

Digitization of AV-Material: Extent and parameters

- [Introduction](#)
- [Overview of the files to be delivered](#)
 - [Master](#)
 - [Derivative Copy](#)
 - [Framemd5](#)
 - [Informationen on Scanning \(xml / json\)](#)
 - [Checksum of Audiostream](#)
 - [DPX](#)
 - [Checksums \(md5\)](#)
- [Folderstructure + Extent](#)
- [Digitization parameters](#)
- [Digitization parameters 16 mm Master and Derivative Copy](#)
- [Digitization parameters DigiBeta Master and Derivative Copy](#)
- [Digitization parameters VHS Master and Derivative Copy](#)

Introduction

This document describes the scope as well as the digitization parameters of moving images from the IWF collection. This document will be reviewed at the beginning of a new project and updated if necessary. Changes are noted in the version history, the old versions are stored as PDF.

Version	valid from	Project	PDF	Change compared to the previous version
1.4	30.10.2020			DigiBeta and VHS: <ul style="list-style-type: none">• Information on color_range, color_space, color_transfer, color_primaries, chroma_location, Timecode of first frame are stored at the container
1.3		DIGITIB 2	Digitalisierung_Umfang_Parameter.pdf (german)	<ul style="list-style-type: none">• Test pattern for films is added• Bit depth of 16mm film is 16 bit (before: 10 bit)• Checksum for audio streams
1.2		DIGITIB		<ul style="list-style-type: none">• one checksum file per folder (previously: per hard disk)• optical sound is also scanned with 96 kHz
1.1		RWU		Derivative copy with h265 codec is no longer created, since it can be created from the master if required
1.0		DELFT		

Overview of the files to be delivered

Master

The master is added to the long-term archive as a Preservation Master. Special features for 16 mm Film with sound:

- Optical sound as first audio stream
- Magnetic sound as second audio stream (German)
- Other magnetic tones as additional audio streams (English, for other languages the order is by request)
The language code according to ISO 639-2 shall be captured as metadata tag in MKV (ffmpeg parameter -metadata:s:a:0), for a silent movie the language tag "qno" is captured for the video stream (ffmpeg parameter -metadata:s:v:0)

Derivative Copy

The derivative copy is made available as a copy for use via the AV portal. Characteristics of the sounds:

- an empty audio track for silent films
- for films with optical and magnetic sound, **only** magnetic sound as audio (if the language version is the same)
- if there are several magnetic sounds or sound tracks, a derivative is created for each language version and named with the respective MAM-ID (different) and signature (same for all derivatives)
- DigiBeta: if there are versions with subtitles in the same language as the spoken language/commentary, these will be provided preferentially

Derivatives for color films with extreme color shifts ("red" films): In the case of color films, massive color shifts can be expected in some cases. In case of a strong color shift, we have decided to have the derivatives produced in black and white by the vendor. The master remains unaffected by this decision and is still scanned and delivered with the original color information. The decision from which film title a black and white derivative is to be generated is the responsibility of the TIB. The films will be clearly marked accordingly.

Framemd5

Checksums per frame must be generated from the RAW (DPX, without sound) e.g.: with the command `-framemd5`, so that a lossless conversion is guaranteed. Framemd5 is used to check the lossless compression of the intermediate format DPX into the master.

Informationen on Scanning (xml / json)

Data which describes the scanning process and is created during scanning should be captured and delivered, as these data describe relevant data for scan processing and the condition of the film (e.g. shrinkage). If possible standardized in xml format.

Checksum of Audiostream

From each created audio stream a md5 checksum should be created before embedding in MKV, for example as follows with ffmpeg: `ffmpeg -i INPUT -map 0:1 -f hash -hash md5 -acodec pcm_s24le Signatur_MAM-ID_audiostream1.md5`. Ensure that the correct bit depth is selected. The checksum for the audiostream is used to verify the correct embedding in the master file.

DPX

From the intermediate format DPX (delivered by the scanner) one DPX frame is delivered. Metadata is extracted from this frame during SIP creation to document the intermediate step.

Checksums (md5)

An MD5 checksum is created for each file on the service provider's servers,. This is used to check the correct transfer from the service provider's servers to a hard disk, as well as from the hard disk to our servers.

Folderstructure + Extent

```
MAM-ID_Signatur
| - MASTER
|   | - MAM-ID_Signatur.mkv (1)
|   | - MAM-ID_Signatur.framemd5 (1)
|   | - MAM-ID_Signatur.xml/.json (1, 16mm Film)
|   | - MAM-ID_Signatur_audiostream[#].md5 (0-n)
|
| - DERIVATIVE_COPY
|   | - h264-MAM-ID_Signatur.mp4 (1-n)
| - MAM-ID_Signatur.dpx (1, 16mm Film)
| - MAM-ID_Signatur.md5 (1)
```

Digitization parameters

The digitization parameters differ depending on the analog format:

- 16 mm Film, with the following additional material
 - partly optical sound
 - partly optical sound and magnetic sound, also in multiple languages
 - separate, asynchronous magnetic sound
- Digital Betacam
 - partly with multiple sounds
- VHS

Digitization parameters 16 mm Master and Derivative Copy

Analogue	Intermediate format (delivered by the scanner)	Parameters	Digital Master - Format	MediaConch-Policy	Digital Derivative
Visual: 16 mm	DPX, uncompressed	<ul style="list-style-type: none"> • 2048x1536 (2k) • 16 bit (linear) • RGB 4:4:4 • 24 fps (or according to original) 	ffv1 version 3, mkv, GOP 1, 16 Slices, CRC-checksums per Slice, Coder 1, Context 1, for silent films, the language tag "qno" is saved for the video stream	DigiTIB2_Filme.xml	<ul style="list-style-type: none"> • h264 Level 5, mp4 • CRF 18 • bitrate 8800k • buffersize 2m • Farbmodell YUV420p
Audio: optical sound	raw,	<ul style="list-style-type: none"> • 96 kHz, • 24 bit 	PCM, 96 kHz, 24 bit, language tag according to ISO 639-2		<ul style="list-style-type: none"> • aac, with video in mp4-container, • for silent films: empty audio stream • if there are several magnetic sounds, a derivative is created for each language version and named with the respective MAM-ID (different) and signature (same for all derivatives)
Audio: magnetic sound	raw, (wav-Container)	<ul style="list-style-type: none"> • 96 kHz, • 24 bit 	PCM, 96 kHz, 24 bit, language tag according to ISO 639-2		

Digitization parameters DigiBeta Master and Derivative Copy

Analogue	Intermediate format (delivered by the scanner)	Parameters	Digital Master - Format	MediaConch-Policy	Digital Derivative
Visual: Digital Betacam	QuickTime, Uncompressed, 10 bit YUV hiervon framemd5	<ul style="list-style-type: none"> • 720x576 • 10 bit, • YUV 4:2:2, • 50 fields per second (interlaced) 	ffv1 version 3, mkv interlaced, SliceCRC with 16 Slices, Information on color_range, color_space, color_transfer, color_primaries, chroma_location, Timecode of first frame are saved in the MKV	DigiBeta_V2.xml	h264, mp4 progressive (no interlaced)
Audio: Digital Betacam	raw,	<ul style="list-style-type: none"> • 48 kHz, • 24 bit 	PCM, 48 kHz, 24 bit		aac, with video in mp4-container, if there are several magnetic sounds, a derivative is created for each language version and named with the respective MAM-ID (different) and signature (same for all derivatives)

Digitization parameters VHS Master and Derivative Copy

The digitization parameters, especially the intermediate format, depend on the scanner and its possible output formats. Before digitizing, therefore the service provider should be consulted about which output formats are possible.

Analogue	Intermediate format (delivered by the scanner)	Parameters	Digital Master - Format	MediaConch-Policy	Digital Derivative
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Visual: VHS	<p>Preferred:</p> <p>v210 (uncompressed, 10 bit, 4:2:2, Y'CbCr), hereof framemd5</p> <p>Alternatively:</p> <p>Uncompressed 10- bit YUV, hereof framemd5</p>	<ul style="list-style-type: none"> • 720 x 576 • 10 bit • YUV 4:2:2 • 50 fields per second (interlaced) • Pixel Aspect Ratio: 1.09 	<p>ffv1 version 3, mkv, interlaced, SliceCRC with 16 Slices, Information on color_range, color_space, color_transfer, color_primaries,chroma_location, TimeCode of First Frame are saved in the MKV</p> <p>PCM</p>	VHS_V2.xml	h264, mp4 progressive (no interlaced)
Audio: VHS	raw, stereo	<ul style="list-style-type: none"> • 48 kHz • 24 bit 	PCM, 48 kHz, 24 bit, stereo		aac, mit Video im mp4- Container