

Creating accessible PDF documents

Information for contractors on behalf of the
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Table of Contents

1	Introduction	6
2	Standards and legal provisions	7
	2.1. The PDF 1.7 Specification	8
	2.2. The PDF/UA Standard	8
	2.3. PDF/UA requirements	9
	2.4. Process steps	10
	2.5. Relationship between BITV 2.0 and PDF/UA	11
3	Making documents accessible in MS Word	6
	3.1. General preparations	13
	3.2. Principle of structuring	14
	3.3. Using styles	14
	3.4. Customising styles	15
	3.5. Further process steps	15
	3.5.1. Spacing between paragraphs	15
	3.5.2. Creating numbered headings	16
	3.5.3. Text in columns	16
	3.5.4. Lists	17
	3.5.5. Tables	18
	3.5.6. Alternative text for visual content	18
	3.5.7. Creating tables of contents	19
	3.6. Using the Accessibility Checker	20
	3.7. Converting to PDF	20
4	PDF remediation in Adobe Acrobat DC	22
	4.1. Getting started with Adobe Acrobat DC	22
	4.1.1. Tools center	22
	4.1.2. Navigation panels	24
	4.2. How to create a semantically correct document structure	25

4.2.1.	Headers and footers	26
4.2.2.	Editing tags	26
4.2.3.	Artifacts / Hiding non-relevant content as background	27
4.2.4.	Adding tags to a document	29
4.3.	Tags for specific types of content	29
4.3.1.	Headings	29
4.3.2.	Images / Visual content	30
4.3.3.	Captions	33
4.3.4.	Lists	33
4.3.5.	Creating a table of contents	35
4.3.6.	Links	36
4.3.7.	Using destinations for internal references	39
4.3.8.	Footnotes and endnotes	40
4.3.9.	Tables	43
4.4.	Setting the PDF/UA identifier	48
4.5.	Selection of popular Adobe Acrobat DC functions / commands	49
5	Creating accessible PDF documents with Acrobat InDesign	50
5.1.	Styles	50
5.2.	Logical content order	50
5.3.	Alternative texts	50
5.4.	Links	50
5.5.	File metadata	51
5.6.	Export	51
6	Overview of PDF Standard Tags	52
6.1.	Grouping elements	53
6.2.	Block-level structure elements	54
6.2.1.	Paragraph elements	54
6.2.2.	List elements	54
6.2.3.	Table elements	55

6.3. Inline-level structure elements	56
7 Testing PDF documents for accessibility	58
7.1. Automated testing with PAC 3 (PDF Accessibility Checker)	58
7.1.1. Fix: Font not embedded.....	60
7.1.2. Fix: Path object not tagged.....	60
7.1.3. Fix: Structural errors	60
7.1.4. Fix: missing alternate description	60
7.2. Automated testing with Adobe Acrobat DC	60
7.3. Visual / semantic check	61
7.3.1. Tag tree structure	62
7.3.2. Language	62
7.3.3. Tab order	63
7.3.4. Alternate text.....	64
7.3.5. Bookmarks	64
7.3.6. Colour contrasts.....	65
7.3.7. Hyperlinks	65
7.3.8. Logical reading order	65
7.3.9. Reflow	66
8 Suitable software and tools	68
8.1. axesPDF for Word	68
8.2. axesPDF QuickFix	68
8.3. CommonLook PDF GlobalAccess	69
8.4. axaio MadeToTag	69
8.5. callas pdfGoHTML	69
8.6. VIP-PDF-Reader.....	69
8.7. NVDA	70
9 Links and resources	71
9.1. Legal provisions / standards	71
9.2. Resources on BITV 2.0.....	71

9.3. Resources on PDF/UA	71
9.4. Tools and assistance for PDF/UA conformity check	72
9.5. PDF documents from Microsoft Word.....	72
9.6. Adobe Acrobat DC	73
9.7. Adobe InDesign	73
9.8. Create, test and remediate accessible PDF	73
9.9. Organisations.....	73
Publication details	75

1 Introduction

Web accessibility is essentially about providing information on websites and technologies that can be equally accessed, used and understood by everybody. This inclusive practice is aimed at various user audiences (such as visually impaired, blind, deaf and hard of hearing people, people with impaired physical skills or with cognitive impairments, but also elderly people or people with different native languages), and includes technical devices for navigating the Internet as well. Apart from the public sector, business companies, too, increasingly recognise the value of accessibility as a quality asset of their online communication.

In Germany, the BITV 2.0, the revised version of the German Ordinance for Accessible Information Technology, has been in force since September 22, 2011.¹ Specifying the technical details of the requirements of §11 Disability Equality Act (BGG), the ordinance obliges the authorities of the Federal Administration - including the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and its Federal agencies to use accessible web technologies for offering their content online. *Länder* authorities have their own regulations, which are generally based closely on the federal BITV.

The BITV 2.0. transposes the International Web Content Accessibility Guidelines (WCAG) 2.0² by the World Wide Web Consortium (W3C) into national German law. The ordinance explicitly addresses the WCAG criteria of level A (minimum requirements) and AA (further requirements), declaring these as compulsory.

Accessibility and PDF

The BITV 2.0 does not only cover websites, but all embedded applications, media and file formats, including PDF documents. For many years now, PDF (Portable Document Format) has been one of the most widely used file formats on the Internet. Consequently, PDF today is an integral part of everyday digital life. The PDF format is usually used to present information across all kinds of different platforms and devices while at the same time preserving its original layout unchanged. Every user receives the document layout exactly as the author intended it to look like.

Accessibility, in turn, demands the very opposite: each and every user shall be able to adapt the presentation of content such as text and images to their individual needs.

¹ http://www.gesetze-im-internet.de/bitv_2_0/BJNR184300011.html

² <http://www.w3.org/TR/WCAG20/>

These web accessibility requirements include:

- Typeface adjustments, e.g. font resizing,
- customising colour representation and / or contrast of text and background,
- operation / navigation only with the keyboard,
- preservation of reading order in linear media,
- automatic language recognition through voice output.³

The concept of *tagged PDF*

In order to meet the requirements mentioned above, web content needs an internal structure assistive technology (AT) can build on. The basic idea of the *tagged PDF* approach is to separate content from layout to make the PDF file accessible for AT such as screen readers.

A PDF file that is properly marked up with tags and bookmarks helps users who rely on certain accessibility features to navigate through the document. Visually impaired users can read and navigate through properly tagged PDFs by software or output in Braille and can adjust font size values to their personal liking.

tagged PDF makes PDF documents machine-readable. This allows an accessible document to be read and customised to individual needs. What's more, a PDF that is semantically enriched by structural tags also qualifies for search engine optimisation (SEO) purposes and better output on mobile devices.

In a nutshell:

An accessible PDF document retains the original visible layout, but it is enriched by additional information such as invisible structure elements (document structure tags, usually referred to as "tags"), navigation links, or bookmarks.

If you as an author, designer or editor, are involved in the process of creation, design, online distribution and use of PDF documents, it is your responsibility to ensure that the resulting documents comply with accessibility requirements. Accessibility issues must be considered effectively from the very beginning of the conception and design process.

This guide is intended to give you an initial technical introduction and guidance on how to prepare accessible PDF documents in Microsoft Word and remediate the resulting PDF documents in compliance with the current standards.

³ <http://www.einfach-fuer-alle.de/artikel/pdf-barrierefrei-umsetzen>

2 Standards and legal provisions

BITV 2.0 represents the legal basis for all publications to be published on the BMU website. This implies that all PDF documents created on behalf of the BMU and intended for publication on a web site of the Ministry are subject to the requirements of this ordinance.

BITV 2.0 applies across technologies, thus making accessibility requirements equally binding for technologies as diverse as HTML, video formats or, of course, PDF. In practice, different aspects and working steps come into play - depending on the technique. However, the ordinance does not offer concrete instructions for fulfilling the respective criteria. For contractors, beneficiaries and service-providers there are additional technical specifications available on how to produce accessible, BITV 2.0-compliant PDF documents.

2.1. The PDF 1.7 Specification

Creating an accessible PDF is all about mapping the document's content to a correct tag structure. The basic rules and structure elements for tags in PDF are defined and explained in the official PDF specification, which sets formal structural rules for PDF documents. The concept of tags has been in use since the PDF 1.7 specification, which was released as ISO standard 32000-1 in 2007 and is available online for free.⁴ An annotated overview of the officially defined structural elements can be found in Chapter 6.

Please note:

In 2017, the new PDF standard 2.0 was released as an ISO standard. This also brought about some innovations in the area of accessibility. In the context of this user guide, however, these aspects shall be mentioned in passing only, as the PDF/UA standard in its currently applicable version PDF/UA-1 refers to PDF 1.7. The release of the successor standard PDF/UA-2, which is planned to incorporate the revised structure concepts of PDF 2.0, has not been announced yet.

2.2. The PDF/UA Standard

Conventional web accessibility tests do not cover all the technical PDF details necessary to achieve full PDF accessibility. Currently, a specifically designed procedure to test PDF for BITV 2.0 compliance does not exist. How a PDF should be built to conform with BITV 2.0 is therefore technically neither clearly defined nor transparently verifiable. In the past, this circumstance made it difficult for Ministry and service providers alike to easily create and check the accessibility of PDF files.

⁴ see chapters 10.7 und 10.8 in http://www.adobe.com/content/dam/Adobe/en/devnet/acrobat/pdfs/pdf_reference_1-7.pdf#page=883

The BMU therefore has decided to introduce PDF/UA (UA = Universal Accessibility) as additional standard for accessible PDF: Since January 2017, all PDF documents published on the BMU website must meet the requirements of PDF/UA-1 (ISO 14289-1) - in addition to the still-valid provisions of BITV 2.0.

PDF/UA closes a normative gap between web and PDF technology: it clarifies and simplifies the PDF requirements to meet BITV 2.0 and WCAG 2.0 respectively by adding technical, PDF-related provisions for achieving full accessibility. The PDF/UA standard was developed by the PDF/UA Competence Center of the PDF Association, who foster and promote international standardization of the PDF technology.

The requirements of the PDF/UA standard not only apply to the PDF file format (documents), but also to conforming assistive technology (AT) and PDF reading or processing software. This is to ensure that a PDF/UA-compliant PDF document read with a PDF/UA-compliant device offers the user the best possible accessibility experience.

The basic testing procedure for PDF/UA compliance is the so-called Matterhorn Protocol 1.0.2. For the technically verifiable criteria a free testing tool is available - the PDF Accessibility Checker (PAC 3).

In 2014, the PDF/UA standard has been translated into the German DIN ISO 14289-1 standard.

The PDF/UA standard is based on the recommendations and guidelines of WCAG 2.0 and PDF specification 1.7 (see footnote 4). Following the release of the new PDF 2.0 standard, the PDF/UA standard is currently under revision to reflect the changes in the future. Until the release of the revised version, which is expected around 2019 / 2020, the old PDF specification PDF 1.7 continues to form the basis for PDF/UA.

2.3. PDF/UA requirements

A PDF document is accessible in accordance with the PDF/UA standard if

1. it is directly accessible based on its tag structure
2. all the requirements and conditions of the PDF/UA standard are met and
3. the test according to the Matterhorn Protocol is successful.

The following conditions must be met in all PDF/UA-1 documents:⁵

⁵ <https://www.pdfib.com/fileadmin/pdfib/pdf/whitepaper/Whitepaper-Technical-Introduction-to-PDFUA.pdf>

- The document must be tagged. While PDF 1.7 includes some requirements regarding the nesting and relationship of different types of structure elements, PDF/UA-1 extends and clarifies these rules ().
- All fonts used in the document must be embedded (except fonts for invisible text, e.g. OCR results).
- Some layer options are not allowed.
- Reference XObjects for external page content (as used in PDF/X-5) are not allowed.
- The document title must be specified in the document's metadata

When creating the structure hierarchy for PDF/UA-1, several semantic aspects must be obeyed. These are discussed in more detail in Chapter 4.2. For more information please see the PDF/UA resources on the PDF Association's website.⁶

2.4. Process steps

The following major steps are required to adapt or remediate a PDF document to comply with the PDF/UA standard:

- Creating a clear tag structure to define content in a comprehensible reading order;
- Standard-compliant mark-up of heading, paragraph and list elements;
- Purposeful and structured use of tables with header cells and connected cells;
- Creating semantically correct bookmarks;
- Explaining acronyms and abbreviations at the first occurrence and listing them in a glossary;
- Inserting meaningful alternative text in graphics, images and formulas;
- Keyboard-operable hyperlinks with speaking link text or alternative text;
- Setting the document's default language, and, if applicable, identifying all language changes within the document (paragraph-level);
- Adding a PDF/UA Identifier to clearly indicate standard compliance to assistive software.

For tagging and remediating the PDF file, it is recommended to use the licensed Adobe Acrobat Pro DC software, which offers many comprehensive features for editing PDF files. Acrobat and a certain amount of experience help to produce reliably accessible results. In addition, starting with

⁶ <https://www.pdfa.org/resource/>

the version of Adobe Acrobat Pro XI, the software comes with an extended range of remediation functions and a user-friendly user interface compared to its predecessor versions.

This manual offers instructions on how to create and remediate accessible PDF documents using the Adobe Acrobat Pro DC version.

Please note:

Even if the Adobe Acrobat PDF Maker plug-in for MS Word produces fairly good results, the software does not deliver PDF/UA-compliant structures by its own, which means that the resulting PDF still requires further remediation to close the gap to full compliance. Combining Acrobat with PDF/UA-compliant software is highly recommended (see also Chapter 8).

2.5. Relationship between BITV 2.0 and PDF/UA

The PDF/UA standard clarifies BITV 2.0 provisions but does not substitute them. There is a large overlap between the two sets of rules. PDF/UA imposes additional requirements beyond BITV 2.0, which, if consistently implemented, significantly improve BITV 2.0 conformance.

The requirements of BITV 2.0 include some aspects that frequently occur in PDF documents but are not addressed by the PDF/UA standard since they are not of technical nature or do not specifically apply to the PDF file format. However, these apply to each and every PDF document:

- Colour should not be used as the only means of conveying information. (Annex 1 to § 3 (1): 1.4.1 *Colour*)
- Provide enough contrast between text and background: " The visual presentation of text and images of text has a contrast ratio of at least 4.5:1" (Annex 1 to § 3 (1): 1.4.3 *Contrast*)
- Navigation without keyboard traps: If keyboard focus can be moved to a component of the page using a keyboard interface, then focus can be moved away from that component using only a keyboard interface, and, if it requires more than unmodified arrow or tab keys or other standard exit methods, the user is advised of the method for moving focus away. (Annex 1 to § 3 (1): 2.1.2 *No keyboard trap*)

In short: all documents that are produced on behalf of BMU are to meet the following legal requirements:

- The provisions of BITV 2.0 apply without restrictions.
- All technical criteria listed in the PDF/UA-1 standard are to be fulfilled as well (as far as applicable).
- For all aspects of accessibility that are not specifically addressed by PDF/UA-1, the requirements of BITV 2.0 apply.

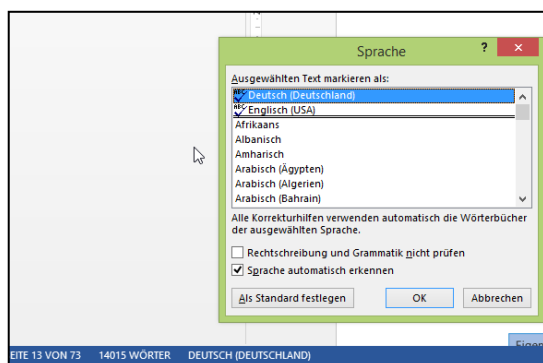
Detailed information, instructions and examples of the BITV 2.0 requirements can be found in the comprehensive online guide BITV-Lotse, published in German by the Federal Ministry of Labour and Social Affairs.

3 Making documents accessible in MS Word

There are some simple design principles and steps to take in creating word documents to make sure that everyone can access them. The following instructions and illustrations are based on Microsoft Word 2013. The practice in older or more recent software versions may vary, but the basic steps are comparable.⁷ Please note that this chapter's additional illustrating images and screenshots were taken from the original German-language manual and have not been translated to English.

3.1. General preparations

When designing a document, always make sure layout provides enough contrast between text and its background to meet BITV guidelines so that it can be read by people with moderately low vision. This requirement applies to all fonts and design elements. For regular font size, the contrast between font colour and background must be at least 4.5:1. Several free software tools such as the Colour Contrast Analyser⁸ can assist you in evaluating the conformance of your colour combinations. Logos are excluded from the requirements for contrast.

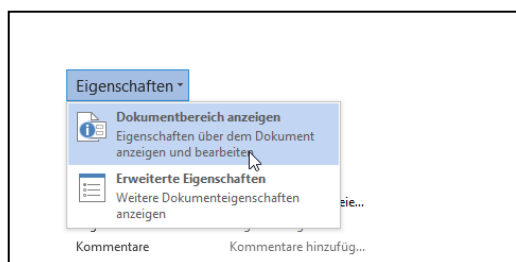


Make sure the default document language is set correctly. If your document contains content written in multiple languages, all language switches must be appropriately indicated. Select the text passage and change the language displayed on the horizontal bar at the bottom of the screen.

The meta information can already be included in the document properties in Word. From the angle of accessibility, it is particularly important to provide a correct document title to allow users of screen readers to identify the file on the local desktop.

⁷ For more details on how to make Word documents accessible for people with disabilities see <https://support.office.com/en-us/article/make-your-word-documents-accessible-to-people-with-disabilities-d9bf3683-87ac-47ea-b91a-78dcacb3c66d?ui=en-US&rs=en-US&ad=US>

⁸ The Color Contrast Analyser can be downloaded from <https://developer.paciellogroup.com/resources/contrastanalyser/>



The document properties can be accessed via the *File* tab > *Info* > select *Properties* from the menu. There, select "Show Document Panel" to enter the document title and author into the appropriate fields.

3.2. Principle of structuring

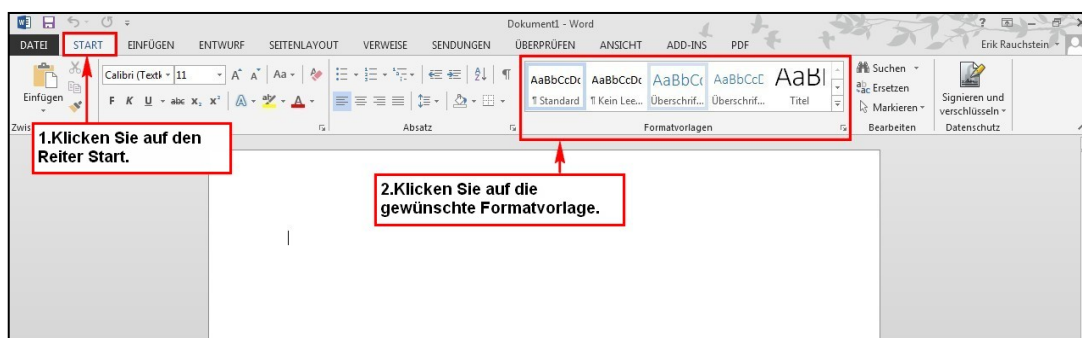
Structure is the key to accessibility. On the one hand, this implies that clear language and a meaningful and consistent organisation of the content lay the foundation of an accessible document.

On the other hand, structure has a technical dimension as well: Starting with Microsoft Office 2000, it is possible to transfer structural information from a Word document to a "tagged" PDF document. For writing the document in Word, this means: Each content element must be explicitly assigned a format that reflects its function. The formatting is transferred as so-called "tags" into the PDF file which form the hidden, structured representation of the PDF content that is presented to screen readers. Typical types of content are, for example, headings, standard text paragraphs, tables, or lists.

3.3. Using styles

A style is a set of formatting instructions. It is imperative to use styles for formatting each item in the Word document, such as headings (ordered by levels), paragraphs, captions, footnotes, and so on.

Example: To apply a heading style to a portion of text, highlight the desired text and click Home > Styles. Select the desired level heading style from the Styles gallery or the Styles pane.

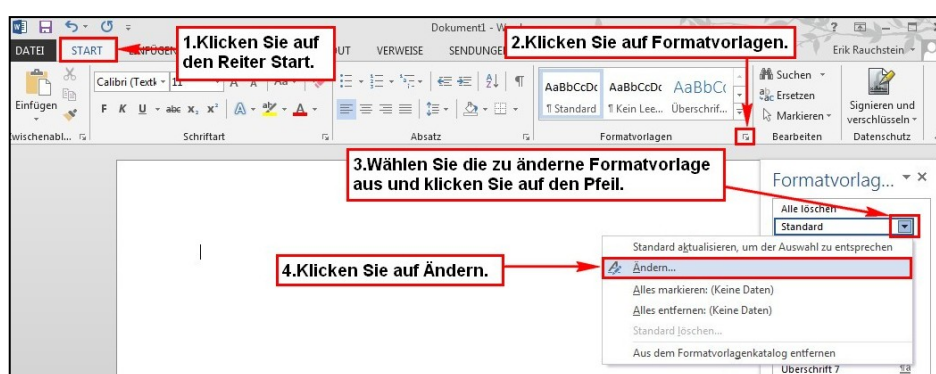


Word 2013 provides insight into all the document's current styles at *Home > Styles*. For an overview of all the styles used in the document, you can display the entire dialog box via the arrow icon. Ensure all heading styles are in the correct order. Use the navigation pane to view and edit the document's organisation: *View > Show group > Navigation Pane*.

3.4. Customising styles

Predefined standard styles may need to be modified to suit the desired document design (font size, font type, etc.). For each recurring design, set up individual custom styles.

To customise existing styles in Word, select the text area you want to apply a particular style to and choose a default style from the *Styles* task pane or the *Styles* gallery.



Select the style you want to change, click the arrow to open the menu and choose *Modify...* In the following *Modify Style* dialog box you can change the formatting for your style (e.g. font, paragraph etc.). Click OK to save your changes.

For more details on different styles types, please check with Microsoft's Word help center or another in-depth user's guide.

3.5. Further process steps

3.5.1. Spacing between paragraphs

Be sure to avoid pressing the Enter key to create additional space between paragraphs. Instead, use your styles properties to define and edit spaces between paragraphs.

Procedure:

Highlight the element which you want to define the spacing for. Proceed as described above to modify the style.

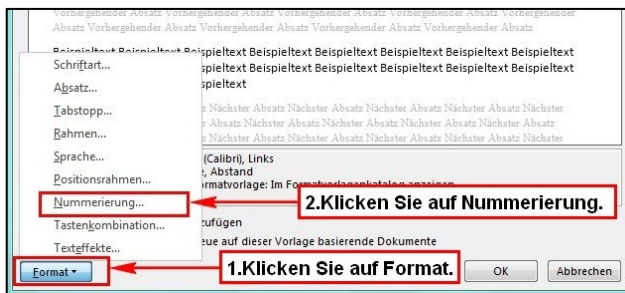


In the *Modify Style* dialog box, select the *Paragraph* from the *Format* drop-down menu (bottom left). In the *Indents and Spacing* tab, enter appropriate values for *Before* and *After* under *Spacing*. These values will be applied to all instances of this style in the entire document.

It may be necessary to create multiple styles with different spacing to accommodate the combination of different formats, e.g. a header may be followed by a standard paragraph or a table and might require different spacing values for each case.

3.5.2. Creating numbered headings

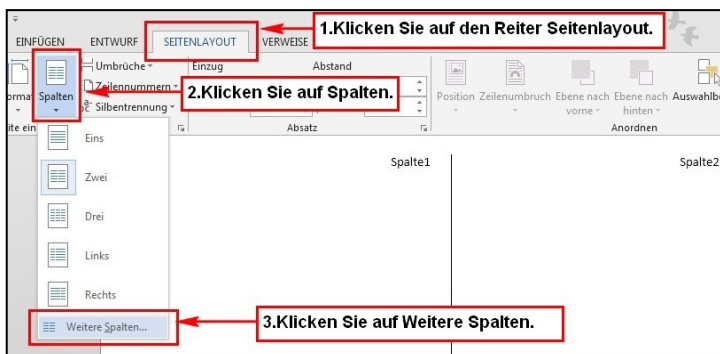
To create numbered headings, you can use Word's built-in *Numbering* function.



Select the desired heading style and go to *Styles >> Modify...* In the window that opens, click *Format > Numbering*.

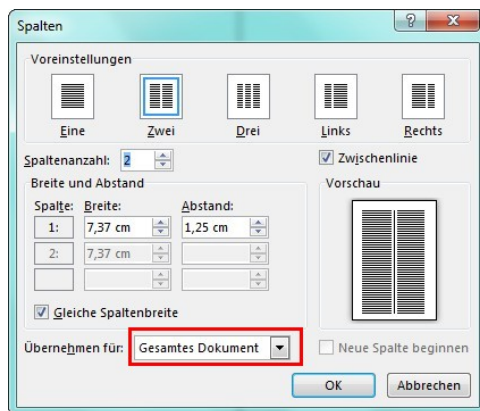
3.5.3. Text in columns

To format your text in multiple columns, never resort to inserting layout tables, but always use the built-in function. It can be accessed via the ribbon *Page Layout > Columns > More Columns...*



In the *Columns* dialog box, select the number of columns under *Presets*.

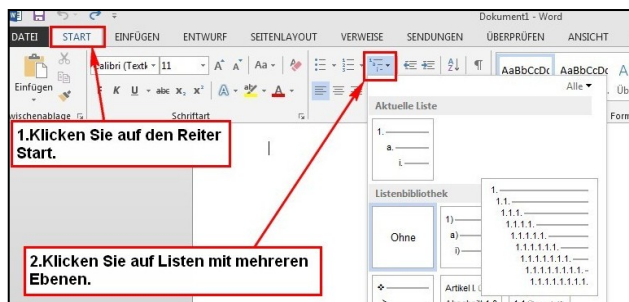
If you want only part of the document to be displayed in a, say, two-column layout, select *Apply to:* >> *This point forward* to insert a section break.



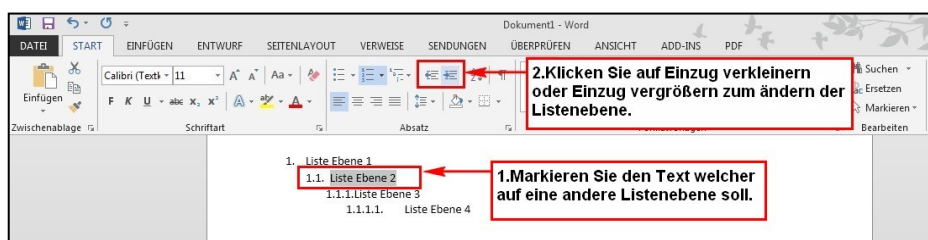
Once you have inserted your multicolumn content, go back to the *Columns* dialog box, choose the One column format and again select “This point forward”, and your document will return to the default single-column format.

3.5.4. Lists

Lists should not be designed using simple indents but must be defined by using the built-in *Bullets* or *Numbering* function. Word offers some formatting automatism: When you type 1, a period, a space, and some text, then press Enter, Word automatically starts a numbered list for you. Type * and a space before your text, and Word makes a bulleted list.



To switch levels within nested lists, you can mark the text and use the *Increase Indent* option or click the desired command in the *Multilevel Lists* options.



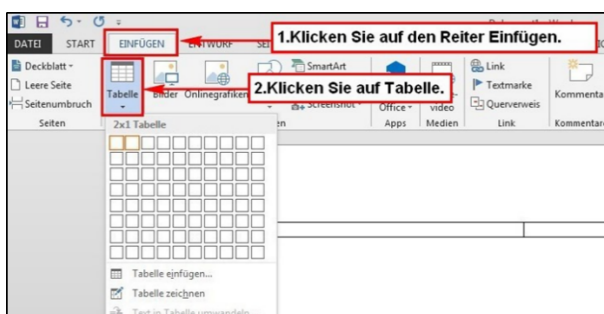
Please note:

Multilevel lists should be scrutinised with particular care in the final PDF, because, errors are likely to occur during conversion.

3.5.5. Tables

Only genuine data tables created with the built-in *Table* function in Word can be properly processed in terms of accessibility. Each table cell must be individually controllable by keyboard or mouse and have visible continuous gridlines.

To create a table, go to the ribbon's *Insert* tab. Click on the *Table* button and set up columns and rows in the *Table* menu.

**Please note:**

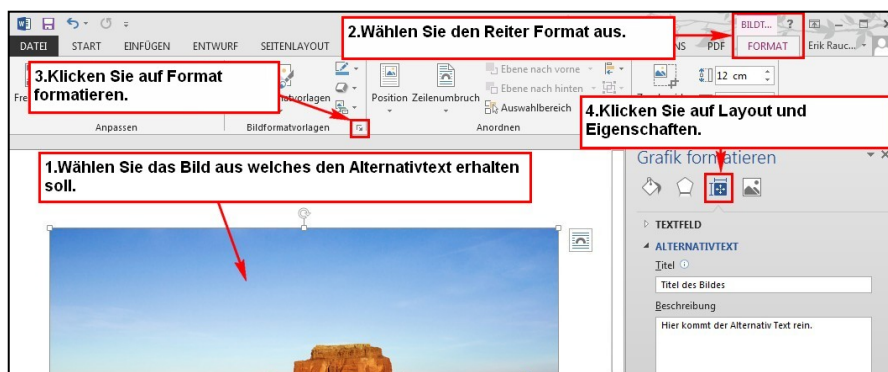
Designing accessible tables takes some conceptual forethought. Complex tables are often not very user friendly, as authors tend to overload the grid space with too many facts and inter-related data. Consider breaking complex tables into a several smaller tables. Besides, complex tables can be difficult to make accessible in PDF, i.e. they often require massive technical remediation in Adobe Acrobat DC.

Tables should be used only for the purpose of setting out tabular data. For general page layout use the layout tools provided by Microsoft Word.

3.5.6. Alternative text for visual content

Images, such as pictures, icons and graphics must be provided with alternative texts. It is not only important that they have an alternative text, but that the alternative text is a true equivalent to the content shown. In a nutshell: Keep it as short as possible and as detailed as necessary.

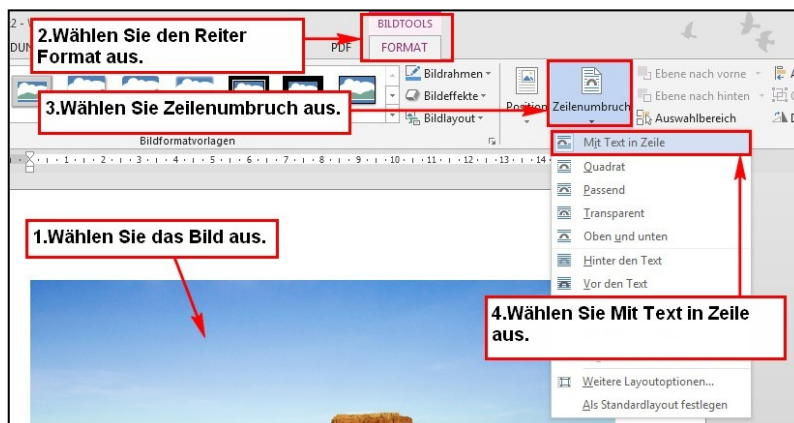
An illustrative, German-language guide to the creation of meaningful alternative texts is provided by the online resource BITV-Lotse (Link see Chapter 7.3.4).



In Word, alternate text can be added to images as follows: right-click on the image and select *Format Picture*. Within the tab *Layout & Properties* >> *Alt Text* you can type in the alternative description; please use the *Description* box; the *Title* box is not relevant in terms of accessibility and does not require input. Alternatively, you can access this function via the *Format* ribbon > *Format Picture* > *Layout and Properties*.

Please note:

Screen readers, i.e. assistive technology for users with limited vision by default identify and read the type “image” ahead of the actual alt text. Therefore, the alternative description should not be prefixed by expressions like “Image:” or “This figure shows”.



In the *Layout* ribbon, choose *In line with text* to make sure the image is correctly displayed and anchored within the logical reading order of the text.

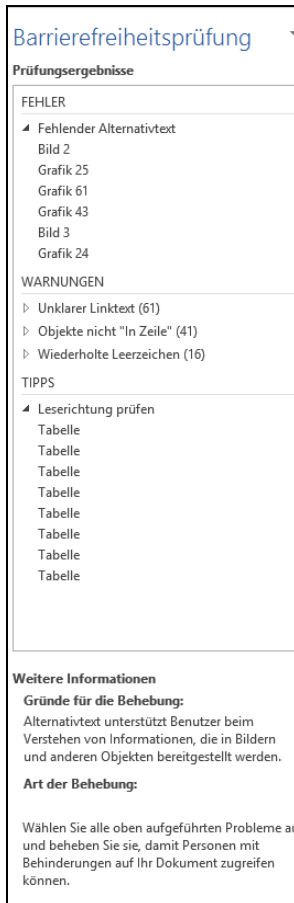
3.5.7. Creating tables of contents

For the sake of accessible organisation, it is particularly important to use suitable headings styles. The paragraph styles Heading 1, Heading 2, and so on, are central to the document’s structural design, since they work automatically with multilevel list numbering, tables of contents and cross-references.

For creating a professional table of contents, use the automated function provided by Microsoft Word. Go to the *References* tab on the ribbon >> click *Table of Contents*. The *Automatic Table*

option uses your predefined headings to create an interactive table of contents, which represents an important navigation aid in the resulting PDF document.

3.6. Using the Accessibility Checker



The built-in Microsoft Office Accessibility Checker can help you check if you have addressed all the aforementioned accessibility issues during the authoring process.

- Click *File > Info > Check for Issues*
- Select "*Check Accessibility*" from the drop-down menu

In recent versions of Microsoft Office Word, the Accessibility Checker is located visibly in the Review ribbon (*Review > Check Accessibility*).

The Accessibility Checker task pane opens next to your main content and presents a list of potential accessibility errors and their explanations, warnings, and suggestions on how to address them.

Under *Inspection Results*, you can now select each issue to see information on how to fix it. A Under *Additional Information* you are directed to the inaccessible content in your document.

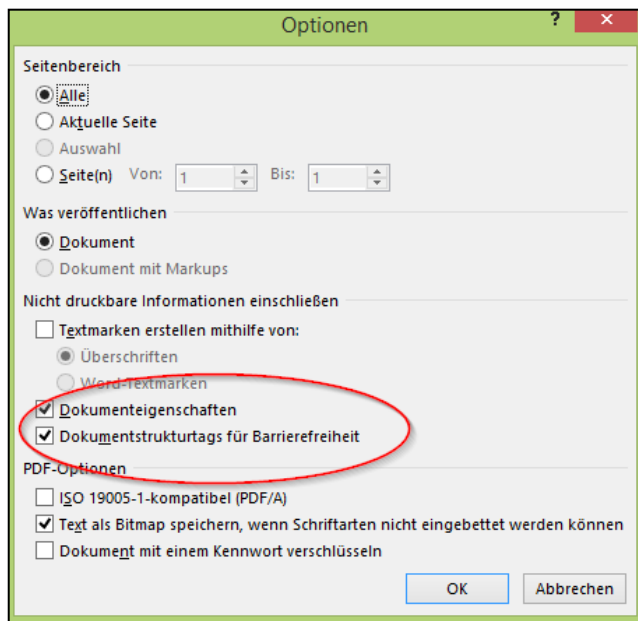
Please note:

As the accessibility checker does not conform with PDF/UA, it is not meant as a substitute for the PDF/UA check (see Chapter 7). It can be useful, though, in identifying and resolving issues in the source document.

3.7. Converting to PDF

You can use Word to save the document as a PDF file or create the PDF with the Adobe Acrobat add-in (recommended). To make sure that all accessibility-related preparations are properly transferred from the source document to PDF, some application settings must be defined before converting.

In Office 2013, select *File >> Export >> Create PDF / XPS Document*. Before saving, click the "Options" button below and select the "Document structure tags for accessibility" option. Click OK to proceed with saving the document. A PDF with structure tags will then be generated.



For better results in terms of structure tags quality, use the Adobe PDFMaker add-in to convert the source document to PDF.

PDFMaker is a feature of Adobe Acrobat that operates with Microsoft Office and other word processors. When you install Acrobat Pro on your operating system, PDFMaker controls are implemented in the workspace of the source application. For Windows, many familiar source applications add both the Adobe PDFMaker toolbar and the Adobe PDF menu.

To check the application settings, go to the Acrobat ribbon and select *Preferences*. In the Acrobat PDFMaker dialog box, check the boxes *Enable Accessibility and Reflow with tagged Adobe PDF* and *Create bookmarks*. In the *Bookmark* tab, you enable the *Convert Word Headings to Bookmarks* option.

Then the accessible PDF document can be created by clicking Adobe PDF> Convert to Adobe PDF.

To export a PDF, go to the Acrobat ribbon and select *Create PDF* or select *File> Save as Adobe PDF*.

Please note:

Neither the Word function “*Export with tags*” nor the Acrobat PDFMaker plugin produce PDFs with a PDF/UA-compliant tag structure. Post-processing and remediation in Adobe PDF are indispensable – but the better your Word document is structured and semantically enriched, the less effort needs to be taken afterwards to bridge the gap to PDF/UA.

Meanwhile, several competitors in the market (see Chapter 8) have come forward with software solutions whose conversion engines come closer to translating Microsoft Word styles and settings to technically PDF/UA-conforming PDF structures, which significantly reduces subsequent remediation work in Adobe Acrobat.

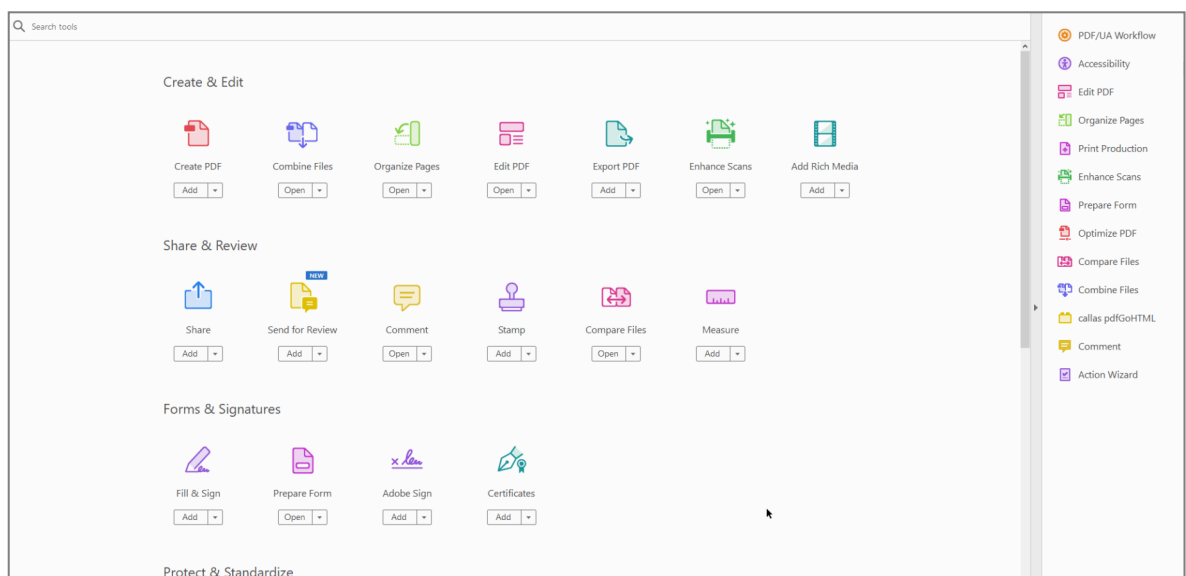
4 PDF remediation in Adobe Acrobat DC

4.1. Getting started with Adobe Acrobat DC

Adobe Acrobat DC offers a number of useful tools and views for remediating PDFs. The following instructions are limited to the basic set-up of the work environment needed to rework accessibility-related aspects.⁹

4.1.1. Tools center

The tools center contains all the tools available in Acrobat listed by categories. Tools that you use for remediating PDFs can be added as shortcuts to the right pane (see screenshot below).



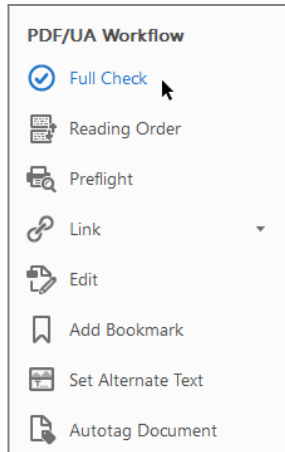
Tools needed for PDF remediation:

- Accessibility
- Edit PDF
- Organise Pages
- Print Production
- Enhance Scans
- Prepare Form

⁹ For information on the Acrobat DC interface please refer to the Adobe website:
<https://helpx.adobe.com/acrobat/using/workspace-basics.html>

- Optimize PDF
- Compare Files

Shortcuts can be added by clicking the *Add* button or by dragging the tool to the right pane.



Tip: For the accessibility workflow it is recommended to create your own customized tool collection. It allows you to quickly access the tools you need during the remediation process. The Acrobat User Guide website offers a step-by-step introduction on how to create custom tools.¹⁰

Full Check: This feature provides an automated way to check the basic technical accessibility of a PDF file. Please note though that this check does not cover all PDF/UA requirements (compare Chapter 7.2).

Reading Order: This tool offers a useful visual approach for assigning basic tags to content. (see Chapter 4.2 ff).

Preflight: Useful for embedding fonts, fixing structural problems and adding the PDF/UA Identifier (see Chapters 4.4 und 7.1.1).

Link: With this tool you can create, or edit accessible, active links for URLs and email addresses (see Chapter 4.3.6).

Edit PDF: Here you can replace, edit, or add text and images.

Add Bookmark: Creating and editing bookmarks (see Chapter 7.3.5.)

Set Alternate Text: this tool guides through all images present in the document and allows to enter alternate text to one after another. Decorative images can be defined by a checkbox (see Chapter 3.5.6 and 7.3.4).

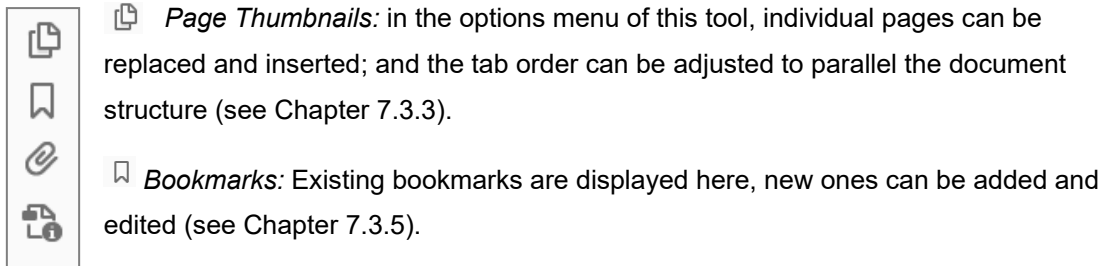
Autotag Document: In case of an untagged PDF, this tool automatically builds a tag tree based on a prior analysis the page elements present. However, it cannot always correctly interpret the structure and reading order of complex page elements, so that manual verification and remediation are mandatory.

¹⁰ https://helpx.adobe.com/acrobat/using/workspace-basics.html#custom_tool

4.1.2. Navigation panels

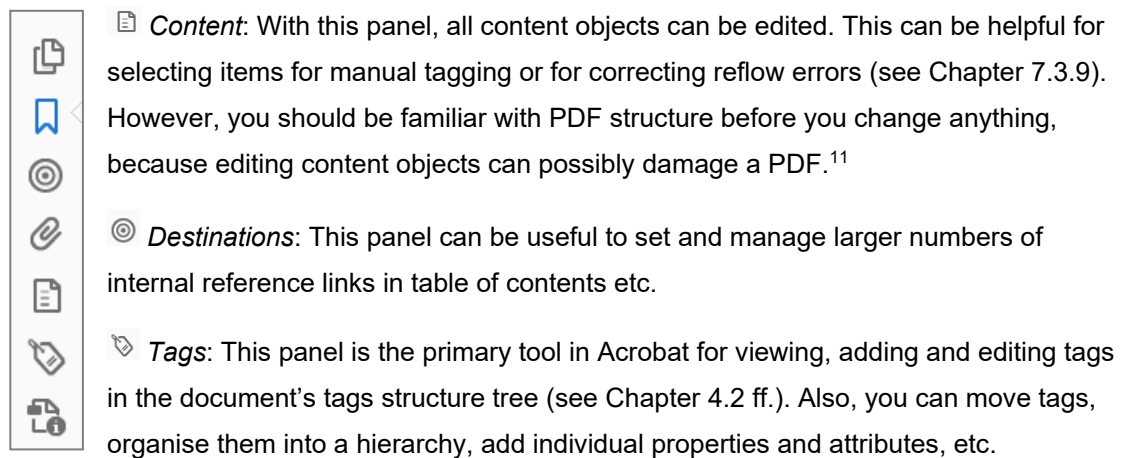
On the left side of the program interface there is the navigation pane with easy access to different navigation panels, which provide various functional tools and options for editing the document.

By default, the navigation panel only contains a selection of available toolbars. For the process of making documents accessible, only the first two tools are needed.



To add more tools that are vital to establish PDF accessibility, go to the Acrobat menu on top and choose *View >> Show/Hide >> Navigation Panes*.

In Acrobat DC, you can also just right-click an empty space in the navigation pane and select the following three navigation panels: *Content*, *Destinations* and *Tags*. The icons of these then appear in the pane below the default panels.



Once you have made these basic settings, your Acrobat DC workspace is ready for PDF editing.

¹¹ More details on the content panel can be found in Adobe's Acrobat User Guide: <https://helpx.adobe.com/acrobat/using/editing-document-structure-content-tags.html>

4.2. How to create a semantically correct document structure

A correct document structure helps all users better understand the content offered. What's more, a syntactically and semantically correct document structure enables users of assistive technology to skim through the document, to skip content and jump to desired passages in the document by using specific commands.

Tags form structural frameworks that provide the basis of an accessible PDF document. Screen readers, for instance, rely on well-structured documents as they interpret tags for speech output.

A PDF/UA-1 compliant tag structure (based on PDF specification 1.7) needs to obey the following semantic rules¹²:

- All tags are arranged in a tree structure with the `<Document>` tag as root element. All further tags are contained in the hierarchy levels below the root tag.
- Tagging must use structure elements that are appropriate for the document's content structure, e. g.:
 - A heading must be marked as heading.
 - A table must be tagged as a table.
 - A list must be tagged as a list.

Content that is not relevant for the document's meaning must not be included in the document hierarchy but must instead be tagged as *Artifact*. Typical examples are running headers and footers, page numbers, and background images (decorative images).

- Structure elements must be arranged in logical reading order.
- Content must be tagged appropriately if the intended information is not otherwise accessible because of the content's colour, format or layout.
- Text represented in a graphic requires the Alt attribute with an explanation if it does not contain text in a natural language (e.g. font or script samples).
- Images must provide alternative text; image captions must be marked with a `<Caption>` tag.
- Links must be accompanied by a suitable Link annotation.

¹² A good breakdown of all the requirements is presented in a whitepaper on PDF/UA by PDFLib: <https://www.pdfliib.com/fileadmin/pdfliib/pdf/whitepaper/Whitepaper-Technical-Introduction-to-PDFUA.pdf#page=3>

- Only a single <Figure> tag must be created for groups of graphical elements which logically belong together.
- Footnotes, endnotes, note labels and references to locations within the document must be tagged as <Note> or <Reference> as appropriate
- When an image contains words, the text displayed in the typographical image must be entered in the *Actual Text* box in the *Object Properties* dialog / tags tab.

4.2.1. Headers and footers

Headers and footers often contain important information that all readers should be able to perceive. However, when such contents are read by screen readers, users may struggle to distinguish main page information from the content in headers or footers.

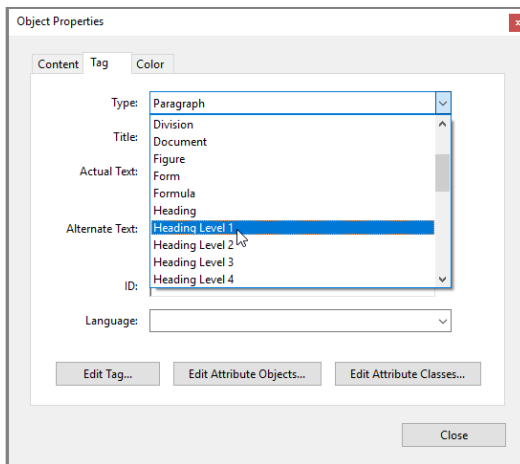
Headers and footers may, of course, be included in documents, but if the information is redundant (such as pagination, information on author or organisation or logos), it is recommended to mark those repetitive elements as background information. This means they should not be included in the regular tag structure, but rather be tagged as an *Artifact*. For more details on artifacts see Chapter 4.2.3.

Other content placed apart from the main text body such as annotations, info boxes or footnotes should be arranged in the tag tree in a way that the logical sequence of information is maintained; i.e. footnotes elements should be placed immediately adjacent to their associated reference elements.

4.2.2. Editing tags

The automatically generated tag structure can and should be reviewed and subsequently reworked in the *Tags* panel.

If a tag is not appropriately assigned to a content item, it must be corrected so that assistive output devices can correctly identify and interpret the information. For instance, if a portion of text designed as a headline in the original document carries the mark-up of a body text paragraph, but provides significant hierarchical information to the user, the associated tag must be changed to a heading tag.



To edit a tag, right-click the context menu and select *Properties*. In the following dialog, the tag properties can be edited; e.g. a Paragraph tag can be changed into a Heading tag.

To do this, go to the Tag tab and select the desired tag type from the drop-down menu. Click on Close (or use the shortcut ALT + C) to confirm the selection and check whether the tag type has now been updated in the tag tree.

Please note:

In the tag tree you will only find standard tag names, while in the properties Object properties dialog the general language description is listed (i.e. <H1> versus "Heading level 1"). For an overview of all standard tag types and their descriptions, see Chapter 6.

Alternatively, tags can also be renamed immediately in the tag tree. Select the desired tag and press F2 or double-click to edit it. Now enter the desired tag name.

Please note:

The tag name must be entered exactly as prescribed by the PDF specification in order to have role assignments function correctly. Make sure you pay attention to the upper and lower case.

4.2.3. Artifacts / Hiding non-relevant content as background

A core aspect of accessibility in PDF is the separation of relevant content from elements that fulfil layout purposes only. Such irrelevant page elements include dividing lines, frame borders, empty lines, illustrative elements or decorative pictures and ought to be treated as background information. This also applies to content organised in running headers and footers, i.e. content that repeats on every page, such as page numbers, author or company name, etc. If included within the linearized output of assistive technology (AT), these elements confuse the user and distract them from the main content.

To ensure that only relevant content be interpreted by the linearized output of assistive technology (AT), all irrelevant or purely decorative elements should be hidden from the structure elements tree and labelled as "artifacts", i.e. background information. Artifacts are not read by a screen reader.

Important: the PDF/UA standard requires ALL contents of a document either to be tagged with the appropriate tag or be marked as "artifact".

There are two ways to do this in Acrobat Pro DC.

- A) Via the context menu of a specific tag within the tag tree

In the *Tags* pane, locate the decorative content you want to hide, right-click the content tag and choose *Change Tag to Artifact...*

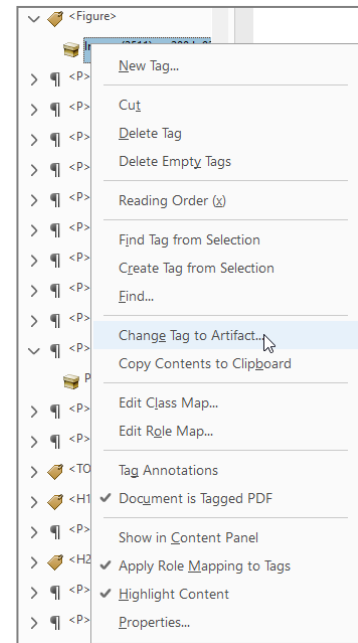
In the ensuing dialog box, define the type of Artifact, e.g. *Layout* and confirm with OK.

Then remove the remaining empty tag shell from the tag tree. Repeat these steps with all other decorative elements.

- B) Use the *Reading Order* tool

In the main document pane, select the page element you want to hide and open the *Reading Order* tool. In the *Reading Order* tool's dialog box, click the *Background / Artifact* button.

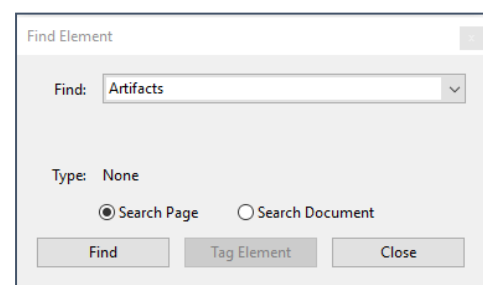
The tag disappears from the tag tree and is no longer highlighted as tag in the main document pane. To check whether the artifacted element really has disappeared from the tag tree, highlight the content in the main document, and in the *Tags* pane select *Find Tag from Selection* from the options menu. The message that the selected content was not found confirms that the element has been turned into an artifact.



If by accident you have defined a relevant element as artifact, you have several options to turn it back into a tagged item:

- A) Select the content in the document. In the *Tags* pane, right-click the context menu on the preceding tag in the tag tree and select the *Create tag from selection* option. It is advisable to create the tag in a position that is close to the location of the accompanying content. This makes it easy to later check the reading order of the content and adjust it if necessary.
- B) Select the content in the document. Use the *Reading Order* tool and select the button for the desired structure element tag.
- C) In the *Tags* pane, right-click any tag and select the "*Find ...*" command. In the dialog box "Artifacts" should already be pre-set. Now select the *Search Document* below and click *Find*.

All non-textual elements (artifacts) will be displayed in the document one after the other and highlighted with a blue rectangle in the document pane. Click *Find Next* until you reach the desired



element. Then select the *Tag Element* button. Now you can assign the desired tag type to the artifact.

Please note:

In the new PDF 2.0 standard, artifacts / background elements have their own tag type Artifact.

4.2.4. Adding tags to a document

When you start editing a PDF document, you should first make sure that the document possesses a tag structure.

To check if tags are present, go to the Tags pane. A window will open and display existing tags. The tree can be expanded with the arrow signs. If there are no tags, the message "*No tags available*" is displayed.

Please note:

Adobe Acrobat DC offers the option to "*Add Tags to Document*". Adobe Acrobat DC then interprets the displayed content and automatically "recognizes" the tag structure of the elements. However, this is not recommended as standard procedure because the tag structure automatically generated by Acrobat DC does not meet the requirements for a semantically correct tag structure according to PDF/UA standard and requires extensive remediation on the tag tree. Typically, the document should already be prepared and exported from authoring software such as MS Word or Acrobat InDesign so that it comes with tags. In Adobe Acrobat DC only minor remediation steps should be necessary (see Chapter 4).

4.3. Tags for specific types of content

4.3.1. Headings

Structured headings elements provide users with a better understanding of the information and its presentation in the document. In addition, headings make it easier for users to find their way around as they allow them to "scan" content and quickly access information of interest. A heading should therefore be descriptive and unique, i.e. only appear once in the document.

Sections such as glossaries and tables of contents should also have headings. This allows users of screen readers to skip these sections as needed without having to listen to all of this content.

Content should be organised in a logical and meaningful way (This is something that should be considered right at the start of the authoring process). Headings must be appropriately applied to reflect the conceptual hierarchy of chapters and subordinate chapters. In PDF 1.7, heading levels 1 to 6 (<H1> - <H6>) are available for structuring. PDF/UA-1 requires heading-

levels not be skipped. If you need to add <H1>-<H6> tags to your PDF, you may want to open the *Reading Order* Tool and click the button corresponding to the appropriate heading tag.

Please note:

PDF 2.0 allows heading levels below the 6th level, i.e. H7-H12.

Document title ≠ Heading

A title is information representing the normal means of referring to the document. Titles can be present as both metadata entry (in the Document properties) and page-content. As such it can be accessed by screen readers: displayed as window title (as required by the PDF/UA standard), it is read out whenever the file is selected by AT, e.g. on a desktop.

Even though PDF 1.7 has no structure type matching the concept of "title", it is recommended document titles appearing on page 1 not be structured with <H1> unless it is the only <H1> in the document.¹³

Since the document title itself is usually not part of the document's heading-level hierarchy, (e. g. it does not appear in the table of contents), it is admissible to simply tag it as a <P> paragraph. This also corresponds to the default formatting in Word: if the "Title" style is used for the document title it results in a <P> tag in the converted PDF.

Please note:

PDF 2.0 adds a <Title> structure type for the purpose of tagging document titles.

If for a PDF/UA-1-conforming document you choose to create a custom <Title> structure element type (which is acceptable), it is recommended to map such structure element types to <P> to be PDF/UA-1 compliant. That way, upgrading this document to PDF 2.0 / a future PDF/UA-2 would simply require deletion of this role map instead of reworking the entire hierarchy of heading levels.

4.3.2. Images / Visual content

All images that are relevant to understanding of the information offered must be tagged as <Figure>.

To tag figures, you can use the *Reading Order* tool. Use the left mouse button to drag a frame around the image and then select the "Image" button in the dialog box.

For some types of images, such as vector graphics, Acrobat DC breaks up the image to many

¹³ See the reasoning by Duff Johnson (PDF Association) in his "Tagged PDF Best Practice Guide: Syntax": <https://www.pdfa.org/wp-content/uploads/2019/06/TaggedPDFBestPracticeGuideSyntax.pdf#page=24>

small single image parts. In this case, the picture has to be tagged again as a whole in Acrobat DC.

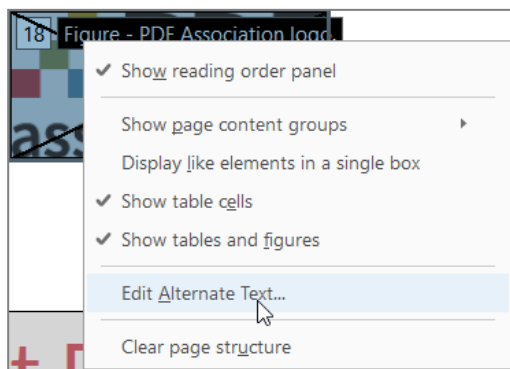
Adding alternate text

All content-bearing illustrations must be provided with meaningful alternate descriptions. Ideally, they should be as clear and concise as possible, but long enough that a person who is blind or with low vision has the same information that a sighted user would get from glancing at the picture. The information should be fully usable when graphics or images are not displayed but replaced by the text alternatives.¹⁴

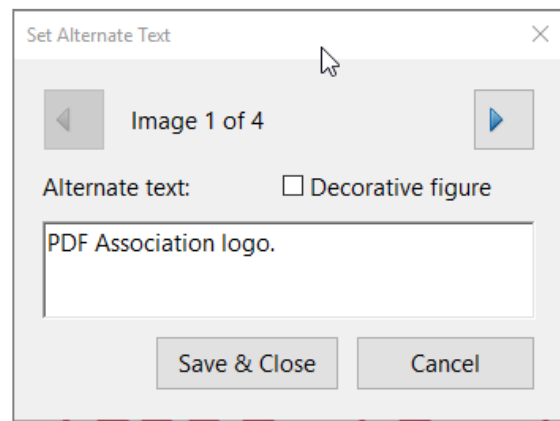


If possible, they shall already be added in the source document.

If alternate texts need to be added to the PDF, open Acrobat Pro DC's *Reading tool* and select the picture.



To create the alternative text or edit it, right-click on the black bar and select *Edit Alternate Text*.



You can also add review and set alternative texts to all images in the document by using the Accessibility tool >> *Set Alternate Text*

Make sure the alternative text does not repeat information already given in the caption or in the preceding or following text paragraphs.

Do not use introductory words ("The picture shows ...") and leave out unnecessary details that are not directly relevant to understanding the key message. Depending on the context, different alternative texts may be adequate descriptions to the very same image.

¹⁴ The German-language "BITV-Lotse" offers an illustrating guide on how to deal with alternate text: http://www.bitv-lotse.de/BL/DE/2_Bestandteile/2_1_Textalternativen/2_1_a_Bilder/2_1_a_bilder_tabelle.html?selectedTab=1

For complex information graphics, diagrams, graphs and charts, the key message of the presented facts or a trend in the development should be conveyed in a concise but clear way. All important aspects and relations shall be mentioned. This may mean a significant editorial effort.

Start thinking about concepts of accessible presentation during initial document design in the authoring application. Ideally, the data presented in a complex infographic should be additionally provided in an accessible data table below each diagram. Another good approach is to create an attachment to the PDF document with the longer more detailed description of the complex image. The image's alternative text can refer to the corresponding table or attachment. This ensures that the information conveyed by a complex image is not hidden in a confusing longish alternate text, but is available to all users alike, regardless of user device or AT.

If typography is used, i.e. images that represent characters or symbols, the text displayed must be entered in the object properties' "Actual text" box instead of as alternative text.

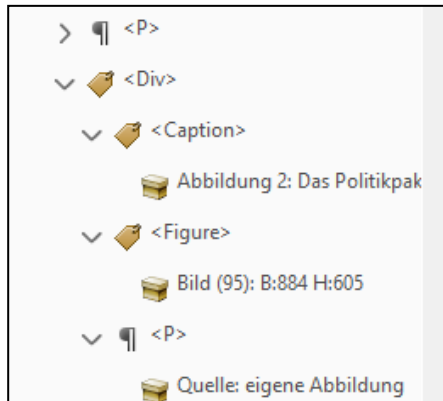
Please refrain from adding alternative text to purely decorative images / symbols. Such duplicate content considerably impedes accessibility for users of linear representations such as screen readers. Decorative images, which represent no relevant information or repeat information already provided in the text content, should be marked as artifact to exclude them from the relevant content reflected by the structure elements tree. For these artifacts, no alternate text description is required and desired. Such duplicate content considerably impedes accessibility for users of linear representations such as screen readers.

If in doubt whether an image requires an alternate description or not, consult the helpful W3C's Alt decision tree.¹⁵

¹⁵ <https://www.w3.org/WAI/tutorials/images/decision-tree/>

4.3.3. Captions

Captions of tables and figure must be tagged with a `<Caption>` tag. As these elements are by default mapped to `<P>` tags during conversion with Adobe PDF maker, these `<P>` tags need to be changed to `<Caption>` (see 4.2.2).



In the tags tree `<Caption>` should precede the element it captions. According to PDF 1.7 it shall be the first or the last structure element inside its parent structure element.

However, the following tag structure has proved to be semantically useful, too – in terms of associating figure elements with their captions and related information:

In the tag tree, group the `<Caption>` tag, the `<Figure>` tag, and any other `<P>` tags with information directly related within a parent grouping structure element such as `<Sect>` or `<Div>`.

4.3.4. Lists

Lists basically consist of several interrelated list items arranged by means of enumeration (either by bullets or list-numbering). The semantics must also be reflected in the tag structure in order to make this content meaningful for all users.

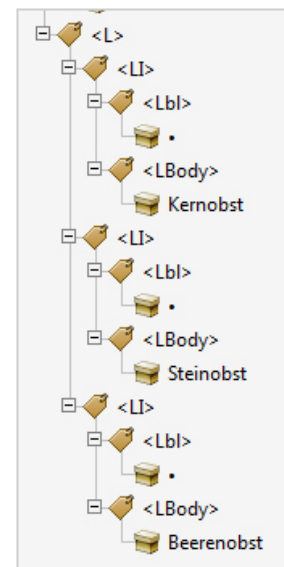
Lists are organised according to a tree structure:

The list (`<L>`) is the parent element, which consists of several child elements, the list items (``). List elements can only have Labels (`<Lb1>`) and List Item Body elements (`<LBody>`) as children.

The label element contains the list item marker, such as a bullet point or a list number. The list element text `<LBody>` contains the content of the list element.

Sample List "Obst" (German for *fruit*)

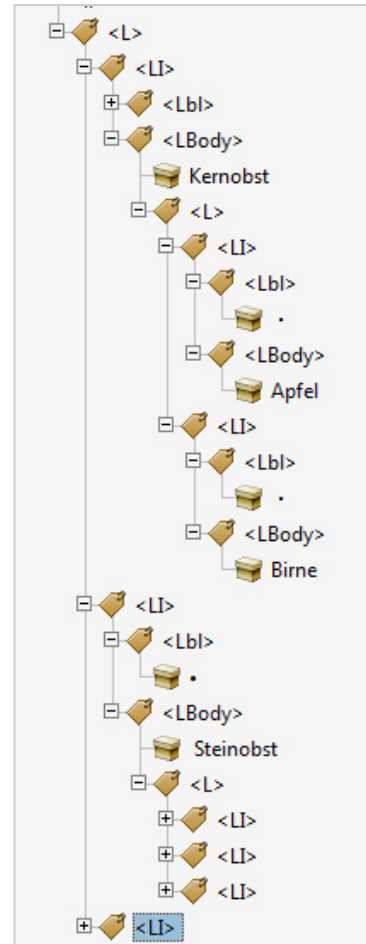
- Pome fruit
- Stone fruit
- Soft fruit



Often, documents contain nested lists, where a list item contains multiple list sub-items. A nested list must be created as a child element in the LBody element of the list item it refers to. The `<L>` tag for the subordinate list must be placed behind the text of the parent list body element.

Here's an example of a nested list:

- Pome fruit
 - Apple
 - Pear
- Stone fruit
 - Cherry
 - Mirabelle
 - Plum
- Soft fruit
 - Strawberry
 - Raspberry
 - Currant

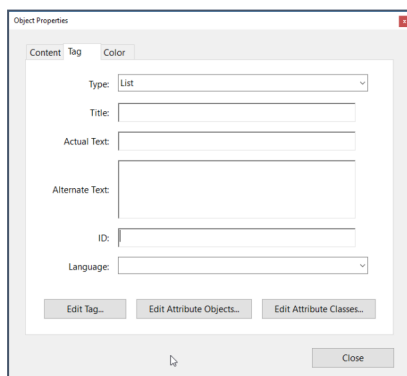


For lists that span multiple document pages, make sure that the list items (``) that appear on the following page are placed within the same list as the previous page, so that users can have related content as such and recognize the number of list items.

Marking numbered lists with the ListNumbering attribute

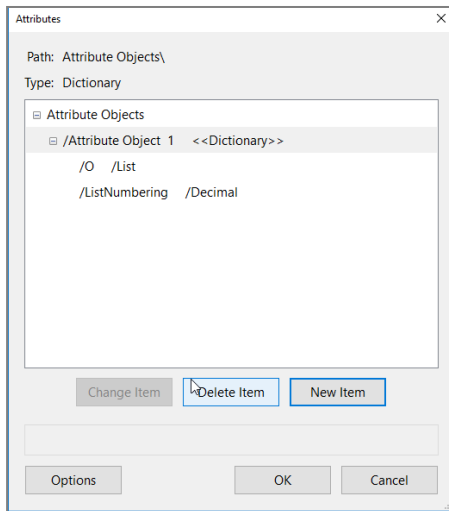
Numbered lists are lists that use numbers (1st, 2nd, 3rd, I, II, III) or letters (A, B, C, aa, bb, cc) as bullets. According to the PDF/UA standard, they must be marked with an attribute value.

Here is how to add the attribute in Acrobat Pro DC:



In the `<L>` tag's object properties, click "Edit Attribute Objects ..." in the Tag tab.

The *Attributes* dialog opens.



If no entry saying */Attribute Object 1 << Dictionary >>* exists yet, click *New Item* to create an entry.

Expand the entry */Attribute Object 1 << Dictionary >>* by clicking the + plus button. Select */O /Layout* and click *Change Item*. Delete the value *Layout* and insert the value *List* instead.

Then select */Attribute Object 1 << Dictionary >>* again and click *New Item*.

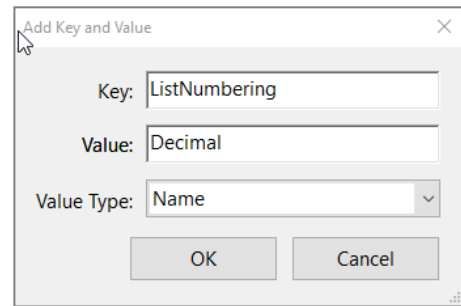
In the Key field, enter *ListNumbering* (please adhere to the exact camel case spelling).

In the Value field, enter the value according to your list numbering (see below).

For Value Type, select *Name*.

ListNumbering values:

- *Decimal* - 1., 2., 3., 4.
- *LowerRoman* - i, ii, iii, iv
- *UpperRoman* - I, II, III, IV
- *LowerAlpha* - a, b, c; aa, bb, cc
- *UpperAlpha* - A, B, C, D



4.3.5. Creating a table of contents

Tables of contents (<TOC>) help navigate within the document. They are basically structured like lists, but with different tags.

Please note:

PDF 2.0 does no longer include TOC and TOCI structure elements. This functionality is going to be covered by the structure tags for generic lists (L, LI, etc.).

A table of contents (<TOC>) consists of table of contents items (<TOCI>). <TOCI> elements contain the content, e.g. description, leader dots (of present) and page numbers.

When documents are converted from Word, the TOC's heading (e.g. "Table of Contents") are automatically generated as a part of the TOC, often as the first <TOCI>. This is not standard-



compliant and needs remediation, i.e. the tag should be dragged out of the parent <TOC> tag, placed in front of it and changed to a heading structure element.

If the document does not yet possess a TOC structure, proceed step-by-step to create the structure shown in the screenshot above.

Create a TOC tag and as many empty TOCI tags you need for your table of contents.

Click the first empty TOCI tag and select the corresponding text of the first table of contents entry. Right-click on the tag tree on the left and select "Create Tag from Selection".

Adding internal references and links to a table of contents

For longer documents, it is recommended to provide the table of contents with links, so that the user can easily navigate to the desired page by clicking on an entry. PDF/UA-1 does not explicitly mandate this¹⁶, but according to BITV 2.0 alternative ways to access content shall be provided. In any case, linked tables of contents in PDF considerably enhance the user experience. BMU therefore requires accessible PDF documents to have a linked table of contents in addition to the bookmarks.

When you use styles to format headings and have the table of contents automatically generated by using the "insert table" function, Microsoft Word usually creates a linked table of contents that already contains a correct tag structure in the converted PDF, with the exception of the above-mentioned heading.

Otherwise, the links must be added manually to the table of contents, ideally below a Reference a tag as shown in the above example. You can do this in Acrobat Pro DC using references and links (see Chapter 4.3.6) or the "destination" feature (see Chapter 4.3.7).

4.3.6. Links

Internal and external links are often used to ensure that the reader has immediate access to related information. Active links let you jump to other locations in the same document or to

¹⁶ See Duff Johnson's reasoning at: <https://www.pdfa.org/wp-content/uploads/2019/06/TaggedPDFBestPracticeGuideSyntax.pdf#page=16>

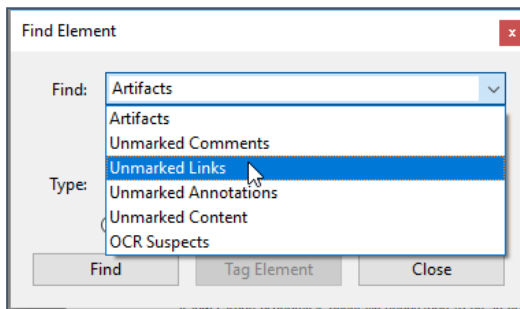
external websites. If you include links in a document, you should make sure that they are designed to be equally accessible to all users.

Link tags must conform to a certain syntax so that they can be activated by keyboard and recognised by AT as starting an action. Links must be tagged as `<Link>`. The `<Link>` structure element typically associates content and an actionable link annotation, i.e. the so-called Object Reference element OBJR. To mark a link correctly, locate the tag of the visible link text in the Tags pane. Select the parent tag of the of the link text content element and change its type to `<Link>` (alternatively, press F2 and rename the tag directly to `<Link>`).

Please note:

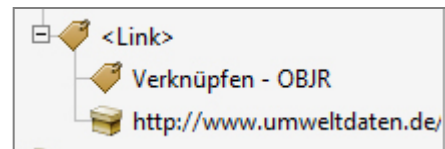
Although most links most likely are bound to visible elements, PDF/UA-1 does not require that `<Link>` structure elements enclose content.

To add the OBJR to the link, follow these steps:



Right-click on the `<Link>` tag to activate the context menu and select the Find ... command. In the dialog box that opens, select "Unmarked links" in the search field and click *Find*. As soon as the desired link is indicated by a blue rectangle, click on the button Tag element.

Close



and check in the logical tree structure whether the OBJR appears within the link tag. Although in general OBJRs may appear at any location within the `<Link>` element, for links that span pages, it is recommended that all OBJRs be next to each other in the logical order.

Link texts and the Contents key

Meaningful link texts help users understand the purpose of the link so they can decide whether they want to follow the link. The purpose of the link shall be clearly stated by the text of the link itself or its context (e.g. the sentence that precedes or contains that link). Meaningful here means short, but precise. General terms such as "see here", "more", "more information" are to be avoided. If the linked resource is a web page, the title of this web page can be used to describe the purpose of the link.

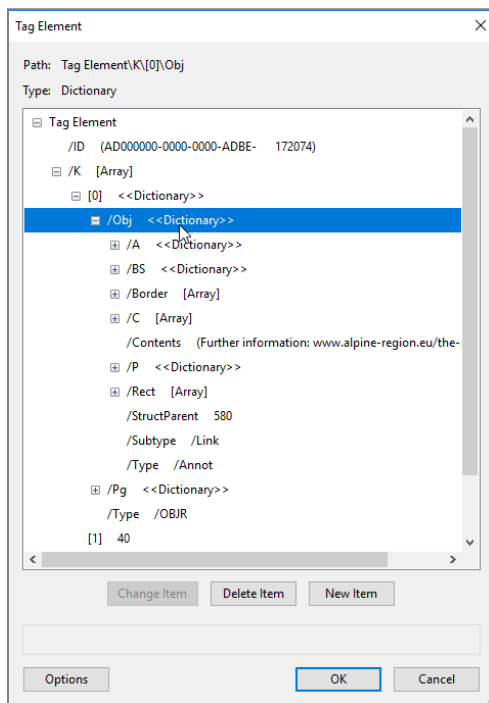
In addition to the general requirements for link text deriving from WCAG 2.1, PDF/UA requires links to have a sort of alternate description as well. This extra information can be useful for users of AT, since it describes what users will find when they follow a hyperlink. According to

the current PDF/UA-1 standard, an alternative description of the link destination must be created in the so-called Contents Key of the <Link> tag properties.

Please note:

In the upcoming PDF/UA 2.0 standard, this criterion is expected to turn into a warning, meaning that link annotations then might no longer be mandatory for conforming PDF. It is important, though, that the link's target or function then becomes absolutely clear from the context or the linked portion of text.

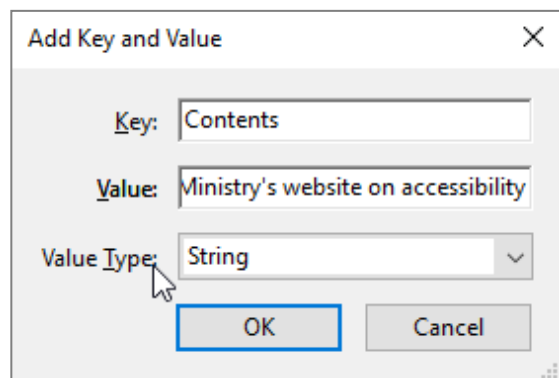
When exporting Word documents with axesPDF for Word or InDesign files with the axaio Madetotag plugin, the content key for links is set automatically. Otherwise, manual remediation in Adobe Acrobat DC is required.



Procedure:

In the *Tags* pane click the <Link> tag, right-click to activate the context menu and select *Properties*. In the following dialog click *Tag auf Edit tag...*

Click the button *New Item* to create the contents key for the link.



In the *Key* field, enter “Contents” and select “String” as *Value Type*. As *Value* field, enter an alternative description of what to expect behind the link. For links to web pages, a good practice to use the title attribute of the target page: you want to make sure that AT users receive the information "Visit the Federal Environment's Ministry's website on Accessibility" instead of the all-too technical and less informative URL “Visit www.bmu.de/WS146”.

Then click OK to save your changes.

4.3.7. Using destinations for internal references



A *destination* is the end point of a link and is represented by text in the Destinations panel. Apart from the fact that the concept is recommended when linking across different PDF documents (which shall not be discussed here), destinations offer several advantages for internal references, too.

The Destinations panel helps keep track of many references. Destinations can thus be used for creating internal reference links in tables of contents. Last but not least destinations help you to narrow down the physical location of the link target on the target page.

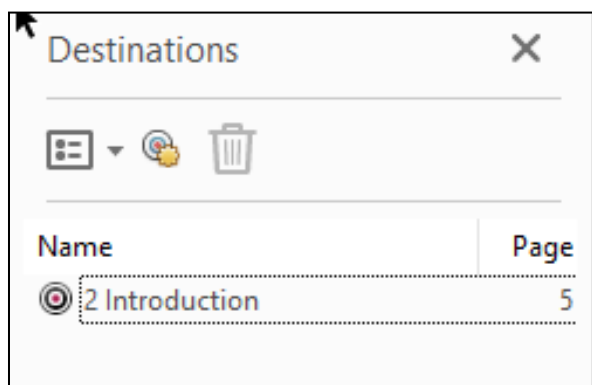
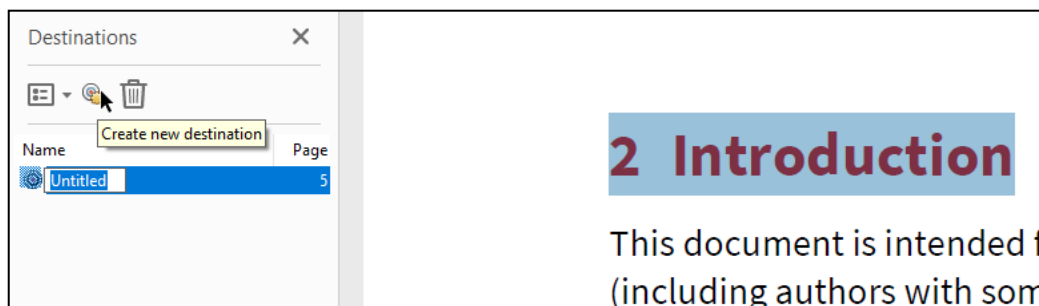
By the way, PDF 2.0 introduces a new concept that allows to create links that directly refer to tags, which will further enhance universal accessibility.

How to create destinations:

Destinations are relatively easy to create with Acrobat Pro DC. To do this, use the Destinations panel in the navigation pane. (If it is not yet displayed in your navigation pane, this is how you activate it:

View >> Show / Hide >> Navigation Pane >> Destinations.)

In the Document navigate to the first heading you want to create a destination from. With your mouse, highlight the complete heading and copy the text to the clipboard. You will need this in the next step to name the target.



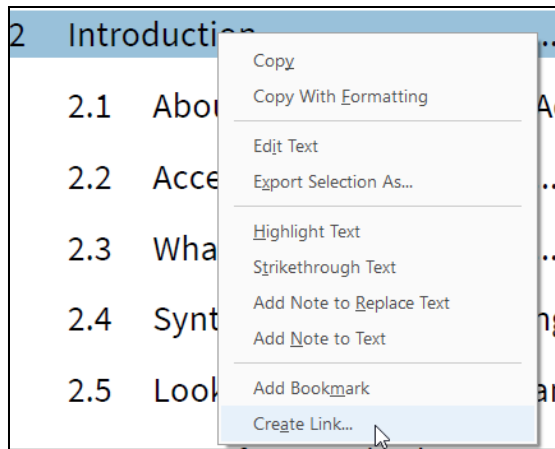
2 Introduction

This document is intended for
(including authors with some)

In the Destinations panel, choose „New Destination” from the options menu, and paste the heading’s name from the clipboard into the name field. In the destinations panel you now find the title and the page of the first link destination.

Repeat this step for all headings that are listed in the table of contents.

In the second step, the destinations are used for creating the internal links for the table of contents.



Select the TOC entry for which you want to create an internal link. Highlight the desired link text (usually the complete line of the entry including the page number) and right-click to open the context menu. At the bottom of the list, select *Create Link*

In the following dialog box, make sure that the settings are correct ("Link Type: Invisible Rectangle" and "Highlight Style: None"). As a link action, choose "Go to a

page view" and click "Next".

Ignore the opening small "Create Go to View" window, and instead open the Destinations navigation pane. By double-clicking on the desired destination, the internal link is automatically saved. The entry in the table of contents is now correctly linked.

Repeat this step for all other entries in the table of contents.

4.3.8. Footnotes and endnotes

Footnotes and endnotes contain in-depth information about a piece of information in the main text. In order not to interrupt the main text, the additional information is visually placed at the bottom of the page or at the end of the document. The visible connection between the running text and related footnotes is generally established by references labelled with consecutive numbers.

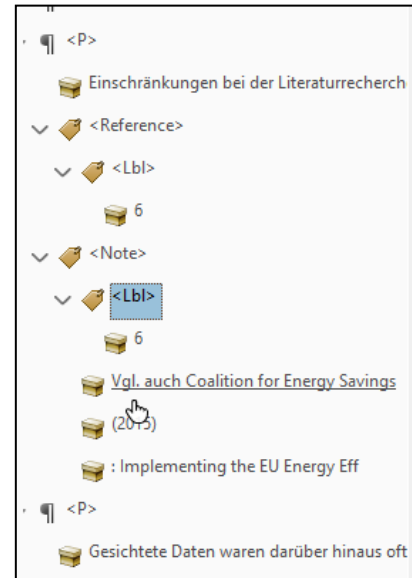
This relationship must be made clear to all users. Therefore, the footnote content must be contained in the linear reading order of the document's tagging structure. For this purpose, the tag type Note, <Note> is available. Each footnote is assigned a separate note tag. The <Note> tag may contain a label for the footnote number, links, etc.

There are several options for implementing footnotes in an accessible fashion¹⁷:

¹⁷ A detailed discussion on conforming ways of implementing footnotes can be Tagged PDF Best Practice Guide by Duff Johnson (PDF Association): <https://www.pdfa.org/wp-content/uploads/2019/06/TaggedPDFBestPracticeGuideSyntax.pdf> (PDF, 460 KB)

- (a) Text and footnote are associated to each other via a reference using a `<Reference>` tag. The associated footnote is placed directly behind the reference tag in the tag tree so that it immediately follows the reference in the linearized reading order. It is common to place both elements within the parent `<P>` tag of the text where the link is located. The associated `<Note>` tag must be sorted manually behind the Reference tag.

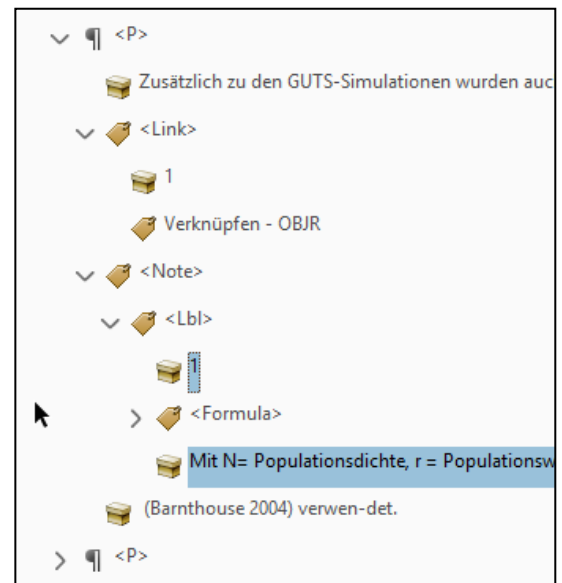
The reference tag ideally contains the number in a subordinate label tag (`<Lbl>`) (see example in the adjacent figure).



The logical reading order is therefore conveyed by the immediate proximity of reference and footnote.

- (b) One frequently used method is to connect footnote to the body text by a hyperlink. If possible, interactive footnotes should be created in the authoring application (e.g. MS Word) to minimize post-processing effort with Adobe Acrobat DC.

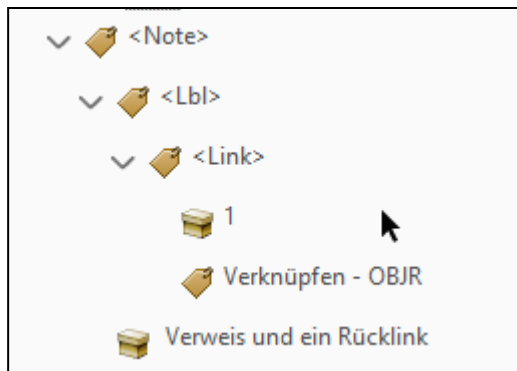
When exporting to a PDF from MS Word, the link to the footnote is automatically generated in the body text as a `<Link>` tag. Remember to add a contents key to the `<Link>` tag afterwards (see 4.3.6).



This approach requires considering the logical reading order, too. By clicking the link, the user can jump directly from the text to the corresponding footnote. However, it must be ensured that they can navigate back to the text from there instead of being stuck at the end of the footnote text.

Putting both tags close to each other as described in (a) helps to maintain an accessible relationship. The `<Note>` tag should be placed as closely as possible to the `<Reference>` tag, or at least at the end of the same page.

- (c) Alternatively, the bilateral relationship between footnote and body text can also be established by back-linking. In this case, the footnote must contain a link that leads the



user exactly to the point where they left the main text body in the first place.

Following this approach, the spatial proximity between the reference link and the footnote in the structure tree is no longer necessary.

This method is particularly suitable for endnotes, which by definition are often

positioned at the end of the document at a great distance from the main text.

Endnotes tagging requires a reliable back-linking mechanism in order to be BITV 2.0 compliant. The goal is to avoid a so-called keyboard trap, i.e. to provide the user with the possibility to get easily back from the endnote information to the very point where they left the main text.

This procedure is relatively time-consuming. Specialized tools such as axes PDFforWord provide fully automated support for this approach.

Please note:

When converting from MS Word, all footnotes of a page are automatically recorded in a <Footnote> tag. This is not standard compliant according to PDF/UA and must be corrected in Acrobat DC: Each note needs to be put into a separate <Note> tag. In the tag structure tree, select the content of the footnote's content and right-click to open the context menu. Click on "New Tag" and choose the type *Note*. Then drag and drop the content into the new <Note> tag.

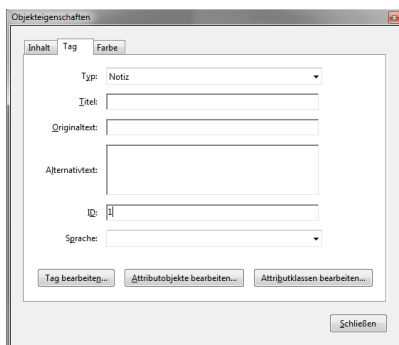
Adding IDs

According to the current PDF/UA-1 standard, every footnote must have a unique ID. Since this is not automatically generated during the conversion from Word with the Adobe PDF Maker, this information must be added in Acrobat DC.

Procedure:

In the Tags pane, click the <Note> tag, then right-click to activate the context menu and

select Properties. In the *Object Properties* dialog, enter the ID of the footnote to the box next to the ID label.



Important: IDs must be unique. To keep it simple, it makes sense to use the number of the footnote as an ID.

Please note:

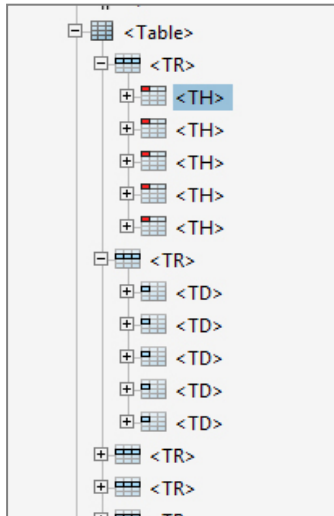
The next version of the PDF/UA standard (PDF/UA-2) is expected to eliminate this requirement. In the current standard, however, it is mandatory to assign IDs to footnotes. When exporting Word documents, the specialised plugin axesPDF for Word automatically sets this ID. Alternatively, the axesPDF Quick Fix software can be used to set IDs for all footnotes of a document at once. (see Chapter 8).

Please note:

In the new PDF 2.0 specification the <Note> tag has been deprecated. This functionality will in future be represented by the new structure element FENote.

4.3.9. Tables

In electronic publishing, tables are frequently used for two purposes: for layout and for organizing and displaying related data. In terms of accessibility, only the latter is admissible: Tables should only be used to represent content whose semantics are specifically defined by representation in a matrix of rows and columns.



Here are some basic instructions for creating accessible tables in PDF documents:

Make sure that your data tables are tagged with the appropriate table structure elements to allow reflow when resized.

Tables consist of table rows <TR>, which in turn contain table data cells <TD> or table headers <TH>.

Several table rows form a <Table>. If other tags such as happen to be at the level of the table rows <TR> or table cells <TH> <TD>, they must be removed from the tag structure or declared as artifacts.

Tables spanning multiple pages are structured as a single table. <TH> cells in repeated header rows or columns (e.g., in tables that span multiple pages) are marked as artifacts.

Depending on the quality of the source document, tables may need to be manually remediated in Acrobat Pro DC. To do this, select Tools > Reading Order. To edit, select the table or a desired cell in the document with your mouse. Now, right-click the *Table Editor* option to make the adjustments, e.g. make the selected cell a header cell or a common data cell.

Alternatively, the table editor can also be opened by right-clicking on a <Table> tag in the structure elements tree.

Table header cells must be related to their associated data cells. This gives the screen reader important information for orientation, where the corresponding data that is associated to this header cell can be found. The so-called scope of a header cell can be specified in the table editor. Possible settings for scope are *Column*, *Row*, *Both* or *None*.

Source of energy	Installed capacity in MW	Feed-in volume	Number of plants	Fees in cent/kWh	Share of feed-in subsidies for eco-e	Average fees in cent/kWh
Small-scale hydropower stations (subsidized)	342	1,4				4.86
Other green electricity plants	2,306	5,2				11.79
Wind power	1,555	2,1				8.34
Biomass, solid	322	2,1				13.55
Biomass, gaseous ²⁶	83	5,2				17.79
Biomass, liquid	5.0					11.83
Photovoltaics	324	2,1				28.67
Landfill gas and sewage treatment plant gas	15.8					5.42
Geothermal energy	0.9	0.306	2	0.002	0.0005%	3.85
Total small-scale hydropower plants and other green electricity plants	2,648	7,140.5	18,482	747.1	12.50%	10.46

In the given example the cell labelled "Installed capacity in MW" is a table header cell. The associated data for this header cell can be found in the column below. The correct input in the *Scope* box is therefore "Column".

Source of energy	Installed capacity in MW	Feed-in volume in GWh	Share of feed-in	Average
Small-scale hydropower stations (subsidized)	342	1,371.3		
Other green electricity plants	2,306	5,769.2		
Wind power	1,555	2,970.0		
Biomass, solid	322	2,013.0		
Biomass, gaseous ²⁶	83	544.3		
Biomass, liquid	5.0	0.19		
Photovoltaics	324	215.2		
Landfill gas and sewage treatment plant gas	15.8	26.0		
Geothermal energy	0.9	0.306	2	0.012
				0.0005%
Total small-scale hydropower plants and other green electricity plants	2,648	7,140.5	18,482	747.1
				12.50%
				3.85

At the same time, the cell labelled “Wind power” is also a header cell; its related data is found in the row to the right of the cell. Therefore, this cell is assigned the scope “Row”.

For table headers spanning more than one cell the number of row or column spanned must be defined in the Table Editor. Alternatively, you can set the RowSpan or ColSpan attribute in the cell's object properties.

In the following example the header cell „Premature deaths“ spans two columns, namely the data of the years 2005 and 2010. Thus, in the attributes section, enter “2” into the box next to the label Column Span.

Country	Premature deaths	
Year	2005	2010
Austria	3,642	3,122
France	17,916	16,892
Germany	50,051	41,582
Italy	34,511	32,447
Slovenia	1,011	876
Switzerland	2,978	2,656

There are two types of data tables: simple and complex data tables.

For simple data tables, data is associated with only one column header and one row header.

Example of a simple table:

No.	Name	Address	Date of Birth
1	Max Müller	Müllerstraße 5, 12345 Mühlberg	01-01-1970
2	Maria Schwarz	Hauptstraße 13, 98765 Neustadt	31-10-1965

For complex data tables, the individual data cells are assigned to multiple levels of header cells at the same time.

Organising complex issues in a single table can impede accessibility for users and assistive technology (AT) software alike, as interpreting the collected data can prove quite difficult in such intricate representations. Ideally, a complex table should therefore be split into several simple tables.

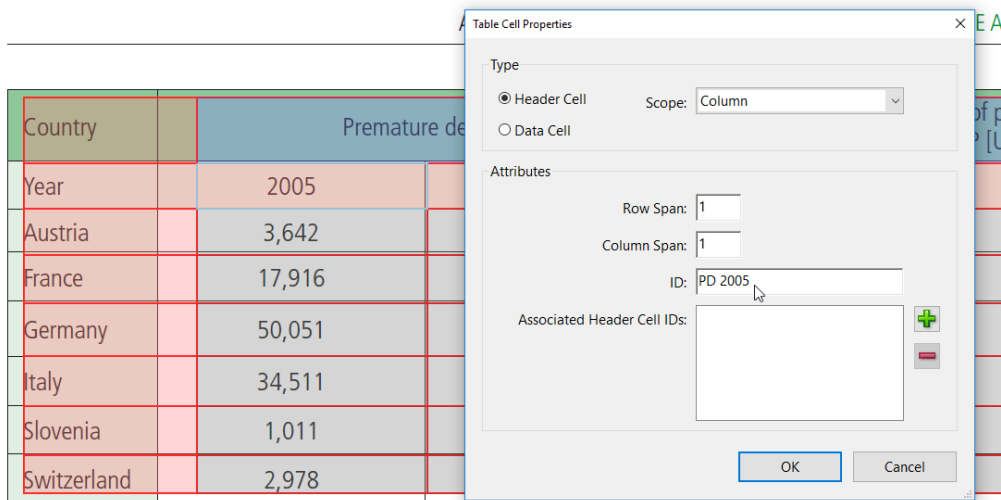
If this is not a feasible approach, Acrobat DC offers options for editing complex tables. Using the table editor, data cells can be uniquely assigned to all header cells to which they refer.

With the help of the following example table how to manually map table cells into complex tables using IDs.

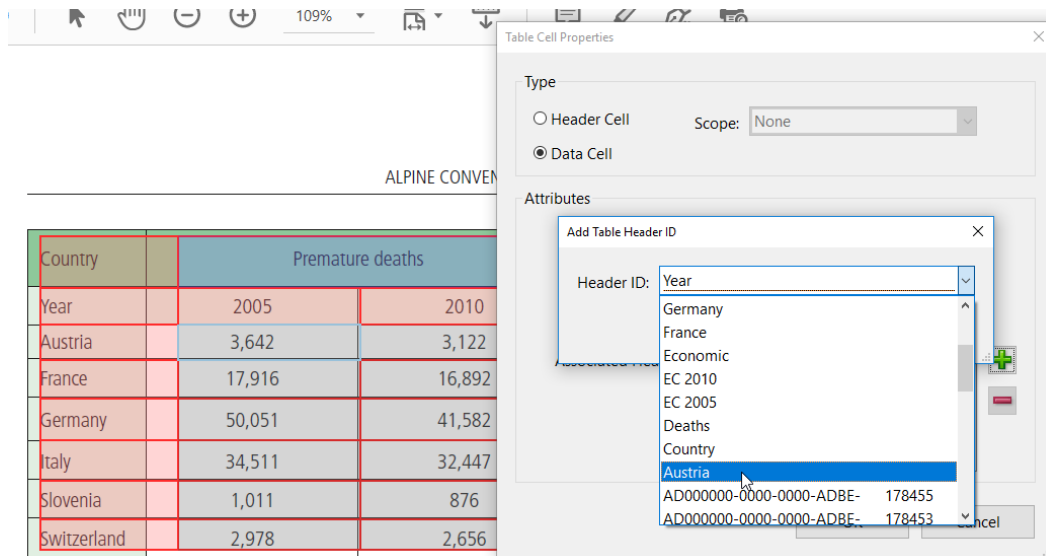
Country	Premature deaths		Economic cost of premature deaths from APMP [US\$ millions]	
	2005	2010	2005	2010
Austria	3,642	3,122	34,511	32,447
France	17,916	16,892	53,031	53,295
Germany	50,051	41,582	154,382	144,715
Italy	34,511	32,447	98,612	97,193
Slovenia	1,011	876	2,489	2,539
Switzerland	2,978	2,656	10,471	10,225

We look at the data cell to the right of the header cell labelled "Austria", which contains the value 3,642.

This information refers to several header cells: "Austria" (which in turn refers to the header cell "Country") "Premature deaths" and "2005". Now we use the table editor to assign all header cells individual IDs.



With the *Reading Order* tool activated, highlight a header cell and open the *Table Editor*. In the properties of the table cell, enter a unique ID into the box labelled ID. Choose a clear name so that you can better distinguish the different IDs from each other later on (here PD 2005 for “premature deaths” in 2005). The descriptions are for your own orientation only and will not be used elsewhere. Repeat this procedure for all other headings that you have identified.



Having assigned IDs for all header cells, you highlight a data cell in the table editor and right-click to open the *Table Cell Properties* dialog.

Click the green plus button to open a list of all header cell IDs.

There, you now select all header cells IDs you want to logically associate with the data cell.

They appear in the box "Related heading cell IDs".

Please note:

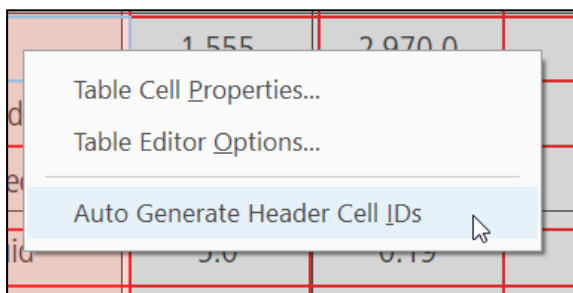
The order of the connected header cells in the field should reflect a logical reading order. This

structure would be interpreted by a screen reader as follows: “**In Austria, the number of premature deaths in 2005 was 3,642.**”

The reading order should read from bottom to top in the associated header cell IDs pane.

Country	Premature deaths	
Year	2005	2010
Austria	3,642	3,122
France	17,916	16,892
Germany	50,051	41,582
Italy	34,511	32,447
Slovenia	1,011	876
Switzerland	2,978	2,656

Table 2.5.3-1 National levels of premature deaths from ambient particulate



Depending on the size of the complex table, the allocation and assignment of IDs can be very time-consuming. Acrobat Pro DC offers a feature that at least automates the creation of table IDs. With the table editor activated, right-click on the table. In the context menu that opens, select „Auto

Generate Header Cell IDs“. Acrobat automatically generates descriptive header cell IDs for all <TH> tags in a given table. These can then be selected and assigned manually to the corresponding data cells as already described in the preceding paragraphs.

4.4. Setting the PDF/UA identifier

For screen readers and other assistive devices to identify a PDF document as conforming to the PDF/UA standard, a so-called PDF/UA identifier must be inserted in the metadata of the document. This is a small xmp snippet containing the appropriate information.

You can create the PDF/UA identifier in Acrobat DC.

Procedure:

Open Preflight by clicking *Tools > Print Production*. In the dropdown of the Profiles tab, select *Show All* and then the Single Fixup wrench icon.

Expand “Document info and Metadata” and select “Set PDF/UA-1 entry”. Click the “Fix” button.

When prompted, save to a new file name.

4.5. Selection of popular Adobe Acrobat DC functions / commands

- Add tags to document
Accessibility Tool > Autotag Document
- Tag object properties
Navigation pane > Tags > Right-click menu > Properties
- Set default language
File > Properties > Advanced > Reading Options > Language
OR
CTRL + d > Advanced > Reading Options > Language
- Reflow (Adobe)
View > Zoom > Reflow OR CTRL + 4
- Tab order
Page Thumbnails > Menu > Page Properties > Use Document structure
OR *STRG + d*
- Bookmarks
Navigation pane > Bookmarks > New Bookmark OR STRG + b
- Alternate Texts
Tools > Accessibility > Set Alternate Text
- Tables
Tools > Accessibility > Reading Order > Table Editor
OR
Navigation pane > Tags > Right-click on Table tag > Table Editor
- Automated check
Tools > Accessibility > Full Check

Useful shortcuts:

- Collapse entire tag tree: /
- Expand entire tag tree: *
- Expand highlighted node with children: +
- Collapse highlighted node with children: -

5 Creating accessible PDF documents with Acrobat InDesign

When creating PDF documents from an Acrobat InDesign layout, it is recommended to execute as many steps and preparations within the authoring tool. This reduces the time and effort required for PDF remediation considerably. Plus, this allows structural information to reside in the InDesign file, making updates faster and easier when you need to generate a revised version.

This requires a somewhat professional command of InDesign and its built-in features for typesetting and layout as well as a clean and diligent way of working. For more details, please consult Adobe's support pages and white papers on InDesign provided online.¹⁸

5.1. Styles

For all elements in InDesign, use consistent paragraph styles that are mapped to the corresponding PDF Export tags. In the Paragraph *Style Options* dialog, set each style's Export Tagging instructions according to its role in the PDF document (heading levels 1 through 6 <H1> to <H6>, normal text paragraphs as <P>, or decorative images or elements as Artifact. Tables and bulleted and numbered lists are recognized automatically in the export process and tagged appropriately, provided they have been created using the built-in features.

Important: The language must also set properly (using character styles).

5.2. Logical content order

The content order should already be defined in the InDesign source document. Use the Articles panel to drag and drop frames and objects and arrange them in the desired reading order or use the option "Use for reading order in tagged PDF". Also, images need to be anchored to the appropriate point within the text flow.

5.3. Alternative texts

Images conveying relevant content require alternative text. Decorative images, in turn, should be marked as Background / artifact.

5.4. Links

In order to provide accessible navigation mechanisms to the document (e.g. active links and cross-references, interactive bookmarks and table of contents) these must be created by using

¹⁸ Adobe InDesign White Paper: <https://www.adobe.com/content/dam/acom/en/products/indesign/pdfs/creating-accessible-pdf-documentw-with-adobe-indesign-cs6-v3.pdf>

the built-in features, such as the Hyperlinks panel, the Bookmarks panel, the cross-reference feature.

5.5. File metadata

To meet minimum accessibility requirements of PDF documents, add a meaningful document title (*File > File Info*).

5.6. Export

After the document has been properly prepared the InDesign file can be exported (*File > Export*) to PDF using the Adobe PDF (Interactive) profile. You also want to make sure you select the *Create Tagged PDF* option in the Export dialog box.

For more detailed instructions on creating accessible documents from InDesign please refer to the support articles on the Adobe website.¹⁹

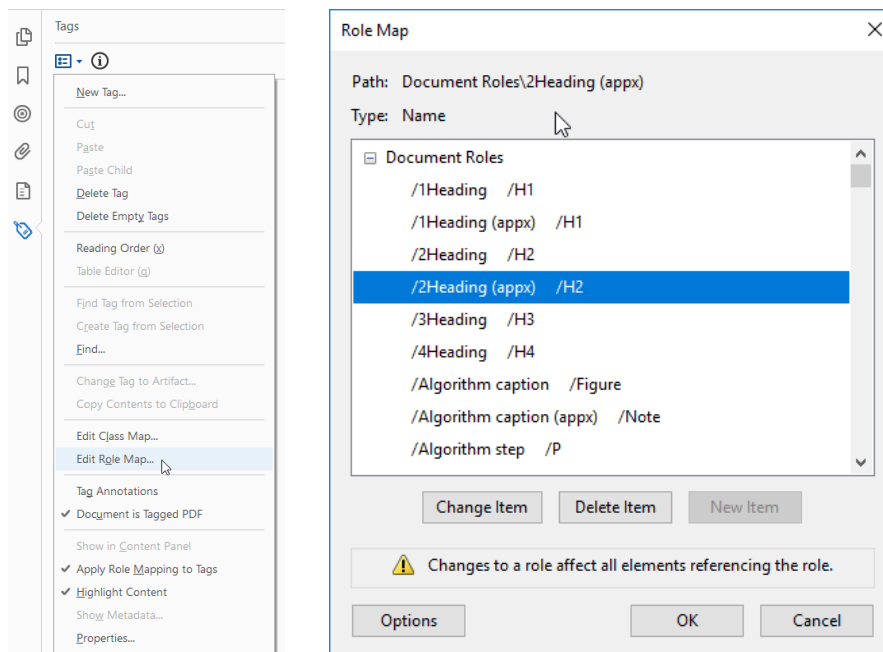
¹⁹ Mapping styles and tags: <http://www.adobe.com/accessibility/products/indesign/mapping.html>

6 Overview of PDF Standard Tags²⁰

PDF offers several standard tags for content mark-up. These standard tags provide helper applications with a basic set of semantic and structural elements that are used to interpret the document structure and to properly format the contents of the document in output devices.

The PDF tags architecture can be extended on demand. Each PDF document can therefore contain any tag set used by a source application (for example, InDesign styles or XML tags from an XML Schema). If that is the case, however, it must be ensured that all customized tags (such as tag names generated from individually named paragraph styles of a source application) are properly mapped to the semantically corresponding standard PDF tag. Role mapping is central to the ability of assistive applications to interpret user-defined tags correctly.

When tags are added to PDF documents according to one of the methods described in this manual, the role mapping for the document will most probably be correct. You can view and edit the role map of a PDF document by clicking Options in the *Tags* pane and choosing *Edit Role Mapping*.



The default tag types are also provided in the *New Tag* dialog in the *Tags* pane. A limited selection is also available as dedicated buttons in the *Reading Order* tool. It is strongly

²⁰ Standard PDF tags listed in Adobe's Acrobat User Guide: https://helpx.adobe.com/acrobat/using/editing-document-structure-content-tags.html#standard_pdf_tags

recommended to use the PDF standard tag types as listed in the specification and in the PDF/UA standard. In addition, standard tags ensure better results if the tagged content needs to be converted to another format, e.g. HTML, Microsoft Word document, Rich Text Format or other accessible text formats that can be interpreted by assistive technology.

6.1. Grouping elements

Grouping elements make up the logical structure of the document and are designed for organizing block-level structure elements hierarchically.

<code><Document></code>	A complete document. This is the top-level element of any structure tree containing multiple parts or multiple articles.
<code><Part></code>	A large-scale division of a document. This type of element is appropriate for grouping articles or sections
<code><Div></code>	Division. A generic block-level element or group of elements.
<code><Art></code>	Article. A relatively self-contained body of text constituting a single narrative or exposition. Articles should be disjoint; that is, they should not contain other articles as constituent elements. <i>- deprecated in PDF 2.0 -</i>
<code><Sect></code>	Section. A container for grouping related content elements. Like „Division“ (DIV Class="Sect") in HTML; usually to be used as sub element of <code><Part></code> . <i>- deprecated in PDF 2.0 -</i>
<code><BlockQuote></code>	Block quotation. A portion of text consisting of one or more paragraphs attributed to someone other than the author of the surrounding text. <i>- deprecated in PDF 2.0 -</i>
<code><Caption></code>	A brief portion of text describing a table or figure.

<Index>	<p>A sequence of entries containing identifying text accompanied by reference elements that point out occurrences of the specified text in the main body of a document.</p> <p><i>- deprecated in PDF 2.0 -</i></p>
<TOC>	<p>Table of contents. A list made up of table of contents item entries and/or other nested table of contents entries.</p> <p><i>- deprecated in PDF 2.0 -</i></p>
<TOCI>	<p>Table of contents item. An individual member of a table of contents.</p> <p><i>- deprecated in PDF 2.0 -</i></p>

6.2. Block-level structure elements

Block-level structure elements consist of text a paragraph-like presentation. They can be further divided as follows:

6.2.1. Paragraph elements

<P>	<p>Paragraph. A low-level division of text.</p>
<H>	<p>Heading. A label for a subdivision of a document's content. It should be the first child of the division that it heads.</p>
<H1> - <H6>	<p>Heading levels 1-6. For use in conforming writers that cannot hierarchically nest their sections and thus cannot determine the level of a heading from its level of nesting. According to PDF/UA-1, 12 heading levels are available for use.</p>

6.2.2. List elements

List element tags are specifically designed for organising the content of ordered and unordered lists.

<L>	<p>List. A sequence of items of like meaning and importance. Its immediate children should be followed by one or more list items (structure type LI).</p> <p>If the list is an ordered list (with the label sub-elements containing numbers), it requires the ListNumbering attribute.</p>
	<p>Listeneintrag (engl. List Item). Einzelnes Element einer Liste; ihm kann ein Beschriftungselement (optional) und muss ein Listenkörperelement (obligatorisch) untergeordnet sein.</p> <p>List item. An individual member of a list. Its children may be one or more labels (optional) or list bodies,(obligatory).</p>
<Lb1>	<p>Label. A bullet point, name or number that distinguishes a given item from others in the same list or other group of like items.</p>
<LBody>	<p>List body. The descriptive content of a list item. In a dictionary list, for example, it contains the definition of the term. It may either contain the content directly or have other block-level structure elements, perhaps including nested lists, as children.</p>

6.2.3. Table elements

Table element tags are specifically designed for organizing the content of tables.

<Table>	<p>Table. A two-dimensional layout of rectangular data cells, possibly having a complex substructure. It contains one or more table rows (structure type TR) as children and may have a caption as its first or last child.</p>
<TR>	<p>Table row. A row of headings or data in a table. It may contain table header cells and table data cells.</p>

<TH>	Table header cell. A table cell containing header text describing one or more rows or columns of the table.
<TD>	Table data cell. A table cell containing data that is part of the table's content.

6.3. Inline-level structure elements

Inline-level structure elements contain a portion of text or other content having specific styling characteristics or playing a specific role in the document. Inline-level structure elements can be located within paragraphs or other block-level elements and may in turn contain block-level elements.

	A generic inline portion of text having no inherent characteristics. It can be used, for example, to delimit a range of text with a given set of styling attributes.
<Figure>	An item of graphical content. Its placement may be specified with the Placement layout attribute. For purposes of reflow it shall be moved (and perhaps resized) as a unit, without examining its internal contents. To be useful for reflow, it shall have a BBox attribute.
<Form>	A widget annotation representing an interactive form field
<Formula>	A mathematical formula. This structure type is useful only for identifying an entire content element as a formula. No standard structure types are defined for identifying individual components within the formula. From a formatting standpoint, the formula shall be treated similarly to a figure.
<Link>	An association between a portion of the content and a corresponding link annotation or annotations. The link destination may be located in the same document, within another PDF document or on a website.

<Note>	<p>An item of explanatory text, such as a footnote or an endnote, that is referred to from within the body of the document.</p> <p><i>- deprecated in PDF 2.0 -; replaced by new tag FENote</i></p>
<Reference>	<p>A citation to content elsewhere in the document.</p> <p><i>- deprecated in PDF 2.0 -</i></p>
<BibEntry>	<p>Bibliography entry. A reference identifying the external source of some cited content.</p> <p><i>- deprecated in PDF 2.0 -</i></p>
<Quote>	<p>Quotation. An inline portion of text attributed to someone other than the author of the surrounding text. This differs from the block-level element BlockQuote, which consists of one or more complete paragraphs.</p> <p><i>- deprecated in PDF 2.0 -</i></p>
<Code>	<p>A fragment of computer program text.</p> <p><i>- deprecated in PDF 2.0 -</i></p>

7 Testing PDF documents for accessibility

With the introduction of the PDF/UA standard and the Matterhorn protocol, it is possible for the first time to test PDF accessibility based on a defined technical standard. The official PDF/UA Conformance Testing Model, also known as Matterhorn Protocol 1.0.2²¹ consists of 31 checkpoints with 136 failure conditions, 87 of which can be tested by software while 47 conditions require manual inspection by a human expert.

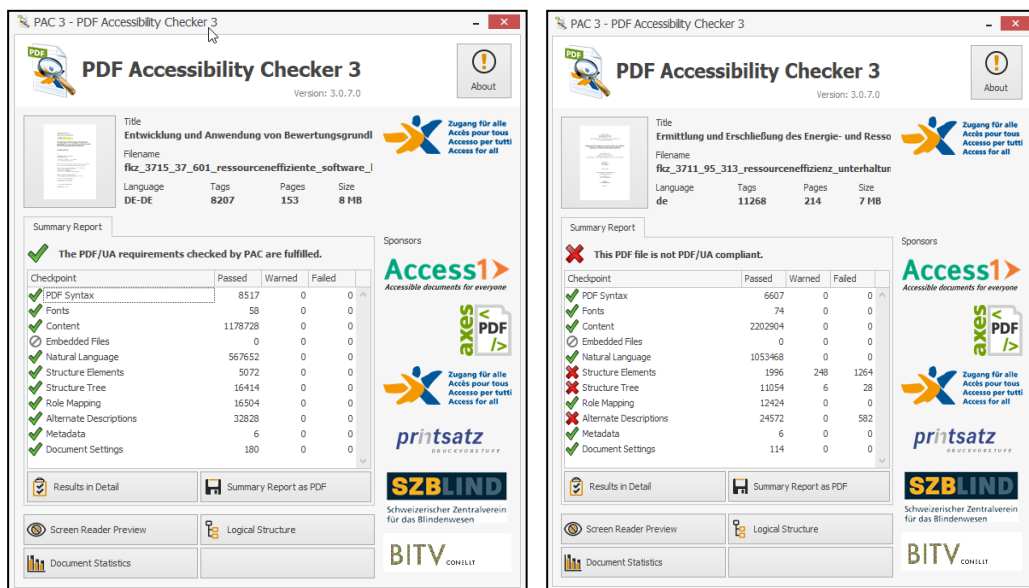
The central tool for the technical examination (software testing) is the free PAC 3, which checks the implementation of the 87 technical PDF/UA criteria.

Since most errors in the PDF can only be corrected in Adobe Acrobat DC, the formal full check in Adobe Acrobat DC can be useful, too, as a first step to get rid of accessibility problems.

7.1. Automated testing with PAC 3 (PDF Accessibility Checker) ²²

PAC 3 is a mighty tool for automatically testing PDF files according to the Matterhorn Protocol (PDF/UA criteria).

It also features a screen-reader emulator and can be downloaded and used free of charge.²³



²¹ Matterhorn Protocol (Version 1.02) : https://www.pdfa.org/wp-content/uploads/2014/06/MatterhornProtocol_1-02.pdf

²² Step-by-step instructions for using PAC 3 (available in German only) : <https://www.access-for-all.ch/ch/pdf-werkstatt/pdf-accessibility-checker-pac.html>

²³ Free download: <https://www.access-for-all.ch/en/pdf-lab/pdf-accessibility-checker-pac.html>

The technical check encompasses the following aspects:

- PDF Syntax
- Fonts
- Content
- Embedded Files
- Natural Language
- Structure Elements
- Structure Tree
- Role Mapping
- Alternate Descriptions
- Metadata
- Document Settings

If a PDF passes the technical check, PAC 3 issues the following message: *"The PDF/UA requirements checked by PAC are fulfilled"*.

If errors have been detected, the following message is shown: *"This PDF file is not PDF/UA compliant"*.

By clicking the "Results in Detail" button, will receive a detailed error report. The different error categories can be expanded for going through the list of error items page by page. Clicking on an item takes the user directly to the corresponding location in the document. The error report can also be exported as an accessible PDF document.

Plus PAC offers several other useful views: the document statistics provide an interesting count of the tags used; the screen reader preview is particularly suitable for the visual check of semantics (see Chapter 7.3).

The PAC error report is quite detailed and picks up on the technical language used in the Matterhorn protocol as well as in the DIN ISO standard PDF/UA 14289-1. In some cases, understanding and correcting the errors may require advanced skills and experience.

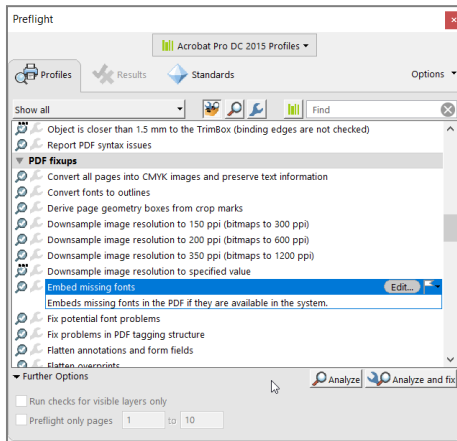
In case of doubt, the wiki by the BITinklusive project offers reliable support. Part of a new testing procedure (see Chapter 7.3), it provides a list of all test steps, each of which related to the corresponding PAC error and the associated checkpoint from the Matterhorn protocol. Detailed bug-fixing instructions are provided for each error type.

All corrections can be performed in Acrobat DC. In addition, specialised software such as axesPDF QuickFix can help solve rather complex PDF/UA conformity issues, making PDF

remediation for accessibility purposes much easier (see Chapter 8). For creating, editing and moving tags in the tag tree, Adobe Acrobat is still the application of choice. Therefore, the PDF remediation procedure requires a combination of specialist software such as axesPDF QuickFix and Adobe Acrobat DC.

7.1.1. Fix: Font not embedded

This error occurs some of the fonts used are not properly embedded in the PDF document.



Open the document in Acrobat DC und activate the *Preflight* tool (*Tool Center > Print Production > Preflight*). In Preflight go to the *Profile* tab, choose *PDF Fixups > Embed missing fonts* and click *Analyze and fix*.

This issue can also be solved earlier in the creation process. The PDF Maker add-in for MS Word, too, provides the possibility to allow all fonts to be embedded prior to converting the source document to PDF.

7.1.2. Fix: Path object not tagged

The error “Path object not tagged” needs to be fixed in Acrobat DC. All path objects need to be changed to artifacts (see 4.2.3).

7.1.3. Fix: Structural errors

PAC 3 checks whether the tag structure is technically consistent and standard-compliant; e.g. no <P> tag nested within another <P>, occurring in <L> only, correct descending sequence of headings (<H1> to <H6> without skipping levels in between), tables etc.

Such structural problems can only be fixed in the Acrobat DC *Tags* panel (see 4.2.2).

7.1.4. Fix: missing alternate description

Alternative text needs to be provided for all images that do not solely serve decorative purposes (see 3.5.6).

7.2. Automated testing with Adobe Acrobat DC

Adobe Acrobat DC provides a limited automatic accessibility check that helps to search the document for potential structural barriers. However, it does not

In the Accessibility tool, select *Full Check*. In the following dialog window, keep the default setting unchanged. By clicking on OK the document will be checked. Further information on the full accessibility check can be found on the Adobe website.²⁴

All passed checkpoints are marked with a green tick. Failed checkpoints are indicated by red icons. To fix the faulty elements, expand the list using the + icon and right-click on the desired element.

In the opening dialog window, either click "Fix" to mend the error immediately (for example, with alternative texts or tab order), or select the item in the Tags or in the Content pane to perform the necessary corrections.

Please note:

Even if Adobe's formal check reveals that no problems have been found in the document, additional specific aspects must be checked manually (for example, logical reading order, navigation links and colour contrast). The following Chapter 7.3 "Visual / Semantic Testing" describes these in more detail.

7.3. Visual / semantic check

A PDF that passes the PAC checker does not necessarily prove to be compliant to PDF/UA. Therefore, the technical / formal check by PAC 3 must always be followed by a thorough visual inspection. It is imperative that the PDF's semantic quality be reviewed and assured by a human (supported by suitable software tools).

According to the Matterhorn Protocol²⁵, this semantic check should cover the following criteria:

- Is Artifact tagged as artifact and real content as real content? Does the tag structure contain all relevant items? (Matterhorn Protocol 01-001 / 01-002)
- Are the assigned tags semantically appropriate? (Matterhorn Protocol 01-006, 09-002)
- Are all non-standard tags mapped in a semantically appropriate way? (Matterhorn Protocol 02-002, 09-003)
- Is information is conveyed by tags or merely by contrast, colour, format or layout? (Matterhorn Protocol 04-001)
- Are graphics objects other than text objects and artifacts not tagged coherently with a Figure tag? (Matterhorn Protocol 13-001, 13-005)

²⁴ <https://helpx.adobe.com/acrobat/using/create-verify-pdf-accessibility.html>

²⁵ <https://www.pdfa.org/resource/the-matterhorn-protocol-1-02/>

- Are captions tagged with a Caption tag? (Matterhorn Protocol 13-003)

In cooperation with the PDF Association, the German BITinklusive project has developed a comprehensive PDF/UA test procedure for PDF documents. It encompasses all the checkpoints from Matterhorn Protocol and is a useful resource to test PDF/UA compliance beyond PAC 3. The test procedure was published as a WIKI and is available in German only.

7.3.1. Tag tree structure

You must manually check that the order of elements in the tag tree matches the sequence of content on the page. Also inspect all headings, lists, paragraphs, labels, images and tables in terms of standard-compliant tags (see Chapter 4.3) and check whether the assigned tags and role assignments are semantically appropriate as well.

Procedure:

- a) In the Tags window, select *Highlight Content*. Then examine the entire tag tree from top to bottom opening every individual tag and checking whether the contents have been captured correctly.
- b) Alternatively, you can check the tag structure with the screen reader preview of the PAC 3 or the plug-in callas pdfGoHTML in the structure tags view.

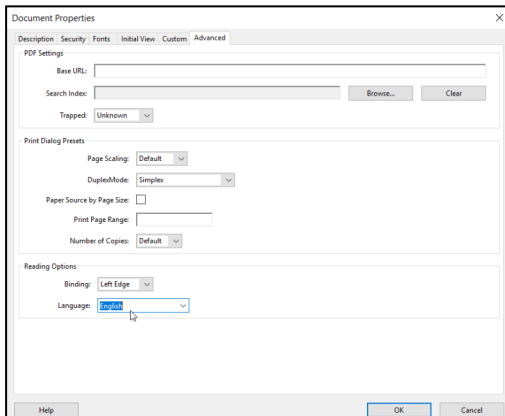
7.3.2. Language

The document's default human language as well as language switches within the PDF need to be properly identified. This allows assistive technology and user agents to display characters and scripts appropriately. Screen readers rely on this information to load the correct pronunciation rules.

Please note:

Even if the formal check does not report an error, this checkpoint requires human judgment. PAC 3 and Acrobat Pro DC can only check whether a natural default language has been set. If the language is appropriate, cannot be determined by software, though.

To set the default language, select File > Properties (CTRL + d) in the menu. In the Advanced



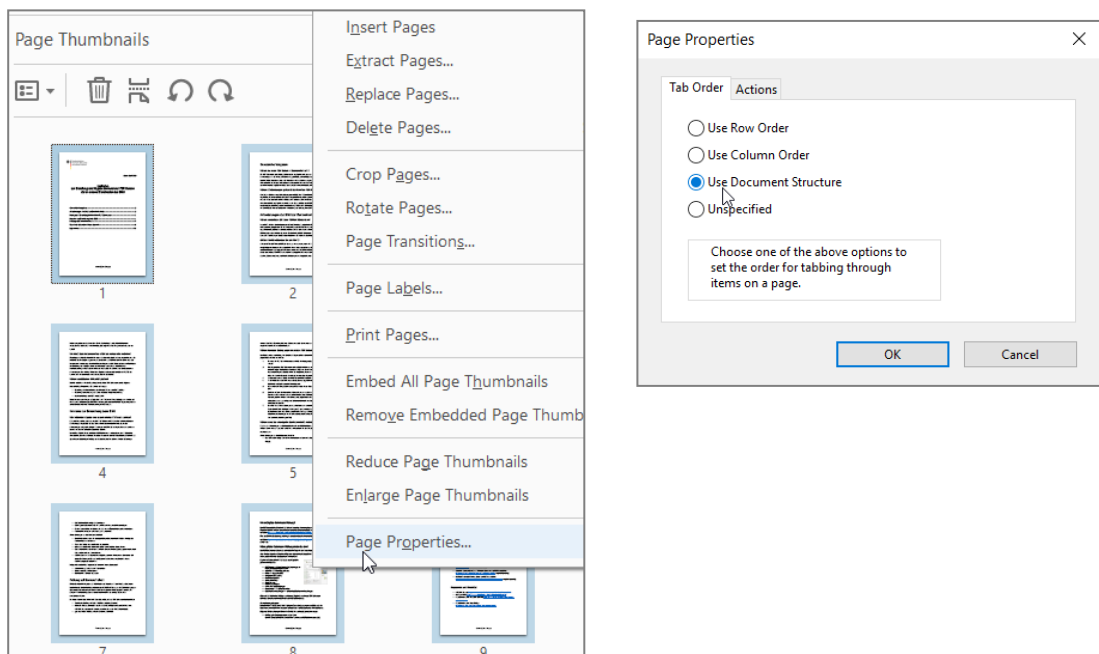
tab, select the language using the drop-down menu.

For marking a language switch in the document, that is, to identify other-language terms, phrases, paragraphs, the language is set directly in the tag properties. They can be edited using the *Tags* panel.

Select the appropriate tag with the right mouse button and click Properties. In the Tag tab, the respective language can be selected by drop-down menu for this tag. In a hierarchical tag structure, a language setting at the first hierarchical level commits the language for all nested tags. Thus, related portions of text can be assigned a language in one single step.

7.3.3. Tab order

The tab order must be defined so that individual elements can be addressed logically using the tab keys on the keyboard. Adobe Acrobat DC usually assigns the correct tab order automatically. However, if PAC 3 or Acrobat's Full Check returns an error message, the tab order can be corrected as follows:



To make the default settings, select the *Page Thumbnails* navigation pane. Select all pages by pressing CTRL + a and right-click *Page Properties*. In the following dialog window, select the option *Use Document Structure* in the *Tab Order* tab.

7.3.4. Alternate text

To examine an alternative description, move the mouse over the corresponding graphic; the alternative text should then appear. Also, alternative texts can be displayed and edited using the tool at *Accessibility > Set alternative text*.

7.3.5. Bookmarks

For all users of PDF, bookmarks represent an important guide for finding one's way about the document. Users of assistive technology rely on bookmarks to navigate within documents, to skip unnecessary content and to quickly find the desired information. From a well-prepared structured source document, bookmarks are usually generated automatically. Depending on the source format and the way the PDF was generated, however, bookmarks might be missing.

All documents longer than two pages that are logically and visually structured by headings require a manual check for bookmarks: Does the PDF contain bookmarks and, if so, do they provide a complete overview of the contents of the PDF to enable selective targeting of sections?

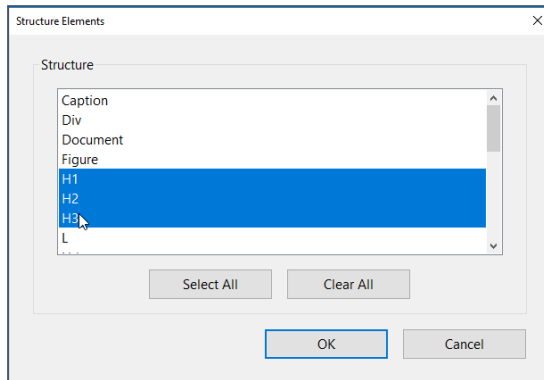
Automated software testing is only able to detect whether the bookmark field contains an entry or not. However, the quality of the bookmarks, i.e. their meaningful description, completeness and hierarchy, must be verified by a human expert.

Existing bookmarks can be displayed, renamed and sorted in the *Bookmarks* panel. To add new bookmarks to the document, left-click on the corresponding portion of text (usually a heading) and then choose *Edit PDF > Add Bookmark* (Shortcut: CTRL + b) from the Tools menu.

The bookmarks should be properly nested to reflect the hierarchical structure of the tags. To nest a list of bookmarks, select the bookmark you want to nest and drag the icon directly underneath the parent bookmark icon.

TIP:

Alternatively, bookmarks can be derived automatically from the existing tag structure. With a well-formed tag structure, this is a clean and effective way of creating correct bookmarks.



Open the drop-down menu on top of the Bookmarks panel and select *New Bookmarks from Structure* from the options menu. The following dialog shows all the tag types contained in the document. Hold down the CTRL key and select the structure elements you want specified as tagged bookmarks. Usually you may want to use heading tags for your tagged bookmarks.

After clicking OK, the complete correct hierarchical bookmark structure appears under a new, untitled bookmark.

7.3.6. Colour contrasts

This checkpoint requires human inspection to determine if the colour contrast between text and background is sufficient or if the document contains relevant elements that some users might not be able to perceive.

The combinations of foreground and background colours should be bright enough to be legible e.g. for users with deficient colour vision or when viewed with a black and white screen. It is highly recommended to use the free Colour Contrast Analyser tool. (Download details can be found in the link list in 9.2.)

While contrast is not addressed in PDF/UA, it is one of the basic requirements of WCAG and BITV 2.0 and therefore obligatory for PDF as well.

7.3.7. Hyperlinks

For URLs to be properly interpreted for voice output, they must be implemented as active links with Object reference and correct labelling. (The easiest way to create accessible links is to use the Acrobat function *Create link*.) Make sure that navigation links do not repeat and that users can skip recurring links.

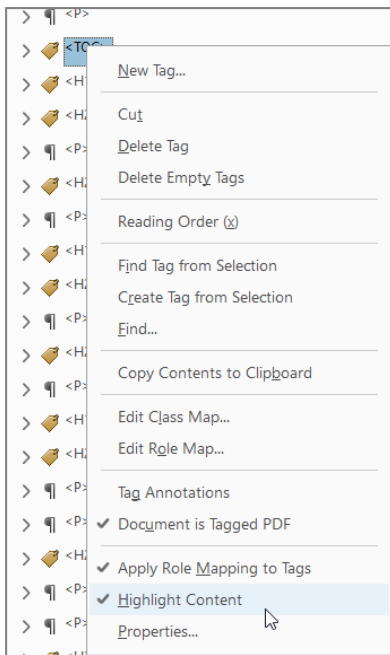
You should review manually the navigation links (e.g. in the table of contents and references) and make sure your document does not contain too many identical links. Also, give users an option to skip duplicate items; e.g. if the same links appear several times per document page, include a link to skip the navigation.

7.3.8. Logical reading order

Making sure that the objects in a document are displayed in a logical, linearized reading order is an important aspect of accessibility testing. Assistive technology render PDF pages based

on their inherent structure. Therefore, the content's reading order as presented visibly on the page must be linearized appropriately for understandable screen reader output.

The logical order of content elements therefore must be checked by a human and corrected if necessary. This check is performed in Acrobat's *Tags* pane. The sequence of the tags in the tag tree specifies the linearized order in which the content is read and interpreted by the screen reader.



To check the tag order, select *> Highlight Content* from the drop-down menu at the top of the Tags window.

Alternatively, right-click on a tag to display the drop-down menu.

Whenever a specific tag is selected, the corresponding position in the document is marked with a blue frame, which allows you to easily compare the tag structure with the structure of the content with the help of mouse or cursor keys (arrow keys). Expand all tags with + to inspect the order of all items in the document.

To correct the reading order, drag the misplaced document to the correct spot (drag and drop), or alternatively use the copy-and-paste commands.

Meanwhile, a range of useful applications have emerged on the market, such as the screen reader view in the PDF Accessibility Checker (PAC) 3 or the tree view in the plug-in callas pdfGoHTML (see also Chapter 8.5).

7.3.9. Reflow

Some people need larger text in order to properly perceive and identify characters. Although increasing text size is most common, some people with tunnel vision and good visual acuity may prefer smaller letters so they can see more words at a time. Creators of accessible PDFs want to make sure that users can resize the text size according to their needs and still be able to easily view and navigate through the content.

"Reflow" means that the reader automatically adapts the layout of the text even when the font is enlarged. Line breaks adjust automatically, while decorative elements are not displayed. Although the document layout may not appear to be very appealing in the reflow mode, linear content does provide a great relief for visually impaired or physically challenged users as it allows them to read the PDF content without having to constantly scroll from side to side.

In line with the BITV test accessible content should support the resizing of text to 150 %. This requires you to manually check that all elements appear in the same logical order as the

original document, that text reflows properly on all pages, that all content is visible without overlapping, and that no important information is missing.

Please note:

Acrobat DC comes with its own reflow mode. However, this view does NOT rely on the tag tree and does not reliably check reading order and presentation. Thus, it should NOT be used for checking text reflow according to the PDF/UA standard.

For examining tag structure and logical order of a document you may want to use a genuine screen reader. A recommended product is the free NVDA Reader, which the Swiss Central Association for the Blind (SZB) has published in cooperation with the Foundation Access for All (see Chapter 8.7). As NVDA is quite a complex piece of software, it is advised to familiarize yourself with the handling of the most important features.

Another highly reliable and effective way for checking text reflow is the PAC 3's excellent "screen reader preview" feature, which clearly displays the document structure according to the tag tree, allowing for easy visual inspection.

Kurzbeschreibung

Mit dem Vorhaben „Analyse, Bewertung und Politikempfehlungen zur Anpassung nationaler rechtlicher, planerischer und informatischer Politikinstrumente zur Anpassung an den Klimawandel“ wurden fachwissenschaftliche Vorbereitungsarbeiten, für die Weiterentwicklung der DAS und die Vorbereitung der nationalen Umsetzung der europäischen Anpassungsstrategie durchgeführt. Der Schwerpunkt des Vorhabens richtete sich auf die Analyse bestehender Instrumente und deren Weiterentwicklung, insbesondere:

- der Analyse des von der EU Kommission veröffentlichten Strategiepakets und bereits erfolgter Rahmenseetzungen und Initiativen in Bezug auf die DAS.
- der Analyse in wie weit sich die Notwendigkeit von Anpassung an den Klimawandel in Folge des DAS-Prozesses in der rechtlichen Rahmenseetzung des Bundes niedergeschlagen hat.
- rechtliche Überlegungen inwieweit die Anpassung an den Klimawandel ein wichtiger Bestandteil der kommunalen Daseinsvorsorge ist.
- Der Prüfung wie eine Berücksichtigung des Klimawandels im Raumordnungs-, Bauplanungs- und Fachplanungsrecht erfolgen kann.
- Juristische Begleitung und Vorschläge zur rechtlichen Weiterentwicklung des UVPG sowie ggf. weiterer für die Umweltprüfungen relevanter Rechtsnormen oder Verwaltungsvorschriften im Hinblick auf die Einbeziehung des Faktors Klimawandel in die Umweltprüfungen.

Abstract

The project "Analysis, Evaluation and Policy Recommendations for the Adaptation of National Legislative, Planning and Informational Instruments for Adaptation to Climate Change" carried out three main tasks: scientific preparatory work, the further development of the German Adaptation Strategy (DAS) and the preparation of the national implementation of the European Adaptation Strategy. The focus of the project was to analyse existing instruments and their further development, in particular:

- the analysis of the strategy package published by the EU Commission and existing frameworks and initiatives related to DAS;
- the analysis of the extent to which the need for adaptation to climate change has been reflected in the federal legal framework as a result of the DAS process;
- legal considerations as to how far adaptation to climate change is integrated into an important component of municipal public services;

Also recommended is callas pdfGoHTML, a free Adobe Acrobat plugin that converts PDFs to HTML, allowing you to read them in different views. These tools should definitely be preferred to the very error prone and hardly usable Acrobat reflow mode.

8 Suitable software and tools

In recent years several new software solutions have been developed to make the creation and remediation of accessible PDF documents easier and more effective. A major driving force of this development has been the publication of the PDF/UA standard. This chapter provides an overview of free and licensed tools available on the market.

8.1. axesPDF for Word

axesPDF for Word²⁶ creates accessible, PDF/UA-conforming PDF documents from Word documents prepared with proper styles and templates. The more accessibility settings are already predefined in the Word template, the less remediation in Adobe Acrobat is needed.

Additional features:

- decorative elements can be marked as artifacts
- all axesPDF settings can be saved in the Word template

8.2. axesPDF QuickFix

axesPDF QuickFix²⁷ is a licensed tool to check and remediate accessible PDF documents to make them compliant to PDF/UA DIN/ISO 14289, WCAG 2.0 and Section 508. This software product provides several useful tools for easily fixing standard accessibility issues.

Additional features include:

- PDF/UA check (using the PAC engine)
- Checking and fixing issues in one step
- Targeted remediation of tag and attribute properties
- 1-click-fix buttons (e.g. Link annotations, Note IDs)
- Mapping non-identified glyphs to Unicode and fixing other compliance issues on PDF/UA that cannot be resolved in MS Word and Adobe Acrobat.
- Marking all non-tagged elements as artifacts (decorative elements) at one go, etc.

²⁶ <https://www.axes4.com/axespdf-for-word-overview.html>

²⁷ <https://www.axes4.com/axespdf-quickfix-overview.html>

8.3. CommonLook PDF GlobalAccess

PDF Global Access²⁸ is a Microsoft Windows tool widely used by US government agencies to create, remediate and review accessible PDFs according to several standards such as PDF/UA, WCAG 2.1, and Section 508 of the U.S. Rehabilitation Act. Coming as an Acrobat plug-in, the software provides a convenient user interface and various options for effective editing. It is recommended as a recognized technique in the WCAG 2.0 guidelines.

8.4. axaio MadeToTag

axaio MadeToTag²⁹ is a paid plugin for Adobe InDesign CS6 to CC to prepare InDesign documents for export as accessible, tagged PDF files complying with the PDF/UA standard.

The MadeToTag user interface is based on a seven-step guide, which leads the user through the creation process of an InDesign file from which to export an accessible, tagged PDF document.

8.5. callas pdfGoHTML

pdfGoHTML by callas software³⁰ is a free plug-in for Adobe Acrobat for converting tagged PDFs into a HTML representation. The resulting view makes it easy to examine the tagging structure and text reflow.

It offers several special views, which help to make the document accessible for people with visual impairments (e. g. contrasts) or dyslexia.

8.6. VIP-PDF-Reader

The VIP PDF Reader³¹ (VIP= Visually Impaired Person) is a non-profit PDF/UA compliant screen reader. It comes with various functions to make PDF documents accessible to visually impaired users as well as to elderly persons or those with cognitive deficits. Users can navigate documents using the mouse or the keyboard. Documents are displayed in reflow. Users can adjust text size and background colour according to their needs and may display images and tables clicking on a button.

²⁸ <https://commonlook.com/accessibility-software/commonlook-pdf-globalaccess/>

²⁹ <https://www.axaio.com/doku.php/en:products:madetotag>

³⁰ <https://www.callassoftware.com/en/products/pdfgohtml>

³¹ <https://www.snab.ch/en/hilfsmittel/digital-tools/the-first-pdf-reader-for-visually-impaired-people/>

8.7. NVDA

NVDA³² (NonVisual Desktop Access) is a free screen reader, which has been developed by an open source project. One of the most popular free screen readers, it enables blind or visually impaired people to access information on a computer. NVDA converts on-screen information to speech and Braille script. In addition, it supports various keyboard commands (shortcuts) for easy handling.³³ This assistive software itself supports the PDF/UA standard, i. e. it correctly interprets PDF/UA-conforming PDF documents.

³² <http://meinnvda.de/?lang=en>

³³ <http://blog.247accessibledocuments.com/2018/10/18/cheat-sheet-screen-reader-commands-for-jaws-nvda-pdf/>

9 Links and resources

9.1. Legal provisions / standards

- Barrierefreie-Informationstechnik-Verordnung (German directive for accessible information technology) - BITV 2.0:
http://www.gesetze-im-internet.de/bitv_2_0/ (in German only)
<http://www.einfach-fuer-alle.de/artikel/bitv> (in German only)
- PDF/UA Standard (ISO-Standard 14289-1):
<https://www.pdfa.org/resource/iso-14289-pdfua/>
- German Act on Equal Opportunities for Persons with Disabilities (Gesetz zur Gleichstellung behinderter Menschen - BGG)
<http://www.gesetze-im-internet.de/bgg/index.html> (in German only)
- Web Content Accessibility Guidelines (WCAG) 2.0:
<http://www.w3.org/TR/WCAG20/>
- EU Directive 2016/2102 on the accessibility of the websites and mobile applications of public sector bodies
<https://eur-lex.europa.eu/eli/dir/2016/2102/oj>

9.2. Resources on BITV 2.0

- BITV-Lotse: BITV 2.0 und PDF (in German only)
http://www.bitv-lotse.de/BL/DE/3_Hintergrundinformationen/3_3_PDF/3_3_pdf_node.html
- Colour Contrast Analyser by Paciello Group (freeware)
<https://developer.paciellogroup.com/resources/contrastanalyser/>

9.3. Resources on PDF/UA

- PDF/UA in a Nutshell:
<https://www.pdfa.org/resource/pdfua-in-a-nutshell/>
- PDF/UA Reference Suite with sample documents conforming to PDF/UA:
<https://www.pdfa.org/resource/pdfua-reference-suite/>
- PDF Association: Tagged PDF Best Practice Guide: Syntax:
<https://www.pdfa.org/wp-content/uploads/2019/06/TaggedPDFBestPracticeGuideSyntax.pdf>

- The Matterhorn Protocol 1.02
<https://www.pdfa.org/resource/the-matterhorn-protocol-1-02/>
- PDF/UA – A Technical Introduction (PDFlib Whitepaper)
<https://www.pdfliib.com/fileadmin/pdfliib/pdf/whitepaper/Whitepaper-Technical-Introduction-to-PDFUA.pdf>
- Video recording: Creating accessible PDF documents with Adobe InDesign:
<https://www.pdfa.org/videoaufzeichnung-barrierefreie-pdf-dokumente-mit-adobe-indesign-erstellen/?lang=de> (in German only)
- Common errors and warnings encountered when using PAC 2 - 508 PDF Help Center:
<https://taggedpdf.com/508-pdf-help-center/>
- YouTube Channel “TaggedPDF”:
<https://www.youtube.com/channel/UCT1tffnD0ICSOH3POUM6zKw>
- YouTube Channel “Metzessible PDF/UA Series”:
<https://www.youtube.com/playlist?list=PLmfVOnJxeSEXsEKv2i20nYMHYuFEcl4fO>

9.4. Tools and assistance for PDF/UA conformity check

- PAC 3 (freeware)
<https://www.access-for-all.ch/en/pdf-lab/pdf-accessibility-checker-pac.html>
- VIP PDF-Reader (free of charge)
<https://www.snab.ch/en/hilfsmittel/digital-tools/the-first-pdf-reader-for-visually-impaired-people/>
- Plug-in pdfGoHTML by callas Software (free of charge)
<https://www.callassoftware.com/en/products/pdfgohtml>
- PDF/UA testing procedure by BITinklusive (available in German only)
https://biti-wiki.de/index.php?title=Einf%C3%BChrung#Vorgehensweise_bzw._Durchf.C3.BChrung_und_Korrektur

9.5. PDF documents from Microsoft Word

- Microsoft Support. Make your Word documents accessible to people with disabilities.
<https://support.office.com/en-us/article/make-your-word-documents-accessible-to-people-with-disabilities-d9bf3683-87ac-47ea-b91a-78dcacb3c66d?ui=en-US&rs=en-US&ad=US>

- Charles Kyle Kenyon. Understanding Styles in Microsoft Word.
<http://www.addbalance.com/usersguide/styleseehtm>
- Microsoft Support. Rules for the Accessibility Checker.
<https://support.office.com/en-us/article/rules-for-the-accessibility-checker-651e08f2-0fc3-4e10-aaca-74b4a67101c1>
- University of Washington: Creating Accessible Documents in Microsoft Word
<http://www.washington.edu/accessibility/documents/word/>
- The National Center on Disability and Access to Education. Accessibility Cheatsheets.
<http://ncdae.org/resources/cheatsheets/>

9.6. Adobe Acrobat DC

- Adobe Support. Workflow for creating accessible PDFs
<https://helpx.adobe.com/acrobat/using/creating-accessible-pdfseehtml>
- Adobe Support. Create and verify PDF accessibility (Acrobat Pro)
<https://helpx.adobe.com/acrobat/using/create-verify-pdf-accessibility.html>
- Adobe Acrobat DC User Guide
<https://helpx.adobe.com/acrobat/user-guide.html>

9.7. Adobe InDesign

- Adobe Support. InDesign / Add structure to PDFs
<https://helpx.adobe.com/indesign/using/structuring-pdfseehtml>
- Adobe Support. Adobe InDesign Accessibility
<https://www.adobe.com/accessibility/products/indesign.html>

9.8. Create, test and remediate accessible PDF

- Creation and implementation of accessible PDF:
<http://www.einfach-fuer-alle.de/artikel/pdf-barrierefrei-umsetzen> (in German only)
- Tipps und Tools für barrierefreie PDF-Dokumente:
<http://www.access-for-all.ch/ch/barrierefreiheit/barrierefreie-pdf-dokumente.html> (in German only)

9.9. Organisations

- BIT inklusiv - Barrierefreie Informationstechnik für inklusives Arbeiten:
<https://www.bit-inklusive.de/> (in German only)

- German UPA (German Usability and User Experience Professionals). Working group for accessibility:
<https://www.germanupa.de/arbeitskreise/arbeitskreis-barrierefreiheit/english>
- German Federation of the Blind and Partially Sighted (DBSV):
<https://www.dbsv.org/dbsv-in-english.html>
- BIK for all:
<http://bik-fuer-alle.de/english.html>
- Bundesfachstelle Barrierefreiheit (Federal Specialist Department on Accessibility):
<https://www.bundesfachstelle-barrierefreiheit.de> (in German only)
- Einfach für Alle: Initiative by AKTION MENSCH for accessible Internet:
www.einfach-fuer-alle.de (in German only)
- Swiss Foundation "Access for All":
www.access-for-all.ch/en (partly available in English)
- PDF Association – PDF/UA Technical Working Group:
<https://www.pdfa.org/community/pdf-ua-technical-working-group/>

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- pp. 13 - 21: Screenshots of the Microsoft Word user interface
- pp. 22 - 48: Screenshots of the Adobe Acrobat Pro DC user interface
- p. 58: Screenshots of PDF Accessibility Checker (PAC) 3.0
- p. 60: Screenshot of the Acrobat Preflight tool
- pp. 63 - 66: Screenshots of Adobe Acrobat Pro DC
- p. 67: Screenshot of the PDF Accessibility Checker 3.0 screen reader preview

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