp file can contain one or more stamps.
For each Tag there is a separate table below, where the Attribute-Names and the Attribute-Values are described.

**<pdfstamp>**

The Root Tag for the PDF stamp XML file. The tag may contain multiple stamps.

```
xmns="http://www.pdf-tools.com/pdfstamp/"  (required)
```

XML namespace used for all stamp elements.

**Stamp**

A stamp is defined by a `<stamp>` tag that specifies the stamp's size, position, and pages to which it is applied to. The stamp's appearance is defined by the content operators contained therein.

**<stamp> Add a Stamp**

- **page="<page_set>" (required)**
  
The pages to which the stamp is to be applied. The syntax is as follows:

  `<page_set> = <page_range> ["," <page_range>]`

  `<page_range> = <n> | <n1>-<n2> | first | last | not_first | not_last | even | odd | all`

  Where:
  - `<n>, <n1>, <n2>`: Page number. 1 defines the first page.
  - `first`: First page
  - `last`: Last page
  - `odd`: Only odd pages including first page and last page in case it is odd
  - `even`: Only even pages including last page in case it is even
  - `all`: All pages
  - `not_first`: First page excluded
  - `not_last`: Last page excluded

  Example: `page="1,2-4,6,10,last"`

- **name="<identifier>" (optional)**
  
  Unique identifier of the stamp, must be less than 127 characters, see section Modify content of existing stamps for more information.

- **relativepos="\<x\> \<y\>" (required)**
  
  Relative position `<x>` and `<y>` of the stamp with regards to the page. Positive values of `<x>` and `<y>` define the distances of the stamp to the left and lower, negative values to the right and upper page boundary respectively. The units of the values are PDF units of 1/72 inch. The positioning algorithm works best for stamp rotation angles that are a multiple of 90° (see rotate attribute).

  `<x>` or `<y>` are ignored, if respective `align` is used.

  Examples:
  1. `relativepos="10 -10"` places the stamp in the upper left corner of the page.
  2. `relativepos="-10 -10"` places the stamp in the upper right corner of the page.
  3. `relativepos="10 10"` places the stamp in the lower left corner of the page.
  4. `relativepos="-10 10"` places the stamp in the lower right corner of the page.

- **align="<alignment>" (optional)**
  
  Align the stamp with the page. Allowed values for `<alignment>` are:

  - `center`: position horizontally at center of page, the `<x>` value of `relativepos` is ignored.
- **middle**: position vertically at middle of page, the \( y \) value of `relativepos` is ignored.

Examples:

1. `<stamp position="0 4" align="center">`
   Centers the stamp horizontally and 4 pt away from the bottom of the page.

2. `<stamp position="-4 0" align="middle">`
   Centers the stamp vertically and 4 pt away from the right edge of the page.

**size="\( w \) \( h \)" (optional)**

The width and height of the stamp. The stamp's content will be clipped to this rectangle. If this is not specified or either \( w \) or \( h \) are zero, the respective size is calculated to fit content.

**rotate="\( angle \)" (optional)**

Rotation of the stamp in degrees clockwise.

**scale="\( scale_set \)" (optional)**

Modify scale of stamp. Allowed values for `scale_set` are:

- **relToA4**: Scale the stamp relative to the page size. For example, make stamp half as large on an A5 and twice as large on an A3 page as specified.
- **shrinkRelToA4**: Shrink stamp for all pages smaller than A4. For example, on A5 make stamp half as large as specified and as specified an A3 page.

**autoorientation="\( b \)" (optional)**

Allowed values for `b` are:

- **false** (default): Always position stamps as defined by stamp attributes.
- **true**: Detect orientation (portrait and landscape) of page automatically and treat landscape page as 90° rotated portrait. Useful to apply stamps to "long" or "short" edge of page.

**alpha="\( c \)" (optional)**

The opacity of the stamp as a whole. \( 1.0 \) for fully opaque, \( 0.0 \) for fully transparent.

Default: \( 1.0 \)

The PDF/A-1 standard does not allow transparency. Therefore, for PDF/A-1 conforming input files you must not set alpha to a value other than \( 1.0 \).

**type="\( t \)" (optional)**

The type of the stamp

- **annotation** (default): The stamp is added to the page as a stamp annotation. Creating or modifying stamps of this type will not invalidate existing signatures of the input document. While it is not easily possible to remove stamps of this type, it is possible to print a document without annotations.
- **foreground**: The stamp is added to the foreground of the page content. Creating or modifying stamps of this type will invalidate all existing signatures of the input document. It is not easily possible to remove stamps of this type nor can the document be printed without them.

- **background**: The stamp is added to the background of the page content. Creating or modifying stamps of this type will invalidate all existing signatures of the input document. It is not easily possible to remove stamps of this type nor can the document be printed without them.

Note that stamps placed this way can be hidden when pages contain a non-transparent background. In these cases, you may rather want to put the stamps in the foreground, but apply alpha transparency to achieve a result with existing content not covered completely.

**flags="\( f \)" (optional)**

Set the flags of the stamp annotation (i.e. stamps with `type="annotation"`). \( f \) is a comma separated list of the following values: `NoView`, `Print`, `ReadOnly`, and `Locked`. See chapter 8.4.2 "Annotation Flags" of the PDF Reference 1.7 for a description of the flags.
For PDF/A conformance, the flag \texttt{Print} must be set and \texttt{NoView} must not be set.
Default: \texttt{Print, ReadOnly, Locked}

\textbf{Coordinates}

All coordinate and size values are in PDF units of 1/72 inch (A4 = 595 x 842 points, letter = 612 x 792 points). The origin of the coordinate system is generally the lower left corner of the reference object. For stamps the reference object is the page, for content operators the reference is the stamp rectangle.

\textbf{Modify content of existing stamps}

Setting the \texttt{name} attribute of a stamp allows the stamp's content to be replaced later. If an existing stamp with the same name exists in the input file, its content is replaced as shown in example \texttt{Example 2: Modify "Simple Stamp"}. Note that when updating a stamp, its position and size remains. Therefore, if you intend to update a stamp, make sure to create it specifying a \texttt{size} that is sufficiently large.

When modifying a stamp, only its content may be changed. All attributes of \texttt{<stamp>} must remain unchanged, in particular \texttt{page} and \texttt{size}.

\textbf{Stamp content}

Each stamp contains a number of content operators that define the appearance (i.e. the content) of the stamp. The content operators are applied in the order they appear within \texttt{<stamp>} where each content element is drawn over all previous elements (i.e. increasing z-order).

\textbf{Text}

Stamp text is defined by \texttt{<text>}. All character data (text) therein is stamped:

\begin{verbatim}
<text font="Arial" size="12">Some text</text>
\end{verbatim}

Text fragments can be formatted differently by enclosing them in a \texttt{<span>} element. All text formatting attributes are inherited from the parent element and can be overridden in \texttt{<span>}:

\begin{verbatim}
<text font="Arial" size="12">Text with a <span font="Arial,Bold">bold</span> and a <span color="1 0 0">red</span> word.</text>
\end{verbatim}

Note that all character data in \texttt{<text>} is added, including whitespace such as spaces and line breaks.

\texttt{<text>} \textbf{Add Text}

All text formatting attributes described in \texttt{<span>} can also be specified in \texttt{<text>}. \texttt{position} \texttt{=} \texttt{"\{x, y\}" (optional)}

The position in points within the stamp, e.g. \texttt{"200 300"}.

With the default values for \texttt{align (align="left top")}, \texttt{position} defines the top left corner of the text\textsuperscript{13}.

---

\textsuperscript{13} Up to version 4.5.6.0 of the 3-Heights™ PDF Security API this type was called \texttt{content}.

\textsuperscript{14} Prior to version 4.4.31.0 of the 3-Heights™ PDF Security API, \texttt{position} specified the origin of the first character. When upgrading, add \texttt{0.75*size} to the value of \texttt{y}.
align="<xalign> <yalign>" (optional)
Align text at position or stamp, if position is not set.

Values for horizontal alignment <xalign>:
- left: align to the left (default)
- center: center text
- right: align to the right

Values for vertical alignment <yalign>:
- top: align to the top (default)
- middle: align to the middle
- bottom: align to the bottom

Examples:
1. <text align="left bottom" ...>
   positions the text in the left bottom corner of the stamp.
2. <text align="left bottom" position="10 10" ...>:
   align left bottom corner of text to position "10 10".

format="<b>" (optional)
Whether or not to enable formatting of variable text. Allowed values for <b> are true and false (default). See chapter Variable Text for documentation.

text="<text>" (optional)
The text that is to be written, e.g. text="Hello World".
Multi-line text is supported by using the newline character \#10; e.g. text="1st line\#10;2nd line".

If the attribute text is not specified, the text content of <text> is used. So <text ... text="Hello World"/> produces the same result as <text ...>Hello World</text>.

<span> Define Formatting of Text
Example: <text font="Arial" size="8"><span font="Arial,Bold">Note:</span></text>

color="<r> <g> <b>" (optional)
The color as RGB value, where all values must be in the range from 0 to 1, e.g.:
- Red: "1 0 0"
- Green: "0 1 0"
- Yellow: "1 1 0"
- Black: "0 0 0" (default)
- Gray: "0.5 0.5 0.5"

font="<name>" (required)
The TrueType name of the font, e.g. "Arial" or "Times New Roman,Bold", or a complete path to the font, e.g. "C:\Windows\Fonts\Arial.ttf".

TrueType names consist of a font family name, which is optionally followed by a comma and style, e.g. "Verdana,Italic". Commonly available styles are "Bold", "Italic", and "BoldItalic". The respective font must be available in any of the font directories (see chapter Fonts).

size="<n>" (required)
The font size in points, e.g. 12. If set to 0, the size is chosen such that text fits stamp size (not allowed if operator is within transformation operator).
fontencoding=""encoding""  (optional)
This attribute is relevant only, if the stamp will be modified later (see section Modify content of existing stamps).
The PDF/A standard demands that all used fonts must be embedded in the PDF. Since fonts with many glyphs can
be very large in size (>20MB), unused glyphs are removed prior to embedding. This process is called subsetting.
The value "encoding" controls the subsetting and must be one of the following:

- Unicode: (default) Only the glyphs used by the stamp are embedded. If the stamp is modified, a new font
  that includes the new glyph set has to be re-embedded. This setting is recommended for stamps that will
  not be modified later.
- WinAnsi: All glyphs required for WinAnsiEncoding are embedded. Hence the text's characters are be lim-
  ited to this character set. If the content of the stamp is updated, fonts using WinAnsi will be reused.

For example, embedding the font Arial with Unicode and approximately ten glyphs uses 20KB while Arial with
WinAnsi (approximately 200 glyphs) uses 53KB of font data.

mode="modes"  (optional)

The attribute mode controls the rendering mode of the text.
Allowed values for "modes" are the following or a combination thereof:

- fill: (default) The text is filled.
- stroke: The text's outlines are stroked. The width of the stroke is specified by linewidth.

linewidth="f"  (optional)
Set the line width in points, e.g. 1.0 (default).

decoration="decorations"  (optional)

The attribute decoration can be used to add any of the following text decorations:

- underline: A small line is drawn below the text.

$link>
Create Link
For all text contained within this element, a link is created. Links work best for stamps with
type="foreground", but are possible for other types as well.
Example: <text font="Arial" size="8">© <link uri="https://www.pdf-tools.com/">PDF Tools AG</link> - Premium PDF Technology</text>

uri="uri"  (required)
The URI which is the link target.

<filltext>  Obsolete tag.
Starting with version 4.9.1.0 of the 3-Heights™ PDF Security API the element <filltext ...> was rendered
obsolete by <text ...>.

<stroketext>  Obsolete tag.
Starting with version 4.9.1.0 of the 3-Heights™ PDF Security API the element <stroketext ...> was rendered
obsolete by <text mode="stroke" ...>.

Variable Text

Variable text such as the current date or the number of pages can be stamped in <text>. The feature must be
activated by setting format="true".
Variable text elements are of the following form:
"{‹value›:‹format›}"  
The ‹value› defines the type of value. ‹format› is optional and specifies how the value should be formatted. To stamp the { character, it must be escaped by duplicating it: {{. 

### Date Values

#### ‹value›

The following values are supported:
- **UTC**: the current time in UTC.
- **LocalTime**: the current local time

#### ‹format›

The default format is a locale-dependent date and time representation. Alternatively a format string as accepted by strftime() can be specified.

**Example:** Stamp the current local time with the default format.

<table>
<thead>
<tr>
<th>Text</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received: {LocalTime}</td>
<td>Received: Thu Aug 23 14:55:02 2001</td>
</tr>
</tbody>
</table>

**Example:** Stamp the current date.

<table>
<thead>
<tr>
<th>Text</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: {LocalTime:%d. %m. %Y}</td>
<td>Date: 23. 8. 2011</td>
</tr>
</tbody>
</table>

### Number Values

#### ‹value›

The following values are supported:
- **PageCount**: the number of pages in the document.

#### ‹format›

Optionally a format string as accepted by printf() can be specified.

**Example:** Stamp the page count.

<table>
<thead>
<tr>
<th>Text</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>{{PageCount}} = {PageCount}</td>
<td>(PageCount) = 10</td>
</tr>
</tbody>
</table>

**Example:** Stamp the current date and time onto each page's lower right corner.

```xml
<?xml version="1.0" encoding="utf-8"?>
<pdfstamp xmlns="http://www.pdf-tools.com/pdfstamp/">
  <stamp page="all" relativepos="-10 10">
    <text font="Arial" size="10" format="true">Date: {LocalTime}</text>
  </stamp>
</pdfstamp>
```

### Images and Geometric Shapes

**<image>** Add Image
rect="\textless x \textgreater \textless y \textgreater \textless w \textgreater \textless h \textgreater" \textit{(required)}

The rectangle where the image is to be placed at. \textless x \textgreater \textless y \textgreater correspond to the location (lower left corner), and \textless w \textgreater \textless h \textgreater to width and height of the image, e.g. 100 200 50 50

\texttt{src=\textless url\textgreater} \textit{(required)}

The URL or path to the file, e.g. C:/pictures/image1.jpg or http://www.mydomain.com/image1.jpg.

\texttt{compression=\textless value\textgreater} \textit{(optional)}

By default bi-tonal images are compressed with CCITTFax, continuous tone images with DCT and indexed images with Flate. To explicitly set the compression use this property.

Supported values are:

- Flate: Flate encoded
- DCT: DCT (JPEG) encoded
- CCITTFax: CCITT G4 encoded

\texttt{<fillrectangle> Add Filled Rectangle}

\texttt{rect=\textless x \textgreater \textless y \textgreater \textless w \textgreater \textless h \textgreater} \textit{(optional)}

The coordinates and size of the rectangle. If this value is omitted, the rectangle fills the entire area of the stamp.

\texttt{color=\textless r \textgreater \textless g \textgreater \textless b \textgreater} \textit{(optional)}

The fill color of the rectangle. The color as RGB value, where all values must be in the range from 0.0 to 1.0. The default is black: \textquoteleft 0 0 0\textquoteright

\texttt{alpha=\textless c \textgreater} \textit{(optional)}

The opacity of the rectangle. 1.0 for fully opaque, 0.0 for fully transparent. Default: 1.0

The PDF/A-1 standard does not allow transparency. Therefore, for PDF/A-1 conforming input files you must not set alpha to a value other than 1.0.

\texttt{<strokerectangle> Add Stroked Rectangle}

\texttt{linewidth=\textless f \textgreater} \textit{(optional)}

Set the line width in points, e.g. 1.0 \textit{(default)}.

For the following parameter descriptions see \texttt{<fillrectangle>}.  

\texttt{rect=\textless x \textgreater \textless y \textgreater \textless w \textgreater \textless h \textgreater}  
\texttt{color=\textless r \textgreater \textless g \textgreater \textless b \textgreater}  
\texttt{alpha=\textless c \textgreater}  

Transformations

The transform operators apply to stamp content defined within the tag. For example, this can be used to rotate \texttt{<text>} or \texttt{<image>}.  

\texttt{<rotate> Rotation}  

\texttt{angle=\textless n \textgreater} \textit{(required)}

Rotate by \textless n \textgreater degrees counter-clockwise, e.g. 90

---

15 Prior to version 4.10.13.0 of the 3-Heights™ PDF Security API, this attribute was called \texttt{filename}.  

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origin="\langle x \rangle \langle y \rangle" (required)
    Set the origin of the rotation in points, e.g. 100 100

<translate> Coordinate Translation

offset="\langle x \rangle \langle y \rangle" (required)
    The \langle x \rangle (horizontal) and \langle y \rangle (vertical) offset in points. A translation by \langle x \rangle \langle y \rangle is equal to a transformation by 1 0 0 1 \langle x \rangle \langle y \rangle.

<transform> Coordinate Transformation

matrix="\langle a \rangle \langle b \rangle \langle c \rangle \langle d \rangle \langle x \rangle \langle y \rangle" (required)
    The transformation matrix to scale, rotate, skew, or translate.
    Examples:
    1. Identity: 1 0 0 1 0 0
    2. Scale by factor 2 (double size): 2 0 0 2 0 0
    3. Translate 50 points to left, 200 up: 1 0 0 1 50 200
    4. Rotate by \langle x \rangle: cos(\langle x \rangle) sin(\langle x \rangle) -sin(\langle x \rangle) cos(\langle x \rangle) 0 0
        For 90° (= π/2) that is: 0 1 -1 0 0 0

5.9.2 Examples

Example 1: Simple Stamps

Apply two simple stamps.

First Stamp: Stamp text ”Simple Stamp” on in upper left corner of all pages.

Second Stamp: Stamp image lena.tif rotated by 90° and located at the center of the top corner of the first page.

example1.xml:

<?xml version="1.0" encoding="utf-8"?>
<pdfstamp xmlns="http://www.pdf-tools.com/pdfstamp/">
    <stamp page="all" name="simple stamp"
        relativepos="10 -10" size="160 0">
        <text align="left middle"
            font="Arial" size="20" fontencoding="WinAnsi"
            text="Simple Stamp" />
    </stamp>

    <stamp page="first"
        relativepos="0 -10" align="center">
        <rotate angle="90" origin="50 50">
            <image rect="0 0 100 100"
                filename="C:\images\lena.tif"/>
        </rotate>
    </stamp>
</pdfstamp>
Example 2: Modify “Simple Stamp”

Modify "simple stamp" from Example 1: Simple Stamps.

The stamp "simple stamp" can be modified by applying the following stamp XML file to the output file of the example above. Note that since position and size of the stamp remain unchanged, the respective attributes can be omitted.

The second stamp applied in Example 1 is not modified.

```
example2.xml:
<?xml version="1.0" encoding="utf-8"?>
<pdfstamp xmlns="http://www.pdf-tools.com/pdfstamp/"
<stamp name="simple stamp">
  <text align="left middle"
    color="1 0 0"
    font="Arial" size="20" fontencoding="WinAnsi"
    text="Modified Stamp" />
</stamp>
</pdfstamp>
```

Result of example2.xml.

Example 3: Add watermark text diagonally across pages

The stamp is specified for an A4 page, which is 595 by 842 points. On each page the stamp is applied to, it is scaled (scale="relToA4") and rotated (autoorientation="true") to fit the page.
Example 4: Apply stamp to long edge of all pages

Stamp has a light gray background and a black border.

---

element3.xml:

```xml
<?xml version="1.0" encoding="utf-8"?>
<pdfstamp xmlns="http://www.pdf-tools.com/pdfstamp/"
  <stamp page="all" size="595 842"
    align="center middle"
    scale="relToA4" autoorientation="true"
    type="foreground">
    <rotate angle="55" origin="298 421">
      <text mode="stroke"
        align="center middle" position="298 421"
        font="Arial, Bold" size="60"
        text="WATERMARK TEXT"/>
    </rotate>
  </stamp>
</pdfstamp>
```

Result of example3.xml.

---

element4.xml:

```xml
<?xml version="1.0" encoding="utf-8"?>
<pdfstamp xmlns="http://www.pdf-tools.com/pdfstamp/"
  <stamp page="all" size="802 28"
    relativepos="5 0" align="middle" rotate="90"
    scale="relToA4" autoorientation="true"
    alpha="0.75" type="foreground">
    <fillrectangle color="0.8 0.8 0.8"/>
    <strokerectangle/>
    <text align="center middle"
      font="Arial" size="20"
      text="stamp on long edge"/>
  </stamp>
</pdfstamp>
```

Result of example4.xml.
Example 5: Stamp links

Stamp a list of links.

element5.xml:

```xml
<?xml version="1.0" encoding="utf-8"?>
<pdfstamp xmlns="http://www.pdf-tools.com/pdfstamp/"
    <stamp page="first" type="content" relativepos="-10 10" >
        <text font="MyriadPro" size="20">Bookmarks:
            <span color="0 0 1" decoration="underline"><link uri="http://www.pdf-tools.com/...">Product website</link></span>
            <span color="0 0 1" decoration="underline"><link uri="http://www.pdf-tools.com/.../seca.pdf">Manual</link></span>
            <span color="0 0 1" decoration="underline"><link uri="https://www.pdf-online.com/osa/secure.aspx">Online sample</link></span>
    </text>
</stamp>
</pdfstamp>
```

Result of example5.xml.

5.10 Error Handling

Most methods of the 3-Heights™ PDF Security API can either succeed or fail depending on user input, state of the PDF Security API, or the state of the underlying system. It is important to detect and handle these errors, to get accurate information about the nature and source of the issue at hand.

Methods communicate their level of success or failure using their return value. Which return values have to be interpreted as failures is documented in the chapter Interface Reference. To identify the error on a programmatic
level, check the property `ErrorCode`. The property `ErrorMessage` provides a human readable error message, describing the error.

Example:

```csharp
public Boolean Open(string file, string password)
{
    if (!doc.Open(file, password))
    {
        if (doc.ErrorCode == PDFErrorCode.PDF_E_PASSWORD)
        {
            password = InputBox.Show("Password incorrect. Enter correct password: ");
            return Open(file, password);
        }
        else
        {
            MessageBox.Show(String.Format(
                "Error {0}: {1}", doc.ErrorCode, doc.ErrorMessage));
            return false;
        }
    }
    [...]
}
```

Note: When validating signatures using `ValidateSignature`, validation warnings are returned using `ErrorCode`. Therefore, this method is special because `ErrorCode` can be meaningful, even if the method returned `True`. See the method's documentation for a detailed description.
6 Interface Reference

Note: This manual describes the COM interface only. Other interfaces (C, Java, .NET) however work similarly, i.e. they have calls with similar names and the call sequence to be used is the same as with COM.

6.1 PdfSecure Interface

6.1.1 AddDocMDPSignature

| Method: | Boolean AddDocMDPSignature(PdfSignature pSignature, Short accessPermissions) |
| License feature: | Signature |

Add a document MDP (modification detection and prevention) signature. A PDF document can at most contain one MDP signature. A DocMDP signature defines the access permissions of the document. It should not be combined with standard encryption, i.e. the function SaveAs should not apply encryption.

PDF documents with DocMDP signatures added with the 3-Heights™ PDF Security API require Acrobat 7 or later to be opened. Since DocMDP signatures were introduced in the PDF Reference 1.6, they cannot be applied to PDF/A-1 input files unless the property ForceSignature is set to True.

Parameters:

pSignature [PdfSignature] The digital signature that is to be added. The properties of the signature must be set before it is added.

accessPermissions [Short] The access permissions granted are one of the following three values:

1. No changes to the document are permitted; any change to the document invalidates the signature.
2. Permitted changes are filling in forms, instantiating page templates, and signing; other changes invalidate the signature.
3. Permitted changes are the same as for 2, as well as annotation creation, deletion, and modification; other changes invalidate the signature.

Returns:

True Successfully added the signature to the document. Note: At this point it is not verified whether the certificate is valid or not. If an invalid certificate is provided the SaveAs function will fail later on.

False Otherwise.
6.1.2 AddPreparedSignature

Method: Boolean AddPreparedSignature(PdfSignature pSignature)

License feature: Signature

Add a signature field including an appearance but without a digital signature. This method must be called prior to SaveAs or SaveInMemory and should only be used in combination with SignPreparedSignature.

Parameter:

pSignature [PdfSignature] The digital signature from which the field and appearance is created. The properties of the signature must be set before it is added.

Returns:

True Successfully prepared signature.
False Otherwise.

6.1.3 AddSignature

Method: Boolean AddSignature(PdfSignature pSignature)

License feature: Signature

Add a digital signature to the document. The signature is defined using a PdfSignature object. This method must be called prior to SaveAs. Do not dispose of the PdfSignature object until the associated document has been saved or closed.

More information on applying digital signatures can be found in Chapter How to Create Electronic Signatures.

Parameter:

pSignature [PdfSignature] The digital signature that is to be added. The properties of the signature must be set before it is added.

Returns:

True Successfully added the signature to the document.
False Otherwise.

Note: At this point it is not verified whether the certificate is valid or not. If an invalid certificate is provided the SaveAs function will fail later on.
6.1.4 AddSignatureField

<table>
<thead>
<tr>
<th>Method:</th>
<th>Boolean</th>
<th>AddSignatureField(PdfSignature pSignature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>License feature:</td>
<td>Signature</td>
<td></td>
</tr>
</tbody>
</table>

Add a signature field only. This method adds a field which is meant to be signed manually in a later step. This method must be called prior to SaveAs or SaveInMemory.

Parameter:

pSignature [PdfSignature]  The digital signature that is to be added. The properties of the signature must be set before it is added.

Returns:

True  Successfully added the signature field to the document.
False  Otherwise.

6.1.5 AddStamps, AddStampsMem

<table>
<thead>
<tr>
<th>Method:</th>
<th>Boolean</th>
<th>AddStamps(String FileName)</th>
</tr>
</thead>
<tbody>
<tr>
<td>License feature:</td>
<td>Stamping</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method:</th>
<th>Boolean</th>
<th>AddStampsMem(Variant MemBlock)</th>
</tr>
</thead>
<tbody>
<tr>
<td>License feature:</td>
<td>Stamping</td>
<td></td>
</tr>
</tbody>
</table>

Add a stamp XML file. This method must be called after the input file is opened and before the save operation. For more information about stamping, see the section Stamping.

6.1.6 AddTimeStampSignature

<table>
<thead>
<tr>
<th>Method:</th>
<th>Boolean</th>
<th>AddTimeStampSignature(PdfSignature pSignature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>License feature:</td>
<td>Signature</td>
<td></td>
</tr>
</tbody>
</table>

Add a document time-stamp. The following signature properties must be set: TimeStampURL. The following signature properties may be set: Provider, TimeStampCredentials.

PDF documents with document time-stamp signatures require Acrobat X or later to be opened. Since this type of signature was introduced in the PDF 2.0, they cannot be applied to PDF/A-1 input files unless the property ForceSignature is set to True.

6.1.7 AddValidationInformation

<table>
<thead>
<tr>
<th>Method:</th>
<th>Boolean</th>
<th>AddValidationInformation(PdfSignature pSignature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>License feature:</td>
<td>Signature</td>
<td></td>
</tr>
</tbody>
</table>
Add signature validation information to the document security store (DSS). This information includes:

1. All certificates of the signing certificate's trust chain, unless they are already embedded into the signature.
2. Revocation data (OCSP or CRL) for all certificates that support revocation information.

Validation information for embedded time-stamp tokens is added as well.

This requires a Cryptographic Provider which has been opened using BeginSession. All types of cryptographic providers support this method. However, this method will fail when using a provider whose certificate store is missing a required certificate. Because providers of digital signature services do not have a certificate store, it is recommended to use either the PKCS#11 or the Windows Cryptographic provider.

This method can be used to create signatures with long term validation material or to enlarge the longevity of existing signatures. See section How to Create a PAdES Signature for more information.

**Note:** This method does not validate the signature, but only downloads the information required.

**Note:** Adding validation information for expired certificates is not possible. Therefore it is crucial to enlarge the longevity of signatures before they expire.

**Parameter:**

`pSignature` [PdfSignature] The digital signature for which validation information is to be added. This must be an existing signature obtained using GetSignature from the currently opened document.

**Returns:**

`True` Successfully added complete validation information for the signature to the document.

`False` Otherwise.

6.1.8 AutoLinearize

**Property (get, set):** Boolean AutoLinearize

**Default:** False

Automatically decide whether to linearize the PDF output file for fast web access.

Applying linearization can lead to a large increase in file size for certain documents. Enabling this option lets the 3-Heights™ PDF Security API automatically apply linearization or refrain from doing so based on the estimated file size increase.

Also, with this option enabled, PDF 2.0 documents are automatically excluded from linearization.

See also Linearize for more information for linearized PDFs.

**Note:** If this property is set to `True` then the value given to Linearize is ignored.
6.1.9 BeginSession

**Method:** Boolean BeginSession(String Provider)

The methods BeginSession and EndSession support bulk digital signing by keeping the session to the security device (HSM, Token or Cryptographic Provider) open. See the Section Guidelines for Mass Signing for more guidelines.

For backwards compatibility the use of these methods is optional. If used, the Provider property may not be set. If omitted, an individual session to the provider indicated by the property Provider is used for each signature operation.

**Parameter:**

Provider [String] See property Provider.

**Returns:**

True Session started successfully.
False Otherwise.

6.1.10 Close

**Method:** Boolean Close()

Close an opened input file. If the document is already closed the method does nothing.

**Returns:**

True The file was closed successfully.
False Otherwise.

6.1.11 ErrorCode

**Property (get):** TPDFErrorCode ErrorCode

This property can be accessed to receive the latest error code. This value should only be read if a function call on the PDF Security API has returned a value, which signals a failure of the function (see chapter Error Handling). See also enumeration TPDFErrorCode. PDF-Tools error codes are listed in the header file bseerror.h. Please note that only few of them are relevant for the 3-Heights™ PDF Security API.
### 6.1.12 ErrorMessage

**Property (get):** String `ErrorMessage`

Return the error message text associated with the last error (see property `ErrorCode`). This message can be used to inform the user about the error that has occurred. This value should only be read if a function call on the PDF Security API has returned a value, which signals a failure of the function (see chapter `Error Handling`).

**Note:** Reading this property if no error has occurred, can yield `Nothing` if no message is available.

### 6.1.13 EndSession

**Method:** Boolean `EndSession()`

Ends the open session to the security device.

See `BeginSession`.

### 6.1.14 ForceEncryption

**Property (get, set):** Boolean `ForceEncryption`

Default: `False`

File encryption is not allowed by the PDF/A standard. Therefore 3-Heights™ PDF Security API aborts and returns an error, when encryption is configured and an input file is PDF/A. Use this option, in order to enable encryption of PDF/A conforming files. The conformance of the output file is downgraded to PDF.

### 6.1.15 ForceIncrementalUpdate

**Property (get, set):** Boolean `ForceIncrementalUpdate`

Default: `False`

An incremental update is a copy of the original file with all modifications appended to its end. This leaves the original file intact, such that it can later be extracted using `GetRevision`, `GetRevisionFile`, `GetRevisionStream`.

By default, modifications to signed files are performed as incremental updates, which preserves all signatures. Using this property, an incremental update can be forced for other files as well, e.g. in order to preserve external signatures.

When applying an incremental update, all encryption parameters (most importantly the user password) must be the same as in the input file.

Unless a revision is signed, there might be white space characters at the revision’s end for which it is unclear to which revision they belong. These white space characters have no influence on the revision’s visual appearance.
or content. However, they might be important in order to preserve external signatures. For a reliable extraction of a revision it is therefore recommended to save the original file's size. The revision can then be extracted from the updated file by reading all data up to the original file's size.

6.1.16 ForceSignature

<table>
<thead>
<tr>
<th>Property (get, set):</th>
<th>Boolean ForceSignature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default:</td>
<td>False</td>
</tr>
</tbody>
</table>

Force signature allows DocMDP (PDF 1.6) and time-stamp signatures (PDF 2.0) on PDF/A-1 documents. The output file's version is upgraded and PDF/A conformance removed. Thus, the output file will contain the signature, but not be PDF/A-1 anymore.

Applying a DocMDP or time-stamp signature breaks PDF/A-1 conformance, therefore the default behavior is to abort the operation with an error.

6.1.17 GetPdf

| Method: | Variant GetPdf() |

Get the output file from memory. See also method SaveInMemory.

Returns:

A byte array containing the output PDF. In certain programming languages, such as Visual Basic 6, the type of the byte array must explicitly be Variant.

6.1.18 GetRevision, GetRevisionFile, GetRevisionStream

<table>
<thead>
<tr>
<th>Method:</th>
<th>Variant GetRevision(Integer Revision)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method:</td>
<td>Boolean GetRevisionFile(Integer Revision, String FileName)</td>
</tr>
<tr>
<td>Method:</td>
<td>Boolean GetRevisionStream(Integer Revision, Variant Stream)</td>
</tr>
</tbody>
</table>

Get the PDF document of a given revision number. This is useful to retrieve the state of the PDF document at the time it has been signed. All incremental updates which have been applied after the given revision are ignored.

Parameters:

Revision  [Integer]  The revision number (beginning with 0).

FileName  [String]  The name of the file to write the revision to.

Stream  [Variant]  The stream to write the revision to.

Returns:

The selected revision of the PDF file.
6.1.19 GetMetadata

**Method:** Variant GetMetadata()

Get the the XMP metadata of the input document as byte array. If the document does not contain XMP metadata, **Nothing** is returned.

**Returns:**

The document XMP metadata as byte array.

6.1.20 GetSignature

**Method:** PdfSignature GetSignature(Long iSignature)

License feature: Signature

Get a signature field from the current document.

**Parameter:**

iSignature  [Long] The selected signature in the document in the range from 0 to n-1, where 0 is the first and n-1 the last signature. The total number of signatures n in the document can be retrieved using the property SignatureCount.

**Returns:**

An interface to the PdfSignature.

6.1.21 GetSignatureCount

**[Deprecated] Property (get, set):** Long GetSignatureCount

Use the property SignatureCount instead.

6.1.22 InfoEntry

**Method:** String InfoEntry(String Key)

Retrieve or add a key-value pair to the document info dictionary. Values of predefined keys are also stored in the XMP metadata package.

Popular entries specified in the PDF Reference 1.7 and accepted by most PDF viewers are "Title", "Author", "Subject", "Creator" (sometimes referred to as Application) and "Producer" (sometimes referred to as PDF Creator).
Parameter:

Key [String] A key as string.

Returns:

The value as string.

Note: Note that the getter does not return values of the input document but merely those that have previously been set using InfoEntry.

Examples in Visual Basic 6:

Set the document title.

```
doc.InfoEntry("Title") = "My Title"
```

Set the creation date to 13:55:33, April 5, 2010, UTC+2.

```
doc.InfoEntry("CreationDate") = "D:20100405135533 + 02'00'"
```

6.1.23 LicenseIsValid

Property (get): Boolean LicenseIsValid

Check if the license is valid.

6.1.24 Linearize

Property (get, set): Boolean Linearize

Default: False

Note: This property is ignored when AutoLinearize is set to True.

Get or set whether to linearize the PDF output file, i.e. optimize file for fast web access.

The 3-Heights™ PDF Security API does not support linearization of PDF 2.0 documents. For such documents, processing fails. In order to automatically disable linearization for PDF 2.0 use AutoLinearize.

A linearized document has a slightly larger file size than a non-linearized file and provides the following main features:

- When a document is opened in a PDF viewer of a web browser, the first page can be viewed without downloading the entire PDF file. In contrast, a non-linearized PDF file must be downloaded completely before the first page can be displayed.
When another page is requested by the user, that page is displayed as quickly as possible and incrementally as data arrives, without downloading the entire PDF file.

The above applies only if the PDF viewer supports fast viewing of linearized PDFs.

When enabling this option, then no PDF objects will be stored in object streams in the output PDF. For certain input documents this can lead to a significant increase of file size.

### 6.1.25 NoCache

**Property (get, set):** Boolean **NoCache**

**Default:** False

Get or set whether to disable the cache for CRL and OCSP responses.

Using the cache is safe, since the responses are cached as long as they are valid only. The option affects both signature creation and validation.

See section on [Caching of CRLs, OCSP, and Time-stamp Responses](#) for more information on the caches.

### 6.1.26 Open

**Method:** Boolean **Open(String Filename, String Password)**

Open a PDF file, i.e. make the objects contained in the document accessible. If another document is already open, it is closed first.

**Parameters:**

**Filename** [String]  The file name and optionally the file path, drive or server string according to the operating systems file name specification rules.

**Password** [String]  (optional) The user or the owner password of the encrypted PDF document. If this parameter is left out an empty string is used as a default.

**Returns:**

True  The file could be successfully opened.

False  The file does not exist, it is corrupt, or the password is not valid. Use the properties **ErrorCode** and **ErrorMessage** for additional information.

### 6.1.27 OpenMem

**Method:** Boolean **OpenMem(Variant MemBlock, String Password)**

Open a PDF file, i.e. make the objects contained in the document accessible. If a document is already open, it is closed first.
Parameters:

MemBlock    [Variant] The memory block containing the PDF file given as a one dimensional byte array.

Password    [String] (optional) The user or the owner password of the encrypted PDF document. If this parameter is left out an empty string is used as a default.

Returns:

True        The document could be successfully opened.
False       The document could not be opened, it is corrupt, or the password is not valid.

6.1.28 OpenStream

Method:    Boolean OpenStream(Variant Stream, String Password)

Open a PDF file, i.e. make the objects contained in the document accessible. If a document is already open, it is closed first.

Parameters:

Stream    [Variant] The stream providing the PDF file. The stream must support random access.

Password    [String] (optional) The user or the owner password of the encrypted PDF document. If this parameter is left out an empty string is used as a default.

Returns:

True        The document could be successfully opened.
False       The document could not be opened, it is corrupt, or the password is not valid.

6.1.29 PageCount

Property (get):    Long PageCount

Get the number of pages of an open document. If the document is closed or if the document is a collection (also known as PDF Portfolio) then this property is 0.

6.1.30 ProductVersion

Property (get):    String ProductVersion

Get the version of the 3-Heights™ PDF Security API in the format “A.C.D.E”.
6.1.31 **RevisionCount**

**Property (get):** Integer RevisionCount

Return the number of revisions of the document (the number of incremental updates).

Although a linearized file looks like an incrementally updated file it only counts as one revision.

See also GetRevision, GetRevisionFile, GetRevisionStream.

6.1.32 **RemoveSignatureField**

**Method:** Boolean RemoveSignatureField(Pdfsignature pSignature)

**License feature:** Signature

Remove a signature field. An empty signature field can be added using AddSignatureField. This method must be called prior to SaveAs or SaveInMemory.

Note that removing signature fields breaks the remaining signatures. Therefore it is important to first remove surplus signatures before signing.

**Returns:**

True Successfully removed the signature field.

False Otherwise.

6.1.33 **SaveAs**

**Method:** Boolean SaveAs(String FileName, String UserPw, String OwnerPw, TPDFPermission PermissionFlags, Long KeyLength, String StrF, String StmF)

Create an output PDF document, apply the security settings and save the content from the input file to the output file.

The last three parameters (KeyLength, StrF, StmF) are only relevant in specific cryptographic situations. In all other cases, it is easiest to use the default values 128, "V2", "V2".

**Parameters:**

FileName [String] The file name and optionally the file path, drive or server string according to the operating systems file name specification rules.

UserPw  [String] (optional) Set the user password of the PDF document. If this parameter is omitted, the default password is used. Use "" to set no password.
OwnerPw [String] (optional) Set the owner password of the PDF document. If this parameter is omitted, the default password is used. Use "" to set no password.

PermissionFlags [TPDFPermission] (optional) The permission flags.
By default no encryption is used (-1). The permissions that can be granted are listed at the enumeration TPDF-Permission. To not encrypt the output document, set PermissionFlags to ePermNoEncryption, user and owner password to "". In order to allow high quality printing, flags ePermPrint and ePermDigitalPrint need to be set.

KeyLength [Long] (optional, Default: 128) The key length is a determining factor of the strength of the encrypting algorithm and the amount of time to break the cryptographic system. For RC4 the key length can be any value from 40 to 128 that is a multiple of 8.

For AESV2 the key length is automatically set to 128, for AESV3 to 256. Notes:
- Certain PDF viewers only support 40 and 128 bit encryption. Other tools, such as the 3-Heights™ tools also support other encryption key lengths
- 256 bit encryption requires Acrobat 9 or later.
- If the selected permission flags require a minimum key length, the key length is automatically adjusted (e.g. to 128 bits)

StrF [String] (optional, Default: "V2") Set the string crypt filter. Supported values are "None", "V2", "RC4", "AESV2" and "AESV3". Setting this value to an empty string or Nothing, means the default filter is used. Supported crypt filters are:
- "None": The application does not decrypt data.
- "V2" or "RC4": (PDF 1.2) The application asks the security handler for the encryption key and implicitly decrypts data using the RC4 algorithm.
- "AESV2": (PDF 1.6) The application asks the security handler for the encryption key and implicitly decrypts data using the AES-V2 128 bit algorithm.
- "AESV3": (PDF 1.7) The application asks the security handler for the encryption key and implicitly decrypts data using the AES-V3 256 bit algorithm.

StmF [String] (optional, Default: "V2") Set the stream crypt filter. Supported values are "None", "V2", "RC4", "AESV2" and "AESV3". Note that certain viewers require the stream crypt filter to be equal to the string crypt filter, e.g. both must be RC4 or AES. Setting this value to an empty string or Nothing means the default filter is used.

Returns:

True The opened document could successfully be saved to file.

False Otherwise. One of the following occurred16:

- The output file or the signature cannot be created.
- PDF_E_FILECREATE: Failed to create the file.
- SIG_CREA_E_SESSION: Cannot create a session (or CSP).
- SIG_CREA_E_STORE: The certificate store is not available.
- SIG_CREA_E_CERT: The certificate cannot be found.
- SIG_CREA_E_PRIVKEY: The private key is not available.
- SIG_CREA_E_INVCERT: The signing certificate is invalid, because it has expired, is not yet valid, or was revoked.

16 This is not a complete list. If SaveAs returns False, it is recommended to abort the processing of the file and log the error code and error message.
SIG_CREA_E_OCSP: Couldn't get response from OCSP server.
SIG_CREA_E_CRL: Couldn't get response from CRL server.
SIG_CREA_E_TSP: Couldn't get response from time-stamp server.
PDF_E_SIGLENGTH: Incorrect signature length.

Set permission flags equally to Acrobat 7:

In Acrobat 7, there are four different fields/check boxes that can be set. In brackets are the corresponding permission flags.

- **Printing Allowed:**
  - None ()
  - Low Resolution (ePermPrint)
  - High Resolution (ePermPrint + ePermDigitalPrint)

- **Changes Allowed:**
  - None ()
  - Inserting, deleting and rotating pages (ePermModify)
  - Filling in form fields and signing existing signature fields (ePermAnnotate)
  - Commenting, filling in form fields, and signing existing signature fields (ePermAnnotate + ePermFillForms)
  - Any except extracting pages (ePermModify + ePermAnnotate + ePermFillForms)

- **Enable copying of text, images and other content** (ePermCopy + ePermSupportDisabilities)
- **Enable text access for screen reader devices for the visually impaired** (ePermSupportDisabilities)

These flags can be combined. For example to grant permission which are equal to Acrobat's 7 "Printing Allowed: High Resolution" and "Enable copying of text, images and other content", set the flags ePermPrint + ePermCopy + ePermSupportDisabilities + ePermDigitalPrint.

### 6.1.34 SaveInMemory

**Method:**

```java
Boolean SaveInMemory(String UserPw, String OwnerPw, TPDPPermission PermissionFlags, Long KeyLength, String StrF, String StmF)
```

Save the output PDF in memory. After the **Close** call it can be accessed using the method **GetPdf**.

All parameters are identical to the **SaveAs** method.

See also chapter How to Use the in-Memory Functions.

**Returns:**

- **True** The document could be saved in memory successfully.
- **False** Otherwise.
6.1.35 SaveAsStream

**Method:** Boolean SaveAsStream(Variant Stream, String UserPw, String OwnerPw, Long KeyLength, String StrF, String StmF)

**Parameter:**

- **Stream** [Variant] The stream the output file is written to. The stream must support read, write, and random access.

All other parameters and the return value are identical to the SaveAs method.

6.1.36 SetLicenseKey

**Method:** Boolean SetLicenseKey(String LicenseKey)

Set the license key.

6.1.37 SetMetadata, SetMetadataStream

**Method:** Boolean SetMetadata(String FileName)

**Method:** Boolean SetMetadataStream(Variant Stream)

Set the the XMP metadata of the document.

**Parameters:**

- **FileName** [String] The file name where the metadata are read from.
- **Stream** [Variant] The stream where the metadata are read from.

**Returns:**

Whether or not the metadata has been set successfully.

6.1.38 SetSessionProperty

**Method:** Boolean SetSessionPropertyString(String Name, String Value)

**Method:** Boolean SetSessionPropertyBytes(String Name, Variant Value)

Provider-specific session configuration.
Properties have to be set before calling `BeginSession` and are deleted when calling `EndSession`.

**Parameters:**

**Name** [String]  The name of the property. The names that are supported are specific to the provider used with `BeginSession`.

**Value** [String]  The value of the property as string.

**Value** [Variant]  The value of the property as byte array.

### 6.1.39 SignatureCount

| Property (get): | Long SignatureCount |

Return the number of signature fields. If 0 is returned, it means there is no digital signature in the document.

### 6.1.40 SignPreparedSignature

**Method:**  Boolean `SignPreparedSignature(PdfSignature pSignature)`

**License feature:**  Signature

Create a digital signature for an existing signature field, which was previously created using the method `AddPreparedSignature`. This method must be called prior to `SaveAs` or `SaveInMemory`.

**Parameter:**

**pSignature**  [PdfSignature]  The digital signature that is to be added. This must be the same signature as used in `AddPreparedSignature`.

**Returns:**

**True**  Successfully added the signature to the document.

**False**  Otherwise.

### 6.1.41 SignSignatureField

**Method:**  Boolean `SignSignatureField(Pdfsignature pSignature)`

**License feature:**  Signature

Sign an empty signature field. An empty signature field can be added using `AddSignatureField`. This method must be called prior to `SaveAs` or `SaveInMemory`. 
Returns:

**True**  Successfully placed the signature into the signature field.

**False**  Otherwise.

### 6.1.42 Terminate

**Method:** Void Terminate()

Terminate all open sessions, and finalize and unload all PKCS#11 drivers. Calling `Terminate` is mandatory, if a PKCS#11 device is used for signature creation or validation (see **PKCS#11 Provider**). Some drivers require `Terminate` to be called. Otherwise, your application might crash and/or your HSM, USB token, or smart card might not be unlocked.

Make sure to end all open sessions and dispose of all PdfSecure objects before calling `Terminate`. After calling `Terminate`, the process may not call any other methods of this class.

When using the C interface, `Terminate` may not be called from the context of the destructor of a global or static object, an `atexit()` handler, nor the `DllMain()` entry point.

### 6.1.43 TestSession

**Method:** Boolean TestSession()

Test if the current session is still alive.

Returns:

**True**  Subsequent calls to `SaveAs` and `SaveInMemory` are likely to succeed.

**False**  Subsequent calls to `SaveAs` and `SaveInMemory` are unlikely to succeed. Error codes are the same as in `SaveAs` where applicable.

### 6.1.44 ValidateSignature

**Method:** Boolean ValidateSignature(PdfSignature pSignature)

**License feature:** Signature

Validate an existing digital signature, which was previously retrieved using the method `GetSignature`. The component supports the verification of signatures including time-stamps using cryptographic tokens and hardware security modules (HSM) through their PKCS#11 interface.

The validity checks are carried out at the time indicated either by the embedded time-stamp, if present, or by the signing time indicated in the PDF signature field object otherwise. Furthermore, this method extracts the following values from the cryptographic signature and sets the respective properties of the `PdfSignature` object: `Date`, `Email`, `Name`, `Issuer`, `SignerFingerprint`, and `TimeStampFingerprint`. 
If you get the error code `SIG_VAL_E_FAILURE`, your cryptographic provider does not offer the algorithms used for the signature. For example, the default provider (CryptoAPI of Windows Cryptographic Provider) does not support the SHA-2 hash algorithms. In this case, choose another provider.

**Parameter:**

`pSignature`  [PdfSignature]  The digital signature that is to be validated.

**Returns:**

**True**  The digital signature is valid, i.e. the document has not been modified. If other problems are detected during signature validation, the property `ErrorCode` may have one of the following values:

1. `SIG_VAL_W_ISSUERCERT`
2. `SIG_VAL_W_TSP`
3. `SIG_VAL_W_TSPCERT`
4. `SIG_VAL_W_NOREVINFO`
5. `SIG_VAL_W_NOTRUSTCHAIN`
6. `SIG_VAL_W_TSPNOREVINFO`
7. `SIG_VAL_W_PADES`

Note that the order of the list defines the priority of the error codes from highest to lowest. If multiple problems are detected, the error code with the highest priority is returned.

**False**  The signature is corrupt or the document has been modified.

See also enumeration `TPDFErrorCode`.

### 6.2 PdfSignature Interface

This interface allows creating a signature and setting its position and appearance. The visual part of the signature consists of two (multi-line) texts. The string of both texts are generated automatically based on the signature properties if not set manually.

#### 6.2.1 ContactInfo

**Property (get, set):**  String `ContactInfo`  
Default:  ""

Add a descriptive text as signer contact info, e.g. a phone number. This enables a recipient to contact the signer to verify the signature. This is not required in order to create a valid signature.

If this property is set to an empty string, no entry is created.

#### 6.2.2 Contents

**Property (get, set):**  VARIANT `Contents`
Get the Contents of the signature as byte array. This is the actual digital signature, whose format depends on the type of digital signature.

### 6.2.3 Date

<table>
<thead>
<tr>
<th>Property (get, set):</th>
<th>String Date</th>
</tr>
</thead>
</table>

Default: 
"D:00000000000000Z" (set to current date when signature is added)

This is the date when the signature is added. When this property is not set, the current time and date is used. The format of the date is: "D:YYYYMMDDHHMMSSZ". The meanings are:

- **D**: Header of Date Format
- **YYYY**: year
- **MM**: month
- **DD**: day
- **HH**: hour
- **MM**: minutes
- **SS**: seconds
- **Z**: UTC (Zulu) Time

Example for December 17, 2007, 14:15:13, GMT: "D:20071217141513Z".

**Note:** This property is set at the time when the signature is applied to the document. If this property is set to an empty string, no entry is created.

### 6.2.4 DocMdpPermissions

| Property (get): | Integer DocMdpPermissions |

Return the document access permissions of a DocMDP signature. For other types of signatures, 0 is returned. See AddDocMDPSignature for a description of valid permission values.

### 6.2.5 DocumentHasBeenModified

| Property (get): | Boolean DocumentHasBeenModified |

Get whether the document has been modified (True) or not (False) since the selected signature was added.
6.2.6 Email

**Property (get):** String Email

This property represents the email address of the signer. The method `ValidateSignature` extracts the address from the signing certificate's subject and sets this property.

6.2.7 EmbedRevocationInfo

**Property (get, set):** Boolean EmbedRevocationInfo

Default: True

Embed revocation information such as online certificate status response (OCSP - RFC 2560) and certificate revocation lists (CRL - RFC 3280).

Revocation information of a certificate is provided by a validation service at the time of signing and acts as proof that at the time of signing the certificate is valid. This is useful because even when the certificates expires or is revoked at a later time, the signature in the signed document remains valid.

Embedding revocation information is optional but suggested when applying advanced or qualified electronic signatures.

This property is not supported by all cryptographic providers and never for document time-stamp signatures. For these cases `AddValidationInformation` must be used.

Revocation information is embedded for the signing certificate and all certificates of its trust chain. This implies that both OCSP responses and CRLs can be present in the same message.

The downsides of embedding revocation information are the increase of the file size (normally by around 20 KB) and that it requires a web request to a validation service, which delays the process of signing. For mass signing it is suggested to use the caching mechanism, see chapter Caching of CRLs, OCSP, and Time-stamp Reponses.

Embedding revocation information requires an online connection to the CA that issues them. The firewall must be configured accordingly. In case a web proxy is used, it must be ensured the following MIME types are supported when using OCSP (not required for CRL):

- application/ocsp-request
- application/ocsp-response

If `EmbedRevocationInfo` is set to True, but the embedding failed, e.g. because the OCSP server is not reachable, the return value of SaveAs is False, and the ErrorCode after SaveAs is SIG_CREA_E_OCSP.

6.2.8 FillColor

**Property (get, set):** Long FillColor

Default: 16761024 (red = 192, green = 192, blue = 255)

This property represents the color of the signature's background as an RGB value.
In order to not set a color, i.e. keep the rectangle transparent, set the FillColor to \(-1\). This is particularly useful in combination with adding an image to the signature.

**Color Examples:** Color values are
\[
\text{color} = \langle \text{red} \rangle + \langle \text{green} \rangle \times 256 + \langle \text{blue} \rangle \times 256 \times 256,
\]
where \langle \text{red} \rangle, \langle \text{green} \rangle and \langle \text{blue} \rangle assume values from \(0\) to \(255\).

<table>
<thead>
<tr>
<th>Color</th>
<th>(\langle \text{red} \rangle, \langle \text{green} \rangle, \langle \text{blue} \rangle)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>(255,0,0)</td>
<td>255</td>
</tr>
<tr>
<td>Green</td>
<td>(0,255,0)</td>
<td>65,280</td>
</tr>
<tr>
<td>Blue</td>
<td>(0,0,255)</td>
<td>16,711,680</td>
</tr>
<tr>
<td>Cyan</td>
<td>(0,255,255)</td>
<td>16,776,960</td>
</tr>
<tr>
<td>Magenta</td>
<td>(255,0,255)</td>
<td>16,711,935</td>
</tr>
<tr>
<td>Yellow</td>
<td>(255,255,0)</td>
<td>65,535</td>
</tr>
<tr>
<td>Black</td>
<td>(0,0,0)</td>
<td>0</td>
</tr>
<tr>
<td>Grey</td>
<td>(128,128,128)</td>
<td>8,421,504</td>
</tr>
<tr>
<td>White</td>
<td>(255,255,255)</td>
<td>16,777,215</td>
</tr>
</tbody>
</table>

### 6.2.9 FieldName

**Property (get, set):** String FieldName

Get or set the name of the signature form field.

If a signature is added to the document and this property is not set, a unique field name is generated.

### 6.2.10 Filter

**Property (get):** String Filter

Get the name of the preferred signature handler for the signature, such as "Adobe.PPKLite".

### 6.2.11 FontName1

**Property (get, set):** String FontName1

Default: "Arial"

This property defines the font used in upper text, i.e. the text that is set by the property Text1. The font can either be specified as a path to the font file, e.g. "C:\Windows\Fonts\arial.ttf", or as a font name, such as "Times"
New Roman Bold. When using a font name, the corresponding font must be present in one of the font directories described in chapter Fonts.

### 6.2.12 FontName2

<table>
<thead>
<tr>
<th>Property (get, set):</th>
<th>String FontName2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default:</td>
<td>FontName1</td>
</tr>
</tbody>
</table>

This property represents the path to the font name used in lower text, i.e. the text that is set by the property Text2. The property works analogously to FontName1.

### 6.2.13 Font1Mem

| Property (set):     | Variant Font1Mem |

Set the font used in upper text (see FontName1) by passing the font as a memory buffer.

### 6.2.14 Font2Mem

| Property (set):     | Variant Font2Mem |

Set the font used in lower text (see FontName2) by passing the font as a memory buffer.

### 6.2.15 FontSize1

<table>
<thead>
<tr>
<th>Property (get, set):</th>
<th>Single FontSize1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default:</td>
<td>16</td>
</tr>
</tbody>
</table>

Define the font size of the Text1.

### 6.2.16 FontSize2

<table>
<thead>
<tr>
<th>Property (get, set):</th>
<th>Single FontSize2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default:</td>
<td>8</td>
</tr>
</tbody>
</table>

Define the font size of the Text2.
6.2.17 HasSignature

**Property (get):** Boolean HasSignature

Get whether the signature has an actual digital signature object or not. If True, this PdfSignature object can be validated using ValidateSignature. If False, this PdfSignature object can be signed using SignSignatureField.

6.2.18 ImageFileName

**Property (get, set):** String ImageFileName

Default: ""

Define the path to an image file that is to be added to the signature. The image is centered and scaled down proportionally to fit into the given rectangle. If the path is Nothing, or the image does not exist, the appearance's background is a filled rectangle using the colors FillColor and StrokeColor.

If you want the appearance to contain the image only and no text, set the property Text2 to a space " ".

6.2.19 Issuer

**Property (get, set):** String Issuer

Default: ""

Set the issuer of the certificate. The "Issuer" corresponds to the common name (CN) of the issuer. In the Windows' certificate store this corresponds to "Issued by".

This property can be used to select the signer certificate for signing (see description of Cryptographic Provider).

6.2.20 LineWidth

**Property (get, set):** Single LineWidth

Default: 2

This is the thickness of the line surrounding the visual appearance of the signature.

6.2.21 Location

**Property (get, set):** String Location

Default: ""

This is the physical location where the signature was added, for example "Zurich, Switzerland".

If this property is set to an empty string, no entry is created.
### 6.2.22 Name

**Property (get, set):** String Name  
Default: ""

In order to sign a PDF document, a valid, existing certificate name must be provided.  
The "Name" corresponds to the common name (CN) of the subject.  
In the Windows' certificate store this corresponds to "Issued to".  
When using a Windows OS, the certificate must be available in the Windows certificate store. See also chapter Digital Signatures.  
This property can be used to select the signer certificate for signing (see description of Cryptographic Provider in use).

### 6.2.23 PageNo

**Property (get, set):** Long PageNo  
Default: -1 (last page)

Define the page number where the signature is to be added to the document. If an invalid page number is set, it is added to the last page.  
The numbers are counted starting from 1 for the first page to the value of PageCount for the last page.

### 6.2.24 Provider

**Property (get, set):** String Provider  
Default: (Windows only) "Microsoft Base Cryptographic Provider v1.0"

This property specifies the cryptographic provider used to create and verify signatures.  
For more information on the different providers available, see the description in the respective subsection of the section Cryptographic Provider.  
- When using the Windows Cryptographic Provider, the value of this property is to be set to a string with the following syntax:

```
"[ProviderType:]Provider[;PIN]"
```

If the name of the provider is omitted, the default provider is used.

**Example:** "123456" being the pin code:
```
Provider = "Microsoft Base Cryptographic Provider v1.0;123456"
```
When using the PKCS#11 Provider, the value of this property is to be set to a string with the following syntax:

"PathToDll;SloId;Pin"

Example:

Provider = ";\WINDOWS\system32\siecap11.dll;4;123456"

When using any of the service providers, such as the Swisscom All-in signing service, the value of this property is essentially the url of the service endpoint:

"http[s]://server.servicedomain.com:8080/url"

6.2.25 ProxyURL

[Deprecated] Property (get, set): String ProxyURL

Default: ""

This property has been deprecated. For more information, see the chapter How to Use a Proxy.

6.2.26 ProxyCredentials

[Deprecated] Property (get, set): String ProxyCredentials

Default: ""

This property has been deprecated. For more information, see the chapter How to Use a Proxy.

6.2.27 Reason

Property (get, set): String Reason

Default: ""

Set or get the descriptive text for why the digital signature was added. It is not required in order to create a valid signature.

If this property is set to an empty string, no entry is created.

6.2.28 Rect

Property (get, set): Variant Rect

Default: [0, 0, 0, 0]
Set or get the position and size of the digital signature annotation. The default is an invisible signature.
The position is defined by the four values for the lower-left (x1, y1) and upper-right (x2, y2) corner of the rectangle.
The units are PDF points (1 point = 1/72 inch, A4 = 595 x 842 points, Letter = 612 x 792 points) measured from the lower left corner of the page. If either the width or height is zero or negative, an invisible signature is created, i.e. no visible appearance is created for the signature. To create a signature in the lower left corner set the rectangle to \([10, 10, 210, 60]\).

Hint about using this property in programming language that do not support the type Variant: In order to find out what type you should use, create a PdfSignature object and look at the default value of the property in the debugger.

6.2.29 Revision

**Property (get):** Integer Revision

Return the revision number of the PDF document associated with this signature. The associated PDF document can be retrieved using the method GetRevision, GetRevisionFile, GetRevisionStream.

6.2.30 SerialNumber

**Property (get, set):** String SerialNumber

The serial number with the issuer can be used to select a certificate for signing.
This property is a hex string as displayed by the “Serial number” field in the Microsoft Management Console (MMC), e.g. "49 cf 7d d1 6c a9".
This property can be used to select the signer certificate for signing (see description of Cryptographic Provider in use).

6.2.31 SignerFingerprint

**Property (get, set):** Variant SignerFingerprint

The sha1 fingerprint of the signer certificate. This property can be used to select the signer certificate for signing (see description of Cryptographic Provider). After validating a signature, this property contains the validated signature's fingerprint.

6.2.32 SignerFingerprintStr

**Property (get, set):** String SignerFingerprintStr

The hex string representation of the signer certificate's sha1 fingerprint. This property can be used to select the signer certificate for signing (see description of Cryptographic Provider).
All characters outside the ranges 0-9, a-f and A-F are ignored. In the Microsoft Management Console, the “Thumbprint” value can be used without conversion, if the “Thumbprint algorithm” is “sha1”. E.g. b5 e4 5c 98 5a 7e ff f4 c6 a3 45 48 0b c6 9d e4 5d f5.

### 6.2.33 Store

<table>
<thead>
<tr>
<th>Property (get, set):</th>
<th>String Store</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default:</td>
<td>&quot;MY&quot;</td>
</tr>
</tbody>
</table>

For the Windows Cryptographic Provider this defines the certificate store from where the signing certificate should be taken. This depends on the OS. The default is MY. Other supported values are: CA or ROOT.

### 6.2.34 StoreLocation

<table>
<thead>
<tr>
<th>Property (get, set):</th>
<th>Integer StoreLocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default:</td>
<td>1</td>
</tr>
</tbody>
</table>

For the Windows Cryptographic Provider this defines the location of the certificate store from where the signing certificate should be taken. Supported are:

- **0** Local Machine
- **1** Current User (default)

For more information, see the detailed description of the Windows Cryptographic Provider.

### 6.2.35 StrokeColor

<table>
<thead>
<tr>
<th>Property (get, set):</th>
<th>Long StrokeColor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default:</td>
<td>8405056 (red = 64, green = 64, blue = 128)</td>
</tr>
</tbody>
</table>

This is the color of the signature's border line as an RGB value. For examples of RGB color values see the documentation of the FillColor;

In order to not set a color, i.e. keep it transparent, set the StrokeColor to -1.

### 6.2.36 SubFilter

| Property (get, set): | String SubFilter |

Indicates the encoding of the signature. This value is set when extracting signatures using GetSignature and can be set when creating new signatures with AddSignature. The following are common SubFilter values:

- **adbe.pkcs7.detached** (PDF 1.6) Legacy PAdES Basic (ETSI TS 102 778, Part 2) signature used for document signatures (AddSignature) and DocMDP signatures (AddDocMDPSignature).
**ETSI.CAdES.detached** (PDF 2.0) PAdES signature as specified by European Norm ETSI EN 319 142. This type is used for document signatures (**AddSignature**) and DocMDP signatures (**AddDocMDPSignature**). See chapter **How to Create a PAdES Signature** for more information.

**ETSI.RFC3161** (PDF 2.0) Document time-stamp signature (**AddTimeStampSignature**).

### 6.2.37 Text1

| Property (get, set): | String Text1  
| Default: | "" |

This is the upper text that is added to the signature.

If this property is set to blank, the signature name is added to the upper text line of the visual signature.

In order to position text use the following syntax:  

```
〈tab〉〈x〉,〈y〉〈delimiter〉〈text〉
```

- 〈tab〉: tabulator
- 〈x〉,〈y〉: integers
- 〈delimiter〉: Single character such as space
- 〈text〉: Any text string not containing a 〈tab〉

**Example:** for Visual Basic .NET

```vbnet
Dim sig As New PdfSecureAPI.Signature
...
sig.Text1 = Microsoft.VisualBasic.vbTab & "5,50 Peter Pan"
sig.Text2 = Microsoft.VisualBasic.vbTab & "15,25 Signed this document"
```

### 6.2.38 Text1Color

| Property (get, set): | Long Text1Color  
| Default: | 0 (black) |

This property defines the color of the upper text, i.e. the text that is set by the property **Text1**. For examples of RGB color values see the documentation of the **FillColor**;

### 6.2.39 Text2

| Property (get, set): | String Text2  
| Default: | "" |

This is the lower text that is added to the signature. The text can be multi-lined by using linefeed (‘\n’, 0xA).
If this property is set to blank, a text three-line text is constructed that consists of:

- A statement who applied to signature
- The reason of the signature
- The date

See also property Text1. If you want the appearance to not contain any text, set this property to a space " ".

### 6.2.40 Text2Color

<table>
<thead>
<tr>
<th>Property (get, set):</th>
<th>Long Text2Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default:</td>
<td>0 (black)</td>
</tr>
</tbody>
</table>

This property defines the color of the lower text, i.e. the text that is set by the property Text2. For examples of RGB color values see the documentation of the FillColor;

### 6.2.41 TimeStampCredentials

<table>
<thead>
<tr>
<th>Property (get, set):</th>
<th>String TimeStampCredentials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default:</td>
<td>&quot; &quot;</td>
</tr>
</tbody>
</table>

If a time-stamp server requires authentication, use this property to provide the credentials. Credentials commonly have the syntax "username:password".

### 6.2.42 TimeStampFingerprint

| Property (get): | Variant TimeStampFingerprint |

The sha1 fingerprint of the time-stamp server certificate. After validating a signature that contains a time-stamp, this property contains the fingerprint of the time-stamp server’s certificate.

### 6.2.43 TimeStampURL

<table>
<thead>
<tr>
<th>Property (get, set):</th>
<th>String TimeStampURL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default:</td>
<td>&quot; &quot;</td>
</tr>
</tbody>
</table>

The URL of the trusted Time-stamp authority (TSA) from which a Time-stamp shall be acquired. This setting is suggested to be used when applying a Qualified Electronic Signature. Example: "tsu.my-timeserver.org". Applying a Time-stamp requires an online connection to a time server; the firewall must be configured accordingly. In case a web proxy is used, it must be ensured the following MIME types are supported:

- application/timestamp-query
- application/timestamp-reply
If an invalid Time-stamp server address is provided or no connection can be made to the time server, the return code of `SaveAs` is false, and the property `ErrorCode` is set to `SIG_CREA_E_TSP`.

### 6.2.44 UserData

**Property (get, set):** Variant `UserData`  
**Default:** `Nothing`

This property has only a meaning if a Custom Signature Handler is used.

### 6.3 Enumerations

**Note:** Depending on the interface, enumerations may have TPDF as prefix (COM, C) or PDF as prefix (.NET) or no prefix at all (Java).

#### 6.3.1 TPDFErrorCode Enumeration

All TPDFErrorCode enumerations start with a prefix, such as `PDF_`, followed by a single letter which is one of `S`, `E`, `W` or `I`, an underscore and a descriptive text.

The single letter gives an indication of the severity of the error. These are: Success, Error, Warning and Information. In general, an error is returned if an operation could not be completed, e.g. no valid output file was created. A warning is returned if the operation was completed, but problems occurred in the process.

A list of all error codes is available in the C API's header file `bseerror.h`, the javadoc documentation of `com.pdftools.NativeLibrary.ERRORCODE` and the .NET documentation of `Pdftools.Pdf.PDFErrorCode`. Note that only a few are relevant for the 3-Heights™ PDF Security API, most of which are listed here:

<table>
<thead>
<tr>
<th>TPDFErrorCode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>PDF_S_SUCCESS</code></td>
<td>The operation was completed successfully.</td>
</tr>
<tr>
<td><code>LIC_E_NOTSET</code>, <code>LIC_E_NOTFOUND</code>, ...</td>
<td>Various license management related errors.</td>
</tr>
<tr>
<td><code>PDF_E_FILEOPEN</code></td>
<td>Failed to open the file.</td>
</tr>
<tr>
<td><code>PDF_E_FILECREATE</code></td>
<td>Failed to create the file.</td>
</tr>
<tr>
<td><code>PDF_E_PASSWORD</code></td>
<td>The authentication failed due to a wrong password.</td>
</tr>
<tr>
<td><code>PDF_E_UNKSECHANDLER</code></td>
<td>The file uses a proprietary security handler, e.g. for a proprietary digital rights management (DRM) system.</td>
</tr>
<tr>
<td>TPDFErrorCode Table</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td></td>
</tr>
</tbody>
</table>
| **PDF_E_XFANEEDSRENDERING** | The file contains unrendered XFA form fields, i.e. the file is an XFA and not a PDF file.  
   The XFA (XML Forms Architecture) specification is referenced as an external document to ISO 32'000-1 (PDF 1.7) and has not yet been standardized by ISO. Technically spoken, an XFA form is included as a resource in a shell PDF. The PDF's page content is generated dynamically from the XFA data, which is a complex, non-standardized process. For this reason, XFA is forbidden by the ISO Standards ISO 19'005-2 (PDF/A-2) and ISO 32'000-2 (PDF 2.0) and newer. |
| **PDF_W_ENCRYPT** | Aborted processing of signed and encrypted document. |
| **PDF_E_PDFASIG** | Signature would destroy PDF/A conformance. Signature can be forced using ForceSignature. |
| **PDF_E_INPSIG** | Input document must not be signed. Signed input files cannot be linearized, because this would break their signature. Also, the encryption parameters (most importantly the user password) of signed input files cannot be changed. |
| **SIG_CREA_E_SESSION** | Cannot create a session (or CSP). |
| **SIG_CREA_E_STORE** | Cannot open certificate store. |
| **SIG_CREA_E_CERT** | Certificate not found in store. |
| **SIG_CREA_E_INVCERT** | The signing certificate is invalid. |
| **SIG_CREA_E_OCSP** | Couldn't get response from OCSP server. |
| **SIG_CREA_E_CRL** | Couldn't get response from CRL server. |
| **SIG_CREA_E_TSP** | Couldn't get response from time-stamp server. |
| **SIG_CREA_E_PRIVKEY** | Private key not available.  
   This is usually because a pin is required and was not entered correctly.  
   Also, this error might be returned because there is no private key available for the signing certificate or the key is no properly associated with the certificate.  
   Finally, this error could be the result of choosing a message digest algorithm or signing algorithm which is not supported by the provider.  
   See section Cryptographic Provider for more information. |
| **SIG_CREA_E_SERVER** | Server error. |
| **SIG_CREA_E_ALGO** | The cryptographic provider does not implement a required algorithm. See section Cryptographic Provider for more information. |
| **SIG_CREA_E_FAILURE** | Another failure occurred. |
## TPDFErrorCode Table

<table>
<thead>
<tr>
<th>TPDFErrorCode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDF_E_SIGLENGTH</td>
<td>Incorrect signature length. A PDF is signed in a two-step process. First, the output document is created with space reserved for the signature. Second, the actual cryptographic signature is created and written into the space reserved. If the space reserved is too small for the actual signature this error is returned. In general this error should not occur. If it does, the next signing attempt should be successful.</td>
</tr>
<tr>
<td>PDF_E_SIGABG</td>
<td>Unable to open signature background image.</td>
</tr>
<tr>
<td>PDF_W_NOENCRYPTION</td>
<td>The file is PDF/A and must not be encrypted. Encryption can be forced using <code>ForceEncryption</code>.</td>
</tr>
</tbody>
</table>

## Validation specific error codes

<table>
<thead>
<tr>
<th>TPDFErrorCode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIG_VAL_E_ALGO</td>
<td>Unsupported algorithm found.</td>
</tr>
<tr>
<td>SIG_VAL_E_FAILURE</td>
<td>Program failure occurred.</td>
</tr>
<tr>
<td>SIG_VAL_E_CMS</td>
<td>Malformed cryptographic message syntax (CMS).</td>
</tr>
<tr>
<td>SIG_VAL_E_DIGEST</td>
<td>Digest mismatch (document has been modified).</td>
</tr>
<tr>
<td>SIG_VAL_E_SIGNERCERT</td>
<td>Signer's certificate is missing.</td>
</tr>
<tr>
<td>SIG_VAL_E_SIGNATURE</td>
<td>Signature is not valid.</td>
</tr>
<tr>
<td>SIG_VAL_W_ISSUERCERT</td>
<td>None of the certificates was found in the store.</td>
</tr>
<tr>
<td>SIG_VAL_W_NOTRUSTCHAIN</td>
<td>The trust chain is not embedded.</td>
</tr>
<tr>
<td>SIG_VAL_W_TSP</td>
<td>The time-stamp is invalid.</td>
</tr>
<tr>
<td>SIG_VAL_W_TSPCERT</td>
<td>The time-stamp certificate was not found in the store.</td>
</tr>
<tr>
<td>SIG_VAL_W_PADES</td>
<td>The signature does not conform to the PAdES standard, e.g. because the signature is not DER encoded or the CMS contains more than one SignerInfo.</td>
</tr>
<tr>
<td>SIG_VAL_W_NOREVINFO</td>
<td>Revocation data (OCSP or CRL) is missing for certificate that supports revocation information.</td>
</tr>
<tr>
<td>SIG_VAL_E_NOREVINFO</td>
<td>Revocation data (OCSP or CRL) is missing for certificate that supports revocation information.</td>
</tr>
<tr>
<td>SIG_VAL_W_TSPNOREVINFO</td>
<td>Revocation data (OCSP or CRL) is missing for certificate in time-stamp.</td>
</tr>
<tr>
<td>SIG_VAL_E_INVCERT</td>
<td>Invalid certificate, e.g. because it has been revoked or is expired.</td>
</tr>
</tbody>
</table>
6.3.2 TPDPPermission Enumeration

An enumeration for permission flags. If a flag is set, the permission is granted.

<table>
<thead>
<tr>
<th>TPDPPermissionFlag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ePermNoEncryption</td>
<td>Do not apply encryption.</td>
</tr>
<tr>
<td></td>
<td>This enumeration value shall not be combined with other values. When</td>
</tr>
<tr>
<td></td>
<td>using this enumeration set both passwords to an empty string or</td>
</tr>
<tr>
<td></td>
<td>Nothing.</td>
</tr>
<tr>
<td>ePermSameAsInput</td>
<td>Use the same permissions as present in the input file.</td>
</tr>
<tr>
<td></td>
<td>This enumeration value shall not be combined with other values.</td>
</tr>
<tr>
<td>ePermNone</td>
<td>Grant no permissions</td>
</tr>
<tr>
<td>ePermPrint</td>
<td>Low resolution printing</td>
</tr>
<tr>
<td>ePermModify</td>
<td>Changing the document</td>
</tr>
<tr>
<td>ePermCopy</td>
<td>Content copying or extraction</td>
</tr>
<tr>
<td>ePermAnnotate</td>
<td>Annotations</td>
</tr>
<tr>
<td>ePermFillForms</td>
<td>Filling of form fields</td>
</tr>
<tr>
<td>ePermSupportDisabilities</td>
<td>Support for disabilities</td>
</tr>
<tr>
<td>ePermAssemble</td>
<td>Document assembly</td>
</tr>
<tr>
<td>ePermDigitalPrint</td>
<td>High resolution printing</td>
</tr>
<tr>
<td>ePermAll</td>
<td>Grant all permissions</td>
</tr>
</tbody>
</table>

Changing permissions or combining multiple permissions is done using a bitwise “or” operator.

**Note:** The special values `ePermSameAsInput` and `ePermNoEncryption` cannot be combined with any other values.

Changing the current permissions in Visual Basic should be done like this:

```vbnet
Allow Printing
Permission = Permission Or ePermPrint
```

Adobe Acrobat XI classifies such signatures as valid.
Prohibit Printing

\[ \text{Permission} = \text{Permission And Not ePermPrint} \]
7 Version History

Some of the documented changes below may be preceded by a marker that specifies the interface technologies the change applies to. E.g. [C, Java] applies to the C and the Java interface.

7.1 Changes in Version 6

- Digital Signatures
  - **New** support to create PAdES signatures (format ETSI.CAdES.detached) with the Swisscom All-in Signing Service.
  - **Improved** embedding of revocation information (OCSP, CRL, and trust chain) to always use the document security store (DSS).
  - **Changed** the creation of signatures of format ETSI.CAdES.detached to include revocation information if EmbedRevocationInfo is True and if supported by the cryptographic provider.
  - **Improved** support for new version of the GlobalSign Digital Signing Service. The service endpoint should be updated to https://emea.api.dss.globalsign.com:8443/v2.
  - [C] **Changed** API of the custom signature handler pdfsignaturehandler.h.

- Stamping
  - **New** value shrinkRelToA4 for attribute flags of <stamp>.
  - **Improved** search algorithm for installed fonts: User fonts under Windows are now also taken into account.
  - [Java] **Changed** minimal supported Java language version to 7 [previously 6].
  - [PHP] **Removed** all versions of the PHP interface.
  - [.NET] **New** availability of this product as NuGet package for Windows, macOS and Linux.
  - [.NET] **New** support for .NET Core versions 1.0 and higher. The support is restricted to a subset of the operating systems supported by .NET Core, see Operating Systems.
  - [.NET] **Changed** platform support for NuGet packages: The platform "AnyCPU" is now supported for .NET Framework projects.

7.2 Changes in Version 5

- Digital Signatures
  - **New** support to get CRLs using HTTPS and via HTTP redirection.
  - **New** additional supported operating system: Windows Server 2019.
  - [PHP] **New** extension PHP 7.3 (non thread safe) for Linux.

- Interface PdfSignature
  - **New** properties Text1Color and Text2Color to set the color of the signature appearance's text.

7.3 Changes in Version 4.12

- **Introduced** license features Signature and Stamping.
- Digital Signatures
  - **New** support to sign OCSP requests, if required by the OCSP service.
  - **New** support for OCSP requests over HTTPS.
  - **Changed** acceptance criteria for OCSP responses that specify no validity interval (missing nextUpdate field, which is uncommon). Previously a validity interval of 24 hours has been used, now 5 minutes due to Adobe Acrobat compatibility.
- **New** support for encryption according to PDF 2.0 (revision 6, replaces deprecated revision 5).
- **Improved** reading and recovery of corrupt TIFF images.
- **New** HTTP proxy setting in the GUI license manager.
- [.NET, C, COM, Java, PHP] **New** property `AutoLinearize` to automatically choose whether to linearize the output document or not.

### 7.4 Changes in Version 4.11

- Digital Signatures
  - **New** support to create Document Time-Stamp signatures using Swisscom All-in Signing Service.
  - **New** ability to sign documents that are larger than 2GB (64-bit version only).
- Stamping
  - **New** default compression Flate for PNG images.
- **New** support for reading and writing PDF 2.0 documents.
- **New** support for the creation of output files larger than 10GB (not PDF/A-1).
- **Improved** search in installed font collection to also find fonts by other names than TrueType or PostScript names.
- [.NET, C, COM, Java, PHP] **Changed** enum `TPDFPermission`: Added a new value `ePermSameAsInput` to adopt the encryption parameters from the input document.

#### Interface `PdfSecure`

- **New** property `DocMdpPermissions`: Return the document access permissions of a DocMDP signature.
- [PHP] **Removed** the method `Terminate`: It is now called automatically by the “PdfTools” PHP extension and has thereby been rendered obsolete.

### 7.5 Changes in Version 4.10

- Digital Signatures
  - **New** support for the new European PAdES norm (ETSI EN 319 142). See chapter “How to Create a PAdES Signature” in the user manual for more information.
  - **New** support for the GlobalSign Digital Signing Service as cryptographic provider to create signatures and time-stamps.
  - **New** signature algorithm RSA with SSA-PSS (PKCS#1v2.1) can be chosen by setting the provider session property `SigAlgo`.
  - **Improved** signature validation.
    - More signature formats supported, most notably the new European PAdES norm. The Windows cryptographic provider now supports the same formats as the PKCS#11 provider.
    - Support signature algorithm RSA with SSA-PSS (PKCS#1v2.1).
    - New and improved validation warnings.
    - Check for missing revocation information.
    - Use validation data embedded in the document security store (DSS).
  - **New** ability to add multiple signatures to encrypted files.
- Stamping
  - **New** attribute `flags` of `<stamp>`, e.g. to create modifiable stamps or stamps that are only visible when printing.
  - **New** attribute `src` of `<image>` allows a HTTP URL or file path.
  - **New** ability to add or modify stamps of signed files that are also encrypted.
- **New** support for writing PDF objects into object streams. Most objects that are contained in object streams in the input document are now also stored in object streams in the output document. When enabling linearization, however, no objects are stored in object streams.

- **Improved** robustness against corrupt input PDF documents.

- [C] **Clarified** Error handling of TPdfStreamDescriptor functions.

- [PHP] **New** Interface for Windows and Linux. Supported versions are PHP 5.6 & 7.0 (Non Thread Safe). The PdfSecureAPI PHP Interface is contained in the 3-Heights™ PDF Tools PHP5.6 Extension and the 3-Heights™ PDF Tools PHP7.0 Extension.

- [C] **Changed** 32-bit binaries on Windows that link to the API need to be recompiled due to a change of the used mangling scheme.

### Interface PdfSecure

- **New** method AddValidationInformation(): Add signature validation information to the document. This method can be used to create signatures with long term validation material or to enlarge the longevity of existing signatures.

- **Changed** method ValidateSignature():
  - The warning SIG_VAL_W_NOTSP has been removed because it is unnecessary and masks other warnings that have a lower priority. The property TimeStampFingerprint can be used to detect whether a timestamp is available.
  - See documentation of the method for a list of new warnings.

- [C] **Changed** API of the custom signature handler pdfsignaturehandler.h.

### 7.6 Changes in Version 4.9

- **Improved** behavior: Before signing, missing appearance streams of form fields are created, because otherwise Adobe Acrobat cannot validate the signature.

- **Stamping:**
  - **New** tag `<link>` to add interactive web links.
  - **New** tag `<text>` allows to format spans in continuous text using nested `<span>` tags.

- **Improved** support for and robustness against corrupt input PDF documents.

- **Improved** repair of embedded font programs that are corrupt.

- **New** support for OpenType font collections in installed font collection.

- **Improved** metadata generation for standard PDF properties.

- [C] **Changed** return value pfGetLength of TPDFStreamDescriptor to `pos_t`\(^{18}\).

### Interface PdfSecure

- [.NET] **New** methods OpenStream() and SaveAsStream().

- [.NET, C, Java] **New** methods GetRevisionFile() and GetRevisionStream().


### 7.7 Changes in Version 4.8

- **New** feature: Images used as signature appearance background or for stamping for PDF/A input files may now have any color space, even if it differs from the input file's output intent.

- **Improved** creation of annotation appearances to use less memory and processing time.

- **Added** repair functionality for TrueType font programs whose glyphs are not ordered correctly.

---

\(^{18}\) This has no effect on neither the .NET, Java, nor COM API
Interface PdfSecure

- [.NET] **Deprecated** method `GetLicenseIsValid`.
- [.NET] **New** property `LicenseIsValid`.
8 Licensing, Copyright, and Contact

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